Research Centre for Gender, Family and Environment in Development (CGFED)

"VICTIMS OF AGENT ORANGE/DIOXIN IN VIETNAM - THE EXPECTATIONS"

Proceedings of the International Scientific Conference

Hanoi, 16 - 17 March, 2006

"NẠN NHÂN CHẤT ĐỘC DA CAM/DIOXIN VIỆT NAM - NHỮNG ĐIỀU MONG MUỐN"

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Collection from Newspaper

Warm greeting and earnestly entrusting words to delegates of the International scientific conference: "Victims of Agent Orange/dioxin in Vietnam – The Expectations"

Ha Noi, March 16-17, 2006

Nguyen Thi Binh
Former Vice - President of Socialist Republic of Vietnam
Honorary President of Vietnam Association of Victims of Agent Orange/Dioxin
President of Vietnam Peace and Development Fund

On behalf of the Association of Agent Orange Victims and the people of Vietnam, I would like to present warmest greetings to Vietnamese and international delegates.

Dear friends,

The war in Vietnam finished over 30 years but its wounds have never been healed yet, particularly the effects of the toxic chemical/dioxin sprayed by the U.S. Army.

Recently, Vietnamese and foreign scientists have implemented studies in this issue. They have seen that effects of the Agent Orange/Dioxin heavily multi-face influenced on economic-social life, people's health, and environment. Therefore, the requirements for resolving this issue are comprehensive, huge, urgent and can not be delayed.

The Vietnamese State, social organizations, community have implemented some positive policies and acts to assist Agent Orange victims, cleaning environment.

However, problems, which need to be resolved, are still huge and complicated.

We think that it is necessary to continue the scientific studies in medicine, psyco, society, environment etc used as the base for forming the strategy to heal the effects of the chemical warfare, damages of Agent Orange/Dioxin in every fields, particularly to the people's health and impact on heredity etc

Simultaneously, it is needed to have resources, lofted hearts to assist at once victims and their children who bearing sequels stronger than their parents and grand parents, living miserably in diseases and to assist victim who can partly rehabilitate, reducing difficulties for these poor victim families. They are depending on us.

I highly appreciate the Research Centre for Gender, Family and Environment in Development for organizing this conference.

Hoping that delegates, scientists, social workers, donors ... together share information, evaluate the already done works; and more important is to recommend guidelines, solutions to agitate a people's movement domestically and internationally to assist Vietnamese Agent Orange victims more practically and actively. Let us try more for the genuine end of the Vietnam War and by such to learn a lesson for people in the world to protect peace and lives of the people.

On behalf of the people of Vietnam, I express my sincere thanks to international friends especially friends from France, England, Sweden, the United States who have been assisting Vietnamese agent orange victims and supporting the struggle for justice for Vietnamese agent orange victims.

Wishing the conference with a great success.
Thank you for your attention.

Opening remark for the International Scientific Conference: "Victims of Agent Orange/Dioxin in Vietnam – The Expectations"

Le Thi Nham Tuyet

Director of Research Centre for Gender, Family and Environment in Development (CGFED)

To respond to the appeal made by participants at the international conference on the defoliant/dioxin held in France in March 2005 to make clear the harmful effects of the Agent Orange/dioxin sprayed by American army during the Vietnam war and to contribute to the struggle for justice, human rights and peace of the world today and tomorrow, CGFED has continued to carry out researching humanitarian view and to take the initiative in organizing an international conference to show the lasting consequences in all social, economic, cultural and psychological fields that the victims and their families have to suffer and their needs to be met.

We have discussed with our colleagues who have been working with us for several years[1] to deploy a research program and organize an international scientific conference entitled ***"Victims of Agent Orange/dioxin in Vietnam – The expectations"***. During the process of shaping this idea, one day I met Mrs. Nguyen Thi Binh, former Deputy President of the SR of Vietnam, who has devoted her whole life to the cause of peace and development and women's emancipation She told me: *"Try to conduct research on really concrete things that respond to the needs of the victims!"* I clearly understand that the victims' desire should be recognized from their concrete situation in all spheres of their life. Therefore, our research this time should be different from previous ones, bringing one more mission.

On our ten-thousand-mile way of seeking, selecting and making contact with the victims – of course different from the previous times, in this research trip the selected victims were people, who have been undergone blood testing of dioxin level - we met a professor[2] of history, a People's teacher, an old and experienced revolutionary, a theoretician on history and culture of Vietnam. He asked us "*Where do you go?*". When learning that we went "*study on the harmful effects of the Agent Orange/dioxin*", he just said briefly: *"No theory needed regarding Agent Orange! Just need evidences on real persons and real facts!*". It is true that in all over the country of Vietnam the consequences of dioxin have been emerged long time ago. Since 1963 President Ho Chi Minh had strictly denounced the US for spraying *toxic chemical that destroyed living environment in Vietnam*[3]. At an international conference in France, Professor Ton That

[1] Annika Johansson, PhD. Sociologist-Sweden and Prof. Jacques Maitre, Sociologist-France.
[2] Mr. Tran Van Giau, professor
[3] Ho Song Huong, "When did President Ho Chi Minh denounce the US use of toxic chemical to destroy living environment in Vietnam", article printed in Proceedings of the Conference "Victims of Agent Orange/Dioxin in Vietnam – the Expectations", Hanoi 16-17 March 2006.

Tung made a request: "***Immediately stop the use of chemical weapon, herbicides***" since "*Vietnamese women are suffering from abnormal pregnancies and frequently giving birth to babies with congenital defects as a result of poisoning by dioxin contained in herbicides*"[4].

However, we carry the research and organize this conference not only because of that reason but also because of Norman Morrison and many other living torch who fought against the war; because of many friends of ours, such as Frederic Whitehurst[5], who joined the US army as a volunteer, joined the war that was started with the lie, believing wrongly that he was fighting for the freedom on a far-away land, but seeing inhuman behaviors US Army soldiers, right in the battlefield, he turned his gun to his army fellow to prevent him from raping a Vietnamese girl; also because of many other veterans who joined the army for similar reasons, who died or became ill, suffering from diseases due to toxic contamination and now living with their family members, withstanding stinging pain days and nights.

We should not disappoint Jordan Ryan, the former representative of the UNDP, serving two terms of work in Vietnam, as well as other "not-quiet Americans" just like him, who always think about Vietnam and cannot control their sentiment about *"the time when dark cloud was covering the land of Vietnam, the time of losses, sorrows and tears of so many people who are victims of the fearful technology that created a terrible destruction; how many children disabled by the vestige of Agent Orange/dioxin there are, while the technology could be used for good things"*. Therefore, he himself and so many others, like him, *"present here to love other lives and to go to poor people who lack fortune that others have"*.[6]

We also should always remember the Vietnamese scientists, such as Prof. Le Cao Dai and his colleagues both in-country and abroad, who show profound concern about the victims of AO/dioxin, and what to do to avoid disaster of warfare in general and chemical warfare in particular. Their scientific work have been saved and continued by us.

Thus, the reason for continuing the study and organizing this conference, in order to analyze the aftermaths of the Agent Orange/dioxin for the Vietnamese society and to reflect the expectations and the concrete needs of the AO/dioxin victims, is not simply to target to a fair dialog on the so-called obligation!

[4] Reiko Watanuki, 1998, "The Reproductive Health of Vietnamese Women and Chemical Weapons" in Indai Lourdes Sajor (ed.), 1998, Common Ground – Violence Against Women in War and Armed Conflict Situation, Manila: Asian Centre for Women's Human Right (ASCENT).

[5] American infantryman, belonging B company, battalion 5, brigade 198, division 23, who has kept the agenda of the female battlefield medical doctor for 35 years and having tormented with remorse from that one .

[6] According to Jordan Ryan's article on Tien Phong daily on 15 Dec 2005, while finishing his term of office in Viet Nam to move and work in Liberyon.

An American friend of mine, a PhD of sociology, former university professor in the United States[5], used to write : *"Today in Vietnam is the day of offering rice soup for forsaken spirits, so certainly American soldiers, who died in Vietnam, would also have rice-soup with others"*. Right at the time when Vietnam was under embargo, mentioning POW and MIA, she said that she did not believe that there were living POWs and MIAs in Vietnam, she did, however, "*believe that there are many suffering souls, both living and dead, and that this is a problem which needs to be addressed and resolved"*. She considers the Call to Wandering Souls "*a call for deeper understanding of the MIA issue*". In his poem 'Call to Wandering Souls', Nguyen Du, the Vietnamese poet well-known for his humaneness, addressed all helpless and lonely souls, from intellectuals to labourers, from soldiers to beggars, from robbers to heroes, from rich to poor, to all people of different ethnic, cultural, political and geographical belonging ! And there is nothing called **"fairness** in terms of **obligation"**? Vietnamese people always offer rice soup annually on Mid July in lunar calendar to *"Your abandoned souls roam in strange lands! No incense burn for you. High class and low, scholars and illiterates. You wander, helpless, in the night";* and to the soldiers who *"Thousands were killed for the glory of one man. Then came defeat and the battlefield was strewn with corpses. The unclaimed bones lie somewhere in a far - away land. The rain lashes down and the wind howls. Who will now evoke their memory?"*.

In order not to make everyone think this ritual of Vietnamese people too strange and too special, I would like to remind about a story that occurred during the last tsunami about a little baby rhinoceros (Owen) which was wiped away by the great wave and saved by the fishermen. He was sent to the zoo and was fed together with a turtle aged 130 years old (Mzee). From keeping distance to getting closer, after a certain time, the two animals became acquainted and love each other as grand father and grand son, always being in company, not a step away[6]. About this phenomenon, some scientists say that we will never know whether the old turtle and little rhino boy have thoughts or not in their mind.[7] I am re-telling this story at the same time with rice-soup offering ritual in Vietnam in order to reflect on whether the research on needs and how to respond to those needs of Vietnamese AO/dioxin victims, is done with ***"emotion"*** or ***"obligation"***, the two opinions that we cannot help mentioning because of the mock made by the American chemical company when saying: "The *verdict of judge Weinstein is correct" "it is a very important message for many people to understand because there are to much* ***emotion*** *in cases as such!"*[8]

[5] Kristin Pelzer.
[6] According to the photographer Peter Grente, author of the photo grand-father and grand-son Owen and Mzee. Tuoi tre Chu nhat (Youth Sunday) Newspaper, 01.Jan .2006.
[7] Tuoi tre Chu nhat (Youth Sunday) Newspaper, 01.Jan .2006
[8] The speaker of the American chemical company Monsanto Glynn Young. Tuoi tre (Youth) Newspaper, 12 Mars 2005.

It is true that "*the Vietnamese victims of Agent Orange have been forgotten too long*!". That is the words of Mrs. Susan Hammond, deputy director of the Fund for Reconciliation and Development (FFRD), who has given active assistance to bring a suit against the American chemical companies (also very active in seeking budget for continuing research and opening this conference). The existing post-war problem in Vietnam is not only the 4,8 million of victims of Agent Orange/dioxin[9] but also the emerging victims of the third generation, the environment containing toxic substances and bombs and dynamites of delayed explosion that potentially cause daily death, the missing people who are still reminded on the program **"Messages to look for fellows "** run by the Voice of Vietnam and the Vietnam Television for more than 30 years with endless expectation, excitation and hope.

Merle Ratner, an American woman who has been involved in the movement of protestation against the war in Vietnam since she was 13 years old now establishes the **"Mobilizing campaign for help and responsibility towards victims of Agent Orange in Vietnam"** and is actively working with Vietnam Association of Victims of Agent Orange/Dioxin (VAVA). Right after Weinstein refused the law-suit brought by the victims of Agent Orange in Vietnam, she said: *"The survivors of the chemical war done by the Government of the United States have been waiting too long for justice-more than 30 years!"; "If the legal system of the USA failed to bring equity, the American people will do it"*[10] . In fact, Vietnam has walked out of the war since over 30 years, and more than 40 years have been passed since 1962 when the operation of spreading of Agent Orange/dioxin was begun on a large scale covering provinces from the 17th parallel downward. Numerous direct victims of Agent Orange/dioxin have passed away; mothers and wives of the **"villages of orange chemicals"** have followed their sons or their husbands after fostering the hopes and expectations without fatigue for all their lives and finally they must suffer a sad farewell with their off springs of the third generation.

This conference also bear a mission to fulfill the vital expectations of the Red Cross organizations and Agent Orange victim's associations not only in our research sites but all over the country, also including places where there are the victims who used to take part in the war.

Even it is late, if it is not yet accomplished, we need to continue! We have been urged to organise this conference by all reasons mentioned above!

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[10] Nong thon ngay nay (Rural Today) Newspaper 14.Mar.2005.

However, I would like to ask you firstly, to consider this conference as a burning stick of incense in remembrance of the victims of Vietnam and other countries, those who died because of the chemical war carried out by the US in Vietnam and in remembrance of the living torches who had given their lives against this war; it is the same as we place a flower, a candle at the Mall in Constitution Garden of Washington D.C.; secondly, to consider this conference as our gratitude to all those who have devoted and will devote their concerns to the study and support the victim's ! A burning stick of incense, a flower, a candle and a thankful heart of us – CGFED, in this case, is considered not only "***emotion***" but "***obligation***".

Finally, we would like to thank sincerely the participants for your heart and efforts for the sake of the victims, **who have been suffering most long-lasting, most severe consequences of Agent Orange/dioxin**, please receive our profound gratitude.

Hanoi, January 15, 2006

WHEN DID PRESIDENT HO CHI MINH DENOUNCE THE US USE OF TOXIC CHEMICALS TO DESTROY LIVING ENVIRONMENT IN VIETNAM?

Collected and introduced by Ho Song Huong

More than a decade ago, the Center for Natural Resources and Environment and the Youth Publishing House, in response to the proposal of many readers from inside and outside the country, asked scientists Vo Quy, Le Dien Duc, Ho Sy Minh and Duc Vuong to compile the book, "Uncle Ho with the living environment."

The pages from 53 to 85 prepared by Duc Vuong tell us about Uncle Ho's environmental protection activities and strict condemnation against the US for destroying the living environment in Vietnam.

June 29, 1963

Nhan Dan newspaper, edition No. 3380 issued on June 29, 1963 carried Uncle Ho's article under his pen-name Chien Si (Fighter). The article entitled "US-styled peace means fire and sword", said, "the US "peaceful strategy" propagandized by President Kennedy was in fact crimes against the Vietnamese people. The US has dropped napalm bombs and hazardous chemicals over southern Vietnam, killing many people, destroying forests and the habitat and causing severe environmental pollution."

Dec. 23, 1963

Nhan Dan newspaper, edition No. 3556 issued on Dec. 23, 1963 carried a letter by Uncle Ho to a child named Thu Oanh. He accused the US of committing heinous crimes against Vietnam, carrying mop-up and terror operations, spreading chemical agents, burning villages, destroying the living environment and killing people in southern Vietnam.

April 3, 1965

In his message of greetings to the 10th anniversary of the Bang Dung conference, Uncle Ho charged the US with "using the most savage war means in southern Vietnam, including napalm bombs and hazardous gas to massacre civilians regardless who they were."

April 10, 1965

Addressing the second plenum of the 3rd National Assembly, Ho Chi Minh condemned the US as "the bitter they were defeated, the more brutal tricks they used including napalm bombs and hazardous gas to kill our compatriots in the south."

April 14, 1965

Nhan Dan newspaper, edition No. 4029 issued on April 14, 1965 carried Uncle Ho's article signed as Chien Si (Fighter). The article, entitled, "The arch-rogue Johnson speaks of peace while waving fire and sword" exposed the US scheme to use napalm and hazardous gas to kill the Vietnamese people. He wrote, "It is ironically that this man speaks of peace!"

Nov. 14 and 15, 1965

Nhan Dan newspaper, edition No. 4241 and No. 4242 issued on Nov. 14 and 15, 1965 carried Uncle Ho's article pen-named Chien Si (Fighter). The article entitled, "The Japanese people and public opinion warmly support our people's struggle against the US for national salvation", condemned US President Johnson for "using southern Vietnam as a testing ground for new weapons, and using chemical agents to carry out a war of mass destruction against people and the environment."

July 17, 1966

Nhan Dan newspaper, edition No. 4484 issued on July 17, 1966 carried Uncle Ho's appeal, "Nothing is more precious than independence and freedom." Uncle Ho accused the US of using extreme brutal war means including chemical agents and napalm bombs against Vietnam, and carrying out the "burn all, kill all and destroy all" policy with an aim to repress people in southern Vietnam.

July 30, 1966

Nhan Dan newspaper, edition No. 4497 issued on July 30, 1966 carried Uncle Ho's letter to the 12th World Conference against A and H bombs. The letter strongly condemned US imperialists for causing the Hiroshima and Nagasaki disasters to Japan in 1945 and pointed out, "They are carrying the "burn all, kill all and destroy all" policy, destroying the living environment of southern Vietnamese people by spreading chemical agents and dropped napalm bombs over the area."

Dec. 23, 1966

Uncle Ho sent a letter to the American people to mark the New Year. He accused the US of using hazardous gas, chemical agents and napalm and steel-pellet bombs to destroy villages, forests and mountains in Vietnam and kill Vietnamese people.

Feb. 14, 1967

Uncle Ho sent a message to Pope Paul VI condemning the US for savage crimes including using napalm, hazardous chemicals and gas to massacre southern Vietnamese people, and destroying villages, forests, houses, churches, hospitals and schools.

Feb. 15, 1967

Uncle Ho sent a letter to US President Johnson charging the US imperialists with using the most brutal weapons including napalm bombs, chemical agents and hazardous gas to massacre the people in southern Vietnam, destroy crops and razed many villages to the ground.

March 26, 1967

Uncle Ho sent a letter of thanks to the Mexico Committee in Solidarity with Vietnam. He informed the Committee of the US using the most savage war means including napalm bombs, chemical agents and hazardous gas to kill people in southern Vietnam and destroy the environment.

July 31, 1967

Ho Chi Minh sent a letter to the 13th World Conference against A and H bombs held in Japan. He condemned the US imperialists for causing disasters to Hiroshima and Nagasaki and also to southern Vietnam by using chemical weapons to destroy the living environment.

July 20, 1969

Marking the signing of the Geneva Agreement on July 20, 1954, Uncle Ho issued an appeal, denouncing US President Nixon as further accelerating the aggressive war against southern Vietnam, using B52 fighter bombers and chemical agents, causing heinous crimes against Vietnam.

July 29, 1969

Ho Chi Minh sent a letter to the World Conference against A and H bombs, demanding for a complete ban on using nuclear and chemical weapons to destroy the living environment and causing disaster to the labouring people.

August 25, 1969

Uncle Ho sent a letter to answer US President Nixon. In his letter, he further accused the US imperialists of accelerating B52 bombing attacks and using chemical weapons, causing more crimes against the Vietnamese people.

Impact of Chemical Warfare with Agent Orange on Women's Reproductive Lives in Vietnam: A Pilot Study

Le Thi Nham Tuyet, Annika Johansson

During the American war in Vietnam, huge quantities of the highly toxic herbicide dioxin ('Agent Orange'), were sprayed over large areas of central and south Vietnam. In addition to polluting the environment and causing cancers and other diseases in those directly exposed to it, dioxin has caused high rates of pregnancy loss, congenital birth defects and other health problems in their children. This paper reports the findings of a pilot study in the year 2000 among 30 Vietnamese women whose husbands and/or who themselves were exposed to Agent Orange. The aim was to develop research in order to explore the impact of chemical warfare on people's lives. Using the reproductive lifeline and semi-structured interviews, information was gathered on both partners' periods of exposure to Agent Orange, pregnancy outcomes, perceived health problems of children and experiences of living with handicapped children. The women had had a high number of miscarriages and premature births. About two-thirds of their children had congenital malformations or developed disabilities within the first years of life. Most of the families were poor, aggravated by impaired health in the men, the burden of caring for disabled children, and feelings of guilt and inferiority. The plight of 'Agent Orange families' is special and should be placed in its historical and political context.

Keywords: dioxin, reproductive history, pregnancy loss, congenital birth defects, disability, stigma, Vietnam

THE American war in Vietnam ended a quarter of a century ago. Between 1962 and 1971, 72 million litres of herbicides were sprayed from aircraft, trucks and by hand on more than 3.6 million hectares of forest and villages in Central and Southern Vietnam, with the aim of killing all the vegetation. The herbicide was named 'Agent Orange' after the orange bands painted on the drums it was shipped in. In the early 1970s it was discovered that one of the components of Agent Orange (known by the shorthand notation 2,3,7,8-tetrachlorodibenzo-p-dioxin, also called TCDD or dioxin) caused birth defects in animals, and it was banned in the USA and several other countries. In 1971 the defoliant operation in Vietnam was halted by the US military, four years before the end of the war in 1975. It is estimated that about 17 million people living in South Vietnam during the war and about one million from the North were directly exposed to dioxin.[1] Exactly how many died or suffered from the consequences of dioxin is not known. According to Vietnamese estimates, the numbers are in the hundreds of thousands.

Dioxin is described as the most toxic substance discovered by mankind to date. It is very persistent in human tissues and the environment. Dioxin infiltrated the country's water and soil, entering the food chain and accumulating in people's tissues, passing from mother to child through breastmilk. Samples of fish, shrimp and breastmilk collected from southern Vietnamese women in the early 1970s showed very high

levels of dioxin, while decreasing levels were demonstrated in the late 1970s and 1980s.[2,3]

More recent studies, however, have shown elevated levels of dioxin in human blood samples from different localities in Vietnam, the highest being near former US bases with Agent Orange storage facilities and loading areas. An example is Bien Hoa, one of the largest US bases in former South Vietnam, where a spill of Agent Orange occurred during the war. Thirty years later blood samples from Bien Hoa showed extremely elevated dioxin levels - up to 271 parts per trillion (ppt), compared to levels of 2 ppt in blood samples from Hanoi, where Agent Orange was not used.[4] The authors suggest that the high dioxin levels in the blood samples is due mainly to contaminated fish, a typical food in the Vietnamese diet. In a 1994 study, Schecter[5] compared dioxin levels in pooled breastmilk samples from various countries. Highest of all was the city of Da Nang, a former US base in central Vietnam (34 ng/kg, lipid), compared to Thailand and Cambodia with levels of 3 ng/kg. Thus, many years after the end of the war in Vietnam, severe environmental contamination remains, potentially exposing people to serious health risks, including during pregnancy.

Adverse effects of dioxin on reproductive health[6]

Research on American ex-servicemen from the Vietnam war has shown significant associations between dioxin exposure and certain kinds of cancer, including soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, respiratory cancers, prostate cancer and multiple myeloma.[7]

Effects on the reproductive system and the ability to bear healthy children are more long-term and therefore more difficult to establish. It is known that dioxin is an endocrine-disrupting chemical with a highly toxic effect on the reproductive system. Even at very low concentrations, it may seriously disrupt normal reproduction in humans, e.g. lowering fertility, increasing antenatal mortality and the risk of endometriosis, and causing birth defects. Though the mechanisms by which dioxin acts are not clear, it interferes with the production and function of many different hormones, growth factors and enzymes. Its effects and toxicity are much more consistent and severe in the early stages of human development than in adults. Erickson[8] reported higher incidence of spina bifida, cleft lip, hydrocephalus and childhood cancers among children of war veterans than in controls. Stellman[9] demonstrated significantly higher incidence of miscarriages in women whose husbands were war veterans compared to controls, though no increased risk was detected by Wolfe[10] in a similar study. However, data from US war veterans are limited by the lack of information on dioxin level in the blood at the time of conception. The power of the study for detecting an increase in the rate of a specific birth defect is also limited because of the relatively small numbers in the exposure groups.[11]

Dioxin accumulates in breastmilk. During nursing, it is transferred from mother to baby, who may absorb as much as 95 per cent of dioxin in the milk. Evaluations of the impact of elevated dioxin levels in mothers' blood and breastmilk show that the most adverse associations are found with *in utero* exposure through the umbilical cord, including neurological effects, low birthweight and intrauterine growth retardation. Reviewing the scientific literature on the potential health hazards of dioxin-contaminated breastmilk for the infant, however, the TSD[1A] concluded that the adverse effects of dioxin seemed to be compensated for by the beneficial effects of breastfeeding.[7,12]

Case reports and health research from Vietnam suggest higher incidences of miscarriages and premature births, birth defects, low birthweight and childhood cancer in offspring among women who themselves or whose husbands were exposed to Agent Orange during the war.[13,14] Le Cao Dai[15] demonstrated that over five per cent of the children of Vietnamese ex-soldiers exposed to Agent Orange were born with defects, compared to only one per cent among soldiers who remained in the North Vietnam and avoided exposure. The congenital malformations associated with Agent Orange range from anencephalus and conjoined twins, to cleft lip and cleft palate, and limb, facial and auricular anomalies, varying from mild to severe. Harada[16] noted: 'There is no one definite feature of the congenital malformations observed in Vietnam; if anything, diversity is their characteristic.'

The official bodies in Vietnam dealing with Agent Orange investigations are the 'Committee 10-80', established in 1980, and the newly set-up Department for the Consequences of the War at the Ministry of Labour, War Invalid and Social Affairs (MOLISA). The leading NGO is the 'Agent Orange Victims Fund' set up in 1998 under the Vietnam Red Cross, which is recording data on Agent Orange victims province by province, organising rehabilitation centres and mobilising support from local to international levels for Agent Orange victims and other disabled people.

Research on Agent Orange in Vietnam consists mainly of epidemiological or clinical studies dealing with the effects of dioxin contamination on human health and the environment. To understand the social and human dimensions, however, medical information needs to be supplemented with qualitative data. For this purpose, a project was initiated in 2000 by the Research Centre for Gender, Family and Environment in Development (CGFED), a Vietnamese NGO. Its aim is to describe the reproductive lives of women whose husbands and/or who themselves were exposed to Agent Orange during the war and who have given birth to disabled children, and to explore the social and family consequences of Agent Orange contamination.

This article reports the findings of a pilot study among 30 Vietnamese women identified as mothers of 'Agent Orange children'. Its purpose was to gain experience with the reproductive lifeline as a tool to map the reproductive histories of the women and generate more specific research questions.

Subjects and methods

Four different areas were chosen for the pilot study: Quang Ngai in the South of Vietnam (9 cases), Hoa Binh in the North (8 cases), Ha Nam in the North (7 cases) and Hanoi, the capital in the North (6 cases). Quang Ngai province, with Da Nang as provincial capital, was one of the areas most heavily sprayed with Agent Orange. Many soldiers lost their lives in Quang Ngai and an even larger number returned home as invalids. Some areas in Quang Ngai are still heavily polluted with Agent Orange, affecting drinking water and farming soil.[3] Throughout the North, there are a large number of ex-soldiers who used to fight in the most heavily polluted central and southern highlands. The three provinces in the North selected for the study – Hoa Binh, Ha Nam and the capital Hanoi – represent mountainous, lowland, rural and urban areas.

With the help of the Red Cross Agent Orange Victims Fund and the Women's Union in the four provinces, we made a purposive selection of 30 women who had given birth to at least one disabled child and who were known to have a history of Agent Orange exposure in the family. Usually it was the husband who had been exposed, sometimes both husband and wife. All families selected were recognised as victims of Agent Orange by the Red Cross, by the local authorities and by the families themselves. The women were informed about the aims of the study and told that they were free to decline. All 30 agreed to be interviewed.

The women were interviewed in their homes by two Vietnamese social scientists, one male and one female. The instruments used were the reproductive lifeline and a semi-structured questionnaire. The reproductive lifeline is a tool, often used in retrospective demographic studies to minimise recall errors. It is a graphic representation of reproductive events along a time axis, to which we added questions about military service during the war.[17] The interviews started by recording the woman's year of birth and marriage, first and all consecutive pregnancies and their outcomes (miscarriage, abortion, stillbirth, live birth) on a lifeline. To rule out obvious hereditary cases, we asked if the woman knew of any birth defects or other disabilities among her husband's and her own siblings or their children. In a qualitative interview, the woman was then asked to describe the disabilities of her own children, how the child/ren coped with daily life, the experience of managing a family with disabled children and any support she got from relatives, neighbours and the local authorities.

If her husband was present during the interview, which happened in several cases, the male interviewer interviewed him, especially regarding the health of the children and how he was exposed to Agent Orange. Although the families all knew they were being interviewed as 'Agent Orange families', we did not emphasis this aspect in the interview. The only question directly related to Agent Orange was about

whether they had been exposed during wartime spraying and, if so, where and for how long. If the husband was not present at the time of the interview, the wife was asked this question.

The women mostly answered freely, but some questions related to the disabilities of their children were very painful and they were hesitant to say much. However, reproductive lifelines were recorded for all women. Most interviews lasted for about an hour; some were shorter, around half an hour. A medical doctor from the Agent Orange Victim Fund accompanied the team and interviewed the families further, asking for more detail about health problems and the need for rehabilitation and care for the children.

Findings

Most of the families in the study were poor farmers with a bare minimum of existence and meagre nutritional levels. A few families in Hanoi had a somewhat higher standard of living. In all cases, the husbands had been soldiers in Agent Orange sprayed areas, for periods from three to eight years. Some of the women had either grown up in areas where chemical spraying took place or had worked as youth volunteers in such areas.

The majority of the women had passed reproductive age and were living with one or several disabled children who at the time of interview were in their teens or older.[18] The mean age of the women was 50. The oldest was born in 1938 and the youngest in 1965. The mean age at marriage for the women was 23 (range 20-34). One third of the women had married after age 25, which is considered late for woman in rural areas, but this was common during the war years due to men's long absences.

The 30 women had had a total of 148 pregnancies, of which 9 per cent had ended in miscarriage and 14 per cent in stillbirths or premature births. Of the 108 children born alive, 14 had died before the age of five and four had died at older ages.

Sixty children (66 per cent of all children born alive) were described by their parents as disabled in some way. Most had been born with some visible malformation or disability (37 per cent) while others had developed a disability during the first years of life (27 per cent). Of the 60 disabled children, 40 were described by their parents as unable to attend school, but able to help with agricultural work and domestic chores. Twenty children were very severely disabled physically and mentally, and had to be attended by their parents for every daily need. Some never left their beds and were unable to utter a meaningful word.

There were no cases of congenital malformation or other disabilities among siblings of the husbands and wives respectively, nor among the children of their siblings.

Case histories

Be

Be is from Ha Nam province, the oldest of the 30 women. The family is very poor and food is short several months per year before harvest. Be was born in 1938 and married Huan in 1959. They had two healthy boys in 1964 and 1966; both sons are now married and have children. In 1968 Huan joined the army and spent three years in Quang Nam-Da Nang. He got sick and was demobilised in 1971. Since then his health has been very bad; he has skin rashes, gets frequent headaches, pain in the joints and feels very weak.

In 1971 they had their third child, a daughter. She is 'slow' and unable to learn, still unmarried (at 29 she is considered too old to find a husband) but she is now the main labourer in the family. In 1974 Be had her fourth child, Thu. This girl was 'unnatural' at birth, she cried a lot and did not grow normally. She was taken to hospital several times but the doctors gave no hope. At 26, Thu is unable to take care of herself, she is always angry and cannot be left alone. A fifth daughter, born in 1976, has developed normally and is now married.

At first, Be felt 'inferior' because of her disabled daughters. She and her husband did not know the reason for Thu's problems. But they have heard that several of her husband's friends who had been in Agent Orange areas during the war have also had disabled children. The neighbours show sympathy and her husband is also very supportive. But he is weak and no longer able to work, so Be has to work very hard although she is quite old. Their greatest worry is who will take care of their disabled children when they get old and pass away.

Normally in rural Vietnamese families, husband and wife share in agricultural work. In many of these families, the impaired health of the husband due to Agent Orange contamination and other war injuries means that the wives, like Be, have had to carry major responsibility both for farming and the children.

Dieu

Dieu, aged 54, is from Hoa Binh; she was married at age 30 to Bieu, who was the same age. They had fallen in love when they were young, but as he was in the army from 1966 to 1975, they had to postpone marriage. Bieu fought in Quang Nam-Da Nang for the whole period and was contaminated by Agent Orange. He was wounded and came back a war invalid. One year after marriage they had a son but he was weak and died at seven months of age. In 1978 their first daughter was born, a healthy child who is now married and has a son. The third child is deaf and dumb but can work tending the cattle and doing heavy farm work. The next child, who died at two months of age, was weak in ways similar to the first child. The two following children are mentally normal but have skin rashes all over their bodies, strange stomach pains and feel itchy and get swollen arms and legs in winter. Dieu took them to the doctor but never got any help for their problems, and now they cannot afford doctors. Her husband, who had been in poor health since he was demobilised, died in 1997. Now she is alone with three handicapped children. Her brothers and neighbours often visit and help the family with clothes, and the local authorities pay for books and pens for the children. She feels unable to care for her family; instead, her children have to take care of her.

Tam

Tam and Quy are from Quang Ngai province, where both grew up. Quang Ngai is known as one of the most fierce battlegrounds of the war and was heavily sprayed with defoliants for many years. Tam was born in 1953 and joined the youth volunteer force in the mountainous areas between 1963 to 1967. She married Quy in 1975 when the war was over. Quy was in Agent Orange sprayed areas between 1963 and 1972. He is now a war invalid, with frequent headaches and pain from his war injuries. They had their first child in 1977, a son. He was very small at birth and remained weak, with deformed arms and legs, and died in 1998. Three consecutive pregnancies resulted in two premature births and one baby who died soon after birth. In 1983 a boy was born, who grew up normally. After two more premature births where the babies died, Tam gave birth in 1987 to another daughter who is severely disabled. She cannot sit, her body and brain did not develop and although she is 13, she looks as if she is 6.

Lan

Lan is a retired teacher, living in relatively good material conditions in Hanoi. Lan was the third of 11 siblings. Born in 1941, she went into teacher training and married at 22. Lan's husband, Duong, was born in 1935 and was trained as a doctor. Between 1963 and 1969 he was a military doctor at the battle fields in Quang Tri. During the spraying in Quang Tri, Duong reported, all vegetation was completely burnt, and he and his friends had to dig hide-outs under the bamboo trees and cover their faces with damp cloths to avoid inhaling the terrible smoke. Their first child was born in 1965 and died at birth. The second son, Lam, seemed normal at birth but gradually it became evident that something was wrong. At 31, the boy only weighs 35 kilos, he cannot control his movements, eat by himself or utter a meaningful word. He needs constant help from his parents. They consulted many doctors, but in vain. Longing for a normal child, Lan gave birth again in 1971. The daughter seemed healthy at birth, but sadly, her neck was too soft and she died when she was three months old. The same thing happened to a baby boy, born two years later: 'How painful it was, the baby had curved arms and was very weak. He also left us forever at three months. What a tearful time it was for me, there was nothing left... As a wife and mother, I always feel tormented and lost... My husband, too, suffers great pain and blames himself for bringing us despair.' They gave up the idea of having another child, and are helped by the encouragement and support of neighbours and relatives. Among Duong's friends from the army, several have suffered a similar fate to Duong.

It was evident from the interviews that the women had been under heavy physical and

mental strain for many years from pregnancy loss and bearing and caring for handicapped children, some of whom had died at early ages. Their burden of work was often extremely heavy, especially in cases where the husband was wholly or partly a war invalid. Sons and daughters who were physically fit often had to shoulder the responsibilities of caring for disabled siblings, farming and household chores. Both parents felt deeply worried about the fate of their disabled children when they themselves would get old and pass away. Some husbands expressed feelings of guilt that their misfortunes were self-inflicted and that they had brought unhappiness to their wives and children. Many women said that they felt inferior for not being able to give birth to normal children. One family had had seven children in the hopes of having a normal son, only to have more miscarriages and disabled children. Some of the women interviewed had as a last-resort 'asked for a child' from another man. These cases were described discretely to the interviewers by neighbours or the Women's Union leaders.

Some families had received help from the local authorities and from the Red Cross in the form of disability aid and financial support to enable their disabled children to be trained and rehabilitated. Neighbours were often cited as helpful, but the women often felt 'ashamed' to ask neighbours for help. Most families were caring for their disabled children at home themselves.

Using the reproductive lifeline

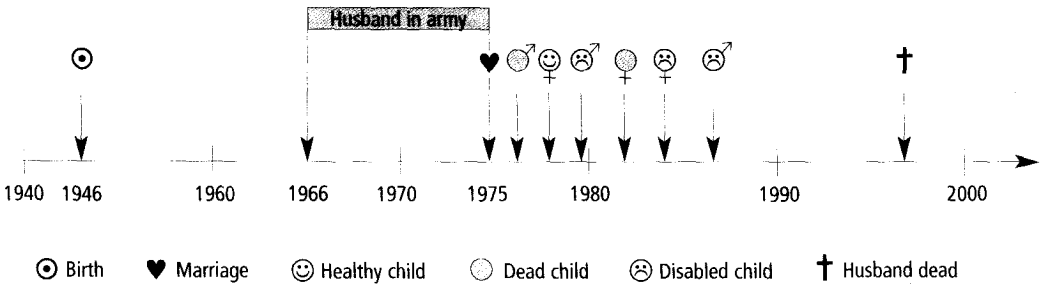
One aim of the pilot study was to gain experience of using the reproductive lifeline as a tool to minimise recall errors and to give a 'backbone' to the interview. Recall errors are common in retrospective studies. The idea of the reproductive lifeline is that by giving a sense of inter-relatedness and coherence to events, the likelihood that relevant events are omitted will be reduced.[19] Our impression from the pilot interviews was that the visual presentation of the lifeline helped the women to recall the timing and sequence of pregnancy-related events, including pregnancy losses. Together with the interviewer the women would try to recall these events by relating them to other events, such as the end of the war or their own marriage, the year the family moved to a new house, etc. In this way, they contextualised their pregnancies and births, and also had the chance to describe their experiences and feelings. We believe that this method was well-suited for interviewing this group of women, who had had many pregnancy losses and generally troubled reproductive lives.

Caspi et al[19] also point to the advantages of event history data (as collected with the help of reproductive lifelines) over longitudinal data collected at fixed points in time. They point out, however, that retrospective event history reports have only been validated against earlier self-reports and that there is no real proof of their greater accuracy. Although our impressions were that the reproductive lifeline data reported by the women were accurate, we have no test of validity or accuracy for the data. In future research, several measures can be taken to enhance the accuracy of data.

Belli[20] points out two particular methods to enhance the accuracy of retrospective recall. One is the use of 'landmarks' to aid the dating of events. By connecting to easily remembered event, the less-easily remembered events may be more reliably recalled. As mentioned above, the 'landmark' method was frequently used in our study, both spontaneously by the women and sometimes prompted by the interviewers. The reference to the end of the war was the most common and, for our study, appropriate landmark. However, the use of landmarks was not fully developed in the pilot study. A more systematic use of locally specific landmarks will be important for further research with Agent Orange families to enhance the accuracy of data.

The effectiveness of using landmarks depends, according to Belli,[20] on their effectiveness in conjuring up associated information regarding other events, both in terms of what happened and when. This, again, was done spontaneously by the women in our study but on an ad hoc basis. Structuring the interviewing to encourage the use of parallel retrieval more systematically will be important in further research. A related component lies in the training of interviewers. Researchers have noted that training interviewers to use the life-history calendar is more time-consuming than for an ordinary survey. It requires, for example, spe-

Dieu: reproductive lifeline



cial skills in being able to encourage 'parallel retrieval' through proper probing techniques. For the pilot study, we spent relatively little time on interviewer training as we were not so aware of the special skills required. This will be an important aspect in further research.

A second aim of the pilot study was to identify more specific research questions. Two main themes for research related to stigma and agency emerged from the interviews. It is known in Vietnamese culture that parents with disabled children may hide them for fear of being blamed or not being able to marry off their healthy children.[21] Feelings of stigma[22] associated with having disabled children were not uncommon among both the women and men in this study. Mixed with this was a sense of inferiority at not being able to have healthy children. The failure to give birth to a healthy son was felt as particularly heavy, as Vietnamese culture strongly emphasises the need for a son to continue the lineage and to care for elderly parents. Whether the stigma associated with having 'Agent Orange children' differs from the stigma that parents of other handicapped children may feel is an important issue to explore further.

The question of whether there is also social discrimination against 'Agent Orange families' and their disabled children is also an important topic for further research. We found no indications of discrimination against the 30 families, but we did not ask specifically about this. It is likely to be a highly sensitive issue, however, that will require delicate probing by skilled interviewers and possibly combining interviews with focus group discussions, where community attitudes and values may be more easily discerned.

'Agency' is based on the notion that 'individuals are active creators of social life'.[23] Linked to agency is the notion of 'entitlement', which can be described as the subjective component of rights – what a person feels entitled to rather than what formal rights they claim. Based on research in different cultures, Petchesky[23] hypothesises that most women, however poor and uneducated, act consciously to negotiate their reproductive rights and needs, based on a sense of entitlement.

An interesting lead for further research would be to explore whether this finding from multicentre research in seven countries in the 1990s applies also to 'Agent Orange families'. Preliminary findings from the pilot study seem to indicate that many of the women had reached the limit of physical and mental exhaustion where there was little space for agency beyond mere survival. Stigma appeared to interfere to some extent in this struggle. Although we did not ask what they thought the cause of their misfortunes was, the women themselves usually mentioned Agent Orange as the cause. There was a time element in this; many said that 'before' they did not know the reason why they were having disabled children, but more recently they had become aware of others with a history of Agent Orange exposure who, like themselves, had had disabled children. However, none of the women expressed a sense of entitlement to assistance or compensation; rather they expressed a sense of resignation to their fate.

What is special about 'Agent Orange families'

The families in our study were recognised by the local authorities, the Red Cross and them-

selves to be 'Agent Orange families', i.e. with records of Agent Orange exposure of the husband and/or wife, and with disabled children. It is difficult and very costly to establish a genetic association between parental dioxin exposure and disabilities in children in individual cases. This was not the aim of our study; rather the aim was to explore the situation of families who are socially recognised as victims of Agent Orange. At the individual level these families' problems are similar to those of other families with handicapped children - all are equally in need of support. Myths and stigma associated with handicaps in children can be dispelled through public education, based on sound knowledge of social perceptions of and attitudes to handicaps.

However, at the societal level the plight of 'Agent Orange families' is special and should be placed in its historical and political context. The impact over time of the largest chemical warfare in history on families and individuals in Vietnam should be highlighted, described and given a human face. This pilot study has been valuable for further research to this end.

'Vietnam is now a country at peace, extending hands to former enemies, but the victims of Agent Orange will never live in peace.' (Lan, a woman in the study)

Acknowledgements

We are thankful to all the women and their husbands who opened their homes for us and shared their often very painful experiences and memories, the local Women's Union and Red Cross who were helpful in identifying the families, Dr Le Cao Dai of the Agent Orange Victims Fund, Vietnam Red Cross, who has been a source of inspiration and information for the whole study, and Dr Pius Okong for valuable comments on the draft.

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7. *The American People's Dioxin Report 1999, Technical Support Document* (TSD).
8. Ericson, 1984. Quoted in [7], p50.
9. Stellman, 1988. Quoted in [7], p50.
10. Wolf, 1992. Quoted in [7], p50.
11. Over 20,000 American ex-servicemen have received compensation from the US government for diseases caused by Agent Orange. Spina bifida is so far the only birth defect accepted as grounds for compensation to war veterans' children. No compensation has been paid by the US government to the Vietnamese people for the damage caused by Agent Orange.
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Résumé

Pendant la guerre américaine au Vietnam, de grandes quantités de dioxine hautement toxique (« l'agent orange ») ont été pulvérisées sur de vastes régions au centre et au sud du pays. Outre qu'il a pollué l'environnement et causé des cancers et d'autres maladies chez les personnes directement exposées, cet herbicide a provoqué de nombreuses fausses couches, des malformations congénitales et d'autres problèmes de santé chez leurs enfants. Cet article reprend les conclusions d'une étude pilote menée en 2000 auprès de 30 Vietnamiennes dont les maris et/ou elles-mêmes avaient été exposés à l'agent orange. L'objectif était de mettre en lumière l'impact de la guerre chimique sur la vie des gens. Avec les historiques génésiques et des entretiens semi-structurés, des informations ont été recueillies sur les périodes d'exposition à l'agent orange des deux partenaires, l'issue des grossesses, les problèmes de santé perçus chez les enfants et la vie avec des enfants handicapés. Les femmes avaient eu beaucoup de fausses couches et de naissances prématurées. Les deux tiers de leurs enfants présentaient des malformations congénitales ou avaient développé des handicaps pendant les cinq premières années de leur vie. La plupart des familles étaient pauvres, pauvreté aggravée par la mauvaise santé des hommes, la charge des soins aux enfants handicapés et les sentiments de culpabilité et d'infériorité, particulièrement chez les couples ayant des enfants gravement handicapés et aucun fils en bonne santé. Le sort des « familles de l'agent orange » est particulier et devrait être placé dans son contexte historique et politique.

Resumen

Durante la guerra norteamericana en Vietnam, se rociaron enormes cantidades del herbicida altamente tóxico, dioxina ('Agente Naranja'), sobre grandes extensiones del territorio central y del sur de Vietnam. Además de contaminar el medioambiente y causar cánceres y otras enfermedades en las personas que fueron directamente expuestas, la dioxina ha causado tasas elevadas de pérdida de embarazo, malformaciones congénitas y otros problemas de salud en los niños. El presente es un informe de los resultados de un estudio piloto del año 2000 realizado con 30 mujeres vietnamitas o sus esposos, o ambos, que estaban expuestos al Agente Naranja. El objetivo era revelar el impacto de la guerra química en las vidas de las personas. Se utilizaron la línea de vida reproductiva y entrevistas semi-estructuradas para recopilar información acerca de los períodos de exposición al Agente Naranja de cada pareja, los resultados de los embarazos, los problemas de salud percibidos en los niños, y sus experiencias viviendo con niños discapacitados. Alrededor de dos tercios de los hijos presentaron malformaciones congénitas o manifestaron discapacidades durante los primeros cinco años de vida. La mayoría de las familias eran pobres, más aún a consecuencia de la mala salud de los hombres, el sobrecargo que significaba el cuidado de los niños discapacitados, y los sentimientos de culpa e inferioridad, especialmente entre aquellas personas que tenían varios hijos discapacitados y ningún hijo varón sano. La situación penosa de estas familias afectadas por el Agente Naranja debe ser ubicada en su contexto histórico y político.

THE EXPERIENCE OF THE FAMILIES OF AO VICTIMS*

Jacques Maître, Sociologist, CNRS
Bernard Doray, Psychiatrist

The dangerous effects of the herbicides spreading almost on the south of Vietnam have been analyzed by the scientists for 3 decades in particular with the biological disciplines and the natural sciences. In this paper, we will pay attention to the experiences of the families whose lives are dramatically devastated by the consequence of the residual herbicides and/or by the toxic effects of the dioxin present in the herbicides.

The paper's title focuses on the herbicide's topic because it is necessary for us to distinguish the seriously contaminated regions and the rest of the lands on the geographical map, and also distinguish the destruction of the vegetations and the effects of the intoxication by dioxin. Devastations by dioxin among the infected people as well as in their children are currently found in families dispersed across the country due to the migrations, and especially due to the contaminated soldier coming from all the regions of the country, including the North. These devastations reach a much higher density where all the people were infected and where the habitants are in the danger of being infected by the residual dioxin in the soil. In addition, the herbicides devastated mainly the forest areas. When that was not the mangrove along the sea shore or the rubber plantations, the objective would be rather the mountains where the target was to destroy the tropical forest – homes of the "ethnic minorities", the hunter gatherers who generally practice agriculture and husbandry in a rudimentary way. Furthermore, the purpose of defoliation often was to destroy the food crops, to starve the population and the combatants.

The families dispersed in the country

For a long time, the socio-medical departments and assistance associations to the victims often came to see the families to evaluate their needs and to discuss with them. Apart from certain cases, it was also necessary to take an overall view and to define which disorders could be attributed to dioxin. By this method, the discussions with the families must be the commence on the medical level, with an epidemiology of the handicaps, and link them to their origin (by assumption, the exposure of the parents to dioxin) and to their pathological or socio-economic consequences (disabilities, misery, disturbance of the social life, financial burden of the treatments). At the moment, it is impossible to carry out biological examinations proving that dioxin is the cause of the

* French – Vietnamese Friendship Association, 2005, "Agent Orange in Vietnam, yesterday's crime, today's disaster", Paris: SARL Editions Tiresias

infected cases, and due to the lack of awareness of the real dimensions of the plague, it was necessary to start with an initial family assessments within the concerned population. In spite of the constraint of medico-social demonstration, the published results already make it possible to give us significant data of the private psychical suffering. The social surveys carried out to evaluate the "needs" of the victims also made it possible to recognize the experience they have spent. Finally, the discussion resorting to a method called "non-directive" could be conducted especially to listen to the expression of the suffered person and families, stated freely under the social control. In this domain, the CGFED[1] has played, for several years, a pioneer role through the interviews with the mothers of "children of dioxin" in different areas of Vietnam. The diffusion of this work initiated the on- site research in the field of social sciences.

Dynamic and Cultural Subjective

The psychical suffering

Initially, there is a fear of the future prospect of the affected children. In the short term, it poses the problems of education, of occupation and medical care. Besides, the parents always worried about what will occur after their deaths. This fear is mentioned many times in the presented cases. A worry appears with the sequence of the generations: the child heavily handicapped will not be capable of satisfying the demands of the parents when they are old, nor to perpetuate the "worship of the ancestors". This worship, a unique element of Vietnamese culture, rests on the basic family value, the inherent sequence debt of the generations through the respect, the love and the solidarity, which connects each one to those which preceded it in the line. It appears through the rituals related to death, the indoor ancestral altar in almost all the houses, the devotion to the parents and grandparents still alive, ect. Traditionally, the solicitude of dead people with regards to their descendant remains conditioned by the way in which the latter honor their debt. Reciprocally, the posthumous destiny of the dead depends on the way in which the living discharge their debt: deaths insufficiently honored become "wandering souls" unhappy and potentially vindictive.

But what is generally expressed in the parents of a handicapped child by dioxin is the pain of knowing that the child will not have nobody to rely on once he becomes orphan.

The desire to have a normal child can result in requiring an artificial insemination, if medical and cultural conditions allow. While waiting, the scandal-bearers sometimes assign illegitimacy to the in-handicapped children in the family. In some cases, the fear to have another abnormal child led to a voluntary termination of pregnancy.

Another fault in the dignity of the family is the shame generated by the infirmities of the children, in particular within a cultural tradition where misfortune indicates the weight of the ancestors' faults. The shame is prolonged with the failures of the matrimonial

[1] Research Centre for Gender, Family and Environment in Development, located at Hanoi and managed by Le Thi Nham Tuyet

projects when the presence of a "child of dioxin" is considered as the sign of passing malformation to the descendant of the family. Even an unharmed young person will be possibly regarded as carrier of the genetic disorder, therefore suspected to be able to transmit the fault to his offspring.

The cultural sphere

Considering the relationship between the social, the biological and the subjective factors, it requires a significant reference to the culture sphere, in Vietnamese culture in general and the differences of the various areas and family traditions in particular.

One thinks of the characteristics of the cultural references when concerning the "ethnic minorities" (15%) or religion: Catholicism (8 to 10%), Protestantism, without taking into account other religions in Vietnam like the Cao Dai or Hoa Hao. To tell the truth, even the majority traditions combine different religions (Confucianism, Taoism, and Buddihsm) and popular religiosities (in particular female) whose impact is particularly life, the explanation of misfortune, conspiracy of disease, death. For example, the worship of Quan Am, Goddess of Mercy, is particularly widespread among women and we met woman who entrusted to a priestess of Quan Am her daughter suffering from a handicap related to dioxin.

The culture plays an important role in the ideological plan in the representation of the causes of the handicap, as well in connection with the material causes as in reference to spirituality. The "destiny" is often evoked in the discussions with the families. It is necessary to know how this "destiny" is concretized: karma, bad spirits, will (punishment or redemption) of a supernatural being, evil spell? It is also necessary to disentangle the traditions which impregnated religious or irreligious socializations of the interlocutors in a country where the influence of Buddhism is largely spread, but where one also finds Catholicism. "sects", "new religions" and the specific traditions to each ethnic minority, without considering the diffusion of Marxism by the political regime. On a more subjective level, it is clear that we should listen to the way in which the religious diagram is invested affectively compared to the handicaps of the children: culpability, persecution, etc.

Medical Dynamics

Dioxin is recognized as the cause of handicap

We know that it is still very difficult to prove, medically, the part of dioxin in many cases of malformations or mental wounds. Moreover, for the families, the scientific explanations of the handicaps are not very clear and satisfied, as the stories of the mothers:

Everyone says that my son is victim of the orange agent. I do not know why. I do not know either which area is infected by the Agent Orange. But we have been living here since we were young. We are now very sad, but we must suffer it.

Said another:

My elder brother has five sons. They are now married and have no problem. Nobody has the case as me. People who come here often say that I am unlucky women.

Indeed, the administrative classification of handicap cases caused by dioxin comprises economic consequences because the material aids depend on it; even small compared to the rich countries like ours, these aids are vital for the families.

Birth control

Even in very remote regions, we met quite often the contraception methods using the morning-after pill provided by the local dispensary; this social activity goes with the policy to restrain the population growth. Male or female sterilization also makes it possible to interrupt the succession of misfortunes on several generations, while meeting the policy. On the other hand, the antenatal diagnosis has not been conducted yet for the people we met.

The cost of the care

The cost of medical care is very high for the Vietnamese families. On this point, the advantaged granted to the children recognized as victims of dioxin remain insufficient. In case of surgery, the poor family must alienate their assets (to sell the buffalo, to be involved in debt, etc.) or to wait for the donations from kind-hearted people or associations. The difficulty of access is even added to the obstacle of distance for people who live far from the well-equipped hospitals, or in badly traffic served regions.

The resource to traditional medicine raises the question of therapeutic effectiveness, and also the ideological problem, particularly for the representations of etiology or acceptance of scientific medicine. Inexpensive and more geographically easy to access, the traditional medicine today still plays a central role in the treatment of the defoliants' spreading consequences.

Economic dynamics

Today, dioxin can have bad economic effects on the flora, fauna and water. Thus we must take into account the biological processes in the analysis of economic dynamics. However, what we propose here is to emphasize the social and psychic factors. Furthermore, the sequel of the defoliation and the intoxication by dioxin strongly influence the factors of poverty, even including the marginalization.

Culture comprises an impact on the economy, for example the specific production method of one ethnic minority group is also plays an important role in the extended family, even with the neighbors.

The effects of dioxin on health of the parents and the handicaps of the children pose an essential factor: the budget-time of the members of the family. The available working time depends obviously on disabilities and schooling; for example, the father usually suffers from the consequences of his intoxication by dioxin, the war wounds and/or diseases like paludism. Besides, the time is partly taken by domestic chores and the care for handicapped people.

At last, the future of the children and that of all the family depend directly on schooling. The disadvantaged children need schooling more than others, whether it is about the general education or special schools for the handicaps; however, it is usually very difficult for them to move. School tuition is another burden for these very poor people.

Minority ethnic groups the High – Lands

Our work with the CGFED was focused on the relation between the social one and the subjective one, starting from the way in which the victims of dioxin (mother, father, child, family) express their psychic sufferings in a situation in which the objective data (medical, economic, school, social, etc.) are systematically collated. The method through the short stories of lives collected in a very little directive way provided us an adequate document. As for the location, we did decide to go to the High-Lands of the Centre, about sixty kilometers from Hue, into the district of A Luoi (at the borders with R.O.P Lao), where more than three quarters of the population belong to ethnic groups: Pa Co, Ta Oi and Ca Tu. As predicted, the interviewed families situate in one of most stripped regions which are isolated by poverty, geography and cultural uniqueness. They do not speak even the national language. This in – field work will be used to emphasize the special situation of a district where the inhabitants are the most vulnerable to the disaster. It is noted that the majority of our observations could not be the same for the whole country.

Problem adjusted to the religions

Until the 1950s, these people made up groups living at an altitude within the primitive virgin forest. Completely immersed in the ecosystem of the natural environment, these hunters-gatherers carried out a rudimentary agriculture: slash-and-burnt farming. Their vision of the world was set up around the pre-Buddhist beliefs; the personified “deities” represent the natural forces on which depended the human groups such as the god of the forest, that of water, of rice, ect. During the French war, the troops engaged in the re-conquest of the country started to patrol on the high lands and built an air base there. Such an occupation was accompanied by the usual exactions in the colonial conquests.

The people had to defend themselves and took part in the armed struggle of the Vietnamese for their independence. The Pa Co, The Ta Oi and the Ca Tu found their recognition in the history and for the first time, their dignity was recognized on the national level. During the American war, their role became essential because the Ho Chi Minh trail passed precisely by A Luoi, and that United States has created three military airports on the high-lands. Several big battles took place in the area. However, the United States Air Force conducted in an intensive way the defoliation of the surrounding mountains and high-lands, which caused the disappearance of the forest and saturated the inhabitants with dioxin. Today, people grow plants on the high-lands, practice agriculture and husbandry following the long-term development plans. The God of the forest disappeared with the ecosystem of which he constituted the vital element. Such a change of the production method requires a very concrete integration of local authorities in their cooperation with the Vietnamese Government, including the participation of local officials in the process of development. But economic dynamics does not improve the quality of life of the poor peasants who make the majority and still live in a very precarious economic situation. For the handicapped children, the medical care access remains extremely limited by the distance, the cost and cultural inequalities. Their schooling is itself dependent on these difficulties. In addition, there exist endemic diseases, lack of drinking water and the effects of poverty (malnutrition, financial limits in the access to care). In contact with the families struck by dioxin who live in the remote areas, where the differences between city and countryside are growing, our co-operation with the CGFED allowed us to share the stories with the families which are most effected by the war, and which are most affected by the war, and which have most difficulties in the development process.

The relation of social and subjective factors

The destruction of the forest and the disturbance of the transmission of the human life constitute major attacks on the biosphere. They involve not only the terrible material consequences but also ruin the social bonds by breaking the available symbol which used to represent the human relation to nature. It is possible to restore the social relations and to replace the damaged visions of the world mechanically by regrouping the villages, re-dividing the regional territories, schooling and information campaigning, etc. An essential part of the rebuilding of the social relations is played on the level of the subjective life of each one and at inter-subjective level in the family. In Vietnamese culture, it is not a tradition to claim or to complain. We come, without holding any economic or administrative power on the interlocutors, to rouse and listen, in a in-directive way, to the histories of life. We have found this method suitable to produce an innovation in exchange, while privileging lives as it is felt. Even the possibilities of a microeconomic family initiative (for example, the State offers a loan to those who agree

to buy oxen to promote the rise of husbandry in the district) also depend on the psychic resources to carry out such an activity.

If one concentrates on building a new vision of the world, it is necessary to take into account the degree of obsolescence of the traditional representations and expression processes, then to seize the innovations in progress. Thus, in the families we visited, we did not see the ancestors altar (popular among the Kinh, the minority ethnic group in Vietnam), but the photographs of "the Uncle Ho", surrounded by the frames where the military distinctions obtained by members of the family are presented. In the same way, many Pa Co gave up their patronymic names for "the Ho" name, to the point that the taboo of traditional food related to such patronymic names become no longer important. To know how such a reference to the uncle Ho has any impact in the way of thinking and of exchanging in the family, it is necessary to give oneself the pleasure of listening. In particular, how they feel about the crucial questions related to the handicapped children: "Why that happens to me?". "Why that happens to us?", "If the man power cannot cure our children, to which superhuman force will we return?" Or there exists no force?". In the same way of feeling in the, even in the mind of each one, what is the real impact of the official speech (political, medical, humanity, etc.) about dioxin?

Conclusion

The devastation consequences of the sprayed defoliants have been dramatically amplified by one century of colonization, finished by thirty years of war. The fast economic development in the current period is still far from to have already ensured for the Vietnamese people the means needed in an industrialized country for environmental restoration, for looking after the victims with modern medical treatment and for ensuring the families of the children with Social Security protection, in comparison with the standards of countries like France, Germany or the Scandinavian countries.

In addition, an anthropological analysis of the situation emphasizes the particular cultural conditions of Vietnamese struck by the long-term defoliation and/or effects of dioxin. Thus, the religious practice and beliefs, the family structures and the recourse to traditional medicine hold a considerable place in the personal and collective impact of the catastrophe. These factors act differently in certain ethnic group (for example, if the worship of ancestors results in wanting a descent), the explanation of the evil, etc. The particular attention paid here is to the Western Highland's minorities who represent well this type of social processes found in various manners in all the areas.

Lastly, the contribution that we can bring to lightening misfortune registers today is within the framework of the Vietnamese economic development; new possibilities take shape, including bandaging the wounds of the war. The alteration of the Ho Chi Minh trail into a "highway of unity" from the Chinese border to the Southern end of the

country embodies the will to disenclose the Western Highland throughout the "Indochinese" mountain range, and this new way crosses throughout the district of A Luoi.

However, currently the big gap between the standard of living of Vietnamese peasants and that of urban citizens has particularly revealed the problems mentioned here. Moreover, the population of which the natural environment was most heavily devastated and the families underwent the intoxication by dioxin are the ones to take the least share of benefits from development. Therefore, they have the right to a moral and material support redoubled, from our side.

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CONVENTIONAL WAR AND CHEMICAL WARFARE IN A LUOI FROM PSYCHOLOGICAL ANGLE

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The work we are going to present is in the multi-disciplinary study of CEDRATE in coordination with Jacques Maître. The paper is to present what we are doing in the field of psychology. The paper is written by two authors - *Concepcion de la Garza-Doray*, a psychological analyst, who cannot attend this conference, and I, a doctor of psychiatry. I'd like to add that both of us have been trained in anthropology. Our study was conducted in A Luoi Valley, where I still remember its special features: A Luoi Valley lies close to the border with Laos, on the central highlands, south of the 17th Parallel. This area was in the past covered by thick tropical forests, with many perinial trees and rich fauna such as tigers, wild buffaloes which can weigh one ton each, and wild elephans. Rare archive photos show us beautiful villages of the Pako and Ta Oi ethnic minority groups with their houses-on-stilt. The people here lived on hunting and gathering of forest products and slash and burn cultivation. Today, such images of the past rarely exist, yet the belief in supernatural power and the worshipping of totem and ancestors are still popular, even legendary clans are being restored here. The shaman seems to be the origin of these cultures.

How to present possible contributions of psychology to clarifying issues related to Agent Orange/dioxin and suggest therapeutic answers? I still remember a workshop sponsored by a French psychological analyst about 10 years ago in Hanoi. He undertook a very heavy task, e.i. to explain the work of Sigmund Freud in 40 minutes. He used his time to retell one of the *Humorous Stories of Vietnam,* in a collection which was sold by the Hoan Kiem (Restored Sword" Lake side. I remember it was about a man who was shot by an arrow in his shin. The story tells about the debate between a foreign expert who suggested cutting off the arrow so that it would not be protruding outside the shin, and a local expert who said the arrow inside the shin must be treated. I cannot find this story again, but I remember it implies something very important relating to psychology.

Spychology is a science comprising many disciplines and many theoretical schools. There are psychology of development, mental measurement, experimental psychology, social psychology, perception psychology, behavior psychology etc. Of those disciplines, sometimes psychological analysis is called psychologie des

profondeurs (psychology of profoundity). This means, opposite to the psychology which is only interested in bahaviors [*Behaviorsm*], the psychology of profoundity is interested in the profoundity of behaviors.

Wounds caused by « the war with conventional weapons » to families

To illustrate the concerns over the documentation resource study of « *psychology of profoundity* », I'd like to provide the case of a young man whom I met in Hong Kim Commune in A Luoi Valley. He lost many parts of his body. He lost his right hand, many fingers on his left hand and his right foot. He does not carry artificial limbs. He seems to be very careless with his moustache and his hair is long and rumpled. He is half-naked, making others see clearly the burns of smokes on his chest. At first, he wanted to make visitors misunderstand that he himself cut off his hand and foot with a knife.

Why did he want others to believe that he used a knife to cut off his hand and foot ? What is his motivation to burn himself with the ciggarettes ? The scars of burns concentrate on his chest to show others that he is the culprit of his lost limbs. What do all these mean ? To answer our questions, he said if he did burn himself with the cigarrettes, he did not fear. His story seems to be unreasonable but it will be very significant if we know the real cause of his wounds: a hand grenade, the vestige of war, exploded in his garden. Of course, the event reappeared in a small context, and in the way he was the author, the burns were suddenly caused by the hand grenade, this is the way to suppress the fear, to retell the sudden incident he suffered earlier in the form of another event pre-meditated by him, thus he was the one who intentionally caused it. This emphasizes a very important aspect of psychology on mental wounds : it was not the event that caused injuries itself, it was the event that when it happened, he felt he could not think of what happened to him and could not do anything about it. In short, what caused the wounds does not exist when facing the incident with his personality.

We can give another example on the act one tried to take after the event happened, in the imagination, in face of the sudden event one could not do anything then. It was a comment we have collected in a city of Turkey, which was destroyed by an earthquake. The population there have been haunted by earthquakes that can happen to them any time. They live in tents and do not dare to come back to their houses. An international non-governmental organization had a very awkward idea of building among tents a plastic house on a huge plastic spring that can swing. This unreasonable act (making a game in such a situation) has become a good instrument of treatment for the children there, because by creating the movement in that house, the children can imagine they are the hosts of the earthquakes.

And the psychologists can raise other questions. They wonder the pain of the injury caused by himself (the burns caused by the cigarettes) cannot set the mind of that young man at rest in face of the fact that he suffered too much loss of his limbs, his body is incomplete, but he can use artificial parts : an artificial foot, an artificial hand and artificial fingers.

Finally, the psychologists have to pay attention to what has happened between that man and his neighbours. In case of the young man in Hong Kim Commune, we talked to his father. He was a courageous figher in the war. He was once injured and sent to a convalescence in a rural area in North Vietnam. There he met his wife.

The way the man retells what he has undergone shows no emotion. It's just a pile of information. But when we asked him to tell us his feelings when he effectively and consciously cared for his son after the explosion of the hand grenade, he seemed to be very emotional while telling us that he had never had such a fear like that in his life. Listening to his father's story, the boy reacted immediately: he quickly left the house, hopping on his only one leg and disappeared at the back of the house. The fact that the boy disappeared when listening to his father's retelling his story can be explained in many ways we will not want to develop here.

Here we want to enter another aspect of psychological analysis, that is the links between humans. The father can suffer many psychological wounds caused by the war, the injuries he tried to avoid thinking of. That is a conscious process [avoiding reminiscence about the saddest aspects of war], but it is also an unconscious process which is called by the psychological analysis branch as fiber split: scenes of injuries exist in one's mind, but in the form of dry information without any feeling. On the contrary, the feeling one had when the event happened exists as a pure emotional memory which can rise up if something reminisces it that linked with the event, sometimes through something which is a bit similar (a word, a taste, a colour etc.). In the case we are considering, the relation between the father and the son is marked by this aspect. For the father, his son may be a live memory of all his bad experiences. And maybe for the father, his son, after all, suffers heaviest wounds of war in the family. For him, the father represents a period of history of the country that he did not know, but injures him deep in his flesh.

Can this psychological analysis bring about any benefit to improve the psychological state of this family? It needs imagination. It's impossible to have any formula. Right in the place, in our first meeting, we recorded the portrait of the son when he pointed to his wounds, yet he did it like a person of good conduct. However, people can imagine that the mediators, not necessarily psychologists, but

who understand the circumstance, can help transmit the stories of the father to their children. For instance, in this specific case, the mediator can help the father and mother listen to what their son want to say through his self-injuring bebaviors. And then, to be more general, an action could be undertaken in A Luoi Valley and would have been supported.

The importance of « clasic » wounds of war.

So, in A Dot Village, the war veterans are used to get together to reminisce their war that lasted for 30 to 40 years. They talk about the dreams that hurt them:

« *At night I still dream of the fiercest moment when there was nothing to eat. I met myself and my dead companions in arms and other companions who are still alive. We do not know who else we can share those bad experiences with except those who have undergone war. In the war, I had some nightmares. I twas normal. But why after the war, I still dream about such scenes ? They are still those nightmares, those companions in arms and their dresses. Years have elapsed, yet the nightmares are the same.*

But sometimes, there are dreams of happiness. I dream about my very close companions in arms. We meet again by the side of a stream after a long time …...

Question: Can you tell those nightmares to the women who have experienced war ?

A woman interrupted : *I took part in the war for 15 years as a woman fighter in a logistic unit. I also had nightmares and I have shared them with other women in the War Veterans' Association, but we, women meet less often. At night, I dream about my companions who are either alive or already dead. But my husband talks about war more than me.*

Question : How old were you when you started to join the fight ?

Answer : *17 »*.

Those statements should be encouraged. Moreover, retelling such stories about war to the next generations may be important, because in general, people listen to less personal things than what the war veterans said. People can think of a place where the memories of the war veterans are still preserved. They are not places as *Vet Centers*, in the US, but places of history of Vietnam and also the history of the world.

By the way, it is noted that in A Luoi Valley, the presence of modernity makes generations closer unreasonably. Many young people did not believe what the adults talked about the war. But the scenes shown on the TV network are more convincing to them about the reality of that war and the destruction caused by the

enemy. The fact that the young generation acknowledges the sufferings of the soldiers and the meaning of their fighting cannot eliminate the nightmares, but can allow the consideration of such nightmares as the scars of war which remain significant for the present time. That is the full acknowledgement of the war veterans with their dignity.

Impacts of the chemical warfare:

Agent Orange/dioxin

The psychological impacts of the chemical warfare, especially of Agent Orange/dioxin, are more complicated than what we just discussed. This is because this chemical warfare, objectively, has had complicated impacts which have been expressed under different forms by time.

We imagine those impacts starting from the concept « support – stay », the concept we use to describe both psychological and sociological characteristics of the matter we are discussing. As you know, they are two words put together : support and stay.

1) In the West, there is an important philosophical tradition around the term: « support», but in general in sociology at present, it points to a specific support to a subject in social life : family, occupation, financial income, friends etc.

2) The word « étayage» (stay), at first has the same meaning with the word support, but it is more on the side of psychology and psychological analysis. For example, the psychological analysis discipline has a theory of desire for pleasant feeling which is developed when a child sucks on its mother's breast and this first pleasant feeling is the (étayer) (stay) of the sexual instinct of a grown-up person. This desire for pleasant feeling of the child sucking its mother's breast concentrates on itself, and long afterward, people can say that such a desire « *pays the way* » for an experience of the adults toward the opposite sex and toward the reproduction of humans. It « pays the way », just like the ancient valley of a river that can suggests a direction for a modern mountainous road.

3) Why do we combine these two concepts: support and étayage? It is because when people face a complicated situation, it is marked by mental injuries caused by real events, such events are not in their imagination, but leave psychological vestiges and so they must be analyzed at the same time at what is happening in the psychological life and in the outside, objective fact. In another words, objective aspects must be related, not talking about an individual person, for instance, the display of personification of nature [such as the theory of origin of the universe] which has been handed down for thousands of years and the spiritual life of everyone, the life

which has been guided, directed and supported by a system of expression not belonging to any individual person.

It is the dialectics on real support, outside, not belonging to any individual person, and the imaginative support, inside and individual, that we will clarify in our theory of trauma.

Four stages of the phychological warfare within

the chemical warfare in A Luoi Valley

In the next session, we will survey four stages in the evolution of attack of the support-stay, linked to four types of consecutive events by time when the US sprayed Agent Orange.

1- The post-spraying period:

Nature is distorted.

The main thing here is the damage of the symbols that create the links between humans and nature. The totem belief and the belief of the Pako and Ta Oi people are characterized by supernatural creatures considered to have supernatural power on humans through nature, and supposed to be directly present in the close world: water, forest, soil, a plant species or an animal… So what happened after each chemical spraying ?

