LONG-TERM CONSEQUENCES OF AGENT ORANGE/ DIOXIN IN VIETNAM

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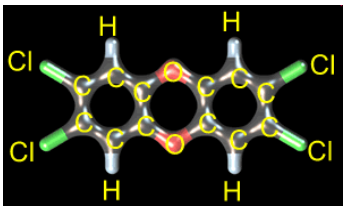
On August the 10th 59 years ago, following the instructions made by the US President, Robert Kennedy, U.S. Air F. orces began to launch the chemical warfare in Vietnam with their first sprayings of toxic substances. During a period of 10 years, from 1961 to 1971, they almost dumped into southern Vietnam about 80 million liters of herbicides, 61% of which was Agent Orange, containing about 366 kg of dioxin, the most toxic chemical that we can know until now. While the 2,4,5-T in Agent Orange was being processed at high temperature and pressure, the chemical companies had figured out the appearance of the **dioxin**, which was the most harmful toxicant to many species, especially to human beings. However, due to profitability and being under pressure to produce for the US military as much as possible, the companies had no intervention to reduce the amount of the poison!



DIOXIN, whose chemical formula is 2,3,7,8 tetra-chloro-dibenzo-para-dioxin or 2,3,7,8 TCDD for short

Figure 1. Dioxin chemical formula

The chemical warfare conducted by the U.S. has caused serious consequences for the people of Vietnam: More than 3 million hectares of forest were destroyed, more than 22,000 villages directly sprayed 4,8 million people were directly exposed to toxic chemicals, of which more than 3 million people have been suffering from dangerous diseases, especially cancers and malformations. Hundreds of thousands of them have died. The rest of them are struggling with cruel diseases or having malformations and deformities. Many women can not become wife and mother. There are many families where the mother has to take care of sick father as well as 2-3 children unable to serve themselves. They are the poorest and hardest families in society. There is even a family with 12 among 15 children died of Agent Orange. That tragedy has been existing for more than 40 years after the war, and illness caused by Agent Orange which has been transmitted to the 3rd generation (the grandchildren) and we do not know when it will finish.

Facing this situation, immediately after the war, with the help and support from international friends, including Japanese friends, Vietnamese people made every effort to deal with the effects of Agent Orange/Dioxin. This cause consists of:

– Clean up dioxin - contaminated lands and replant the mangrove and inland forests.

- Treat diseases and cancers in people who have been affected by dioxin.
- Prevent birth defects by close antenatal care with ultrasonography and blood tests.
- Help the victims of Agent Orange to overcome difficulties caused by diseases and poverty.

At present, most of the sprayed land has been cleaned up. Only 28 hot spots with a high density of dioxin remain, among them 3 hot spots in Da Nang, BienHoa (Dong Nai province) and Phu Cat (Binh Dinh province). Recently, Vietnam and the United States have finished decontaminating dioxin at the former Da Nang military base and begin to work with the Bien Hoa air base.

For people, about 350,000 people (former soldiers who have beaten at the front and their children affected by dioxin) can receive monthly pensions enough to live from the government. We are beginning to provide social benefits to civilians living in areas where Agent Orange has been sprayed.

In January 2004, the Vietnam Association for Victims of Agent Orange/Dioxin (VAVA) was created with two main tasks: Mobilizing of all domestic and international supports and assistance to help the victims; and protecting their legitimate rights and interests.

Through 16 years of operation, VAVA has so far its chapters in on over the country: (63/63 provinces and cities) with 400,000 members. We have raised about VND 2,500 billion VND (more than 100 million USD) to help victims cure diseases, build houses, develop production for improving their life conditions, support scholarships for their children...VAVA are forming a widespread network with 26 center to regularly take care of and help victims.

In the cause of dealing with the consequences of Agent Orange used by the Americans during the war in Vietnam, we have been benefited from very precious help and support from friends all over the world, including Japanese friends. I would like to take this opportunity to thank the Japanese people and government, who have shown us a special feeling by providing us with very effective aid for several years. I can not remember all the names of Japanese friends, but I mean that many Japanese people have become great friends, wholehearted donors to Vietnamese victims of Agent Orange.