It is more frightened than an instant panic and several evidence on the feelings of those who witnessed herbicide and defoliant sprayings which remain in their memory on the surprise of a strange phenomenon. A veteran retold his naive dellusion : young soliders are « *like children, knowing nothing* ». They even ran to see that marvellous scene: « *They sprayed in the afternoon, it was beautiful. [...] We even took those kegs* [dropped] *to contain water »*

Some others are less naive, like three veterans whom we met in A Dot, as they have experienced chemical sprayings because they were holding most vulnerable positions and they were surprized by the instantaneity of the destruction of forests: « *Leaves wheathered immediately »*. Moreover, these strange substances, oily, made them feel itchy and unconscious, but they could not imagine that those destructive substances can damage human health.

So, the main thing in the first instance is that people paid attention to the nature around and close to them which seemed to be distorted, like looking at a distoring mirror. For example, they described fish in the river as « *luminescing flourescent colour* », vegetable roots as swelling up and blackening, trees falling

leaves rapidly, animals dying and humans feeling strangely irritating... But the symbolic relation between human and Nature has not been changed completely.

People imagined clearly that the forest Genies must be very angry at human for destructing nature, but genies remain a reference, allowing people to think of events, even if the relation between the shaman and those genies does not remain as it was before the war. An advanced age person in A Ngo said:

« *Before the war, there were forest genies and 'fotune tellers' [shamans]. But with dioxin poisonous substance, all trees have been destroyed. So the genies had to move to father places. They did not die, but it is hard to meet the ».*

Question: Can people « meet » genies ?

Answer : *'Forune tellers' can meet genies. The genies have long beard and white hair… In the past, all ailments were caused by forest genies and ghosts. 'Shamans » know whether those illnesses are caused by forest, stream or earth genies….. »*

And in the system of belief in gods and deities, the dialogue can continue even when the shamans cannot 'meet' discontented genies :

« *If the disease is caused by the forest Genie, the shaman will go to forests to pray and gather leaves to organize a ceremony for treatment of the disease. And then, he returns to the patient's house. The shaman asks for a sacrifice. Everyone shares the sacrificed animal, except the patient who is not allowed to eat it. And the ceremony continues with leaves gathered from the forest put on the body of the patient.* »

After all, people try to restore the dialogue with Gods, just like making symbolic tombs for wandering souls. People tell us that there are many «*wandering souls* » in this area where many dead bodies had not been burried decently, where there were many missing people or people who died without having anyone to maintain the continuity of their family line. But, the souls, in a large number, which cannot be grasped and cause worrying anxiety, can incanate into grasshoppers flying on the feet when people walk through the pasture. Therefore, they consider grasshoppers as « wandering souls»:

« *When people have to die far from home, their dead bodies cannot be taken back to be burried, many grasshoppers are caught and kept in a box. People think that they are the souls of the dead and so they burry those grasshoppers in the box* ».

(Pa ko Village, A Luoi Valley).

2. Dioxin: a strange substance, limit of the witchcraft thinking and symbolically personified Nature

The A Ngo villager who told us the traditional ways of treatment of diseases by shamans [«fortune tellers »], ended the story by saying: "*If all those ways of treatment are not effective, they would say that the disease is not caused by Gods, but 'dioxin' "*. So it means it enters into another system. The support – stay of the symbolic system is withdrawn. And people have to face a strange subject, the word: dioxin. In the past, the shaman had got replies expressed instantly through their acts which were considered treatment of diseases. But sciences now open up possibilities of stopping certain beliefs in real symbolic rites. Before returning it to the truth of history (the decision of a US President on the launch of Operation Ranch hand), the term Dioxin is linked with a world that cannot approach and is not the origin of unhappiness. Medicine makes this new word, but cannot be able to affect the object that it designates.

The support – stay, being attacked here, is simply a way of witchcraft thinking, describing that a personified Nature is always being influenced by symbolic acts.

The elimination of Nature is personified as an injuring situation, because it is left everyone to the discretion of a strange fact, whose shape is not clearly seen, with that fact, there cannot be any dialogue. Scientific labour, of course cannot be read. So what is in between human and this terrible fact, a reality that does not follow any human rules? Nothing if it is not human society itself that must withdraw from its own power something to relieve their unhappiness, injustice and lack of human dignity. Basically, it is the reply of the society at national and of course international levels. It is the support, but also an acknowledgement of crimes. And the nature, disillusions in the relation with Nature and with the world in general and with history should be re-defined. People see what Jacques Maitre called a "*historic religion*". It is a complicated system and one of the expressions of this system is the fact that some clans took the sir name of Uncle Ho.

3. Children's diseases: fear of racial preservation

The third level overcome when children were born deformed who often contract diseases which have never been known before. It is the support – stay that is attacked, it is the time perspective, the heredity, the continuity of family line, the future that gives meaning to the present and the past. The maintenance of the continuity of family line has practical aspects: Who will care for parents in their advanced age when they have no healthy children to care for them, but on the contrary, parents have to support their children until whenever they can?

Before being explained by dioxin, this phenomenon was assigned to each individual the determinism or the living conditions in the war:

"*After the war, people started to give birth to abnormal children. With the first abnormal children, they thought it was their fate. But more and more children were born with birth defects and illnesses, people thought it was possibly because during the war they were so hungry for everything was destroyed by chemical sprays that they ate darkened maniocs and dead fish... [...] And then, the living conditions of the women during the war were very miserable. When leaving the underground shelters, women had to carry heavy papooses. And a woman waited for her children, sometimes, women gave birth on the road…*"

The explanation with dioxin has turned a situation experienced as a destiny and like lack of human dignity into a cause at the national level: "*For only several years now since having TV, people know that in other parts of Vietnam, there are also children born with deformities*."

And here, it is the same. Attaching importance to necessary assistance to relieve the consequences, at least in economic aspect, of the disorder of family lines, and bearing responsibility of caring for people with disability to give them a foothold in society and prospects of an independent life are important factors to overcome trauma.

4. Genetic disorder – destruction of genetic heritage of human kind?

There remains this strange object that even science has to stop in front of it. A hypothesis stresses that, in fact, many children have been born deformed due to genetic disorder, this means the disorder can transfer to their children and grandchildren, sometimes can skip to many generations. In this case, it is not only a disaster to the families concerned, but it is an attack to the set of human haploid genes. In another words, it is the attack against the memory of life placed in the set of human genes, and as known to everyone, it is a common property of human kind.

Now, the scientific debate on this issue is on the aspect of epidemiology. And it is bogged down in the matter of methodologies without a way out. Such an approach to the issue tends to throttle the debate, because when a section of international community demands that Vietnam implement, with a real size compared to the ill population, measurement of invaluable dioxin in blood. This is what happens when people follow an ideal assessment which cannot be achieved because of the management of evidence is always questionable.

On the contrary, people can reverse the issue of evidence by posing the question: Whether there is an attack against the set of human haploid genes any

where on this planet? So we touch a legal issue: if there is such an attack and if it did not lead to a certain consequence: we are in the situation in which someone has lit the fire to burn the common roof and the fire is extinguished by itself. Does this action lose its criminal characteristic?

So we have said in the Workshop on Agent Orange/Dioxin in Paris a year ago that research should be expanded to the mechanism of possible effects of dioxin on the system of haploid genes. And we raised a question, which, in our opinion, is not a hypothesis, but a confirmation that dioxin clearly affects what is called protéines chaperons. What is it?

Since 1998, with the studies by Susan Lindquist and Susan Ruthrford, researchers at the University of Chicago, we know that these protéines allow maintaining genetic change in the system of the set of haploid genes in a virtual form. This has been proved when we neutralize protéines chaperons, we'll see deformed wings, two rib-cages and other deformities appeared in drosophila.

Yet, dioxin affects this protective system, i.e. protéines chaperons, because it gets a chemical key to infiltrate into the core of cell, AhR, normally used in this protective protéines system. This may not really make the system of haploid genes disordered or to what extent it may make it disordered when causing clinical consequences. This is what we want geneticists and experts of molecular biology to show us.

As psychological analyst and doctors of psychiatry, of course we cannot go further than what we have presented. On the contrary, we see very clearly that this is an attack against a system that links the body shape of an individual with that of a common body of mankind.

In this case, an issue of ethics relating to the whole human kind is raised. Whether in the near future we will see, in one of those who were affected most strongly, devils and monsters who are not humans? Or on the contrary, it is considered that those persons are humans who have suffered heaviest injuries and most terrible injustice: a scheme to separate them from human shape. If we look at the situation in this way, it will be considered that the wounds of someone will also be the loss of the integrity of the whole mankind.

Therefore, there must be symbolic acts which can be heard, even outside Vietnam. Such acts can rally artists to fight for the cause of defending human dignity. They will have to reconfirm that those people with serious disabilities belong to the history of human kind. They will have to confirm the need to prevent similar acts against mandkind in the future. They must highly value the admirable industrious labour which we have seen in families and villages trying to help those

victims to integrate into community as well as great efforts of the national community of Vietnam. And they will have to emphasize the urgency of measures for strengthening international solidarity to help those people with serious disabilities reintegrate into human community.

THE PAINFUL HIGHLANDS

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Defoliants spread on a large part of Vietnamese territory south of the 17th parallel some decades ago still have harmful effects on people and their environment. To date, the disaster has particularly been analyzed in the light of biomedical disciplines and the sciences of the nature. In this article with anthropology as the dominant, we focus our attention on the real experience of families whose existence is tragically devastated by after-effects and/or by deleterious effects contained in defoliants. Or to be more precise, it is an inquiry conducted about minority people whose ecosystem has been destroyed by American troops. The mode of production and cultural traditions of those people have been brutally wrecked in the second half of 1960s since the primary tropical forest where they have lived for centuries has been wiped out; moreover, the health of many adults still is seriously affected; eventually, life transmission itself is now jeopardized; occurrence of congenital defects due to poisoning by dioxin reaches a dreadful high.

Whereas there are a good deal of anthropological publications on ancestral social and cultural traditions of ethnic minorities, we are lacking for research works on those people at the present time, especially in areas where forest has been eradicated by American troops.

Gaps in our knowledge of Vietnamese evidently constitutes an obstacle to the collection of documents, and to pertinent conclusions. We would like to contribute only to the content of Vietnamese scientific reviews and collections in this research domain.

The talks we have on the field have brought evidence on changes achieved or under way that are connected to ecocide and current mutations in Vietnamese context. Since forest destruction was started forty years ago, we meet many people who still remember the time when they were hunters-gatherers. The past buried by chemical warfare is quite recent in proportion to a life's size. We directly find again the witnesses.

Our enquiry

What we can bring is the result of an enquiry conducted for years with families, local authorities and privileged informants on a central highland where "minority" people account for 76% of the population[1]. In order to raise our problems, we have enjoyed thorough exchanges of views with distinguished Vietnamese anthropologists from Hanoi (Museum of Ethnology) and Hue (Department of Anthropology and Sociology of the University).

[1] We have carried out two fieldworks, in 2003 and 2005. The latter has been made possible by the support of the Foundation "Un monde par l'homme" to which we owe heartfelt acknowledgements.

The structure of our research team results from a coalition between CGFED (Hanoi) and CEDRATE (Paris). Our close collaboration proves to be fruitful in university methological[2] training, next on the field, and then in the collective wording of results.

The choice of field has been commanded by the intention of supporting the cause of families suffering from dioxine. So social science research becomes apparent to us as an essential dimension. We have distinguished on the geographical map the areas heavily affected by defoliants from the rest of territory. Also for forest regions where chemical warfare has been implemented on a large scale, we should not forget that massive poisoning by dioxin, for inhabitants of the region, goes hand in hand with destruction of vegetation. In Vietnam, ravages of defoliation on poisoned people and their children are found again in families scattering throughout the country because of migrations, and since affected combatants have come there from all regions, including the North. Those ravages reaches a much higher density where the whole population is hit by defoliants, and where the persistence of dioxin on the ground has prolonged the exposure of natives to the risk of poisoning[3]. Moreover, defoliation has ravaged mainly wooded regions. When the objective is not mangrove swamps on the seashore, it is rather on the mountain, because defoliation consists in destroying the tropical forest often inhabited by ethnic groups taking up farming and breeding cattle in rudimentary forms.

Three wounded ethnic groups on Central Highlands

We have concentrated right away on the nexus between the social and subjective, from the way victims of dioxin (mother, father, child, family) convey their psychic suffering in a situation whose objective data (medical, economic, school, social...) are systematically collated. Life stories taken down in the most spontaneous manner are likely to provide an adequate material. As for the field, we agree to go to A Luoi, on the borders between Vietnam and Laos, a district where the Pa Co, Co Tu, and Ta Oi account for three quarters of the population. As we have expected, interviewed families are the most destitute, isolated by poverty, geography and cultural singularities; even old people do not speak the official language. This fieldwork help us bring out the specificity of the situation in which are found the inhabitants of one of the districts most seriously wounded by chemical warfare.

THE WEIGHT OF HISTORY

Wars and revolution

Up to about 1960, the population consisted of groups living in the forest. Completely immersed in the ecosystem of this natural environment, those hunters-gatherers live on slash-and-burn farming. Their view of the world was organized around prebuddhist beliefs:

[2] Beginning with a four month-training period undergone by two Vietnamese researchers in Paris.

[3] The main scientific documents we find here are the reports by the Canadian organism Hatfield Consultants (Vancouver), drawn up in collaboration with the Committee 10-80. It is especially the *Preliminary Assessment of environmental impacts related to spraying of Agent Orange during the Vietnam War* (1999), and the *Development of impact mitigation strategies related to the use of Agent Orange herbicide in the A Luoi Valley, Vietnam* (2000).

Human groups were dependent on natural forces personified by *yang*, beginning with *yang* of forest, water, mountain, rice, etc...Other *yang* corresponded to the "souls" of some deceased.

During the French war, troops involved in the reconquest of the country began patrolling the plateau, and set up a landing runway. Such an occupation were accompanied with usual acts of violence in colonial conquests. The population defended itself, and then took part in the struggle waged by the Vietnamese for their independance. Ho Chi Minh sent to A Luoi plateau revolutionary militants who became afterwards "Uncle Ho's cadres". Those people imparted to the population the Vietnamese patriotism and the struggle against the calamities doing harm to the natives, particularly as regards hygiene. Uncle Ho called to the North village patriarches settling in the forest, and he himself participated to their training.

A former schoolteacher from A Luoi[4] related very clearly to us the modalities of transformation:

> *When the French attacked our region and patrolled our village, I was not able any more to stay in clandestine trenches; I was ordered to go to A Luoi so as to set up a resistance base against the French among minority people. The mountainous region of Thua Thien-Hue has four ethnic groups settling in three zones: the Pa Hi near the plain, the Pa Co and Co Tu in A Luoi valley, and the Ta Oi on the slopes of the Indochine Cordillera, on the frontier between Vietnam and Laos. In the old days and under colonialism, it was a remote and isolated region without any economic attraction. And minority people living there were referred to as Moi, a pejorative term used to denote the savages of the forest. Administration was very simple. Each district had its chief, a deputy chief and a village head, but those people worked only on the face of it. As far as the population register goes, for instance, merely a few names were inscribed, and likewise for the tax roll. The French and district officials never came to this remote area to maintain control.*

When I came to A Luoi early in the year 1947, I found that people living there were quite primitive. Men wore only a loincloth, women only a short skirt without any other garment. They had neither mattresses nor mosquito-nets in winter, and they warm themselves by the fire. Slash-and-burn farming being quite rudimentary, people made the most of fertile soil of the forest in an early time for some harvests, and then moved away. Food contained very few rice. It was mostly manioc, Indian corn, sweet potatoes. Women worked in the fields, while men went hunting. Teenagers gathered vegetables by the brook or bamboo shoots in the forest. Mutual aid was found only in the close community of the extended family or between neighbours, mostly of the same lineage. There was often rancor and hostility between different families, and slaughter sometimes occurred. By the time I came there, I saw a barrier and the killing between two ethnic groups in the first week. Backward costumes retained several taboos. Birthrate was very low, with many risks after childbirth.

[4] This passage is entitled "Un Parisien among the savages" in the Anthropology *Route des tropiques*

For example, the mother must have her baby on her own in the forest, and the baby had to be dipped in the brook, even in winter, before being bought home.

Pa Co, Co Tu and Ta Oi attained for the first time a human dignity acknowledged at the national level. This new path began with a cultural change.

> *Being a schoolteacher struggling against obscurantism and illiteracy in lowlands before revolution, I first started teaching young people, and then I organized them into groups of pionneers to build a new life. I was able to set up some schools in villages. People were enthusiastic over having a cadre sent by Uncle Ho to give them instruction. The solicitude for children won me the confidence of their parents who began loyally following Uncle Ho's precepts. I set an example with my acts, not with my words. To prevent diseases, for example, they must drink boiled water, wash their hands before mealtime, cover excrement with ashes to avoid flies, etc...They must put a ban on hostilities and revenges, encourage mutual aid and understanding.*

Minority people's dignity materialized through the strategic role they played in political and military fields.

> *In the years 1958-59, President Ho Chi Minh took the initiative to invite village chiefs and cadres from minority people belonging to the Front of National Union in the central mountainous region to successively visit the North. The President himself held discussions with them on different problems. He inspired them with the faith in the solidarity of every Vietnamese, in the final victory of the struggle for the just cause of liberation and unification of the country.*
>
> During the American war, the role played by the Pa Co, Ta Oi and Co Tu became essential since the Ho Chi Minh trail went through A Luoi, and because the US set up three military airports on the plateau.

Forest put to death

Three large US Air Force bases were set up on A Luoi plateau, from where the agressors have been dislodged after fierce battles. US forces reacted by destroying vegetation with napalm and defoliants, claiming a lot of casualties. The death of the forest has immediately entailed the annihilation of the natural basis of the life and culture of hunters-gatherers. Dioxin was used in the chemical warfare.

At the present time, Agent Orange cause after the event serious handicaps among children. Before being identified by victims as the cause of unspeakable misfortunes, dioxin had massively destroyed the most treasured possession, the life transmission. In A Luoi district, scientific survey shows that some hot spots still are characterized by a very dangerous dioxin content in the soil, in some tissues of cattle, and even in breast milk. Dioxin concentrations have particularly been found on former American bases. This is especially the case with A So, where all the area has totally been evacuated because of its

insalubrities, in such a way that habitation, farming, and cattle breeding are nowhere to be seen.

With the lasting destruction of nature by defoliants and the permanent sanitary disaster due to dioxin, A Luoi has become a painful plateau for minority people in the district. The former mode of production has been wiped out, entailing a lasting food shortage. In the economic field, calamities caused by dioxin to the health are factors in sordid poverty, to such an extent that malnutrition is frequently found in those families. Mouths to feed do not form the object of sufficient food programmes; there were indeed such programmes some years ago, but they have nearly disappeared. For lack of enough funds to meet needs, allocations in case of handicaps owing to dioxin are not given even to all rightful claimants.

And today?

Since the epoch when Georges Condominas has conducted his anthropological investigation in the area inhabited by the Mnong Gar of Sar Luk (1948-49), highlands have been overrun by industrial plantations. Deforestation motivated by economic development has disrupted landscapes, and migrants from lowlands have settled in large numbers on traditional territories of minority people. Such mutations radically contrast with what has occurred at the same time on A Luoi plateau. As a result, the district we survey does not form the object of sociological, economic and demographical research works similar to those carried out in zones affected by the exploitation and development of the territory.

market economy

In the face of the market economy, that plays a growing part in the development of the country, traditional representations prove to be inadequate. The global development project of the district has not been able to turn towards a reforestation which allows a return to the life ot hunters-gatherers; the only negotiable path is an exploitation with competitive agriculture and cattle breeding within the framework of market economy. Can minority people of A Luoi move into this type of activity? The weight of cultural handicaps is clearly perceived here in the face of factors in economic behaviour that lead the entire Vietnamese society to industrialisation. Not merely the mode of production of people living on slash-and-burn farming does not generate technical know-how of “modern” agriculture and cattle rearing, but representations and values of the relation to nature and culture are radically different.

In the old days, reserves, investment, profitability, marketing, and technical innovation had no place in this group’s horizon. So in A Dot, the traditional weaving practised by women has been relaunched thanks to a NGO. But raw material is made in factories and purchased by the Women Union, that acts as a cooperative, and finished products are marketed in shops in town. The expertise of weavers is brought into play in the framework of a new mode of production. This example shows that the lack of know-how constitutes a nub of major difficulties; it’s the same for the investment of an initial capital.

The Red Cross lends a cow to each family that can embarks on cattle breeding. Engineers from Hue University come for vocational training, but it's not uncommon to see the cow "eaten" by the breeder instead of being considered as a capital with a view to productivity. For marketing, breeders sell their cow or pig according to the animal's length, not to its weight! And they sell the animal when they need some money instead of selling it at a commercially favourable moment.

In ethnic minorities, most families essentially practised autosufficiency, or forms of marketing very close to the ancestral barter. Suffice it to come to A Luoi market as early as 4. 30 am to see women from ethnic minorities going there on foot or by bike to sell their goods near the market (The Kinh are found inside, where they must pay a tax); they bring baskets of vegetables or fruits to be sold particularly to merchants from Hue. Prices of foodstuffs drop quickly, and fall very low at 6. 30 am. Those women will go back home with rice and condiments to feed their families. The sum earned at the market will be spent for next mealtimes.

Some categories cannot be marketed. The peasants remunerated by the State tobacco-growing farm or payed for reforestation also benefit from a revenue other than the sums allocated to dioxin victimes or disabled ex-servicemen. Living standards of civil servants are still better.

Social system

I would not go into details about the public health system that is similar to that of other countrysides in Vietnam. Geographical and financial difficulties that prevent people from getting access to specialized medicine weigh down on the situation of groups where chemical warfare continues to cause massively chronic diseases and handicaps, not to speak of nutritional deficiency linked to a very poor living standard. Malnutrition remains a major problem that carries great weight over development troubles among children of the poorest families. For example, 5% of children at the day-care centre and 4% at the nursery school suffering from nutritional deficiency are estimated by people in charge. The canteen can constitute an effective means of making up for this shortage, but people who have recourse to the day-care centre are those that have rather substantial means (especially civil servants, inhabitants of district town). Other parents on the whole cannot afford to pay school fees and canteen.

Three types of "medicine" are offered to ethnic minorities: scientific medicine, officially organized and legitimated by the State; traditional medicine of the Kinh; ancestral shamanist medicine. A register is put aside for troubles due to dioxin. Real effects of shamanist medicine show themselves in a symbolical order, whether the social field or the psychical dynamics. The other two medicines can also produce symbolical effects according to the culture on which they come up. The scientific medicine benefits by its official character, and its preventive or therapeutic functions even for groups slightly marked by scientific nature, provided that its techniques are brought into play. For its part,

shamanist medicine can only bring about its symbolical effects in the framework of a group where the shamanist system retains its resonance, anchored in the reference to a pantheon or a cosmogenesis. The shaman should be perceived as having power over some *yang* to make them his (or her) auxiliaries in order to avoid the misfortune, fight it, or at least explain it[5].

Such processes can be analyzed from data we have gathered on the question of culpability in case of serious diseases or fatal accidents. Persons who have been poisoned by Agent Orange come up against traumatic words. If troubles follow from the behaviour of people exposed to dioxin sprays, or who have consumed foodstuffs impregnated with dioxin, he (or she) explains that no one knows the risk encurred, that he (or she) is too young to be stopped by dangers, that famine does not leave them free to choose eatables, that official instructions given to the population have been followed. In brief, the victim is not in the wrong. On the other hand, scientific medicine declares itself powerless to treat the troubles (because orthopedic surgery costs a lot, or for lack of therapeutic devices to treat handicapped persons in A Luoi, for example). On the traditional side, reference to misdeeds committed in the former life (*karma*) doesn't work for these ethnic minorities whose prebuddhistic beliefs leave no room for reincarnation. But personal immoralities haunt the horizon; mothers of handicapped children tell us the opinion of neighbours: they incur so extraordinary misfortunes because they are extremely evil. At last, shamanist reference says that the misfortune is a consequence of *yang*'s displeasure, yet the shaman can negotiate with them to detect the source of displeasure and what sacrifice must be made to appease it.

Such an example brings to light the way some type of medicine or other allows a sick person or a family to symbolize the misfortune, find the words to speak of it, and ward it off so that the weigh of culpability be lightened.

Schooling and vocational fraining

The district of A Luoi benefits from the general mechanism in force in the Vietnamese school system. A considerable bonus is even granted to teachers from lowlands who agree to come teaching there. Nevertheless, many specific needs of minority people are neglected. We have picked out three: vocational training, classes for handicapped people, and school fees.

[5] I use here the term "shaman" without making a distinction between the officiating priest in funerals, the soothsayer, etc. We lack ethnological works similar to those conducted by Vo Thi Thuong among the Thai of Mai Chau: *Traditional medicine, rites and therapy among the Thai of Mai Chau (Hoa Binh)*, doctoral dissertation, University of Paris, 10, 2002.

An acute problem of the locality

Hunters-gatherers whose forest has been destroyed don't have neither the expertise of peasants (cattle breeding, flooded agriculture, etc...) nor that of industrialized societies, even on a small scale. There is not any vocational training class in the school system.

The number of handicapped people is one of major characteristics of the district. Nothing is planned for them in schools; there are no such institutions as "protected workshops" offering to handicapped people a vocational life.

The construction of Ho Chi Minh road is about to create new activities: garages, businesses, then hotels, taxis, etc...But the upkeep of the road will require professionalism; I have seen in A Luoi an area where two concrete slabs are missing so the drainage main is filled with stones...There are no roadmenders, whose job can be learnt rather easily.

Education is a domain where a lot can be done for destitute families

The absence of vocational training goes hand in hand with the lack of classes for handicapped people to aggravate the difficulties of the most destitute families. Let's take the example of A Luoi that has a day-care centre and a nursery school. The teachers have identified the deficiency suffered by children: absence of classes for handicapped children. They have no ground, no premises, and no specialized teachers.

Among the children we saw in villages, many of them go deaf. According to the cause and seriousness of deafness, the socialisation of these children could be largely facilitated by medical means (surgery, equipment), but also by pedagogical means (learning of pronunciation, reading on lips, sign language...) And deafness is here an only example.

Training of adults

Given the disruption in the relationship to nature, the new peasants generally lack experience to devote themselves in favourable conditions to cattle rearing, farming and reforestation. Specialists come to A Luoi to give advice and train those adults. Those are especially experts from Hue University of Agroforestry. Likewise, the State Coffee plantation and the institution in charge of reforestation appeal to local labour force, and so they ensure the training staff.

Unfortunately, building and roadmaking sites fail to coordinate their plans with training programmes. For example, governement funds are used to build a lot of permanent structures for the sake of families living in the poorest habitations. That is an essential aid that helps improve the living conditions of the most destitute families. But qualified labour force comes from the outside, while natives can be trained as builders.

The creation of specific devices for vocational training and for handicapped people would be a decisive element to involve minority people in a new mode of production. This point is all the more crucial as families comprising handicapped people feel the most urgent need to acquire the competences allowing them to raise their living standard.

A particular problem is the economic motivation linked to conditions of production and the question relating to land ownership. For instance, the People's Committee of a commune explains the population's request to us: the forest should be divided into plots to be shared among families that will recreate it (after ten years, for instance). In the same commune, a private enterprise offers to make investments, provided that it will receive 60% of the profit, which demand the People's Committee considers excessive. Anthropological considerations on economic motivations of former people of the forest can weigh much in the balance...

We have seen that languages of minority people are not taught, except an introductory course for civil servants being in touch with the public. But I will return to this point on the articulation between the social and the subjective.

Regional development and minority people's needs

The spiral of poverty

In the most destitute families, burdens grow in number (disabled ex-servicemen and handicapped persons, medical fees), while resources are paltry (for example, allocation for handicapped persons won't be granted if there is already in the family an allocation for a disabled ex-serviceman). Subsistence farming only permits a very precarious life. The lack of productive and commercial know-how locks those families in this spiral.

A society of hunters-gatherers that practised forty years ago a rudimentary slash-and-burn agriculture not only lacks technical competence to make peasant farming profitable. That society has no financial and commercial tradition: reserve fund, investment, selling, preparation for sudden changes of prices. Marketing remains the key of failure or success for many local initiatives in the productive domain (animal husbandry, farming, handicraft).

Marketing

From the moment that operations relating to market economy are ensured by a NGO, a structured association or a government establishment, new or traditional productive know-how can achieve success. I have given above a typical example of the weaving practised by women of A Dot with traditional techniques, on a NGO's initiative.

We sometimes recall the cooperative system, which plays an important part in France in the running of many family farms. But this idea always falls into empty space.

An alternative is the payment by wages. I have recalled above the advantages of civil servants over other families in A Luoi that can leave their children to the charge of the day-care centre or nursery school. Likewise, we have seen as early as 2003 that the houses with paved floor belonged for the most part to civil servants.

spiritual resources and the subjective real experience

Coming there without an economic or administrative power on people we talk to, so as to provoke and listen to life stories as flexibly as possible, that is the method which can produce an innovation in the exchange favouring the real experience as it was felt. This approach allows us in particular to understand the way the patrimony of ancestral spiritual resources and the values of modern Vietnam are mobilized in the face of traumas of war, the harshness of living conditions and the drama of handicapped children.

Shamanism

Shamanism constitutes a central theme in the anthropology of many societies without writing, especially among hunters-gatherers. As regards minorities on Highlands, reference to shamanist systems is not a new idea.

Shamanism, classical theme in anthropology of ethnic diversities in Vietnam

We have gathered many elements on current shamanist therapeutic practices. But it remains for us to examine more thoroughly their religious basis (the pantheon, the cosmogenesis); we contemplate making of it a central theme for a next gathering of data, especially in relation to the sanitary damages caused by dioxin. In fact, the lack of understanding of the religious stature of Ta Oi, Co Tu and Ta Co shamanism in A Luoi district seems like a manner of accentuating the process that deprives these ethnic groups of their cultural patrimony. It would seem that custom is merely a combination of "superstitions", that is to say incoherent social practices. Our perspective places us in all an university tradition. In fact, speaking of shamanism embraced by "Indochinese" ethnic groups is not a new idea. It already becomes classical in anthropological works conducted in the colonial epoch. During the Frence war, the theme of shamanism continues to go around, particularly through the thesis by Georges Condominas, based on the investigation carried out in 1948-49 among the Mnong Gar[6]. Someone also follows this trail with various works, for example those of Jacques Lemoine&Maurice Eisenbruch (1997) on the Hmong[7]. More recently, we find them again with the thesis of Vo Thi Thuong on the Tai[8].

For the three ethnic groups we survey, we don't find many elements dealt with by publications on the current situation. One of them makes mention of the Co Tu, more precisely of those living on the other side of the frontier between Vietnam and Laos, in an area adjoining the provinces of Quang Nam and Thua Thien-Hue[9]. We don't know whether the pantheon and cosmogony of the Co Tu in A Luoi are the same as those of their cousins in Laos.

For the Ta Oi, one of the specialists describes the cultural life:

[6] The author has subsequently published a new version of his work, completed by observations made during his return to the area: *L'exotique est quotidien. Sar Luk,, Vietnam central*, Paris, Plon, 1965 (collection Terre Humaine).
[7] *L'exercice du pouvoir de guérison chez les chamanes hmong et les maitres-guérisseurs khmers d'Indochine*, L'homme, 144, 1997, 63-103.
[8] *Médecine traditionnelle, rites er thérapeutique chez les Tai de Mai Chau (Hoa Binh, Vietnam)*, thesis cited.
[9] Nancy A. Costelle, *La société katou: un mode de vie harmonieux*, in Yves Goudineau, dir., *Cultures minoritaires du Laos: valorisation d'un patrimoine*, Paris, Editions de l'UNESCO, 2003, p. 181-186. The bibliography of this contribution refers to various publications of K. Sulavan and Nancy Costello..

The Ta Oi believe that any being has a transcendant spirit; sky, earth, mountain, forest, brook, tree, rice as well as man and animal all have a "soul". Consultation with soothsayers and worship play an important part in the individual and community life. [...] There are a good deal of offerings relating to health, property, prevention of diseases and epidemics, slash-and-burn farming, etc...Great ceremonies always include the sacrifice of buffalos to genii during a village festival[10].

How are the *yang* today?

It seems that one characteristic of *yang* is its location; each *yang* locates in a place: banian, forest, water, soil, basket... Traditionally, a big basket containing a coat was placed in a corner of the house; it was the *yang*'s habitat; strangers must not look in this direction. Conversely, souls of the deceased can go through walls (in the case of phantoms) or remain wandering (a few ancestors). A village chief says that *yang*, phantoms and ancestors are worshipped. He explains to us the practices helping one entertain good relations with *yang* through the agency of the shaman. When a house is built, *yang* is worshipped to bring good luck. For this ceremony, a member of the family may sacrifice a pig or chicken. We have noticed that an altar dedicated to the *yang* of earth is set up in front of most houses. We are told that a ceremony is celebrated at this altar when a permanent structure is built. On the other hand, we learn that *yang* of heaven, earth, and ancestors are presented with offerings when each house is built.

The number of shamans is on the decrease, but there is still two in each village. Villagers say that they are women. Let's note that shamanist power is precisely exercised by women among the Co Tu of Laos:

Every disease is caused by a break of the harmony with spirits. [...] The shaman is the only one who can communicate with spirits. People recourse to her to understand, by means of divination, what tradition or what taboo has been violated and what is the spirit that causes sickness. [...] The shaman has six divination methods to determine the cause of illness. She reveals the name of the offended spirit, and tells what must be sacrificed to it in order to restore a good relation with it. Sometimes, the shaman, through singing, calls back a wandering soul. [If a man is victim of a spell cast on him, he] can fall sick and must appeal to the shaman so that she determines what spell has been cast on him. The shaman rubs and shakes him so as to expel the spell of his body[11].

In A Luoi, if medical care falls through, the shaman referred to as kuru is invited and, during the ceremony, the family is gathered around the sick person sitting near the offerings. The shaman uses rice, coats, leaves, and she dances around her paraphernalia. When she sets out the cause of disease, she sings a song that

[10] Luu Hung, *Les Ta Oi*, in Nguyen Van Huy, dir., *Mosaïque culturelle des ethnies du Vietnam*, s.l., Education Publishing house, 1999, p. 179.
[11] Nancy A. Costello, article cited, p. 183.

nobody understands. The singing lasts two hours, then she uses the leaves to cure the sick person. In the end, the family hands the offerings over to her.

Pieces of evidence converge during the conversation. In the case of serious diseases, a pig, or even a cow, is sacrificed; meat is shared among villagers, except the sick person who does not eat meat.

During the period when grave pathologies appear among the population of A Luoi following defoliation, affected families did not know that the observed troubles are closely connected to defoliants. Quickly, a link is established with poisons contained in plants of the forest, well-known to those hunters-gatherers. But the poison came from the white powder spread by the Americans, not from the plants (besides, dioxin is not found in tissues of plants). It will take many years so that dioxin is brought to light by Vietnamese media; reference to dioxin toxicity is very progressively popularized. Explaining congenital handicaps caused by chemical warfare means bringing the problem to the field of biomedicine and politics. We were from that moment in the process of secularization with regard to traditional conceptions of the disease as being sent by spirits from the other world (*yang*, phantoms, souls of the deceased).

During the early period of our investigation (2003) on pathologies imputed to dioxin by health services, families in A Luoi only recall the recourse to *kuru* as a traditional resource that has fallen through before congenital handicaps. It remains, in the medical sphere, the official medicine and references to chemical warfare. When we put more subjective questions: “Why does it happens?”, they talk about their destiny shaped by those events, about the inexplicable...The forces of the other world appear as neither the cause of the misfortune nor the recourse. Our approach veered off course because of a dodge. In fact, our way worked up by us to reach the area tends to screen the content of the conversation. The authorities and privileged informants are for the most part representatives of the administrative ladder whose bottom rung is the commune. Those are the same who sort out the families we are going to see. It is not uncommon for them to be present at the conversation. Although the families know that we don’t have any power on them, we are unable to do away from a certain dose of conformism. This situation explains why we have trouble perceiving the recourse to spiritual resources handed down by the ethnic tradition. Nevertheless, evidence of traditional practices rises to the surface. For example, a married couple talk to us about why the young wife (29 years old) wears a pearl necklace:

He – *I gave her that necklace as a present on the day of our marriage. I asked her to wear it round her neck wishing that we love each other for ever.*

She – *As for me, I have offered him the necklace that he always wears round his neck, I wished him a good health, and I hope that we will have many children. However, I have only a girl, and I suffer successive miscarriages. [The small things on the necklace] are amulets that my husband tells me to wear to protect ourselves from ill spells. Those are bits of turmeric.*

He – [...] *My father has told me to wear these amulets to protect ourselves from ill spells. But why does my wife suffer miscarriages while she always wears them? We continue to wear them all the same.*

Such examples reveal how representations and practices relating to troubles of procreation remain dependant on religious tradition despite the official discourse on damaging effects of dioxin. In fact, that is the whole system of rites and representations of the world rising to the surface during conversation. The vice-president of a commune so describes some revealing elements:

In the old days, the Pa Co worshipped A Da after the harvest of December. That is the great festival of the community. In those sacrificial ceremonies, a buffalo was killed with spears, and meat was shared among villagers. At present, the festival is held by the village, but people does not sacrifice bullalo any more.

Question – *If there are handicapped children in the family, what do you think about?*

Answer – *We have very strict rites, especially for funerals and the change of coffin; after five years, bones are taken out of the coffin and replaced in a smaller coffin made from a tree trunk, which is then put in the monument where are placed bones of grand-parents, uncles, aunts, kinsfolk, brothers and sisters of the same lineage. During the war, villagers have done away with all rites, and they had no coffins for the deceased. Nowadays, descendants perform the task of replacing bones in the monument (previously made of wood, at present made of bricks). The man presiding over the ceremony must be chosen. If this one violates the rules, or if he is not pure (for example, if he entertains illegitimate sexual relations), there is a punishment translated into troubles in the family (quarrels, diseases, accidents). If there is a normal child in the family, next he catches a disease at a certain age, and he is dead although he has been given necessary aid, then people say that it is his lot, decided by yang, the genie of heaven. Nothing more can be done for him, and he must leave the life at this age.*

Question – *Are there male and female yang? Are there yang of forest, brook, etc...?*

Answer – *There are still yang of heaven and earth, called yang, full stop. It has no shape, and it is neither male nor female, it is a spirit.*

The president of the People's Committee of another commune produces similar evidence:

Prior to the war, we held village festivals towards December, after the harvest, in acknowledgement of yang of heaven and earth that have help bring in a bumper harvest. [...] Previously, members of the same lineage set up a village, and festival is held each year in honour of the village ancestor. For ten years, we have held village festival three times. The village chief supervises the collection of

contributions to buy a cow which is sacrified during the ceremony; but spears are not used any more, and alcool is not drunk.

Question – *Do villagers believe there are wandering souls, for instance, souls of those who die from accident far from home?*

Answer – *If someone dies from accident, people think it is a disaster resulting from a violation of customs in the family. Then, rites must be performed to make amends for the mistake. In the case of victims of Agent Orange, sick and handicapped people are taken to hospital.*

Shamanism

For A Luoi, we had echoes on shamans regarding the explanation and exorcizing of evils with recourse to the other world. On the other hand, the activities of those shamans were reproved and forbidden by the authorities as "superstitions". For a certain time, they were subjected to coercive measures of reeducation, but they are now left in peace on behalf of the freedom of conscience.

These women determine what being of the other world has caused the sickness. They hold therapeutic ceremonies, with sacrifice of domestic animals. They "extract" various materials from the sick body. Are they in ecstasy or in trance? Are they been considered as leaving sometimes their own body to travel in the world of spirits? At last, what are the psychic and social effects of such symbolizations of the disease?

In case of therapeutic failure, we are told that sick people turn towards official medicine. But what occurs when this medicine suggests nothing but an aethiology (dioxin toxicity) without therapy? Upstream, does this "highbrow" aethiology suffice to drive the congenital handicap officially imputed to dioxin out of the field of shamanist therapies?

Articulation of the social and the subjective

Forest destruction and the harm done to the transmission of human life constitute major agressions against biosphere. Not only they entail terribly serious consequences, but they tear the social link in shreds. The conversation we have with victims show that those aggressions have broken the availabily of symbols that allow to imagine and say the human relation to nature. Restoring the social link and replacing pulverized views of the world can not be conducted mechanically by grouping together plans of territorial development, schooling, and campaigns of information, etc...in villages. An essential part of the reconstruction of social link is played at the level of the subjective experience of each one and at the intersubjective level of the family. In Vietnamese culture, it is not traditional to talk about oneself or to moan. Coming there without any economic or administrative power on people we talk to in order to provoke and listen to life stories in a spontaneous manner, that is the method that seems suitable to produce an innovation in the exchange privileging the real experience as they were felt. Even possibilities of a family microeconomic initiative depend on available psychic resources to conduct such an activity (for instance, if

we offer a loan to those who accept to buy a cow so as to embark on cattle breeding in the district).

If people attempt to build a new view of the world, they must first take into account the obsolescence of traditional processes of representations and expressions, then seize the innovations in current use. For example, in the houses we enter on A Luoi plateau, we did not seen altars of ancestors (very common among the Kinh), but photos of "Uncle Ho", surrounded with military distinctions obtained by members of the family. Likewise, many Pa Co have forgone their patronymic in favour of "Ho", to such an extent that the traditional taboos connected to some or other patronymic have ceased to be respected. How does such a reference to Uncle Ho work on the plane of fundamental points of reference in the way of thinking within the family? In the way of feeling things within the family, even in the heart of hearts of each one, what is the real impact of the official discourse (political, medical, humanitarian, etc...) on dioxin? Are images of Uncle Ho the symbol and legitimation of the official discourse? Or an unconscious and politically acceptable way of representing a supreme *yang*?

The question of languages

During our conversation with the above-mentioned schoolteacher, the question of mother tongue is clarified by the educational policy conducted by "Uncle Ho's cadres".

> *It is very hard to eliminate illiteracy in the population, since people learn by rote Vietnamese words without understanding the meaning, and they quickly become illiterate again. From 1947 to 1957, I had to master the Pa Co language, and I had to teach Vietnamese to mountain dwellers, and train teachers for their ethnic groups. But teaching Vietnamese alphabet remains ineffective. I then had to ask my superiors in the province to compose the Pa Co script, and begin with teaching ethnic minorities their own alphabet to favour the education. I cooperated with two young Pa Co teachers for three months to have the Pa Co script. Then I gathered together all teachers from ethnic groups who have learned Vietnamese to teach the Pa Co language. We have reached a quite impressive success. Everyone is motivated. Old people, women and children, everybody wants to learn reading and writing in their own language. And those who already learned their script passed on their knowledge to others. Each ethnic minority is proud of their own script, minority people are the equals of the Kinh, and their feelings of inferiory are little by little banished.*

For every human being, existing as a subject goes through the language, and above all the mother tongue. At present, the language of each ethnic group in A Luoi, spoken in the family, is not taken into considertion by the district educational system. Civil servants are indeed incited to acquire some rudiments necessary for contacts with the population; there are manuals designed for retraining. Moreover, many local cadres come from some ethnic group or other. But is it possible to examine more thoroughly those problems?

The political will of the authorities is strongly reaffirmed in an anthropological reference work:

> *Each ethnic group's cultural patrimony is developped. People try to jealously safeguard fine customs, noble traditions; people gather tales, stories, sayings, popular songs, that have until now been orally handed down from generation to generation, to be published and translated with a view to a wider distribution*[12].

For each of three languages in use in A Luoi district, there is an alphabet that permits publishing works where are perpetuated oral traditions of songs, myths, and various tales (for example, evidence provided by those who have lived through the time when they were hunters-gatherers). In versions for children, such pieces of work – eventually bilingual – can pass on recipes, songs, tales, nursery rhymes and games...Nobody has recalled those achievements.

Can we take stock of this editorial policy for the sake of the Co Tu, Ta Oi and Pa Co?. What is published in original language, in Vietnamese and in bilingual versions? What is the distribution of published documents? Do printed texts provide the basis of teaching skills that carry communication between generations within the family and in the village? Eventually, can this transmission of cultural patrimony find its place in education?

Such a transmission not only has a benefit in the field of aesthetic culture. It strengthens minority people's dignity, contributes to restoring the social links broken by the war, and favours each one's accession to his position inscribed in a genealogy. For instance, let's think about young people who can take over the cultural patrimony of their ethnic group with their mother tongue, at the same time as hunting feats, memories of the war, and personal life stories carried by the family discourse...

Conclusion

Devastating consequences of defoliation are dramatically amplified by hardships inherited from a century of colonization ended with thirty years of war. The quick economic development that marks the current period is still a long way from having ensured to Vietnamese people the means already found by an industrial country to do up environment, care for victims with the aid of modern medicine, and ensure to families of affected children a social security cover comparable with norms of such countries as France, Germany or Scandinavian nations.

At the present time, the growing difference between the living standard of Vietnamese peasants and that of their urban compatriots is brought out when problems evoked here are broached. Moreover, populations whose natural environment has been most heavily devastated, and families most affected by dioxin are particularly handicapped. So they are eligible for our redoubled moral and material support.

[12] Dang Nghiem Van, Chu Thai Son, Luu Hung, Les ethnies minoritaires du Vietnam, 3è édition revue et corrigée, Éditions The Gioi, 2004, p.14.

On the other hand, an anthropological analysis of the situation can bring out the exceptional cultural conditions of the real experience of the Vietnamese suffering from defoliation or from long-term effects of dioxin. So the modalities of religious beliefs and practices, of family structures and of the recourse to traditional medicine have a considerable place in the personal and collective impact of the catastrophe. These factors act differently according to ethnic groups and religions. Cultural framing is particularly essential when we find ourselves with people belonging to ethnic minorities. It remains to make clear, for each ethnic group, what are the traditional mode of production, the kinship system, the religious world, the explanation of sickness, etc...The special attention given here to the natives of A Luoi brings out this type of social processes, which are found again in different ways in all regions. There have been for a long time Vietnamese scientific institutions that do research on ethnic minorities, popular religiosity, traditional pharmacopoeia...Yet we don't know much, in those domains, about representations and practices relating to dioxin, nor about the mutations of mythology and practices resulting from destructions afflicted on tropical forest.

Even for vocational training and economic development, anthropology plays here a part, as professor Le Tien Dung (from the University of Agroforestry of Hue) affirms to us:

> *On the whole, environment is improved; but to raise the standard of living of families with handicapped people, we must directly and indirectly help improve their knowledge. So social organisms must work in collaboration with research institutions, and to obtain a good result, it is necessary to study the sociology of minority people's customs.*

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DEMOGRAPHIC AND ECONOMIC CONSEQUENCES OF AGENT ORANGE SPRAYING

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Examination of long-term effects produced by the spraying of defoliants (among which is the Agent Orange) during the American war must take into account the question's demographic and economic aspects.Let's recall that the spraying aimed at two purposes: annihilating vegetation to deprive the Viet Cong of their protection and camouflage[1]; and destruction of crops and environment (hunting and gathering) to prevent villagers from accommodating and feeding the Viet Cong.

Spraying was massive and systematical: total destruction of targeted areas (forests, mangrove swamps, land under cultivation, and river-banks) sparing no hamlets (and their inhabitants), repeated spraying (two, three, even more times). The strategy of destruction has a lot of means at its disposal: classic bombings, bulldozers, napalm, phosphoric bombs, etc...

The spraying aimed not so much at localized defoliations as lasting effects on the whole of affected spots: not only inhabitants, but also physical environment (soil and water) and every form of animal and plant life (forests, mangrove swamps, savannahs, crops).

But public health and environmental aspects of spraying have held the attention of researchers as much as demographic and environmental ones. Research we carry out is not easy, particularly on account of the tragic absence of documented and checked data.

So this paper is aimed above all to constitute a contribution to the collective reflection. It bases itself on existing data and tries to raise some important questions for Vietnam's development and future, which it is impossible to find immediate answers to, but which would form the subject of prospective studies.

From this viewpoint, we will first examine one of the main problems immediately confronting us when we broach the subject of Agent Orange: what is an Agent Orange victim? Then we will try to bring forward some elements relating to the dynamic of

[1] The roundup of people in "strategic hamlets" (an operation got under way in 1964) probably related to spraying.

population. Afterwards, we will contemplate the economic dimension of the question, at least what regards some of its facets. Finally, we will particularly examine the case of the rural society.

What is an Agent Orange victim?

Difficulties of definition and assessment

On the whole, there are no accurate data regarding handicaps among the Vietnamese population, notably in each province[2]. Problems of assessment in this field are complex and, in Vietnam as well as in other poor countries, data on handicaps are partial and relatively reliable[3].

So it is quite difficult to give the number of victims since we not easily define a victim because we lack epidemiological investigations[4]. In fact, it is difficult, 40 years after the facts, to find definite medical "pieces of evidence" allowing to determine whether a handicap is due to dioxin or another cause. Even among the consequences connected to the American war, specific effects of defoliants containing dioxin are difficult to isolate from those produced by other weapons utilized (napalm, bombings, gas, etc...) For example, how to tell the effects of the Agent Orange from those produced by other defoliants utilized (Agents Blue, White...) Apart from their effects on the population (and also on the flora and fauna), we must notice that the combined effects of those chemicals are in all probability more noxious than those of each of them taken separately. And with time, other sources of contamination by dioxin can emerge, notably important quantities of pesticides utilized in agriculture, that come from the same chemical plants producing defoliants utilized during the war.

Let's note that these difficulties are scientifically and politically important, including in terms of responsibilities, but that they may appear secondary, as a victim is above all a person who needs help, whatever the origin of his handicap may be.

Some kinds of evidence?

In relation to all these questions, we set out three comments. First of all, we must distinguish between the individual evidence telling that such a person is a victim or not of Agent Orange, and the statistical proof if we can show that we find in Vietnam specificities for some pathologies in comparison with countries where modes of life are

[2] "Not only is it important to have estimates of the overall prevalence of various disabilities, but, perhaps more importantly, it is important to know the geographic distribution of persons with disabilities and the type and location of rehabilitation centers and staff for the disabled" (Kane. 1999, p. 1)

[3] The quality of reported data varies widely, and a fair amount of data are missing. Over-reporting or under-reporting of specific kinds of disability occurs due to problems in the definitions of disability or staff being inadequately trained in proper methods of collecting disability data in surveys, CBR reporting, or at rehabilitation centers" (Kane, 1999, p. x).

[4] The Vietnamese government estimates at one million people actually suffering from affections linked to their exposure to Agent Orange.

comparable. For instance, a larger proportion (in comparison with the population or with the number of births) of miscarriages, type 2 diabetes, malformed babies, etc. This "statistical proof" could be produced by epidemiological investigations targeted on those pathologies.

Afterwards, individual evidence may be medical proof if we conduct a chemical analysis of fat or milk allowing to bring to the fore high rates of dioxin. But we know that such analyses cost a lot and cannot implemented on large groups of specimens. In fact, to prove the exposure many years after the event, and to prove the link between exposure and pathology is a difficult and sometimes very expensive job. And Vietnam, despite the quick economic development in the course of fifteen last years, remains a poor country where funds are allocated as a priority for health care and assistance rather than for the search for evidence.

At last, without mentioning this individual evidence, we doubltessly may make a presumption with regard to second or third-generation descendants through genealogical researches like those conducted by CGFED[5] But we then must carefully select the specimens to distinguish families, of which some members have "met" Agent Orange (a combatant parent or grand-parent who was present in areas whereon defoliation was targeted, or who just inhabited there by the time of defoliation; or else who has migrated in areas acknowledged as being still impregnated with dioxin), from families that we may consider as having never been in touch with defoliants utilized during the war.

Different possible types of victims

Preceding reflections bring us to contemplate many possible types of victims, and this typology can help clarify the discussions. It seems that we may consider at least four categories of populations:

a) people and soldiers who were present by the time in areas where defoliation was targeted and who are "potential victims": they may have or have not developed pathologies that can be linked to Agent Orange;

b) among them, those who have been affected by defoliants, whether directly (their bodies were hit by defoliation), or indirectly (they have lived for a certain time in areas affected by defoliation, fed themselves[6], drunk water, had a swim, etc...) and who have contracted an affection (and who whether still are alive, or whether they already are dead); those people can be found anywhere in Vietnam as a result of migrations; those are "immediate victims" (of the first generation);

[5] Center for Gender, Family and Environment in Development, Hanoi.
[6] The most common contamination comes from the consumption of fish or animals which have ingested dioxin accumulated in adipose tissues.

c) their children (and grandchildren) possibly affected directly (through the placenta, through breast-feeding, even through genetic mutations) or indirectly (because they have eaten contaminated food or have had played in polluted lakes, etc...); those are victims of the second or third generation;

d) people who, by migration, settled themselves in contaminated areas, and their children and grandchildren, that have developed some affections connected to dioxin; those are victims by migration.

Agent Orange and dynamic of population

Our knowledge of Vietnamese demography permits to be more specific about two points in order to shed light on this typology and call in mind afterwards a third question.

Survivors, 35 or 40 years after defoliation

The utilization of data provided by Stellman (Stellman et al., 2003) and the dynamic of population of Vietnam (see chiefly the results of the 1999 population census) leads to following orders of importance. We mean orders of importance because data are hardly accurate.

Defoliations, that were conducted from 1961 to 1971, were concentrated on the period of 1966-1969. The average of this distribution is set approximately on 1 January 1968.

By this time, Southern Vietnam had about 38 million inhabitants.

Survivors from this population on 1 January 2005 are now 37 years old and more.

People of 37 years old or more represent, according to the population census of 1999, about 27,5% of the total population.

Now we may consider that the population living on 1 January 2005 within the former South Vietnam is about 44,4 million inhabitants.

Among this population, people of 37 years old or more are about 12,2 million inhabitants.

Stellman shows us that 4611 villages have been struck by defoliants. There is a population estimate for 3181 villages out of these villages, that is to say a total of 2,1 to 4,8 million inhabitants. If we suppose that the remaining 1430 villages had an average population identical to that of other villages, the total population directly struck by defoliation was between 3 and 7 million inhabitants, that is to say, in adding this number to 38 million inhabitants of South Vietnam at that time, between 8 and 18% of the population. Let’s note that it is a minimal estimate because we don’t take into account other means of spraying defoliants (trucks, ships, by hand) that were near dwelling places.

By applying these proportions to the population of 12,2 million inhabitants, we find that the number of people hit at the time by spraying and who are still alive is between 1 and 1,2 million.

Such is the estimate that can be given of "potential victims". But it is only an order of importance, since the calculation, applied to the present-day population, takes into account immigrants. It doesn't take notice of emigrants, fighters from the North that were present in the South at the time, all those who resided in the neighbourhood of American camps where were stocked a great many chemicals and who can be directly or indirectly contaminated by the utilization of storage barrels (reused to lay in stores other things, including foodstuffs or drinking and bathing water); moreover, a deathrate was doubtless higher among these potential victims than the rest of the population.

The role of population movements

Vietnam has experienced a long history of migrations, that can be traced back to the Southwards Movement (Nam tiến) In recent years, Vietnam has seen "organized migrations" meant to redistribute the population on the territory by force of circumstance (in particular owing to high population densities observed in the Red River delta). These organized migrations have concerned practically all provinces, known as emigration provinces or immigration provinces (Gendreau et al., 2.000).

Since the risks linked to defoliation were not observed, and regions still polluted by defoliants had not be identified yet, it is probable that some provinces particularly damaged by defoliation can be provinces of emigration, which has furthered the dispersion of people affected in all the territory, or conversely, provinces of immigration, which can contaminate people initially healthy but who settled themselves later in polluted environments.

We have been able to analyze data per province on organized migrations over the period of 1976-1998[7]. Results of the analysis show that the above-evoked possibilities have effectively materialized in many cases. So, without going into details, if we characterize the provinces by the proportion of their surface having been damaged by defoliants in relation to their total area:

- The three provinces most affected by defoliation (more than 37% of the damaged area) are listed among the provinces having accommodated the most immigrants; those are the provinces of Dong Nai, Song Be (now Binh Duong and Binh Phuoc) and Tay Ninh. situated in the of South-East of Vietnam;
- the following five provinces, much affected by defoliants (over 17% of the surface damaged), are those which have sent the most emigrants to other provinces; those

[7] Data provided by the Department of Population redistribution and New economic zones (Ministry of Agriculture and Rural development).

are southeastern Ho Chi Minh-City, Quang Nam-Da Nang (Da Nang and Quang Nam today) and Nghia Binh (Quang Ngai and Binh Dinh today), situated on the central littoral, Binh Tri Thien (Quang Binh, Quang Tri and Thua Thien-Hue today) situated in the Centre-North, and Ben Tre, situated in Mekong delta;

- we may also cite the case of Dac Lac, province on Central Highlands, scarcely damaged by defoliants (4% of the surface affected), but which accommodates a lot of immigrants, especially from Binh Tri Thien and Quang Nam-Da Nang.

Through these examples, we understand well that victims of Agent Orange are found again everywhere in the country, not merely in the Centre and the South, and that people who have not yet been contaminated by dioxin can be by migration.

Vietnamese communities living abroad

Finally, a last point deserves to be considered. Since the end of the war, and until the middle of the 1990s, a great many Vietnamese from the South emigrated, either illegally (the "boat people") or in the framework of a programme set up in 1979 (Barbieri). Those populations can have been potentially exposed to Agent Orange. Yet there has not been any particular treatment of them, nor any specific research regarding them. Nevertheless, 1,4 million people have emigrated.

In particular, these emigrants have gone to the United States (over 800.000 people). Have they made themselves heard, especially in relation with American veteran? We don't know. Does this population present a particular pathological situation? In fact, it appears difficult to think that the emigrants have not been, at least as much as American veterans and the Vietnamese staying there, damaged by that exposure.

Likewise, many countries have accommodated a lot of those emigrants: Canada (160.000), Australia (160.000), France (50.000), etc...But we have not found in scientific literature any article dealing with the effects of Agent Orange in these overseas Vietnamese.

The burden of Agent Orange borne by Vietnam

Difficulties of estimation

For all the reasons called up previously, it is extremely difficult to estimate the burden of Agent Orange borne by Vietnam.

The costs belong to two orders: human cost and environmental cost. These costs are both direct (deaths linked to exposure, destruction of the flora and fauna, health spending and expenditure involved in cleaning contaminated areas) and indirect (costs entailed by the analyses necessary to producing evidence of the connection between exposure to Agent Orange and the pathologies developed, to know the dioxin content in the soil and animal products, as well as the cost of administering the aid offered to

victims by the Vietnamese government and by households), and the cost of opportunity (loss of income for families and the country, connected to handicaps and pathologies caused by Agent Orange and by defoliation that has made thousands of hectares unsuitable for farming and potentially threatens the export of Vietnamese processed foodstuffs).

If the noxious effect of dioxin on man is not challenged, the number of people affected, the effects in time, the nature and scale of contamination according to exposure would remain subjects much discussed. It is frustrating to notice that science hardly gives clear answers to the many questions being asked. On the subject of the assistance provided for Vietnam war veterans, the American government has settled the question by listing, on the one hand, the pathologies that the Academy of Sciences of the United States acknowledges as being directly associated by exposure to dioxin, and by determining, on the other, that this help should be accessible to all Vietnam veterans, independent of the evidence produced on the link between treated affections and exposure[8]. Although it has protected itself by a law that anticipates any possibility to start legal proceedings against the State for a loss sustained in the service of the State, the American government explicitly acknowledges its responsibility in assitance to be provided for veterans. In those conditions, the American government's position vis-a-vis diseases of veterans can constitute a basis of reasoning to evaluate the loss sustained by the Vietnamese, whether or not they are fighters, or more often mere civilians in combat zones.

Three distinct questions being linked together are put on economic costs: compensation for the loss sustained until now by Vietnam, and for costs of opportunity; financing of the assitance; and financing of analyses necessary to the evaluation of the contamination of the soil, the flora and fauna, as well as the money put up for the decontamination of soils. We won't venture here to evaluate these costs.

Thus, the estimation of costs associated with deaths depends on many factors. The estimation of the cost of a Vietnamese life of 60 years can only give a very small number, and the war situation implies a slight hope of survival (both because of the risks directly connected to the fighting and the hygienic and health conditions prevailing in the zone). It is evident that in the course of following generations, the level of education was higher, hygienic and health conditions were better, death-rates were lower, bringing about an increase of life value measured in monetary terms. Yet these new generations have not been directly affected by the spraying of Agent Orange during

[8] "Under current law, the Department of Veterans Affairs (VA) provides medical treatment to veterans for disabilities associated with exposure to Agent orange and ionizing ratiation. VA treats these veterans for certain diseases whether or not sufficient evidence connects the conditions to the exposure. This bill would extend VA's authority to provide medical treatment to veterans exposed to Agent orange through December 1997, but would limit treatment to conditions the National Academy of Sciences has deemed positively or suggestively associated with exposure, or for wihich there is not enough evidence to permit a conclusion. Diseases for which limited or suggestive evidence shows no association would not be treated unless credible evidence of suggestive association is found" (Congressional Budger Office, 1995, p.2 basis of estimate).

the war. In order that they could be involved in the category of people entitled to compensation, evidence must be found of the causality between defoliation during the war and the deaths/pathologies observed.

Consequences on economic life of families

Economic and social impacts on damaged families is immeasurable (in literal and figurative sense), not to speak of individual problems (psychological and physical). Immediate effects on the life of damaged populations regard in the first place the loss of their means of production. Small farming exploitations that were affected by defoliation were reduced to poverty (some specific products of the spray prevent the maturation of crops when they are not destroyed). The workforce is affected, even if it is impossible to make clear statistically the handicaps and their impact. Healthy adults in a family have to devote part of their time caring for handicapped family members. Providing schooling for sick children is difficult. Incomes of families are reduced, and the cost of medical care aggravates their situation.

A survey (carried out by Gibb, 1999) evaluated at about 60% the proportion of farming households compelled to live in poverty/ or to live in refugee camps.

An investigation conducted in 2001 in Quang Tri province (next to the 17th parallel, an area particularly damaged) has shown that the income per person of families having at least one handicapped member is mush less than that of families that are not damaged, and that health spending per person is much higher (Palmer, 2005).

It is then necessary to set up procedures furthering the integration of victims into the economic and social life, and giving them the means to meet their basic needs. For example, we can provide them with a vocational training. Or we can help them to increase incomes in families, for instance, by supplying them with farm animals (fish-farms, cows, cow-buffaloes).

As far as assistance is concerned, it is logical to consider that damaged populations have a right equivalent to that of American veterans to get access to health care and to the assistance they need. The US government has at least a moral obligation in this field, and we hardly see how criteria different from those enjoyed by American veterans can be applied to the Vietnamese.

Macro-economic consequences

Macro-economic effects (at regional and national level) are multiple: activities of health services devoted to victims, loss of the creation of wealth (between 500.000 and 1.000.000 adults are to some extent handicapped by dioxin, which inevitably has a knock-on effect on the GDP) etc... We will examine here two aspects of these consequences: budgets devoted to the help of victims, and the question of exports.

The Vietnamese authorities are active in the face of providing help for victims. The government provides some victims with allocations ranging from 5 to 10 euros per month (apart from the assistance which can be provided by provinces and districts) (Palmer, 2005). Those are people (ex-servicemen or civilians) who were exposed to Agent Orange and/or their children, who suffer from handicaps preventing them, totally or partially, from working. It is insignificant, even when taking into account the average living standard in Vietnam (530 euros per inhabitant and per annum), that is to say 0,5% of public expenditure).

With regard to exportations, the problem of innocuousness of Vietnamese products (shrimps, fish, etc...) is raised. Regardless of the real effect, the impact on the export of processed foodstuffs is potentially devastating. On the whole, plants do not absorb dioxin, but it was rumoured in 2001 that Vietnamese coffee can be contaminated with dioxin, as a result of the falling prices of coffee which was attributed by some to the massive growth of Vietnamese exports.

The export of farm and aquatic products represented in the early 2000s nearly 5 billion dollars, that is to say 13% of the GDP (GSO, 2005). Vietnamese exports in 2002 were made up of 14% for farm products and 12% for aquatic products. Exports, in relative terms, of farm products tend to decrease, while exports of aquatic products tend to increase. For farm products, the majority of exports is fulfilled, besides rice, in such crops as coffee, cocoa, rubber, etc. Aquatic products are partly freshwater ones such as the well-known catfish, but most are made up of sea products..So there is limited risk of dioxin exposure for consumers abroad. However, suspicion could taint the credibility of all products from Vietnam. To anticipate the panic internationally would require information campaigns that are backed up by indisputable scientific results, meanwhile, Vietnam is faced with strong budget constraints.

With regard to fish and shrimps, the Vietnamese government, in the early years 2000, worried about that dioxin levels in some areas of Vietnam would constitute a prejudice against Vietnam's exports. American catfish farmers were claiming that Vietnamese food exports – particularly catfish – were contaminated with dioxin stemming from Agent Orange. However, research carried out in 2001 by the University of Texas – Dallas, School of Public Health, on twenty two food specimens exported to the United States and Laos (mainly fish) revealed minimal dioxin rates. According to its conclusion, it was improbable that Vietnamese food exports were strongly contaminated with dioxin from Agent Orange or from other sources (Schecter et al., 2003).

Consequences of the spray on rural life.

Finally, let's remember that the Vietnamese population is still essentially rural (77% of the total population), and that this population has particularly been affected by the spray.

Overall view

Ecological consequences must be differentiated according to circumstances in time. Lasting deforestation, surfaces made unsuitable to cultivation, sterilized soils and destruction of the fauna in defoliated zones are listed among direct consequences of the spray. However, it is difficult to impute to Agent Orange all effects noticed on the flora since the spray is merely one of the means utilized to prevent farming production and deprive the enemy of food sources. Thus it is agreed that attention should be paid rather to the effects of the war.

If rivers, lakes, and mountains without vegetation are removed, 24% remain of the surface of Vietnam that is not utilized, part of which is a certain number of areas sterilized by the Americans. These surfaces represent a loss of profit that must be evaluated according to their utilization as cultivable and habitable zones, or fauna and flora reserves. Moreover, in order to know exactly the environmental consequences of Agent Orange, it should be agreed to examine accurately the long-term effects of this product on vegetation and the fauna susceptible to being genetically modified.

With respect to losses (in certain cases in terms of sterile soils and wildlife) of the productive capacity (agriculture, hunting and fishing), we should talk about recurrent costs for regeneration and rehabilitation, and the delayed impacts: the farmer must now go farther in less affected areas in search of their subsistence, those areas being not suitable to cultivation if they were not utilized.

Forests

Naturalists have indicated for a long time the decrease of forested areas as a result of the demographic expansion and the movement southwards of populations. With the post-bellum reconstruction, due to the need for firewood and charcoal, forest fires, and slash-and-burn agriculture, Vietnam loses about 200.000 hectares of forests per annum (Kemf, 1988). At present, besides areas intended for agricultural exploitation, we find two extremes of the country, on the one hand, the forests that have not yet been exploited yet (a slight expanse, in zones that are protected or not very accessible), and on the other, the bare soil without vegetation or overrun by herbaceous plants of the *imperata* type. Tropical forests with many levels of vegetation were sprayed several times until the soil was visible: "For the dense forest, the first spray kills some trees. But successive sprays will affect young trees. Two or three sprays can eliminate about 50% of the forest biomass" (Tschirley, 1969). In more damaged areas, herbs or

bamboos, resistant to defoliants, overrun the zones and bring regeneration to a standstill (Blanc, 1988).

Denudation of hills and even flat zones can entail a pronounced deterioration of the fertility of soil due to the disappearance of the canopy which acts protection by preventing torrential rains from eroding sloping soil and compacting flat soil (causing laterization making them unsuitable to planting trees and agriculture). Deforested areas remain subject to frequent floods (often catastrophic) or to drought. When nature "reasserts itself", the pioneer vegetation often consists of resistant herbaceous plants (the famous *imperata cylinfrica* often called "American grass") or bamboos. Large programmes of planting eucalyptus have also been conducted in those zones.

Damaged and unexploited land accounts for 14 million hectares, of which 6 million are bare land. Regeneration has already started. We must indicate that the return of forest ecosystems to their initial state is a long process for tropical zones: 30 years for mixed forests, 70 years to obtain a stable number of secondary species, and 150 years for species characteristic of primary forests (Blanc, 1998).

An ambitious programme of regeneration and reforestation has been implemented [9] including: a programme of reforestation of 1,5 million hectares to reconstitute tropical forests (Da Ma forest) and the regeneration of mangrove swamps (such as in Rung Sat near Ho Chi Minh-City, although the proliferation of fish farms constitutes a real danger for mangrove swamps). But there are still large devastated zones, known as "Museums of Agent Orange" (Tully, 2003).

Special mention should be made of mangrove swamps. They play an ecological role of consolidating alluvial deposits carried by rivers, an economic role of making firewood and charcoal, and constitute zones of spawning beds for crustaceans and zones of fish and shrimps farming.

These areas have been particularly damaged by spraying, while they are fragile ecosystems (land vegetation, and land and marine fauna) which do not withstand brutal interventions (Marius, 1989). We estimate that 50% of productive wood and fisheries in Ca Mau mangrove swamps were destroyed (Kemf, 1888). The regeneration of damaged mangrove swamps is now fortunately well advanced (cf. the Can Gio protected zone).

Hot spots

As we may think and hope that traces of Agent Orange tend to disappear in time, research shows there are still high dioxin rates in certain zones, these are the dioxin "hot spots". For example, this is the case in A Luoi or Bien Hoa. Recent research conducted

[9] Programme in the framework of the "World Conservation Strategy" launched in 1980 by the International Union for the conservation of nature and natural resources (UICN) in cooperation with the United Nations for Environment (PNUE), the FAO and the UNESCO.

between Quang Tri and Da Nang incicates that 15 out of 20 sites surveyed are particularly contaminated, with at least 60 times as much as the toxicity norm (Tuan Anh Mai, 2004).

Likewise, a recent study made at the Bien Hoa airbase, where there was a large spills of Agent Orange, shows that dioxin rates are particularly high, and also affect people coming to settle there after the war (Schecter et al., 2001). The authors suggest the possibility that contamination is due to dioxin leeching from the soil to the sediment in water, and then attach to phytoplanktons which are ingested by fish, that are then consumed by man. If this hypothesis proves to be correct, then the potential of contamination of man is very important and concerns all population now living in these hotspots.

Measures must be taken to protect the populations and their economic activities: a decontamination must intervene, the populations must be informed and eventually moved away.

Conclusion

While the war came to an end nearly 30 years ago, the lack of research to evaluate the effects of Agent Orange on demographic and economic planes is sorely felt. Today, this question is difficult to study because a lot of time has elapsed and most dioxin has fortunately disappeared. But, following the works of Stellman and the research by CGFED, investigations seem possible and they must be carried out.

Because, apart from the question of compensations and the evidence produced, an in-depth study is necessary: for Vietnam, it is an imperative need that must be met for the sake of development and a question of public health. And the international community, especially the United States, takes a responsibility in this domain, notably from the viewpoint of commitments in the framework of the objectives to be reached in this millennium. We hope that this communication may contribute to the awareness of the necessity of a joint commitment by Vietnam and the international community to make headway in this knowledge.

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AGENT ORANGE THROUGH THE NEW YORK TIMES – CHRONOLOGICAL (UP TO 1970)

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1962:
Jan. 19: "U.S. Spray Strips Foliage Hiding Vietnam Reds"- U.S. forces have just started using defoliants to clear foliage hiding communist guerillas and to kill their food sources, sweet potato and manioc fields in the highlands. The U.S. has dropped pamphlets assuring the villagers that the chemicals are safe.

1963:
Mar. 11: "Washington Rebuts Poison Gas Charge"- Soviets charge that U.S. is using poison gas in Vietnam. U.S. DD spokesman says the charges were "without foundation" like the charges the Communists are making about the defoliants and herbicides used being poisonous when they are "harmless to people, animals and the soil."

Mar. 20: "Germ-War Charge Is Denied By Saigon"- Saigon and the U.S. deny Communist charge that they've used poison gas warfare which has "caused damage to crops of many villagers in highly populated areas and had led to the deaths of many Vietnamese and to several major protest meetings by non-Communist peasants." The U.S. gov. denied all of this today.

1964:
May 26: "Vietnamese Lifelines: Goldwater's Advocacy of Interdicting Reds Supply Routes Has Some Support." Senator Barry Goldwater opened discussion on the use of nuclear weapons to clear terrain in Vietnam. Some Pentagon officials supported his ideas.

Aug. 15: "U.S. Urges Inquiry On Poison Charge." U.S. responds to charges that U.S. planes have been spraying poison, a toxic powder, over Cambodia. They said all they were

using were the standard "harmless weed-killers," and blamed the allegations on Communist propaganda.

1965:
Mar. 28: "Weed Killers Aid War On Vietcong"- Defoliation in Vietnam has gone on since 1961. The compounds are not harmful to people, animals, soil, or water. According to US, only S. Vietnamese have taken part in the crop destruction missions.

Dec. 20: "Defoliation Unit Lives Perilously." Defoliation spray plane pilots are turned into heroes for flying the Ranch Hand missions, which are especially dangerous because flying at low levels makes them vulnerable to enemy fire.

Dec. 21: "U.S. Spray Planes Destroy Rice in Vietcong Territory"- U.S. has started a drive to destroy Vietcong rice crops using commercial defoliants that are so harmless that food it touches, that is not destroyed will not be unhealthy or unpalatable. U.S. says that no herbicide missions will be flown in highly populated areas. Approx. ½ of Ranch Hand missions are spent on herbicide as opposed to defoliation.

1966:
March 10: "U.S. Tells of Crop Destruction in South Vietnam." Herbicides and defoliants are being used to destroy crops and clear wilderness to make areas less vulnerable to guerilla attack. The State Departments says "herbicides used are nontoxic and not dangerous to man or animal life. The land is not affected for future us." All defoliation and crop-destruction were initiated by the S. Vietnamese, not the U.S.

Sept. 20: "U.S. Will Step Up Defoliation Missions in Vietnam." Defoliation has been effective, and it will be increased. When rubber trees are destroyed, accidentally, the owners are compensated.

Sept. 21: "Pentagon Backs Use of Chemicals." 22 leading scientists, including 7 Nobel Prize winners, sent a letter to President Johnson asking that chemical anticrop and

antipersonnel weapon uses be halted. The Pentagon responded saying that the defoliants are not poisonous, and claims that they are stem from Vietcong propaganda.

Sept. 25: "The Pentagon States the Case for CB in Vietnam"- The weed-killers used are non-toxic an do not prevent future growth. Once again claims of poisoning are blamed on Communist propaganda. Opposing scientists stress that even limited chemical war will lead to escalation.

1967:
March 15- "Pentagon Triples Spending on Defoliation in Vietnam"- U.S. spent 32 million on defoliants, an increase from 10 million in the previous year.

Oct. 18- "Use of New Defoliant in Laos Studied"- Laos has let U.S. use defoliants to help them patrol its border with Vietnam. Now the U.S. is looking at studying even stronger defoliants along the border area.

1968:
Jan. 4- "Use of Herbicides by U.S. in Vietnam Defended"- Biologist Commoner and military scientist Minarik argue pros and cons of defoliants. Commoner claims they will have long term negative affects on the environment. Minarik says that the defoliant is not absorbed into cattle's breast milk, and tales of deaths related to the chemicals are Vietcong believing their own propaganda. Minarik urges even stronger defoliants to be used.

Feb. 13: "Defoliation Study Casts Doubts on Long-Term Damage in Vietnam"- DD report undertaken by the Midwest Research institute finds that "there are no clear indications that widespread aerial spraying to strip Vietnamese war zones of foliage will do long-term damage. However, too little is known to assess the efforts with confidence."

July 20- "U.N. Study Urged on Defoliation." The board of directors of the American Association for the Advancement of Science urged the U.S. to sponsor a long-term study on the effects of herbicide/defoliant use in Vietnam.

Aug. 25- "C.B.W. Bases and What They Do."- C.B.W. bases exist at Fort Detrick, MD, Pine Bluff, AK, Edgewood, MD, Rocky Mountain Arsenal northeast of Denver, and the Newport Chemical Plant. These bases work on research and testing of chemical and biological weapons.

Sept. 21- "Study Finds Defoliants Change Vietnam Ecology"- Dr. Tschirley found the affects of defoliation on plant life severe. He is not a zoologist, but he said he didn't notice any harm to animals. He claimed the greatest effect of the chemicals in that bamboo will take over and keep other plants out.
Dec. 31- "Scholars: Study of 'Risks and Benefits' of the Use of Herbicides In War is sought"- AAAS voted for study of herbicides in war. They deleted mention of Vietnam in their proposal to avoid getting involved in politics, however, it is well understood that the study would take place in Vietnam.

1969-
Apr. 4- "Zoologist, Back from Vietnam, Notes Defoliants' Value and Toll"- Zoologist Dr. Pfeiffer saw major changes in animal life of Vietnam. However, he notes that without the use of defoliants he would not have been able to make it down a river in Vietnam and back alive.

April 20- "Does Science Give Good Values for Out Money?"- This articles debates questions involving scientists and ethics.

July 3- "Saigon Shuts a Newspaper."- The South Vietnamese government shut down a newspaper in Saigon for publishing stories about unnatural births due to consorting with Americans and defoliant chemicals.

Oct 2- Letter to the Editor, "Defoliants in Vietnam"- Dr. Arthur Galston contends that defoliation can lead to incredible environmental damage on all levels.

Oct. 30- "U.S. Curbs Use of Weed Killer that Produces Rat Deformities."- Lab results show that tests of 2,4,5-T on rats produced a higher than expected about of birth

deformities. The government put in place mild restrictions on its use while further testing is done.

Nov. 26- "Germ Warriors Retired."- Nixon administration unilaterally renounced use of biological weapons. Herbicides and CS-2 will still be used, but many say this is a step in the right direction.

Nov. 26- "Nixon Renounces Germ Weapons, Orders destruction of stocks; Restricts use of Chemical Arms"- Nixon calls for an end to germ warfare weapon development. He also calls for the halt of use of chemicals weapons, with the exception of herbicides and riot control gases.

Dec. 2- "Books of the Times: Let Us Spray.."- Review of book *War by Pestilence, Asphyxiation, and Defoliation* by Congressman Richard D. McCarthy. Reviewer makes several interesting comments. First, he expresses widely felt sense of relief about Nixon's recent ban on biological and many chemical weapons. Also, reviews says only angle not looked at by McCarthy is "why we experiment with such stuff (as chemicals) only on Orientals, rioting blacks, and young white demonstrators."

Dec. 28- "Scientists Press Study of Defoliants in Vietnam"- AAAS appoints scientist Meselson to design a study of the ecological effects of herbicides and defoliants in Vietnam. One of his tasks in the year of planning the study is to get the appropriate authorizations.

Dec. 31: "Scientists Call for a Ban On 2 Vietnam Defoliants"- AAAS scientists call for a ban on 2,4-D and 2,4,5-T citing studies that show exposure leads to birth abnormalities in experimental animals. Scientist like Prof. John Edsall of Harvard said the question was too urgent to wait for the outcomes of Meselson's study. Those against pointed to the chemicals as saving American lives.

1970:

Feb. 8: "Deformities and Hermorraging Laid to Forest Spray in Arizona"- 2,4,5-T use in Tonto National Forest surrounding family farms leads to death and birth defects in goats and fruit tree; health problems in people included respiratory ailements, swelling feet, chest pains, extreme weight loss, miscarriages, internal hemorrhaging in pregnant women. Dr. Dubridge, science advisor to Pres. Nixon was so shocked by reports that he banned use of 2,4,5-T near populated areas in U.S. immediately. Forestry service says chemicals in the land will break down over 72 hours, some independent scientists say it could take 15 yrs or longer.

Feb. 15- "We Lay Waste the World"- Some believe use of chemicals is leading to epidemic of birth defects throughout world. Chemicals include Agent Orange and Thalidomide, a tranquilizer. The U.S. and Soviets are beginning to see need for monitoring environmental threats.

Mar. 15- "U.S. Shows Signs of Concern Over Effect of 9-Year Defoliation Program in Vietnam"- Environmental damage by herbicides is undeniable but health consequences are not proven, and defoliants might just be a scapegoat. The benefits, reducing guerilla attacks and denying food to enemies, outweigh the "psychological" consequences according to U.S. military officials.

Mar. 18:- "Dow Aides Deny Herbicides Risk"- Dow officials state that birth defects in animals that resulted from testing 2,4,5-T is not the direct result of the herbicide, but of the common contaminant in it- dioxin. Nixon's science advisor says that now the compound will only be used in areas remote from the population.

Apr. 16- "U.S. Curbs Sales of a Weed Killer: Also Suspends 2,4,5-T Use as Defoliant in Vietnam"- 2,4,5-T use halted as home weed-killer and in Vietnam because DHEW tests show it might cause "abnormal development in unborn animals." Pentagon says Vietnam suspension is only temporary.

June 23- "Use of Defoliants in War Suspended: Controversial U.S. Program May Resume in July on a Very Limited Scale"- Use of all chemical defoliants and herbicide suspended because the planes are being used to haul enemy arms captured in Cambodia. American military sources say limited spraying will continue after that operation is finished on June 30.

July 19: "Surgeon General Defends Herbicide"- Surgeon General told a Senate Commerce sub-committee that 2,4-D is harmless in response Agricultural director's statement that 2,4-D led to similar birth defects in experiments as the banned 2,4,5-T. 2,4-D is popularly used in the U.S. and as a defoliant in Vietnam.

Aug. 27- "Senate, 62 to 22, Rejects Herbicide Ban for Vietnam"- Senate defeated 2 (more) bills that would curb herbicide use in Vietnam. Senator Nelson of Wisconsin argued that use of herbicides would lead to the legitimization of starvation tactics in warfare. Also, he points out use of protecting S. Vietnam if U.S. is going to destroy it in the process. Opponent Senator Dominick of Colorado says that because it prevents American soldiers from dying, it is worthwhile. Nelson also argues that you shouldn't use something when you don't know it's effects on plants, animals, and humans. Opponents contend that point by looking at lack of clear evidence as enough.

Oct. 24: "Plundering South Vietnam"- Comment of Ngo Cong Duc, Secretary-General of the Socialist Opposition bloc in the National Assembly of South Vietnam. He talks about disasters of this war including that the Vietnamese are "plagued with strange diseases: women are giving birth to monsters, and there is an ever-growing number of women with psychic disorders" due to U.S. herbicide use.

1971:

Jan. 16: "Poison is Good for You"- Jerry Friedheim, DD spokesman, contested AAAS criticism of defoliation program by saying that the effects are on Vietnam's environment are actually beneficial. He says destroyed hardwood forests can now be used for lumber. However, author points out that live trees are used for lumber because dead ones are eaten

quickly by insects, also sun on forest floor leads to bamboo invasion. Author says U.S. defoliation is against international treaties.

Mar 27- "2 Experts Back Ban on Tear Gas and Sprays in War"- Two scientific consultants to Exec. Branch, Drs. Meselson and Brennan, argue that signing herbicide and tear gas ban is in U.S.'s best interest because failure to do so would encourage less developed nations to turn to chem. and bio. weapon usage.

Jul. 11- "Foes of Spraying Win Coast Round: Forest Service Agrees to Use Milder Defoliants"- Under pressure from conservationist groups, U.S. Federal Forest Service has called off use of defoliants in national forests.

Jul. 12- "'Agent Blue' in Vietnam"- Agent Blue is bad because food destruction tactics in general are bad and cause women and babies to starve.

Aug. 15- "Herbicides: Should We Use Them or Not?"- Discusses whether home gardeners should use 2,4,5-T and other herbicides similar to those used in Vietnam. Currently domestic use continues. It says the 2,4,5-T used in the test has more dioxin than commercially marketed 2,4,5-T so it should not be too dangerous for continued limited and careful use.

Nov. 21- "Defoliant Leaving Vietnam"- More than a million gallons of Agent Orange will be taken back to the U.S. from Vietnam to be destroyed today.

1972:
Jan. 25- "Lethal Defoliant to Be Destroyed: 2 Tentative Sites Chosen for Disposal of Chemical"- Air Force plans to destroy 23.4 gallons of Agent Orange. It will be incinerated likely at Deer Park, TX and Sauget, MO over 468 days. Report says destruction of Agent Orange will result in 44.7 million pounds of carbon dioxide being released into the atmosphere and 12.4 lbs. of salt into public streams.

Aug. 14- “Army Study is Said to Back Defoliants”- According to a Washington science writer, “Use of defoliants in Western Europe to help stall a Communist attack is recommended in a secret United States Army study.” He also claims the study backs use of herbicides in counter-insurgency wars in Cuba, Ethiopia, and Venezuela and in conventional war in Venezuela.

Sept. 19-"Vietnam: A Medical Consequence"- Dr. Perrera writes that experiments on animals have already shown dioxin has given rise "liver injury, to chromosonal changes, to embryonic tumors called teratoma, and to cancer."

1973:

Apr. 6: "Contamination of Fish in Vietnamese Waters Laid to U.S. Defoliant"- Dr. Meselson finds fish and shellfish in Vietnam contaminated by dioxin. Pentagon has no immediate comment. AAAS scientists are pushing for partial domestic ban on 2,4,5-T be extended.

1974:

Feb. 22: "Vietnam Defoliation Scars Expected to Last a Century":- National Academy of Sciences has concluded that scars to the environment of S. Vietnam will take at least a century to heal. Damage both tropical and mangrove forests. Report sad that there were indications that crop destroying herbicides "caused deaths among children of the montagnard tribes in the hill of western South Vietnam." 1/7 of Vietnam sprayed. Chemicals used more potent than domestic varieties generally. Spraying also psychological effect, causing the Vietnamese opinion to become more negative towards the U.S. Since the scientists on the panel investigating weren't viewed as conservationists, the DD expected reports to be more positive. In interviews conducted stories that children died after chemicals were sprayed.

Apr. 9: "Defoliation Was Weighed in Fight on Yellow Fever"- Scientists trying to solve problems of Panamanian Yellow Fever epidemic spread to the U.S. initially suggested a geographical line be drawn with defoliants like those used in Vietnam and insecticides. After the proposing scientist read the report from the Feb. 22 article he dropped the idea.

Apr. 29: "U.S. Panel to Study Steps to Heal Herbicide Damage in Vietnam"- head of Academy of Sciences report Dr. Anton Lang says that information released about the then-not-yet-released report of herbicide use in Vietnam was inaccurate and incomplete. The report urged more study and that aid be given to the Vietnamese to help them recover environmentally. Gov. departments are arguing about who should provide the funding for committee recommendations. Interviews about deaths of children were not scientifically proven, but the amount of interviews saying the same things makes it hard to dismiss out of hand.

June 20: "Times is Criticized By News Council"- The Times was criticized by the National News Council, a group that investigates public grievances about the national news media. It said the Times had been "'remiss' in handling complaints earlier this year about an article it published regarding a report on the effects of chemical herbicides that the United States used in the Vietnam War." The Times declined to participate in the council's query. Last year, the Times refused to cooperate with the council for fear it would have negative effects on freedom of press.

June 27: "E.P.A. Ends Drive To Ban Defoliant: Says It Lacks Evidence to Press Move on 2,4,5-T- New Study Planned"- After 3 yrs trying to ban 2,4,5-T, E.P.A. withdrew legal motions due to lack of evidence. Environmental Defense Fund "contended that the withdrawal represented a fundamental policy change that shifts the burden of proof from the manufacturer to the Government." They will continue to look for evidence then consider reopening the case. Although evidence is inconclusive, studies have showed dramatic increases in birth defects and fetal death rates. Many fear withdrawal of court case will lead to a slow-down in research. Meselson says "Dioxin is slightly more toxic than the most toxic nerve gas developed for wartime use." EDF lawyer disagrees with EPA, and says current evidence is enough. EPA is helping to set precedent for accepting the changes in who bears burden of proof.

Aug. 4: "Herbicide Spraying Stirs Court Fight"- Court fight is starting between several states and the government because the US Forest service is planning on using 2,4,5-T and 2,4-D on large National Forests.

Aug. 28: “Death of Animals Laid to Chemical: Dioxin Identified as Cause of Fatalities in Missouri- 2 Children Became Ill”- In Jefferson City, MO dioxin contained in 2,4,5-T is linked to the death of animals and unidentified kidney diseases of 2 little girls. The chemicals had been sprayed in the family’s barn to control dust.

Dec. 16: "Capping Chemical War"- The Ford administration said it would be willing to sign treaty banning first-use of herbicides and tear gases left out by Nixon. Environmental warfarei still left out.

1975:

*Apr. 27: "Plan to Burn Surplus Defoliant On Ship in Pacific is Protested"- Air Force plans to burn 2.3 million gallons of Agent Orange about 120 miles west of the Johnston Island in the Pacific. Hawaiian and Micronesian environmentalist groups are protesting because they are the ones who are upwind from the burning, and any consequences would be seen by their peoples.

1976:

Apr. 25: "Advice from Dow Chemical: Always a Borrower Be"- Article mostly on the economic success of Dow. Chairman says "I think honesty is not only good morals and ethics, but it's more profitable." In WWI Dow produced napalm and made some of the defoliants used in Vietnam. Dow has made great progress cleaning up its plants' pollution.

July 29: "20 More Evacuated From Area in Italy Hit by Poison"- Cloud of trichorophenol gas used to make defoliants escaped from plant, About 4.5 lbs of dioxin is said to be contained in the gas. Many animals in the area have died. All the children have been evacuated or are being evacuated. Dioxin was “implicated in numerous birth defects among Vietnamese children.”

Aug. 3: “Poisonous Cloud’s Effects Still Baffle Italy’s Officials”- Officials still don’t know how to deal with long-term health risks related to cloud of poisons in Seveso, Italy. 14 children are hospitalized with severe skin rashes. “More than 100 pregnant women stand an increased chance of bearing malformed infants.” NIH directors says victims are human guinea pigs since this has never happened before. Lack of safety rules and warning system made accident possible. Some of the pregnant women chose to have abortions for fear of malformations.

Sept. 5: "California Forbid Burial of Defoliant"- California officials refuse to let a Texas company bury sealed steel barrels of 2,4,5-T in an underground storage unit due to lack of knowledge about whether such containment would hold forever.

Oct. 10: “Under the Poison Cloud”- Experts estimate between 22 and 132 lbs. of dioxin were released in the gas from the Italy plant. The ground around Seveso remained contaminated and the dioxin spread with movement of water, animals, humans. 300-400 women pregnant, 40 have asked for abortions. Scientists are suggesting turning the area into a desert with chemicals to get rid of the dangers of the dioxin.

1978:
June 25: “Company Says ’76 Blast in Italy Caused Little Injury”- Findings related to the Seveso disaster permit “the confident assumption that no serious and permanent damage to health occurred.” Most of the skin problems have went away, and some liver damage is evident but no “breakdown of liver functioning.” They now say the population was only exposed to a small amount of dioxin.

1979:
Mar. 10: "Dow Condemns Ban on Herbicide"- Dow says gov. used "bad science" in determining to ban 2,4,5-T last week, calls evidence of miscarriages "fallacious."

Mar. 12: "A Chemical in the Balance: A Decade After the Danger to Life was Discovered, Action to Bar the Herbicide 2,4,5-T Is Not Final"- According to article's author, Dept. of Health, Education and Welfare tests showed that 2,4,5-T is linked with birth defects in lab.

animals in 1969, but lobbying by agricultural and chemical lobbying groups stopped an earlier ban. Current ban is being challenged in court by Dow Chemical. Those against the ban on 2,4,5-T are clearly the bad guys.

May 6: "U.S. Defoliant Linked to Liver Cancer in Vietnam"- High ranking Vietnamese health official, Dr. Tong That Tung, strongly suspects a link between not only dioxin and birth defects, but also dioxin and liver cancer which has increased in occurrence majorly after sprayings.

May 27: "Two Crippled Lives Mirror Disputes on Herbicides"- Two men, one a former U.S. soldier who fought in Vietnam and one a former cattle rancher from the Ozarks both claim that herbicide Agent Orange(includes all similar chemicals) caused their debilitating health problems. "Medical studies that would either prove of refute those charges to the satisfaction of all parties have never been done." Both men have hard to explain unpleasant symptoms.

May 28: "U.S., Despite Claims of Veterans, Says None are Herbicide Victims"- Kenneth Pullen is a veteran confined to his home with swollen feet covered with painful red sores and rot-like scabs. Doctors can't agree on a diagnosis, and they have suggested he have his feet amputated. He feels the damage was caused by Agent Orange. He is one of thousands of veterans with illnesses they believe linked to the chemicals. None have been classified as Agent Orange victims because "officially, Agent Orange poisoning does not exist." VA spokesman said widespread testing "had been ruled out for the present because it might 'needlessly alarm people.'" Air Force sprayed 12 million gallons. It was stopped in 1979 largely because S. Vietnamese newspapers linked it with birth defects. Last Feb. 28 E.P.A. enacted partial ban on 2,4,5-T because of reports of stillbirths in Alsea, OR, the site of much spraying. Organizations argue in circles about who should do the testing.

1980:

Mar. 18: "Burnt. Orange."- In 2 yrs, 5000 U.S. vets have claimed illness caused by Agent Orange. N. Vietnamese vets are claiming birth defects and Hanoi gov. is seeking major reparations. Dr. Tung of Vietnam has seen many cases of birth defects and strange cancers.

Mar. 19: "Genetic Problems Linked To 2 Vietnam Defoliants"- V.A. memorandum was released that connected cancer and genetic-alterations to Agent Orange and Agent Blue. This contradicts previous V.A. statements. From or to who the memo was written was not clear on the document. It's legitimacy is being argued.

In 1980s- lot of articles about law suits, specific cases of sick veterans, and incidents of Agent Orange scares in the U.S. Various studies were done esp in Europe(Apr. 5, 1980) linking AO to various diseases, but VA is slow to accept them.

AGENT ORANGE AND THE NEW YORK TIMES 1961 – 1979

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I. Introduction

Agent Orange is a term that is commonly used in two contexts. First, it is used to describe the chemical 2,4,5-T itself, and secondly it is used to describe any singular chemical or group of chemicals as herbicides or defoliants associated with the Vietnam War. Today, the controversy surrounding Agent Orange has still not been fully resolved. Many scholars and scientists continue to study the effects of the chemical on Vietnam, on places it was sprayed in the United States, and in laboratory tests. Why has nothing been found conclusively? The answer to this is not simple, but the closest simplification is that Agent Orange has been surrounded by domestic and international political conflict. Any conclusive discoveries revealing the toxic nature of Agent Orange or of the Pentagon knowledge of this toxicity before its usage would have implications about the United States government and might have consequences to the powerful country's reputation and pocketbook. Agent Orange is an issue connected to many greater issues in science, public policy, ethics, public health, and others.

The New York Times, first published in 1851, is one of the oldest and most successful newspapers still published today. The paper has covered major events in war and peace time. Looking into its coverage of an event over time can reveal subtle, gradual, and sudden paradigm shifts. This paper will use the New York Times as a lenses for observing and analyzing the attitudes, events and controversies surrounding Agent Orange.

II. Goals, Procedure, and Limitations

1. Goals

This paper is meant mostly as a tool for examining Agent Orange rather than a list of conclusive answers about any aspect of the controversy. It will ask questions about why about why events were covered in a certain way, but any answers provided will be more useful if seen as this author's best guess and a launching point for further papers and discussions. The goal of this paper is to bring out information available to the public during the Vietnam War and the years directly after. The first newspaper

article found is from 1962, and the last one used is from 1980.

The Analysis and Chronology section will look at articles in order to develop a chronology of general shifts in how Agent Orange is approached. It will look for trends in the general assumptions of the articles, trends in the groups and individuals being covered and quoted, and trends in what solutions the articles are pointing to. These categories are broad, and they will by no means encompass every single article of the Times from that time period, but clearly definable eras are definitely present. Era might not even be the right word because what it is more like starting points because once an issue or idea becomes relevant it might continue to come up in the newspaper's discussion of Agent Orange to the present. This section will also seek to provide a brief examination of the players and events involved in the Agent Orange controversy as they arise. It will look at broad groups and agencies more often, but will also discuss individuals whose views are presented frequently. This section of the paper will examine the evolution of the positions of these players and characterizations of their treatment of the issues.

The paper will conclude with suggestions for further research. Hopefully topics in this paper will inspire other work using resources that can delve into issues and history more deeply than a newspaper might.

2. Procedural Notes

To find the New York Times articles I used the search string "herbicides"-or-"defoliants"-and-"Vietnam" in the Proquest database of the Historical New York Times. This query brought forth approximately 950 articles with dates ranging from 1962 to 2005. In the pertinent time period, between 1961 and 980, the search revealed approximately 400 articles.

Once the articles were obtained, they were all scanned to find the most pertinent articles to the analysis intended to be attempted. Around seventy articles were selected to be looked at more closely either for containing especially pertinent information or because they were representative of a number of very similar articles.

Next the articles were summarized for easy access, and to make looking at their relationships to each other easier. Then many lines and arrows were drawn all over the printed pages, attempting to follow threads and ideas. The chronology was split into categorized sections, and articles with similar voices were grouped together. The final outcome is a little messy, but the connections are nonetheless clear for it.

The list of concise summaries of all the articles is attached to the end of the article for easy reference. The authors of the articles can also be found there since for simplicity's sake I will not be citing the author of every article mentioned. On looking at the articles connected to certain articles over time, no obvious connections to specific authors and certain viewpoints emerged. This is not surprising since, given the size of

the New York Times, journalists working in a section do not remain the same over more than a couple of years for the most part. Also, since Agent Oranges issues span so many topics, they are found in different sections of the newspaper. All of the complete articles are available through the Proquest database.

3. Limitations

Using only the newspaper articles this paper is somewhat limited as a source of accurate and complete information. If something was not covered by the newspaper, or if an article concerning an issue was left out because of the sampling procedure employed then it will not be included in this paper. Because sampling was used instead of all the articles, this paper should be viewed in some ways a little incomplete and preliminary. It does, however, provide a starting point for the important and lengthy process of examining the historic documents recording the events surrounding Agent Orange.

Also at some points in the section examining the voices of the Agent Orange section it is hard to tell what an article mean by the "U.S. government" or who they mean by "some scientists." At other places anonymous sources within government and scientific agencies are used, but determining the exact nature of validity of these sources is impossible. Please try to look past some of the confusion involving who is who into the greater connections that can be made.

III. Analysis

1. Chronology

This chronology will outline the addition of popular viewpoints or new issues to the previous discussion of Agent Orange.

<u>1962-mid 1966:</u>

This era is characterized by little information being volunteered from the government. The government's responses during this period are confident reassurances to countries bordering Vietnam who complained about poisons being dropped on their peoples. The United States gives no evidence and sites no studies to prove the safety of the chemicals. Yet the articles seem to suggest that the government was not even discouraging people from coming into contact with falling chemicals.

Agent Orange was first reported on in January of 1962 in an article titled "U.S. Spray Strips Foliage Hiding Vietnam Reds." The article reports of the recent start of the defoliation program in Vietnam. The most interesting piece of information in this

article is that "[t]he spraying operation along the high was accompanied by the dropping of pamphlets assuring farmers that the chemicals were harmless to humans and animals.

Despite these assurances, in March of 1963 Communists in the Soviet Union and Vietnam began to accuse the United States of using poisoning the Vietnamese people in warfare. The Soviets first thought the damage was done by some sort of poison gas, which is described in the first article published "Washington Rebuts Poison Gas Charge." In the second article the results of the gas seem to be eerily similar to the reported affects of dioxin and Agent Orange. The Communists charge that poison gas used by the United States "caused damage to crops of many villagers in highly populated areas and had led to the deaths of many Vietnamese." The United States denied these charges. Their spokesmen said that the only chemicals being used were the "harmless herbicides"-a description seen in many articles of the early and mid-sixties.

Another poisoning charge came from a country loosely allied to the U.S., Cambodia in the article "U.S. Urges Inquiry On Poison Charge" published August 15, 1964. Cambodia accused them of using a substance similar to the one that the Communists described. The article also blames accounts of poisoning on "lies and false Communist propaganda." The United States in so confident in its innocence, however, that members of the State Department urged an investigation by an impartial international body like the United Nations, so at least parts of the U.S. government must have believed strongly that the chemicals were harmless.

Cold War rhetoric of needing to build the biggest arsenal, and the framing of all Communists as the worst kind of evil is seen even in the early years of the Vietnam war. This mentality threads its way through all of the time periods studied in this chronology. In the article "Vietnamese Lifelines" published on March 26, 1964 reports on a debate within the Congress initiated by Senator Barry Goldwater urging the use of nuclear weapons to clear out large areas of dense forest. According to the article some Pentagon officials were supportive of his ideas. It is difficult to deny that in the public eye, using Agent Orange, even if all the worst published about it in 1964 was true, would seem merciful next to dropping atomic weaponry on the countryside.

In 1965 and the first half of 1966, several articles come out about Agent Orange. All of them are very positive about the role the chemicals are playing in the war. United States military officials stated that all of the crop destruction missions had been initiated by the South Vietnamese in the article "Weed Killers Aid War on Vietcong" published on March 28, 1965. An article entitled "Defoliation Unit Lives Perilously"published on December 20, 1965 paints the heroic portrait of the pilots involved in Operation Ranch Hand(the code name for the defoliation and herbicide missions) because they are in increased danger compared to ordinary pilots because their planes fly so low. The men risk their lives because they feel the benefits of defoliation are so important. The strongest statement about the lack of danger connected with Agent Orange came in the

article "U.S. Spray Planes Destroy Rice in Vietnam" where officials describe chemicals as "not poisonous [..,] and that any food that survives its deadening touch will not be toxic or unpalatable." These claims are supported by the fact that chemicals are the same as those used in much smaller quantities.

An article titled "U.S. Will Step Up Defoliation Missions in Vietnam" published September 10, 1966 is noteworthy not only because it announces the United States' plan to increase the frequency of Ranch Hand mission, but also because it addresses the accidental destruction of rubber trees, which are important to Vietnam's economy. According to "officials associated with the program," "When claim are made, prompt action is taken to pay damages. The current price of a mature rubber tree is $87. With this statement, the government has taken responsibility for reparations for collateral damage done to the environment when it affects the livelihood of the South Vietnamese.

Mid 1966- Mid 1968

In the next three years, debate starts to spring up about whether Agent Orange is as safe as the government had previously claimed. The strength of the voices of those claiming that Agent Orange is 100% safe is still much greater than their opponents. Nonetheless, the few articles that do express the contrary voices are very effective, and the reasons for their positions are described in much more detail than the government's previously had been.

The September 21, 1966 article, "Pentagon Backs Use of Chemicals," reports the early positions of both sides of the debate. Twenty-two scientists, including seven Nobel Prize winners, drafted a letter to President Johnson "asking him to halt the growing use of chemical antipersonnel and anti-crop weapons in South Vietnam not only to spare civilian suffering but also to prevent 'a chemical and biological arms race' throughout the world." Pentagon sources countered this argument by pointing out that there is little difference in the results between traditional crop-destruction methods and using chemicals. The assurances about the dangers of coming in contact with Agent Orange lose there strength. Instead of "harmless" Agent Orange is called "not lethal"- is a big jump from edible!

The government continues to embrace Agent Orange as a useful tool, and the self-explanatory title of an article published on March 15, 1967, "Pentagon Triples Spending on Defoliation in Vietnam" announces the government's plans to increase the operations significantly.

A few months later it is reported that they want to go even further than increasing the amount of missions occurring using their current herbicides and defoliants. The October 17, 1967 article "Use of New Defoliant in Laos Studied" the United States discusses a plan that is being considered to use stronger defoliants along the Laos-Vietnam border in order to completely kill vegetation and poison the ground so that new plants would not grow after one spraying.

A couple months later on January 4, 1968 scientist Dr. Charles Minarik, director of the Plant Science Laboratory at Fort Detrick, Md., takes the side of the government. He justifies the claims that Agent Orange is safe with the evidence (no mention was made of what study it is from) that "when eaten by cattle with their fodder the substance is excreted in their urine, and, unlike DDT, does not appear in their milk. He also reiterates the government's position that the Vietcong just "believe their own propaganda." The article also presents the views of an opposing scientist, Dr. Barry Commoner, who expresses frustration at the government's unwillingness to release scientific data supporting their contention that Agent Orange has no ill effects.

Just a month later, Dr. Minarik's position is backed by a study done by the Midwest Research Institute that is announced in the January 4, 1968 article "Defoliation Study Casts Doubt on Long-Term Damage in Vietnam. The study was done by reviewing already published literature on the herbicide and defoliant use, and it found that "there are no clear indications that widespread aerial spraying to strip Vietnamese war zones of foliage will do long-term damage." However, it admits that "too little is known to assess the efforts with confidence."

In July of the same year, the scientists are back in the Times when the American Association for the Advancement of Science urged the U.S. to sponsor a long-term study on the effects of Agent Orange, and urged the Department of Defense to pay attention to the part of the Midwest Research Institute's report that said too little information exists to make a clear case either way.

Mid 1968- Mid 1969

During this year, more concrete evidence was being published by scientists and reported on by the New York times describing the dangers of Agent Orange on the environment. More scientists were traveling to Vietnam to get first-hand experiences and observations of the situation.

An September 21, 1968 titled "Study Find Defoliants Change Vietnam Ecology" reported the findings of Dr. Fred Tschirley of the United States Department of Agriculture, "an American authority on tropical plant life." He finds that "defoliation has caused an ecologic change is undeniable," but he "does not feels that the change is irreversible, but recovery may take a long time." In April of 1969, another scientist, this time a zoologist- Dr. Pfeiffer of the University of Montana. He noticed significant damage to animal life as a result of defoliation, but he also notes that he would have never been able to get down the river safely to study the effects of defoliation had it not been for defoliants. Both announce that severe environmental damage is occurring, but neither came out and recommended that it be stopped.

A couple months later, in December, the A.A.A.S. voted to start a study of herbicides in war. They decided to delete mention of Vietnam in the proposal for fear of it hitting roadblocks if it seemed too political. The study would take place in

Vietnam, but some of the scientists thought the deletion was necessary in order to make sure they were able to get the proper permission from the government to study in the country during the war. The outcomes of this meeting of the A.A.A.S. was reported on in the December 31, 1968 article "Scholars: Study of 'Risks and Benefits' of the Use of Herbicides In War is Sought."

Mid 1969- 1970

In this period, fears and studies concerning birth defects and Agent Orange start to come forward. During this year, however, they are not taken very seriously, and none of the articles describe the government as having any intention of permanently banning the use of herbicides and defoliants though some small points of progress are made. The Cold War mentality also shows strongly during this period as President Nixon tried to rewrite the rules of modern warfare to include Agent Orange and CS gas. Surprisingly to people today but understandable considering the fears of CB arms races with the Communists.

The first article primarily concerning Agent Orange and birth defects was a small paragraph printed in the July 3, 1969 Times titled "Saigon Shuts a Newspaper." This article briefly reports without detail that a newspaper in Saigon, Tin Sang, was closed down by American forces by publishing stories of unnatural births caused by "B-52 raids, defoliant chemicals and consorting with Americans."

In a letter to the editor published on October 2, 1969 by Yale biology professor Arthur Galston expresses concern about the ethical use of starvation tactics and chemicals that destroy the natural ecology of Vietnam. Surprisingly though, he is the first scientist without apparent government connections to call the defoliants "innocuous directly on human populations."

Serious concern about deformities arrived in October of 1969 with the publishing of a study conducted by Bionetics Research Laboratories that was reported in the article "U.S. Curbs Use of Weed Killer That Produces Rat Deformities." According to Dr. Dubridge, science advisor to the president, the study "indicated that offspring of mice and rats given relatively large doses of the herbicide (2,4,5-T) during early stages of pregnancy showed a higher than expected number of deformities." The government was quick to respond to the study by banning use of 2,4,5-T is populated areas in the United States. Whether spraying in Vietnam would be altered was not directly addressed in the article, which is why it can only be counted a small victory for those opposed to the herbicide.

The two articles "Germ Warriors Retired" and "Nixon Renounces Germ Weapons" were published on November, 26 1969 in response to President Nixon calling for a ban on all chemical and biological weapons except for Agent Orange and CS gas. This announcement came as a relief to most people in the United States who feared an escalating chemical or germ warfare. In the minds of most Americans of the

time, Agent Orange must have seemed almost insignificant when placed next to the threat bubonic plague or botulism as weaponry in war. This event can also be seen from certain vantage points as a step in the right direction, a direction that could eventually bring the president to banning all chemicals.

In the last few days of December 1969, the A.A.A.S. scientists planned for a study of the ecological effects of Agent Orange over the next several years led by Dr. Meselson of Harvard, as reported in the article "Scientists Press Study of Defoliants in Vietnam"(December 28). Other scientists in the organization are pushing for faster action be taken to ban the chemicals without waiting for the results using already existing studies that connect Agent Orange to birth defects through experiments on laboratory science, which is described in "Scientists Call for a Ban On 2 Vietnam Defoliants"(December 31). The scientists feel limited by there tool, science because strong scientific evidence can take years to gather when they sense that damage is being done immediately.

1970- Mid 1971

During this year and a half long period, the health risks attached to Agent Orange become more and more evident to the government because of domestic incidents and more scientific students pointing to a connection between the chemicals and birth defects. Some parties involved with the chemical manufacturers and the government hold firmly by their positions, but that group seems to be shrinking and temporary bans are put on the chemicals.

The first major domestic incident involving Agent Orange was reported in the February 8, 1970 New York Times in the article "Deformities and Hemorrhaging Laid to Forest Spray in Arizona." 2,4,5-T was being sprayed in Tonto National Forest near family farms and a small town. The farms saw death and birth defects in goats and fruit trees, people experienced respiratory ailments, swelling feet, chest pains and extreme weight loss, pregnant women experienced a heightened rate of miscarriages and internal hemorrhaging. Dr. Dubridge quickly imposed a ban on 2,4,5-T near populated areas immediately. The ban from the rat study must already have been lifted if the forestry service was spraying within the vicinity of even a small population. This event is a major event in the Agent Orange chronology because the event brought Agent Orange's health consequences to American soil where they are more difficult to hide of blame on Communist propaganda.

On March 15, 1970, as described by the title of the article reporting on it, the "U.S. Shows Signs of Concern Over Effect of 9-Year Defoliation Program in Vietnam." The signs were not quite as large as this title might imply, however. The government cedes that ecological damage has been done to Vietnam, but points out that the health consequences are not proven. Reports of illness described as partially the result of psychological damage brought on by the war. The government still feels that the

benefits of Agent Orange outweigh this "psychological" consequences. The government does not seem to link the health problems linked to the Tonto incident to the claims of similar health problems in areas of Vietnam sprayed by Agent Orange.

Dow Chemical Company responds to concerns about Agent Orange three days after the government in the article "Dow Aides Deny Herbicide Risk." This title is also misleading because what the article talks about is that the poison is not inherently in 2,4,5-T, but from a contaminant-dioxin- that can show up if it is manufactured in certain ways. Dow of course defends its own method of producing 2,4,5-T, but its announcement admits that something dangerous exists in the chemicals being used in Vietnam. Dr. Dubridge once again announced that the compound would not be used in populated areas.

On April 16, 1970 the United States announces a temporary ban on Agent Orange domestically and in Vietnam in response to U.S. Department of Health, Education, and Welfare tests that show it might cause "abnormal development in unborn animals" as recorded in the article "U.S. Curbs Sales of a Weed Killer." This is the 3rd or 4th scientific study recorded in Times that connects Agent Orange and birth abnormalities. What is missing from the New York Times articles are the flaws that must have been found with the earlier studies that prevented them from having the effects of this one.

The ban on Agent Orange is extended the following June, but instead of health reasons the Pentagon points to the need to employ the planes for arms carrying missions. Military guarantee the Times that limited spraying will resume after those operations are finished on June 30. No mention of health concerns is made in the article. Whatever convinced the government in the D.H.E.W. study must have been forgotten or proven fallible.

On August 27, 1970, as the title of the Times article reporting on it suggests, the "Senate, 62 to 22, Rejects Herbicide Ban for Vietnam." Senator Nelson of Wisconsin was one of the main advocates of the ban. He uses the arguments that use of herbicides legitimizes starvation tactics in warfare as well as destroying the country that the United States is fighting to protect. Also, he finds fault in using chemicals with unknown consequences to humans, animals, and the environment. Senator Dominick of Colorado is one of the leaders against the legislation. His main arguments stemmed from cost-benefit analysis favoring the salvation of American lives, and he says that nothing completely incriminating Agent Orange has been proven. This kind of debate is representative of conflict in different government bodies and agencies. Look back at Dr. Dubridge who becomes convinced by several different studies and events. He bans Agent Orange, but within months the bans are lifted; Agent Orange once again harmless.

On January 16, 1971 Jerry Friedheim, a spokesman for the Defense Department shared with the New York Times his unique ideas for why Agent Orange usage should

continues. In the article "Poison is Good For You" Friedheim says that Agent Orange is actually good for the Vietnamese economy because the all the wood in the dead forests can be marketed as lumber. The author of the article clarifies the fact that live trees are typically used for lumber because dead ones are eaten quickly by insects and lead to bamboo invasions that prevent future growth of new trees. The comments of the spokesman are almost comical because they are so off-target. The lack of pertinent knowledge lacking in the statement of spokesman for one of the most complicated government departments does not speak well for the competency of the minds at work behind the spokesman.

The article "Foes of Spraying Win Coast Round" report that groups advocating an end to domestic Agent Orange use won a small victory on July 11, 1970 when they convinced the U.S. Forest Service to stop spraying in national forests. The victory is small and likely temporary if it follows the trend of domestic bans in earlier years.

Mid 1970- 1979

During the nine years between 1970 and 1979 the Agent Orange debate changed so frequently that breaking the years up into small groups is extremely difficult. For Agent Orange, those years were pendulous; filled with win and losses great and small on both sides of the debate. Agent Orange is eventually removed from Vietnam, but issues with the legacies of its usage remain in contention. New problems also arise when it comes time to destroy or contain the chemicals. Many important event happened, so reporting on them is crucial. From previous sections, it is noteworthy to notice that the controversy and threads become harder to follow as the years progress. This phenomenon reaches its peak in this period.

The removal of Agent Orange from Vietnam started on November 21, 1971 according to the article "Defoliant Leaving Vietnam." The current plans do not call for the immediate removal of all of the chemicals, but a sizeable amount of a million gallons were recalled to be destroyed. This action represents a final commitment to ending the use of herbicides and defoliants in Vietnam. According to the article, the April 1970 ban was permanent after all, and the returning of the chemicals is a direct result of that ban.

Problems with the destruction of Agent Orange are brought forward in the article "Lethal Defoliant To Be Destroyed" published on January 25, 1972. A report by the Air Force announced that the destruction of 23.4 million gallons of Agent Orange would tentatively take place at Deer Park, TX and Sauget, MO. The report also revealed that the incineration of such a large quantity of the chemicals would release 44.7 million pounds of carbon dioxide into the atmosphere and 12.4 million pounds of salt into local streams. Yet the report concluded that there would be "no adverse effect on the environment." Later in April of 1927 the article "Plan to Burn Surplus Defoliant On Ship in Pacific is Protested" describes the United States' readiness to bring this

"clean" process to the middle of the ocean near Micronesia instead of doing the burning in our own country this time. The protestors dislike the ideas of toxic substances being incinerated upwind from their country without their permission. If the burning of Agent Orange was actually environmentally friendly, this 2.3 million gallons of poison would be burned in the United States like the rest of it instead of being shipped to the middle of the ocean.

A really unusual article titled "Army Study is Said to Back Defoliants" came out in August of 1972. According to this article a Washington science writer revealed that "use of defoliants in Western Europe to help stall a Communist attack is recommended in a secret United States Army study." He also says that the report recommended use of Agent Orange in counter-insurgency wars in Cuba, Ethiopia, and Venezuela. If this report is legitimate then it catches the United States government in the midst of hypocrisy; denouncing and changing policies while recommending them to others.

Dr. Meselson reports his findings on the effects of Agent Orange on Vietnamese fish in "Contamination of Fish in Vietnamese Waters Laid to U.S. Defoliant" published on April 6, 1973. The fish and shellfish had levels of dioxin that were significantly higher than average. The Pentagon had no immediate comment of the destruction of yet another of Vietnam's primary sources of food and income.

On February 22, 1974 the New York Times ran an article using information from a not-yet-revealed study done by the National Academy of Sciences provided by anonymous sources. The article revealed that the government-backed study found major health and environmental damages resulting from Agent Orange. This information was later revealed to have been exaggerated, and the Times received harsh criticism about the quality of its coverage. In an article published on April 29 after the release of the report, titled "U.S. Panel to Study Steps to Heal Herbicide Damage in Vietnam," the scientists who had conducted the study had much milder suggestions than implied in the earlier article. They recommended that the government give financial aid to the Vietnamese in order to help pay for the damages caused by Agent Orange to the environment. While in Vietnam, they heard many consistent stories about deaths linked to chemicals sprayings, but none of it was able to be proven scientifically while they were there. Passing the responsibility for funding the recommended environmental cleanup has already began, and every government agency seems to be pointing at someone else with no one stepping up to volunteer.

In the summer of 1974, described in the articles "E.P.A. Ends Drive to Ban Defoliant"(June 27) and "Herbicide Spraying Stirs Court Fight,"(August 4) court battles sprang forth as groups tried to get a permanent ban placed on Agent Orange domestically. In the first article, the E.P.A. backed out of their court case because it felt that due to a shifting burden of proof, they would need more evidence to present in order to make the case solid. And Environmental Defense Fund lawyer disagrees with decision of the E.P.A. He feels that the large amount of circumstantial evidence should

be enough to win the case, and he thought that accepting the shifting of the burden of proof would only legitimize it. In the second article, a court fight is just beginning between several states and the government over whether the Forest Service should be able to use Agent Orange.

Later that same summer on August 28, another domestic incident occurring in Missouri was reported. The article "Death of Animals Laid to Chemical" tells of the mysterious kidney-related illnesses of two girls and the death of many animals in Jefferson City. The deaths and illnesses were later attributed to a chemical containing dioxin that had been sprayed in the family's barn to control dust.

A much awaited day finally arrives on December 16 when the Times reports in an article titled "Capping Chemical War" of President Ford's plans to sign a treaty banning the use of Agent Orange and CS Gas in warfare, which Nixon had purposefully left out of his CBW treaties.

In July of 1976 disaster occurred in Seveso, Italy. A factory producing Agent Orange-like chemicals overheated and released a cloud of poisonous gas on to the surrounding areas. The first estimates, released in the article "20 More Evacuated From Area in Italy Hit by Poison"(July 29), said that about 4.5 pounds of dioxin was contained in the cloud. Animals on farms near the factory soon died, and children developed skin rashes. The article state clearly that "dioxin was implicated in numerous birth defects among Vietnamese children." The use of the word implies a direct connection between dioxin and birth defects. The United States government has never made this connection. A later article published on August 3 titled "Poisonous Cloud's Effects Still Baffle Italy's Officials" and one from October 10 titled "Under the Poison Cloud" offer further physiological symptoms observed in Seveso resident and relates the shared concern about the long-term effects dioxin might have on the residents. About 10% of pregnant women from the area requested abortions after consultation with obstetricians about the risks of malformations. Two years later on June 25, 1978 the company that owned the factory announced in the appropriately titled article "Company Says '76 Blast in Italy Caused Little Injury." The company decided that two years was long enough to determine if the dioxin released into the atmosphere had any long term negative effects on the population. It also announced that no deformities occurred in children born after the incident. The article does not take into account the women who decided to get abortions under the advisement of doctors. What did the doctors know about the women's babies when they advised the mothers?

In March of 1979 2,4,5-T was finally banned- or was it? Dow immediately condemned the evidence used in the court case as "bad science" and "fallacious" in an article titled "Dow Condemns Ban on Herbicides"(March 10). A March 12 article titled "A Chemical in Balance"describes briefly the 10 year history of court challenges concerning the banning of 2,4,5-T. The article expresses a sense of frustration about the lack of a permanent ban despite evidence.

The articles "Two Crippled Lives Mirror Disputes on Herbicides" and "U.S., Despite Claims of Veterans, Says None are Herbicide Victims" published on May 27 and 28 respectively reflect a new issue that will color the treatment of Agent Orange in the 1980: the Veteran's law suit. Both tell of victims with unexplainable symptoms and exposure to Agent Orange who think their diseases are related to that exposure, and the government's unwillingness to admit that Agent Orange related illnesses even exist. The second article also briefly discusses the reports of stillbirths in Alsea, OR, the site of much spraying, as evidence that Agent Orange can have severe physiological consequences. This is another incidence of Agent Orange in America that ends with severe health problems. How can there still be doubt that dioxin in 2,4,5-T has the potential to do long-term damage, especially to children alive and unborn?

Conclusion

Agent Orange articles in the 1980s will contain a lot of stories about the veterans' lawsuits and their individual stories, more domestic Agent Orange-related health scares, and various new studies being done. The V.A. will emerge as a new character in the drama of Agent Orange, playing a role similar to those played by the government and government agencies. Further research should be done to follow up on the information reported in the New York Times newspaper articles. The chronology also might be re-organized and/or expanded for added depth and clarity. The complex issues of Agent Orange are difficult to fit into a straightforward diagram; there are just too many players and intricacies involved in the debate.

Will the Agent Orange controversy ever be completely resolved? In the next ten years, definitely not. As long as the victims still survive, Agent Orange cannot be forgotten. More lawsuits are emerging today in 2005. The ghosts of America's poisonous past will continue to haunt the media and the courtrooms for years to come.

5 January 2005

LOOSING THE REPRODUCTIVE AND REPRODUCTIVE HEALTH RIGHTS – A DISASTER OF THE CHEMICAL WARFARE

Truong Thi Ngoc Lan

My name is Truong Thi Ngoc Lan, the third child in an eleven-sibling family. I was born in 1941 and got married at the age of 22. After university graduation, I began my teaching in Chi Linh district, Hai Hung province (former) from 1961 to 1970. After this period, I moved to Hanoi and taught there. I retired in 1989.

Among four times of my giving birth, we only have the second son alive; the others were died at their infancy. My son is 37 years old now, his name is Lam, Pham Duong Lam. Usually, a mother having a son at such age will be very happy because he would support for his own life, have his own family, or make her a grandmother. However, I am denied the pleasure of these simple things.

My husband and I are victims of a painful and angry event - the event with lasting consequence. How painful it is! We do not know when it will end for us, as well as for other victims like us. For how long each individual, family and society will pay the price and suffer great pains caused by such consequences!

Pham Chieu Duong is my husband's name. He was born in 1935. He graduated from Medical university and joined the army working as a doctor. In 1965, he worked at Military Medical Research Institute. From 1963 to 1969, he was a medical officer in the battlefields of Quang Binh, Quang Tri and even the severe battle along the Road No.9-Southern Lao. At that time, the war was very fierce. Like other soldiers, he was suffered from malaria and bomb pressure. He often told me about the battle fields, Duong and his friends had to dig hideouts under the low bamboos due to other kind of trees were fired and destroyed. They even had to cover their noses and mouths by wet clothes in order to prevent inhaling terrible smoke and smell.

I knew through mass media, newspapers and books, about chemical agents that were used during Vietnam War by the US army. They carried out the Ranch Hand Operation from 1961 to 1964, mainly using three chemicals: Purple Agent, Pink Agent and Blue Agent. Following years, they moved to use much Orange Agent. They sprayed totally more than 600kg of dioxin in the South of Vietnam throughout the war from 1961 to 1971.

The dioxin used in Vietnam war had been openly released and criticized in mass media with undeniable evidences and alive witnesses, not only in Vietnam but also in the US and some other countries. Dioxin has affected on both the environment and human. In 1994 and 1995, the Institute of Medicine under the American Academy of Sciences officially admitted that there was evidence linking several diseases to Agent Orange exposure. Vietnamese scientists also have conducted many studies on the long-lasting effects of chemicals on human health. Those studies suggest that it have serious health consequences on men, women and children. In both men and women, it causes an increasing rate of cancer, immune-deficiency, metabolism disturbances, diabetes and general health impairment such as loss of appetite, insomnia, weight loss, headache, impaired vision and/ or impaired hearing. In women specifically, it causes abnormalities of pregnancy such as miscarriage, still births, premature births and birth defects ranging from external, benign defects (cleft lip, cleft palate) to deformity of limbs (clubfoot, clubhand) to severe neural defects (anencephalia, learning disabilities) to most severe (cerebral palsy, several children with disabilities in the same family, second generation disabilities).

I gave my first birth in 1965. The baby was died just after being born. In 1969, I had Lam, at first, he was very chubby with 3,9 kg weight. He grew up normally in the first few months; he was able to roll over when he was five months. Since then, we realised that my son seemed to be abnormal. He had no expression to prove the ability to recognize mother and father touch and gestures. We brought him for medical check but no disease was seen. We received lots of my relatives' love and affection. My brothers tried to help Lam learning to walk. He could totter at the age of two and stammer nearly three. However, our anxiety increased day by day when we could not control his everyday life.

At the age of 37, he is just like a one-year-old child, needs all assistance from parents. So far, he can not say a meaning word, no ability to do anything. Sometimes, he is sleepless and eats nothing, hops at night and cry without reason for a period of time; then he sleeps all day after that time. We have tried on different methods but no bright change. It is more painful to my husband because of his helplessness as a doctor in front of the son's suffer, though he still tries on oriental medicine.

Being so disappointed about this son, we wished to have a normal child in the third giving birth in 1971. My daughter was very lovely and like other babies. Terribly, she got her neck too soft, atelectasis and died at the age of three months. Hoping still for a normal child, I gave birth to another son in 1973. How painful it is, the baby had curved arms and very weak. He also left us forever at three-month age. What was a tearful time for me, there was nothing left... We gradually came to accept the fact of giving up to have other children. We encourage each other to persist in bringing up our abnormal

son. Our pain is less thanks to neighbour and relative's encouragement and help. However, we can not feel assured and confident deeply. Being a wife and a mother, I always feel torment and lost. I fear of leading my son on the road. This self-pitifulness cannot be stated...

There was question squeezing our mind why we had to suffer that despair. Our siblings in both sides have their children healthy and normally grown up. My husband and I had no diseases related to reproductive function since we got married. However, my husband health appears worse and worse. He usually has headache, feels dizzy and his eyes is always wet. In 1982 he experienced an eye operation in Military Hospital 108. He also suffers chronic colitis. His teachers and colleagues advised him to get comprehensive health checked and diagnosed. Many of his mates in the army have suffered from similar effect of dioxin infection. Of the three children born to Nguyen Tuan Binh – one was born with cleft lip, one is clubfooted and the newborn has skin disease with white dots all over the body. Another of my husband's colleagues, Nguyen Ngoc Tha is infertile and has worsened eyesight. Yet another of his colleagues, Nguyen Xuan Thu has blood diseases caused by dioxin and is being treated in Army Hospital.

It was then that we started realising the cause of the despair we are suffering. The time my husband was in the battlefields constitutes the peak time of chemical spraying by the American army. The spraying was aimed at protecting the US and the military bases alliance from attack by clearing grass and shrubs and by defoliating trees, destruction of foliage in order to discover the guerilla's hidden military positions, stores and transport routes, thus facilitating air and artillery strikes and destruction of crops thought useful to guerilla forces. In the early period of the chemical war, Western pilots in civilian clothes flying US aircraft with Sai Gon regime markings conducted aerial spraying operations. The soldiers in the sprayed areas were all at high risk of dioxin infection through three routs: food, direct contact and respiration. Duong has been concluded to be dioxin infected. I often wonder why they would use such severe chemical to destroy human beings, not only direct contact person, but also his/her partner and their innocent children who are unable to be a complete human.

Whenever looking at the children of my siblings, my neighbours and friends, both my husband and I can not help feeling self-pity and comparing to our situation. I am not loosing my mind thanks to my husband. He is always by my side. We both have to rely on each other; one is living for other's shake. For me, the "human right" voiced in many national and international arenas just the right to have normal children as it naturally is. I want to have such a simple right fully enjoyed by my sisters and brothers. They have wonderful, clever and competent children. I feel pity for my lost children, and more for my son, Lam, as he has no right to play, to go to school and to grow normally as others, as a human being! He cannot understand that he should have lives a normal life if that

terrible chemical did not infect his father Duong. I feel sorry for my husband so much as I know that he suffers too great pain and always complains himself because of bringing the despair to his wife and child. We now understand the cause of our pain and cannot accept its violation to the right of many like us to live freely and safely.

In my view, spraying of that toxic chemical into the living creatures is so savage, violating reproductive rights of any living beings in the earth. This violation is violation of human rights of everyone: a man who should enjoy the right to be a father, a woman who should enjoy the right to be a mother and a child who should enjoy the right to live, play and go to school. I am also thinking of many others, families in the same situation like ours, of children who are taken away the right to grow up healthy and happily. For how long will such physical and mental pains seize our future generations and us? Is there no one who is responsible for that terrible violation? Both of us are intellectual, normal citizens. Why we had to bear the severe consequences caused by the US army that affected to our children and next generations.

Now, our standard living is being improved. I am a native of Hanoi; both of my brothers and sisters live in Hanoi so that they could help my family in material and spiritual aspects in difficult time. After retirement, Duong had a traditional medicine store at home to earn our's living and time to take care of my son. Though our standard living is not well off but it ensures the life as most of Vietnamese people. Everyday, we have to work hardly, save every bit of money to improve the living conditions and moreover to have no free time to think about our misery and unhappiness.

On the coming of the old age, we have to make every effort, take medicine for restorative day by day for a better health, overcoming the difficulties and miseries by our fortitude and spiritual help from relatives and friends.

However, my husband and I always bother about the future of our pitiful child and ourselves. Everyday, from giving birth to Lam to now, we are spiritually obsessed with the misery and torment. When we are observing my son hopping whole day, spelling meaningless words, my husband and I feel the pain in our heart. The pain cannot be treated, as it is hurt more by constant torments and anxieties. There comes one day when my husband and I fall sick and being treated at the hospital, who will take care the patience and Lam who is the victim of Agent Orange. And when we become too old to take care of him or later pass away, who is the person to take over for us? This is the most worry before we decease.

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The legacy of agent orange: empirical evidence from central Vietnam

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Abstract

This paper seeks to provide a socio-economic impact assessment for Vietnamese victims of the principal US military herbicide, Agent Orange, used during the Vietnam War in the period 1961–71. The study is based on a field survey of 30 affected and 30 unaffected households in Quang Tri province. With this assessment, the paper attempts to address the broader issues of compensation currently available to victims. The coverage and composition of current benefits are deemed inadequate as an effective redress. In view of this, revision of current compensation, the mobilization of an international donor fund and spurred non-governmental support is strongly recommended.

Keywords: Agent orange; Survey; Quang tri; Compensation; Donor fund; Vietnam

Introduction

Between August 1961 and April 1971, the US Military is reported to have dispersed some 72 million litres of herbicides over the former South Vietnam, of which 42 million litres were Agent Orange. This represents the world's largest dioxin contamination (10–80 Organizing Committee, 1993, p. 2).[2] Agent Orange (AO) was a term of the US Military for a mixture of herbicides, containing a dioxin by-product, that was used for purposes of defoliation and crop destruction.[3] The former was aimed to destroy plant cover to enemy troops while the crop destruction programme was aimed at food denial, namely the control of rice distribution and production (Johnstone, 1971, p. 714). Amidst doubts over their effectiveness, as well as preliminary scientific evidence in the US of possible birth defects resulting from AO exposure, the programmes were discontinued in 1971 (Ibid.). Over time, there has been a number of studies both in Vietnam and abroad into the environmental and health effects of the chemical; however, 30 years on, the full effects are yet to be known.

In recent studies, Vietnamese scientists have revealed there still exists a residual dioxin quantity in the soil directly proportional to the areas sprayed with Agent Orange (10–80 Committee, 1993, p. 463). A further study 1994–98 by a Canadian group, Hatfield Consultants, confirmed that defoliants had destroyed 50% of mangrove forests in Vietnam and had irreversibly altered ecosystems (Hatfield, 1998). The Vietnamese government, in cooperation with other governments and international organizations, has begun the process of inland and mangrove afforestation. However, results to

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[2]According to American government sources, AO was used in Vietnam between January 1965 and April 1970 (Environmental Agents Service, 2001, p. 1).

[3]Agent Orange was a mix of two herbicides, known conventionally as 2,4,D and 2,4,5,T that contained dioxin by-product 2,3,7,8-TCDD (10–80 Organizing Committee, 1993, p. 461).

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date have been modest due to a shortage of manpower and funds (10–80 Committee, 1993, p. 465). It was estimated that in order to cover the forest area destroyed it would take many more decades, perhaps even a century with industrious labour and a steady supply of international funding.

In terms of the human health effects, an early study by Vietnamese scientists in cooperation with a New York-based scientist showed disproportionately high levels of dioxin in the blood of residents in southern sprayed areas compared to a number of control groups in the north (10–80 Committee, 1993, pp. 5–8). As recently as 1995, dioxin blood levels were found to be between 25 and 170 times higher in sprayed villages than in northern villages (Cayo, 2000). Meanwhile, in the US the National Academy of Sciences has set out a list of diseases that are found to have "sufficient" evidence or "suggestive" evidence of an association to AO (Institute of Medicine, 2000). Updated in 2000, these include sufficient evidence of soft-tissue sarcoma, non-Hodgkins lymphoma, Hodgkin's disease and chloracne, and suggestive evidence of respiratory cancers (lung, bronchus, larynx, trachea), prostate cancer, multiple myeloma, acute and subacute transient peripheral neuropathy, porphyria cutanea tarda, type 2 diabetes, spina bifida and acute myelogenous leukemia in the children of veterans. In the US some 300,000 veterans have undergone medical tests and an estimated 2000 children are potentially suffering from the birth defect spina bifida (Veteran Affairs, 2000, p. 4,8). Meanwhile in Vietnam preliminary research estimates 1 million first, second and third generation victims of AO (Vietnam News, 2001a). Of these, 50,000 deformed children are believed to have been born to parents exposed either by location or though access to sprayed foodstuff (Vietnam Investment Review, 2000). In some villages one in every 10 children suffers serious birth defect such as spina bifida, celebral palsy, physical and or mental retardation, missing or deformed limbs (Satchell, 1999). The full extent of the problem, however, remains unknown. Current estimates are based on a National Health Survey that was begun in 1999 as a preliminary register of persons who reported or displayed any possible AO-associated diseases. It is very possible that the social stigma attached to AO-affected persons could have cautioned them (especially unmarried men and women) from an open disclosure in the survey. Furthermore, prospects of benefits may have led others to claim diseases without blood testing and medical verification. At a quoted $2000 per person, blood testing for supernormal levels of dioxin continues slowly (Mai Phuong, 2001).[4] More recent government estimates put numbers at 3 million while a Columbia University study estimates up to 4 million persons may be directly affected by AO (Tran Dinh Thanh Lam, 2004; Stellman, Stellman, Christian, Weber, & Tomasallo, 2003).

The use of Agent Orange in the Vietnam War is allegedly a war crime. A lack of political resolve on the part of governments, and a lack of accessible judicial forums for individuals, has, however, resulted in few legal actions for the compensation of victims (Palmer, 2004). Since the US government cannot be sued without its consent, all civil action to date has instead proceeded against US companies involved in the manufacture of AO. In 1984, a class action lawsuit brought by American and Australian veterans resulted in a settlement of $180 million that extended only to veterans with death or total disability claims (Smoger, 1993 in 10–80 Committee, 1993, p. 458). In Vietnam, it was only in January 2004 that the first suit was filed by three victims against several dozen US companies including Dow Chemical and Monsanto, in a New York district court (Agence France Press (2004); Kokkoris, Moore, & Goodman, 2004). Compensation has thus for the most part relied on domestic mechanisms. In the US, subsequent to the Agent Orange Act of 1991, any veteran who served however briefly in Vietnam and is suffering from any of the above-listed National Academy of Science AO-associated diseases with at least 10% disability are entitled to compensation from the Department for Veteran Affairs. Compensation consists of payments rated according to disability ($98 per month for a veteran with 10% rating to $2036 for a 100% rating), hospital care and medical services, and the possible provision of nursing home care (Veteran Affairs, 2000, p. 3). Children are eligible for vocational training support if suffering from spina bifida. While the American government is required by law to compensate American or Vietnamese-Americans living on its soil it has yet to compensate victims in Vietnam. In 1997, the US Ambassador to Vietnam questioned the availability of scientific evidence to establish the "exact consequences of Agent Orange" (Ha Thang, 1997). In early 2000, the Vietnamese government formally introduced the AO Central Payments Programme. Compensation consists of monthly payments ranging from $3.40 to $7.14 for adults and children who have partially or totally lost the ability to work (Vietnam Investment Review, 2000). As in the US programme, compensation is only extended to children suffering from the condition of spina bifida and furthermore includes orphans of deceased persons as a result of AO-associated diseases; however, the US programme includes spouses and

[4]Note the American government does not test American veterans for dioxin on the basis of the National Academy of Science's finding in 1993 that results are not usually meaningful due to common background exposures, variations amongst individuals, and possible measurement errors and exposure to other herbicides (Environmental Agents Service, 2001, p. 2).

dependent parents as well as children. Under the Vietnam programme, no provision is made for non-monetary benefits except for humanitarian center assistance and medical treatment for orphans. To remedy this, the Vietnam Red Cross Society Fund was established in 1998 with donations from societies in Denmark, the US, Switzerland and other international organizations to provide treatment and rehabilitation, literacy and vocational training programmes and monetary support for victims in selected provinces (Vietnam News, 2001a, p. 7). Meanwhile, other non-governmental and inter-governmental support has been largely area based and non-specific to AO.

Government and international donors have thus recently tried to address the issue of compensation but there are no studies to quantify the socio-economic costs borne by individuals affected by AO in Vietnam. This paper, therefore, attempts first to provide a preliminary assessment of the social and economic costs of victims (including loss of income, increase in resources devoted to medical expenses, educational and marital attainments) and, second, to review the current mechanisms of compensation available to victims. The findings of the paper are based on a field survey of 30 affected and 30 unaffected households in Quang Tri province in May 2001. Section two outlines the survey site and representation of affected and unaffected households and section three summarizes the methodology adopted for socio-economic assessment. The fourth section presents the results of the survey and is followed up with a review of current compensation in terms of coverage and composition. A concluding note and suggestions for further research complete the paper.

The survey site and representation

Vietnamese sources have recorded the spraying of AO 10 and 30 km from the center of defined localities in the then South Vietnam (10–80 Organizing Committee, 1993, p. 15). It is reported that only 4 and 1 localities were exempt from spraying to this degree (10–80 Organizing Committee, 1993, p. 7). Sprayed localities are listed in Table 1 with details on the number of flying missions and quantity of AO sprayed.

Quang Tri province was chosen as an upper middle sprayed proxy for total sprayed areas with a reported 150 flying missions and quantity of 6602 l/hectare. Quang Tri borders the demilitarized zone along the 17th parallel that once divided the north from the south and represents one of the most heavily AO-exposed regions in the country (Vietnam Investment Review, 1999). According to the 1999 National Health Survey, of a population of 576,666 the province is home to 15,000 persons affected by AO, of which 5240 are children suffering from birth defects (Vietnam Investment Review, 1999). Within the province of Quang Tri there are nine districts and 136 communes, which contain any number of villages (Quang Tri Statistical Office, 2000). The two districts of Gio Linh and Cam Lo were identified as accessible, yet separate, AO-sprayed areas with a reported AO-affected population. Within Gio Linh and Cam Lo districts there are 20 and nine communes, respectively. For each district, single communes, Gio Mai and Cam Thuy, respectively, were chosen on the basis of their similarities with Quang Tri in terms of population size and characteristics.[5] These communes, Gio May, Gio Linh district and Cam Thuy, Cam Lo district are marked on the map as known AO-sprayed areas. Within each commune the same selection criteria were applied to select the final two villages for survey (Charts 1 and 2).

Whilst we are primarily interested in measuring the costs borne by individuals affected by AO, data were collected at the household level and later appropriated per capita because the majority of workers were farmers whose income (and often medical expenses) was pooled amongst family members.[6] Given that the affected

Table 1
Agent orange flying missions and quantity by locality

Provincial locality	Missions no.	Quantity (l/ha)
Tay Ninh	334	21007
Ma Da (Tri An)	507	19206
Song Be	246	17693
A Loi	271	14737
Hue	196	6964
Quang Tri	**0**	**6602**
Giong Trom (Ben Tre)	115	4384.5
Bac Lieu	35	3191.7
Bien Hoa	38	2609
Ho Chi Minh City	73	2423
Tra Vinh	35	1332.2
Co Quao (Rach Gia)	20	485
Da Nang	8	185

Source: 10–80 Organizing Committee, 1993, Ministry of Health, Ministry of Science, Technology and Environment, The II International Conference on Herbicides in War—"The Long Term Effects on Man and Nature", Final Report, Hanoi, 15–18 November 1994, p. 15 (figures are aggregate for 30 and 10 km radius).

[5]Based on the above statistics, approximately 2.6% of the Quang Tri population is AO-affected. Gio Mai commune in Gio Linh district has a reported population of 4667 persons of which 2.8% are AO-affected while Cam Thuy commune in Cam Lo district has a population of 4608 and 2.1% affected persons.

[6]Survey statistics indicate that in both communes around 70% of households derived their main income from farming, and in particular crops of rice, peanuts and cassava.

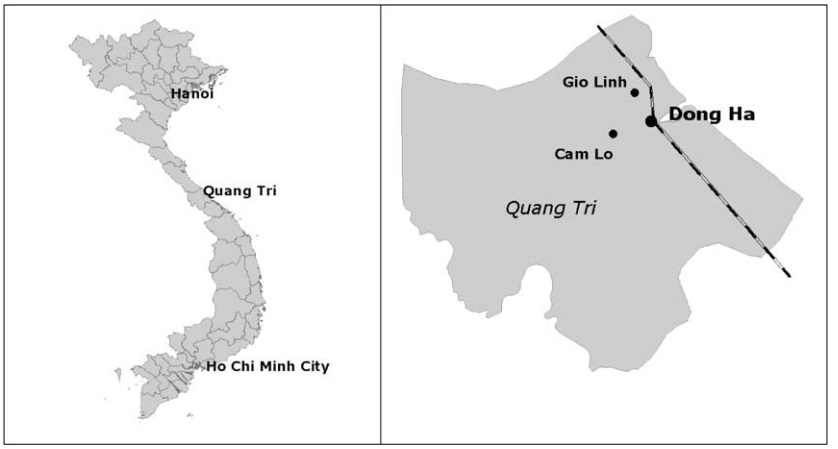

Chart 1 & 2. Quang Tri Province.

households (a household in which at least one member is affected) represent only 8% of the total population of households in Gio Mai and Cam Thuy communes, to select randomly from the total population of households would have necessitated a very large sample to adequately represent affected households. A disproportionate stratified systematic sample method was consequently adopted where the population was divided into affected and unaffected strata and a survey of every *X*th household taken from the given population list (Sapsford, 1996, pp. 33–34).[7] With an affected household population proportion of 9.63% in Gio Mai commune and 6.3% in Cam Thuy commune, adequate representation of affected households was estimated at 18 and 12 households, respectively.[8] An equal control group of 30 unaffected households provided the basis for comparison. To stand up against affected households these households were ensured to have had an equal exposure to AO and similar demographics to that of affected households. For instance, it may have been possible that survey respondents had immigrated to the region from other provinces and thus were not directly exposed to AO. Or, it may have been possible that unaffected households simply had more household members, and therefore labourers, or alternatively, access to employment that kept them away from the AO-contaminated land. Therefore, all unaffected households selected had a tenancy status of at least 30 years. Furthermore, in terms of demographics, average members per household for affected and unaffected were 4.2 and 4.7, respectively, and average age per capita at 31 and 26 years, respectively. In both cases over two-thirds of family members worked as self-employed farmers.

Since the affected stratum is of most interest, it was necessary to increase the proportion of the sample taken in the population to a level disproportionate with the unaffected strata. This is indicated in Table 2 with affected households representing 18.86% of the population compared to 1.63% for unaffected households. To bring the sample data back into line with the true population proportions, population weights were applied to the following estimates. The result is that only 3% of the total population was surveyed where each affected and unaffected household stands as a reasonable proxy for an equal number of households in each population.