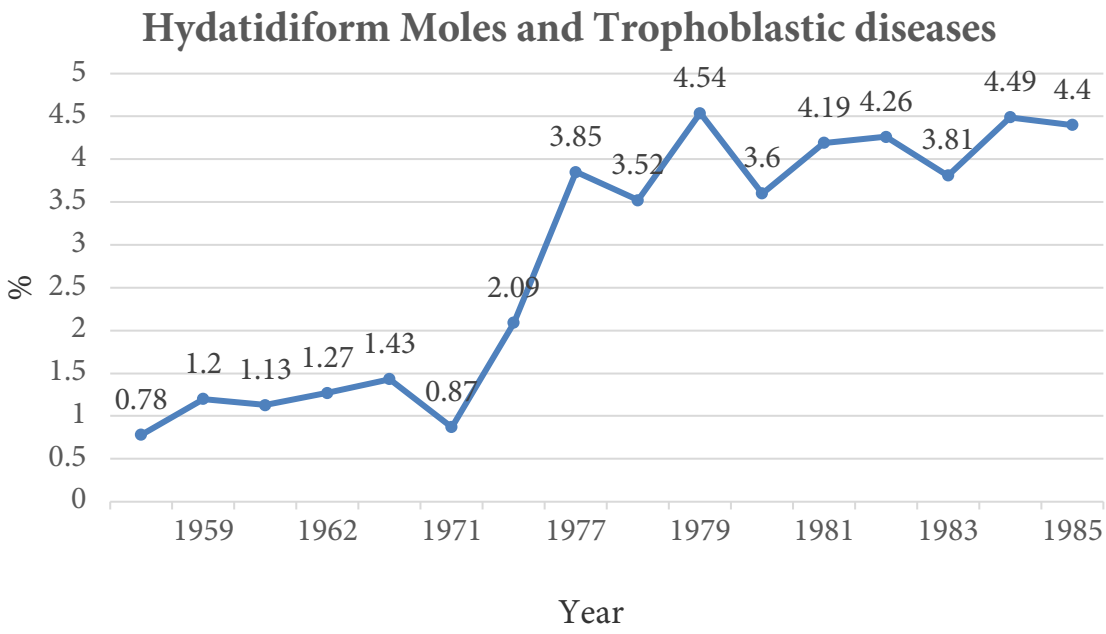
I would also like to express my wish that the help and support from Japanese friends may continue and develop further in the future.

Dear friends, I would like to reserve the second part of my speech to speak in particular of the effects of Agent Orange/Dioxin on children's health. I will talk with you about

1. Research on the Cause – Effect relationship and the USA's acknowledgement on this issue
2. Recommendations

I. RESEARCH FINDINGS FROM SCIENTIFIC COMMUNITIES IN VIETNAM AND IN THE WORLD OVER HAVE PROVED THE CAUSE-EFFECTS RELATIONSHIP BETWEEN THE EXPOSURE TO AGENT ORANGE/DIOXIN AND CONGENITAL MALFORMATIONS, DISEASES AND CANCERS.

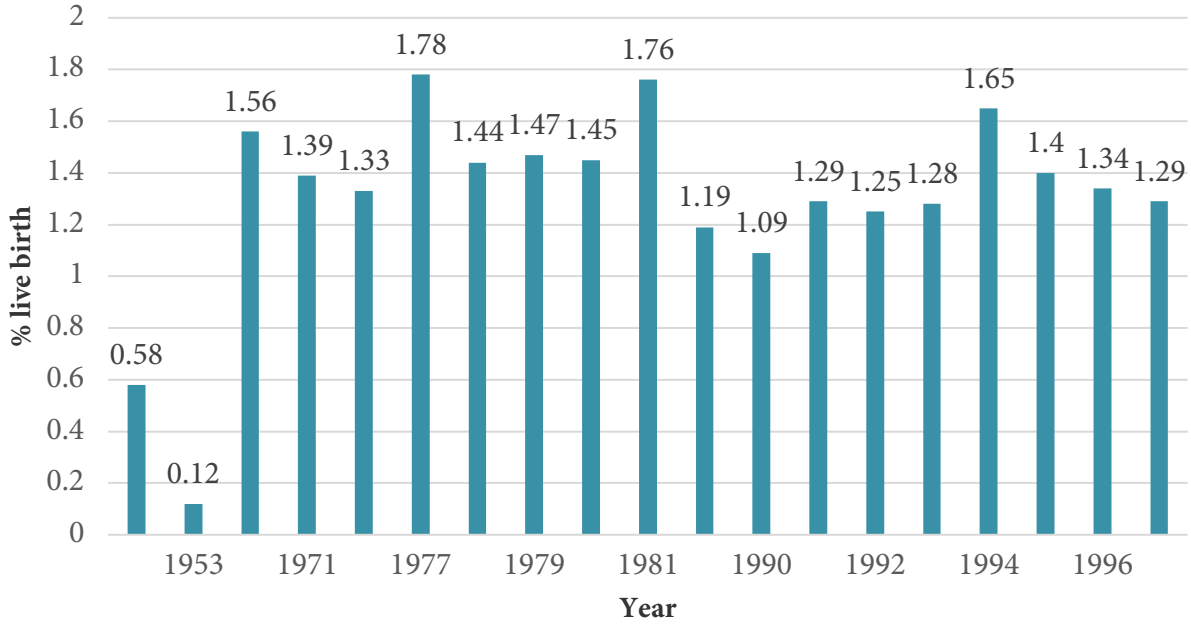
1. Retrospective Study in Tu Du Hospital *(Hồ Chí Minh city - Vietnam)*