Methodology of socio-economic impact assessment

The subsequent result estimates are henceforth generated from Vo's (2001) survey of 30 households affected by an exposure to AO and a control group of 30 unaffected households, across four villages in Gio Mai commune, Gio Linh district, and Cam Thuy commune, Cam Lo district, Quang Tri province. Analysis is provided of the real costs of illness in the form of lost productivity and output and the increase in resources devoted to medical care, together with effects on years of education and marital status of affected households

[7]Note this method is adequate in this case where the order of household lists were alphabetic and therefore did not display any patterns that may lead to a bias.

[8]The precision of sample estimates has been found to depend much on the sample size and little on the size of the population sampled (Sapsford, 1996, p. 49). Statistical techniques allow us to balance the costs of surveying against the level of precision required or standard error, as given by the following sample size formula: $n = p(1-p)/[\mathrm{SM}]^2$ where n denotes sample size, p is the population proportion and SM the standard error (0.13/1.96) (Moser, 1971, p. 147). In the case of affected strata in both communes, an interval range of 13 percentage points was allowed under a degree of confidence of 95%.

Table 2
Survey representation, Gio Linh and Cam Lo districts, Quang Tri Province

Subgroups	Affected		Unaffected		Total no.
	No.	%	No.	%	
Households					
Survey	30	50	30	50	60
Population	159	7.97	1836	92.03	1995
%	18.86		1.63		3
People					
Survey	37	20.90	140	79.10	177
Population	229	2.46	9066	97.54	9295
%	16.16		1.54		1.90

Source: Vo Xuan Hong, 2001, "Household Survey Data Bank, Gio Linh and Cam Lo districts, Quang Tri province, May 2001", Ho Chi Minh City: University of Economics.

compared to the control group of unaffected households. Averages per capita per annum of earnings (income), medical expenses and years of education of affected households are compared to that of unaffected households.[9]

Household income was collected according to the Vietnam Living Standards Survey 1997–1998 to include off-farm and on-farm income. Off-farm income was divided into sources from salaries, pensions, wages/self collected, self-employment and other transfers (including from relatives, local and/or national government). On-farm income was split between crops (rice, peanuts, sweet potato, red pepper and cassava) and livestock (pigs, chicken and duck) income. In each case, income was taken as total revenueless expenditure.

Medical expenses were collected as the sum of household hospital, local clinic, private doctor, traditional medicine and self-treatment expenditure per annum. Medical expenses range from tiered public services of central, district and provincial hospitals and commune health centers (Donor Working Group on Public Expenditure Review., 1999, p. 48). Private health services extend in descending order of usage to drug commission sellers, general practitioners' clinics, traditional medicine clinics, and nursing homes. Also of consideration is the possible eligibility of AO victims to income and medical benefits from social assistance programmes, most fittingly, the Vietnam Health Insurance scheme and the Social Protection Fund for Regular Relief.[10]

As mentioned, a practical difficulty arose in attributing individual contributions to income and medical expenses and hence apportioning individual loss. This is especially the case in the four villages surveyed where pooled on-farm income represented the main source of income. Since the data was collected at the household level it was necessary to transform it to a per capita basis.[11] While statistical advances have attempted to construct weights that are theoretically appropriate to children, they are yet to yield widespread approval (Deaton, 1997, pp. 150–151). Equal weightings are here attached to adults and children.

The following results were derived from affected households identified in the National Health Survey which commenced in June 1999. The survey exists as a register of persons potentially affected by AO with diseases categorized to those able and unable to work. While enlisting diseases and disabling effects, the survey was not able to verify an exposure to AO and the alleged diseases of respondents. Respondents who reported or displayed any possible AO-associated diseases were short-listed to be later blood tested. In Vo's survey of May 2001, 25 out of the 37 affected persons surveyed had been positively blood tested for supernormal levels of dioxin but were yet to receive medical verification of diseases.

The other consideration, subject to the Vietnamese government AO Central Payments Programme for the year 2000, is the possibility of surveying survivors of deceased persons from AO-associated diseases. While their eligibility is not in question, such households form

[9]Debate exists over the choice of income or household consumption as a measure of living standards; however, income was chosen on practical grounds of ease of measurement (see Deaton, 1997, pp. 148–151).

[10]The Vietnam Health Insurance programme entitles users to public health facilities and the Social Protection Fund for Regular Relief provides regular monthly benefits to three

(*footnote continued*)
groups of beneficiaries including the elderly, disabled and homeless (Donor Working Group on Public Expenditure Review., 1999, p. 79, pp. 83–84).

[11]Simply by dividing the total value by the number of members of the household.

Table 3
Gini-coefficent and average income and medical expenses for affected households able/unable to work and study and unaffected households

Subgroups (households)	Affected (x_2)				Unaffected (x_1)		t-stat[a]
Variable	Able Mean	Unable Mean	Total Gini-coefficient	Mean	Gini-coefficient	Mean	
Income per capita ($ p.a.)	41.69	30.48	0.46	33.93	0.48	65.86	−3.74
Medical expenditure per capita ($ p.a.)	10.65	13.26	0.35	12.40	0.41	9.47	1.83
Education per capita (years)	5.34	5.16	0.18	5.22	0.23	5.81	−1.34

$t(54) \cong \pm 1.6723$, $p < 0.10$.
1USD:15650VND.
Source: author's calculation based on Vo (2001).
[a] $t = (\bar{x}_1 - \bar{x}_2)/\sqrt{s^2(1/n_1 + 1/n_2)}$.

a separate category and the information networks required to access them were not available in this context and are therefore excluded from this survey. Assessment is thus reduced to income and medical expenses per capita per annum and years of education per capita for the categories of (i) affected persons able to work and study (ii) affected persons unable to work or study.

Results

Of affected persons surveyed, 60% were adults of which over half (52%) were unable to work or study.[12] Of children surveyed, a similar proportion of 50% were unable to work or study. Greater than 40% of affected persons had zero education and 71% over the marriageable age of eighteen years were single. Affected households were found on average to have just under one half annual income per capita, and 31% greater medical expenditures per capita than unaffected households. They were also found to have lower within-group inequality of income and medical expenses than unaffected households as reflected by lower Gini-coefficients. When asked about coping mechanisms for major medical expenses, 28% of households reported that they sold productive assets of land or cattle, 18% borrowed from relatives or friends and 12% reduced their food intake. Others relied on savings, credit and or government support. Over 96% of households said that if they were to receive more income they would spend it on health care (Table 3).

When we break down affected households into those able and unable to work or study, the inequalities are even greater. Affected individuals with no capacity to work or study had, on average, an annual income that was less than half, 40% greater medical costs and 11% less education (years) per capita than unaffected households. Compared to affected individuals able to work or study, those unable had on average over a quarter less income and near a quarter more medical expenses. Whereas affected individuals able to work experienced on average over a third less income (37%), 12% greater medical expenditures, and 8% less education per person per year than unaffected households. It is worthy to note that the overall effect of AO on education was found to be statistically significant. Therefore based on this preliminary data, the incidence of an AO-associated disease, on average, has marginal effects on years of schooling. The overall low level of education in the areas surveyed could potentially explain this as may the fact that over two-thirds of all households surveyed were in on-farm employment. Thus it could be said that levels of education had a limited effect on employment opportunities. Whilst this is the general picture, there is some evidence that AO-affected households had less opportunity for off-farm employment with 17% of unaffected households in public sector jobs compared to just 4% for affected households.

Review of current compensation

Presently, there are three potential sources of compensation for affected persons: central government compensation, non-governmental and inter-governmental assistance. The central government's January 2000 initiative marks a positive step forward in the formal recognition and compensation of victims in Vietnam. Payments are directed towards persons as distinct from households and are in excess of previous provincial mechanisms (Vietnam Investment Review, 2000). Monthly payments range from $3.40 to $7.14 for all former soldiers, civilians and children of persons

[12] Persons unable to work were taken as those equal to or above 18 years unable to undertake regular full time employment on or off the farm.

Table 4
Government of Vietnam Compensation Programme 2000

No.	Affected person category	Benefits per person ($ per annum)	Quang Tri ($ per annum)	Viet Nam ($ per annum)
1	Persons able to work or study	—	—	—
2	Adults unable to work or study	85.68	355,486	26,732,160
3	Children unable to work or study	72	188,640	14,400,000
4	Total		544,126	41,132,160

Note: annual Government of Vietnam figures are derived from maximum AO Central Payments Programme payments of $7.14 and $6.00 per month for adults and children unable to work (Vietnam Investment Review, 2000).

exposed to AO. There are three categories for eligibility to compensation including (i) those who have partially or totally lost the ability to work, (ii) children who have suffered deformities and lost the ability to work, (iii) and orphans also suffering deformities and unable to work. In the first two cases, victims are awarded monthly payments of up to $7.14 and $6, respectively, and payments are apportioned as a percentage of the minimum state salary.[13] Only orphans of direct victims are eligible for humanitarian assistance and medical treatments ($0.38 payment per month), and persons able to work or study, or those already receiving state benefits are excluded. Based on ratios derived from Vo's survey in Gio Linh and Cam Lo districts, Quang Tri, and conservative estimates of 1 million living victims, the maximum overall cost of the existing government compensation programme for Quang Tri and Vietnam is estimated at $544,126 and $41,132,160, respectively per annum.[14] This represents around one-half of one percent of current public expenditure, which for a country with an income per capita of $440 and some 33% of its population below the international poverty line, is a significant contribution (UNDP, 2003). In a review of basic social services by the Ministry of Labour, Invalids and Social Affairs, and the United Nations Development Programme, (2003), it was reported that in 1997 the overall proportion of state spending for social services including programmes for the poor, war contributor classes (veterans, invalids, martyrs), the disabled, victims of natural disasters and others (including street children, orphans, elderly, drug addicts) was 14% (MOLISA-UNDP, 1999, pp. 31–33). This nearly equals the share of state spending for education, which gives some indication of the scale of demands in this sector. Furthermore, not all needs are being met, with government sources reporting in 1998 that 15% of disabled, 24% of orphaned children, and 46% of the elderly were receiving state benefits (MOLISA-UNDP, 1999, p. 34) (Table 4).

The current compensation programme is thus constrained by the government's limited ability to pay. The programme extends only to those who have partially or totally lost the ability to work, children who have suffered deformities and lost the ability to work, orphans also suffering deformities, and those who are not already claiming state benefits. On this basis nearly half of affected adults and children surveyed who were able to work are not entitled to compensation. Furthermore, under the programme there are no formal provisions for non-monetary benefits except for humanitarian center assistance and medical treatment for orphans. To help counter this, it should be noted that the government has in addition set up a number of special schools or "peace villages" for children suffering from AO (BBC News, 1998). The Vietnam Red Cross Society is currently cooperating with the government to help fill the void with the provision of $34,500 each to affected provinces for treatment and rehabilitation, literacy programmes and vocational training, as well as monetary support for victims (Vietnam News, 2001b, p. 6). However, the existing fund base of 2 million dollars falls well short in meeting current needs; amounting to an allocation of less than $2 for each of the estimated 1–5 million living victims. Despite calls to foreign NGOs from the Vietnamese Foreign Minister, at the time of writing non-governmental and inter-governmental assistance has been area based and mostly

[13]Minimum state salary quoted at $12.80 per month (Vietnam Investment Review, 2000).

[14]In Quang Tri province there are an estimated 7921 adults and 5240 children affected by an exposure to Agent Orange (Vietnam Investment Review, 1999). Based on ratios derived from victims in Gio Linh and Cam Lo districts it is estimated that 4149 adults will be unable to work and 2620 children will be unable to attend school. These ratios, in conjunction with programme payments of $7.14 and $6.00 per month for adults and children unable to work, exclusive of those already receiving benefits, were applied to preliminary affected person estimates of 13,161 and 1,000,000 for Quang Tri and Vietnam, respectively (Vietnam Investment Review, 2000; Vietnam News, 2001a). The calculated figures in Table 4 are the maximum amounts since maximum programme payments are applied.

non-specific to victims of AO (VNA News Agency, 2002). Examples of non-government activity include the work of Green Cross International in the provision of orthopedic childcare in Hai Phong and Hanoi, and a vocational training center set up by a Samaritan in Hanoi for victims of AO (Green Cross International, 1999; Vietnam News, 2001c).

Of the 30 households surveyed in Quang Tri province, all were yet to receive any support bar six households who received an average annual payment of $3.58 from provincial authorities. Furthermore, there was found to be no health care or non-governmental support.

Conclusion and suggestions for further research

While steps forward have been made in the formal recognition of victims of AO, recent findings from Quang Tri province indicate that the current levels of assistance for victims are inadequate as an effective redress. With over 96% of affected households reporting that if they were to receive more income it would be spent on health care, the primary need identified for recipients is health care support. This support could take the form of monetary and or non-monetary benefits. A combination of benefits is recommended here for the reason that large on-going income payments can disrupt social cohesion. This is especially the case in Vietnam where almost everyone has been affected by war in one way or another, and where a large proportion (around three quarters) of the population live in rural areas constituting 90% of the poor (CPRGS, 2002, p. 66). It is foremost recommended that benefits be revised to better reflect the loss in income and increase in medical expenditures for all victims including those able and unable to work (affected households able to work reporting 37% less income and 12% greater medical expenditures per capita than unaffected households). Following the results from this preliminary research, income and medical benefits to those unable to work should be 25% greater than those able to work. Current monetary support should be revised to concentrate on the loss in income while medical benefits be extended in kind with the provision of treatment and prescription drugs. A government medical scheme already exists to some extent in the form of the government Health Insurance Card scheme that provides free health care, but its coverage is not universal and may infringe upon a recipient's right to receive monetary compensation as per the AO Central Payments Programme. Current resources fall short in meeting this recommendation but the special circumstances of this issue lend itself to a multiplicity of contributors. In consideration of the prior colonial involvement of France and the allied troop participation of the US, Australia, South Korea, the Philippines, New Zealand and Thailand, not to mention the manufacturers of AO, there exists the real possibility of an international donor fund. This could perhaps be mobilized through the auspices of the existing Vietnam Red Cross Society Fund as an established fund with developed political channels of operation.[15] Furthermore, in the immediate term there is the strong need for co-operation with local and foreign non-governmental organizations to provide necessary income and medical assistance. Full compensation, however, should also take account of the restrictions in capability borne by victims of AO including education, marital attainments and general social interactions. In this connection it is finally recommended that allowances be made in monetary benefits as well as access to vocational training centers, special education and counseling centers.

On this final point the research demonstrated here is lacking. Further analysis would better account for social damages for pain and suffering including broader aspects of diminished prospects of marriage, employment opportunities and community involvement. Another limitation and thus scope for further research is that these results were derived from survey participants in only two districts in one province and reflecting this small sample size are univariate methods of statistical analysis. Furthermore, the above results are derived from categories of those able and unable to work. Medical verification of diseases would allow for increased categorization according to a rating of disability and hence a more detailed cross-section of analysis and estimation of damages. However, special health examinations for potentially AO-affected persons will require a significant injection of additional funds. The benefits for victims of continuing research across all areas of this topic are great in that it may bring about a consortium of compensation that better reflects their loss. Compensation and accompanying international recognition are essential in the improvement of future living conditions and social acceptance of victims both within and outside of Vietnam.

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[15]See *Fund for Reconciliation and Development—Agent Orange* (www.ffrd.org/indochina/agentorange.html.) begun in 1985 as a US-Indochina Reconciliation Project currently collecting monies on behalf of the Vietnam Red Cross Society Fund.

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POSTTRAUMATIC STRESS DISORDER AMONG VIETNAMESE WAR VETERANS LIVING IN VIETNAM

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ABSTRACT

There appears to be a lot of researches studying Posttraumatic Stress Disorder (PTSD) among American veterans of the Vietnam-America war, yet, there is no information available on PTSD among Vietnamese veterans. This study investigated PTSD and other psychological symptoms among Vietnamese veterans of the Vietnam-America war. Participants were one hundred sixty nine (mean age = 63.5) former soldiers in the North Vietnamese Army (NVA) who currently live in Nha Trang city, Vietnam. Questionnaires used in this study assessed demographics, war zone exposure (WZE), combat roles (CR), combat exposure (CE), and included the Impact of Events Scale – Revised (IES-R) (1), Peri-Traumatic Dissociation Experiences Questionnaire (PDEQ) (2), Symptoms CheckList 90 Revised (SCL-90-R) (3), Trauma Symptoms Inventory (TSI) (4), and a DSM-IV-TR PTSD measure of symptoms in the context of war experiences. Results indicated that 19.5% of Vietnamese veterans in this sample had probable PTSD, which was defined by meeting the minimal DSM-IV-TR PTSD diagnostic criterion (5). Independent t-tests indicated that the levels of war-related stress symptoms among Vietnamese veterans were significantly lower than those reported for American and Australian veterans as reported in the literature. Pearson correlation coefficients showed that the levels of PTSD and other psychological symptoms correlated significantly with war-related stressors among Vietnamese veterans. The factors which resulted in the differences in symptoms levels between Vietnamese veterans and American and Australian veterans are also discussed.

INTRODUCTION

The United States officially began direct involvement in the Vietnam - American war on August 5, 1964. On May 7, 1975, President Gerald R. Ford officially proclaimed an end to the "Vietnam era". To the American government and people, it probably meant that it was over. But it was not over. The soldiers in all countries involved in the war continued to struggle with post-war psychological problems resulting from their war experiences and from readjustment to civilian life. According to researchers, the veterans of that war were viewed as presenting special problems in readjusting to post-war society.

Prevalence of PTSD

As part of the Epidemiologic Catchment Area Survey, Helzer, Robins, and McEvoy (1987) found a one percent rate of PTSD in the total population, 3.5 percent in civilians exposed to physical attack and in Vietnam veterans who had not been wounded in war, and 20 percent in veterans wounded in Vietnam (6). The Center for Disease Control's Vietnam Experience Study (VES, 1988) found that about 15% of Vietnam veterans had a lifetime diagnosis of PTSD and that 2.2% had the disorder during the month before the examination (7).

In order to establish the prevalence and incidence of PTSD and other psychological problems in readjusting to civilian life among Vietnam veterans, Kulka et al. conducted the National Vietnam Veterans Readjustment Study (NVVRS), from 1983 through 1988, and found that 15.2% of the male veterans and 8.5 percent of the female veterans are currently suffering as clinical cases of PTSD. Another 11.1 percent of male and 7.8 percent of female veterans suffer from PTSD symptoms that adversely affect their lives but are not of the intensity or breadth required for a diagnosis of PTSD. The NVVRS also indicated that the lifetime prevalence of PTSD is 30.9 percent among male veterans and 26.9 percent among females. The lifetime prevalence of partial PTSD among male veterans is 22.5 percent and among female veterans 21.2 percent (8).

According to some researchers, the reason why the rate of PTSD is high among Vietnam veterans is the uniqueness of the Vietnam-America war. King and King (1991) wrote:

> The war itself has been judged unique in several ways. First, it lasted longer than any previous war involving American troops. Second, American military

> personnel were not deployed to the combat area in intact units, but rather on an individual rotational basis with an explicit time frame of 13 months for Marines and 12 months for all other services. Third, there were no clearly discernible lines of battle. Instead, guerilla tactics predominated, and danger was perceived as being everywhere. Fourth, the entire purpose of the American involvement in Southeast Asia was never made clear, either to the personnel who fought the war or to the American public. Fifth, and finally, the Vietnam war came to be highly unpopular, and returning veterans were greeted with very little support and in many cases contempt (p. 107) (9).

Trauma Model of Factors Related to PTSD

Researchers have attempted to construct a model to account for the factors related to the possibilities of PTSD developing among Vietnam veterans. They have identified the following factors: 1) pre-military factors (e.g., childhood antisocial behavior, age at the time entering military, previous trauma history, personality, and ethnicity); 2) military experience (e.g., combat exposure, participation in abusive violence, exposure to abusive violence, and injury in the war); and 3) social support upon coming home.

Some investigators strongly endorsed pre-military factors such as school difficulties, behavioral problems, adjustment problems in children or adolescent, childhood physical abuse, personality (6, 8, 10, 11,12, 13, 14, 15, 16); those who strongly supported the causal role of combat exposure (17, 18); those who concluded that both pre-military and military history contributed significantly to levels of veteran functioning (19, 20); and those who proposed that post-military social support was a powerful moderating influence on present veteran status (21, 22, 23, 24, 25, 26, 27); those who proposed that both combat exposure and social support were mutually related to PTSD symptoms (24, 28, 29); and those who found that all factors were related to post-war psychosocial problems (30, 31, 32, 33).

Do Vietnamese veterans suffer any war related stress symptoms? If so, what patterns of stress symptoms do they have? How are their symptoms different from those of American veterans? And what is the basis of those differences? Do the facts that the ideology of being “Uncle Ho’s” soldier; the belief of fighting for a just war; the conviction of victory; and recognition by the Vietnamese people and government play significant roles in those differences?

This research interviewed Vietnamese veterans who were soldiers in the North Vietnam Army during the Vietnam-America war. The term "Vietnamese veteran" will be used hereafter as indicating the soldiers of the Northern Vietnam Army (NVA) in the Vietnam-America war.

The hypotheses of the present study are: 1) Vietnamese veterans of the Vietnam-America war suffer war-related stress symptoms of PTSD; 2) there exist significantly lower levels of war-related stress symptoms in Vietnamese veterans than in American and Australian veterans; and 3) the levels of PTSD and other psychological symptoms would correlate with war-related stress among Vietnamese veterans.

METHOD

Sample

Participants were volunteers from those veterans who were contacted through the Associations of Veterans Club. Participants consisted of 169 Vietnamese veterans (143 males (84.6%), 22 females (13.0%), 4 unidentified (2.4%)) living in three districts which have the largest numbers of veterans in Nha Trang city, Vietnam. Ages ranged from 41 to 83, with a mean age of 63.52, and a standard deviation of 9.918.

Instruments

Demographic Survey
History of Vietnam-America War Experiences
SCL-90 R Scale (3)
Impact of Event Scale – Revised (IES-R) (1)
Peri-Traumatic Dissociation Experiences Questionnaire (PDEQ) (2)
Dangerous Situations in the Vietnam-America War
Military Experiences in the Vietnam-America War
Trauma Symptoms Inventory (TSI) (4)
The Vietnam-America War: Your Personal Feelings

Procedure

The researcher translated all of the questionnaires from English into Vietnamese in consultation with Dr. John P. Wilson, a well-known expert on PTSD. Those translations were double-checked by an American who has been studying Vietnamese for over ten years and back-translated by a Vietnamese-American who has been living in the United Sates for 31 years.

The sample interview took place from June 15th to July 31st, 2004 in Nha Trang, Vietnam. After having being approved by local authorities to do research among Vietnamese veterans, the researcher discussed with leaders of three Associations of Veterans in three districts in Nha Trang to determine a process to carry out the research. After having screened the lists of Vietnamese veterans which were available in each district to select appropriate soldiers, about two hundred invitation letters were sent to prospective participants. The letters explained briefly that the aim of the study was to investigate and understand the impact of the Vietnam-America war on psychological aspects of Vietnamese veterans. Due to time limits the researcher could not interview veterans on a one-to-one basis in a private office. Instead groups of ten or more veterans at a time, in a hall, responded to the questionnaires. Participants were told that the primary purpose of the study was to gather their perceptions of experiences in the Vietnam-America war and learn about the effects of the war experiences on the course of their lives; and that researchers were interested in learning how individuals adapt to difficult and stressful wartime experiences. All information would be anonymous. Participants were asked not to put their name on any of the materials. Researcher stressed that their testimony about the Vietnam-America war and its aftermath was very important and meaningful for future generations. During the collective interviews, the researcher explained the instructions and read each item aloud and waited until each veteran finished the item then moved to the next item. Four collective interviews yielded a sample of 169 Vietnamese veterans.

In the process of administrating the interviews, there were some terms which seemed to be new or not easy for the participations to understand. There were times they did not understand what they were asked. This happened more often with the IES-R, SCL-90-R and PDEQ than with other scales. The reasons for that perplexity are the jargon, and/or abstractness of the wordings, for instance “on-guard”, “blank out”, or “space out”. The researcher was always available to explain the items and questions by the participants.

RESULTS

Results of Tests of Hypotheses

There were three independent measures of PTSD: IES-R, DSM-IV-TR-PTSD in context questionnaire, and the TSI.

Hypothesis 1. It was predicted that some Vietnamese veterans of the Vietnam-America war would suffer war-related stress symptoms of PTSD. To test hypothesis 1, several steps were carried out:

First, probable PTSD (P-PTSD) and non-probable PTSD (N-PTSD) cases on the IES-R were identified using DSM-IV-TR minimal algorithmic criteria. To be classified as a P-PTSD case the respondent must endorse at least one intrusion item (items 1, 2, 3, 6, 9, 14, 16 and 20), three avoidance/numbness items (items 5, 7, 8, 11, 12, 13, 17 and 22), and two hyperarousal items (items 4, 10, 15, 18, 19 and 21). Cases which did not satisfy the criterion were classified as N-PTSD. Using this procedure, 109 (64.5%) Vietnamese veterans were identified as P-PTSD and 60 (35.5%) as N-PTSD. If Creamer's cut-off value (34) for the IES-R (M = 1.5) was applied to this research, instead of using the standard scoring procedure for the PTSD, the rate of P-PTSD identified would be 40.2% instead of 64.5%.

Because the Intrusive Experiences (IE) scale (item 1, 8, 12, 62, 66, 70, 72, and 74) on the TSI is used to measure intrusive symptoms associated with posttraumatic stress, the IE was used as the B criterion of the DSM-IV-TR. Similarly, because the Defensive Avoidance (DA) scale (item 2, 4, 23, 59, 67, 83, 87, and 89) is used to measure posttraumatic avoidance, the DA was used as the C criterion of the DSM-IV-TR. The Anxious Arousal (AA) scale (item 22, 27, 31, 41, 51, 54, 91, and 97) and Anger/Irritability (AI) scale (item 3, 15, 34, 35, 37, 45, 57, 63 and 93) were used as the D criterion of the DSM-IV-TR because they were used to measure the posttraumatic hyperarousal symptoms. Therefore, a participant who checked at least 1 IE item, 3 DA items and any two AA and/or AI items was considered to be P-PTSD. All other participants were considered to be N-PTSD. Out of 169 Vietnamese veterans responding to the study, 53.3 percent (N= 90) were P-PTSD and 46.7 percent (N=79) were N-PTSD.

The same process as step 1 was applied to the "DSM-IV-TR-PTSD in context questionnaire" to determine probable PTSD cases. The questions used in this questionnaire specifically addressed the Vietnam war context. If the veterans endorsed at least one intrusion symptom (B criterion, items 1 to 5), three avoidance/numbness symptoms (C criterion, items 6 to 12), and two hyperarousal symptoms (D criterion, items 13 to 17) he or

she was identified as P-PTSD. Cases which did not satisfy the principle were assigned to the N-PTSD group. Forty-nine (29%) of Vietnamese veterans were identified as P-PTSD, and 120 (71%) as N-PTSD.

Since the researcher did not conduct clinical interviews with participants there was no way to unambiguously determine a positive diagnosis of PTSD among the Vietnamese veterans. Following the recommendation of Keane (1988) that researchers should use multiple assessment measures prior to conferring the PTSD diagnosis (35), the match of P-PTSD cases from these three scales led to a final conservative rate of P-PTSD reported in this study. Results indicated that 33 (19.5%) Vietnamese veterans in this study show P-PTSD, and 136 (80.5%) N-PTSD on all three measures. The NVVRS conducted by Kulka et al. (1990) indicated that 30.9 percent of American male veterans and 26.9 percent of American female veterans of the Vietnam-America war experienced PTSD during their lifetime (8). Although the female Vietnamese veterans sample was small for statistical purposes, the P-PTSD rate was 27.3%.

Hypothesis 2. It was expected that Vietnamese veterans would evidence lower levels of war-related stress symptoms than would American-Australian veterans. This hypothesis was strongly confirmed.

To test hypothesis 2, a review of the literature on symptoms for American Australian veterans of the Vietnam-America war was conducted. Data from previous studies on PTSD among American and Australian veterans (34, 36, 37, 38, 39, 40) (see Table 1) were combined into a composite index, in which means for the IES-R, PDEQ, and SCL-90-R scales and their subscales were calculated by weighting the means by their appropriate sample sizes.

Table.1. ***Summary of Studies of PTSD Symptoms of American-Australian Veterans***

	Tampke	Carson	Orr	Metzger	Creamer	Forbes
SCL-90-R-GSI	-	N=17 M=1.2	N=20 M=1.7	N=29 M=1.2	-	N=12 M=2.0
IES-R	-	N=17 M=2.3	-	N=29 M=49.7	N=120 M=2.64	N=12 M=2.4
IES-R-Intrusion	-	-	-	-	N=120 M=2.72	N=12 M=2.5
IES-R-Avoidance	-	-	-	-	N=120 M=2.30	N=12 M=2.1
IES-R-Hyperarousal	-	-	-	-	N=120 M=2.99	N=12 M=2.8
PDEQ	N=74 M=27.68	N=17 M=25.4	-	-	-	-

Note. Means of scales and subscales. Dashes indicate the number and mean were not estimated. PTSD = Post-Traumatic Stress Disorder. N = Sample size. M = Mean. IES-R = Impact of Event Scale – Revised. IES-R-Intrusion = Intrusion subscale of IES-R. IES-R-Avoidance = Avoidance subscale of IES-R. IES-R-Hyperarousal = Hyperarousal subscale of IES-R. PDEQ = Peritraumatic Dissociation Experiences Questionnaire. SCL-90-R GSI = Symptoms CheckList-Revised Global Severity Index.

Comparisons between these composite means and the means for the Vietnamese sample were made using independent t-tests. The means on IES-overall, IES-Intrusion, IES-Avoidance, IES-Hyperarousal, PDEQ, and SCL-90-R were significantly lower in the Vietnamese sample than in the American-Australian sample
(t from 8.11 to 36, df from 163 to 166, see Table 2).

Table.2. ***Differences Between Vietnamese Veterans and American-Australian Veteran's Level of PTSD and Other Psychological Symptoms***

	Vietnamese sample	American-Australian sample	Results
IES-R	N=167	N=178	t= 14.68
	M=1.44	M=2.53	df=166
	SD=.998	SD=.77	p<.001
IES-R-Intrusion	N=166	N=132	t= 9.36
	M=1.58	M=2.61	df=165
	SD=1.04	SD=.76	p<.001
IES-R-Avoidance	N=165	N=132	t= 27.69
	M=1.18	M=2.26	df=164
	SD=1	SD=.8	p<.001
IES-R-Hyperarousal	N=165	N=132	t= 36
	M=1.53	M=2.97	df=164
	SD=1.1	SD=.84	p<.001
PDEQ	N=164	N=91	t= 10.73
	M=16.49	M=27.25	df=163
	SD=7.05	SD=9.8	p<.001
SCL-90-R-GSI	N=167	N=78	t= 8.11
	M=.85	M=1.45	df=166
	SD=.56	SD=.68	p<.001

Note. Sample size (N), mean (M) and standard deviation (SD) of scales and subscales. IES-R = Impact of Event Scale – Revised. IES-R-Intrusion = Intrusion subscale of IES-R. IES-R-Avoidance = Avoidance subscale of IES-R. IES-R-Hyperarousal = Hyperarousal subscale of IES-R. PDEQ = Peritraumatic Dissociation Experiences Questionnaire. SCL-90-R GSI = Symptoms CheckList-Revised Global Severity Index.

Hypothesis 3. It was predicted that levels of PTSD and other psychological symptoms would correlate with war-related stress among Vietnamese veterans.

War zone exposure (WZE) scores were created by calculating the mean of 15 items on which respondents reported war experiences ("A history of Vietnam-America War Experiences" questionnaire). Combat roles (CR) scores were similarly calculated as the mean of 19 items describing the veterans' roles in combat ("Dangerous Situations in the Vietnam-America War" questionnaire). Combat exposure (CE) scores were the mean of 25 items related to the degree of direct experience with combat ("Military Experiences in the Vietnam-America War" questionnaire).

The WZE scores ranged from 1.31 to 3.93 (M = 2.52, SD = .51). Correlations between WZE and PTSD and other psychological symptoms showed that almost all the correlations between WZE scores and SCL-90-R, IES-R, PDEQ, and TSI scales and their subscales scores were statistically significant, except for the Avoidance subscale of the DSM-IV-TR-PTSD in context questionnaire, and the Sexual Concerns and Dysfunctional Sex Behavior subscales of TSI (see Table 3). The correlations ranged from 0.159 (Psychotic subscale of SCL-90-R, p = .043) to 0.442 (Anxious Arousal subscale of TSI, p = .000). The results indicated that the higher the level of WZE the higher the level of PTSD on IES-R and its subscales; PDEQ; SCL-90-R and its subscales; DSM-IV-TR-PTSD in context questionnaire and its subscales; TSI and its scales.

Table. 3. ***Correlations of War Zone Exposure, Combat Roles and Combat Exposure scores with SCL-90-R, IES-R, PDEQ, DSM-IV-TR-PTSD in context, TSI scales and their subscales***

Scales and their subscales	War zone exposure	Combat roles	Combat exposure
SCL-90-R GSI	.338(**)	.374(**)	.436(**)
	N = 165	N = 164	N = 165
SCL-90-R-Somatization	.405(**)	.364(**)	.495(**)
	N = 164	N = 163	N = 165
SCL-90-R-Obsession-Compulsion	.374(**)	.336(**)	.424(**)
	N = 164	N = 162	N = 164
SCL-90-R-Interpersonal	.197(*)	.319(**)	.293(**)
	N = 163	N = 162	N = 164
SCL-90-R-Depression	.298(**)	.373(**)	.390(**)
	N = 164	N = 164	N = 164

SCL-90-R-Anxiety	.343(**)	.352(**)	.435(**)
	N = 162	N = 162	N = 163
SCL-90-R-Hostility	.231(**)	.255(**)	.333(**)
	N = 163	N = 163	N = 164
SCL-90-R-Phobia	.309(**)	.349(**)	.382(**)
	N = 162	N = 162	N = 163
SCL-90-R-Paranoid	.176(*)	.316(**)	.277(**)
	N = 163	N = 162	N = 164
SCL-90-R-Psychotic	.159(*)	.329(**)	.282(**)
	N = 162	N = 162	N = 163
IES-R	.364(**)	.458(**)	.538(**)
	N = 165	N = 164	N = 165
IES-R-Intrusion	.438(**)	.505(**)	.591(**)
	N = 164	N = 164	N = 164
IES-R-Avoidance	.271(**)	.335(**)	.448(**)
	N = 164	N = 164	N = 164
IES-R-Hyperarousal	.400(**)	.455(**)	.511(**)
	N = 164	N = 163	N = 165
PDEQ	.250(**)	.405(**)	.374(**)
	N = 163	N = 163	N = 164
DSM-IV-TR-PTSD in context	.274(**)	.313(**)	.379(**)
	N = 166	N = 163	N = 165
Intrusion DSM-IV-TR-PTSD in context	.315(**)	.273(**)	.325(**)
	N = 166	N = 163	N = 165
Avoidance DSM-IV-TR-PTSD in context	.069	.207(**)	.189(*)
	N = 166	N = 163	N = 165
Hyperarousal DSM-IV-TR-PTSD in context	.286(**)	.252(**)	.395(**)
	N = 165	N = 163	N = 164
IES-R-PTSD	.256(**)	.227(**)	.344(**)
	N = 167	N = 164	N = 165
TSI-DSM-PTSD -Probable	.264(**)	.290(**)	.319(**)
	N = 167	N = 164	N = 165
DSM-IV-TR-PTSD in context - Probable	.093	.208(**)	.254(**)
	N = 167	N = 164	N = 165
Probable PTSD- Overall	.096	.246(**)	.268(**)
	N = 167	N = 164	N = 165
TSI	.308(**)	.483(**)	.522(**)
	N = 165	N = 163	N = 164
TSI - Anxious arousal	.442(**)	.374(**)	.538(**)
	N = 160	N = 159	N = 160
TSI- Depression	.310(**)	.337(**)	.377(**)
	N = 160	N = 159	N = 160

TSI - Anger/Irritability	.358(**)	.410(**)	.463(**)
	N = 160	N = 159	N = 160
TSI - Intrusive experience	.426(**)	.374(**)	.494(**)
	N = 160	N = 159	N = 160
TSI - Defensive avoidance	.236(**)	.281(**)	.331(**)
	N = 160	N = 159	N = 160
TSI - Dissociation	.293(**)	.319(**)	.386(**)
	N = 160	N = 159	N = 160
TSI - Sexual concerns	.116	.193(*)	.229(**)
	N = 160	N = 159	N = 160
TSI - Dysfunctional Sex-Behavior	.107	.235(**)	.197(*)
	N = 160	N = 159	N = 160
TSI - Impaired Self-reference	.270(**)	.375(**)	.368(**)
	N = 160	N = 159	N = 160
TSI - Tension Reduction Behavior	.250(**)	.292(**)	.298(**)
	N = 160	N = 159	N = 160
TSI - Trauma	.326(**)	.374(**)	.449(**)
	N = 160	N = 159	N = 160

Note. SCL-90-R = Symptoms CheckList-90-Revised. SCL-90-R GSI = Global Symptoms Index of SCL-90-R. IES-R = Impact of Event Scale – Revised. PDEQ = Peri-Traumatic Dissociation Experiences Questionnaire. DSM-IV-TR-PTSD in context = Questionnaire is designed based on DSM-IV-TR criteria. . IES-R-PTSD = PTSD on Impact of Event Scale – Revised. TSI-DSM-PTSD = PTSD on TSI based on DSM-IV-TR criteria. DSM-IV-TR-PTSD in context= PTSD on DSM-IV-TR-Formatted questionnaire. PTSD-Overall = PTSD on all three scales. TSI = Trauma Symptoms Inventory. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

An independent t-test compared the mean WZE scores of the P-PTSD group (M = 2.65, SD = .45) with that of the N-PTSD group (M = 2.38, SD = .53) on the TSI. This test was found to be statistically significant [t (165) = 3.518, p< 0.001], indicating that the P-PTSD group had significantly higher scores on WZE than did the N-PTSD group. Likewise, for the IES-R, the P-PTSD group was found to have significantly higher scores on WZE than did the N-PTSD group (M = 2.62, SD = .47 vs. M = 2.35, SD = .53, t (165) = 3.403, p< 0.001). However, independent t-tests showed no WZE significant differences between P-PTSD and N-PTSD groups based on the DSM-IV-TR-PTSD in context questionnaire and overall P-PTSD variables (see Table 4).

Table. 4. ***Independent t-tests comparing war zone exposure scores of non-probable PTSD versus probable PTSD group for IES-PTSD, TSI-DSM-PTSD, DSM-IV-TR-PTSD in context, and PTSD-Overall***

Scales	Mean Difference	t	df	Sig. (2-tailed)
IES-R-PTSD	-.27	-3.40	165	.001
TSI-DSM-PTSD	-.27	-3.52	165	.001
DSM-IV-TR-PTSD in context	-10	-1.20	165	.233
PTSD-Overall	-.12	-1.23	165	.623

Note. IES-R-PTSD = PTSD on Impact of Event Scale – Revised. TSI-DSM-PTSD = PTSD on TSI based on DSM-IV-TR criteria. DSM-IV-TR-PTSD in context = PTSD on DSM-IV-TR-Formatted questionnaire. PTSD-Overall = PTSD on all three scales.

The CR scores ranged from 0.05 to 3.33 (M = 0.78, SD = .68). Correlations between CR scores and SCL-90-R, IES-R, PDEQ, and TSI scales and their subscales scores were statistically significant. The correlations ranged from 0.193 (Sexual Concern subscale of TSI, p = .015) to 0.505 (Intrusion subscale of IES-R, p = .000, see Table 3), indicating that the more dangerous the CR the higher the level of symptoms of PTSD and other psychological symptoms.

Independent t-tests compared mean CR scores of the IES-R P-PTSD group (M = .89, SD = .72) with that of the IES-R N-PTSD group (M = .57, SD = .54). This test was found to be statistically significant [t (162) = 2.967, p< 0.003], indicating that the P-PTSD group had significantly higher CR scores than did the N-PTSD group. Likewise, the P-PTSD group was found to have significantly higher CR scores than did the N-PTSD group for groupings based on the TSI (M = .96, SD = .72 vs. M = .56, SD = .56, t (162) = 3.952, p< 0.000), DSM-IV-TR-PTSD in context questionnaire (M = 1.00, SD = .81 vs. M = .69, SD = .60, t (162) = 2.4, p< 0.019), and overall P-PTSD variables (M = 1.11, SD = .87 vs. M = .70, SD = .60, t (162) = 2.608, p< 0.013) (see Table 5).

Table. 5. ***Independent t-tests comparing combat roles scores of non-probable PTSD and probable PTSD group for IES-PTSD, TSI-DSM-PTSD, DSM-IV-TR-PTSD in context, and PTSD-Overall***

Scales	Mean Difference	t	df	Sig. (2-tailed)
IES-R-PTSD	-.33	-3.25	141.455	.001
TSI-DSM-PTSD	-.40	-3.95	161.611	.000
DSM-IV-TR-PTSD in context	-.31	-2.40	71.357	.019
PTSD-Overall	-.42	-2.61	40.138	.013

Note. IES-R-PTSD = PTSD on Impact of Event Scale – Revised. TSI-DSM-PTSD = PTSD on TSI based on DSM-IV-TR criteria. DSM-IV-TR-PTSD in context = PTSD on DSM-IV-TR-Formatted questionnaire. PTSD-Overall = PTSD on all three scales.

CE scores ranged from 0.04 to 3.32 (M = 1.22, SD = .78). Correlations between CE scores and SCL-90-R, IES-R, PDEQ, and TSI scales and their subscales scores were statistically significant. The correlations ranged from 0.189 (Avoidance subscale of DSM-IV-TR-PTSD questionnaire in context, p = .015) to 0.591 (Intrusion subscale of IES-R, p = .000) (see Table 3). The results indicated that the more dangerous the CE the higher the level of PTSD and other psychological symptoms.

Independent t-tests compared mean CE scores of the IES-R P-PTSD group (M = 1.41, SD = .72) with that of the IES-R N-PTSD group (M = .86, SD = .76). This test was found to be statistically significant [t (163) = 4.67, p< 0.000], indicating that the P-PTSD group had significantly higher CE scores than did the N-PTSD group. Likewise, the P-PTSD group was found to have significantly higher CE scores than did the N-PTSD group for groups formed using the TSI (M = 1.45, SD = .74 vs. M = .95, SD = .74, t (163) = 4.301, p< 0.000); DSM-IV-TR-PTSD in context questionnaire (M = 1.53, SD = .84 vs. M = 1.10, SD = .71, t (163) = 3.359, p< 0.001); and overall P-PTSD variables (M = 1.64, SD = .84 vs. M = 1.12, SD = .73, t (163) = 3.553, p< 0.000) (see Table 6).

Table. 6. ***Independent t-tests comparing combat exposure scores of non-probable PTSD and probable PTSD group for IES-PTSD, TSI-DSM-PTSD, DSM-IV-TR-PTSD in context, and PTSD-Overall***

Scales	Mean Difference	t	df	Sig. (2-tailed)
IES-R-PTSD	-.56	-4.67	163	.000
TSI-DSM-PTSD	-.50	-4.30	163	.000
DSM-IV-TR-PTSD in context	-.43	-3.36	163	.001
PTSD-Overall	-.52	-3.55	163	.000

Note. IES-R-PTSD = PTSD on Impact of Event Scale – Revised. TSI-DSM-PTSD = PTSD on TSI based on DSM-IV-TR criteria. DSM-IV-TR-PTSD in context = PTSD on DSM-IV-TR-Formatted questionnaire. PTSD-Overall = PTSD on all three scales.

Results indicated the more dangerous the WZE, CR and CE Vietnamese veterans experienced the more PTSD, dissociative and other psychological symptoms they suffered.

DISCUSSION

Hypothesis 1, which Vietnamese veterans of the Vietnam-America war would suffer war-related stress symptoms of PTSD, was supported.

In this study, 64.5% Vietnamese veterans were identified as P-PTSD on the IES-R; 53.3% on the TSI; and 29% on the DSM-IV-TR-PTSD in context questionnaire. The overall rate of P-PTSD among the Vietnamese veterans of this study was estimated to be 19.5%. The rate of P-PTSD decreased as the time periods (before the interview) specified in the questionnaires increased. The time periods specified in IES-R and TSI were 30 days and 6 months, respectively. No time period was specified in the DSM-IV-TR-PTSD in context questionnaire. This finding seems to be counterintuitive. In the present study, it took 3 hours, on average, for the participants to complete the questionnaires. The expected time to complete the packet was 70-80 minutes. The apparent reason for this difference is that most Vietnamese veterans in this sample were elderly, as evidenced by the mean age of 63.5. Mental and physical impairment associated with age, may have contributed to fatigue and lack of concentration when responding to the questionnaires, especially the DSM-IV-TR-PTSD in context questionnaire, which was situated at the end of the set of questionnaires. The researcher noticed that some participants checked the questionnaires

inattentively and indiscriminately. This was a shortcoming of the long collective interview. A shorter one-to-one interview would overcome this problem. Another reason for the low rate of P-PTSD when using the DSM-IV-TR-PTSD in context questionnaire is that this questionnaire is more restricted or conservative than the IES-R and TSI with respect to the range of symptoms.

The present findings are in the range of frequency of PTSD among American veterans in the Vietnam-America war reported by other studies. Egendorf et al. (1981) found that 21% to 26% of American veterans who served in Vietnam suffered PTSD, or even up to 35% for those exposed to heavy combat (21). Helzer et al. (1987) found that the rate of PTSD was 20% in veterans wounded in Vietnam (9). Likewise, Card (1987), as cited by Oei (1990), found that 19% of all veterans and 27% of veterans who were exposed to heavy combat suffered from PTSD (41). The Centers for Disease Control Vietnam Experience Study (1988) (the VES) reported that about 15% of American veterans experienced combat-related PTSD at some time during or after military service (7). Kulka et al. (1990) indicated that 30.9 percent of American male theater veterans and 26.9 percent of American female theater veterans experienced a lifetime prevalence of PTSD (8). In the present study, the P-PTSD rate of Vietnamese female veterans was 27.3%.

It is difficult to say whether the rate of P-PTSD among Vietnamese veterans is lower or comparable to that of American veterans because the methods used to determine rate of PTSD are different across studies. The present study was also conservative in determining PTSD, but the diagnosis in this study was for P-PTSD, not a clinical diagnosis for PTSD. Furthermore, the instruments used in the present study were different from those used in other studies. This study did ask participants about traumatic events confronted by them in the war, but did not ask their emotional reaction immediately accompanying those traumatic events. This study also did not involve a thorough clinical interview. As a result, the present study can not determine a rate of actual PTSD for this sample, and thus is not able to make a confident comparison between the estimate of PTSD in this sample and the foregoing studies of American veterans.

Hypothesis 2, which the levels of war-related stress symptoms among Vietnamese veterans were significantly lower than those among American Australian veterans, was strongly confirmed.

The results of this study indicated that the profile configuration of symptoms of Vietnamese veterans was similar to the one of American and Australian veterans but Vietnamese veterans reported significantly lower levels of PTSD symptoms than did American-Australian veterans, including overall, intrusive, avoidance, and hyperarousal symptoms on the IES-R. They were also significantly lower in dissociative symptoms on the PDEQ and in other psychological symptoms on the SCL-90-R (see Fig. 1). From reviewing the available literatures on PTSD among American veterans and the observations from this study, the following tentative explanations could be attempted for these differences.

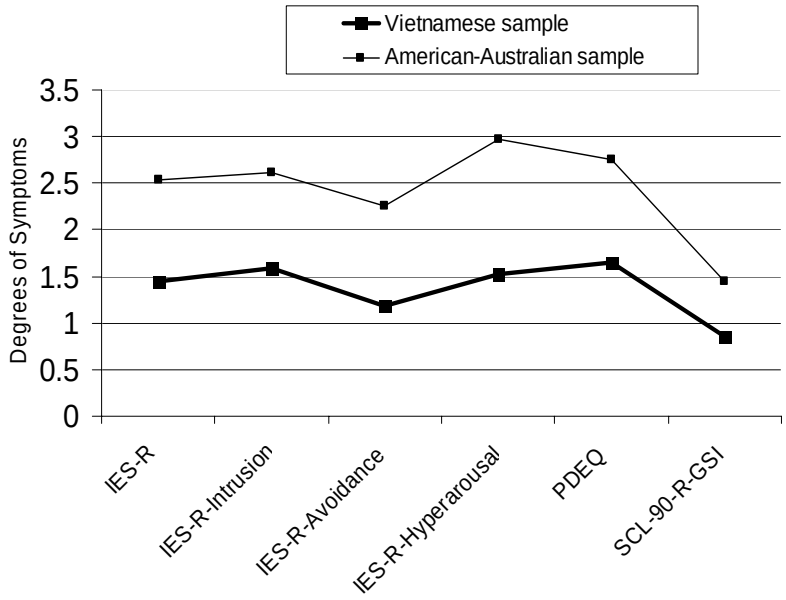

Fig.1. Differences between Vietnamese veteran's and American-Australian veteran's level of PTSD and other psychological symptoms.

As mentioned previously there are three factors related to the development of PTSD among American veterans. These are pre-war experiences and conditions, war experience, and post-war factors. With regard to war trauma, the Vietnam-America war was a very special war which brought unique experiences to American veterans (9, 31, 42, 43, 44). It was the first to end without an American victory (20). There were no front lines in this war, and it was often difficult to tell friend from foe (31). These features dramatically impacted the experiences of American soldiers. They had no clear sense of the identity of the

adversary, no sense of security, and no support from the Vietnamese that they thought they were helping or allied with (43). As a consequence, an unavoidable sense of isolation and bad feeling developed between the American forces and their allies.

The situation of the Vietnamese veterans was totally different. The Vietnamese had justified reasons for engagement in the war, could discern the adversary, were able to feel relatively safe, and had the strong support of their country, and the local population. The Vietnamese veterans fought for their lives, for their families, relatives and country. They were founders of the guerilla war therefore they knew actively what they were doing, how it should have been done, or where and when they did it. They knew who were their comrades or adversaries. They did not have the passive or uncertain feelings characteristic of many American soldiers. The hit-and-run tactics, the fluidity, and the mobility of the Vietnamese soldiers generally made the American soldiers confused in locating them, and this, in turn, helped them minimize their casualties. Additionally, the Vietnamese soldiers got strong support from the Vietnamese population. As a result, they had greater feelings of safety than did the American soldiers.

Pride and identification with their leadership made the experience of the Vietnamese veterans very different from that of the American veterans. Vietnamese veterans were asked "What does it mean to you to belong and/or to attend the meeting of the Veterans Club?" This open-ended question was aimed at investigating the feelings and thoughts of the Vietnamese veterans about being a member of the Veterans Club. In response to this question several veterans expressed their pride to have been "Uncle Ho's soldier" and to have fought for the ideals of the revolution and army. Among 142 participants responding to that item, 66.2% revealed that they were there for re-meeting their comrades, recollecting their hard war experiences, and receiving mutual support from one another; 25.4% noted that they were there for recalling their revolutionary ideals and army traditions; and 20.4% said that they felt honored to have been "an Uncle Ho's soldier" and a member of the Communist Party. Although there was no item in the set of questionnaires in this study asking about participants' perceptions about the result of this war, through personal discussions with them, the researcher noted that the majority of veterans considered themselves to be the winners of the war. From these disclosures we can see contrasts between the American veterans and Vietnamese veterans in the war. The researcher hypothesizes that there exists a negative correlation between Vietnamese

veteran's belief of winning the war and the level of PTSD symptoms. This feature should be extremely important in minimizing the level and intensity of their later PTSD symptoms. America's postwar homecoming environment: lack of social support. The lack of social support for American veterans probably contributed to the development of PTSD symptoms. The Vietnam-America war was a politically unpopular one, and many American veterans were ostracized on their return home. This was in contrast to the experiences of veterans coming home from previous wars such as World War II who were given a hero's welcome. The effect of the negative homecoming environment on the development of PTSD symptoms has been mentioned by many researchers (9, 21, 22, 23, 24, 26, 27, 29, 33, 41, 44, 45). Society had subjected American soldiers to catastrophic combat victimization, and, when they returned, society avoided the victims, then blamed them for what they had done in Vietnam (45).

The situation of the Vietnamese veterans was totally different. After the war, they were recognized by their government, country, and citizens as contributors to the victory. Many of them were even recognized as heroes of the country. They were encouraged and helped to continue and follow their education and careers, as evidenced by the rate of high school and university or higher levels of education (73.3%) in the sample. They were given jobs, provided with houses, and other privileges. They were given more opportunities than other people in society. Those privileges may have made the Vietnamese veterans feel that they were compensated and rewarded for their sacrifice and contribution. This may have minimized their potential PTSD and other psychological symptoms. And they could be the reasons for the lower level of PTSD and other psychological symptoms among the Vietnamese veterans than among the American veterans. As a result, it would be expected that the rate of PTSD among the Vietnamese veterans would be significantly lower than that of the American veterans if the same method and instruments as other studies were employed. Further study needs to be conducted to investigate this hypothesis.

Hypothesis 3, that levels of PTSD and other psychological symptoms would correlate with war-related stress among Vietnamese veterans, was strongly supported.

The results of the present study indicated that almost all the correlations of WZE, CR, and CE scores with SCL-90-R, IES-R, PDEQ, and TSI scales and their subscales scores were statistically significant. These results indicated that the higher the level of war-related stress the Vietnamese veterans experienced, the higher the level of PTSD symptoms

they suffered post-war on the IES-R and its subscales, on the DSM-IV-TR-PTSD in context questionnaire and its subscales. Likewise, the higher the level of war-related stress the Vietnamese veterans experienced, the higher the level of dissociative symptoms on the PDEQ, the higher the level of other psychological symptoms they had on the TSI and its scales, and on the SCL-90-R and its subscales.

The correlations between WZE scores and the Avoidance subscale of the DSM-IV-TR-PTSD in context questionnaire, and Sexual Concerns and Dysfunctional Sex Behavior subscales of the TSI were not significant. The insignificant correlations of Sexual Concerns and Dysfunctional Sex Behavior subscales of the TSI with war zone exposure scores could possibly be explained by the fact that sexual issues are not openly disclosed or discussed among the Vietnamese, especially among the elderly. The participants may have responded to those items related sex with denial. It is necessary to investigate this issue more in future studies.

In summary, the Vietnamese veterans in the Vietnam-America war with higher war-related stress had significantly more PTSD and higher levels of other psychological symptoms of psychopathology. These findings are generally consistent with results of previous studies (8, 18, 21, 29, 46, 47, 48).

Methodological Considerations

Translation. Although the procedures of translation into Vietnamese and back translation into English were strictly followed, there were still some items in which meanings and/or concepts seemed abstract, ambiguous, quite new or too technical for the participants to understand as translated into Vietnamese. In particular, phrases that are idiomatic such as “blank out”, “space out” or “automatic pilot” were very hard to translate into Vietnamese. The researcher could make the participants understand the intended meanings of those terms, but in order to do that he had to use terms in Vietnamese, not in English. Some participants commented that certain terms in the set of questionnaires were difficult to understand. This may have affected the accurate understanding of items, and the accuracy of responses. In addition, some participants may not have asked for explanation in cases where they did nott understand. A one-to-one interview would help minimize this problem. However, the number of such items was too few to cause major interpretation problems with the instruments. Further adaptations of the scales would be necessary if they are to be used in this culture in the future.

Length of the protocol. As mentioned in the discussion of the first hypothesis, the length of interview may have affected the quality of responses and willingness to respond to questions by the participants. A shorter one-to-one interview would overcome this shortcoming.

Under-endorsement of symptoms. The fatigue of the participants near the end of the interview may have led some of them to indiscriminately mark zero on the symptom checklist. Further, there may have been a tendency to deny on those items related to trauma. A comparison between the mean Response Level scores of the P-PTSD and N-PTSD groups on all scales was made using independent t-test. The Response Level scale is a validity scale of the TSI. It consists of the number of zeros endorsed for those items least likely to receive a zero in the standardized sample. A high score on this scale reflects a tendency toward defensiveness, a general under-endorsement response set, or a need to appear unusually symptom-free. The result indicated that the Response Level means of the N-PTSD group on all scales (IES-R, TSI, DSM-IV-TR-Vietnam, and PTSD-overall) were significantly greater than those of the P-PTSD group (t ranged from 3.51 to 8.11, df from 86.49 to 122.78, see Table 7). The denial or under-endorsement by the N-PTSD group may have led to the underestimation of symptoms in this study. Future studies should take into consideration this issue when conducting studies of PTSD.

Table. 7. ***Independent t-tests comparing TSI - Response Level means of non-probable PTSD and probable PTSD group for IES-R-PTSD, TSI-DSM-PTSD, DSM-IV-TR-PTSD in context, and PTSD-Overall***

Scales	Mean Difference	t	df	Sig. (2-tailed)
IES-R-PTSD	9.27	4.78	86.49	.000
TSI-DSM-PTSD	12.91	8.11	110.23	.000
DSM-IV-TR-PTSD in context	5.9	3.51	122.78	.001
PTSD-Overall	8.9	5.94	96.92	.000

Note. IES-R-PTSD = PTSD on Impact of Event Scale – Revised. TSI-DSM-PTSD = PTSD on TSI based on DSM-IV-TR criteria. DSM-IV-TR-PTSD in context = PTSD on DSM-IV-TR-Formatted questionnaire. PTSD-Overall = PTSD on all three scales.

CONCLUSIONS AND SUGGESTIONS FOR FUTURE STUDY.

In summary, the present study found that Vietnamese veterans in the Vietnam-America war did suffer from PTSD and other psychological symptoms similar to the victims of trauma in general, and American veterans in particular. However, the level of PTSD and other psychological symptoms among the Vietnamese veterans was significantly lower than among American veterans. The level of war-related stress
significantly correlated with the level of PTSD and other psychological symptoms. Future research should study the rate of positive PTSD rather than P-PTSD among Vietnamese veterans, including the rate among female Vietnamese veterans. It would be expected that PTSD and other psychological symptoms exist among Vietnamese veterans who were soldiers in the South Vietnam Army (ARVN) in the Vietnam-America war. It would be also expected that rates and level of PTSD and other psychological symptoms among Vietnamese veterans of the former North Vietnam Army would be lower than the rate for ARVN Vietnamese veterans currently living in Vietnam and in other countries. With respect to instruments and methodology, future studies should be conducted on a one-to-one basis to limit potential for error. The under-endorsement issue, especially for sexual dysfunction, should be considered in the future studies. Furthermore, appropriate standardized scales should be created for studying PTSD in the Vietnamese population. Finally, this research is unique in that it represents the first study of former Vietnamese military personnel who fought in the Vietnam-America war and assessed their prolonged war-related PTSD symptoms.

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SOME MAIN SOLUTIONS TO MITIGATE LONG – TERM CONSEQUENCES ON VICTIMS OF AGENT ORANGE/DIOXIN IN VIETNAM

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1. Introduction

In Vietnam, during the Operation Ranch Hand (1961-1971) the U.S. Army had sprayed over 70 million liters of Agent Orange containing more than 170 kg dioxin (according to some recent reports this number is up to about 600 kg) on almost all the southern part of Vietnam. The sprayed Agent Orange has seriously destroyed the environment and caused heavy consequences on human health from generation to generation during the war and even long time after the war (now it is 31 year after the end of the war).

The problem is how to mitigate the serious and long-term consequences caused by agent orange/dioxin on the environment and human health of sprayed areas and exposed people, respectively. To solve this problem it is not an easy task and it requires time and patience.

Degradation pathways of dioxin have been researched by scientists in the world, of them many are Vietnamese. Generally, it can be classified into 6 degradation pathways of dioxin as follows:

a. Volatilization in the natural environment (negligible)
b. Thermal degradation at 750 – 1200^{o}C
c. Chemical degradation (at small scale)
d. Photodegradation by sunlight or UV rays
e. Biodegradation in the body of a living organism (at low level)
f. Degradation by fungi and microorganisms.

Data from many researches provided a half-life of 15-20 years for dioxin in the natural environment. Dioxin can enter the human body through two main ways: direct and indirect exposure.

Direct exposure can be: by sprays falling directly over the human body and/or by human direct contact with contaminated water soils and trees.

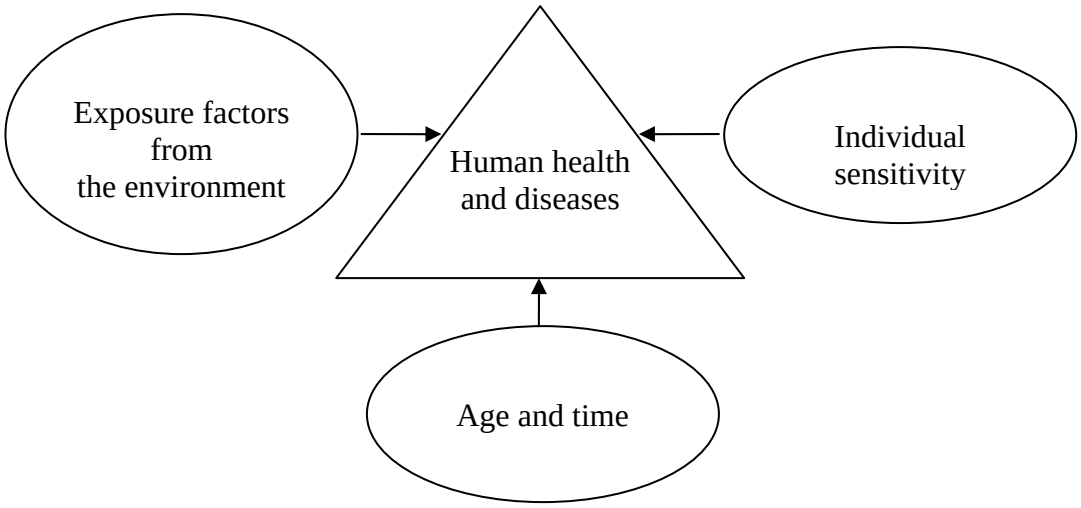
Indirect exposure can be: by human food consumption of domestic and wild animals and plants, which are already contaminated with dioxin.

Dioxin is among the most toxic substances ever known. When inside a human body, they can badly affect many internal organs and cause grave diseases on the exposed person.

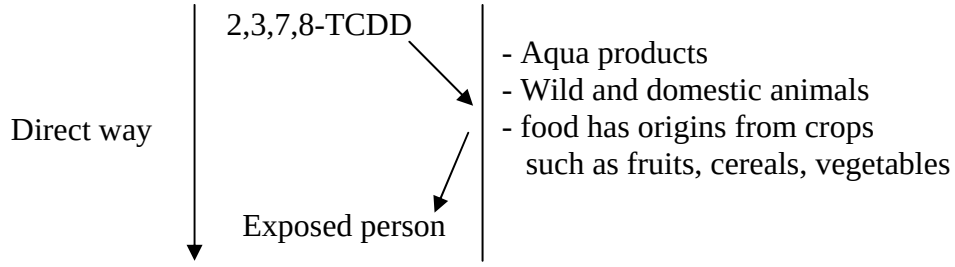
Solutions to mitigate long-term consequences caused by agent orange/dioxin on the human health should be integrated solutions that combine environment-related solutions, community-related solutions and solutions for specific diseases.
Human health and diseases are affected by three groups of factors as follows:

- Group 1: environmental factors
- Group 2: Individual sensitivity
- Group 3: Age and time

National Institute of Environmental Health Sciences (in the U.S.) described factors, which affect human health and diseases, according to the following model:



When discussing solutions for mitigation, we have to fully consider factors affecting human health and diseases, in the other hand we also have to fully look into the ways through which dioxin enter the human body. The following simple diagram is about the ways that dioxin use to enter the human body.



The solutions for mitigation must solve the following problems:

- Eliminate sources of dioxin exposure through both direct and indirect ways
- Speed up the degradation and excretion for dioxin in the body to lower the dioxin concentration in the body
- Improve the immune defense, capability of immune responses, and ability to clean up free radicals of the human body in order to overcome bad effects of dioxin on the body.
- Diagnose and specifically treat for each kind of disease that an exposed person can contract

- Society- and community-related solutions to reduce the disease burden that the exposed person and the society have to bear.

Scientific works by international and Vietnamese scientists have focused on the above mentioned groups of solutions at different levels. Group of environmental solutions (group 1) is the group that has gained many interests for research and suggested methods and technologies for environmental treatment. However, this also poses a challenge for developing countries because of expensiveness of treatment technologies that require big financial resources to be able to solve problems completely. The four remaining groups focus on human race as an object. This is a very difficult problem because of complexity in action mechanism of dioxin, thus, it is necessary to carry-out more researches in the future in order to work-out effective solutions. For the above reason, only when victims of Agent Orange/ dioxin contract (develop) a specific disease, then we can work-out a specific treatment procedure. For example, when a veteran (who was exposed to dioxin) contracts diabetes, we need to apply treatment procedures that are specific for diabetes. When a female patient (who was exposed to Agent Orange/dioxin) contracts breast cancer, we need to have a treatment procedure for breast cancer by medical operation combined with radiation and chemical treatment. However, if we wait until victims of Agent Orange/dioxin contract a specific disease then we cures the disease, it will be a very passive solution. We need solutions that can mitigate consequences at the early stage right after the exposure to dioxin of a victim, but what are these solutions? still remain a big question for international and Vietnamese scientists.

In this study, we are discussing some solutions for mitigation of long-term consequences on victims of Agent Orange/dioxin in order to provide issues that can be applied in each specific case under instructions of medical doctors. In addition to detoxification treatment for exposed victims, we should remember a very important task of preventing re-exposure and new exposure of victims to Agent Orange/dioxin in hot zones that used to be storage places for Agent Orange/dioxin or washing places for airplanes after each spraying mission during war time in the South of Vietnam.

2. Some mitigation solutions applied for victims of Agent Orange/dioxin in Vietnam

2.1. Eliminate sources of dioxin exposure

Researches on environmental residues of dioxin by Vietnamese authors and some international authors have shown that in the South of Vietnam, in some storage places for Agent Orange/dioxin left behind by U.S. Army after the war in Vietnam, levels of dioxin in soils of these places are 10.5 to 1150 times higher than the level (in the U.S.) that is considered as dangerous and needs to be detoxified. The problem here is how to prevent the continuous (long-term) exposure to dioxin for residents living around the hot zones. Many Vietnamese authors have applied some solutions to treat (detoxify) contaminated soils on-site or in laboratory.

Le Van Hong et al. used some solutions to prevent movement of dioxin to surrounding environments by isolation of the contaminated soils for treatment. Some researches by Vietnamese scientists were conducted at laboratory scale to study treatment for contaminated soils by chemical, thermal and biological degradation methods (Le Huy Du et al., Nguyen Duc Hue et al., Dang Thi Cam Ha et al., etc.). Laboratory researches have obtained initial results; and the results of the treatment methods, which showed effectiveness at laboratory scale, can be applied for on-site (field) researches.

If we can solve the problem of preventing exposure of dioxin in hot zones, we can protect residents living around the hot zones from dioxin sources. However, this work is expensive and requires advanced technologies; therefore, it is unrealistic to solve the problem in a short-time. It also requires an international cooperation to find-out solutions as early as possible. In our recent researches (Nguyen Van Tuong et al.), it has been shown that there is a new exposure to dioxin for residents living near to Danang airport, which has storage houses for Agent Orange/dioxin used by the U.S. Army during the war time.

To explain for the above phenomenon, we need to understand the movement of dioxin in the environment. It can be hypothesized that dioxin from storage tanks at Danang airport have migrated into lakes and ponds around the airport and contaminated aquatic organisms of these lakes and ponds; the residents living around the airport have caught and eaten aquatic products (e.g. fishes, shrimps) and become exposed to dioxin. Our above mentioned hypothesis was confirmed by quantitative results of dioxin in soil samples in storage tanks, in sediment samples in the lakes and ponds closed to the airport, and in liver and fat

samples of fishes caught from the lakes and ponds, as well as dioxin levels in individual blood samples taken from children living near to the airport and the lakes and ponds.

The above result confirmed that eliminating sources of dioxin exposure in hot zones is an urgent task, even when we know that this task is difficult, expensive and cannot be accomplished in a short-time. It is also important to have an education program soon for the residents living there, so that they will not consume aquatic products caught from lakes and ponds near to the airport. This education program can be implemented immediately and has a high feasibility if we really consider the danger posed by this dioxin exposure.

2.2. Speed up the degradation and excretion for dioxin in the body to lower the dioxin level in the body

Many scientific works have demonstrated that a person can absorb 2,3,7,8 TCDD (tetrachlorodibenzo-p-dioxin) through his/her respiratory tract, digestive tract and skin when being exposed to dioxin. Some research results have also shown that 2,3,7,8 TCDD is eliminated in form of metabolites from the human body together with excrement (Wendling et al., 1990). Berg et al. (1994) presented degradation pathways of TCDD based on results of in vivo experiments performed on mammals. Researches on elimination of dioxin from the body by Bickle et al. (1989), Michalek et al. (1996), and others have found a half-life of 2,3,7,8 TCDD at different values. Some authors provided a half-life of 7.1 years (Bickle et al., 1989), some provided 8.7 years (Michalek et al., 1996), some provided 11.3 years (Wolfe et al., 1994), and others provided 5.8 years (Off and Zober, 1996). The half-life of 8.78 years provided by Michalek et al. has been most accepted. Researches by Schester and Gorolwiez (1987), Furst et al. (1994) have demonstrated that 2,3,7,8 TCDD is also secreted through breast milk, and thus decreasing dioxin concentration in the body.

- Bouran (1999) calculated a value of 391 days for the half-life of TCDD in a group of female monkeys (with an error of 88 days).
- Kissel and Robarge (1998) applied the PBPK model (Physiologically based Pharmacokinetic) to study an ability to eliminate TCDD from the body. These authors estimated levels in tissues that were exposed to a background dioxin level, and elimination for 2,3,7,8 TCDD in veterans (who participated in Operation Ranch Hand) and volunteers.

It was estimated that the elimination of 2,3,7,8 TCDD from the veterans of Operation Ranch Hand (who were exposed to the background level of dioxin) was 50 pg/day. Under these conditions and according to 2,3,7,8 TCDD concentrations in fat tissues, the authors obtained the following results:

Concentration in fat tissues	**Half-life**
100 ppt	4,4 years
50 ppt	5,2 years
30 ppt	5,9 years
20 ppt	7,2 years
15 ppt	9.1 years
10 ppt	20 years

These results were in consistence with the results, obtained from studying veterans who has 2,3,7,8 TCDD concentrations in blood lipids > 10 ppt, showing a half-life of 7.1 years (Pirkle et al., 1989). The results showed that the half-life will increase considerably when concentration in tissues reaches a stable level (combined with the background level).

Vietnamese authors have begun using some pharmaceutical ingredients and some traditional ways of medical treatment, which are good for liver and bile, to increase detoxification for dioxin-exposed veterans; and the initial results are promising. Following this study trend, many scientists from South Korea, China and Japan have a tendency to find medicines, which have an origin from plants, to boost up the elimination of dioxin from the human body. Junya Nagayama et al. applied the FBRA method (food rich in fibrous substances) to reduce PCDDs and PCDFs concentrations in adult blood. The author applied a one-year FBRA for his patients and found that it was reduced by 41% of the average PCDFs equivalent and 37% of the average PCDDs equivalent in 9 blood samples of FBRA-treated patients. In blood sample of patients without FBRA treatment (non FBRA-treated patients), there are only a decrease of 34% in the average PCDFs equivalent and a decrease of 29% in the average PCDDs equivalent. The author believed that FBRA help increased the elimination of PCDDs and PCDFs. Professor Takaolida has researches focusing on the excretion of dioxin from the body and suggested that this method is the

most effective. Due to its lipophilic characteristic, in the body, dioxin accumulates much in fat tissues. Some authors tried to make the dioxin-exposed patients drink vegetative oils at a specific dose. These authors hoped that in the renewal process for lipids in the body, an excessive lipid amount to be excreted via the digestive tract would bring together it a considerable amount of dioxin. In detoxification, it is important to cure a victim at the acute stage when he/she is initially exposed. However, all victims of Agent Orange/dioxin have passed the acute stage, therefore, detoxifying at the chronic (long-term) stage is a very difficult task. Moreover, dioxin has a very long half-life and accumulates mainly at fat tissues; therefore, re-mobilization of accumulated dioxin into blood for its excretion needs to be studied too. One way to detoxify a toxic substance in the body is the excretion via sweat. Applying this detoxification mechanism, many authors have applied a sauna method combined with drinking vitamins, oils and doing exercise to increase elimination of toxicants via sweat. Dioxin can also be eliminated from the body by the above method (detoxification method by Hable).

2.3. Improve the human health and immune defense, capability of immune responses, and ability to clean up free radicals

Researches on human beings have found clear evidences about bad effects of CDD on the immune system (Formest et al., 1998; Jarsing and Kroff, 1994; Jung et al., 1998; etc.) However, researches on animals have shown that CDD are immune inhibitors (Kerkviet, 1995). 2,3,7,8 TCDD caused depletion in the weight of thymus gland when a person is exposed to dioxin via the drinking way (Hanberg et al., 1989; Meconnel et al., 1978). Hong et al. (1989) found damages in the marrow of the monkeys that were exposed to 2,3,7,8 TCDD orally.

Usage of traditional medicines and pharmaceutical ingredients is effective in positively stimulating the immune system, and in enhancing ability for immune responses of cells. This can be good solution for detoxification. Some Vietnamese scientists have been testing on experimental animals following a study trend that focuses on application of Vietnamese traditional medicines to stimulate the immune system and/or to enhance an ability to clean up free radicals formed in the metabolism of 2,3,7,8 TCDD.

Nguyen Thi Ngoc Dao et al. used a synthesized product called Naturenz, which is a mixture of vegetative enzymes, natural anti-oxidants, amino acids and vitamins. Naturenz is effective in increasing levels of the free –SH group, total Hem content, and Aniline hydroxylase activity in blood and serum of patients. Naturenz improves liver function, and makes a better health for the patients. Following this study trend, authors from Japan, South Korea and Vietnam have worked-out many medicines of plant and animal origin, which enhance the immune adaptability, immune defense, and ability of anti-oxidation. This group of solutions does not have any direct effects on detoxification, which eliminate dioxin from the body, but it has indirect effects through generally helping the human body defense against toxic consequences at both cellular and body scale.

2.4. Diagnose and specifically treat for each kind of disease that an exposed person can contract

Based on investigation of hundreds of scientific works relating to dioxin from early 1970s to the end of 1999, American Medical Academy officially proclaimed that some diseases have clear evidences relating to dioxin, some diseases have limited evidences of relationships to dioxin and other diseases have insufficient evidences. Annually, from obtained research results, American Medical Academy has published dioxin-related diseases. Some diseases with clearly confirmed evidences relating to dioxin include:

- Soft Tissue Sarcoma
- Lymphoma non-Hodgkin
- Hodgkin
- Chloracne

Some diseases are considered as having evidences of relationships to dioxin include:

- Respiratory tract cancers (e.g., lung cancer)
- Prostate cancer
- Multiple myeloma
- Spina Bifida
- Porphyria cutanea tarda
- Disorders in external neural system
- Diabetes

For some other diseases, there are not enough evidences to state that they are involved by dioxin. At the International Conference on Dioxin in 2000 and 2001, scientists presented some results on the involvement between exposure to dioxin and some diseases. Solutions (for reducing disease burden)for dioxin-related diseases and non dioxin-related diseases face many difficulties because first of all we have to determine the dioxin exposure, and then determine related factors and eliminate contamination factor. However, solutions of medical treatment according to specific diseases are inevitable. Regardless a disease is dioxin-related or non dioxin-related, the attitude of a medical doctor toward his/her patients must be to devote his best for the treatment of patients. In this paper, although treatment solutions for non-specific detoxification are mentioned more, but if we do not mention about problems of the treatment according to a specific disease, we will make the readers misunderstand (or understand with more priorities) the solutions of health care for victims of Agent Orange/dioxin.

2.5. Society- and community-related solutions to reduce the disease burden that the exposed person and the society have to bear. This is the group that very early gained interests of Vietnamese scientists.

Media should be used to help broadening knowledge of the general population. The people will know how to protect themselves when being contacted with the environment and when consuming food and water, etc.

Functional rehabilitation based on community helps children with birth defects being cared more carefully. Hoang Dinh Cau et al. at Committee 10-80 helped build “Hoa Binh” (Peace) village systems to care for the children suffering birth defects who have their mother and/or father were exposed to dioxin during the war time. With supports from international organizations, and humanity organizations, from 1971 to 1999, Vietnam has invested for building 113 health centers at commune and ward level for 53 provinces and cities; and it will continue building more local health centers to (1) diagnose and treat for victims of exposure to dioxin during the war and (2) provide general health care for local people.

Vietnam government has policies to support victims of Agent Orange/dioxin by providing monthly subsidiary money, health insurance, and many support programs such as "to eliminate hunger and reduce poverty " program, " to mitigate the pain caused by Agent Orange" program, and "to support victims of Agent Orange/dioxin" fund, etc.

Although the above social and communal solutions have no effectiveness on the detoxification, as well as enhancement of body immune defense, they are effective ways to support the victims psychologically. By consolidating psychologically, the solutions help the victims overcome burdens on their diseases, on their family and descendants, all of these burdens are daily influencing feelings and sentiments of the victims.

3. Conclusion

Diseases caused by U.S. Army's Agent Orange/dioxin, which was sprayed during Vietnam War are not only complicated and difficult health problems, but also widespread social problems; and they are heavy burdens for Vietnam nowadays and in the coming several tens of years of the 21st century. Finding solutions to eliminate the sources of dioxin exposure to the human body in some hot zones is an urgent task in order to prevent re-exposure to dioxin for the population living around the hot zones. Similarly, finding solutions for increasing the elimination of dioxin from the body, for detoxification, for enhancement of human health, and for reducing disease burdens is also a very difficult task, but worth to invest and research; and it is necessary to establish a wide cooperation between Vietnamese and international scientists to solve the problems of dioxin timely.

In non-specific detoxification solutions, which are mentioned in this paper, there are solutions that are not only applied specifically for victims of Agent Orange/dioxin, but also applied for other human objects (patients). The action mechanism of dioxin in the human body is a very complicated mechanism and at molecular scale. Consequences caused by the mechanism on the human body are not specific, thus, it is not possible to point them out exactly. Instead, we can only mention some diseases with certain or uncertain relationships with exposure to dioxin.

For the above mentioned reason, the view on solutions for mitigation of long-term consequences caused by Agent Orange/dioxin must be an all-sided view; and it must combine mitigation solutions for both the human health and the environment.

Recently, we have done many things for the victims of Agent Orange/dioxin. However, due to limits of resources (e.g., human and financial resources), lacks of experiences, works to mitigate long-term consequences on the health of the victims of Agent Orange/dioxin are still so urgent, heavy and difficult works that require bigger investments and wider scientific international cooperations in order to accomplish.

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MECHANISTIC VIEWS ON THE ROLE OF DIOXIN IN EMERGING EPIDEMIC OF AVIAN INFLUENZA

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The global threat that most preoccupies the national and international health organizations is the H5N1 bird flu virus, which has ravaged poultry stocks in Asia since 2003 and recently spread to Europe through migratory birds. World health authorities fear the disease could mutate into a form that spreads easily from person-to-person, sparking a flu pandemic.

Here, we discuss mechanistic viewpoints on how an elevated level of 2,3,7,8-tetrachlorodibezo-p-dioxin (TCDD) in Asian nesting birds, primarily ducks and chicken might contribute to lessening avian antiviral defense (Part 1), and also on how body burden TCDD in the people might become a molecular enhancer for influenza virus NS1 protein (Part 2). Both TCDD roles emerge into the factors of emerging global pandemic of influenza virus type A. Our general concept is based on science-proven data that at very low doses TCDD is fully potent of binding in mammalian or avian cells to a transcriptional factor, so-called Ah receptor, and activate the battery of target genes (Whitlock, 1996). As the proper targets of TCDD-caused transcriptional activation, these genes contain “dioxin response elements” (DRE) in their promoter region (Denison et al., 1989).

Part 1. Concerning a triggering role of ducks in pandemic ‘bird flu’ outbreak, scientists have good reason to say that animals play key role in flu pandemics. According to a “Species DRE Summary”, there are 19 DREs in the genome of the duck, which might shed a light on the ability of bioaccumulated TCDD to decrease duck’s antiviral resistance, and augment persisting strains of bird virus. The above amount of DREs in duck genome suggest this species possible high susceptibility to TCDD, as this figure (19 DREs) prevail

over the amount of DREs in the genes known as sensitive targets to low-dose TCDD in mammals. Thus gene of CYP1A1 in the mouse contains 6 DREs, in the rat - 3 DREs, and in humans - 2 DREs.

Following literature data add to the above information on multiple DRE in the duck genome, all demonstrating that this species is susceptible to (immuno) toxic effects of bioaccumulated from the environmental TCDD:

A marked elevation of TCDD in residents of Southern Vietnam was found resulted from some of the food products, primarily ducks with 276 ppt and 331 ppt wet weight (A. Schecter et al., 2003);

Very high levels of TCDD in soil, fish fat, duck fat, pooled human blood and breast milk were determined in samples collected between 1996 and 1999 in southern Vietnam (L. Dwernychuk et al., 2002);

Specific biomagnification of TCDD and TFDD was measured in tufted ducks (Aythya fuligula) (Kang et al., 2002);

The tissues of fish-eating bird and duck (Anas platyrhynchos) were very highly contaminated by TCDD/F due to ingestion of fish and other aquatic organisms from sediment. (Wu et al, 2001);

Nesting wood ducks (Aix sponsa) were shown more sensitive to TCDD and PCDF contamination than some other aquatic birds and could serve as an indicator species for monitoring biological impacts from these contaminants (White & D. Hoffman, 1995);

The thymus cells of both chicken and ducks embryos were very sensitive to toxic effects of TCDD, however for duck embryos, about a 100-fold higher concentration of TCDD was needed (Nikolaidis et al., 1988);

TCDD levels in food of Agent Orange-sprayed and non-sprayed areas of Laos, and found that duck eggs from sprayed areas had several-fold higher TCDD levels than similar food samples from non-sprayed areas (Schecter et al., 2003);

Environmental contaminants, if ingested, could affect the immunological status of wild birds, and in particular, ducks resistance to infectious disease. Immunosuppression caused

by environmental contaminants, could have a major impact on waterfowl populations, resulting in increased susceptibility to contagious disease agents, such as duck plague virus (Goldberg et al., 1990);

A strong immunotoxicity of TCDD was demonstrated in birds. The Ah receptor-mediated toxic effects of TCDD on avian B-lymphocytes were shown (Puebla-Osorio et al., 2004);

A systematic study might be designed to evaluate in TCDD-exposed and non-exposed areas in Vietnam what correlations (if any) exist among environmental TCDD level, bioaccumulated level of TCDD in ducks (and chicken), inducibility of avian P450s (a marker on Ah receptor involvement), the state of avian immunological status, and the titer and/or virulence activity of avian influenza virus type A (H5N1 and/or non-deadly strain of type A virus).

Part 2. Researchers at St. Jude Hospital in Memphis, USA discovered the gene after a large analysis of samples of about 11,000 influenza viruses that Dr. Robert Webster has gathered from around the world since 1976. The samples include about 7,000 bird flu viruses, from poultry, ducks, gulls and other flocks. Initial results from the genetic analysis at all the bird flu viruses studied had the unique gene and none of the human flu viruses did. They also said people infected with H5N1 flu virus in Vietnam and Thailand had the "avian" version of the flu virus, and so was the case with the 1918 flu pandemic, which killed tens of millions of people globally. The researchers have completed the first large genetic analysis of more than 300 bird flu viruses from the virus collection. They identified 2,196 bird flu genes and 160 complete genomes.

The study suggests that two nonstructural proteins, NS1 and NS2, may be key in helping avian virus latch onto and disrupt certain important cellular processes. The H5N1 bird flu virus was first found to have spread to people in 1997. It resurfaced in 2003 and has since infected at least 152 people and killed 83, according to the World Health Organization. Scientists fear the virus would soon mutate to become easily transmissible among people and cause a global pandemic similar to the 1918 outbreak

How the problem of Agent Orange and later food-driven contamination with TCDD relates to one of the above non-structural proteins of influenza virus, namely NS1 protein, to low-

dose TCDD proven activation of the Ah receptor-mediated transcriptional pathway, and generally to pandemic Influenza viruses?

To answer this complex question, the data corresponding to TCDD-influenza virus issue may be presented at the gene, cellular, and population levels. On the key level of gene structure, while searching through Dioxin Responsive Gene Database, we found that, similar to DREs within mammalian genes and genes of cancer-associated viruses, the gene encoding influenza virus NS1 protein does possess totally 13 DREs (i.e., 3'A-CGCAC 5' sequence), of those 2 are located in its 5'-flanking region. Three separate probes of NS1 gene were analyzed, and the following DRE positions were revealed in 5'-flanking region: (- 7900, - 645),
(-7942, -687), and (-7942, -687). Therefore, in case if future direct experiments show that TCDD at very low concentrations causes upregulation effect on NS1 expression, all reverse genetics techniques to manipulate virus genome could be applied. Because exact DRE positions in promoter region are determined, a site-specific mutational analysis might also be designed.

On a cellular level, it was postulated that some changes in infected cell expression might be beneficial for viral replication. So, a proposed ability of body burden (intracellular) TCDD to directly trans-activate expression of NS1 gene might represent not just a laboratory-set but rather very real set of events between cellular proven transcriptional factor, i.e., TCDD, and its newly target – NS1 gene, which might determine the severity and outcome of viral infection. As regards TCDD effective concentration, because NS1 gene contains two DREs in promoter region, it is twice as much than a DRE in HIV-1 gene, but 5 times less than in cytomegalovirus gene promoter (10 DREs). Therefore, a proposed effective intracellular concentration of TCDD upregulating NS1 protein is a one lower than 1 nM but higher than 0.3 pM, i.e. about or slightly above than dioxin current human body burden. This proposition, again, might make TCDD-NS1 relationship the real problem related to emerging influenza pandemic.

It is important that, if proven, all the above might lead to the development of a new tool for inhibition (complete or partial) of TCDD-caused upregulation of NS1 protein in infected cells. Specifically, some already known antagonists of TCDD binding at the Ah-receptor might be utilized, as well as inhibitors blocking binding of ligand-activated Ah-receptor-Arnt complex at the DRE. These candidates antagonists/inhibitors can also include

pharmaceutically used medicines like salycilamide, as well as some natural compounds like coplanar bioflavonoids.

Finally, about a population level characterizing the TCDD-NS1 problem. I seems it is not a coincidence that the regions with most frequent ducks and poultry dying caused by H5N1 strain of the bird flu virus in China, Taiwan, Hong Kong, and geographically adjacent areas in Laos and Vietnam are often the same regions known as the most heavily contaminated with TCDD and other dioxin-like compounds. For instance, in contaminated (resulted mainly from Agent Orange usage during the Vietnam War) areas of Laos and Vietnam, the TCDD level determined in duck eggs is 29 ng/kg and 11 ng/kg, respectively, which might be pretty enough for effective upregulation of NS1 gene in H5N1 virus. With prioritizing the TCDD-H5N1 subject, XENOTOX Inc. is currently preparing a mutual epidemiological project with the Russian-Vietnamese Tropical Canter.

It is XENOTOX's principal scientific and humane position that all efforts possible have to be made, in close collaboration with Russian and Vietnamese molecular toxicologists, virologists, and environmental epidemiologists, in order to lessen or defeat "an awful virus strain that could become a pandemic with a horrendous outcome," as the WHO's representative in Vietnam Hans Troedsson said on February 3, 2005.

HUMAN BURDEN 2,3,7,8-TCDD MAY AUGMENT COMMON VIRUSES ASSOCIATED WITH CANCER MALIGNIZATION

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Elevated levels of dioxin associated with the herbicide Agent Orange is still routinely found in blood samples from persons living in areas sprayed with Agent Orange between 1962 and 1970. By Vietnam estimations, more than a million of its people were exposed to the spraying with Agent Orange contaminated by 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The effects of TCDD on human health can be studied in Vietnam because of the unique situation where both current and older dioxin contamination exists for a potentially large population of exposed men, women, and children over several generations. It was hypothesized that a major route of current is from the movement of dioxin from soil into river sediment, then into fish, and from fish consumption into people (Schecter et al., 2001).

According to the Institute of Medicine, sufficient evidence is shown for an association between Agent Orange and the following cancers: Soft tissue sarcoma, Non-Hodgkin lymphoma (NHL), Hodgkin disease, Chronic lymphocytic leukemia (CLL). Almost all of these cancers are strictly or tentatively associated with common human viruse, suvh as Epstein-Barr virus (EBV), Herpes simplex viruses (HSV), or cytomegalovirus (CMV). For other viruses, like Hepatitis B virus (HBV), there are conflicting reports on its role in the development of malignant hepatocellular carcinoma in Vietnam (Ngaon & Yoshimura, 2001).

In general, human cancers associated with papillomavirus (HPV), HBV, EBV, and human T cell leukemia-lymphoma virus (TCLLV) infections are responsible for approximately 15 percent of the worldwide cancer incidence. Cancer of the cervix and hepatocellular carcinoma (in Africa) account for about 80 percent of virus-linked cancers. Because experimental and epidemiologic data imply the key role for viruses, particularly in cervical

and liver cancer, viruses must be thought of as the second most important risk factor for cancer development in humans, exceeded only by tobacco consumption.

The RNA and DNA tumor viruses have made fundamental contributions to two major areas of cancer research. Viruses were vital, first, to the discovery and analysis of cellular growth control pathways and the synthesis of current concepts of cancer biology and, second, to the recognition of the etiology of some human cancers. DNA tumor viruses encode oncogenes of viral origin that are essential for viral replication and cell transformation; viral oncoproteins complex with cellular proteins to stimulate cell cycle progression and led to the discovery of tumor suppressors. Viral systems support the concept that cancer development occurs by the accumulation of multiple cooperating events. The infectious nature of viruses distinguishes them from all other cancer-causing factors; tumor viruses establish long-term persistent infections in humans, with cancer an accidental side effect of viral replication strategies. Viruses are usually not complete carcinogens, and the known human cancer viruses display different roles in transformation. Many years may pass between initial infection and tumor appearance and most infected individuals do not develop cancer. Variable factors that influence viral carcinogenesis are suggested, including possible synergy between viruses and environmental cofactors (Butel, 2000).

Here, we present a newly concept, which historically came into existence in the 1990s when we discovered TCDD ability to significantly trans-activate the HIV-1 virus in the target human cells (Pokrovsky & Tsyrlov, 1991; Tsyrlov & Pokrovsky, 1993). Inasmuch as our discovery has been confirmed in several labs in the US and Japan, it took about ten more years before it turned out into revelation of a health threatening ability of human body burden TCDD to trancriptionally up-regulate cancer-associated human viruses.

The understanding of the mechanisms of TCDD action on human viruses emerged from the "Species DRE Summary", which appeared in 2002 on the website of Michigan State University. It showed that 5'-flanking regions of genes of several cancer-associated human common viruses possess multiple "dioxin-response elements" (DREs), a feature earlier known only for mammalian genes.

The key question still remained, namely is human body burden TCDD potent enough to up-regulate common viruses? This obstacle to the concept was cleared after it was

demonstrated that human CMV was strongly up-regulated in human cells with only 0.3 pM TCDD, i.e., concentration at least twenty times lower than dioxin background level currently determined in general population of this country (Murayama et al., 2002).

According to "Species DRE Summary", a single DRE is localized in the HIV-1 promoter, while 10 DREs are found within powerful CMV promoter. If juxtapose these with the above TCDD concentrations causing up-regulation of the HIV-1 and CMV, the most susceptible candidates viruses to be augmented with body burden TCDD are those viruses possessing at least similar to CMV amount of promoter DREs. For instance, it is fully applicable to the abovementioned EBV, which contains 22 DREs in the gene 5' upstream region, and which is commonly associated with human malignant human B-lymphomas. There are several epidemiological and medical findings showing TCDD as a factor associated with increasing incidence of the lymphomas, and demonstrating increased titers of EBV DNA in the lymphomas observed even in immunocompetent patients.

As regards the CMV, numerous clinical studies show that this common virus is linked to the malignization of such major human tumors as breast and colon adenocarcinomas. Thus nuclear acids and the major tegument protein pp65 of CMV were detected in 92% of colorectal
adenocarcinomas but not in adjacent nonmalignant biopsy samples (Harkins et al., 2002). CMV infection of Caco-2 cells in vitro resulted in induction of anti-apoptotic Bcl-2 and COX-2, which shift cells to more malignant phenotype contributing to tumor progression (Cinatl et al., 2004).

In addition to the above viruses, there are several other cancer-associated human common viruses also containing multiple DREs in the 5' flanking region of their gene, namely human papillomavirus (HPV), type 18 (2 DREs); hepatitis B virus (4 DREs); adenovirus (HAV), types 5 and 7 (5 DREs), and 12 (4 DREs); herpes simplex virus (HSV), type 1 (30 DREs), and type 2 (8 DREs).

From the mechanistic point, all the data published on up-regulation of the HIV-1 by 1.0-10.0 nM TCDD, as well the CMV by 0.3 pM TCDD, show an involvement of the aryl hydrocarbon receptor (AhR), a TCDD-activated transcription factor earlier known as mediating expression of genes in the Ah gene battery in mammals. This

corresponds very well to numerous publications on a significant overexpression of the AhR in various cancer cells. It was shown (Diliberto et al., 2001) that at low doses a local dose of TCDD in extrahepatic tissues is determined not only by its partition between lipid and hydrophilic phases, but also by its binding to the AhR. It might be proposed that an overexpressed AhR binds higher amounts of TCDD. The individual risk assessment of human burden TCDD might also be dependent on human AhR binding affinity to TCDD, which varies ~ 20-fold.

The IARC classification of TCDD as a group 1 carcinogen (IARC 1997) has stirred some controversy. Some authors ignored the original IARC focus on high-exposure subcohorts, ignored the positive exposure-response analyses, and raised the issue of possible confounding by smoking and other chemical carcinogens without any serious consideration of whether such possible confounding is likely, or whether it could account for the observed elevation of all-cancer mortality in those with higher TCDD exposure. In our view, the epidemiologic and toxicologic evidence since the IARC (1997) classification of TCDD as a human carcinogen has strengthened the case for IARC's decision. Furthermore, the dose-response assessments for TCDD and cancer indicate that TCDD exposure levels close to those in the general population may be carcinogenic and argue for caution in setting the upper ranges of long-term permissible exposure to dioxins.

This totally relates to our concept on body burden TCDD's ability to augment malignancy-associated human viruses. According to the IARC biennial report of 2003, a high frequency of the common virus genome and antigens in tumor cells is documented in persistent viral infection, which is necessary for formation of high-grade lesion and invasive cancer. In other words, body burden TCDD might be one of those still "poorly understood factors that determine
the persistence of specific cancer-associated virus in tumor malignancy".

It is important that a mammalian cell-based bioassay system is already developed that is enabled detection of 0.5 pM TCDD. The system is called the fast-track DRESSA (dioxin-responsive-element-based sensing via secreted alkaline phosphatase), where tandem copies of the DREs fused to minimal viral promoter are subcloned into an expression plasmid upstream of the

reporter gene (Kasai et al., 2005). Thus is the most vivid practical demonstration that TCDD at doses lower than its current human body burden is able to stimulate viral expression plasmid containing DREs in its 5'-upstream region. Moreover, it was shown that TCDD action is mediated thru the AhR transcriptional pathway, as the AhR antagonists blocked the above stimulation, and therefore were used for elimination of nonspecific, false-positive responses.

As the receptor concept is fully applicable to TCDD action on human common viruses, the above might lead to the development of a new tool for inhibition (complete or partial) of TCDD-caused up-regulation of cancer-associated viruses. I am talking here about already known antagonists of TCDD binding at the Ah-receptor, and inhibitors blocking binding of activated AhR-Arnt complex at the DRE. These antagonists/inhibitors include pharmaceutically used medicines such as salycilamide, as well as some natural compounds like coplanar bioflavonoids in green tea, etc.

Summarizing the above, the common viruses and body burden TCDD, i.e., two entirely different endogenous factors characteristic for the current general population, supposedly interfere in certain circumstances (like currently in Vietnam) thus leading to tumor malignization. From a bioscience standpoint, this is the worst-case scenario of chemico-biological interactions. From a clinical standpoint, new developments in this field might discover preventive tools, which will help solving key problems in virus-linked oncology and organ transplantation. These consist the essence of the XENOTOX, Inc., an innovating and consulting company, which focuses on the assessment and regulation of the effect of TCDD, at or near its body burden, on human common viruses linked to specific malignancies.

Geographical difference in liver cancer incidences and its possible risk of HBV, HCV, liver fluke infections, and dioxin contamination in Vietnam

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Abstract

Liver cancers (ICD-9 code 155) were estimated to be one of the most frequent cancers in developing countries where 81% of all new cases of the world occurred in 1990. It was also an important cancer site in developed countries because an increased trend in liver cancer mortality and incidences has been reported. Based on published data, a geographically variation of liver cancer incidences between South and North Vietnam was examined. Standardized incidence rate ratios (RR) between Ho Chi Minh (1995-1996) and Hanoi (1991-1993) were estimated. Age-specific and stratified standardized incidence rate ratios and 95% confidence intervals were calculated by Mantel-Haenszel test using STATA Statistical Software. Liver cancer incidences were found to have a significantly elevated in Ho Chi Minh when compared to those in Hanoi in males, (RR: 1.21, 95% CI: 1.08-1.35) and a slight elevated in females, (RR: 1.19, 95% CI: 0.97-1.47). A significant elevation in the age group 65 years or older was found in both males (RR: 1.60, 95% CI: 1.27-2.02) and females (RR: 2.11, 95% CI: 1.44-3.17) in Ho Chi Minh when compared to those in Hanoi. In addition, a significant increase in the age group 45-54 years was observed in male Ho Chi Minh, (RR: 1.45, 95% CI: 1.12-1.89). A role of HBV, HCV, liver fluke infection, and Dioxin in developing liver cancer in Vietnam was reviewed and discussed.

Introduction

Vietnam, an ASEAN country, was classified as a high endemically area of hepatitis B virus infection (HBV) where populations are infected by hepatitis B virus in 8% or greater, (WHO). Areas of the world with high HBV infection rates also have high mortality rates for HCC. And there has an increased mortality from HCC in regions where with a prevalence of HBV infection greater than 2%, (London and McGlynn, 1996). Chronic hepatitis B virus (HBV) infection was found to have etiologically associated with 80% of primary hepatocellular carcinoma (HCC) in the world and particularly in developing countries, (World Health Organization, 1983). Therefore, a large number of primary liver cancer cases should be expected to occur in Vietnam due to chronic HBV infection and liver cancer incidences should be very common cancer form in Vietnam. That is, primary liver cancer was estimated to have 4512 cases and ranked in the second most common cancer in males, 1368 cases and ranked in the fifth most common cancer in females in 1990, (http://www-dep.iarc.fr/globocan/globocan.htm, 1999).

In the HBV endemic regions, not only HBV infection alone but also dual HBV and HCV infections and HCV infection alone were found to be an important role in HCC. For instance, the proportion of liver cancer cases in the population of southern African blacks attributable to HVB infection alone is 43%, HCV infection alone is 5% and dual HBV and HCV infections is 20%, (Kew et al ., 1997). In other hepatitis endemic region, the proportion of liver cancer cases in the population of Taiwan, China attributable to HVB infection alone is 69%, HCV infection alone is 3% and dual HBV and HCV infections is 6%, (Yu et al ., 1991). In contrast, HCV infection was found to be an important role in the etiology of HCC in regions where is low HBV infection but high rates of mortality from liver cancer. For instance, HBV and HCV infections were reported to be cause 21% and 78% of HCC occurring among residents of Fukuoka, Japan, respectively, (Tanaka et al ., 1996). In addition, HCV infection was also reported to be cause an increased trend in liver cancer mortality and incidence in Japan, (Easton, 1999), in the UK from 1979 to 1994, (Taylor Robinson et al ., 1997), in France from 1979 to 1994, (Deuffic et al ., 1998). Those figures are suggested that control program not only for HBV infection but also for HCV infection is very important in reducing HCC in both developing and developed countries.

During the Vietnam War, the U.S. military sprayed approximately 1.7 million hectares of Vietnam (around 10% all Vietnam areas and 14% all forest of country) with herbicides between one to five times. Approximately 167 kg in total of TCDD were sprayed over Vietnam, (Sterling and Arundel, 1986). Liver cancer incidence in a population accidentally exposed to dioxin (2,3,7,8 TCDD) was significantly elevated, especially for people living for more than 5 years in zone B, (Bertazzi et al., 1993). Opisthorchis viverrini is endemic along the Mekong River basin where are located regions of northeast Thailand, Laos, Cambodia, and southern Vietnam. A large number of cholangiocarcinoma in northeast Thailand was reported due to infestation with the liver fluke, opisthorchis viverrini infected, (Vatanasapt et al ., 1993).

In the present study, a geographically variation of liver cancer incidences in Vietnam and its liver cancer risks of HBV, HCV infections, a potential association between exposure to dioxin, liver fluke infection and liver cancers in Vietnam were estimated and discussed.

Material and methods

Data was derived from the Hanoi and Ho chi Minh population-based cancer registries for analysis a geographically variation of liver cancer incidences between Ho Chi Minh and Hanoi Vietnam. From 1991 to 1993, cancer incidences in Hanoi have been published (Parkin *et al*., 1997). Cancer incidences in Ho Chi Minh were also published for the period 1995-1996, (Quoc *et al*., 1998).

Data of HBV and HCV infections in Vietnam was derived from published papers to estimate the proportion of liver cancer cases in Ho Chi Minh and Hanoi, Vietnam attributable to HBV and HCV infections. The prevalence of HBV and HCV infections among hospital control that without HCC referenced as representation of population HBV and HCV infections to calculate the proportion of liver cancer cases in Ho Chi Minh and Hanoi, Vietnam attributable to HBV and HCV infections, (Breslow and Day, 1980).

Liver cancer incidences stratified to ascending age groups as 0-14, 15-24, 25-34, 35-44, 45-54, 55-64, 65+, (Years). Standardized incidence rate ratios (RR) between Ho Chi Minh (1995-1996) and Hanoi (1991-1993) were estimated. Age-specific and stratified standardized incidence rate ratios and 95% confidence intervals were calculated by Mantel-Haenszel test using STATA Statistical Software, [STATA, 1997 #89].

Results

1. South excess in liver cancer incidence in Vietnam

Liver cancer incidences was found to be significantly elevated in Ho Chi Minh when compared to those in Hanoi in males, (RR: 1.21, 95% CI: 1.08-1.35) and slightly elevated in females, (RR: 1.19, 95% CI: 0.97-1.47) for all ages combined. A significant elevation in age group 65 years or older was found in both males (RR: 1.60, 95% CI: 1.27-2.02) and females (RR: 2.11, 95% CI: 1.44-3.17) in Ho Chi Minh when compared to those in Hanoi. A significant increase in the age group 45-54 years was also observed in male Ho Chi Minh, (RR: 1.45, 95% CI: 1.12-1.89). For young ages in both males (aged of 44 and younger) and in females (aged of 64 and younger) there were not significant differences between Ho Chi Minh and Hanoi, (Table 1).

2. A large proportion of liver cancer cases in both Ho Chi Minh and Hanoi, Vietnam attributable to HBV infection

Table 2 shows the prevalence of HBV infection among HCC cases and controls in the two cities of Ho Chi Minh and Hanoi, Vietnam. In Ho Chi Minh at early period in decade 1976s, the prevalence of HBV infection was found to be very high (80%) in cases of HCC when compared to those in hospital controls (10%) that was significant difference ($P<0.01$), (Welsh *et al.*, 1976). That is, a total of 61 cases of primary liver cancer (66% of males) and a total of 41 hospital controls without liver diseases (88% of males) were examined for HBV infection. Age average was 50 (from 15 to 76 years of aged) in cases and 45 (from 17 to 65 years of aged) in controls. Vietnamese ethnic was

in 86% of cases and in 80% of controls, (Welsh *et al*., 1976). Among those 49 of 61 cases and 4 of 41 hospital controls was found to be positive HBsAg(+), giving relative risk of 38 and approximate 95 % confident interval 12-121. The proportion of liver cancer cases in the population of Ho Chi Minh attributable to HBV infection is 79% in the early time period in decade 1970s.

In Hanoi, north Vietnam, based on previous study results, one hundred thirty eight of 149 cases (93%) and forty four of 240 hospital controls (18%) were examined to be positive HBsAg(+), giving a relative risk of 62 and approximate 95% confident interval 30-128. The proportion of liver cancer cases in the population of Hanoi attributable to HBV infection is 92%, (Table 2). In an early period (1976), the proportion of liver cancer cases in the population of Ho Chi Minh (79%) attributable to HBV infection is smaller than that when comparing with Hanoi (92%) in a recent period (1993). That figure can not explained the south excess in liver cancer incidences within Vietnam.

3. Suggestive a large proportion of liver cancer cases attributable to HCV infection in Ho Chi Minh

Table 3 shows the prevalence of HCV infection among cases of primary liver cancer and controls in Ho Chi Minh and Hanoi, Vietnam. In Ho Chi Minh, south Vietnam, twelve of 35 cases of primary liver cancer (34%) and thirty nine of 260 controls (15%) were examined to be HCV infection, (Lien *et al*., 1993), giving relative risk of 3 and approximately 95% confident interval 1.4-6.4. In Hanoi, North Vietnam, for all cases and controls, relative risk of HCV infection was about 2.0, approximately 95% confident interval 0.3-17.4 that was not significant differences between cases and controls, (Cordier *et al*., 1993). Among the same 11 cases of primary liver cancer, 6 cases were examined to be HCV infection in Ho Chi Minh, (Lien *et al*., 1993), while 3 cases only were examined to be HCV infection in Hanoi, (Cordier *et al*., 1993). It is suggested that HCV infection among liver cancer cases in Ho Chi Minh was more frequent than that in Hanoi, (6/11 vs. 3/11), (Table 3).

The suggestive proportion of liver cancer cases in the population attributable to HCV infection is 23% in Ho Chi Minh but that is not significant difference between liver cancer cases and controls in Hanoi.

4. *A potential association between exposure to dioxin, liver fluke infection and liver cancers in Vietnam*

Dioxin (2, 3, 7, 8 TCDD) toxic equivalents (lipid basis, parts per trillion) was found to be two times higher (40.3 TEq) in Vietnamese north veterans in south areas than people living in north Vietnam only (TEq from 12.0 to 18.0), (Schecter *et al*., 1995). For liver cancer following exposure to herbicides during the Vietnam War, soldiers who

stayed for long time (more than 10 years) in the south Vietnam had a significantly increased risk of HCC (OR = 8.8, 95% CI 1.9-41), (Cordier *et al*., 1993). The similar observation was found to have significantly increased risk of liver cancer after exposure to herbicides (OR = 2.1, 95% CI 1.1-4.0 and OR = 4.4, 95% CI 1.7-11.5), (Long *et al*., 1993; Van *et al*., 1986), (Table 4).

In endemic areas, opisthorchis viverrrini (O.V.) infection was discovered in Southern Vietnam, (Chuong, 1996). That is, the prevalence of O.V. infection was found to be in 28% among the population of endemic areas. Based on results of a cross-sectional study, the prevalence of O.V. infection among the northeast population of Thailand was reported to be in 49%. And patients who was severely O.V. infected had a significantly increased risk of cholangiocarcinima (prevalence odds ratio = 14.1, 95% CI 1.7-118.6), (Haswell Elkins *et al*., 1994), (Table 5).

Discussion

Population-based cancer registries were established in 1987 in the city of Hanoi (north) and in 1990 in the city of Ho Chi Minh (south). Population-covered was numbered about 4,820,131 in Ho Chi Minh (1995-1996) and 2,115,673 in Hanoi (1991-1993), (Parkin *et al*., 1997; Quoc *et al*., 1998). There were some limitations of completeness of cases reported in Vietnam condition in particular in both Hanoi and Ho Chi Minh in the decade 1990s where cancer information systems are going to improve and in progressing. Based on technical assistance of IARC and population cancer registered running under the same Vietnam health care policy, the two population-based cancer registries have been conducing good results and providing a comparability data within Vietnam.

From 1990-1994, liver cancer cases were reported about 1,702 cases that ranked in the first most common cancer in males (16.3% of all male cancers reported) and 526 cases that ranked in the sixth most common cancer in females (3.1% of all female cancers reported), (Hung *et al*., 1995). At this time period study, liver cancer incidences were also ranked in the first most common cancer in males (ASR 25.3 per 100,000) and in the fifth most common cancer in females (ASR 5.9 per 100,000), (Quoc *et al*., 1998). Liver cancer incidences were the first most frequent in Ho Chi Minh from 1990 to 1996 while that were the third most common in Hanoi from 1988 to 1993 in male cancers registered, (Hung *et al*., 1995), (Anh *et al*., 1993; Parkin *et al*., 1997; Quoc *et al*., 1998). Our results showed a significant elevated in male liver cancer incidence in Ho Chi Minh in compared to that in Hanoi for all ages and for the age group 45-54 years. For old age group 65+, liver cancer incidence was observed to be significant increased in both male and female Ho Chi Minh when compared to those in Hanoi. However, for ages less than 44 years in males and ages less than 64 years in females, there was not significant

difference in liver cancer incidences between Ho Chi Minh and Hanoi, (Table 1). Are their remaining risk factors associated with primary liver cancers in old ages in Ho Chi Minh?

Prevalence of HBV infection was found to be highest in cases with viral hepatitis (89%), followed by cases with primary liver cancer (80%), (Welsh *et al*., 1976). The prevalence of HBV infection (10%) among cases without liver diseases should be represented this infection among population of Ho Chi Minh and it was the reason to believe the high proportion of liver cancers in the population of Ho Chi Minh (79%) attributable to HBV infection. The early results in the decade 1970s in the city of Ho Chi Minh were also supported that the prevalence of HBV infection was about 6.3% among normal population, (Blumberg *et al*., 1970). The recent results were also confirmed that the high prevalence of HBV infection among adult healthy in Ho Chi Minh and in south Vietnam was ranked from 9.2% to 14.4%, (Tran *et al*., 1993). And it was 19.5% of children 2-12 years of aged that examined to be HBV infection, (Katelaris *et al*., 1995). Based on results of one study, HBV infection was found in 10% in Ho Chi Minh and 16% in Hanoi for all examined subjects combined, (Nakata *et al*., 1994). In addition, a predominant high prevalence of HBV infection was observed in both Ho Chi Minh (from 63% to 80% of all liver cancer cases) and Hanoi (from 77% to 93% of all liver cancer cases). Our estimated results confirmed that the proportion of liver cancer cases attributable to HBV infection is higher (92%) in the population of Hanoi and is lower (79%) in the population of Ho Chi Minh. A large proportion of liver cancer cases in the population of Ho Chi Minh and Hanoi attributable to HBV infection but it was not positive correlation with south excess in liver cancer incidences within Vietnam.

Anti HCV positive was found to be highest in cases with suspicion of hepatitis (55%), followed by cases with hematopathies (47%), cases with hemodialysis (44%) and cases with primary liver cancer (34%) and lowest in blood donors (15%), (Lien *et al*., 1993). A suggestive high proportion (23%) of liver cancer cases in the population of Ho Chi Minh attributable to HCV infection should be reflected a true problem of this viral infection in the south Vietnam. It is seemed to be positive correlation with a significant high prevalence of HCV infection in Ho Chi Minh when compared to those in Hanoi for several populations. That is, HCV infection among blood donors was 20.6% in Ho Chi Minh (males and females combined) while only 0.8% in Hanoi that was significant difference, (Song *et al*., 1994). The similar observation was seen in other study that was about 22% of all examined subjects in Ho Chi Minh and about 13% of all examined subjects combined in Hanoi positive for HCV infection, (Nakata *et al*., 1994). The excess in liver cancer incidence in old age group in Ho Chi Minh will be strongly associated with high prevalence of HCV infection in this region that is

suggestively responsible for about 23% of all HCC cases in Ho Chi Minh. Based on previous study results, HCC patient who were positive for HCV infection were significantly older than those negative for HCV infection, independent of their serum HBsAg status, (Kew *et al*., 1997).

Hanoi and Ho Chi Minh are the two largest cities and it can be represented the north and south population in Vietnam. Differences in patterns of liver cancer incidences and HBV, HCV infections are reflected their north and south population. Between south and north Vietnam, there are no difference in race and ethnic groups, but there were differences in climate, geographical demography, history, and lifestyle. Viral infections were confirmed to be specific causal association with HCC in both north and south Vietnam.

Our results of this work to estimate the proportion of liver cancer cases in the population of Ho Chi Minh attributable to HBV and HCV infection will be some limited because cases and controls were not matched for sex, age, occupation, alcohol consumption, tobacco smoke, chemical exposure. However, our estimated results will provide useful information and possible explained the south excess in liver cancer incidences and population attributable risk of HBV and HCV infection and liver cancer in Vietnam.

Based on results of case-control studies, a elevated liver cancer risk was found to be significantly among soldiers who stayed in the south during the Vietnam War, (Cordier *et al*., 1993; Long *et al*., 1993; Van *et al*., 1986). The prevalence of HBsAg positive among HCC cases in dioxin exposed and not exposed was detected similarly about 60% of HCC cases, (Long *et al*., 1993). The increased risk of HCC was found to be independent with HBsAg status and alcohol consumption, (Cordier *et al*., 1993). For south military purpose, soldiers should also have been exposed to arsenic herbicides and other possibly toxic war materials, (Sterling and Arundel, 1986). However dioxin toxic equivalents in pooled blood from north people of Vietnam had shown about 2-3 times higher among north soldiers who stayed in the south Vietnam (TEq 40.3 vs 12.0-18.0) than north people who stayed in the north only, (Schecter *et al*., 1995). Estimated range of maximum lifetime risk of cancers (cases/million) relative to the U.S. was from 2,900 to 29,000 for the north population and from 6,000 to 60,000 for the south population of Vietnam, (Schecter and Olson, 1997). Risk of hapatobiliary cancer following accidentally exposure to dioxin (2, 3, 7, 8 TCDD) was found to be significantly in zone A for females (RR = 12.1, 95 % CI 1.6-88.7). Similar observation was found for people living in zone R for >5 years (RR = 2.8, 95 % CI 1.2-6.3), (Bertazzi *et al*., 1989, Bertazzi *et al*., 1993).

Opisthorchis viverrini is endemic along the Mekong River basin for Thailand, Laos, and Cambodia that was reported in 1995 by WHO, (Report of a WHO Study Group, 1995). Southern Vietnam is also located on the Mekong River basin and opisthorchis viverrini is easily translated through fresh fish infected by O.V. In an endemic areas in southern Vietnam, prevalence of O.V. infection was detected to be in 28%, (Chuong, 1996). The significant increased risk of opisthorchis viverrrini infection among cholangiocarcinoma cases in Thailand, Khon Kaen was seen (OR: 5.0, 95% CI: 2.3-11.0), (Parkin *et al*., 1991), and in Pusan, Korea (RR: 2.7, 95% CI: 1.1-6.3), (Shin *et al*., 1996).

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Table 1- Number of registered cases, population at risk, and standardized rate ratios of liver cancer incidences between Ho Chi Minh (1995-1996) and Hanoi (1991-1993)

Age group	Ho Chi Minh 95-96*		Hanoi 1991-1993**		Standardized rate ratio (RR)	95% confident interval (CI)
	Cases	Population	Cases	Population		
Males						
<15	1	646823	8	350119	0.10	0.00-0.76
15-24	18	477690	12	190984	0.90	0.41-2.05
25-34	42	480508	26	178212	0.90	0.54-1.53
35-44	159	337705	85	122078	1.01	0.77-1.34
45-54	154	138047	100	86910	1.45	1.12-1.89
55-64	171	109010	150	66338	1.04	0.83-1.30
65+	258	102424	106	44750	1.60	1.27-2.02
All ages	803	2292207	487	1039391	1.21	1.08-1.35
Females						
<15	0	615615	3	329935	0	-
15-24	6	496916	5	193213	0.70	0.18-2.90
25-34	13	529334	10	192672	0.71	0.29-1.81
35-44	27	395348	17	136306	0.82	0.43-1.61
45-54	38	184618	30	85696	0.88	0.53-1.47
55-64	59	149511	36	66892	1.10	0.71-1.71
65+	111	156594	36	71568	2.11	1.44-3.17
All ages	254	2527936	137	1076282	1.19	0.97-1.47

Sources: * (Quoc et al ., 1998), ** (Parkin et al ., 1997)

Table 2 - HBV infection among cases of primary liver cancer and controls between the south and north Vietnam

Cases of primary liver cancer		Control		Sources
Number of tested sample	Number of positive, (%)	Number of tested sample	Number of positive, (%)	
South				
61 cases of primary liver cancer	49, (80.3)*	41 hospital controls	4, (9.8)*	(Welsh et al ., 1976)
225 cases of primary liver cancer	141, (62.7)	-	-	(Tran et al ., 1993)
35 cases of primary liver cancer	24, (68.6)	-	-	(Lien et al ., 1993)
North				
57 cases of primary liver cancer	44, (77.2)	-	-	(Luc and Nga, 1985)
149 cases of primary liver cancer	138, (92.6)**	240 hospital controls	44, (18.3)**	(Cordier et al ., 1993)

*Relative risk = 38, approximate 95% confident interval = 12-121

** Relative risk = 62, approximate 95% confident interval = 30-128, (Cordier et al ., 1993)

Table 3 - HCV infection among cases of primary liver cancer and controls between the south and north Vietnam

Cases of primary liver cancer		Control		Sources
Number of tested sample	Number of HCV positive, (%)	Number of tested sample	Number of HCV positive, (%)	
South				
35 cases of primary liver cancer	12, (34.3)*	260 blood donors	39, (15.0)	(Lien et al ., 1993)
11 cases of primary liver cancer with HBsAg (-)	6, (54.5)			
North				
149 cases of primary liver cancer	3, (2.0)	240 hospital control	2, (0.8)**	(Cordier et al ., 1993)
11 cases of primary liver cancer with HBsAg (-)	3, (27.3)	194 hospital controls with HBsAg (-)	2, (1.0)	

*Relative risk = 3.0, approximate 95% confident interval = 1.4-6.4,

** Relative risk = 2, approximate 95% confident interval = 0.3-17.4, (Cordier et al ., 1993)

Table 4: Dioxin toxic equivalents (lipid basis, parts per trillion - TEq) in pooled blood from northern Vietnam, summary of case-control studies on liver cancer among veterans for military services in the south after 1960

Number of cases and controls	Time study	Results	Source
35 veteran cases in dioxin sprayed areas 133 controls stayed in the north	1991	Dioxin toxic equivalents-TEq: Cases exposed: 40.3 Control: 12.0-18.0	(Schecter *et al*., 1995)
152 male HCC cases 241 hospital controls	1989-1992	For military service in the South after 1960 (number of years): 1-4 years: OR*: 0.9, 95% CI: 0.4-2.3 5-9 years: OR*: 1.4, 95% CI: 0.5-4.0 ≥10 years: OR*: 8.8, 95% CI: 1.9-41	(Cordier et al ., 1993)
76 male HCC cases ** 152 hospital controls	1985-1989	For liver cancer after exposure to herbicides: OR: 2.1, 95% CI: 1.1-4.0)	(Long et al ., 1993)
62 male HCC cases 124 hospital controls	1982-1985	For liver cancer after exposure to herbicides: OR: 4.4, 95% CI: 1.7-11.5	(Van et al ., 1986)

*OR adjusted for matching variables (hospital, age, place, of resident), HBsAg status and alcohol consumption using unconditional logistic regression

**HBsAg (+) was detected similarly 60% of HCC cases in both 28 cases exposed in south and 48 cases in north not exposed to herbicides

Table 5: Cross-sectional study of opisthorchis viverrini infection and cholangiocarcinoma in some endemic areas

Egg count classified	Results of stool examined cases and per cent	Cholangiocarcinoma detected by ultrasound			Prevalence odds ratio	Country and source
		Examined	Cases detected	Prevalence (%)		
0	6,252 (51%)	410	1	0.2	1.0*	Thailand, (Haswell Elkins et al ., 1994)
1-1,500	5,075 (41%)	753	3	0.4	7* (0.2-16.3)	
1,501-6,000	755 (6%)	477	4	0.8	3.2* (0.4-29.5)	
>6000	230 (2%)	167	7	4.2	14.1* (1.7-118.6)	
Negative	2,010 (72%)	-	-	-	-	Southern Vietnam, (Chuong, 1996)
Positive	790 (28%)	-	-	-	-	

*Adjusted for age, sex, district

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Speech of Thien Phuoc Institution for Disable Children Care

Phan Khac Tu
Catholic Priest, Director of Thien Phuoc Institution for Disable Care

Ladies and Gentlemen,

Our organization, Thien Phuoc was established on December 30, 1999 according to the Decision 8128/QĐ – UB-VX issued by Ho Chi Minh city People's Committee, started from my heart-felt aspiration in order to assuage chemical infected innocent children's pain in Vietnam.

Thien Phuoc is a non-governmental charitable institution taking care of and bringing up children with severest diseases, most of them are living like botany, weak resistance that cause them always ill.

Those come to our institution, they will not forget real pictures of life of severely suffering pain, blind, deaf and dump. They may understand and have sense in their sub-consciousness, but they could not speak out and prized mouths open to feed.

How miserable it is with children with disable hands/arms, legs/foot and body, while they still have their normal mind/head and they are able to think. We have sought every ways and made our effort to educate and train them according to their own aptitude and remaining ability that help them happy to fall in line with the community, living unprejudiced and forgetting inferiority.

There are children, have disable hands/arms, legs/foot and body affected by Agent Orange but still clever and behave lively and well, can only subsist to thirteen like Bui Khac Chuong in Dak Lak. There have children able to hear but can not be able to speak and prized mouths open to feed like Liem, No, Yen,.. Some children with disable hands/arms, legs/foot and body, but have intelligent mind and can sit on wheelchair, can subsist till over twenty like Hai, Binh Queo, Thuan Cong

Though the war passed more than thirty years, Vietnamese people leaves war crime behind in order to smile unaffectedly and clearly with friends all over the world. But obvious reality of affected children's suffered is taking place, day by day, in human kind's presence. We cannot afford for receiving more children while there are hundreds request letters asking for sending children to us, because:

- Limited finance as we are self-operation
- Narrow housing due to lack of financial source for construction that can not enable us receiving more children

- Lack of equipments for physical therapy, therefore we can only have less than 100 children

In coming time, we focus attention on care at the community as it has good point of taking advantage of family's labour from grandparents, aunts/uncles and siblings. We will organize a group of doctors, nurses and caregivers going to each family in order to understand their situation as well as provide guidance to them in taking care of their children with the spirit that Thien Phuoc institution and families care for them together. This will create good conditions to help the children living in family's love. The institution will have plan to support monthly them money and materials, apart from care for. Compared with taking care in the institution, care for the children at the community has very big impact, in terms of both quality and quantity, piloting in district 12, district 8 and Cu Chi district in 2006, then will expand to the whole Ho Chi Minh city and all of the provinces wish to have a care centre like Thien Phuoc institution in Ho Chi Minh city.

For your imagines about care for children in Thien Phuoc institution, we would like to present all of you two poems made by Dao Truong San, vice-director of Sai Gon Tobacco Company, head of Agent Orange Save Children branch of Thien Phuoc.

- The first poem was written in the end of 2003 with title "Humankind's pain".
- The second one was written in the end of 2004 with title: "As mothers"

CONSCIENCE AND RESPONSIBILITY TOWARD AGENT ORANGE /DIOXIN VICTIMS

Phan Bao Hoa
Chairman of Red Cross Association of Quang Nam Province – Chairman of Agent Orange victim fund

Distinguished participants,
Ladies and gentlemen,

We may understand that peoples of Vietnam in general and of Quang Nam province in particular have ever suffered great loss for decades of struggle for national independence. Not mentioned as a whole, in the American war there have been 61,935 martyrs, 6,499 heroic mothers, 21,112 war invalid soldiers and 4,287 badly sick veterans. These above mentioned numbers are not inclusive of Quang Nam people who are living and receiving special treatment for veterans in other provinces and cities. Among more than 41,000 poor disable people almost 24,000 are allegedly infected with Orange Agent/dioxin. Most of these people are leading miserable lives at 214/231 communes and wards of 17 districts and towns, particularly in 8 remote and mountainous districts of the province. As consequences of Orange Agent, more than 1,000 villages were devastated and more than 100,000 hectares of forest and rice field were defoliated and destroyed. Moreover, the Quang Nam people usually suffer from natural disaster which took away many lives and property accumulated during their life...Difficulties heap up difficulties.

But there are no such miseries that has been protracted to the descendants of Orange Agent victims as concerns and worries of the parents gave birth to child with inborn deformity, crippling, dullness : " What would happen to our children in case we did not exist in this life?", and they themselves are the victim allegedly infected with Orange Agent.

Over the past years, under the instructions and guidance of the People's Committee of Quang Nam province, the Red Cross Association and the provincial Orange Agent Victim's Fund have recognized their duties and responsibilities in mobilizing donation from organizations and individual both domestic and overseas for assisting Orange Agent victims. As of today, there have been 11,516 victims received assistance and donation worth of VND 5 billion from Red Cross Association of Switzerland, Holland, Norway,

Germany and England. Particularly, in the mobilizing campaign in 6 months of 2005, there have been 469 individuals and organizations inside and outside the province donated VND 541,731,265 , including the donation from lawyers, scholars and students in the United States, New Zealand, Australia, Canada and from Quang Nam people living and working in Ho Chi Minh City, Da Nang city and in Germany. The Red Cross Association and provincial Orange Agent Victim's Fund transferred this amount of money to the Orange Agent victims of the province in a timely manner by building compassionate houses for people in specially difficult circumstances, hundreds of households were assisted with capital for livestock raising and other thousands of households were provided with rice and house wares. Scholarship and vocational training have also been awarded to children of families under extremely difficult circumstances...

In collaboration with the local government and family clans in the community, the Red Cross Association and Orange Agent Victim's Fund of the province yearly initiated a Campaign Month among staff and members of Red Cross Association and communities under the theme " Traditional Tet for Orange Agent Victim, Orphans and poor disable people". As a result, every year nearly VND 900 million is raised.

We do expect that more and more assistance and donation from kind hearts " Love others as we love ourselves" "Little donation but great deed" from near and far people and international community in terms of housing, health care service, community based adaptive vocational training, financial assistance for livestock raising and micro business production are dedicated to misery people in order to help Quang Nam province fulfill the motto "Improve livelihood of vulnerable people by mobilizing strength of humanitarian programs"

Allow me to be on behalf of Orange Agent Victims of Quang Nam province to express my acknowledge with deep gratitude to the domestic and international organizations and individuals for such valuable assistance and donation.

May I wish you all good health and happiness.
Thank you.

SPEECH OF NAM DINH RED CROSS ASSOCIATION

Nam Dinh Red Cross Association

Nam Dinh is a plain province in the Red River Delta with a population of two million, 80 % of them are involved in farming. A large number of people in the province were exposed to and affected by Agent Orange. Of the more than 17,000 victims, 9,424 have been partly subsided. The Nam Dinh provincial Party Committee and People's Committee have paid much attention and created favourable conditions for Agent Orange victims to receive subsidy as defined by the State. However, their lives remain very difficult in terms of physical conditions, health, rehabilitation, livelihood and means of production.

The Nam Dinh Red Cross Association is a social organization playing a key role in humanitarian activities in the province. In recent years, guided by the provincial Party Committee, People's Council and People's Committee, the Red Cross has launched campaigns to help the poor, people with disabilities, helpless elderly and orphans. Particularly, it has taken the lead in launching and organizing "For Agent Orange victims" activities. Proceeding from Decision No. 105/1998/QD-TTg issued by the Prime Minister on June 9, 1998 on the establishment of a fund for Agent Orange victims in Vietnam, the provincial People's Committee signed a decision to establish a steering committee for the establishment of the provincial Agent Orange Fund. The Committee comprises 15 members, who are leaders of relevant departments, agencies and mass organizations. The provincial Red Cross is its standing agency. The province has named April 30 as the "For Nam Dinh Agent Orange Victims Day". Red Cross chapters at all levels in the province have disseminated information on activities to support Agent Orange victims carried out by agencies, social organizations and individuals and examples of victims who overcome their own difficulties to build their lives. The information was carried out by the provincial mass media agencies, particularly the provincial radio and TV station through news, stories, interviews and letters of appeal.

The provincial Red Cross has promoted the role and functions of the Steering Committee members in implementing the "for Agent Orange victims" action plan. The member agencies have launched a campaign among their staff to encourage them to contribute to the fund. The provincial department of Education and Training and the provincial Confederation of Labour are the most active in the campaign.

The Chapter has held workshops on implementation of the People's Committee's directives, official letters and circulars, and review annual and periodic activities in support of Agent Orange victims. It has successfully carried out activities such as "Tet (Lunar New Year Festival) for the poor and Agent Orange victims", and "Action month for people with disabilities and Agent Orange victims" launched by the Vietnam Red Cross Association.

During its operation, the provincial Red Cross Chapter has coordinated actions with other members of the Steering Committee to monitor and encourage activities in support of Agent Orange victims. Organizations and individuals who are actively and effectively participated in these activities have timely been commended over mass media agencies from provincial to commune levels.

"For Agent Orange victims" activities are diverse such as visiting the victims, encouraging them, mobilizing people's contribution, helping the victims in their study and job training, awarding study grants, providing mobility and working means, and encouraging agencies, social and mass organizations and benefactors to sponsor and support the victims. The Chapter has joined efforts with other agencies, organizations and the Agape Charity Hospital to provide free health checks for the victims, and free orthopedic surgery for those with mobility disabilities. It has effectively held activities for Agent Orange victims during annual festivals and anniversaries such as Children's Day, June 1, War Martyrs and Invalids Day, July 27 and the Mid-Autum and Lunar New year festivals.

With these activities, the Steering Committee for the establishment of the provincial Agent Orange Fund has successfully agitated agencies, sectors, social and mass organizations, businesses, armed forces, religious dignitaries, benefactors, fellow-villager association and people in the province to contribute to the Fund and participate in activities to support Agent Orange victims. Since 1998, nearly VND 4 billion have been contributed to the Fund at all levels. The provincial fund alone has raised VND 400 million. The money has been used for visiting, giving presents, providing regular and sudden subsidies for an accumulated number of 17,917 victims; giving them 192 wheelchairs and bicycles and 06 production means; awarding study grants, sponsoring and supporting the community-based care of these victims; providing free health checks, free medicines and 146 voluntary health insurance cards; providing money to the victims to repair 22 houses, and help 149 households breed cows, 68 others breed pigs with a total amount of VND 3 billion. The provincial fund alone provided more than VND 200 million for an accumulated number of 1,500 victims.

In addition to this, Agent Orange victims also received support from the Vietnam Red Cross and benefactors from the whole country. Since 2004, the Agent

Orange website, the National Agent Orange Fund and the "Contribution to easing the pain of Agent Orange victims" programme launched by the "Youth of Ho Chi Minh City" newspaper have provided VND 388.5 million to build 8 charity houses, buy 45 calves for 53 families of poor Agent Orange victims in Y Yen and Vu Ban districts, award 50 grants to children of Agent Orange victims who overcome their difficulties in study, give presents to 5 families of victims who met with financial difficulties, teach tailoring to 12 children of the victims, buy rehabilitation equipment for the Duc Anh Orphanage in Bui Chu parish and provide free orthopedic surgery for 6 victims with mobility disabilities.

In respond to the movement "Tet for the poor and Agent Orange victims" held during the Binh Tuat (2006) Lunar New Year Festival, Red Cross chapters at all levels encouraged agencies, sectors, organizations and people in the province to contribute while extracting from the Agent Orange Fund nearly VND 300 million to organize visits and gave presents to 1,270 victims.

Since 2004, activities to support Agent Orange victims have focused to meet their specific needs and wishes. These activities have helped the victims overcome their physical and spiritual pains to integrate in the community, and contributed to poverty reduction and economic development in the province. They also show Vietnam's tradition of "eating fruits remember growers", and "drinking water remember its source."

However, assistance and support provided by the Red Cross remains minor comparing with severe losses and pains that Agent Orange victims have been endured. They are permanently sick and need daily care and treatment.

In order to give further assistance to Agent Orange victims to help them overcome their difficulties, be able to take care of themselves and integrate in the community, the Nam Dinh Red Cross at all levels will coordinate with all sectors, agencies and socio-mass organizations to investigate and classify victims to work out suitable and effective activities. In the immediate future, they will carry out activities to meet the victims' major needs including **regular assistance to their medical treatment, house repair and household economic development.**

The Nam Dinh Red Cross Association wishes very much to receive the sympathy, concern, assistance and care from the Vietnam Red Cross Association, other organizations and individuals to Agent Orange victims in the province.

IMPORTANT INFORMATION OF THAI BINH RED CROSS ASSOCIATION ABOUT NEEDS AND HOPES OF AGENT ORANGE/DIOXIN VICTIMS IN THAI BINH PROVINCE

Bui Vu Khuc, MD
President of Thai Binh Red Cross Association

I. General Information

Thai Binh is an agricultural province in coastal area of Vietnamese Northern Delta. Although the people's life is improved in currently economic development, but Thai Binh is still a poor and difficult province. One of the big difficulties that the party, people and other social and mass organizations have paid much attention to cope with is serious consequence of the war in which solving/supporting living for Agent Orange is a big problem.

According to survey made by provincial labour, invalid and social affair show that:
Thai Binh has 27,934 Agent Orange infected people, including:
+ 18,828 people who was directly contacted (mothers and fathers)
+ 8,547 infected children (second generation)
+ 559 infected grandchildren (third generation)
+ 303 people of diplegia
+ Died people: 1,942
+ Alive people: 25,992

More than 100 families have been infected in three generations (parent, children and grandchildren)
There are families having 5 children and grandchildren disable and abnormal
There are couples gave 9 births but all died after of a period
Among alive infected victims, there are 7,420 ones getting monthly subsidy from the government, 6,000 victims are sending documents to Ministry of Labour, invalid and social affairs (MOLISA) to wait for approval of getting subsidy. The other 12,572 victims have not finished their documents to request to MOLISA.

II. Roles and capacity of Thai Binh Red Cross Association

Having sympathy with and understanding of difficulties, loss and suffer of Agent Orange victims, since early 90s Thai Binh Red Cross Association in collaboration with 10-80 Committee conducted surveys on Agent Orange victims. At the same time, Thai Binh Red Cross Association has developed and set forth directions and measures to advocate community help and support Agent Orange victims

Thai Binh Red Cross Association, promoting its humanitarian and charitable/merciful tradition, has launched programs in its networks, staff, members as well as in people from all walks of life to support and care materially and spiritually for Agent Orange victims' families that help to put themselves in tune with joint happiness with the community, such as loan programs for developing husbandry and production; spiritual encouragement and visit at difficult situations; providing relief and gifts for them, support and care for treatment and medicines when they are ill, etc.

At the provincial Red Cross, one center was established in order to provide health counseling, humanitarian examination and treatment for people, especially many Agent Orange victims has been helped by this center. The Red Cross often launches donation movement from people in terms of money, assets, and labor to help the victims and their families in grave circumstances, to visit and offer gifts on the occasions of New Year, ceremonies, and historical anniversaries.

From 2000 up to now, The Red Cross, at all level, in the province has motivated 600 million VND to support Agent Orange victims; bought more than 3,000 health and body insurance books, 79 sewing machines and 50 wheelchairs were presented to Agent Orange victims.

From 2001 up to now, undertaking directions of poverty elimination and hunger reduction, elimination of leaking and dilapidated roofs for the poor launched by the Party and Government, Thai Binh Red Cross Association has built more than 245 charity houses worth nearly 3 billions VND to offer Agent Orange victims. "Agent Orange Victim Fund" assigned to Red Cross by the Government to mobilize, manage and support, has effectively developed by Thai Binh Red Cross Association contributing to care and support victims that reduce difficulties, pain and suffer, misfortune of the victims. For the past years, The Red Cross has collaborated with some NGOs to provide vocational trainings, rehabilitation, primary health care, etc, for victims at difficult situations. This proves that Agent Orange victims still have ability, need of productive works and social activities and hope to have health care and integration into their community.

The Party and Government as well as party committee levels, mass organizations and people of Thai Binh tried to organize many supportive and assistant activities to the Agent Orange victims' families. However, Thai Binh is an agricultural province with difficult economy, material support to the victims is still very limited compared with their actual need, the victims therefore would like to voice their urgent needs and requests to kind-hearted individuals and organizations nationally and internationally for their understanding and helps.

III. Request and Need of Thai Binh Agent Orange victims

By communicating, helping and need assessment of the victims, we learn about their different requests and needs are identified as followings:

1. *For victims who are hemiplegia and diplegia*

Need of these people are:

+ To be taken care by family members

+ Families of seriously infected victims need to have support through loan for their agriculture and husbandry or side-occupation in order to generate constant income reducing difficulties.

2. *For victims who are always ill and suffered from diseases but so poor that they cannot afford for health care and treatment.*

Their needs are followings:

+ To have periodically medical examination and care in the locality by humanitarian and free medical examination and medicine supply of voluntary doctors.

+ To be helped to buy voluntary health insurance card for the poor

+ To have opportunity participating in rehabilitation

3. *For victims who still have good health but poor, illiterate and jobless. Their needs are followings:*

+ To have appropriately vocational trainings that helps to get job

+ To have support by providing loan for small-scaled production of side-occupation or agriculture and husbandry.

4. *For families having victims of generations that are always at difficult economic situations and leaking and dilapidated houses. Needs of these victims are:*

+ To receive financial support for re-building their houses

+ To receive monthly subsidy

+ To receive capital support and guidance for economic development to escape from poverty and hunger

5. *For victims who are disable and abnormal children. Their needs are followings:*

+ To have care for and orthopedic surgery
+ To be sent to school and integrated into community's life

IV. Recommendations of Thai Binh Red Cross Association

Recommendations to kind-hearted individuals and organizations that help directly or indirectly through activities to meet minimum need of Agent Oranges, as followings

1. Thai Binh Red Cross Association hopes to receive financial support to provide trainings for 303 persons who are members of families of 303 people with hemiplegia and diplegia so as to help them having skills needed in taking care of the infected family members, how to give massage and point acupuncture helping the victims' rehabilitation, know-how to use regular medicines and Vietnamese traditional medicines.
2. Thai Binh Red Cross Association currently has a health care centre with voluntary doctors and wishes donors/sponsors to provide aids of a 16-seat vehicle and paraclinical materials/equipments (X-ray machine, scanning machine, dentist's chair, pacemaker, etc.) or provide medicines so that The Red Cross have schedule to take the doctors and medical equipments for mobile examination and treatment for the victims in poor and remote areas.
3. With its humanitarian roles, Thai Binh Red Cross Association hopes to be supported to set up a vocational training center, rehabilitation and job creation suitably for Agent Orange victims.
4. Thai Binh Red Cross Association calls national and international kind-hearted individuals and organizations for their support and assistance to poor Agent Orange victims' families having capital for household economic development in order to make their living.

The above are necessary and urgent needs of Agent Orange victims in Thai Binh and The Red Cross's ability and roles, we are looking forwards to receive attention and support from generous governmental and non-governmental organizations as well as individuals nationally and internationally.

Thai Binh Red Cross Association
Address: 237 Hai Ba Trung Street, Thai Binh city
Tel: 036 835281 Fax: 036 833759

SPEECH OF CAN THO RED CROSS ASSOCIATION

Nguyen Thi Nhung
President of Can Tho Red Cross Association

Can Tho City was the centre of the Fourth Tactical Zone of the former US-Puppet Administration. It was also the centre of many nerve organs of the Saigon puppet army and administration with a military airport in Can Tho. It was the key province in the Delta with many free-raided places such as Vi Thanh, Long My, Phung Hiep… The US and puppet army often conducted mopping up operations, 'burn all and kill all' operations and defoliant sprayings to defoliate leaves and destroy all trees and plants in the province with an aim to cutting off supplies and wiping out hiding places of the people and liberation army. They did not think of the consequences of defoliant sprayings, except defoliation. The people living in this zone have burdened over their heads tones of bombs and toxic chemicals that left great consequences not only on themselves, but also on their children and grandchildren.

More than 30 years since peace has been restored, the consequences and vestiges of war remain. It was thought that when the war ended, everyone would have lived in freedom and happiness and their families reunited. But it is not so to families whose members sacrificed their lives in the war and killed by bombs and shells. Many mothers lost their dearest children and wives lost their husbands. Not all, the war consequences have been left on many families having children with disabilities. Many people have been affected by Agent Orange/dioxin, resulting in cancer, cerebral palsy and deformities and live in lasting pain, making their family economy exhausted.

In Can Tho City now, there are more than 1000 people who are affected by Agent Orange/dioxin, half of them are children. Although the State has enforced a policy in support of the victims of Orange/dioxin, it cannot meet all the needs of their difficult material life and their spiritual life.

The Can Tho City Red Cross Association, with its function as a humanitarian organization, made a proposal and recommendation to the Can Tho City People's Committee and agencies concerned to set up the Fund in Support of Victims of Orange/dioxin on October 21, 1998. Over the past years, we have raised VND300 millions and undertaken many activities such as providing regular allowances, health check ups and medicines, wheelchairs and charity houses and making house visits during holidays and traditional Lunar New Year Festival to an integrated number of 3400 of victims.

I'd like to take this opportunity to introduce to you some cases such as the family of Mrs. Tran Thi Linh Phuong (a member of the Can Tho City Association of Photographers). During the war, she gave birth to three children. When peace was restored, her family had not yet enjoyed full happiness when her husband died because of Agent Orange/dioxin and then her children took turn to pass away, leaving her alone with lasting pain and sufferings. Mr. and Mrs. Nguyen Thanh Phuong have three grandchildren affected by Agent Orange/dioxin. We could not hold back our tears

whenever visiting victims of Agent Orange/dioxin and seeing girl children who, at the age of over 20, could only eat and sleep at the same place and cry and laugh from time to time or lie with rolled up limbs, knowing nothing. Some families have 3, 4 children with disability and deformity. Some married couples gave birth 7 times but only four are alive and all of their children are living with disabilities.

There are numerous disasters and sufferings caused by Agent Orange/dioxin sprayed by the US army. Many victims told us that they are leading a miserable life, shortage of food and clothing, but their deepest pain is in their heart, although the State and many organizations and individuals have empathized and shared with them.

Ladies and gentlemen,

Agent Orange/dioxin has not only destroyed the living environment but also damaged many human generations. This is clearly known by both producers and users of Agent Orange/dioxin. But they have ruthlessly destroyed a country and a nation which has been patriotic, peaceful, friendly and hospitable.

At this workshop, on behalf of the victims, we'd like to express their feelings and call for more support and assistance to the victims of Agent Orange/dioxin.

First of all, we would like to thank organizations, individuals and benefactors at home and abroad for giving support and assistance – both spiritual and material – to victims of Agent Orange/dioxin in the past. We hope that such support and assistance will be expanded because at present, families of the victims are in great need of support and assistance, including:

- Free health check ups, medical treatment, orthopedic operations at State-run clinics.
- Education and jobs suitable to their health
- A centre to care for children with disabilities to reduce difficulties for their families, so that their families can concentrate on production to improve their family economic conditions.
- Provision of necessities in service of their daily life and movement
- Spiritual and material support and assistance.

We wish that social and humanity scientists continue research studies on the consequences of Agent Orange/dioxin so as to urge chemical companies to hold responsible for the victims who are affected by their products and call for more humanitarian activities of the Vietnamese and international community to provide them with material and spiritual support and assistance.

Finally, I wish the conference a success and all of you the best of health.

Thank you for your attention!

SPEECH OF ASSOCIATION OF VICTIMS OF AGENT ORANGE/DIOXIN IN DA NANG

Association of Victims of Agent Orange/dioxin in Da Nang

Ladies and gentlemen,

First I would like to thank the organizing board to allow me to be on behalf of the Association of Victims of Agent Orange/dioxin in Da Nang to present this paper to the conference. I would also like to express our deep empathy and sharing with the sufferings and losses of the victims of Agent Orange in the past time.

I. Background

Da Nang city is one of the localities experienced many years of fierce war. The war, particularly the use of toxic chemicals by the US during the war in Vietnam have left heavy consequences to thousands of people in Da Nang City who are living with disabilities, deformities and other ailments. In implementation of Decision 7549/1998/QD-UB dated December 28, 1998 of the Da Nang City People's Committee, the Fund in Support of Agent Orange Victims has been set up. In November 2005, under the guidance of the Vietnam Association of Agent Orange Victims and the permission of the Da Nang City People's Committee under Decision 54/QD-UB dated January 5, 2005, the Da Nang Association of Victims of Agent Orange was set up and the Fund in Support of Agent Orange Victims which was formerly affiliated to the Red Cross was then transferred to the Association.

Ladies and gentlemen,

According to statistics released by the City Department of Labour, Invalid and Social Affairs, in Da Nang City, there are now 7,510 people affected by toxic chemicals, including 1,209 children. Among them, 4,396 are directly affected and 2,865 are indirectly affected by toxic chemicals.

6823 affected people are still alive among them 2,653 lost their working capacity.

2,485 affected people were directly involved in the war and 3,703 are civilians.

Visiting the families of the victims, we can understand the sufferings and pain they themselves and their relatives are experiencing. Many families have 3 or 4 members

who are affected by Agent Orange. It is heart-renting seeing children lying there lifeless. As humans, they are not healthy, physically and mentally. All members of the visiting delegation were very moved, meeting parents who have cried because of the health situation of their children. Our Association wishes to have more funding to provide medical treatment to the victims. But many of the devil diseases are incurable, even if money is available. As for parents who have experienced the war, now in their advanced age are still worried that who will care for and nurture their children when they pass away. In particular, many women who lost their youthhood and health during the war are unable to marry. Their simple desire is to be "mothers" like others and to have a child to rely on in their advanced age. But the children of these single mothers were born not as normal as others, with birth defects, thus becoming a burden to their mothers in all their remaining life with collapsed spirit, weakening health and difficult economy. Many married men and women, when having children affected by Agent Orange, have left their spouses, leaving the children to be cared for by grandparents. Some families have 2 or 3 children who are affected by Agent Orange, leading them to mental disorder. These are common situation of families whose children are affected by Agent Orange.

II. Result of fund-raising activities for the Fund of victims of Agent Orange:

1. Fund-raising:

Since the establishment of the Fund on December 31, 2004, VND 2,661,584,983 have been raised in 6 years.

Since the founding of the Association of Victims of Agent Orange in 2005, VND1,415,000,000 have been raised.

2. Care and support to victims of Agent Orange:

Over the past 6 years since the establishment of the Fund in Support of Agent Orange Victims and five years since the founding of the Association of Agent Orange Victims, the following achievements have been recorded in the care for and support of the victims:

- In the 6 years of operation of the Fund, 4,458 victims of Agent Orange have been supported with a total amount of VND1,961,284,000
- In the one year of activities of the Association of Agent Orange Victims, 1,700 victims have been supported totaling VND875,000,000, including
- 30 persons are given regular allowances by benefactors and 170 persons are given regular allowances by the Fund.
- As for victims of Agent Orange who took part in the war before 1975, under the Decision 120 of the Prime Minister dated July 5, 2004, the Da Nang City

Department of Labour, Invalid and Social Affairs has given monthly allowances to 772 persons.

3. Forms of care and support for Agent Orange victims

- Building of charity houses, sponsoring life-long support and regular support, health check ups and medical treatment, credit granting in production and presentation of gifts etc.

III. COMMENTS

1. Reasons of success:

- The results recorded to maintain the activities of the Fund in Support of Victims of Agent Orange are thanks to the concerns given by the Vietnam Association of Agent Orange Victims, the guidance of the Da Nang City Party Committee and the People's Committee, Departments, agencies and mass Organizations, members of the Executive Committee of the Association of Victims of Agent Orange and members of the Fund's Management Council, particularly the Chairman of the City People's Committee who is honorary President of the Association of Agent Orange Victims who have given favourable conditions for the Fund's activities.
- Communication and mobilization activities of the Fund to raise public awareness by central and local newspapers, radio and TV which have given a wide coverage with news stories and reports and live broadcasts, and the publication of the list of those who contribute to the Fund have left great impression on the people who join hand to help and share with the victims of Agent Orange. Not only people having conditions, but also poor people, people with disability and students save money to contribute to the Fund. Many pensioners use their monthly pension to support victims of Agent Orange.
- The Executing Board of the Fund has strictly observed the Fund's regulations, providing support to correct target groups with financial transparency, periodical auditing and making public the list of individuals and organizations who contribute to the Fund over radio, TV and newspapers, thus creating confidence for people of all strata. In particular, they have invited organizations and individuals to visit and present their gifts and money to victims of Agent Orange.
- The devotion and efforts made by the officials and members of the Executive Committee and the Fund Management Council and volunteers and the coordination of departments, agencies and mass organizations, particularly the Red Cross, have created aggregate strength in fund-raising activities for the Fund and the Da Nang City Association of Agent Orange Victims in the past time.

2. Recommendations:

- Victims of Agent Orange are a political and social issue that will exist for a long time, from one generation to another. It is an urgent issue of society and supporting victims of Agent Orange is a correct guideline. This will contribute to lessening the burden for their families and society.
- Financial contribution to nurture victims of Agent Orange in specially-difficult circumstance, who have no income sources and no one to rely on. If social organizations which are involved in nurturing the victims, the Government should give them some financial support to encourage them.
- For victims of Agent Orange who can overcome difficulties to go to schools, the local administrations should provide them school fees and health insurance.
- Policy is needed to support those who joined the army after 1975 and are affected by Agent Orange and civilians who were affected by toxic chemicals during the war and are now in great difficulty.

That was our presentation of the result of care for and support to victims of Agent Orange of the Fund in Support of Agent Orange Victims under the Association of victims of Agent Orange/dioxin in Da Nang City and some recommendations. We'd to ask the Government, ministries and agencies concerned to create more favourable conditions to effectively implement policies toward victims of toxic chemicals in general and those in Da Nang City in particular in the coming years.

I wish the participants the best of health and the conference a success!

Thank you very much for your attention.

SPEECH OF ASSOCIATION OF VICTIMS OF AGENT ORANGE/DIOXIN IN KON TUM

Pham Truong An, Pharmacist
President of Kon Tum Red Cross Association
President of Association of Victims Agent Orange/Dioxin in Kon Tum Province

I. Geographical, population, socio-economic characteristics of kon tum province

Kon Tum is a mountainous province in the northernmost part of the Central Highlands. The province has a complicated and divided topography and is 700 - 800 m above sea level. Its Ngoc Linh peak is 2998 m high and it is the highest peak in the Central Highlands. Kon Tum is a multinational and multi religious province with seven ethnic groups living together _ Sedang, Gie-Trieng, Jrai, Bannah, R'ngao, Brau, Kinh and some other ethnic minority groups who have migrated from Northern provinces such as Tay, Muong and Thai under the New Economic Zone Program after the liberation.

Kon Tum has a population of nearly 400,000 (of which the ethnic minority population accounts for 54 %). The province has 8 districts and a provincial town and an area of nearly 10,000 km^2.

Kon Tum has a border line of 280 km (with 9 border communes), 125 km with Atopeu province (of the Lao People's Democratic Republic) and 155km with Ratanakiri province (of Cambodia).

The province has 96 communes and wards, including 56 communes in specially-difficult conditions. The province's economy is under-developed and the local people's life is difficult. Its GDP growth rate is low. However, in the past several years, it has been much improved thanks to the Government's national programs.

Kon Tum has two main rivers – the Po Ko and the Dak Po Si Rivers flowing to the Sesan River with the great Yali Waterfall where the Yali Hydro-electric power plant – the Century Project was built and Kon Tum is in the upstream.

Kon Tum is a province having rich revolutionary tradition during the anti-French and the anti-US wars of resistance. It is also a province with typical and rich cultures imbued with national identity.

II. Overview on Victims of Agent Orange and Practical activities of the Association of Victims of Agent Orange/Dioxin and Kon Tum Red Cross Association in support of the victims

During the US war of aggression against Vietnam in the 1960s and 1970s, the US sprayed toxic chemicals (called by the US army as defoliants) in South Vietnam including Kon Tum province.

The war has ended for 30 years, but the US toxic chemical sprayings have left great consequences such as destroying the environment and damaging human health, causing great sufferings to the Vietnamese people. These disasters can be very difficult to overcome.

Kon Tum was one of the first provinces the US aggressors had sprayed toxic chemicals. On August 10, 1961, US cargo aircraft C 130 sprayed toxic chemicals on the western side of Highway 14 (in the two districts of Sa Thay and Ngoc Hoi). Forty Five years have elapsed, its disasters left on the people of all ethnic groups in Kon Tum Province remain painful.

With conscience and sense of responsibility, the Red Cross and the Association of Agent Orange Victims of the province have in coordination with the Department of Labour, Invalid and Social Affairs and the health sector have conducted a general survey on victims and disasters and vestiges left by the war in the province.

According to incomplete statistics, 9700 people in the province are victims of Agent Orange/dioxin, most of them are children and are in the districts of Sa Thay, Ngoc Hoi, Dak Ha and Kon Tum provincial town. In particular, many families have 2 or 3 children affected by Agent Orange.

Stemming from conscience, sentiments and responsibility, over the past years, the Red Cross and the Association of Agent Orange Victims have organized meetings, calling for support and assistance from benefactors, international and domestic organizations – both material and spiritual – to help victims of Agent Orange to reintegrate into community.

Over the past more than 4 years, we have raised VND 2.5 billion to help victims of Agent Orange, concentrating on the areas such as orthopedic operations and functional rehabilitation, support the building of charity houses, job training, credit for production development and construction of water wells to help relieve their pain.

- Orthopedic operations and functional rehabilitation have been given to 500 patients, most of them are in school age (this program will continue until 2010).

- Support in building charity houses: 45 houses have been built, worth VND50 millions.
- Support in building water wells: More than 100 water wells have been sunk, worth VND100 millions.
- Credit support to households in raising cows: about VND 150 millions.
- Scholarships given to children affected by Agent Orange: more than VND70 millions.
- Visits and gifts presented during Tet traditional Lunar New Year under the theme "Tet for the poor and victims of Agent Orange", worth billions of Dong over the past four years.
- In coordination with the Province Job Training School: 25 persons have been trained in dress making

III. EXPECTATIONS AND RECOMMENDATIONS

When visiting families of victims of Agent Orange, we could not see tears running down their cheeks but heard voices choked with emotion: "Looking at the children who neither know crying nor laughing, dressing up nor eating. They do not even know whether they exist on earth. There is no other pain and losses like what we are suffering. We need kind hearts."

Each Vietnamese and each person in the world with conscience and sense of responsibility as a human being cannot, but learn more about the origin of Agent Orange, its production and formation and the scheme of using its by the US army in the war in Vietnam.

The pain and sufferings caused by Agent Orange are immeasurable. We earnestly call on the Party and State to adopt suitable policies and take measures to help victims of Agent Orange improve their living standards, and first of all to win the court case against US chemical companies by victims of Agent Orange/dioxin.

Dropping tears to share with the victims, we should act in the spirit: ***Let's support and help Vietnamese Agent Orange/ dioxin victims – the poorest of the poor, the deepest sufferers among suffering people./.***

SPEECH OF THANH XUAN (PEACE) VILLAGE

Nguyen Thi Thanh Phuong, MD
Director of Peace Village

Ladies and Gentlemen,

The founding of Thanh Xuan Peace Village shows the earnest will for peace of the Vietnamese people and is to help relieve partly the sufferings and losses caused by the war, because beneficiaries of the Village are children with disabilities relating to Agent Orange/dioxin. They are children or grandchildren of war veterans who fought in the anti-US war of resistance for national salvation to restore peace for the Vietnamese people today. This shows the tradition of "dinking water, remembering its source" and good deed of the Vietnamese people.

Ladies and gentlemen!

Millions of liters of Agent Orange/dioxin used by the US in the war in Vietnam have destroyed the environment and damaged the lives of millions of Vietnamese. In particular, they have left un-healable wounds on innocent children. Many children are living with disabilities: epilepsy, body paralysis, heart diseases, deformities and many have died after birth or premature... For this reason, we have given them check ups, medical treatment and functional rehabilitation to help them have a chance to reintegrate into their families and society and lead a useful life. After 15 years of operation, with care and attention given by the Party and State, with deep sympathy and support from organizations and kind-hearted individuals at home and abroad, who have given us encouragement and effective and practical assistance both spiritual and material, in particular, with high sense of responsibilities and great efforts of the Village leaders and staff, Thanh Xuan Peace Village has recorded encouraging achievements in medical treatment and functional rehabilitation for children with disabilities. The teachers here have persisted in fulfilling the universalization of primary education for children at the Village under a special program and given them vocational guidance with some simple jobs. Medical doctors and technicians have given medical treatment and functional rehabilitation for thousands of children with functional disability and mental retardation. This has helped them prevent

myasthenia and rigid joints. In particular, from the Village, many children have made great progress and can walk, serve themselves and earn their living.

On the occasion of this conference, we earnestly call for empathy and sharing of people of conscience all over the world and wish that all of you will provide favourable conditions and help resolve the difficulties in the lives of the victims of Agent Orange/dioxin, contributing to improving the quality of their lives – both spiritual and material.

On the occasion of the New Year, I wish the leaders and all participants the best of health, happiness and great success in all aspects of life.

Thank you for your attention.

Hanoi, Feb. 20, 2006

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35 Nguyen Huy Tuong st. –Thanh Xuan Trung Ward
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SPEECH OF HUU NGHI (FRIENDSHIP) VILLAGE

Mai Xuan Thai
Director, Huu Nghi Village, Vietnam

Ladies and Gentlemen,

On behalf of 160 victims of Agent Orange/dioxin who are cared for and given medical treatment at the Huu Nghi (Friendship) Village, under the Vietnam Veterans' Association, I'd like to express our thanks and wish you all the best of health and the conference a success. The Huu Nghi Village has been assigned by the Vietnam Veterans' Association the task to receive and care for war veterans, former young volunteers and their children who are affected by Agent Orange/dioxin left by the US war of aggression in Vietnam. The village always caters 40 war veterans and 120 children with disabilities.

For the 40 war veterans and former young volunteers, when receiving them into the Village, they are given check ups, blood tests and X-rays … diagnosis for later treatment with traditional and western medicines. For very serious cases that need surgery, we have to send them to hospitals – both military and civilian for help. After two months of health recovery, they are sent back to their families and the Village receives new patients. By so doing, the Village has so far received 6 batches, comprising 240 war veterans and former young volunteers.

- For children and grandchildren of war veterans, about 120 children regularly stay in the Village: They are given orthopedic operations on limbs, medical treatment and functional rehabilitation. When their health is stable, depending on the placement tests, they are put in different general education classes, from grade 1 to grade 5. And children with better health conditions attend job training classes such as artificial flower-making, embroidery, dress making, or computer science. After 2 –3 years, when their health is stable and they have learnt a job, they are sent back to their families and communities and then the Village receives new children and the cycle starts again. Since being established on March 18, 1998, the Village has cared for 2,280 war veterans and former young

volunteers and 532 children from 35 provinces and cities from Quang Ngai Province upward to northern provinces and cities.

- Those who have been admitted into the village suffer from different ailments. Some war veterans and former young volunteers have stomach ache, liver, spleen and kidney diseases and others have warts and tumors on their whole body and suffer at least 2 – 3 diseases.

For children, they are even more pitiful with different disabilities: deaf and dumb, blind, loss of memory, rolled up limbs and deformities. Some can neither walk nor sit up. Some, at the age of 15, 16, but look like children of 5, 6 years old. Others cannot realize who their parents are and cannot remember even their names. The devil poison has greatly damaged human health, its effect is transferred from parents to children and even grandchildren (3^{rd} generation). Naive children and stunted war veterans are eroded by Agent Orange/dioxin day and night. Their families have never enjoyed full happiness and they themselves have never been relaxed and peaceful. They are ill-fated children of parents affected by Agent Orange/dioxin, born with birth defects. They need love, compassion, support and shelter to relieve their complex to make great stride to quickly integrate into family and community.

To care for those two target groups of war veterans and children, we mainly rely on the assistance given by the International Committee on Friendship Villages comprising five countries: France, Germany, USA, Japan and Canada, and local and international organizations and individuals. For this reason, we cannot avoid being financially passive in the care, medical treatment and functional rehabilitation for affected war veterans, former young volunteers and children.

Once again, I wish you the best of health and great success.

Thank you for your attention.

EXPECTATIONS OF THE AGENT ORANGE/DIOXIN VICTIMS IN VIETNAM

(Opinions of the victims collected by tape recording from the interviews)

Collected by Nguyen Thuy Hanh
Research Centre for Gender, Family and Environment in Development - CGFED

I. Living and economic related requests

**** Housing, land and other issues:***

1. "*Actually building this house (house of gratitude), I didn't want. The department for labour, invalids and social affairs did this, the Government cared and did this, knew that the Government gave money to build but... this actually caused difficulty for me... I just said, now I concentrate on food and education of my children. He thought I asked that money for my children. He said he would build a house, not ... give me money. I hadn't wanted to build yet."* (Do Huu Sen, Binh Lam commune, Hiep Duc, Quang Nam).
2. *"Only hope that the Vietnamese and American Governments have a humanitarian heart to help my family, economical support is just a part but it can encourage us spiritually*" (Mr. Ma, Khe Lu, Nguyen Khue commune, Dong Anh, Hanoi).
3. "*My living standard is not so good, both of us try to bring up our children with difficulties. I really hope that kind-heart people help our children so that they will not feel so disadvantaged"* (Tran Thi Nam Giang, Du Son village, Nguyen Khe commune, Dong Anh, Hanoi).
4. *"Our couple only want a land plot, and then build a shed to live there"* (Tran Thi Khanh Huyen, Binh Thuan).
5. *"Coming from a farmer family with many difficulties, due to economic conditions I also took part in working. However, unfortunately I got an occupational accident in 1998, generally my arms and legs are unable to work, my elder child is busy with study, our family is generally in very hard condition, I hope that authorities at all levels, kind-heart donors of the Government support us so that our family can improve economically"* (Truong Tien Hung, Y Yen, Nam Dinh).
6. *"Want to raise a cow, my house has not been constructed completely, without a kitchen, my first dream is to have a water well, two children study and get scholarships"* (Ho Xuan Chieng, Hong Quang, A luoi).

7. *"I just want to ask for my children some house space, because this house is gonna collapse soon"* (Tran Thi Chung, Bo De, Yen Phong commune, Y Yen district, Nam Dinh).
8. *"Only hope to repair the house"* (Nguyen Thi Nguyet, Ninh Xa Ha village, Yen Ninh commune, Y Yen district, Nam Dinh).
9. *"Hope I and my children can earn money, my husband will not be sick. Have money for husbandry, widen, tidy up, the furniture from the bowls and plates are not ok yet. Many expectations. Have proper places to sit. From the chairs we've also not got, need to borrow."* (Nguyen Thi Hoa, Ninh Xa Ha village, Yen Ninh commune, Y Yen district, Nam Dinh).

**** Policies and regulations***

1. *"We hope this problem is soon solved, the Government can have solution soon like having policies for victims, compensate for the disadvantages that we unfortunately meet. For example the children can be considered to be allowed to go to school with reduced fees or exemption from paying tuition fees."* (Nguyen Dinh Hanh, G3/1, Street 6, Trung Dung quarter, Bien Hoa, Dong Nai).
2. *"I request the Government to support for my three children"*. (Nguyen Quang Canh, Chanh Liem village, Cat Tuong commune, Phu Cat, Binh Dinh).
3. *"I hope that you visiting our home can help us a little bit, too pity for us, old like me trying to raise him is also not enough, I feel pity for him"*. (Phan Minh, Phan Dieu's father, Phu Cat district, Binh Dinh).
4. "*Hope to have a little support for the children*" (Nguyen Van Khanh, Chanh Liem village, Cat Tuong commue, Phu Cat, Binh Dinh).
5. *"I think there should be a policy for the children of the agent orange victims and some compensation policies for them, so that they can settle their mind to live and are supported by the society to live"* (Le Thanh Chi, Hue city).
6. *"I also hope that the children can benefit from some policies so that our couple will not be so hard."* (Phung Thi Thuy, 23 years old, Phu Nghia village, Phu Kim commune, Thach That district, Ha Tay).
7. *"Request the Government that we have contributed our youth years, now in the elder years we hope the Government can care... When we join the army, the commune complimented and encourage us with drums and flags. That year, not so many women participating, was transfered to the district, now we came back and receive no benefits... Request the Government to care about me, 7 years service in the army and now have nothing, no more privileges than the normal people"* (Hoang Van Tinh, Nhoi Tren village, Co Loa commune, Dong Anh, Hanoi).

8. *"My hope is if my child is affected with agent orange then you can help to raise a voice so that my child can benefit from some policies so that he does not fell so disadvantaged."* (Nguyen Thi Ngai, Village 5, Tan xa commune, That That, Ha Tay).
9. *"Want my child to have some monthly support so he do not feel so pity for himself."* (Le Van Chiem, Ngoai Thon village, Phu Kim commune, Thach That, Ha Tay).
10. *"Hope that the Government can care, give my child some support for being affected with agent orange"* (Ninh Xuan Thong, 40 years old. Ninh xa Ha village, Yen Ninh commune, Y yen distrit, Nam Dinh).
11. *"Want to have some support, not sugar or biscuit ...during Tet... but also not dare to compare like Mr. Thach in Doai, eye disability but I still have healthy children, can work in the farm. We do not require so much, everyday only some thousands are enough for us to live. On 27/7 they go and receive gifts, my family is still quiet..."* (Tran Minh Thao, Quynh Hong, Quynh Phu, Thai Binh).
12. *"Expectations but we cannot have, only hope, Governmental policies or Provinces and local agencies have any support for people with disability, if so please help us something, honestly I do not dare to request for anything."* (Nguyen Thi Bao, Ngoai Thon village, Phu Kim, Thach That, Ha Tay).

**** Jobs***

1. *"I hope that I can have some stable job, enough income to meet the needs of my family"* (Do Van Giap, child of Hoang Thi Dieu, Kim Bong, Tan Xa, Thach That, Ha Tay).
2. *"Hope my child can have some stable job in the future"* (Dng Thi Hong Van, 22 Lane 810, La Thanh, Ba Dinh district, Hanoi).
3. *"The war has robbed all of my children, I at the moment only have one child, an only girl grandchild, and with an only wish that she can have a job in the future so that her life can be maintained. So her parents will not be so worried in their later life"* (Pham Hong Phong, Y Yen, Nam Dinh).
4. *"I hope my children will be provided with a job" (Nguyen Van Ngo, Hong Thuong commune, A Luoi district, Thua Thien Hue province)*
5. *"I wish that his business will prosperous and my disabled children will be received financial support to ensure their lives in case I pass away"* (Nguyen Anh Tuyet, born in 1959, farmer in Tan Binh commune, Ham Tan district, Binh Thuan province. She has 8 children. Her first son, born in 1983, with heart disease, the forth child is a girl born in 1989 with feet atrophy and the seventh child is also a girl with cleft palate and lip)

6. *"I have an aspiration that the government will create a job for her and support a sum of money. I am old now, there comes a day I will pass away. And when this daughter will be old and die there will be my small granddaughter alive"* (Cao Thi Cuu, Tan An township, Hiep Duc district, Quang Nam province. She now is living with her daughter with feet atrophy, and granddaughter who has only half of the feet)

**** Salary:***

"I hope that the government will pay attention to the salary of teacher like me so that it will deserve the labour capacity" (Tran Thi Nam Giang, Son Du group, Nguyen Khe commune, Dong Anh district)

Capital creation:

1. *"I wish that I could run a small bussiness to support him to go to school"* (Do Huu Sen's wife, Hiep Duc district, Quang Nam province)
2. *"I expect to be supported with the capital"* (Hoang Thi Dieu, Kim Bong village, Tan Xa commune, Thach That district, Ha Tay)
3. *"Our hope is to receive the capital for production so that the incomes will help us in raising our grandsons"* (Phung Van Tiep, Phu Nghia village, Phu Kim commune, Thach That district, Ha Tay province)
4. *"We hope to receive amount of money for raising catles"* (Le Van Chiem, Ngoai Thon village, Phu Kim commune, Thach That district)

II. Health related requests

**** Policy***

1. *"We need a government policy for his treatment. We will bring him for treatment even if we have to spend everything and even only one hand is treated."* (Tran Thi Nam Giang, Son Du village, Nguyen Khe commune, Dong Anh district, Ha Noi)
2. *"The only thing we want is that the government takes care of him. I would like to ask for his health examination to identify the level of exposure. Now, he is ranked at 4^{th} level with 100,000 VND monthly financial support. He has been identified to be wounded in the war from 1990"* (Hoang Van Tinh, Nhoi Tren village, Co Loa commune, Dong Anh district, Ha Noi)

3. *"I hope the local authorities pay attention to my granddaughter so that she could receive the financial support from the government. We expect that she can receive the incentives for stable life*" (Hoang Thi Dieu, Kim Bong village, Tan Xa commune, Thach That district, Ha Tay province)

**** Health***

1. *"I wish that my child will overcome this disaster and his disease will be treated*" (Tran Thi Thuy, Phu Nghia village, Phu Kim commune, Thach That district, Ha Tay province)
2. *"My expectation is that he can walk, I can bear any difficulties for that"* (Tran Thi Thu Ha, born in 1981, houseworker, Binh Lam commune, Hiep Duc district, Quang Nam province. She gave birth a son in 2002 with soft neck. Her husband works as a bricklayer with unstable salary)
3. *"I feel pity for him so much, while other kid are healthy and can walk. I wish that my grandson health is improved"* (Nguyen Thi Thai An, 36 Apartment 28B Dien Bien Phu, Ba Dinh district, Ha Noi)
4. *"The most expectation is that he can sit, his health is recovered. I hope that some social organization fund for my son treatment as our economic is limitted"* (Nguyen Thi Thanh Van, 36 Apartment 28B Dien Bien Phu, Ba Dinh district, Ha Noi)
5. *"Firstly, I wish that I could live as long as I could because these two children need parent's support. In case we pass away, it will be unfortunate for them. Moreover, I gave birth the last two child at the old age so I wish to live longer to see their grown up"* (Trinh Thi Toan, Yen Phong commune, Y Yen district, Nam Dinh province)
6. *"My biggest hope is that my grandchildren have been treated so that they could go to school like their peers*" (Nguyen Thi Dan, village 5, Tan Xa commune, Thach That district, Ha Tay province)

7. *"Wishing for being healthy for long time, not having diseases. The Government should pay attention to Agent Orange affected people, if the country is picking up."* (Hoang Van Tinh, 59 years old, Nhoi Tren village, Co Loa commune, Dong Anh district, Ha Noi)

8. *"My biggest hope is he can walk, he can fit in life"* (Nguyen Van Khoi, lottery vender in Tan An townlet, Hiep Duc district, Quang Nam province. Khoi has four children, the second son born in 1986 is cerebral-palsied and paralysed in bed that always needs care and help by others)

9. *"I have a dream of happy end that will help our children rehabilitated to be able to walk, to sit so that we/family members are less hard*" (Tran Thi Ngoc Phuong, Tan Binh, Ham Tan, Binh Thuan)

10. *"Hoping that in the future there will have an organisation, a mass organisation to examine and have conclusions of Agent Orange affected people, so we can know at what level we are affected? to create conditions to help us mentally and materially. So we will not always to think of being infected that influences both material and spiritual life. The hope is that there will have exact result of myself in order to help us feel safety to earn living in peace"*. (Do Van Giap, Hoang Thi Dieu's son, Kim Bong village, Tan Xa commune, Thach That district, Ha Tay province.)

**** Giving birth:***

1. *"Our family did not want to have the third child. But, they (the couple) always think that: firstly, this child (the third generation affected with paralysis) is hopeless, secondly the other child is cross-eyed. So they tried to have another child with hope of better situation"* (Do Bich Canh, Nguyen Viet Trinh's grandmother, Khe Lu village, Nguyen Khe commune, Dong Anh district, Hanoi)
2. *"Do not want to give birth continuously like that, it was unplanned, then had pregnancy extrauterine, then it broke and blooding, so I had to have operation. After that, we applied family planning, it was difficult time so we did not want to have more births, but it was unplanned then we had the last son"* (Vo Thi Thuy, Ngo May townlet, Phu Cat, Binh Dinh)
3. *"We wanted to have more children, as we thought one was disable/affected then the next one would not be like that, not be ill,.. Only desire for having a healthy child and normal. We are poor, we would have been happy if we have had a healthy child, but being poor and having the children like these, we are very sad"*. (Tran Thi Thuy, Phu Nghia village, Phu Kim commune, Thach That district, Ha Tay province)
4. *"I have no dream rather than giving birth to normal children"* (Phung Thi Thuy 23 years old, Phu Nghia village, Phu Kim commune, Thach That district, Ha Tay province)
5. *"My aspiration is to have a perfect child"* (Mai Thi Tu, her husband is Ho Ngoc Huan – born in 1955, farmer in Que Tho commune, Hiep Duc district, Quang Nam province. Tu has three children, the first daughter, born in 1984, is mental problem, stunned)

**** Health check and treatment:***

1. *"We wish to have medicines that can limit chemical's impact. Currently, some have been examined and blood tested so that they know about infection level, but most of*

the people do not have chance to have blood test" (Nguyen Dinh Hanh, G3/1 ward 6, Trung Dung precinct, Bien Hoa, Dong Nai)

2. *"Hope for our children not being sick, having medicines"* (Quynh Ong, Nham commune, A Luoi).
3. "*Wishing for our children can speak, that is enough*" (Hoang Van Ay, Hong Kim, A Luoi)
4. *"I hope to have more money for taking my child to treatment, as people said it can be operated to reshape vein. We always keep in mind that try to work and save money if there is a chance, if the government can support something or organisations working on disability help my child going for treatment, we really wish that"* (Nguyen Dac Thuc – Hong Thuong, A luoi).
5. "*We would like to request you to talk to higher levels for giving my child a health care notebook. Having it will help us to go for treatment easier*" (Nguyen The Quang, Yen Phong, Y Yen, Nam Dinh)
6. "*Hope the government and national/international organisations to study and produce appropriate medicines and provide support to victims"* (Huynh, Yen Phong, Y Yen, Nam Dinh)
7. *"We are poor in rural areas, we can afford to take our children to hospital for examination and buying medicines, we can not be possible to seek for doctor for our children... I really want to have a good doctor to treat for our children"* (Nguyen Thi Ca, Yen Phong, Y Yen, Nam Dinh)
8. "*Hope that higher levels can help our ill children to have examination and treatment*". (Dinh Thi Dien, Hoa Binh)

**** Supportive equipments:***

1. *"Giving it a wheelchair, it can go to the streets for peaceful mind, only staying at it is pitiful*" (Do Thi Nham, Chanh Liem village, Cat Tuong, Phu Cat)
2. *"My three children only defecate in the house, hoping for a wheelchair that can help them do outside"* (Nguyen Van Khanh, Chanh Liem, Cat Tuong, Phu Cat, Binh Dinh)
3. "*I wish that kind-hearted people and organisations create conditions for my a to give a wheelchair so that my child can move from one place to other place, and the mother will not have to carry the child. My child is very heavy now to carry, nearly as tall as the mother*". (Tran Thi Nam Giang, Son Du village, Nguyen Khe commune, Dong Anh, Hanoi)
4. *"He always asks me to buy him a wheelchair, I said he will have one whenever his father earn enough money"* (Tran Thi Khanh Huyen, Binh Thuan)

5. *"I like to have a wheelchair, no one give me. The small one that was carried passing over the church, not big one. But no one give. Each time passing over the church, someone has to carry"* (Tran Van Tu, Binh Thuan)
6. *"Hoping that my child can sit, sit on the wheelchair then we can push, that's alright. Do not have to carry, it is very difficult to carry when the child grow up, the more growing, the more heavier, but we can not just leave the child lying in bed all the time as the child's back will be ulcerated, that's why I always have to carry my child"* (Huynh Thi Huong, born in 1978, house-keeping, husband is clock/watch repairman in Tan Binh, Ham Tan district, Binh Thuan province. She has two daughters; the first one Tran Huynh Vy Vy born in 1999 is disable).

**** Centre for caring:***

1. *"I do not know if the government can help us to bring up one child. It is good if the government has one place to bring up that child"* (Nguyen Van A, born in 1951, bike/motorbike repairman in Que Tho commune, Hiep Duc district, Quang Nam province. Mr A has four daughters; the second one born in 1984 is mental deficiency, the last daughter born in 1998 has acnemia and dumb. His family became more difficult and hard since his wife died)
2. *"It is very good if the government has a centre to take the children there before we die"* (Nguyen Minh Tam, Bo De village, Yen Phong commune, Y Yen district, Nam Dinh province)
3. *"I want to send my child to some rehabilitation centre where he can be treated to be able to walk. Then I can go working. If I must stay at hom and take care of them like this, our life cannot be improved"* (Tran Thi Chin, Doan Van Dao's wife, born in 1972, farmer in Binh Lam, Hiep Duc district, Quang Nam province – having two sons, the first one Doan Van Kien, born in 1995 is cerebral-palsied.)
4. "*My last hope/expectation is that we can give our child to society when we become old"* (Nguyen Van Khoi, lottery seller in Tan An townlet, Hiep Duc district, Quang Nam province. Khoi has 4 children, the second son born in 1986 is cerebral-palsied and paralyzed in bed and always need helps and care from others).

III. Cultural and education related requests

**** Environment:***

1) *" I really wish to leave this area – where my children seriously affected. So that we want to move to the North. But nowadays, it is difficult to change the residence and move to the North; furthermore, it is easier to find a job here. We want to leave this area, move to the countryside – where our relatives is living. We hope that the new*

cases of diseases will be limited, our next generations will not be affected" (Nguyen Dinh Hanh, G2/1, quarter 6, Trung Dung ward, Bien Hoa city, Dong Nai province).

**** Mass media:***

1) *" I do not like to be taken photos or to be filmed at all. I gave birth to my child, so I raise him/her up even though my child is disabled. I do not want my child be a burden to society"*(Hoang Van Tro, Trang Commune, Co Loa, Dong Anh).
2) *"One should not spread informations about dioxine victims because this will affect the children negatively. I was discontent the press for their photo coverages of some families. Journalists spread some informations about the families, bu they have not seen the negative effects of their reportages. We do not like to be reported because in psychological term. If girls know that tis boy or that boy is a dioxine victim, they will not marry him"* (Nguyen Dinh Hanh, G3/1 Zone, Trung Dung Ward, Bien Hoa, Dong Nai).

**** Education***

1) *"We intend to take our child to the school for disabled in Dai Bi, Co Loa to study, but there, only people who can move around on their own legs, be accepted. Parents do not like to have children care institutions; institutitionalisation is taken as the last resort"* (Tran Thi Nam Giang, Son Du Hamlet, Nguyen Khe Commune, Dong Anh District).
2) *" Wish my children could study at a school for Dumb and Deaf people, or at a Vocational Training school for disabled, so that they could have a bright future. I also wish my children would find a job, so they would earn money for their lives"* (Dang Thi My Hanh, Binh Trung hamlet, Tra Binh, Quang Ngai).
3) "*Wish to have vocational training for disabled children, so they can earn living when the parents get old"* (Ho Thi Nga, Tra Xuan townlet, Tra Bong district, Quang Ngai province)
4) " *I wish my children could study in a school for disabled people; here, in normal schools, my children are not accepted"* (Nguyen Thi Tu, Hiep Duc, Quang Nam).
5) "*I am much worried. My children cannot go to school. I want to send them to some school for disabled children. What will they live on in the future?*" (Nguyen Thi Tu, Binh Tam commune, Hiep Duc district, Quang Nam province).
6) *" Having enough money for the children to study*"(Dinh Thi Dien,Hoa Binh)
7) "*There is a special class for disabled children in every local, district and province*"(Truong Tien Hung, Y Yen, Nam Dinh).
8) *" They integrate with the community*"(Truong Dinh Chung,Y Yen, Nam Dinh)

9) *"The Govenrment pay more attention to disabled children, they themselves are underprivileged, and help them integrate with the community*"(Duong Xuan Thieu,Y Yen, Nam Dinh).
10) *" I feel self-tity because I gave birth an abnormal child. I am overcome with grief when I cannot allow her to go to school though she wants to go to school*".(Nguyen Dac Thuc, Hong Phuong, A Luoi).
11) *" Firstly I wish he can walk in order to go to school, anyhow he can read. It is very pitiful to be illiterate.*"(Pham Van Tuong, Hop Thuong, Hong Thuong, A Luoi).
12) "*We don't have money to pay for the children's schoolfee, even though we really want*"(Hoang Van Ay, Hong Kim, A Luoi).
13) *"I want my child to go to school, she would be able to read and write. But she can't study, so the teachers do not accept her*". (Le Van Chiem, Ngoai hamlet, Phu Kim commune, Thach That, Ha Tay).

III. Some recommendations to the Vietnamese government

1)"*We really wish, but we do not know where we can find and adopt a child, for example, an 3 – 4 or 5 year old one"* (Nguyen Dang Thien, Yen Phong Commune, Y Yen District, Nam Dinh Province).
2) "*There are a lot of discriminations in public*" (Phung Van Tiep, Phu Nghia Hamlet, Phu Kim Commune, Thach That District, Ha Tay province).
3" I wish all my children healthy, household economy returns to normality, jobs are stable" (Vo Thi Thuy, Ngo May town, Phu Cat District, Binh Dinh Province).
4) *" I wish my children grow up, take care for their brothers and sisters; and when I get old, I have time to have furlough after strenuous service*"(Do Huu Sen's wife, Hiep Duc District, Binh Dinh Province).
5) " Wish *the Government pay more attentions to us, so we do not feel self – pity"* (Hoang Van Tinh, Nhoi Tren Hamlet, Co Loa Commune, Dong Anh District, Ha Noi).
6) *" I have had many wishes, but I do not know the wishes are achieveable. So I put up with it"* (To Thi Chau Thuan, 48 years old, Number 8, Ngoc Ha Bluff, Ngoc Ha Precinct, Ba Dinh District).
7*) "I only wish my father and all the family members healthy, household economy more prosperous (than today)"* (Ninh Xuan Lap, Lower Ninh Xa Hamlet,Yen Ninh Commune, Y Yen District, Nam Dinh Province).
8) "I *wish I am healthy, live long to look after the child"(*Tran Thi Toan, Hoang Nghi hamlet, Yen Phong commune, Y Yen District).

9) "*Wish the Government pay more attention to my child, more and more*"(Mai Thi Tu – whose husband is Ho Ngoc Huan, born in 1955, a farmer in Que Tho Commune, Hiep Duc District, Quang Ngai Province. She has three children, her first daughter is stunned).

10) "*The State politics should concern themselves with every patient and his/her real situation. They should not pay attention to whether the patient is the first or second generation*" (Do Van Giap, Kim Bong Hamlet, Tan Xa commune, Thach That District, Ha Tay Province).

Intrinsic Function of the Aryl Hydrocarbon (Dioxin) Receptor as a Key Factor in Female Reproduction

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ABSTRACT

Dioxins exert a variety of adverse effects on organisms, including teratogenesis, immunosuppression, tumor promotion, and estrogenic action. Studies using aryl hydrocarbon receptor (AhR)-deficient mice suggest that the majority of these toxic effects are mediated by the AhR. In spite of the adverse effects mediated by this receptor, the AhR gene is conserved among a number of animal species, ranging from invertebrates to vertebrates. This high degree of conservation strongly suggests that AhR possesses an important physiologic function, and a critical function is also supported by the reduced fertility observed with AhR-null female mice. We demonstrate that AhR plays a crucial role in female reproduction by regulating the expression of ovarian P450 aromatase (Cyp19), a key enzyme in estrogen synthesis. As revealed by in vitro reporter gene assay and in vivo chromatin immunoprecipitation assay, AhR cooperates with an orphan nuclear receptor, Ad4BP/SF-1, to activate Cyp19 gene transcription in ovarian granulosa cells. Administration to female mice of an AhR ligand, DMBA (9,10-dimethyl-1,2-benzanthracene), induced ovarian Cyp19 gene expression, irrespective of the intrinsic phase of the estrus cycle. In addition to elucidating a physiological function for AhR, our studies also suggest a possible mechanism for the toxic effects of exogenous AhR ligands as endocrine disruptors.

INTRODUCTION

The aryl hydrocarbon receptor (AhR), a member of the growing superfamily of basic helix-loop-helix (bHLH)-PAS transcription factors, functions as an intracellular mediator of xenobiotic signaling pathways (37). AhR was originally discovered to occur in hepatocytes as a transcription factor that binds with high affinity to an environmental contaminant, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (also referred to as TCDD or dioxin) (49). The molecular properties of AhR as a transcription factor have been elucidated by studies of *CYP1A1* gene expression. Normally, AhR exists in the cytoplasm as part of a

complex with Hsp90, XAP2, and p23 (28, 34, 35). Upon binding of xenobiotics, such as TCDD and 3-methylcholanthrene (3MC), the receptor complex translocates into the nucleus, where AhR heterodimerizes with the AhR nuclear translocator (Arnt) (61). Within the nucleus, the AhR/Arnt heterodimer binds to XREs (*x*enobiotic *r*esponsive *e*lements) in the promoters of target genes to activate gene expression. A number of genes encoding drug-metabolizing enzymes, including *CYP1A1* and genes encoding UDP-glucuronosyl transferase and glutathione *S*-transferase, have been identified as targets of AhR (18, 21). Gene disruption studies have also revealed that AhR functions in the toxicological effects of dioxins, such as teratogenesis, immunosuppression, tumor promotion, and estrogenic action (6, 19, 38, 50, 56). Despite promoting these multiple adverse effects, AhR is conserved throughout a number of animal species, from invertebrates to vertebrates (20), suggesting that AhR plays a fundamental role in some physiologic process in addition to mediating the response to xenobiotics.

Ovarian functions are primarily regulated by the hypothalamus-pituitary-gonadal (HPG) axis. Gonadotropin-releasing hormone (GnRH) is discharged from the hypothalamic central nervous system and transported through the portal vascular system to stimulate the gonadotrophs of the anterior pituitary. Subsequently, the anterior pituitary secretes the gonadotropins follicle-stimulating hormone (FSH) and luteinizing hormone (LH) into the venous system. In the ovary, FSH promotes the development of immature follicles, eventually leading to the formation of mature preovulatory follicles. Upon stimulation with LH, the mature follicles rupture, leading to ovulation (52). Through the period of follicular maturation to ovulation, gonadotropins stimulate ovarian steroid synthesis. FSH upregulates expression of the P450 aromatase (*Cyp19*) gene (51), which catalyzes the final step of estrogenesis. Although the genes regulated by estradiol are largely unknown, the involvement of estradiol in folliculogenesis was revealed by the phenotype of *Cyp19* knockout (ArKO) mice (17). Due to impaired synthesis of estradiol, *Cyp19* knockout females displayed severely impaired follicular development, resulting in defective ovulation. Interestingly, ovarian defects similar to those seen with ArKO mice were observed upon simultaneous disruption of the estrogen receptor genes, ERα and ERß (14).

Our analysis of AhR-deficient mice revealed a phenotype defective in reproduction that was similar, albeit milder, to that seen with ArKO and ERα and ERß double knockout (ERαßKO) mice. AhR-deficient female mice were subfertile, resulting from impaired folliculogenesis and ovulation. These ovarian defects were likely due to insufficient synthesis of estradiol, consistent with the observation that the *Cyp19* gene is a novel target gene of AhR within the ovary. While the mechanisms by which AhR induces drug-metabolizing enzyme genes in response to exogenous ligands have been extensively studied, the intrinsic function of AhR has remained unknown. In this report, we have identified an intrinsic function for AhR, in which this receptor adjusts ovarian

MATERIALS AND METHODS

estradiol concentrations by regulating *Cyp19* gene transcription. Based on this novel function for AhR, we propose a molecular mechanism by which the AhR ligands, such as DMBA (9,10-dimethyl-1,2-benzanthracene) and TCDD, also function as endocrine disruptors.

Fertility assessment. For 3 months, eight $AhR^{+/+}$ and $AhR^{-/-}$ females each were mated with $AhR^{+/+}$ or $AhR^{+/-}$ males. The litter size of each pregnancy, average litter size, and total number of pups were determined. To exclude any effect caused by individual differences in male fertility, two female mice (one $AhR^{+/+}$ and one $AhR^{-/-}$) were housed in the same cage (mating cage) with a single male mouse ($AhR^{+/+}$ or $AhR^{+/-}$). Once known to be pregnant, female mice were isolated until they gave birth. The numbers of pups were counted on the day of bearing. Female mice were returned to mating cages the next day. This experiment continued for 3 months.

Determination of estrus cycle. To determine the estrus cycle phase, vaginal smears were collected by rinsing the vagina with phosphate-buffered saline (PBS) at 1700 h. Collected smears were mounted on glass slides and stained with Giemsa solution. When angular cells or nucleated epithelial cells occupied the majority of the smear, we determined that the mice were in proestrus or estrus. When a multitude of leukocytes were observed, animals were in metestrus or diestrus (42). These observations were performed for 21 consecutive days.

Superovulation. The estrus cycle was induced artificially by intraperitoneal injection of 5 U pregnant-mare serum gonadotropin (PMSG) (Teikoku Zouki, Japan) at 1700 h on day 1 of the experiment and 5 U human chorionic gonadotropin (hCG) (Teikoku Zouki, Japan) at 1700 h on day 3. In this superovulation protocol, follicles developed to the preovulatory stage following PMSG treatment, and ovulation was induced by hCG

treatment. Experiments attempting to rescue $AhR^{-/-}$ ovulation required the intraperitoneal injection of ß-estradiol (water soluble; Sigma) dissolved in PBS at 1700 h on day 2. Ovulated oocytes were collected from the oviduct and quantified on day 4.

Determination of serum LH concentrations. One hundred microliters of a GnRH agonist, buserelin (Sigma), in vehicle (PBS-0.3% bovine serum albumin) or vehicle alone was injected into the skin behind the necks of ovariectomized $AhR^{+/+}$ and $AhR^{-/-}$ females as described previously (11, 57). One hour after the injection, mice were anesthetized with diethyl ether. After collection of serum samples, serum LH concentrations were determined by radioimmunoassay (SRL, Inc., Japan).

Determination of hormone concentrations. After subjecting mice to the superovulation protocol, we collected ovaries at three time points during the preovulatory period (48 h after PMSG treatment [PMSG + 48 h], hCG + 5 h, and hCG + 8 h). Each ovary was weighed and then homogenized in diethyl ether to a concentration of 10 mg tissue/100 µl methanol. Aliquots (30 µl) of the redissolved materials were subjected to liquid chromatography-mass spectrometry (Applied Biotechnology, Inc., Japan) to determine the concentrations of estradiol and testosterone by comparing intensity values with standard curves made by standard hormones.

Immunohistochemistry. To detect LH, frozen sections (10 µm) were prepared from paraformaldehyde-fixed pituitaries of $AhR^{+/+}$ and $AhR^{-/-}$ mice, embedded in the Tissue-Tek compound (Sakura Finetechnical Co., Ltd., Japan). After being washed in Tris-buffered saline (50 mM Tris-HCl [pH 7.6], 150 mM NaCl) containing 1 mM $CaCl_2$, slides were boiled in 10 mM sodium citrate (pH 6.0) for antigen unmasking (43) and then treated with methanol at -20°C for 30 min. Sections were then incubated with an antibody against the ß subunit of LH (Biogenesis) overnight at 4°C, washed, and treated with a biotinylated donkey anti-rabbit immunoglobulin G (Jackson ImmunoResearch Laboratories, Inc.) for 3 h at room temperature. After being washed, sections were developed with horseradish peroxidase-conjugated streptavidin (Nichirei, Japan) and visualized with diaminobenzidine (Nichirei, Japan) for 10 min at room temperature.

To detect AhR and Cyp19, we prepared paraffin sections (5 µm) from paraformaldehyde-fixed ovaries isolated from $AhR^{+/+}$ and $AhR^{-/-}$ females given PMSG and hCG (hCG + 5 h). After deparaffinization, sections were treated with proteinase K (20 µg/ml) (Sigma) to unmask antigen epitopes and then treated with hydrogen peroxide (0.3% H_2O_2 in methanol). Sections were incubated overnight at 4°C with either anti-AhR (generously provided by R. Pollenz) or anti-Cyp19 (22) antibody, washed, and then incubated with biotinylated donkey anti-rabbit immunoglobulin G for 3 h at room

temperature. After being washed, sections were incubated with horseradish peroxidase-conjugated streptavidin and visualized with diaminobenzidine for 4 min at room temperature.

ChIP assay. We performed chromatin immunoprecipitation (ChIP) as previously described (46, 48), with the following modifications. Briefly, to fix the chromatin-protein complexes, ovaries isolated from $AhR^{+/+}$ and $AhR^{-/-}$ females treated with PMSG and hCG (hCG + 2 h) were punctured with a needle containing Dulbecco's modified Eagle's medium (DMEM)-Ham F-12 medium-1% FBS with 1% formaldehyde immediately after removal. After fixation was stopped in 125 mM glycine, the suspension of ovarian cells was filtered through a 70-µm cell strainer (Falcon). The isolated granulosa cells were then resuspended in lysis buffer (50 mM HEPES [pH 7.4], 140 mM NaCl, 1 mM EDTA, 10% glycerol, 0.5% NP-40, 0.25% Triton X-100). Nuclei were recovered by centrifugation at 4°C for 30 min. After dissolution in Tris-EDTA (10 mM Tris-HCl [pH 7.4], 0.1 mM EDTA), nuclei were sonicated to shear genomic DNA to approximately 1-kb fragments. Sheared chromatin-DNA complexes were then subjected to immunoprecipitation with either anti-AhR or anti-Ad4BP antibody (41). DNA was extracted from the precipitates by incubation with proteinase K at 65°C, followed by treatment with phenol-chloroform. Presence of the *Cyp19* promoter region was determined by PCR with the appropriate primer sets, indicated below.

Transfection and luciferase assay. The 5'-flanking regions of the human *CYP19* and mouse *Cyp19* genes were inserted into the pGL3-basic vector (Invitrogen) to generate h*CYP19*-3853Luc and m*Cyp19*-5335Luc, respectively. Human embryonic kidney-derived 293 cells were grown in DMEM (Sigma, St. Louis, Mo.) supplemented with 10% fetal bovine serum (FBS) at 37°C in 5% CO_2. Cells were plated at approximately 15% confluence 1 day before transfection. Transfections were conducted in triplicate in 24-well plates by using Lipofectamine Plus (Gibco BRL, Gaithersburg, Md.), according to the manufacturer's protocol. Each well received 500 ng reporter plasmid, 10 ng of the reference pBOS-LacZ vector, and one of various concentrations (0 to 50 ng) of the expression plasmid encoding either AhR, Arnt, the AhR repressor (AhRR) (36), or Ad4BP/SF-1 (39). Cells were treated for 3 h with lipofection reagent in DMEM without serum and then incubated for 48 h in DMEM-10% FBS with or without 3MC (Wako, Japan). Cells were harvested and subjected to luciferase and ß-galactosidase assays. All luciferase activities were normalized to the corresponding ß-galactosidase activities. Values are represented as the means ± standard deviations (SD) of three independent experiments.

Immunoprecipitation assay. The full-length cDNAs encoding AhR and Ad4BP/SF-1 were inserted into the expression vectors p3xFLAG-CMV-10 (Sigma) and pEGFP-c1 (Clontech) to generate 3xFLAG-AhR and EGFP-Ad4BP, respectively. These plasmids (1 µg) were cotransfected into 293 cells with the expression vector encoding Arnt as described above. An enhanced green fluorescent protein (EGFP) expression vector was included in the transfection as a control. Forty-six hours after transfection, 1 µM of 3MC was added to stimulate nuclear translocation of AhR. After a 2-h incubation, cells were harvested in lysis buffer (50 mM Tris-HCl [pH 8.0], 300 mM NaCl, 1.5 mM $MgCl_2$, 1 mM EDTA, 1% Triton X-100, 10% glycerol) containing 1x Complete protease inhibitor cocktail (Roche) (30). FLAG-tagged and associated proteins were immunoprecipitated from whole-cell extracts (400 µg) by using anti-FLAG M2-agarose affinity gel (Sigma) in immunoprecipitation buffer (50 mM Tris-HCl [pH 8.0], 150 mM NaCl, 1.5 mM $MgCl_2$, 1 mM EDTA, 1% Triton X-100, 10% glycerol) containing 1x Complete protease inhibitor cocktail. Isolated proteins were subjected to immunoblotting with an anti-GFP antibody (MBL, Nagoya, Japan).

PCR conditions. Primer pairs used for semiquantitative reverse transcription- PCR (RT-PCR) were as follows: AhR(fwd), 5'-CGC GGG CAC CAT GAG CAG-3'; AhR(rev), 5'-CTG TAA CAA GAA CTC TCC-3'; AhRR(fwd), 5'-GCT TTC TGT CCT GCG CCT C-3'; AhRR(rev), 5'-GAA GTC CTG CCG GTC ATC C-3'; Cyp19(fwd), 5'-TCA ATA CCA GGT CCT GGC TA-3'; Cyp19(rev), 5'-GTA TGC ACT GAT TCA CGT TC-3'; P450scc(fwd), 5'-CGA ATC GTC CTA AAC CAA GAG-3'; P450scc(rev), 5'-CAC TGA TGA CCC CTG AGA AAT-3'; 3ß HSD(fwd), 5'-ACT GCA GGA GGT CAG AGC T-3'; 3ß HSD(rev), 5'-GCC AGT AAC ACA CAG AAT ACC-3'; P450 17α (fwd), 5'-GGG GCA GGC ATA GAG ACA ACT-3'; P450 17α(rev), 5'-GGG TGT GGG TGT AAT GAG ATG-3'; $P27^{kip1}$(fwd), 5'-AAG CGG ATC ACC CCA AGC CT-3'; $P27^{kip1}$(rev), 5'-GTT GGC GGT TTT GTT TTG CG-3'; C/EBPß(fwd), 5'-TCT ACT ACG AGC CCG ACT GCC T-3'; C/EBPß(rev), 5'-AGCTTG TCC ACC GTC TTC TT-3'; GAPDH(fwd) (GAPDH, glyceraldehyde-3-phosphate dehydrogenase), 5'-GGC ATG GCC TTC CGT GTT CCT-3'; GAPDH(rev), TCC TTG CTG GGG TGG GTG GTC-3'; ß-actin(fwd), 5'-ATG GAT GAC GAT ATC GCT-3'; and ß-actin(rev), 5'-ATG AGG TAG TCT GTC AGG T-3'. Thermal-cycling conditions were as follows: 28 cycles of 30 s at 94°C, 30 s at 60°C, and 1 min at 72°C for the amplification of AhR, $P27^{kip1}$, and C/EBPß; 32 cycles of 30 s at 94°C, 30 s at 58°C, and 1 min at 72°C for AhRR; 25 cycles of 30 s at 94°C, 30 s at 60°C, and 1 min at 72°C for Cyp19, P450scc, 3ß HSD, and P450 17α; and 22 cycles of 30 s at 94°C, 30 s at 60°C, and 1 min at 72°C for GAPDH and ß-actin. Quantitative RT-PCR was performed with a TaqMan gene expression assay (Applied Biosystems) on a 7500 real-time PCR system (Applied Biosystems). Thermal-cycling conditions were 50 cycles of 15 s at 95°C and 1 min at 60°C.

Primer pairs used for ChIP assays were as follows: XRE of Cyp19 (fwd), TGA GAG TGA ACT GCA GGA AG-3'; XRE of Cyp19 (rev), ACC TCA TGG CTA AGG CAA TG-3'; Ad4 of Cyp19 (fwd), ATA AGG AGG ATT GCC TCA GC-3'; Ad4 of Cyp19 (rev), GCT CCT GTC ACT TGG AAG GG-3'; -2740~-2441 of Cyp19 (fwd), GAC TTT GCA TAG AGA CTT GG-3'; -2740~-2441 of Cyp19 (rev), CTG TTT AGT GTT GTC AAT GC-3'; ß-actin(fwd), AGG GTG TGA TGG TGG GAA TGG-3'; and ß- actin(rev), TGG CTG GGG TGT TGA AGG TCT-3'. Thermal-cycling conditions were 32 cycles of 30 s at 94°C, 30 s at 62°C, and 1 min at 72°C.

RESULTS

Phenotype of AhR$^{-/-}$ females related to reproduction. The reproductive defects of AhR$^{-/-}$ females have remained controversial (1). We therefore examined if fertility was impaired in the AhR$^{-/-}$ females used in this study. To avoid experimental variation due to genetic background, we used AhR knockout (AhR KO) mice backcrossed to C57BL/6J mice for more than eight generations. For 3 months, AhR$^{+/+}$ and AhR$^{-/-}$ females were mated with AhR$^{+/+}$ or AhR$^{+/-}$ males, and the number of pups delivered was counted. Using eight randomly selected AhR$^{+/+}$ and AhR$^{-/-}$ females, the total number of pups delivered by the AhR$^{+/+}$ females was 213, while those delivered by AhR$^{-/-}$ females was 57 (Table 1). The average litter size of AhR$^{-/-}$ females was approximately 40% that of the wild type. None of the AhR$^{-/-}$ females examined bore a third litter, and one of these mutant animals was unable to deliver pups during the mating period. Although levels of reproductive activity varied among individuals, these results clearly indicated a decreased fertility of AhR$^{-/-}$ females.

View this table: TABLE 1. Distribution of pups by female genotype

To explore the causes of AhR$^{-/-}$ subfertility, we histologically examined the reproductive organs. Examination of the organs revealed a reduction of the ratio of ovarian weight to body weight in the AhR$^{-/-}$ females to 56% of that seen in the wild-type animals (0.055 ± 0.010% for AhR$^{+/+}$ versus 0.031 ± 0.003% for AhR$^{-/-}$, $n = 3$, $P < 0.05$). In contrast, the uterus appeared to be unaffected (0.272 ± 0.030% for AhR$^{+/+}$ versus 0.294 ± 0.049% for AhR$^{-/-}$, $n = 3$) (Fig. 1A and B). Based on histological analyses, the ovaries of AhR$^{-/-}$ animals developed follicles up to the antral/preovulatory stage in the presence of slightly hypoplastic interstitial cells (Fig. 1C). The corpus luteum, however, was barely detectable in AhR$^{-/-}$ ovaries. As the corpora lutea develop from postovulatory follicles,

this observation implied a failure in a final step of follicular maturation and/or ovulation.

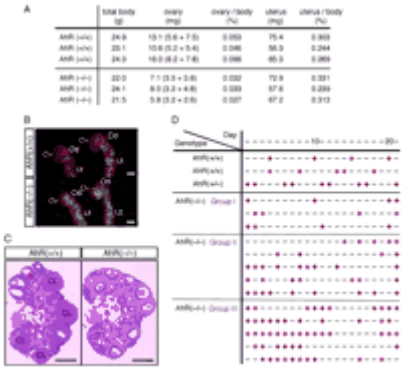

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FIG. 1. Estrus cycle and folliculogenesis affected in $AhR^{-/-}$ ovaries. (A) Ovarian and uterine wet weights of $AhR^{+/+}$ and $AhR^{-/-}$ females. The ovaries and uteri isolated from 9-week-old mice were weighed. The ratios of ovarian or uterine wet weight to total body weight are also indicated. Three $AhR^{+/+}$ and $AhR^{-/-}$ mice each were examined in this experiment. (B) Morphologies of the reproductive tracts of 9-week-old $AhR^{+/+}$ and $AhR^{-/-}$ females. The ovaries are outlined in broken yellow lines. Ov, Od, and Ut indicate the ovary, oviduct, and uterus, respectively. Bar, 1 mm. (C) Histological analysis of the ovaries of $AhR^{+/+}$ and $AhR^{-/-}$ mice. Five-micrometer paraffin-embedded sections of $AhR^{+/+}$ and $AhR^{-/-}$ ovaries were stained with hematoxylin-eosin. CL indicates the corpus luteum. Bar, 0.5 mm. (D) Disordered estrus cycles in $AhR^{-/-}$ females. Vaginal smears from $AhR^{+/+}$, $AhR^{+/-}$, and $AhR^{-/-}$ female mice were collected for 21 consecutive days and stained with Giemsa solution. +, proestrus or estrus; -, metestrus or diestrus.

As failures of follicular maturation and ovulation are frequently accompanied by a disordered estrus cycle (29, 58), we then examined if the ovarian estrus cycle proceeds normally in $AhR^{-/-}$ mice (Fig. 1D). In wild-type and $AhR^{+/-}$ mice, the estrus cycle progressed regularly, lasting 4 to 5 days. Although we observed considerable individual variation, $AhR^{-/-}$ females displayed significantly disordered estrus cycles (Fig. 1D), which we classified into three groups. Mice in group I showed a prolonged cycle. In group II, animals exhibited a cycle that was irregularly shortened or prolonged. Unusually prolonged estrus phases were observed for mice classified as group III. Such irregularities were not observed for $AhR^{+/+}$ or $AhR^{+/-}$ mice.

As the HPG axis is crucial for progression of the estrus cycle, we examined the tissues of the HPG axis to determine which region is affected in $AhR^{-/-}$ animals. First, we examined the ability of the ovaries of $AhR^{-/-}$ mice to respond to gonadotropins. $AhR^{-/-}$

females aged 3 and 12 weeks were subjected to a standard superovulation protocol, and the numbers of ovulated oocytes in response to gonadotropin stimulation were counted. In $AhR^{-/-}$ mice, the total number of the ovulated oocytes decreased to approximately one-sixth the level seen for age-matched wild-type females (Table 2). We then examined the production of gonadotropins in the pituitaries of $AhR^{-/-}$ animals by immunohistochemical analysis using an anti-LH antibody (Fig. 2A). LH-immunoreactive gonadotrophs were present in the anterior lobes of the pituitary glands of both $AhR^{-/-}$ and $AhR^{+/+}$ mice. We then investigated the ability of gonadotrophs to secrete LH in response to stimulation with a GnRH agonist, buserelin (des-Gly_{10}-[D-Ser{t-Bu}$_6$]-LH-RH ethylamide). To exclude any feedback effects from the ovaries, animals were ovariectomized prior to experimentation. After subcutaneous injection of buserelin into the ovariectomized mice, we determined the serum LH concentrations. Neither the basal nor the buserelin-induced concentrations differed between $AhR^{+/+}$ and $AhR^{-/-}$ mice, indicating that the ability of $AhR^{-/-}$ gonadotrophs to secrete gonadotropins in response to upstream signals was not impaired (Fig. 2B). These results strongly suggest that the reduced fertility of $AhR^{-/-}$ females was due primarily to ovarian defects.

View this table: TABLE 2. Numbers of ovulated oocytes according to female genotype

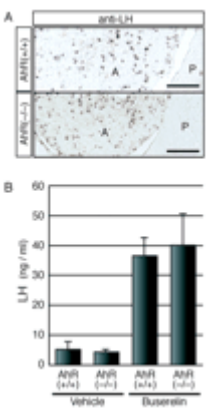

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FIG. 2. Functionally normal gonadotropes of $AhR^{-/-}$ pituitaries. (A) Presence of gonadotrophs in the pituitary anterior lobes of $AhR^{-/-}$ females. Cryosections of pituitaries isolated from $AhR^{+/+}$ and $AhR^{-/-}$ mice were treated with an anti-LH antibody, which should specifically stain pituitary gonadotrophs. A and P represent the anterior and posterior lobes, respectively. Bar, 0.1 mm. (B) Secretion of LH from the gonadotrophs of $AhR^{-/-}$ pituitaries. A GnRH agonist, buserelin (2 µg), or vehicle alone was injected subcutaneously into ovariectomized $AhR^{+/+}$ and $AhR^{-/-}$ females. One hour after injection, serum levels of LH were determined. Values are represented as means ± SD for three to four mice.

Synthesis of estradiol in $AhR^{-/-}$ ovaries is insufficient compared with that of the

wild type. Estradiol is an essential sex hormone for female reproduction, and serum concentrations increase transiently during the preovulatory stage (54). We measured the concentrations of estradiol in the ovaries at three time points during the preovulatory stage (Fig. 3A). As $AhR^{-/-}$ females failed to demonstrate normal estrus cycles, we forced the estrus cycle to proceed by gonadotropin stimulation. In $AhR^{-/-}$ females, the concentrations of intraovary estradiol were decreased to 20 to 30% of the levels seen for wild-type animals at all three time points (Fig. 3B). Testosterone, the precursor of estradiol, was slightly increased in the ovaries of $AhR^{-/-}$ mice in comparison with the concentrations observed for $AhR^{+/+}$ females (Fig. 3C). These observations suggest that the decreases in ovarian estradiol are responsible for the reproductive defects of $AhR^{-/-}$ females. We therefore reasoned that an intraperitoneal injection of estradiol at the appropriate time of the ovulatory cycle would rescue the observed phenotype. $AhR^{-/-}$ mice were treated at day 2 with estradiol in the superovulation protocol (Fig. 3D), and then released oocytes were quantified. Administration of up to 10 ng estradiol to $AhR^{-/-}$ mice partially corrected the decrease in the number of ovulated oocytes in a dose-dependent manner. Administration of 20 ng estradiol failed to increase the number of ovulated oocytes further (Fig. 3E). Although these results clearly indicate that insufficient estradiol at least contributes to $AhR^{-/-}$ subfertility, either the timing or the site of estradiol administration may not have been optimal for full recovery of fertility. Additional factors may also be affected with $AhR^{-/-}$ mice, influencing the reproduction process.

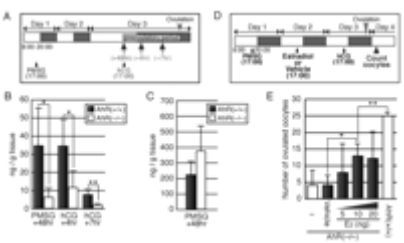

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FIG. 3. Concentrations of intraovarian steroids in $AhR^{-/-}$ females and the rescue of ovulation by estradiol treatment. (A) Schematic representation of the experimental procedure used to determine intraovarian steroid concentrations during the preovulatory period. (B) Intraovarian estradiol concentrations in $AhR^{+/+}$ and $AhR^{-/-}$ females. The ovaries of at least three $AhR^{+/+}$ and three $AhR^{-/-}$ female mice were collected at the times indicated in panel A. Estradiol concentrations were then determined by liquid chromatography-mass spectrometry analysis. *, $P < 0.10$; **, $P < 0.05$. (C) Intraovarian testosterone concentrations were determined as described for panel B. (D) Schematic representation of the experimental estradiol administration procedure used to rescue the ovulation of $AhR^{-/-}$ mice. Mice treated with

PMSG at day 1 were divided into two groups. One group was treated with various quantities of estradiol, while the other group was given vehicle alone on day 2. The mice from both groups were treated with hCG on day 3, and ovulation was assessed at day 4. (E) Effects of estradiol administration on ovulation in $AhR^{-/-}$ females. After the treatment of $AhR^{+/+}$ and $AhR^{-/-}$ females with PMSG and hCG, the oocytes released by ovulation were counted (open bars). $AhR^{-/-}$ females were also given an intraperitoneal injection of 5 to 20 ng 17ß-estradiol (E2) or vehicle alone (filled bars) as described for panel D prior to counting the ovulated oocytes. *, $P < 0.025$; **, $P < 0.005$.

AhR is indispensable for proper expression of the *Cyp19* gene in the ovary. As AhR functions as a transcription factor, the above observations suggested that this receptor is involved in the transcriptional regulation of steroidogenic genes. The expression pattern of AhR during folliculogenesis, however, is largely unknown. We therefore examined AhR expression throughout an artificially produced estrus cycle in wild-type mice (Fig. 4A). AhR mRNA was expressed throughout the preovulatory period. AhRR, a target of AhR transcriptional regulation, represses AhR function (2, 36). Interestingly, the expression of AhRR was upregulated at 6 and 7 h after hCG injection (Fig. 4B), suggesting that, while AhR becomes functionally active after treatment with PMSG, its activity thereafter is repressed by the action of AhRR. We therefore examined the expression of the *Cyp19* gene, whose product is essential for estradiol production, during folliculogenesis. *Cyp19* gene expression was activated 48 h after PMSG treatment and downregulated gradually after hCG treatment. This downregulation appeared to coincide with the induction of AhRR expression.

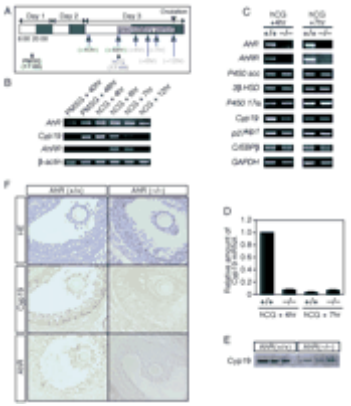

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FIG. 4. AhR regulates the expression of ovarian *Cyp19* during the preovulatory period. (A) Schematic representation of the experimental procedure. The estrus cycle was induced artificially by intraperitoneal injection of PMSG at 1700 h on day 1 and of hCG at 1700 h on day 3. Ovaries were collected 40 and 48 h after PMSG injection or 4, 6, 7, and 12 h after hCG injection (indicated by arrows). (B) Profiles of mRNA expression for AhR, AhRR, and Cyp19 during the preovulatory period. Total RNA samples, prepared from ovaries derived from hormone-treated mice at the indicated times (top), were subjected to RT-PCR with primers sets specific for AhR, AhRR, and Cyp19. ß-Actin mRNA was used as a control. (C) Expression of mRNAs encoding steroidogenic enzymes and proteins involved in ovarian folliculogenesis. Total RNA samples, prepared from the ovaries of hormone-treated $AhR^{+/+}$ and $AhR^{-/-}$ mice at the indicated times (top), were used for RT-PCR with the PCR primers. (D) Quantification of Cyp19 mRNA levels. Total RNA samples, prepared from the ovaries isolated 4 and 7 h after hCG injection, were subjected to quantitative RT-PCR analyses. Three animals were used for this experiment. (E) Expression of Cyp19 protein within $AhR^{+/+}$ and $AhR^{-/-}$ ovaries during the preovulatory period. Whole-cell extracts (10 µg), prepared from the ovaries of hormone-treated (hCG + 5 h) mice, were subjected to Western blot analysis with an anti-Cyp19 antibody. Three $AhR^{+/+}$ and three $AhR^{-/-}$ animals were used for these experiments. (F) Immunohistochemical staining of Cyp19 and AhR in the granulosa cells of $AhR^{+/+}$ and $AhR^{-/-}$ ovaries. Five-micrometer paraffin sections were prepared from the ovaries of hormone-treated (hCG + 5 h) mice. Sections were stained with hematoxylin-eosin (HE) or with anti-AhR or anti-Cyp19 antibody.

We then compared the expression levels of other steroidogenic enzymes within the

ovaries of wild-type and AhR$^{-/-}$ mice at 4 and 7 h after hCG treatment (Fig. 4C). We did not observe any alteration in expression of mRNAs encoding steroidogenic Cyp11A (P450scc), 3ß HSD, and Cyp17 (P450 17α, 17α-hydroxylase) between wild-type and knockout animals at the two time points examined. While Cyp19 mRNA was potently upregulated in wild-type ovaries during the final maturation stage of folliculogenesis induced by hormone treatment (Fig. 4B), expression of this gene was markedly reduced in AhR$^{-/-}$ ovaries, even at 4 h after hCG treatment. Quantitative RT-PCR demonstrated that the expression of Cyp19 in AhR$^{-/-}$ females was reduced by greater than 90% from that of wild-type animals 4 h after hCG treatment (Fig. 4D), indicating that Cyp19 mRNA expression was not upregulated in AhR$^{-/-}$ ovaries during hormone treatment. There were no detectable differences between the wild-type and AhR knockout mice in the expression of either p27^{kip1} or C/EBPß, both of which are involved in ovulation (16, 29, 47, 58). As expected, there was no expression of AhRR mRNA in AhR$^{-/-}$ ovaries at 7 h after hCG treatment. To determine if Cyp19 protein levels were also altered in AhR$^{-/-}$ ovaries, we prepared whole-tissue extracts from hormone-treated ovaries (hCG + 5 h) and subjected these samples to Western blot analysis with an anti-Cyp19 antibody. In agreement with the results of our mRNA expression analysis, we detected decreased levels of Cyp19 protein in the ovaries of AhR$^{-/-}$ mice (Fig. 4E). Consistent with previous reports (53, 62), immunohistochemical staining with anti-AhR and anti-Cyp19 antibodies demonstrated coexpression of AhR and Cyp19 in the granulosa cells of antral follicles (Fig. 4F). We also confirmed by immunohistochemistry that Cyp19 protein levels were diminished in the granulosa cells of AhR$^{-/-}$ ovaries (Fig. 4F).

AhR directly activates *Cyp19* gene transcription in cooperation with an orphan nuclear receptor, Ad4BP/SF-1. As the previously described results strongly suggest the involvement of AhR in *Cyp19* expression, we examined the mechanism by which AhR regulated *Cyp19* gene transcription. The *Cyp19* gene has multiple tissue-specific first exons (23, 33, 55). In the ovary, this gene is transcribed from exon PII (Ex 1d) in a mechanism involving the orphan nuclear receptor Ad4BP/SF-1 (8, 32, 40, 45). The binding site for Ad4BP/SF-1 is conserved within the 5' upstream regions of the human and mouse genes. We also determined that the human *CYP19* and mouse *Cyp19* genes have an AhR/Arnt-binding sequence (XRE) 3,756 and 5,058 bp upstream of the ovary-specific first exon, respectively (Fig. 5A and B). We therefore transiently transfected the expression vectors of AhR, Arnt, and Ad4BP/SF-1 into cultured cells to investigate the promoter function of the *CYP19/Cyp19* genes. While Ad4BP/SF-1 clearly activated *CYP19/Cyp19* gene transcription, cotransfection of AhR and Arnt resulted in only weak activation. Simultaneous expression of AhR/Arnt with Ad4BP/SF-1, however, synergistically activated the Cyp19 promoter (Fig. 5C and D). Subsequent expression of AhRR suppressed the transcription activation induced by AhR (Fig. 5C and D).

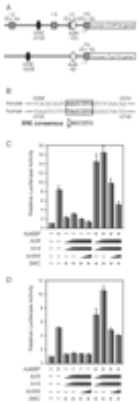

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FIG. 5. Cooperative activation of AhR and Ad4BP/SF-1 on the *Cyp19/CYP19* promoter. (A) Schematic representation of the mouse *Cyp19* and human *CYP19* gene promoter regions. The square boxes indicate the first exons, exons I.2 (Ex 1e), I.6, I.3 (Ex 1c), and PII (Ex 1d), expressed specifically in the placenta, bone, adipose tissue, and ovary, respectively. The filled and open ovals represent the AhR/Arnt-binding (XRE) and Ad4BP/SF-1-binding (Ad4) sequences, respectively. The ovary-specific transcription start site is numbered as +1, and the positions of the XRE and Ad4 sites were numbered as the negative values of their distances from the transcription start site. (B) Nucleotide sequences containing the XRE site from the mouse *Cyp19* and human *CYP19* gene upstream regions. The consensus XRE sequence is indicated in bold letters. (C) Cooperative activation of AhR and Ad4BP/SF-1 on the human *CYP19* gene promoter. Expression plasmids encoding AhR, Arnt, AhRR, and Ad4BP/SF-1 were cotransfected into 293 cells with a reporter plasmid, in which luciferase expression is driven by the *CYP19* promoter (h*CYP19*-3853Luc), in the presence (+) or absence (-) of 3MC. After a 48-h incubation, cells were recovered and subjected to luciferase assays. All values are the means ± SD for three experiments. (D) Cooperative activation of AhR and Ad4BP/SF-1 on the mouse *Cyp19* promoter. m*Cyp19*-5335Luc was used for this assay. All other conditions were as specified for panel C.

The observed synergistic activation of the *CYP19/Cyp19* promoter by AhR/Arnt and Ad4BP/SF-1 implied a physical interaction between these proteins. To verify this interaction, we cotransfected expression vectors encoding 3xFLAG-AhR, Arnt, and EGFP-Ad4BP/SF-1 and then attempted to coimmunoprecipitate these components by using an anti-FLAG antibody. EGFP-Ad4BP/SF-1, but not EGFP, was coimmunoprecipitated with FLAG-AhR (Fig. 6A), indicating a potential physical interaction between AhR/Arnt and Ad4BP/SF-1. To investigate if AhR binds to the XRE within the promoter of *Cyp19* in vivo, we performed a ChIP assay using chromatin isolated from the granulosa cells of gonadotropin-treated ovaries (Fig. 6B). PCR analysis of the immunoprecipitates isolated using an anti-AhR antibody (Fig. 6B) revealed that the XRE of the *Cyp19* gene was associated with AhR in samples derived from wild-type mice but not $AhR^{-/-}$ mice (Fig. 6C). This result clearly indicates that AhR

was recruited to the *Cyp19* promoter in vivo. As the *Cyp19* gene is synergistically activated by AhR/Arnt and Ad4BP/SF-1, we assumed that AhR, Arnt, and Ad4BP/SF-1 physically interact on the *Cyp19* promoter. We next examined whether anti-AhR antibodies precipitate the Ad4 site of the *Cyp19* promoter and whether the anti-Ad4BP/SF-1 antibody reciprocally precipitates the XRE sequence. Both the XRE- and Ad4-containing sequences of the *Cyp19* promoter were recovered in both anti-Ad4BP/SF-1 and anti-AhR immunoprecipitates (Fig. 6D). As a control, the sequence between bp -2740 and -2441 was not recovered in either the anti-AhR or the anti-Ad4BP/SF-1 immunoprecipitate, excluding the possibility that incomplete fragmentation of DNA during chromatin preparation resulted in artifactual coimmunoprecipitation of the Ad4- and XRE-containing sequences. To confirm the interaction between AhR and Ad4BP/SF-1 on the *Cyp19* promoter, we investigated whether the XRE is coimmunoprecipitated with Ad4BP/SF-1 in the $AhR^{-/-}$ chromatin (Fig. 6E). Anti-Ad4BP antibody failed to precipitate the XRE-containing sequence in the absence of AhR, indicating that Ad4BP/SF-1 does not bind directly to the XRE but binds indirectly through interaction with the XRE-bound AhR. In addition, we investigated whether AhR knockout affects Ad4BP/SF-1 binding to the Ad4 site and found that there is no difference in binding of Ad4BP/SF-1 between $AhR^{+/+}$ and $AhR^{-/-}$ mice (Fig. 6E). These results clearly demonstrated that both AhR and Ad4BP/SF-1 bind to their cognate binding sites within the *Cyp19* promoter and physically interact, probably leading to cooperative enhancement of *Cyp19* expression.

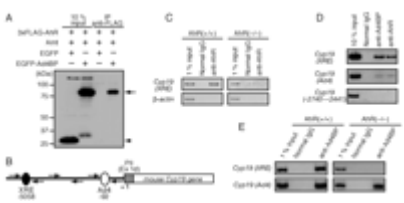

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FIG. 6. Interaction of AhR with Ad4BP/SF-1 on the *Cyp19* promoter. (A) Detection of a physical interaction between AhR and Ad4BP/SF-1 by coimmunoprecipitation. FLAG-tagged proteins from whole-cell extracts of 293 cells transfected with 3xFLAG-AhR, Arnt, and EGFP-Ad4BP were immunoprecipitated (IP) with an anti-FLAG antibody. The immunoprecipitates were then subjected to immunoblotting with an anti-GFP antibody. An EGFP expression vector was transfected as a control. An arrow and an arrowhead indicate the EGFP-Ad4BP and EGFP samples, respectively. (B) Schematic representation of the location of primers used in the ChIP assays. Three sets of primers were used to amplify DNA regions containing the XRE site at -5058 and the Ad4/SF-1 sequence at -92 and a

third unrelated region (-2740 to -2441), containing neither of them, as a control. (C) Binding of AhR to the promoter region of the *Cyp19* gene, revealed by ChIP assays. Soluble chromatin, prepared from preovulatory granulosa cells (hCG + 2 h), was subjected to ChIP assay with an anti-AhR antibody. ß-Actin was used as a negative control. (D) Interaction between AhR and Ad4BP/SF-1 on the *Cyp19* gene promoter. Chromatin isolated from preovulatory granulosa cells was incubated with anti-AhR or anti-Ad4BP/SF-1 antibody and then subjected to PCR with two sets of primers amplifying the XRE and Ad4 sites. A primer pair specific for the sequence from -2740 to about -2441 was used as a control. (E) Binding of Ad4BP/SF-1 to the XRE and Ad4 sites in the presence or absence of AhR, revealed by ChIP assays. Chromatin isolated from preovulatory granulosa cells of the $AhR^{+/+}$ and $AhR^{-/-}$ ovaries was incubated with anti-Ad4BP/SF-1 or control antibody and then subjected to PCR to amplify the XRE and Ad4 sites. IgG, immunoglobulin G.

AhR ligands exerted an estrogenic effect by aberrantly activating *Cyp19* gene expression. While *Cyp19* is expressed transiently at a particular time point in the preovulatory period, AhR is constitutively expressed in granulosa cells. Inadvertently introduced AhR ligands may exert an estrogenic effect by aberrantly upregulating *Cyp19* expression in the ovary. To examine this possibility, we administered DMBA, an AhR ligand, to randomly selected female mice regardless of estrus cycle phase. After a 5-h treatment, we examined the expression of Cyp19 mRNA in the ovary. In a normal estrus cycle, expression of Cyp19 and the resultant estradiol production are induced transiently at proestrus. We observed that Cyp19 mRNA accumulated at proestrus but not at other phases of the estrus cycle in the ovaries of wild-type female mice (Fig. 7A and B). DMBA effectively induced *Cyp19* expression at most of the cycle phases except for metestrus. This reagent, however, failed to induce *Cyp19* gene expression in the ovaries of $AhR^{-/-}$ mice. Thus, AhR appears to have the potential to activate *Cyp19* gene

transcription inappropriately in response to exogenous ligands, even when intrinsic estrogen synthesis should not be stimulated.

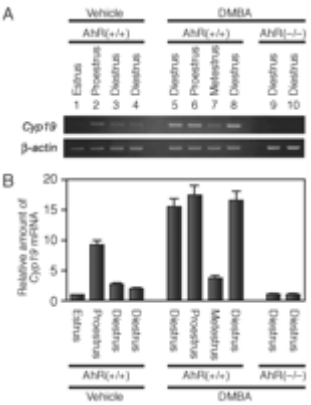

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FIG. 7. Upregulation of *Cyp19* expression by an exogenous AhR ligand, DMBA. (A) Expression of *Cyp19* induced by intraperitoneal injection of DMBA. $AhR^{+/+}$ (lanes 1 to 8) or $AhR^{-/-}$ (lanes 9 and 10) female mice were injected intraperitoneally with DMBA (50 mg/kg of body weight) or vehicle alone. Five hours after injection, we prepared total RNA from the ovaries. The amounts of *Cyp19* mRNA were then evaluated by RT-PCR. The estrus cycle phase of each animal was determined by observing vaginal smears collected just before injection of DMBA. ß-Actin was used as a control. (B) Quantitative representation of *Cyp19* mRNA levels. Quantification of the *Cyp19* transcript was performed by using a 7500 real-time PCR system (Applied Biosystems, Japan).

DISCUSSION

In agreement with a previous report (1), $AhR^{-/-}$ females demonstrated compromised fertility. The number of delivered pups was clearly decreased in comparison to those delivered by wild-type animals. As the phenotype of *AhR* gene disruption suggested a novel physiological function for AhR, in addition to its well-established xenobiotic metabolizing function, we investigated the molecular mechanisms underlying defective fertility in $AhR^{-/-}$ female mice.

Reproductive defects seen with $AhR^{-/-}$ female are primarily due to insufficient synthesis of estradiol in the ovary. Abbott et al. described that $AhR^{-/-}$ females exhibited difficulties in maintaining conceptuses during pregnancy (1), while Benedict et al. reported that AhR deficiency affected follicular maturation and ovulation under normal growth conditions (3, 4). Our studies indicated that follicles present in the ovaries of $AhR^{-/-}$ mice developed to an antral/preovulatory stage, while the corpus

luteum was barely detectable. Upon stimulation of superovulation, the number of ovulated oocytes in AhR$^{-/-}$ females was significantly lower than those seen with the wild type. In conjunction with the observations of Benedict et al., these results suggested that the reduced fertility of AhR$^{-/-}$ females was a consequence of ovarian defects during the period of late folliculogenesis to follicular rupture.

Both implantation and follicular maturation are highly dependent on estrogenic action (12). The phenotype of AhR$^{-/-}$ mice suggested the hypothesis that the observed reproductive failure might be induced by the disruption of genes involved in estrogen production or action. The ovaries of ArKO mice were reported to contain many large follicles filled with granulosa cells, with an absence of a corpus luteum (17). ER$\alpha\beta$KO female mice (14), completely lacking a receptor-mediated response to estrogen, failed to induce preovulatory follicle formation after superovulation treatment. The female reproduction defects of ArKO and ER$\alpha\beta$KO mice resembled those of AhR KO mice, albeit with a more severe phenotype. The similarities between these phenotypes strongly suggested that AhR KO mice have deficits in estrogen production or action. After hypothesizing that estradiol production in the preovulatory period was affected in AhR KO females, we determined that intraovarian estrogen concentrations during the preovulatory stages were decreased in AhR$^{-/-}$ females. Administration of estradiol increased the number of ovulated oocytes in AhR$^{-/-}$ females, suggesting that the subfertility of AhR$^{-/-}$ mice results primarily from reduced levels of ovarian estrogen.

***Cyp19* gene transcription mediated synergistically by AhR and Ad4BP/SF-1.** Ovarian sex steroids, such as estrogen and progesterone, are synthesized from cholesterol through multiple reactions in the ovary. Investigation of steroidogenic gene expression revealed that *Cyp19* expression was significantly reduced in AhR$^{-/-}$ females. Immunohistochemical and immunoblotting analyses confirmed the reduced levels of Cyp19 in granulosa cells. As Cyp19 is the rate-limiting enzyme in estrogen synthesis, it is likely that the reduced estradiol concentrations result primarily from lower levels of Cyp19 synthesis in the ovaries of AhR$^{-/-}$ females.

The *Cyp19* gene has multiple tissue-specific first exons (23, 33, 55). A survey of the 5' sequence upstream of the ovary-specific first exon revealed the presence of a potential XRE sequence in both human and mouse genes. The presence of such an XRE sequence has recently been reported to occur within the promoter of the fish ovarian-type *CYP19* genes, although a functional analysis remains to be performed (7, 27, 59, 60). The conservation of XRE among a variety of animal species, however, suggests functionality of this sequence in the ovary-specific expression of *Cyp19*. In this study, we substantiated this hypothesis by transient transfection and ChIP assays. In addition,

the *Cyp19* gene proximal promoter contained a functional Ad4/SF-1 site (32). Our investigation of the functional correlation between Ad4BP/SF-1 and AhR revealed that these factors cooperatively enhanced *Cyp19* gene transcription. This synergistic action resulted from a physical interaction, revealed by coimmunoprecipitation and ChIP assays.

Recently, another orphan nuclear receptor, LRH-1 (*l*iver *r*eceptor *h*omologue 1), has been reported to be selectively expressed in ovarian granulosa cells (15, 24) and to transactivate the ovary-specific *Cyp19* promoter in transient transfection assays. Structurally, LRH-1 exhibits homology with Ad4BP/SF-1, and the recognition sequences of these proteins are quite similar. Using the Ad4/SF-1 site from the *Cyp19* promoter as a probe, however, electrophoretic mobility shift assays revealed that Ad4BP/SF-1 is the dominant binding factor (9, 10, 15). These observations suggest that Ad4BP/SF-1 and LRH-1 play distinct roles in the regulation of target gene transcription. As LRH-1 is involved in cell proliferation via regulation of cyclin D1 and E1 gene expression (5), further investigations are needed to clarify the function of LRH-1 in the AhR-mediated expression of *Cyp19* in the ovary.

Role of negative feedback regulatory loop formed by AhR and AhRR. AhRR is one of the downstream targets of AhR transcriptional regulation (2, 36). Structurally, AhRR belongs to a family of bHLH-PAS transcription factors and suppresses AhR-mediated transactivation by competing with AhR for heterodimer formation with Arnt. This study confirmed the suppressive function of AhRR on *Cyp19* gene expression. The expressions of both AhRR and *Cyp19* are similarly regulated by AhR via binding of AhR to the XRE sequences in their promoters. Superovulation experiments, however, revealed that the *Cyp19* gene displayed an earlier peak of expression (reaching a maximum at 48 to 52 h after gonadotropin [PMSG] treatment) than AhRR, which was upregulated as *Cyp19* expression began to decline. Although the mechanisms producing this time lag of AhRR expression are unknown, cyclic expression of *Cyp19* in the estrus cycle could be explained by a lag in AhRR synthesis. From these observations, it is possible that AhR and AhRR regulate the ovarian biological clock governing the estrus cycle. In support of this possibility, it is interesting to note that expression of CLOCK and BMAL1 (Arnt3), two members of the bHLH-PAS family (to which AhR and AhRR belong), in the suprachiasmatic nuclei of the hypothalamus regulates the expression of their inhibitors, PERs, to generate the biological clock governing circadian rhythms (31).

In a normal ovarian cycle, the expression levels of AhR appear to be constant. Thus, to transactivate the expression of *Cyp19* and AhRR, AhR may also need to be activated.

Although a number of endogenous ligands have been reported to activate AhR (13), the identity of the endogenous ligand required for the activation of AhR in the ovary and the mechanism by which this activation occurs during the estrus cycle remains unknown. In keratinocyte cell lines cultured at low density or in Ca^{2+}-free medium, AhR translocates to the nucleus to activate reporter genes, even in the absence of obvious AhR ligands (25). The activation of AhR by phosphorylation has been suggested for such cases (26).

Estrogenic effect of AhR ligand through two distinct mechanisms. In this study, we characterized the subfertility phenotype of $AhR^{-/-}$ female mice, identifying the key role of AhR in *Cyp19* gene transcription controlling the temporal synthesis of ovarian estrogen in the estrus cycle. This intrinsic physiological role of AhR provides an explanation for the high degree of AhR conservation throughout vertebrate species. This finding also provides a molecular basis for the estrogenic actions of AhR ligands. DMBA, an AhR ligand, induced *Cyp19* expression, leading to unscheduled increases in estradiol regardless of estrus cycle phase. Recently, functional cross talk was reported between AhR and estrogen receptors (ER) (44), and the ligand-bound AhR exerts estrogenic effects through a direct interaction with nonliganded ER molecules associated with estrogen response elements in target gene promoters. Together with our observations, ligand-bound AhR likely exerts an estrogenic effect via two distinct mechanisms, the stimulation of estradiol production through the activation of *Cyp19* gene expression and the activation of empty ER by AhR coactivation.

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FOOTNOTES

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Effects of endocrine disrupters on the expression of growth hormone and prolactin mRNA in the rainbow trout pituitary

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Abstract

It is now widely accepted that chemical pollutants in the environment can interfere with the endocrine system of animals, thus affecting development and reproduction. Some of these endocrine disrupters (EDs) can have estrogenic or anti estrogenic effects. Most studies to date have focused on the effects of EDs on the reproductive system and sex hormones and only limited information exists on how EDs may affect pituitary gland function. A rainbow trout (Oncorhynchus mykiss) pituitary gland culture system was used for studying the effects of EDs on growth hormone (GH) and prolactin (PRL) mRNA expression. We determined that the pituitary glands actively synthesized and secreted GH and PRL over the experimental time-course. In addition, we found that treatment with 17¥â-estradiol (positive control) increased levels of GH and PRL mRNA, in a concentration-dependent manner. Treatment of pituitary glands with 500 and 1000 nM of a xenoestrogen, o,p¡Ç-DDT (o,p¡Ç-dichlorodiphenyltrichloroethane), resulted in a significant induction of GH and PRL mRNA, with a 20-fold increase for PRL and 3-fold increase for GH following treatment with 1000 nM o,p¡Ç-DDT. Co-incubation of pituitary glands with ICI 182 780 (a selective estrogen receptor antagonist) and o,p¡Ç-DDT resulted in inhibition of PRL mRNA levels; however, the stimulatory effect of DDT on GH mRNA was not seen in this experiment, nor was the inhibitory effect of ICI 182 780 observed with GH mRNA. To the contrary, ICI 182 780 (2.5 nM) had a stimulatory effect on GH mRNA levels. TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin), which is known to exert antiestrogenic effects, had an estrogenic-like effect that resulted in a concentration-dependant increase in the levels of GH and PRL mRNA. Co-incubation of pituitaries with TCDD and ¥á-napthoflavone (ANF), which is an inhibitor of the aryl hydrocarbon receptor (AhR), caused an inhibition of TCDD-induced PRL mRNA at the higher and lower concentrations, but these effects were less consistent on GH mRNA levels. However, the responses of PRL and GH mRNA to co-incubation with TCDD and ANF, at the various concentrations, were bi-phasic wherein stimulation was seen at the low concentrations and inhibition at the high concentrations. Combined, these results suggest that o,p¡Ç-DDT and TCDD are xenoestrogens and that their effects on the expression of GH and PRL genes in the rainbow trout pituitary are modulated, in part, through the ER and AhR, respectively.

Keywords: Endocrine disruptor; Growth hormone; Prolactin; Pituitary gland organ culture

1. Introduction

Endocrine disrupters (EDs) are pollutants that can act as agonists or antagonists to natural hormones. EDs have been intensively studied for their actions as estrogen mimetics wherein they work by binding to the estrogen receptor, thus affecting estrogen-regulated cellular and reproductive processes (Datson et al., 1997 and Witorsch, 2002). Increasing evidence suggests that aquatic vertebrates, which are widely exposed to EDs, may have altered endocrine physiology and impairment of reproductive processes (Guillette and Gunderson, 2001). For example, juvenile alligators exposed to organochlorine contamination in Lake Apopka (Florida) displayed abnormalities in male and female gonads and altered sex steroid levels (Guillette et al., 1994 and Guillette et al., 1995). In feral fish, male roach, with ovotestis, were found in heavily contaminated rivers in the United Kingdom (Sumpter and Jobling, 1995 and Tyler et al., 1998) and vitellogenin has been detected in male fish in contaminated water bodies in both North America and Europe (Kavanaugh et al., 2004 and Purdom et al., 1994). Vitellogenin is an egg yolk precursor protein normally seen only in female fish and its presence in male fish is used as a biomarker for exposure to estrogenic compounds (Matthiessen and Sumpter, 1998).

DDT (dichlorodiphenyltrichloroethane) is one of the most well studied, estrogenic, environmental pollutants. Since the 1960s, reproductive impairments such as feminization of male birds or eggshell thinning have been linked to exposure to DDT (Fry, 1995 and Fry and Toon, 1981). Most of the estrogenic action of DDT has been attributed to one of the isomers *o,p*¡Ç-DDT which binds the estrogen receptor (ER) and which comprises about 20% of the commercial DDT preparations (Soto et al., 1994). In lower vertebrates, microinjection of medaka eggs with *o,p*¡Ç-DDT was shown to cause sex reversal of genetic males to a female phenotype, with functioning ovaries and were capable of breeding (Edmunds et al., 2000). Furthermore, *o,p*¡Ç-DDT has been shown (in vivo) to induce vitellogenin production in male rainbow trout and tilapia (Edmunds et al., 2000).

In contrast to estrogenic compounds, other environmental contaminants such as 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) have tissue-specific antiestrogenic effects in vitro and in vivo. In mice, in utero exposure to TCDD caused decreases in uterine weight, higher incidence of ovarian and mammary tumors, and other reproductive abnormalities (Gray et al., 1995). Carp hepatocytes treated in vitro with TCDD showed decreasing levels of vitellogenin secreted into the culture medium (Smeets et al., 1999), further suggesting an antiestrogenic action.

Endogenous steroid hormones such as 17¥â-estradiol, affect the hypothalamus–pituitary–gonad axis by positive and negative feedback (Arukwe, 2001). The pituitary gland synthesizes and secretes many hormones that regulate organismal physiology directly or indirectly via regulating other endocrine glands (Arukwe, 2001). Growth hormone (GH) and prolactin (PRL) are peptide hormones produced by pituitary gland. These hormones play important roles in controlling growth, osmoregulation, metabolism, reproduction and development in all vertebrates (Björnsson, 1997, Bole-Feysot et al., 1998, Manzon, 2002, McCormick, 2001, Sakamoto et al., 1993, Scanes and Daughaday, 1995 and Scanes and Harvey, 1995).

Studies have shown that the promoter regions of vertebrate GH and PRL genes contain estrogen response elements (ERE) and the expression and release of PRL is modulated by estrogen (Borski et al., 1991, Williams and Wigham, 1994 and Yang et al., 1997b). In addition, secretion of GH from the pituitary has been shown to be modulated, in mammals and fish, by sex steroids especially 17¥â-estradiol (Trudeau et al., 1992, Veldhuis and Bowers, 2003 and Zou et al., 1997). It is therefore plausible that xenoestrogens and antiestrogenic pollutants may also affect pituitary gland function by affecting the synthesis and secretion of GH and PRL. Indeed, recent work has shown that a number of EDs influence pituitary PRL gene expression and release in mammalian pituitary cell lines and in rats (Abraham and Frawley, 1997, Rousseau et al., 2002 and Steinmetz et al., 1997), however, very little is known about the effects of EDs on teleost pituitary function, particularly DDT and TCDD.

Anadromous salmonids undergo a complex process during the parr-smolt transformation that requires changes in physiology, morphology, growth, and metabolism, which enables adaptation to seawater. Many hormonal regulators are involved including gonadal steroids, cortisol, GH, and PRL (Dickhoff, 1993, Hoar, 1988 and McCormick, 1994). GH is known to stimulate seawater adaptability, while PRL inhibits seawater adaptability and changes in the balance between these two hormones can adversely impact osmoregulatory capacity. To address this concern, researchers have begun to examine the effects of steroids and EDs on salmonid physiology, using growth, smoltification, and osmoregulation as study end-points (Arsenault et al., 2004, J©ªrgensen et al., 2004, Madsen et al., 2004 and Moore et al., 2003). Despite promising findings, which indirectly suggest that estrogen and EDs influence these physiological processes, no conclusive links have been made between ED exposure and changes in the pituitary hormones (GH and PRL) that regulate smoltification and seawater tolerance in salmonids.

The regulation of the teleost pituitary is highly analogous to that of higher vertebrates (Harvey, 1993 and Nishioka et al., 1988). Organ culture techniques for the rainbow trout pituitary gland are well established and, therefore, are an excellent model for the analysis of the direct effects of xenobiotics on the pituitary hormone synthesis in salmonids. The goal of this work was to examine the effects of estrogen (positive control), the xenoestrogen *o,p*¡Ç-DDT and the antiestrogen, dioxin (TCDD), on pituitary hormone gene expression. We report the effects of estrogenic and/or antiestrogenic EDs on pituitary GH and PRL mRNA expression in the rainbow trout.

2. Materials and methods

2.1. Animals

Male and female rainbow trout were obtained from the Quinnebaug trout hatchery, Plainfield, CT, USA. Fish used in this study were 12–18 months old with fairly uniform body weights (200–300 g) and were comprised of both sexes. Fish were maintained in the fish culture facility at the University of Connecticut in tanks with partial recirculation of fresh water (12–14 ¡ÆC) under the photoperiod of 12 h light/12 h dark for a minimum of 2 weeks before use. Fish were fed to satiety, once a day, with pelleted trout feed (Melick aqua feeds, Catawissa, PA, USA). Food was with held 24 h before the pituitary glands were removed.

2.2. Reagents and chemicals

Phenol red free minimum essential medium (MEM) and methionine free MEM were obtained from Sigma Chemical (St. Louis, MO). Penicillin-G, streptomycin, 17¥â-estradiol, and protease inhibitor cocktail were also obtained from Sigma Chemical. TCDD, *o,p*¡Ç-DDT, ICI 182 780 and alphanapthoflavone were purchased from Ultra Scientific (North Kingstown, RI). Cytotox One-membrane integrity assay kit was obtained from Promega (Madison, WI), and [^{35}S]-methionine, [^{32}P]-¥ãATP and [^{32}P]-¥ádCTP were purchased from Amersham Biosciences (Piscataway, NJ). Trizol reagent was purchased from Invitrogen (Carlsbad, CA). 17¥â-estradiol was prepared as a 10 mM stock solution in ethanol, and *o,p*¡Ç-DDT, TCDD, ICI 182 780 and ANF were prepared as 10 mM stock solutions in dimethylsulfoxide (DMSO). Stock solutions were diluted to the required concentrations with phenol red free MEM, and the concentrations of ethanol (for 17¥â-estradiol) and DMSO (for the rest of the chemicals) were maintained below 0.01% of the original stocks.

2.3. Pituitary gland culture

The pituitary glands were removed from the fish following decapitation and the glands were cultured in vitro following conditions described by Yada et al. (1991) with modification. Individual pituitary glands were cultured in 96 well plates, in 200 ¥ìl of phenol red free MEM supplemented with Na-bicarbonate (2.12 g/l), penicillin (100 U/ml) and streptomycin (4 U/ml). The 96 well plates were placed in containers that were gassed with 95% O_2/5% CO_2. The osmolality of the medium was 290 mOsm, which is similar to that of trout plasma. Pituitary gland cultures were incubated at 12–14 ¡ÆC in an orbital shaker and the medium was changed daily. For treatment with 17¥â-estradiol, or other chemicals, pituitary glands were removed from the fish and maintained in culture for 24 h before addition of the test agents. Following the pre-incubation period, media was replaced with media containing the test agents (17¥â-estradiol, *o,p*¡Ç-DDT or TCDD) alone or in combination with estrogen receptor and AhR antagonists, and the glands incubated for an additional 24 h. Antagonists of the estrogen receptor (ICI 182 780) and arylhydrocarbon receptor (AhR) (ANF), were co-incubated with either *o,p*¡Ç-DDT or TCDD. Controls consisted of media with solvent(s) alone. When the pituitary glands were co-incubated with 17¥â-estradiol, and other chemicals, controls contained both ethanol and DMSO. Organ culture medium and pituitaries were harvested and stored at −80 ¡ÆC until assayed. The viability of pituitary glands under the culture conditions was assessed daily for 6 days. Pituitary glands were dissociated with trypsin as described by Chang and Jobin (1994) and the viability of cells assessed by trypan blue exclusion. To examine the integrity of cell structure, pituitary glands were fixed in Bouin¡¯s fixative, embedded in paraffin wax and sectioned into 4 ¥ìM thick sections. Tissue sections were stained with eosin and hematoxylin and analyzed.

2.4. Measurement of GH and PRL mRNA levels

Total RNA from each pituitary was extracted according to the acid phenol guanidinium iso-thiocyanate-method (Chomczynski and Sacchi, 1987), or using Trizol reagent (Sigma Chemical, St. Louis, MO). Total RNA was quantified by UV spectrophotometry. Quality of total RNA obtained from individual pituitary glands was determined using formaldehyde agarose gel electrophoresis. Using Northern blots and dot blots, the cDNA probes for GH and PRL mRNA were found to be specific as previously described (Yang et al., 1997a and Yang and Chen, 2003). For quantification of mRNA levels for GH, PRL and 18S rRNA, 4 ¥ìg of total RNA from each pituitary gland was blotted onto a pre-wetted nylon membrane using a dot blot apparatus as previously described (Tang et al., 2001, Yang et al., 1997a and Yang and Chen, 2003). For quantification of mRNA levels, different concentrations of GH and PRL cRNA

were also included in the blots to ensure that the signal obtained upon probing was specific and in the linear range of detection.

GH and PRL probes were labeled with ¥á-[^{32}P]-dCTP by the random priming method and hybridized to the blots as previously described (Shamblott and Chen, 1993, Yang et al., 1997a and Yang and Chen, 2003). Membranes were sequentially hybridized, following stripping after each hybridization with GH, PRL and then 18S probes. The membranes were then exposed to a Phosphor Imager screen (BioRad, Hercules CA) and the signal obtained was quantified using Quantity-One software (BioRad, Hercules, CA, version 4.4.1).

2.5. Detection of newly synthesized GH and PRL

Pituitary glands were incubated in methionine free MEM for 2 h, followed by incubation for 24 h in MEM containing 20 ¥ìCi [^{35}S]-methionine (SA 1000 Ci/mmol). The pituitary glands were removed from the incubation medium and homogenized in a lysis buffer (1 ml of PBS containing 0.1% triton X-100 and 1 ¥ìl of a 100¡¿ solution of protease inhibitor cocktail p8340) (Sigma, St. Louis, MO). The homogenate was centrifuged at 2000*g* for 15 min, and the supernatant and culture medium were stored in −80 ¡ÆC until use. For immunoprecipitation of [^{35}S]-methionine-labeled pituitary hormones, 50 ¥ìl of a 1:10 dilution of universal GH antiserum or PRL antiserum (Gonzalez-Villasenor and Chen, 1999) was added to 50 ¥ìl of pituitary homogenate, or medium, and incubated at 4 ¡ÆC overnight in a bi-directional shaker. To this, 6 ¥ìg of protein A–agarose beads were added and incubated for an additional 6 h at 4 ¡ÆC. Following washing with lysis buffer twice, the protein A–agarose beads were re-suspended in SDS–PAGE sample buffer containing ¥â-mercaptoethanol (Laemmli, 1970) and boiled for 5 min. The [^{35}S]-methionine-labeled proteins were resolved by SDS–PAGE (4% stacking gel/12% separating gel). The gels were fixed in a solution of 50% methanol and 10% acetic acid for 1 h and then soaked in Amplify Flurographic Reagent (Amersham Biosciences, Piscataway, NJ) for 15 min before drying. The newly synthesized GH and PRL were visualized by exposing the dried gels to X-ray film (Biomax MR, Kodak) for 4 days at −80 ¡ÆC. The X-ray films were scanned with a table top scanner (Hewlett–Packard ScanJet 3C) and images analyzed using Quantity-One software (version 4.4.1, BioRad, Hercules, CA). The percent release was calculated as [density of bands obtained from medium/density of bands obtained from medium + tissue] ¡¿ 100.

2.6. Cytotoxicity assay

Cytotoxicity was determined by measuring the presence of lactate dehydrogenase (LDH) in the culture medium. Briefly, LDH activity was determined by a fluorimetric, 10 min coupled assay that resulted in the conversion of rezasurin to resorufin by the Cyto Tox-One assay kit supplied by Promega (Madison, WI).

2.7. Statistics

Data presented here are representative of two experimental repeats unless otherwise specified in the figure legend. Data are presented as means ¡¾ standard error of the mean. The data were log or arc sin transformed for homogeneity of variance when necessary. Differences among groups were analyzed by one-way analysis of variance (ANOVA), and effects of time and treatment using two-way analysis of variance (ANOVA). For pair wise comparisons, Fisher¡¯s test for least significant difference (FPLSD) was used for only those groups being compared (Steele and Torrie, 1980), whenever significant differences were obtained following ANOVA. Differences between means were considered significant if $P < 0.05$.

3. Results

3.1. Validation of the pituitary gland culture conditions

To analyze the viability of cells from cultured pituitary glands, the pituitary glands were cultured for 6 days and then dissociated into single cells and the viability of the cells assessed by trypan blue exclusion. About 95–99% of cells did not take up trypan blue. Cytological observation of stained sections of pituitary glands maintained in culture for 1–6 days revealed that different regions of the pituitary gland were clearly distinguishable including regions of GH- and PRL-secreting cells (data not shown). To evaluate whether hormone secretion was retained by the cultured pituitary glands, GH that was released into the media was quantified by radioimmunoassay. The pituitary glands released GH up to the 6 days in culture. The pituitary glands secreted GH continuously for up to a week in serum-free medium (100–300 ng/pituitary/day), but levels decreased over time (data not shown).

To rule out the possibility that the glands were merely releasing stored hormones into the culture medium, newly synthesized GH and PRL in the pituitary gland and culture medium was determined by [^{35}S]-methionine incorporation. Pituitary glands contained newly synthesized GH and PRL from days 1 to 7. On all the days assayed, labeled GH and PRL recovered from the medium was (80%) greater than GH or PRL present in the

pituitary gland, showing that the pituitaries actively stored and released newly synthesized GH and PRL (data not shown).

Specificity of the GH and PRL probes was confirmed by Northern blot hybridization. A single transcript was detected with each of the specific probes for GH, PRL and 18S ribosomal RNA, demonstrating probe specificity (data not shown). For quantitative determination of hybridization signals by RNA dot blot hybridization, a standard curve was established for each experiment using serial dilutions of GH or PRL sense cRNA. The signals obtained from the pituitary RNA samples were determined specific and to be within the linear range of the standard curves (data not shown).

To determine if pituitary glands maintained in culture for 24 h were responsive to treatment with 17¥â-estradiol (E_2), a concentration–response study was undertaken to examine the effects of different concentrations of E_2 on GH and PRL mRNA expression. As shown in Figs. 1A and B, E_2 induced significant increases in pituitary GH ($P < 0.001$, one-way ANOVA) and PRL mRNA ($P < 0.001$, one-way ANOVA). Specifically, the highest PRL mRNA levels were seen at the 5 nM of E_2 ($P < 0.01$). There was also a significant ($P < 0.01$), 6-fold, increase in GH mRNA levels at this concentration of E_2 (Fig. 1B). In all subsequent experiments, the 2.5 nM E_2 concentration was used for the positive controls as this produced a significant increase in GH and PRL mRNA levels and this dose is within the linear range of the concentration–response curve.

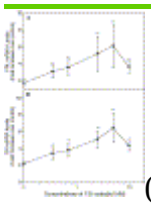
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Fig. 1. Concentration-dependant response of pituitary glands to induction of GH and PRL mRNA by 17¥â-estradiol (E_2). (A) PRL mRNA and (B) GH mRNA in pituitary glands incubated in vitro. The pituitary glands were exposed to E_2 in media for 24 h. Total RNA (4 ¥ìg) from each pituitary gland was dot blotted on to nylon membranes and hybridized with ^{32}P-random-labeled GH and PRL probes and normalized to 18S rRNA. Phosphorimages were analyzed using the Quantity one using software from BioRad. GH and PRL mRNA levels are expressed as fold increase over controls. Data are representative of at least two repeats. Values represent mean ¡¾ SEM ($n = 8$); *$P < 0.05$ and **$P < 0.01$ (ANOVA followed by FPLSD for pair wise comparisons)

represent significant (general *P*-value cut off points) differences from respective controls, at a single time-point.

To assess the responsiveness of pituitary glands to E_2, during several days in culture, the pituitaries were exposed to E_2 every 24 h for 6 days. There were significant effects of E_2 treatment ($P < 0.001$, two-way ANOVA) and incubation time ($P < 0.05$, two-way ANOVA) on PRL mRNA levels, with higher levels occurring at days 1–4 compared with days 5 and 6 (Fig. 2A). There was no significant treatment ¡¿ time interaction on PRL mRNA levels in this experiment. Levels of PRL mRNA, were significantly elevated by E_2 treatment on days 1 ($P < 0.001$, FPLSD), 2 ($P = 0.014$, FPLSD), 3 ($P = 0.02$, FPLSD) and 4 ($P = 0.002$), compared with their time matched controls. Mean control values tended to increase over the time-course, with a significant elevation at day 5 when compared with days 1 ($P = 0.016$, FPLSD), 2 ($P = 0.041$, FPLSD) and 6 ($P = 0.024$, FPLSD). There were significant effects of E_2 treatment ($P < 0.001$, two-way ANOVA) and incubation time ($P = 0.004$, two-way ANOVA) on GH mRNA levels, with higher GH mRNA levels (Fig. 2B) occurring at days 1 ($P = 0.015$, FPLSD), 3 ($P = 0.05$, FPLSD) and 4 ($P = 0.005$, FPLSD), compared with time matched controls. There was no significant ($P = 0.057$) treatment ¡¿ time interaction on GH mRNA levels in this study. In the controls, levels of GH mRNA showed changes with time, with control values on day one being significantly lower than values on days 2 ($P = 0.008$, FPLSD) and 5 ($P = 0.014$, FPLSD) and a decrease with levels on day 6 being lower than levels on day 5 ($P = 0.024$, FPLSD).

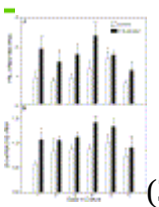
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Fig. 2. Time-course effects of 2.5 nM 17¥â-estradiol (E_2) on GH and PRL mRNA levels in pituitary glands incubated in vitro. (A) Time-course effect of E_2 on PRL mRNA. (B) Time-course effect of E_2 on GH mRNA. Pituitary glands removed from trout were immediately placed in culture medium. After 24 h, the culture medium was replaced with 2.5 nM E_2 in MEM or medium with vehicle alone (for control) and incubated for an additional 24 h. Following this, the glands and culture medium were removed and stored at −80 ¡ÆC for subsequent analyses. The experiment was repeated with pituitary glands maintained in culture from 1 to 7 days. Four micrograms of total RNA was dot

blotted on to nylon membranes and hybridized with GH and PRL probes and normalized to18S rRNA by hybridizing with 18S rRNA oligo probe. Data are representative of at least two repeats. Values are mean ¡¾ SEM values ($n = 8$); *$P < 0.05$ and **$P < 0.01$ represent significant (general P-value cut off points) differences (two-way ANOVA followed by FPLSD for pair wise comparisons) from controls, and ¢Ó$P < 0.05$ represents significant differences between control values at day 1 and days 2–6.

3.2. Effect of *o,p*¡Ç-DDT on Pituitary GH and PRL mRNA Expression

To analyze the effects of EDs on pituitary function, we examined the ability of the estrogenic contaminant *o,p*¡Ç-DDT to influence GH and PRL gene expression. As shown in Figs. 3A and B, both GH ($P < 0.001$; one-way ANOVA) and PRL ($P = 0.003$; one-way ANOVA) mRNA were significantly elevated in a concentration-dependent manner, with the highest levels of PRL ($P < 0.001$, FPLSD) and GH ($P < 0.001$, FPLSD) mRNA expression occurring at a concentration of 1000 nM *o,p*¡Ç-DDT. For subsequent experiments, 750 nM *o,p*¡Ç-DDT was chosen as it was within the linear range of the concentration–response curve and between the two highest concentrations (500 and 1000 mM), where maximal stimulation was seen. When this experiment was repeated, using different fish, PRL and GH mRNA were significantly induced by *o,p*¡Ç-DDT (data not shown); however, while the fold induction of GH and PRL mRNA was lower in these studies, the concentration-dependent trend of increased GH and PRL mRNA levels, to *o,p*¡Ç-DDT treatment, was maintained.

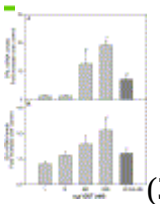
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Fig. 3. Concentration–response effect of *o,p*-DDT on mRNA levels of (A) PRL mRNA and (B) GH mRNA in pituitary glands incubated in vitro. Pituitary glands removed from trout were immediately placed in culture medium. After 24 h, the culture medium was replaced with the media containing different concentrations of *o,p*¡Ç-DDT. The glands were incubated with media containing *o,p*¡Ç-DDT for an additional 24 h. Following this, the glands and culture medium were removed for analysis. Controls consisted of media with vehicle alone and 2.5 nM of 17¥â-estradiol as a positive control. Total RNA was extracted and dot-blotted on to nylon membranes. GH and PRL

signals were normalized to 18S rRNA levels. Levels of GH and PRL mRNA are represented as fold induction over control and data are representative of at least two repeats. Values are represented as means ¡¾ SEM (n = 7); *P < 0.05 and ** P < 0. 01 for significant (general P-value cut off points) increase in mRNA levels over controls (ANOVA followed by FPLSD for pair wise comparisons).

To test whether the stimulatory effect of *o,p*¡Ç-DDT on GH and PRL mRNA levels was mediated through binding with the estrogen receptors, ICI 182 780, a known estrogen receptor antagonist, was co-incubated at various concentrations (1.25, 2.5 and 5.0 nM) with 750 nM *o,p*¡Ç-DDT. As shown in Fig. 4A, there were significant (P = 0.001; one-way ANOVA) effects of E_2, *o,p*¡Ç-DDT and ICI 182 780 on PRL mRNA levels. As a positive control, pituitaries were incubated with 2.5 nM E_2, which resulted in a significant (P < 0.001; FPLSD) induction of PRL mRNA levels, and the addition of 2.5 nM of ICI showed that the E_2-induced PRL gene expression was also significantly (P = 0.009, FPLSD) inhibited by ICI (Fig. 4A). Additionally, incubation of pituitary glands with 750 nM *o,p*¡Ç-DDT resulted in a significant (P < 0.05, FPLSD) elevation in PRL mRNA levels, compared with controls. Furthermore, the addition of ICI 182 780 to pituitaries incubated with 750 nM of *o,p*¡Ç-DDT, resulted in a significant decrease in PRL mRNA levels at the ICI 182 780 concentrations of 1.25 nM (P < 0.05, FPLSD), 2.5 nM (P = 0.04, FPLSD) and 5 nM (P = 0.04, FPLSD) used in this study.

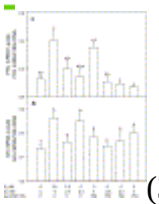
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Fig. 4. Effect of the estrogen receptor antagonist ICI 182 780 on 17¥â-estradiol (E_2) and *o,p*¡Ç-DDT induced PRL mRNA and GH mRNA levels. (A) Effect of ICI 182 780 on PRL mRNA. (B) Effect of ICI 182 780 on GH mRNA. Following a 24 pre-incubation period, pituitary glands were then co-incubated (media replaced with test agents and solvents for control) with E_2 and ICI 182 780, *o,p*¡Ç-DDT and ICI 182 780 or *o,p*-DDT and ICI 182 780 alone for an additional 24 h. Negative controls consisted of solvent only. Four micrograms of total RNA was dot blotted on to nylon membranes and hybridized with GH and PRL probes against GH and PRL mRNA and normalized to18S rRNA by hybridizing with 18S rRNA oligo probe. Values represent mean ¡¾ SEM (n = 6) obtained from one experiment. Groups with different alpha characters (a–e) are

significantly ($P < 0.05$, a general P-value cut off) different from other groups (one-way ANOVA followed by FPLSD for pair wise comparisons).

Pituitary GH mRNA levels were significantly ($P < 0.01$; one-way ANOVA) elevated by E_2 treatment and ICI 182 780 treatment. Specifically, the stimulatory effect of E_2 was significantly ($P < 0.01$, FPLSD) attenuated when ICI 182 780 (1.25 nM) was present (Fig. 4B); however, ICI 182 780 alone significantly ($P < 0.05$, FPLSD) elevated GH mRNA above the solvent controls. Unlike that of PRL, the 750 nM *o,p*¡Ç-DDT treatment was without effect ($P > 0.05$, FPLSD) on GH mRNA levels and co-incubation with ICI 182 780 (1.25-5.0 nM) had no further ($P > 0.05$, FPLSD) effect on GH mRNA expression, although mean levels tended to increase with higher amounts of ICI 182 780 ($P > 0.05$, FPLSD) (Fig. 4B). To rule out the possibility that the inhibition of PRL mRNA by ICI 182 780 was not the consequence of the toxic effect of the compound, the cytotoxicity of ICI 182 780 was assessed by measuring the presence of lactate dehydrogenase (LDH) in the medium. There were no observable cytotoxic effects in all concentrations, and treatments, employed in the study (data not shown).

3.3. Effect of TCDD on GH and PRL gene expression

In contrast to xenoestrogens, TCDD is known to have antiestrogenic effects. The effect of different concentrations of TCDD (0.01–20 nM) on expression of the GH and PRL genes was assessed. Treatment with TCDD significantly altered PRL ($P < 0.001$; one-way ANOVA) and GH ($P < 0.01$; one-way ANOVA) mRNA levels in a concentration-dependent manner. Interestingly, bell shaped concentration–response curves were seen for both PRL and GH, as shown in Figs. 5A and B.

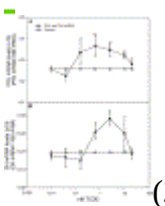
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Fig. 5. Concentration–response effect of TCDD on levels of PRL and GH mRNA expression in pituitary glands incubated in vitro. (A) Levels of PRL mRNA in TCDD treated samples and controls (B) Levels of GH mRNA in TCDD treated samples and controls. Following a 24-h pre-incubation period, pituitary glands were exposed to different concentrations of TCDD for an additional 24 h. Controls contained vehicle only. Data are representative of at least two repeats. Values represent mean ¡¾ SEM

($n = 8$); $*P < 0.05$, $**P < 0.01$ represent significant (general P-value cut off points) differences between treatment and control values at the respective concentration of TCDD (one-way ANOVA followed by FPLSD for pair wise comparisons).

To determine whether the effects of TCDD on pituitary PRL and GH mRNA expression were mediated via the arylhydrocarbon receptor (AhR), pituitary glands were co-incubated with TCDD (0.03 and 2.5 nM) and alphanapthoflavone (ANF, a known antagonist of the AhR, Merchant et al., 1993) at various concentrations. A 0.03 nM concentration of TCDD, instead of a 0 concentration, was chosen based upon preliminary work (and a limited number of animals) which demonstrated a synergistic effect when low concentrations TCDD were co-incubated with the AhR antagonist (ANF), resulting in an increase in mRNA levels; this was in contrast with the stimulatory effects of higher doses of TCDD (2.5 nM) that could be attenuated with co-incubation with ANF. Additionally, there was no E_2 control, due to the lack of animals; however, the response to E_2 had been consistent from study to study (see Fig. 1, Fig. 2, Fig. 3 and Fig. 4). Consequently, the E_2 and TCDD treatments in this study were designed to be compared with the effects seen with 0.03 nM and 2.5 nM TCDD alone.

In this experiment, there were significant effects of E_2, TCDD, ANF, and their combinations, on GH ($P = 0.009$; one-way ANOVA) and PRL ($P = 0.004$; one-way ANOVA) mRNA levels. An induction of GH ($P = 0.004$, FPLSD) and PRL ($P < 0.001$, FPLSD) mRNA was observed at 2.5 nM TCDD (Figs. 6A and B). Co-incubation of TCDD (2.5 nM) with E_2 (2.5 nM) resulted in a significant ($P < 0.05$, FPLSD) attenuation of the induction caused by TCDD (2.5 nM) with both PRL and GH (except for the 0.03 TCDD ¡¿ 2.5 nM E_2 group) mRNA. In contrast, co-incubation of 2.5 nM E_2 and 0.03 nM TCDD resulted in an increase in mean PRL and GH mRNA levels over control values, however, this increase was not statistically significant. The TCDD-dependent induction of PRL mRNA was significantly ($P < 0.05$) attenuated, in a concentration-dependant manner, upon co-incubation of with ANF, with the greatest decrease occurring at 12.5 ¥ìM ANF, which was indistinguishable from control values. At the 0.03 nM concentration of TCDD tested (Fig. 6), where a non significant induction or inhibition of GH and PRL was seen, co-incubation with all three concentrations of ANF showed significant ($P < 0.05$) increases over controls in GH mRNA and increases in mean levels (non-significant) of PRL mRNA (Figs. 6A and B); however, ANF alone (6.25 ¥ìM) did not produce any changes in GH or PRL mRNA levels (Figs. 6A and B). The concentrations of ANF or TCDD used in the study did not

exert any significant cytotoxic effect on the pituitary glands as determined by the LDH assay (data not shown).

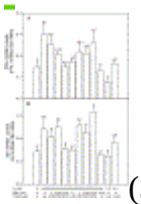
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Fig. 6. Dose–response, and interaction, of the AhR antagonist, alphanapthoflavone (ANF) and TCDD, on (A) PRL mRNA and (B) GH mRNA in pituitaries cultured in vitro. The gray bars, in each treatment row on the *x*-axis, represent the treatment concentrations immediately to the left of each bar. Following a 24-h pre-incubation period, pituitary glands were incubated (media replaced with test agents or solvents for control) with 2.5 nM TCDD alone or co-incubated with 2.5 nM TCDD and 1.25, 6.25, and 12.5 ¥ìM ANF for an additional 24 h. Similarly, the glands were also treated with 0.03 nM TCDD alone or co-incubated with 1.25, 6.5, and 12.5 ¥ìM ANF. Pituitary glands were also co-incubated with 2.5 nM TCDD and 2.5 nM 17¥â-estradiol or 0.03 nM TCDD and 2.5 nM 17¥â-estradiol. Glands were also cultured in medium containing 6.25 ¥ìM ANF alone or with vehicle alone for control. The treatment procedure was as described earlier and the dot blot hybridization for PRL and GH mRNA was performed as described in the materials and methods section. Values represent mean ¡¾ SEM ($n = 6$) obtained from one experiment. Groups with different alpha characters (a–f) are significantly ($P < 0.05$, general P-value cut off) different from other groups (one-way ANOVA followed by FPLSD for pair wise comparisons).

4. Discussion

In this study, we have demonstrated that the two EDs, *o,p*¡Ç-DDT and TCDD, exert a direct effect on the pituitary physiology of an aquatic vertebrate, the rainbow trout. While some differences appear to exist between the mechanisms by which the PRL and GH genes respond to treatment with these EDs, we have shown that the EDs used in this study stimulate PRL and GH mRNA expression in a manner similar to that of 17¥â-estradiol (estradiol), and that these effects are likely mediated via the estrogen and aryl hydrocarbon receptor(s).

Since our study focused on the pituitary hormones, GH and PRL, we validated the functionality of pituitary glands in serum-free culture, and then examined the effects of the *o,p*¡Ç-DDT (estrogenic) and TCDD (antiestrogenic) on the gene transcription of GH and PRL. To analyze the response of cultured pituitary glands to xenoestrogens,

estradiol was used as a positive control. Exposure of pituitary glands to estradiol resulted in a significant increase of mRNA levels for both GH and PRL. PRL gene expression and secretion is known to be regulated by estradiol (Williams and Wigham, 1994) in rainbow trout and in higher vertebrates (Cullen et al., 1993). It is therefore important that PRL mRNA was found to be significantly elevated by 0.5–10 nM estradiol as this verifies that the in vitro system used in this study responds as predicted.

Pituitary GH mRNA was induced upon treatment with estradiol and a maximum increase of 6-fold over controls for GH mRNA was seen with the 5 nM dose of estradiol. In the case of GH, many lines of evidence suggest that gonadal steroids regulate it. In mammals and teleosts, patterns in GH levels and secretion are sexually dimorphic (Harvey and Daughaday, 1995 and Riley et al., 2002). In fish, high levels of GH are seen during ovulation and spawning. Gonadal steroids can modulate GH by affecting hypothalamic releasing hormones, or via receptor/post receptor mediated mechanisms at the level of the pituitary (Melamed et al., 1998). Moreover putative estrogen response elements have been identified in the promoter region of the trout GH gene (Melamed et al., 1998 and Yang et al., 1997b), and gonadal steroids have been shown to stimulate GH release in cyprinids, tilapia and salmonids (Holloway and Leatherland, 1997, Melamed et al., 1995, Shepherd et al., in press and Zou et al., 1997). Nevertheless, the significance of involvement of estrogen in regulating GH gene transcription is not clear.

While our results agree with the aforementioned studies, Yatedie and Male (2002) were unable to demonstrate differences in PRL or GH mRNA levels in juvenile Atlantic salmon (*Salmo salar*) exposed to estradiol or the xenoestrogen, nonylphenol. In the latter study, the lack of a stimulatory effect of estradiol on pituitary PRL and GH is not consistent with current findings reported in this study, nor with previously reported stimulatory effects of estradiol on the teleost pituitary gland (Borski et al., 1991, Melamed et al., 1995, Trudeau et al., 1992 and Zou et al., 1997); however, these differences may be related to experimental differences (route of exposure or dose) or species, sex and developmental differences. It is evident that a conclusive link has not been demonstrated between ED exposure and alteration in the pituitary hormones (GH and PRL) that control salmonid growth and osmoregulation. Consequently, this should be an area of intense focus and investigation.

It is well known that *o,p*¡Ç-DDT acts as a xenoestrogen, although its potency is much lower than that of estradiol. Our data support this as *o,p*¡Ç-DDT caused increases in GH and PRL mRNA at concentrations that were about 500-fold higher than that of estradiol. To establish that *o,p*¡Ç-DDT is working through the estrogenic pathway, we examined

the effects of the estrogen receptor antagonist, ICI 182 780, and found that *o,p*¡Ç-DDT-induced PRL mRNA levels were blocked by co-incubation with ICI 182 780 at increasing concentrations. In this same experiment, it was also found that GH mRNA levels were induced by estradiol (2.5 nM) and that this induction was significantly reduced following the addition of ICI 182 780 (2.5 nM); however, levels of GH mRNA were also significantly induced by ICI 182 780 alone (2.5 nM). As for the stimulatory effect of ICI 182 780 (2.5 nM) on GH mRNA levels, it is interesting to contrast the lack of a stimulatory effect of ICI 192 780 on GH mRNA levels when co-incubated with *o,p*¡Ç-DDT, compared with controls. Another observation from this experiment is that the intermediate concentration (750 nM) of *o,p*¡Ç-DDT used in this experiment did not stimulate GH mRNA levels, unlike the concentration–response study where *o,p*¡Ç-DDT (500 and 1000 nM) did stimulate GH mRNA levels. There is no certain explanation as to why the 750 nM concentration of *o,p*¡Ç-DDT did not stimulate GH mRNA in this instance, however, this difference could be related to the size, condition and sex of the animals used in the different experiments which were also conducted at different times of the year. Additionally, while the stimulatory effect of ICI 182 780 on GH mRNA is difficult to explain at this time, some possible mechanisms are discussed below.

Although *o,p*¡Ç-DDT is known to act as a xenoestrogen by binding to the estrogen receptor (Soto et al., 1994 and Vom Saal et al., 1995), its mechanisms of action are not well understood. For example, in the rat uterus, *o,p*¡Ç-DDT has been known to cause a gene expression pattern that is different from that of estradiol (Diel et al., 2000). Studies using a rat pituitary cell line (MtT/S) have revealed that while estradiol could stimulate GH promoter activity, even in the absence of estrogen response elements, it still required the presence of the pit-1binding site suggesting that the ER might induce GH transcription indirectly via ER/Pit-1 interactions (Iwasaki et al., 2004). Alternatively, work on the rainbow trout ER revealed that proteolysis of the ER protein, bound to nonylphenol, resulted in a differential confirmation compared to that bound to estradiol (Madigou et al., 2001). Therefore, xenoestrogens may alter ER conformation, compared to that seen with estradiol, due to differential binding (proteolysis), recruitment of co-activators, changes in ER subunit (¥á and ¥â) distribution and interactions, and ER-DNA (response element) interactions (Margeat et al., 2003). GH mRNA induction by estradiol requires a number of interrelated, and independent, interactions between ER and Pit signaling, as well as other pathways involving transcriptional and translational (proteolysis) modification, or tissue-specific uptake and metabolism of ICI 182 780 (which may be a partial agonist to the ER) which may account for the stimulatory effects of ICI on GH mRNA levels via one or more of these mechanisms (Dipippo and Powers, 1997, Madigou et al., 2001 and Margeat et al., 2003).

To contrast the effects of estrogenic and antiestrogenic xenobiotics, pituitary glands were treated with tetrachlorodibenzo-*p*-dioxin (TCDD), a xenobiotic with antiestrogenic effects. Most of TCDD¡¯s biological effects have been ascribed to its ability to bind the aryl hydrocarbon receptor (AhR), a receptor that is known to bind a wide range of halogenated aromatic hydrocarbons (Fernandez-Salguero et al., 1995). In our studies, TCDD caused an increase in GH and PRL mRNA levels similar to the xenoestrogen, *o,p*¡Ç-DDT. Though most reports have focused on the antiestrogenic effects of TCDD, these actions are tissue-specific and its antagonistic effects have been shown to include varying mechanisms involving estrogen signaling: (1) TCDD induces cytochrome p450 enzymes (CYP1A1 and CYP1B1) that increase the metabolism of estradiol leading to depletion of intracellular hormone levels; (2) TCDD decreases the levels of expression of various estradiol-inducible genes by blocking or disrupting the binding of estrogen receptor ¥á to the estrogen response element, and binding sites for the transcription factors Sp1 and AP-1 which are adjacent to, or overlapping with, AhR-binding sites (Kietz et al., 2004); and (3) TCDD reduces the level of estrogen receptor ¥á protein by increasing proteosome-mediated degradation (Safe and Wormke, 2003).

TCDD has been shown to have estrogenic effects, resulting in endometriosis in mammals, where the main stimulus for cell proliferation in the endometrium is estradiol (Rier et al., 1993). Although previous studies have revealed the antiestrogenic effect of TCDD in estrogen responsive tissues (Safe, 2001), this may be the first report to reveal effects similar to that of estradiol on pituitary hormones GH and PRL. The molecular mechanisms of TCDD¡¯s antiestrogenic, and sometimes estrogenic effects, has been recently revealed in the MCF-7 and Ishikawa breast cancer cell lines. Here, cross-talk between estrogen receptors and AhR signaling appeared to be partly involved in the estrogenic actions of TCDD (Ohtake et al., 2003). Specifically, when estrogen was absent, the dioxin-activated AhR (aryl hydrocarbon receptor)–Arnt complex associates with the estrogen receptors ¥á and ¥â in the nucleus, leading to activation of transcription and estrogenic effects. However, when estradiol is present, the AhR activation represses estrogen receptor function, thus inhibiting the expression of estrogen responsive genes (Ohtake et al., 2003). Although not measured directly in this study, the data obtained in our studies are in agreement with the above mechanism. While we lacked an estradiol only control, due to experimental limitations, co-incubation of TCDD and estradiol attenuated the induction of PRL and GH mRNA caused by TCDD alone. With this in mind, one could speculate that a similar mechanism may occur in the pituitary, where TCDD, in the absence of estradiol, may cause elevations in GH and PRL mRNA levels.

To analyze the role of the AhR in the modulation of GH and PRL mRNA by TCDD, we tested the effects of the AhR antagonist alphanapthoflavone (ANF), on TCDD-induced GH and PRL mRNA expression. We found that the AhR appears to be involved with mediating the effects of TCDD on both PRL and GH mRNA expression in the rainbow trout pituitary. Here, co-incubation of TCDD (only the 2.5 nM concentration) with ANF (only at the 12.5 ¥ìM concentration of ANF for GH and all concentrations for PRL) attenuated the estrogen-like response (increased PRL mRNA) of the trout pituitary to TCDD exposure. Additionally, while ANF (6.25 ¥ìM concentration) alone did not affect GH or PRL mRNA levels in vitro, the combination of ANF, with the low dose of TCDD (0.03 nM), had a stimulatory effect on PRL and GH mRNA levels. Unlike the clear concentration-dependent attenuation of TCDD-induced increases in PRL mRNA levels, by ANF, the effect of TCDD on GH mRNA expression was less clear and lacked a concentration–response relationship. However, the effect of TCDD (2.5 nM concentration) on GH mRNA was attenuated by the 12.5 ¥ìM ANF concentration. One possible explanation for these unusual findings is that the threshold model of dose responses used in classical toxicology cannot adequately account for such responses, whereas the hormone-like biphasic dose–response model (seen in this study), termed ¡°hormesis¡±, which is characterized by low-dose stimulation and a high-dose inhibition, is now acknowledged as paradigm that more accurately models biological dose–response phenomena (Calabrese and Baldwin, 2003a and Calabrese and Baldwin, 2003b). In this study, co-incubation of TCDD, with the AhR antagonist ANF, revealed a biphasic response to ANF, when the 0.03 and 2.5 nM concentrations of TCDD (which induced GH and PRL) were compared. The data obtained here, especially with TCDD and the TCDD concentration–response effects on GH and PRL mRNA levels, further underscores the need to consider low dose effects when undertaking endocrine disrupter and toxicology studies.

When we consider that the pituitary hormones GH, PRL and somatolactin (SL), and their intermediaries (insulin-like growth factors I and II), control teleost osmoregulation (McCormick, 2001 and Sakamoto et al., 1993), growth (Duan, 1997, McCormick et al., 1992 and Shepherd et al., in press), reproduction (Bhandari et al., 2003, Björnsson, 1997, Gomez et al., 1999, Planas et al., 1992 and Rubin and Specker, 1992) and immune function (Sakai, 1999, Yada et al., 2001, Yada et al., 2004 and Yada et al., 1999), there is no doubt that EDs can seriously impair some or all of these systems, through their effects on pituitary function. A plausible example of this can entail alterations in the release of PRL at an inappropriate time in the life-history of a euryhaline teleost. Specifically, the most conserved function of PRL, in teleosts, is its sodium-retaining (hyperosmoregulatory) actions that facilitate adaptation to, and

survival in, the freshwater environment (Manzon, 2002). Consequently, the sodium-retaining actions of PRL are antagonistic to the seawater-adapting (hypo-osmoregulation) actions of GH (Madsen and Bern, 1992 and Sakamoto et al., 1997) and to seawater survival. Given the stimulatory effects that estrogens, and estrogenic EDs, have on pituitary PRL release, and the antagonistic actions of PRL on hypo-osmoregulatory processes, one would predict that the stimulation of PRL in a migrating salmonid smolt could be deleterious to this, important, transitory developmental period. Indeed, recent studies on salmonids indicate such a mechanism may be involved in delayed smoltification and migration or impaired hypo-osmoregulatory ability (Arsenault et al., 2004, Madsen et al., 2004 and Mancera et al., 2004).

In conclusion, our studies showed that cultured pituitary glands retained functionality in serum-free culture and were responsive to estradiol and EDs. Expression levels of pituitary two pituitary hormones, GH and PRL, were modulated by two persistent xenobiotics, *o,p*¡Ç-DDT being estrogenic and TCDD which has been typically antiestrogenic, but demonstrating some estrogen-like actions in this model system.

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FIAT LUX: AN ARTISTIC DIALOGUE ABOUT AGENT ORANGE

Debra Jeanne Kraus

> "We must try to expand the boundaries of human wisdom, empathy and perception, and there is no way of doing that except through education."
>
> Senator J. William Fulbright

It would be fourteen years of bouncing every-which-way between Elizabeth Kubler-Ross' grief stricken stages of denial, anger/resentment, bargaining, depression, and acceptance before the words of Senator Fulbright would confirm what I instinctively knew. I missed my late husband, professor of Theater and Music. He had a grave cancer prognosis when we met. It didn't matter. We were in love. Throughout our twelve-year marriage we chose to transcend his illness by transforming ourselves through art, finding beauty in each new day, and we both shared what was learned from living in the physical, emotional, and spiritual suffering it wrought. We found humor in the most obscure places. After all, we are all going to die. We had God and eternal life, so why should we worry about our temporary physical being? He believed his life would continue through the images he painted, his guitar students, published music, his KRASU invention that stabilizes the guitar, and me.

My husband knew in his heart it was Agent Orange that was killing him from his 1965 tour of duty in Viet Nam, but there was nothing to confirm it. He received nothing from the Agent Orange class action lawsuit in 1984. His illness wasn't deemed epidemiologically associated as one of the illnesses connected to Agent Orange. Most disturbing to me is that he died before our government admitted guilt for his exposure. The Veterans Administration took a year to determine whether the secondary cancer that caused his death, adenocarcinoma of the lung, was related to it. It was. They compensated me when it should have been him. Along with the monthly dependent indemnity compensation (DIC) the Montgomery Bill granted an educational stipend. I was 42-years old, childless, heavily indebted, and widowed from a war that had ended decades earlier. I wanted answers.

No one can warn you about death's evils. Even if they tried we wouldn't listen. Death blackens your soul. The immediate pain of it is shockingly intense no matter how long you've known the person is going to die. Then it happens. For the first year you walk around hemorrhaging from a gaping hole in your heart. You are devastated from that intrinsic final battle to survive. We all experience death from our own perspective. After a loss you'll find yourself immersed in memories. They are your saving grace. You'll begin to communicate with their spirit. They'll communicate back. For a moment we are happy. We are touched. Sometimes their being is embodied in an old valentine that drops from its marked passage inside a book you've decided to pick up and begin reading again. These are the kind of memories and experiences that trigger those five-stages of grief all over again and you roll as the waves of emotion crash over you, pulling you back under, taking you back out to the sea of inner turmoil. I have surrendered to the fact these emotions will be with me until the day I die. It is a lifelong process.

I had to find out what physically happened to me, to us, to our allies. I went back to school to find answers to the many questions that plagued me. I found some answers in every single course I took, however I couldn't find direct answers concerning Agent Orange in any college course. Even my Environmental History professor omitted the use of Agent Orange from

her lecture when discussing Dow Chemical Corporation's poisoning of American citizens here in the states. Why had American history denied the longest and largest act of chemical warfare known to mankind and our environment? Millions had died. Millions more were still suffering. Didn't we care about our freedom fighters, our loved ones, and our environment?

Filmmakers in Hollywood even neglected to inform us. There was no mention of the 21 million gallons of TCDD dioxin contaminated herbicides sprayed over Viet Nam in any mainstream popular film produced like *The Deer Hunter, Apocalypse Now, Platoon,* or *Forest Gump* to name a few. In 2003 when chronic lymphocytic leukemia (CLL) and Type II diabetes were being service-connected to Viet Nam veterans, HBO debut their latest film, *Path to War*. President Lyndon B. Johnson's inside story never mentioned Agent Orange or the scientific outcry from Nobel Laureates to stop its use in the portrayed dialogue between the president and his staff members. I thought of veterans and their children who could have benefited from an early diagnosis of illnesses if they had been warned to have annual physicals. My husband may have had a stage-one chance for survival instead of stage-four. Most veterans don't even know if their illness is related to Agent Orange. Veterans' children don't have a clue about what their mom or dad may have been exposed to by the military and has been genetically passed onto them. It is time they were educated for their children's sake. The poisoning is not going to end anytime soon unless we acknowledge it, embrace it, and work overtime to resolve the issues poor judgment has made.

For over 30 years Viet Nam veterans have sought compensation for illnesses they believe were caused by their wartime exposure to contaminated herbicides. U.S. soldiers and airmen who prepared, handled or sprayed the herbicides were routinely denied compensation by the federal Department of Veterans Affairs (VA) because the VA had taken the position that there was not enough scientific evidence linking herbicide exposure to specific diseases. The VA reviewed studies that came from people who were exposed as a result of their jobs or from industrial accidents. These exposures were often at high levels and for long periods of time. Levels of exposure in Viet Nam veterans were extremely wide ranging. The VA's argument was that they simply did not know the degree of risk for Vietnam veterans. Animal studies provided valid evidence for those trying to understand human cancers in relation to chemical exposures, but the VA reviewed only human studies to evaluate herbicide effects.

My husband's pure seminoma (testicular cancer) did not fall into one of those VA disease risk categories. They would determine there would not be sufficient evidence for his cancer to be caused from dioxin exposure. Examination prior to my husband's surgery found no sign of tumor growth in his testis where the disease would normally begin. He was 44-years old and his age defied what was common among victims. There were no markers in his blood to identify what exactly was appearing on the X-ray films and CT scans. Doctors were baffled after surgery when pathology revealed his abdominal stage-four tumor was pure seminoma. It was like a large water balloon. Upon resection it exploded releasing cells throughout his abdomen. This exacerbated his case. Normal treatment procedure would have been radiation therapy to shrink the tumor before surgery, then a regiment of chemotherapy afterwards. Pure seminoma has over a 90% cure rate. Lance Armstrong is living proof. He was not exposed to contaminated herbicides.

As my husband's illness progressed it became evident there would not be a child conceived between us. From time to time these issues would surface; mostly by family members who felt alternative methods could be used for conception. We sought professional help and decided to consider genetic counseling. We paid money to receive sperm donor background and

genetic trait profiles. We reviewed the three to make the selection. I liked one, my husband and mother liked the other. It was left up to me to make the selection. The one thing that stood in the way of the final decision was that the child would not be able to know their father. I decided on the way to be artificially inseminated I couldn't go through with it. It wasn't fair. We decided to take out our nurturing instincts on our cat, Sassy Kraus, the real anthropomorphic fallacy.

Collectively these issues compelled me to create an art exhibit that would bear witness of those who are suffering and commemorate those we've lost through the use of TCDD dioxin contaminated herbicides in Viet Nam. Through college coursework I was introduced to Pop artists who inspired me to utilize their artistic techniques from the 1960's as a lens to look at contemporary veteran illnesses and visually discuss American history that have been abated for over 30-years. I drew upon these artists' same social facets of artistic expression to expose the temporality of human experience. I set out to create a timeline of my own that uses propaganda against the war to discuss military loyalty, religion, and philosophy narrating you into the 21st century. Once these works were completed they were installed into vignettes that revealed a soldier's inner struggle of doing right by his country even though his religious and philosophical upbringing were the complete opposites of what he had been groomed to believe in. The project grew to enormous proportions from embracing American Pop culture in ways that subjected art to science, medicine, history, sociology, religion, philosophy, and ethics. It is a story from birth to death.

Fiat Lux (Let there be light): An Artistic Dialogue about Agent Orange
The Exhibit

Homecoming, installation sculpture and mixed media

The events artist Alan Kaprow created were non-verbal theatrical productions that involved the spectator as well as the performer. His movement of embracing nonsensical language and poetry through art making broke down the boundaries between the arts during a period of time in history that demanded a celebration from an alternative society. Kaprow's artistic expression posed a question about artists restricting themselves to canvas. He felt that an artist is a composer with routines and habits and wanted to create events in settings new to art. Merging these ideas, Kaprow composed with police files, old socks, a dog, trash, and tires stating that anything aesthetically disciplined metaphorically is art. Exposed to Kaprow's ideas, I thought about the discards of life.

After the loss of my husband I had sifted through our home trying to decide what to toss out and what to keep. I remembered a box in the backroom closet that my mother in law had sent us. It was laden with Viet Nam memorabilia. One letter in particular set my mind on fire. My husband wrote that he was coming home on Christmas day. He was so excited and joked about the fact that he'd be arriving before he left, referring to his crossing of the International dateline. For the next three hours time stood still as I sat there in the middle of the floor scattering his letters and photographs around me, flipping each one over I traced each loop, each dot of each word that he had written to describe his experience. In these passages I looked for evidence of his knowledge of the spraying around his evacuation unit's perimeter and thought about trees.

Trees are one of the most significant symbols known to mankind. The family tree is used to represent our genealogy. Trees sustain life through the fruits they bear and are home to animals, birds, and insects. Legend has it that the triangular shape of the fir tree was used to describe the Holy Trinity of God, the Father, and the Holy Ghost as early as the 7th century. To Christians the tree also shares reference to Christ's death. He died on the tree when they nailed Him to the wooden cross. I continued to mall over the tree's significance to the Christmas season and what it represented into the next.

One week after Christmas New Years day is celebrated. While that day marks the Christian New Year, in Viet Nam they celebrate a different day. Their new year is a movable feast beginning with the first new moon in January called Tet. The Tet tree, called cay neu, is a bamboo pole stripped of everything but its tuft on top. It is used to ward off evil spirits. These ideas progressed from one to another as I continued to formulate the installation of *Homecoming* in my mind's eye. I wanted to speak to these two traditions to tell Viet Nam's toxic environmental story.

Seventy trees were defoliated and spray painted to create a tree lot found on American neighborhood corners throughout the Christmas season. The fragrance of pine permeates the installation triggering remembrances of holidays past. *Homecoming* would also represent what Viet Nam's mangroves and forests looked like after herbicide exposure. The French pulled America into the war, so I thought it appropriate to use the French curve to design Plexiglas frames enabling the viewer to engage with letters and images my husband had sent home. The curve also represents the horn of the water buffalo used throughout Viet Nam's agriculture. Red lanterns are a common sight during Tet. Mixing them with Christmas lights on a bow enabled me to suspend the documents for viewing and create a perimeter of before and after exposure. Red represents happiness and spiritual power. Catholic priests wear red vestments to celebrate the Eucharist during high holy days. Red is the color of blood.

Incensed by what President Kennedy had done through the use of contaminated herbicides in warfare, I decided to use ideas that merged Catholic ideology with the massive birth defects and spontaneous abortions being reported throughout South Viet Nam. A commercial plastic nativity of Joseph, Mary, and the baby Jesus are illuminated, serving as a reminder that Catholics are confirmed in their ideology to emulate the Holy family through word and deed. The church upholds its articles of religion regarding family and reproduction and does not allow for abortion. Ceramic Milky storks were sculpted as dead or dying to reference their legend of delivering the newborn infant. The importance of the installation is to move the spectator from thinking herbicides killed only trees. America had destroyed the very foundation of its religious beliefs by exposing humanity and the environment to contaminated herbicides. Would Jesus do this?

Two Peter Gunns, acrylic on wood panel diptych

Andy Warhol's art making addressed issues of capitalism, celebrity, and current events. He documents American history through art in ways that distort the media's standard use of imagery. Using the public's fascination with a world graphically filled with violence and celebrity, he includes the poor and ordinary people who were subjected to death. Warhol was

enigmatic about the meaning of his art. He provoked you to ask; where's the conviction, the compassion and the condemnation?

Television's imagery of Viet Nam aired nightly in the news, projecting the mechanistic use of young men at war while at the same time reporting their numbers killed in action. The draft terrified young men. I remembered my husband nervously laughing at two images of him taken in front of the 85th Evacuation unit during his tour of duty. He related how these photographs revealed how his hand was glued to his gun. He said he slept with his gun, he ate with his gun, and if he could, he'd have even showered with his gun when there was a shower available.

My husband didn't see combat in the fields, but he smelled the blood of his evacuated buddies as they arrived from battle with missing limbs, gunshots, and embedded shrapnel wounds. Post traumatic stress disorder affected military personnel as they were moved from the peaceful United States into the horrors of war. Their exposure to contaminated herbicides exacerbated the effects of the adrenalin that surged through their sympathetic nervous system.

21 Million Gallons, video installation

One of Warhol's mechanical painting processes created a numbingly repetitive grid that produced the phenomenon of societal image inundation. The grid is not found in nature. It is a product of our culture. Warhol used the grid in his work to suggest strips of film or grocery store merchandising. Caught up in the commercial mechanistic process of producing the frightened or manipulated, tragic or exploitative photographic imagery into paintings, he stated he wanted to be a machine and named his art studio the Factory.

Incorporated into the size, scale, and elementary techniques used in Warhol's paintings were the memories of psychedelic oil lamp light shows that accompanied rock concerts during the 1960's. These ideas moved me to present evidence of contaminated herbicides sprayed over Viet Nam by editing and colorizing film clips from Barbara Sonnenborn's documentary, *Regret to Inform*. The imagery was colored by referencing the use of the other Agents White, Pink, Purple, and Blue. The clips were looped to present repetitious visual imagery that mocked the commodity of chemicals, but testified to the continued assaults on Viet Nam's environment exposing our soldiers, allies, and the innocent victims we were fighting to protect.

Dying to Live, sculpture and mixed media

The Department of Defense set parameters for The Wall in Washington, DC to inscribe the names of those killed in action during the Viet Nam War. It left off those lost to Agent Orange cancers and suicide from severe post traumatic stress disorder (PTSD). Victim empathy moved me forward in formulating a sculptural piece. Edward Kienholz lent me his sculptural technique of casting the human body into form by using assemblages from the discards of life contained in photographs, pieces of clothing, and scavenged objects found in our home. Medicine and its records gave witness to the truth about the cost of human suffering.

I wanted to compose a scene choosing a musical and theatrical setting in honor of my husband's education, performance, and teaching career. It is a composition of a soldier following the propaganda of life's orders from birth to death. A guitar, the heart, soul, and most popular image of the 1960's, is used as the torso of the sculptured body, fusing the former officer's

lifestyle with the civilian classical guitarist. Since the French enlisted United States' support for their war in Vietnam, I selected the masterwork, *Faure Requiem,* to resonate continuously from within the stage. It is considered to be one of the purest pieces concerning a mass for the dead. Both music and text emphasize elements of faith and hope in the Christian philosophy of life rather than the fears and terrors of judgment. It is in this elevated spirit that homage to our soldiers whose lives were destroyed by the ravages of this war should be honored.

Questions are posed through the use of objects and symbolism: a dead Christmas tree and the folded American flag, IV bags and tubes, medical bills, the broken guitar, snakes, photographs, published music, medicine and vitamin bottles, army decorations, concert posters, educational degrees, teaching credentials, letters of recommendation, wood, a wallet, a car key, and bolts. They are part of what makes up the artistic human figure, an image that represents what America does not want to see, and universalized in a soldier who is sick and dying from Agent Orange, but still following orders. A supine body on an army cot salutes his folded American flag. The war has ended but he is forced to say, "Yes Sir," to radiation, "Yes Sir," to chemotherapy, "Yes Sir," to the medical bills, and "Yes Sir," to the pain and suffering. He has asked for none of it. He receives only denial from his government.

The other hand clutches medical breathing apparatus. A hat stand behind the cot holds an army cap, a gas mask, and multiple IV bags with tubes running into the left arm closest to his heart. The folded flag's staff is a dead Christmas tree with all the branches cut off and bolted to the stage floor symbolizing all the men and their possible children who have ceased to exist due to their chemical exposure. The bolts symbolize the fact that men had no choice. Most went whether or not they wanted to. In my late husband's case he was groomed through ROTC in High School and as an army officer in college graduating with a Masters as second lieutenant.

The stage made of Mahogany is painted black and has the constellation of Taurus drilled into the top. Light from inside pierces the constellation. The stage's architectural composition mocks The Wall. It is covered with hospital and medical bills wallpapered in chronological order. The back of the wall is a pictorial time line from birth to death using techniques in collage on paper with photographs. It testifies that this soldier entered heaven through the corridor of loyalty.

Life Investment, mixed media sculpture

To discuss the continuing effects of Agent Orange and the value placed on human life, I used techniques from the Minimalist movement that followed Pop art. The founders and leading Minimalists were poetic in their dealings with timelessness, discussing issues of indefinite duration through their sculpture and earthworks. Drawing from this idea, the sculptural work *Life Investment* presents 107 feet of cancelled checks to doctors and pharmaceutical companies placed end-to-end. The sculpture creates awareness to Agent Orange by projecting future health issues onto the next ten generations of people who have been exposed. Repetition, commercialism, and capitalism represent the commodities of life through documented insurance payments to surgeries and mental healthcare physicians, creating a personal timeline from cancelled checks. The monetary drain is intertwined with the day to day living experienced by the sick.

On the Moon, oil on canvas

Warhol's fascination with the news media led me to seek ways to visually discuss the ethical choices our government was making during a time of national chaos. While touring the Air and Space museum in Washington, DC I found a copy of the front page cover of the Wisconsin State Journal morning edition newspaper from Monday, July 21, 1969. It announced that at 9:56 p.m. CDT America had landed men on the Moon. These space missions would unify our nation while at the same time divide us over the thousands who were dying in Viet Nam. The space program's success permeated American culture through Pop music and art.

From the Earth to the Moon and Back, installation and mixed media sculpture

As a young man my husband had saved the black and white glossy photographs of astronauts his sister had sent him from Texas. He was proud of America's space achievements and was always joking about wanting to go to the moon so he could play guitar in a weightless environment. Astronaut images, X-rays that revealed his disease, and the race to space against Russia throughout the 1960's moved me to create and integrate sculpture that would cause the viewer to reflect on ethical issues surrounding choice.

I wanted to artistically juxtapose the 20 billion taxpayer dollars spent for these space missions with the governmental choice not to fund proper research regarding the mutagenicity of TCDD-dioxin. Mature rhesus monkeys, a primate considered our nearest biological relative and superior models for handling diseases, kept dying when exposed and scientists were claiming they were too expensive to replace. Thought provokingly, I posted excerpts in text of the live television broadcast from the first lunar orbit of Commander Borman, Pilots Lovell and Anders taking turns reading from the book of Genesis. I used quotes from Jean Paul Sartre's *Existentialism is Humanism* highlighting, "To do nothing is to do something. To accept status quo is to tolerate. To tolerate is to condone." I would also quote Sartre to say, "In fashioning myself I fashion man." These events and philosophy would weave the exhibit's works together and give additional weight to the religious structure affecting subliminal self examination.

In retrospect I felt our government had said, "Hey, look over here while we do this over there." I created a kinetic sculpture of the earth and moon to visually speak about Agent Orange issues. Following the cancer and birth defect trail from the use of contaminated herbicides sprayed over Viet Nam, I realized through research that our entire globe had been contaminated. It affected not only the United States, but our allies from France, Britain, Canada, Australia, New Zealand, Thailand, South Korea, and people in Laos and Cambodia. It was being used throughout our agriculture globally.

Two lampshade skeletons painted orange suspend a globe of the earth, allowing the moon to rotate around it. The globe of the moon is in equal size to the earth to represent an out of balance budget. It metaphorically states that we are caged in. It speaks to the power of the chemical corporations. They would be licensed to kill for monetary gain. The effects of Agent Orange would be scientifically buried as classified information for a decade until the dead would resurrect its toxicity through the mournful cries of humanity.

Until the Passing of the Sun, Moon, and Stars, mixed media sculpture

In my internet search for images of effected children I came upon two Vietnamese infants. These thumbnail JPEGs bore witness to the devastating effects of Agent Orange. Society has been kept in the dark regarding such terrible birth defects. I wanted to soften the harshness of the imagery and bring light to the darkness these children experience from their illnesses. I wanted to elicit a response from the public to help them physically, emotionally, and monetarily. Upon viewing the piece my mother's response was, "Why don't they surgically remove that head from her foot so she can lead a normal life? I had asked the same question.

Faux Paw, sculpture and mixed media

Shortly after my husband's retroperitoneal lymph-node resection in 1988, he transcended his hard recovery by writing a suite of solo guitar pieces in honor of the Sequoia National Forest, the world's largest living things. He used the musical sonorities of his favorite French composer, Erik Satie, and the multidimensional simultaneity of Sequoia's aural stimuli to compose them. They were completed shortly before the centennial celebration of the park in 1990. During his concert debut at the celebration he dedicated the suite to all the people who worked to conserve the Sequoia tree's environment. He also dedicated each composition to friends, family, and the doctors that saved his life.

Sharing his joy with the Satie Foundation in Paris, France he sent them a copy of his published work. In the cover letter he told Joseph Laffosse-Satie, Erik Satie's grand nephew that he had given birth to this creation of music. My husband's French was substandard and Joseph interpreted it that we had had a child. A few weeks later we received a package containing a beautiful red merino wool baby creeper. To neutralize the embarrassment from this misinterpretation, I grabbed our cat and secretly dressed him up in it and presented our "son" to my husband. He almost busted a gut laughing. This intense memory would give me reason to use Marisol's sculptural techniques to memorialize this event.

Living Without, ceramics and mixed media

I employed Claus Oldenburg's artistic techniques to create a pathology lab using ceramics and mixed media. A repetitive image of the dioxin molecule was fired onto handmade tiles using decals to create the foundation for this work. X-rays document the seriousness of my husband's case history and I used one to frame the malignant lung, testicle, ribs, and tumor on top of the surgical tray. I wanted to discuss the commodity of illness, infusing the viewer with visceral internal body parts to illustrate how humanity is being forced to give up necessary organs due to malignancies from exposure to Agent Orange. The cabinet, an old trash receptacle found in a second-hand store, is turned into an illuminated coffin.

PTSD, DSMIII, and Solidarity, oil on canvas and mixed media

Post traumatic stress disorder is prevalent throughout the global Viet Nam veteran community. I wanted to visually discuss combat issues by developing a painting that integrated works of color theory and Pop art, with the plight veterans experienced when seeking help for

their mental health problems. Dr. Max Luscher's 1969 book, The Luscher Color Test, used color theories of functional psychology to reveal personality. Through the grouping and positioning of his eight manufactured colors anxieties, compensations, and conflicts are revealed in the individual.

Mixing Luscher's eight colors in oil, I used his theory to pair the colors into groups of two. I then layered in Robert Rauschenberg's creative concepts of using photographic imagery to the painting. The paired colors were then painted around historical photographs to illuminate veterans' experience. Rauschenberg also added objects to the canvases he painted to give them a three dimensional quality.

Reflecting on a chapter from Gerald Nicosia's book, Home to War: A History of the Vietnam Veterans Movement, I wanted to tell his story of veterans who returned home with severe post traumatic stress disorder. I also wanted to memorialize the healthcare professionals who worked so diligently in aiding veterans who were suffering from this trauma. The Pentagon and VA would spend years denying veterans the existence of their illness. Nicosia would document:

> "If Vietnam vets were seen at all, it was usually to provide them with the "quick cure" a bag full of pills. Whether a vet was depressed, suicidal, chronically drunk, beating his wife, suffering from severe headaches, insomnia, nightmares, night sweats, and attacks of paranoia, or simply unable to hold down a job or to care about the physical circumstances of his life, he was handed a junkie's fortune in tranquilizers, with plenty of renewals."

Disneyland in Anaheim would historically mark the place where VA doctors and mental healthcare personnel would meet to argue the reinstatement of PTSD into the third edition of the Diagnostic and Statistical Manual of Mental Disorders. This would enable doctors to begin treating affected veterans. I added plush sculpture of Goofey flying on Dumbo. They would reference how veterans felt while taking their prescriptions and beckon the viewer back to the nursery. The experiment worked. My mentor hated it.

For Future Protection, photographs and mixed media

My grandfather, father and every uncle were veterans of WWII. My brother retired from the Air Force in 1996. His daughter paid a brief visit with the Navy and later opted out. My husband died as a result of his exposure to contaminated herbicides in Viet Nam. We were not the only military family. There are many others.

Behind closed door sessions regarding the reinstatement of the draft, our current administration is being briefed by the "what ifs" the United States would encounter in the war against terror. When the war in Iraq began in 2003 I could not help but think of those families who are being exposed to toxins and the wrath of war. Looking over the history of lies that began these preemptive strikes on other countries I asked myself, who will safeguard America? Will our government? Will our politicians? The mirror in this installation is used to suggest it is up to us to protect our future generations who may be called to fight an unjust war and insure their safety against weapons of mass destruction.

Heaven on Earth, video installation and photographs

Certain inventions of our century have given us new ways of experiencing art. To preserve the memory of my husband's dedication to classical guitar, existential clips from guitar performances and teaching videos are presented through visual and auditory methods. This intimate setting uses earphones and the TV, allowing the viewer to engage with his music and life.

Anonymous, ceramics and mixed media

The inspiration for *Anonymous* came after working with ceramicist Richard Shaw who used casting methods to obtain tromp l'oeil (to trick the eye) effects in his work, mixing curiosity with reality. Using his ideas I decided to cast the human body to discuss the effects of Agent Orange. The government has not kept records regarding its dead and dying military personnel, nor have they warned civilians of its toxic effects. They have tested it throughout the world with complete disregard of its effects or bearing any responsibility for the disaster these contaminated herbicides have created. Thirty years later people are still fighting for their lives in hospitals, nursing homes, and hospice awaiting science and medicine to come to a conclusion on how TCDD dioxin exposure is affecting their bodies. The government still states the evidence is not clear.

As humanity is forced to pay into dying to live through slash and burn procedures of surgery, radiation, and chemotherapy, victims' lives continue to be disrupted by illness and malignancy. Instead of taking annual time off for a family vacation enabling them to relax and enjoy their lives, they wait in surgeon, psychiatrist, and psychosocial counselors' offices to hear their prognosis, or be prescribed medications that will dampen their depression. They spend vacation and retirement funds undergoing expensive treatments to prolong their lives. Maybe they'll get to see their child graduate High School, their daughter marry, or their grandchild born. Maybe they'll be meeting with their lawyer to discuss a divorce brought about by having to relate to their spouse through the stress of dealing with the day to day fear of illness or death. The instinct to overcome their disease will compel them to pray for another day, month, or year without additional indebtedness, physical pain, or mental and spiritual anguish.

Bed, intaglio print over blind collagraph

The effects of TCDD dioxin on humans became a quest for knowledge through current research, compelling me to create an artistic piece that incorporates how it disrupts the endocrine system. I would entitle it *Bed*, for we all, collectively, are lying in it. The war in Viet Nam has ended, but the continued assault on our global citizens and environment has not. I am haunted by the fact that civilians, veterans, and their families are sick and dying. They suffer from the consequences of contaminated herbicides without any federal financial assistance because their illnesses do not meet certain epidemiological criteria. They pass unnoticed while our governments drag their feet regarding research that scientifically explains what is truly going on.

The body is an enclosed system. Whatever enters it will be processed throughout its entirety. How can scientific research look at one part of this system and say there's evidence while denying there's a connection to other parts of the same system? Literally and figuratively I cut the body into pieces to protest the way scientific research would ignore specific diseases, denying any connection of the effects of TCDD dioxin from one organ to another. It is now

scientifically acknowledged that 2,3,7,8 - tetrachlorodibenzo-*p*-dioxin (TCDD) is an endocrine disruptor that exerts a variety of adverse effects in animals and humans causing teratogenesis, immunosuppression, and tumor promotion mediated by the aryl hydrocarbon receptor (AhR).

It is known that TCDD dioxin is absorbed into fatty tissues. The brain is composed of fat, yet science has not researched its effects on it. For instance, the pituitary, sometimes called the "master" gland, controls the functions of other endocrine glands. The pituitary's anterior, intermediate, and posterior lobes help to regulate certain hormonal functions. What does the pituitary gland do when exposed to dioxin? Does the dioxin molecule just bind to the Ah receptor and destroy its affected organs over time?

After researching the most basic information on the endocrine system for this project, it would be logical for one to conclude that *ALL* endocrine related illnesses are connected. The *Partial List of Hormone-Releasing Glands* (Fig.1) taken from the sixth edition of *Biological Psychology* by James Kalat identify the bodily functions of the endocrine system. Via a small initial signal from the pituitary, its chemical communication system provides the means to control a huge number of physiological processes. Target cells for most of these hormones produced in tissues are themselves endocrine cells. The balance in the production of these hormones dictates our well-being.

Current research reveals that depending on the cell type examined, TCDD can affect cell proliferation, apoptosis, and differentiation. Its effects can also be contradictory. This xenoestrogen and antiestrogenic pollutant may affect pituitary gland function through the synthesis and secretion of growth hormone (GH) and prolactin (PRL). Limited information exists on how TCDD may affect pituitary gland function and it is imperative to fund further research.

The National Academy of Science Institute of Medicine's 2002 *Table 1: Strength of Association of Diseases and Herbicide Exposure* (Fig. 2) lists illnesses reported by civilians, veterans, and their families. Diseases directly related to the endocrine system are shown to have inadequate/insufficient evidence to presume there's strength of association to TCDD dioxin exposure. Why is this? If TCDD dioxin has been proven to be an endocrine disruptor, what evidence is present to determine them as having inadequate and insufficient evidence?

Specific hormones that control important functions of the body are secreted by the anterior lobe of the pituitary. The examination of these hormones reveals interesting connections between their functions and diseases considered to have inadequate /insufficient/no evidence to be herbicide related. I am not a medical physician, biological psychologist, or chemist. I am an artist who seeks to find the long overdue answers to a problem that seems to be escalating cancer statistics in our society. I believe there is sufficient evidence for scientific research to study the toxic effects of TCDD dioxin on the pituitary. I would also presume a connection is mediated through the pituitary's control over the whole endocrine system. Empirical observation of endocrine related illnesses in light of current research would suggest that Viet Nam veterans who are suffering or deceased from illnesses listed by NAS IOM as having "inadequate/insufficient/suggestive evidence of no association" should be reconsidered for service-connection.

While we manipulate the genetics of our food producing plants to resist the contaminated herbicides we spray and recycle slaughterhouse trimmings from dioxin exposed livestock back into animal feed to avoid emissions through incineration, I question what we are doing to ourselves and future generations. Time is running out. Viet Nam and its veterans are our future. Our government must correct the pattern of denial regarding TCDD-dioxin poisoning. They

must protect all future generations from contaminated herbicides. They must learn to treat all peoples with respect and compassion. They must value humanity.

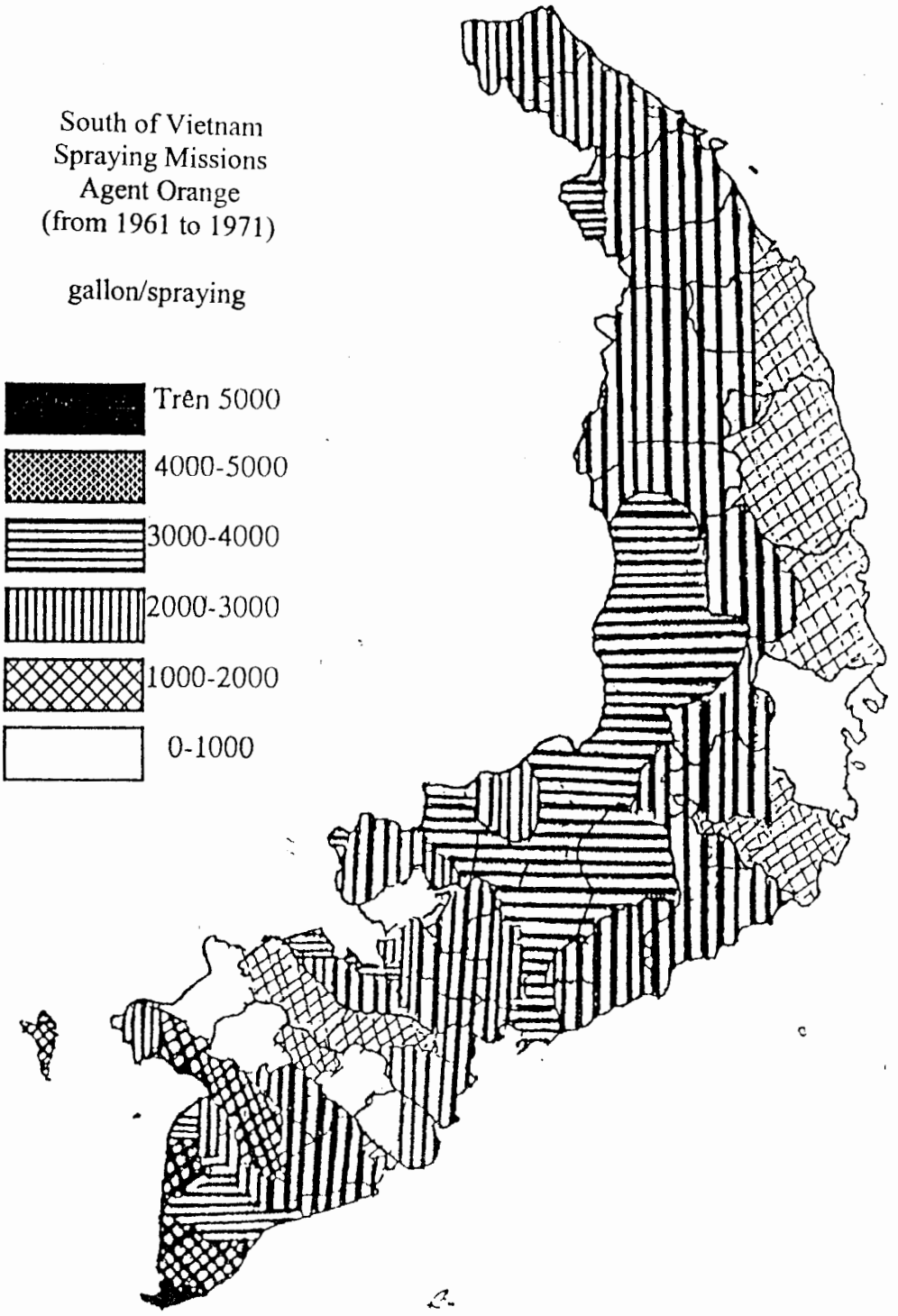
(Fig: 1) ***Partial List of Hormone-Releasing Glands***

Organ	**Hormone**	**Function to Increase or Decrease Production**
Hypothalamus	Various releasing hormones	Promote or inhibit release of hormones by pituitary.
Anterior pituitary	Thyroid-stimulating hormone (TSH)	Stimulates thyroid gland.
	Luteinizing hormone (LH)	Progesterone / testosterone and ovulation.
	Follicle-stimulating hormone (FSH)	Estrogen / maturation of ovum / sperm production.
	ACTH	Secretion of Steroid hormones by adrenal gland.
	Prolactin	Increases milk production.
	B-endorphin	Reduces pain.
Intermediate	melanocyte	stimulating hormone - to control skin pigmentation
Posterior pituitary	Oxytocin	Controls uterine contractions, milk release.
	Vasopressin	Constricts blood vessels and raises blood pressure.
Pineal	Melatonin	Increases sleepiness; also has role in puberty onset.
Thyroid	Thyroxine	Increases metabolic rate, growth, and maturation.
	Triiodothyronine	
Parathyroid	Parathyroid hormone	Increases blood calcium and decreases potassium.
Adrenal cortex	Aldosterone	Reduces secretion of salts by the kidneys.
	Cortisol, corticosterone	Elevates blood sugar, metabolizes proteins in liver.
Adrenal medulla	Epinephrine, norepinephrine	Similar to effects of sympathetic nervous system.
Pancreas	Insulin	Entry of glucose to cells / increases storage as fats.
	Glucagon	Increases conversion of stored fats to blood glucose.
Ovary	Estrogens	Promote female sexual characteristics.
	Progesterone	Maintains pregnancy.
Testis	Androgens	Promotes sperm production /male characteristics.
Liver	Somatomedins	Stimulates growth.
Kidney	Renin	Converts a blood protein into angiotensin.
Thymus	Thymosin (and others)	Support immune responses.

(Fig: 2) ***Table 1: Strength of Association of Diseases and Herbicide Exposure***

Hierarchy by Strength of Association	**Disease**
Sufficient Evidence	Chronic lymphocytic leukemia (CLL) Soft tissue sarcoma Non-Hodgkin's lymphoma Hodgkin's disease Cloracne
Limited /Suggestive Evidence	Respiratory cancers (lung, larynx, trachea) Prostate cancer Multiple Myeloma Acute and subacute transient peripheral neuropathy Porphyria cutanea tarda Type II diabetes Spina bifida (in offspring)
Inadequate/Insufficient Evidence	Hepatobiliary cancers Nasal/nasopharyngeal cancer Bone cancer Breast cancer Cancers of female reproductive tract Renal cancer Bladder cancer Testicular cancer Leukemia including acute myeloid leukemia (in offspring) Skin cancers Spontaneous abortions Birth defects (other than Spina bifida) Neonatal/infant death and stillbirths Low birth weight Childhood cancer in offspring including AML Abnormal sperm parameters and infertility Cognitive and neuropsychiatric disorders Immune system disorders Circulatory disorders Respiratory disorders AL-type primary amyloidosis
Limited/Suggestive Evidence of NO association	Cancer of the gastrointestinal tract (colon, rectal, stomach and pancreatic tumors) Brain tumors

Map 2[a]: Land area where is sprayed with Agent Orange



The commonwealth of Massachusetts
Massachusetts Maritime Academy
Robert E. Black

Excerpt from "Ranch Hand Campaign" by Hoang Dinh Cau

Collaborative USA-Vietnamese Agent Orange Research From 1968 to 2002:

Also Including German, Canadian, Dutch, Japanese and Finnish Scientific Collaboration

Arnold Schecter[1], Marian Pavuk[1], Le Cao Dai[2], John D. Constable[3], Olaf Päpke[4], John Jake Ryan[5], Peter Fürst[6], Rainer Malisch[7], Kees Olie[8], Michael Gross[9], M. Matsuda[10], Seppo Räisänen[11], Paolo Toniolo[12]

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Introduction

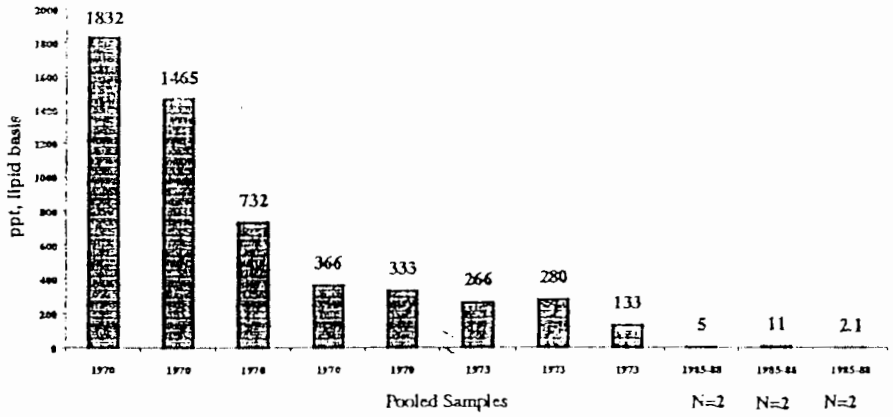
This paper selectively summarizes Vietnamese and United States collaborative research on Agent Orange and its dioxin contaminant, 2,3,7,8-TCDD. This work which began in 1968 includes TCDD measurements in approximately 3000 Vietnamese human and environmental samples; similar work in Cambodia and in Laos; and parallel work in the United States with American Vietnam veterans. Many of the published results are referenced in this paper (references 1-64). Major findings include the first measured 2,3,7,8-TCDD levels in humans and in food, with findings as high as 1,850 ppt TCDD, lipid, in human milk from fish-eating Vietnamese women living in a sprayed area in 1970, and up to 800 ppt TCDD in fish, whole weight.[1-5] Later studies from the 1980s and 1990s reported declining human tissue levels of TCDD; elevated TCDD in some southern food and wildlife; elevated TCDD in some sediment (and elevated higher chlorinated dioxins in sediment, this latter not from Agent Orange).[6-11] The newest findings, from Bien Hoa City as compared to Hanoi, show elevated blood TCDD (up to 413 ppt; comparison 2 ppt) in most residents sampled, some elevated TCDD in the presence of other dioxins in nearby river sediment, and one area of soil with over 1,000,000 ppt TCDD, apparently from a spill at an airbase which stored Agent Orange.[12-13] The contamination of people is ongoing: some children born after Agent Orange spraying ended in 1971 and some new residents to Bien Hoa had elevated TCDD. This research documents exposure of humans to TCDD and environmental contamination with TCDD, primarily from Agent Orange, in selected areas in the south of Vietnam which were sampled because of known Agent Orange spraying.

Results

Figure 1 presents TCDD levels in milk samples from the south of Vietnam during three collection periods (1970, 1973, and 1985-88).[3] Specimens from 1970 and 1973 were collected by John D. Constable and those from 1984 on were collected by A. J. Schecter, Le Cao Dai, and other Vietnamese colleagues. Fish eaters, especially from Can Gio and Tan Uyen villages, volunteered milk in 1970 and 1973 for TCDD analysis by R. Baughman in the laboratory of Mathew Meselson at Harvard University. The very high levels measured in the 1970s seemed to decline markedly over time (Figure 1). TCDD levels in northern Vietnam were much lower with TCDD concentration of 2.1 ppt when first measured in the 1980s.[3]

The plausibility of dioxin exposure through fish consumption was highlighted by levels measured by Baughman in fish and shrimp samples collected in 1970-73 as shown in Table 1. TCDD levels were found to be as high as 810 ppt in catfish and 540 ppt in carp (wet weight).[5]

Figure 1: 2,3,7,8-TCDD in Human Milk From the South of Vietnam, 1970-1988 (ppt, lipid basis)



The 1970 and 1973 analyses were from individual samples and were calculated assuming 3% milk lipid.
Collection sites (1970 & 1973): the villages of Tan Uyen, Can Gio, Quang Xuen, Dau Tieng, and Hiu Cuong

Table 1: TCDD levels in fish and shrimp from southern Vietnam, 1970-73

Sample	Location	TCDD level (ppt wet weight)
Interior		
Carp (Cyprininae)	Dong Nai River	540
Catfish (Siluridae)	Dong Nai River	810
Catfish (Tachysuridae)	Dong Nai River	520
Catfish (Schilbeidae)	Sai Gon River	70
River Prawn (Palemonidae)	Sai Gon River	42
Seaside		
Croaker (Sciaenidae)	Can Gio Village	79
Prawn (Peneidae)	Can Gio Village	18

Table 2 shows TCDD levels in blood samples from population studies conducted in the early 1990s (in collaboration with Vietnamese researchers from medical schools and hospitals in northern, central and southern Vietnam). In this collection of over 2,500 human samples, we observed TCDD levels ranging from 1.2 to 6.1 ppt in the north, from 2.9 to 19.0 ppt in the center, and from 1.0 to 33.0 ppt in the south of Vietnam in individual as well as pooled samples that were analyzed.[3] Total dioxin toxicity or toxic equivalents (TEQ) were as high as 104 ppt, due to contributions from other dioxins not characteristic of Agent Orange.

In some American Vietnam veterans, including sprayers of Agent Orange, elevated TCDD was reported.[49, 51-52] Various dioxins were measured, although not elevated TCDD, in semen of American Vietnam veterans, potentially exposed to Agent Orange spraying.[53]

Table 2: 2,3,7,8-TCDD and Dioxin Toxic Equivalents in Pooled Blood from Vietnam (1991-92)

	Collection Date	Number	Mean Age	TCDD	TEQ	TCDD/TEQ
Northern Vietnam (n = 168)						
Hanoi, Hospital 103	3/91	33	45	1.2	12.0	TCDD 1.2-2.9 (6.1)*
Tay Nguyen (veterans)*	11/91	35	48	6.1	40.3	TEQ 12-18 (40.3)*
Quang Binh, Dong Hoi	1/91	50	47	2.9	17.2	
Than Hoa	11/91	50	55	2.9	18.0	
Central Vietnam (n = 490)						
Thua Thien, Hue	1/91	30	57	11.0	57.0	TCDD 2.9-19.0
Quang Tri, Quang Tri	1/91	50	51	9.5	34.0	TEQ 23-118.2
Da Nang, Da Nang	2/91	49	59	18.0	77.0	
Thua Thien, A Luoi	1/91	35	52	15.0	23.0	
Kh. Hoa, Nha Trang	1/92	50	49	4.1	29.5	
Phu Yen, Phu Yen	1/92	43	51	6.2	26.4	
Ninh Thuan, Phan Rang	1/92	33	56	2.9	31.7	
Da Nang, Da Nang (18-40 y)	8/92	100	30	14.0	96.3	
Da Nang, Da Nang (>40 y)	8/92	100	56	19.0	118.2	
Southern Vietnam (n = 2062)						
Dong Nai, Tri An (Ma Da Forest)	3/91	50	47	12.0	19.0	TCDD 1.0-33.0
Cuu Long, Vinh Long	8/91	51	59	4.3	16.9	TEQ 8.7-104.6
Dong Nai, Bien Hoa	3/91	50	51	28.0	47.0	
Ben Tre, Giong Trom	8/91	34	55	10.2	29.0	
Kien Giang, Go Quao	8/91	37	58	10.9	27.5	
Kien Giang, Rach Gia	8/91	48	58	4.9	17.3	
Minh Hai, Ca Mau	8/91	52	59	7.2	19.9	
Song Be, Song Be	3/91	47	47	9.0	48.0	
Song Be, Tan Uyen	3/91	48	54	32.0	55.0	
Tay Ninh, Tan Bien	2/91	50	60	5.3	25.0	
Tay Ninh, Tay Ninh	3/91	50	53	6.8	16	
Cuu Long, Tra Vinh	8/91	48	57	7.2	27.7	
Hau Giang, Can Tho	8/91	52	61	4.8	16.4	
An Giang, Long Xuyen	8/91	49	62	2.2	10.5	
An Giang, Chau Doc	8/91	46	56	3.5	16.8	
Ho Chi Minh, Cho Ray Hospital	2/91	48	54	10.8	30.0	
Minh Hai, Bac Lieu	8/91	50	60	10.3	34.8	
Gia Lai, Pleyku	1/91	50	57	4.2	34.2	
Tay Ninh, Chau Thanh	8/92	100	54	4.6	19.4	
Tra Noc, Can Tho	8/92	102	51	33.0	104.6	
Song Be, Tan Uyen (18-40 y)	8/92	100	32	9.4	25.4	
Song Be, Tan Uyen (>40 y)	8/92	100	51	5.7	18.9	
Song Be, Ben Cat	8/92	100	32	12.0	49.8	
Dong Nai (18-40 y)	8/92	100	51	14.0	61.0	
Dong Nai (>40 y)	8/92	100	53	19.0	53.7	
Tay Ninh, Hoa Thanh	8/92	100	50	1.0	38.8	
Song Be, Dong Xoai	8/92	100	50	3.1	8.7	
Tay Ninh, D.M. Chan	5/92	100	50	7.0	35.3	
Dong Nai, Bien Hoa (18-40 y)	5/92	100	47	7.3	22.8	
Dong Nai, Bien Hoa (>40 y)	5/92	100	N/A	12.0	49.0	

Note: N/A = not available; TCDD = 2,3,7,8-TCDD; TEQ = total dioxin toxic equivalent; (Lipid Basis, Parts per Trillion)

Elevated TCDD was also found in sediments collected by Schecter and Dai in southern Vietnam in 1984-86 and analyzed by Gross, Hites and colleagues as shown in Table 3. We found elevated TCDD levels from Agent Orange and also elevated higher chlorinated dioxins (not from Agent Orange) compared to northern sediment and sediment from certain other parts of the world.[9-11]

Table 3: Vietnam Sediments Concentrations in Comparison to Average Total Concentrations in Lake Sediments of Industrialized Countries (pg/g)

Site	Total Concentration of PCDD/F	Site	Total Concentration	TCDD only [a]
		South of Vietnam		
Lake Huron	1240	Saigon River	6782	210 (6)
Lake Michigan	1600	Dong Nai River 1	1365	ND (21)[b]
Lake Erie	2150	Dong Nai River 2	838	
Lake Ontario	11000	Dong Nai River 3	1437	
Siskiwit Lake	730	Dong Nai River 4	1052	
Lake Zurich	1500	Dong Nai River 5	1433	
Lake Balderg	1500	North of Vietnam		
Lake Lugano	2000	Red River 1	255	ND (47)[b]
		Red River 2	219	

[a] For TCDD only limit of detection in parenthesis; [b] Pooled sediments results for Dong Nai and Red River

Food collected in the 1980s in Agent Orange sprayed areas showed elevated TCDD in some southern samples as compared to both northern samples and to selected European samples. For instance, a pork fat sample from the south had 6.2 ppt, from Hanoi, 0.58 ppt, and from the Netherlands, 0.42 ppt TCDD. A chicken fat sample from the south measured 31.5 ppt, from Hanoi, 3.30 ppt, and from Holland, 1.61 ppt TCDD.[7-8]

Because 10 % of the south of Vietnam was sprayed with Agent Orange and none of the north was sprayed, most Vietnamese people probably were not contaminated and most food in or from Vietnam is probably low in dioxin content. We will present new data on dioxin levels in Vietnamese food exported to USA at this meeting.

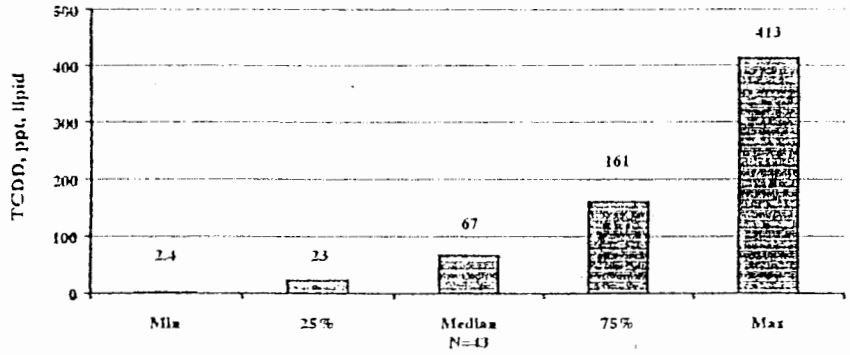
In the 1980s, we also reported elevated TCDD levels from limited samples of wildlife living in Agent Orange sprayed areas. The values of TCDD in turtle ovaries was 250 ppt, turtle liver 88 ppt, turtle gall bladder 39 ppt, and snake muscle 11.6 ppt.[7-8]

Bien Hoa City was the location of an airfield used for Agent Orange storage and spray missions. Spills of Agent Orange occurred there, especially in 1970. During 1999-2001, elevated TCDD was detected in the blood of most sampled residents of Bien Hoa City (Table 4 and Figure 2), with levels up to 413 ppt; whereas non-exposed persons averaged 2 ppt. Forty-one out of 43 blood samples (95 %) from Bien Hoa City have elevated TCDD (>5 ppt) and 15 subjects (36%) had TCDD levels above 100 ppt.[13] This nearly 200-fold increase in human TCDD blood level exposure in Bien Hoa is almost certainly from current contamination of fish and other animal food.[13]

Table 4: Vietnamese blood TCDD levels, Bien Hoa City, 1999-2001

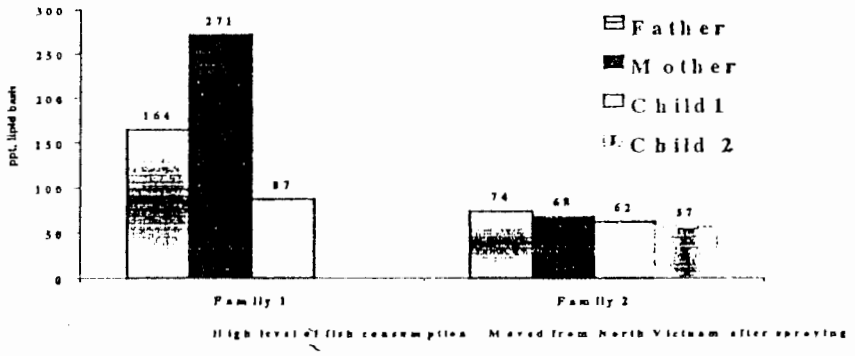
Sample	Year of Birth	TCDD level (ppt lipid basis)	Sample	Year of Birth	TCDD level (ppt lipid basis)
		South Vietnam (individual samples)			
1	1962	2.4	23	1942	68.3
2	1950	3.4	24	1962	70.2
3	1952	5.1	25	1935	73.9
4	1962	5.6	26	1960	76
5	1980	5.7	27	1980	87
6	1942	7.1	28	1985	91
7	1950	7.8	29	1962	101
8	1930	20	30	1966	102
9	1947	21	31	1963	103
10	1939	22	32	1963	154
11	1955	23	33	1959	161
12	1955	24	34	1954	162
13	1942	29	35	1955	164
14	1955	30	36	1958	168
15	1982	35	37	1982	174
16	1955	38	38	1985	177
17	1952	39	39	1967	236
18	1979	50	40	1950	238
19	1981	57	41	1954	271
20	1981	62	42	1963	326
21	1983	63	43	1973	413
22	1958	67			
		North Vietnam (individual samples)			
1	1930	1.6	4	1930	1.2
2	1924	1.9	5	1932	2.3
3	1939	1.4			
		North Vietnam (pooled sample, n=100)			
Hanoi	1959-79	2.2			

Figure 2: Summary of Bien Hoa City Blood TCDD Levels, 1999-2001



As shown in Figure 3, some newcomers to the south of Vietnam (arriving after Agent Orange spraying ended) had elevated TCDD blood levels consistent with TCDD contamination subsequent to the end of Agent Orange spraying. Figure 3 also shows elevation in a sustenance fish eating family including a child born after spraying ended. These blood levels are of the same order of magnitude as found in 1970 and 1973 milk samples when Agent Orange spraying occurred or had recently ended.[3, 12, 13]

Figure 3: TCDD Blood Levels in Bien Hoa City, 1999 - 2001



River and lake sediments collected in 2000 showed moderately elevated TCDD (Table 5) in 2000. TCDD was not detected in most Vietnam soil, but one sample from Bien Hoa airbase contained 1,100,000 ppt, presumably from an Agent Orange spill in 1970 (Table 6). A Canadian study conducted in central Vietnam also showed elevated TCDD in some humans and food samples.[14] To date, no elevations of TCDD in humans or in environmental samples have been found in Cambodia or Laos.[45-49]

Table 5: Dioxin Levels in Sediment of Lake Bien Hung and the Dong Nai River, 1999-2001

	Hanoi	Bien Hung Lake-1			Bien Hung Lake-2			Dong Nai River		Bien Hung Lake-3	
		A	B	C	A	B	C	A	B	Down-Stream	Up-Stream
2,3,7,8-TCDD	ND	10	14	1.6	177	114	98	0.8	1.5	1.7	1.1
Total PCDD Measured	403	199	291	532	1,970	1,413	1,455	543	715	697	497
Total PCDF Measured	703	9.2	11	9.9	134	98.8	89.4	2.1	6.8	18.9	28
Total TEQ	7	12	17	4	193	126	108	2	3	4	4

TEQ = Total Dioxin Toxicity. "Down" and "Up" stream reference relative to airbase.

Table 6: TCDD Levels in Soil at Bien Hoa Airbase

	Sample 1	Sample 2	Sample 3	Sample 4
2,3,7,8-TCDD	1,164,699	603,968	ND	1,058

ND = Not Detected, Pg/g (ppt). "Up" stream and "Down" stream in reference to Airbase.

Table 4: Vietnamese blood TCDD levels, Bien Hoa City, 1999-2001

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6	1942	7.1	28	1985	91
7	1950	7.8	29	1962	101
8	1930	20	30	1966	102
9	1947	21	31	1963	103
10	1939	22	32	1963	154
11	1955	23	33	1959	161
12	1955	24	34	1954	162
13	1942	29	35	1955	164
14	1955	30	36	1958	168
15	1982	35	37	1982	174
16	1955	38	38	1985	177
17	1952	39	39	1967	236
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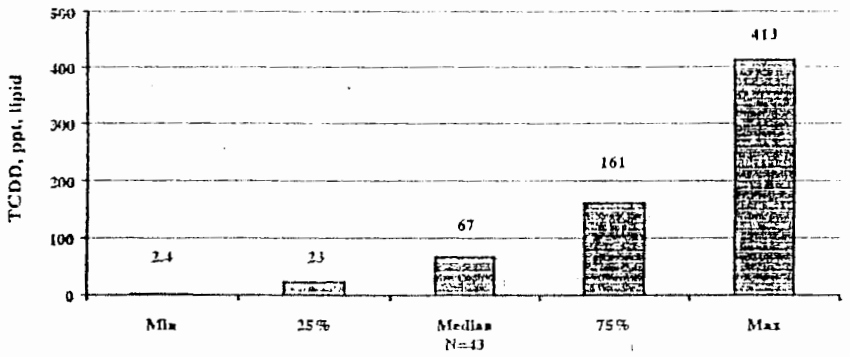

Conclusions

Our Agent Orange research indicates elevated TCDD from Agent Orange in some southern Vietnam residents. Sampling was deliberately performed in areas of high Agent Orange spraying, and in the north (Hanoi) for comparison. Although levels of TCDD and of other dioxins varied, breast milk TCDD levels of up to 1,850 ppt were found in fish-eating southern residents living in sprayed villages. These are apparently the highest measured breast milk dioxin levels to date. Levels of TCDD in northern Vietnam residents were found to be much lower, with typical levels at 1-2 ppt. Fish in highly contaminated areas were found to have quite high TCDD levels as were some food, wildlife, soil and sediment samples collected from 1970 to 2001 in sprayed areas of Vietnam. Most recently, elevated TCDD levels were found in blood and environmental samples from Bien Hoa City, a city 35 kilometers north of Ho Chi Minh City, where an airbase used for Agent Orange spraying existed. Most persons sampled had elevated blood TCDD; some sediment had elevated TCDD levels; and several samples of soil were highly contaminated with TCDD. Fish-eaters, children born after Agent Orange spraying ended, and newcomers to the city, had elevated TCDD levels, documenting exposure after cessation of spraying in 1971.

Discussion

The finding of high levels of TCDD in humans and in food during and shortly after Agent Orange spraying is not unexpected. However, the finding of elevated levels from current exposure, 3 decades after spraying ended, is unexpected. This indicates that TCDD can remain in the environment and work its way through the food chain for substantial periods of time following initial contamination. Such findings have implications for Vietnam and other locations contaminated with dioxins, including those American Superfund sites which are contaminated with dioxins. We postulate that TCDD has moved through the soil, into sediment, into the food supply, especially fish, and then into humans in Bien Hoa City and similar Agent Orange sprayed areas. We believe the data suggest that there may be many dioxin contaminated areas or "hot spots" in Vietnam.

Recommendations

Based on our research, we suggest several courses of action. First, further sampling to document other potential "hot spots" (Agent Orange sprayed areas) seems strongly indicated. Second, for persons with elevated dioxin levels, additional medical monitoring and care appear to be warranted. In addition, elimination of contaminated food from the diet constitutes appropriate public health action. Clean up of contaminated areas may be indicated, as may keeping people from contaminated areas. Further human and environmental surveys, followed by health studies, perhaps in concert with health care clinics, also seem reasonable steps to be taken in the very near future.

In addition, there is a need for health studies comparing the large Vietnamese populations exposed to dioxin from Agent Orange (starting in 1962 with the first spraying of Agent Orange), with the large unexposed reference populations, to better characterize the health consequences of dioxins to the exposed populations. With blood dioxin measurements as the established current "gold standard" for exposure, better epidemiological studies can now be performed than in the past. Most Agent Orange was sprayed in Vietnam, but some was also sprayed in Laos,

Cambodia and Thailand. Future studies conducted in these countries would provide additional data on exposure of persons, environment, transport and fate, uptake and elimination of TCDD, as well as health aspects of TCDD exposure.

Further studies might target additional populations. Where TCDD levels in Vietnam are elevated, the potential exists for exposure of foreign Vientam war veterans. Where levels are low, it is less probable that others, such as American Vietnam veterans, were exposed to Agent Orange. Similarly, former Vietnamese citizens who lived in dioxin contaminated areas who are now living in other countries (such as the USA) may have been exposed and it might be useful to measure their blood dioxin levels.

Finally, TCDD is associated with an increased risk for various diseases. Identification of those at risk, considering spray records and TCDD blood levels, in Southeast Asia and elsewhere, would allow better medical monitoring and hence a decrease in morbidity and mortality in those exposed to dioxins.

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Conclusions

Our Agent Orange research indicates elevated TCDD from Agent Orange in some southern Vietnam residents. Sampling was deliberately performed in areas of high Agent Orange spraying, and in the north (Hanoi) for comparison. Although levels of TCDD and of other dioxins varied, breast milk TCDD levels of up to 1,850 ppt were found in fish-eating southern residents living in sprayed villages. These are apparently the highest measured breast milk dioxin levels to date. Levels of TCDD in northern Vietnam residents were found to be much lower, with typical levels at 1-2 ppt. Fish in highly contaminated areas were found to have quite high TCDD levels as were some food, wildlife, soil and sediment samples collected from 1970 to 2001 in sprayed areas of Vietnam. Most recently, elevated TCDD levels were found in blood and environmental samples from Bien Hoa City, a city 35 kilometers north of Ho Chi Minh City, where an airbase used for Agent Orange spraying existed. Most persons sampled had elevated blood TCDD; some sediment had elevated TCDD levels; and several samples of soil were highly contaminated with TCDD. Fish-eaters, children born after Agent Orange spraying ended, and newcomers to the city, had elevated TCDD levels, documenting exposure after cessation of spraying in 1971.

Discussion

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Social consequences of the chemical warfare in Vietnam

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For most Swedes of my generation, the Vietnam war is vivid in our minds, and with that the images of the airplanes spraying their toxic mist over the landscape. We heard the early warning signals from Dr Thon That Thun in 1970, that Vietnamese women gave birth to malformed babies. But after the war ended, little was heard in Europe about the chemical warfare and its consequences, in fact it seemed to be forgotten. So when I was asked by Mme NT some years back if I wanted to take part in CGFEDs research about social and family consequences of Agent Orange, I felt both enthusiastic and privileged to be able to learn about what had happened to people in Vietnam, 30 years after the spraying ended. Together we developed a research project and I will tell you something of our findings and share some concerns.

During the last few years, with a team of researchers from the CGFED and with a Swedish colleague, we have visited families in the North, Central and South, families where one or both parents were exposed to chemical spraying during the war and who later got disabled children. We have listened to their stories about war and spraying, what it was like coming home after the war, set up families and how many of them got one disabled child after the other... We have seen the parents' extremely heavy burden of care for the disabled, their severe economic problems and their worries about who will take care of the sick children when they themselves have died. We have learnt from them how, in the midst of suffering and hardships, they manage to find meaning in life in the love of their children and in the conviction that they are doing the right thing in taking caring of them. But in the meetings with these families, where there are also many single parents, it has become clear to me that the consequence of the chemical warfare is indeed one of the most painful and complex issues of post-war Vietnam. One specific concern, which I will focus one here, is the fear of getting a 'third generation AO victims'.

But first a few words about what is known and not known about the bio-medical effects of dioxin on reproduction. We know that dioxin may interfere with the normal foetal development after exposure by one of the parents, either directly by spraying or indirectly by eating polluted food. Damages can also be caused to the baby though the

mother's breast milk. In the scientific literature, it has been shown that dioxin is associated with higher risks of miscarriages and infant deaths, and with lower rates of male babies born. There are also proven associations between dioxin and some birth defects such as spina bifida. Few other birth defects in humans have been possible to link scientifically with dioxin. This doesn't mean that such links cannot exist, simply that studies have not yet been able to demonstrate them. But through laboratory research, we know the extreme toxicity of dioxin and that it causes birth defects in animals and also many other diseases such as cancers. Therefore in the West, when dioxin leakages have occurred in industrial accidents, big effort have been made to clean up and protect the population, no-one has waited for 'scientific evidences' to prove that people might get sick. An example is in Sweden, where we advice women of fertile age not to consume fish from the Baltic sea more than once or twice per year. The Baltic sea is heavily polluted, also with dioxin, and although the level of dioxin in the fish from the Baltic is very low compared to what is found in some 'hot spots' today in Vietnam, we want to be on the safe side.

When it comes to the possible genetic effects, in the current state of scientific research, not much is known about this. But today in Vietnam many people fear that the transmission of dioxin damages is taking place to a third generation AO victims, even to later generations. This fear has come up in recent years, as it has been noted that some families, with one or both parents exposed to AO, have got healthy children but grandchildren are born disabled or develop strange diseases when they get older. This fear is very understandable and is a matter of great concern. For the natural sciences this is a complicated research issue, which Dr Doray will bring up later.

As social scientists we are concerned about the social consequences created by the fear of transmission to the third generation. We have met many families with disabled children where the healthy siblings worry about getting married, especially the young girls and women. One young woman said: "I am worried that the poison that entered my father's body has been transmitted to my genes and will harm my future children. I don't think I can ever get married, no man wants me". Other families tried to hide the fact that they had disabled children, they worried that the families of the future husband would find out and stop him from marrying their daughter. Reading your presentations, I have seen that there are many other families

like this, even cases of suicides among young women who fear that they carry 'bad genes' of their fathers. We have also heard from other people in the communities that they think that such children in fact should not get children. There seem to be a fear that the 'dioxin genes' may spread in the population and reduce its quality. This is a very serious concern indeed.

What are the consequences of this fear for young people? How many young women and men in families with a history of AO will not be able to marry and get children because of the fear of genetic effect? And what are the consequences for the parents who may not get grandchildren? How should young women and men with AO victims in the family be counselled? In TV and newspapers much is written about the possibility of transmission of dioxin damage to the 3rd generation. How are these messages designed, how are they understood and diffused among people? I think we have an important task in trying to understand the fears and perceptions about dioxin and its transmission in society, and to share this with policy makers and those responsible for counselling, education and information. This is an important challenge for the social scientists together with educationists to reduce the fear and stigma associated with disablement in general, not only dioxin-related, and through information and health education help young people to make realistic choices and to get healthy children.

There are always risks involved in getting children, but much can be done to reduce these risks by advising pregnant women to avoid exposure to all sorts of environmental hazards, drugs and toxic substances. As I told you, Swedish pregnant women are advised not to eat certain fish because of the dioxin risk. In Vietnam, most urgent is of course the 'hot spots' where the dioxin levels are high. If such high levels would be found for example in the US or Sweden, the cleaning up of the environment would be a matter of great urgency. Before this is done in Vietnam, other measures and education is urgently needed; many of you will talk about this so I will not go into this here.

A final comment: As we are all aware, the US Gvt and the chemical firms that produced Agent Orange and other defoliants used in the war, deny their responsibility referring to the 'lack of scientific evidences'. Such evidences can only be found through large scale epidemilogical studies which are both very complicated and costly to do. After the dioxin conference in Hanoi in 2002, the hope was raised that a new research programme between Vietnamese and American scientists would finally find some answers concerning the damage caused by dioxin for people's health. Unfortunately it failed and the plans were stopped. I think this is truly unfortunate and I sincerely hope that new initiatives will be taken to throw light on the real effects of the atrocious chemical warfare in Vietnam, and the biggest dioxin disaster ever.

I hope this conference will be a forceful voice, helping to make sure that the chemical warfare in Vietnam is not forgotten by the world but written into the history books and told to our children and grandchildren.* We owe this to all those who already lost their lives, and to those who today live in great hardship and sufferings. We also need this as a lesson for the future. In many parts of the world, different fora for documenting life stories and historical events of all sorts are created. In Sweden we have something called 'Living History' where we now collect stories from survivors from the Nazi crimes in Europe. Could we during this conference suggest some form for keeping all the valuable stories and documents about the chemical warfare for future generations? I would very much appreciate to discuss this with you.

Finally, I would suggest that we use the momentum created around the attention to the consequences of Agent Orange as a lever to mobilise initiatives for the rights of all disabled to a better life, to 'enable the disabled'.

*[In fact, the opposite seem to take place. I was very surprised when I attended a lecture in Sweden about the 2000 century's use of chemical and biological weapons, and not one word was mentioned about the use of chemicals in the Vietnam war! I later found out that this is the situation in most history books and other documents on modern wars. One reason is that at that time, the international conventions had no provisions for such things as 'herbicides', this sounded quite innocent and was not defined as a chemical weapon. The international convention is now rewritten and had Agent Orange been used today, it would be classified as a criminal use of chemical weapons.)

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128.	Ms. Pham Thi Cuc	Social activist		
129.	Ms. Bui Thi Suu	Specialist on women's studies		
130.	Ms. Le Thi Ngoc Dau	Specialist on women's studies		
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Tentative Agenda

(Draft 7/3/06)

THURSDAY, 16/3/2006

8:00 - 8:30 **Registration**

8:30 - 8:45 **Introduction of participants**

8:45 - 9:00 **Opening Speech,** Ms. Le Thi Nham Tuyet, Director of Research Centre for Gender, Family and Environment in Development, (Vietnam)

9:00 - 9:15 **Welcome speech and the expectation from participants,** Ms. Nguyen Thi Binh, President of Vietnam Peace and Development Foundation, (Vietnam)

9:15 - 9:30 **Information on the documents of the conference from the Conference's Scientific Committee,** Mr. Hoang Ba Thinh, Ph.D., Head of Sociology on Gender and Family, Sociology Department, University of Social Science and Humanity, Hanoi National University, (Vietnam)

9:30 - 9: 50 Presentation 1:

Mr. **TRAN XUAN THU**, Ph.D of chemistry, Vice President and General Secretary of Vietnam Association of Victims of Agent Orange/Dioxin, (Vietnam) *"About the establishment of a research and rehabilitation centre for Agent Orange/Dioxin victims"*

9:50 - 10:10 Presentation 2:

Ms. **ANNIKA JOHANSSON**, Ph.D., Sociologist, Department of Public Health Sciences, Division of Int.Health (IHCAR), Karolinska Institute, (Sweden), *"Consequences of the chemical warfare in Vietnam - The known and the unknown"*

10:10 - 10:25 **Break**

10:25 - 10:45 Presentation 3:

Mr. **LE KE SON**, Ph.D., MDH, Director of General Office, The national steering committee for the overcoming of the consequences of toxic chemicals used by USA in the war in Vietnam, (Vietnam), ***"Overcoming consequences of chemical warfare – A difficult and longterm task"***

10:45 - 11:05 Presentation 4:

Mr. **JACQUES MAITRE**, Prof., Sociologist, Center for Research and for Actions against Trauma and Exclusion, France) ***"Agent Orange in front of social science"***

11:05 - 11:20 Presentation 5:

Mr. **PHAN BAO HOA**, President of Red Cross Association in Dong Nai, (Vietnam), ***"Conscience and responsibility toward Agent Orange/Dioxin victims"***

11:20 - 11:50 Presentation 6:

Ms. **DEBRA JEANNE KRAUS**, Artist, (USA), *"Fiat Lux: An Artistic Dialogue about Agent Orange"*

11:50 - 12:10 Presentation 7:

Mr. **HOANG TRONG QUYNH**, Ass.Prof., Ph.D., MD, Director of Centre for Ecologically and Sustainable Agriculture, (Vietnam), ***"Dioxin and the environment in Vietnam"***

12:10 – 13:00 **Lunch**

13:00 – 13:20 Presentation 8:

Mr. **KHONG DIEN**, Prof., Ph.D., Director of Institute for Social Science in the central region and the highland, (Vietnam), ***"Damaging effects of Agent Orange/Dioxin; the pain of many communities, families and generations"***

13:20 - 13:40 Presentation 9:

Ms. **DIANE NICBLACK FOX**, Fellow in Asian studies, Hamilton College, (USA) ***"Speaking with Vietnamese Women on the Consequences of War, Writing Against Silence and Forgetting"***

13:40 - 14:00 Presentation 10:

Mr. **DANG DUY THANH**, MD, MA, Hospital of psychiatry of Khanh Hoa, (Vietnam), ***"Posttraumatic stress disorder among Vietnamese war veterans (cựu chiến binh) living in Vietnam"***

14:00 - 14:20 Presentation 11:

Mr. **BERNARD DORAY**, psychologist, Center for Research and for Actions against Trauma and Exclusion, (France), ***"An introduction to the psychological problem of war victims"***

14:20 – 14:40 Presentation 12:

Ms. **LE THI**, Prof. of Philosophy, Former director of Center for Family and Women Studies, (Vietnam), ***"Vietnamese women and children facing the effects of Agent Orange"***

14:40 – 15:00 Presentation 13:

Mr. **ILYA B. TSYRLOV**, Ph.D., MDH, Chief Scientific Officer, Xenotox Inc, (USA), ***"Human burden 2,3,7,8-TCDD may augment common viruses associated with cancer malignization"***

15:00 – 15:15 **Break**

15:15 – 15: 35 Presentation 14:

Mr. **DAO DUY CHAP**, President of Binh Dinh Red Cross, (Vietnam), ***"The chemical warfare in Binh Dinh and some activities of Binh Dinh Red Cross in the care for Agent Orange victims"***

15:35 – 15: 55 Presentation 15:

Mr. **MICHAEL PALMER**, Center for Epidemiology and Reproductive Health, National University, (Australia) ***"The legacy of Agent Orange: a Socio-economic impact assessment from central Vietnam"***

15:55 – 16:15 Presentation 16:

Ms. **PHAM KIM NGOC**, MA, Vice Director of Research Centre for Gender, Family and Environment in Development, (Vietnam), ***"Disastrous loss of right to reproduction and damaged reproductive health"***

16:15 – 16:35 Presentation 17:

Mr. **TRAN MANH HUNG**, Head of Division for mitigation of the consequences of the chemicals use during wartime on the human health (10-80 Division), Ministry of Health, (Vietnam), ***"Spina bifida occulta among the adult's children of the people living in Agent Orange/Dioxin contaminated areas during wartime was revealed by lumbar vertebra X-rays"***

16:35 – 16:55 Presentation 18:

Ms. **TRUONG THI NGOC LAN**, representative of Agent Orange victim families, (Vietnam), ***"Loosing the reproductive and reproductive health rights – Disaster of the chemical warfare"***

FRIDAY, 17/3/2006

8:30 – 8:45 Presentation 19:

Ms. **INDAI SAJOR**, Former Executive director of Asian Centre for Women's Human rights, (Ethiopia), "***The researches on consequences of Agent Orange/Dioxin on human body in Vietnam"***

8:45 – 9:05 Presentation 20:

Mr. **HOANG BA THINH**, Ph.D. of Sociology, Head of Sociology on Gender and Family, Sociology Department, University of Social Science and Humanity, Hanoi National University, (Vietnam), ***"Families of Agent Orange/dioxin victims of the third generations"***

9:05 – 9:25 Presentation 21:

Ms. **NGUYEN HAC DAM THU**, Sociologist, N-T Research Centre for psychology of children, (Vietnam), ***"Echos from the Truong Son mountain"***

9:25 – 9:45 Presentation 22:

Mr. **NGUYEN VAN TUONG**, Ph.D., MDH, Prof. Hanoi Medical University, (Vietnam), ***"Some main solutions to mitigate long-term consequences on victims of Agent Orange/Dioxin in Vietnam"***

9:45 – 10:00 Presentation 23:

Mr. **PHAN KHAC TU**, Catholic priest, Director of Thien Phuoc, Centre for disabled children, Ho Chi Minh, (Vietnam), ***"About the disabled children"***

10:00 – 10: 15 Break

10:15 – 10:35 Presentation 24:

Mr. **KENNETH J. HERRMANN**, Prof., Director of Suny Brockport Vietnam Program in Quang Nam, Da Nang, (Vietnam), ***"The simple and the spirit: Simple justice for Agent Orange victims in Vietnam"***

10:35 – 10:50 Presentation 25:

Ms. NGUYEN THI HIEN, Vice President of Da Nang Association of Victims of Agent Orange/dioxin, (Vietnam), ***"The result of Fund for Agent Orange/dioxin (Da Nang Association of victims of Agent Orange/dioxin) in aiding for Agent Orange victims program from 1998 to 2005"***

10:50 – 11:05 Presentation 26:

Mr. **MAI XUAN THAI**, Director of Friendship village, (Vietnam), ***Activities of Friendship village...***

11:05 – 11:25 Presentation 27:

Mr. **LE TRAN NGOAN**, Ph.D., MD, Department of Occupational Health, Hanoi Medical University, (Vietnam), ***"Geographical difference in liver cancer incidences and its possible risk of HBV, HCV, liver fluke infections and dioxin contamination in Vietnam"***

11:25 – 11:40 Presentation 28:

Mr. **PHAM TRUONG AN**, Phamacist, President of Kon Tum Red Cross Association, (Vietnam), ***Some information on victims of Agent Orange and practical help of Kon Tum Red Cross Association, Kon Tum Association of Victims of Agent Orange/Dioxin for victims...***

11:40 - 12:00 Conclusion on presentations

12:00 – 13:00 Lunch

13:00 – 14:00 **Group discussion:**

Group 1: The Red Cross/ Association of victims of Agent Orange/Dioxin

Group 2: Centres for disabled children

Group 3: Non governmental organizations/ social organizations

14:00 – 15:00 **Reports of discussion groups**

15:00 – 16:30 **Conclusions and letter to the US court**

8:00 – 12:00 **SATURDAY 18/3/2006:** FREE

Some participants go for a field visit at Vietnam Friendship village (Van Canh, Hoai Duc, Ha Tay)

We sincerely thank the Fund for Reconciliation and Development (FFRD) for support in printing this proceedings