Hydatidiform moles (abnormal pregnancy in which there is no fetus but only the placenta develops too strongly, becoming water vesicles and their cells can invade into the womb and the blood).

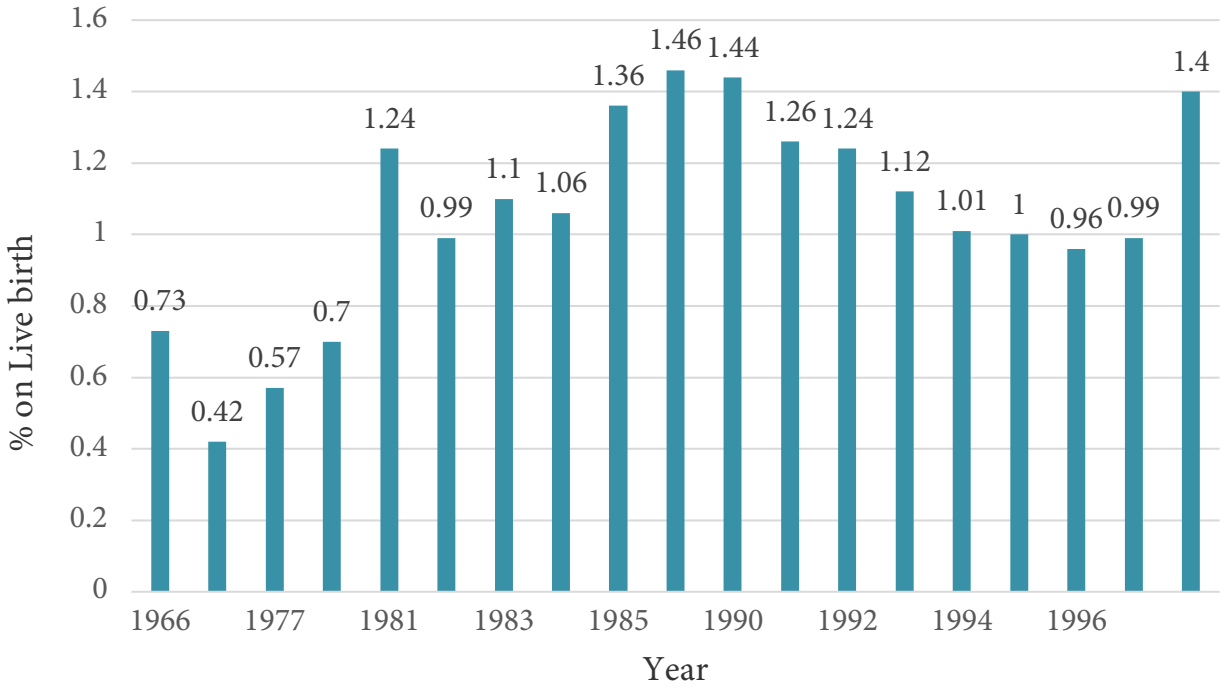
The percentage of this disease was very low during the decade 50's and 60's. Only after the chemical warfare, it began to increase up to the decade 80's and 90's.

Stilbirth



The percentage of stillbirth also increased after the spraying of toxic chemicals especially of Agent Orange/Dioxin

Congenital Malformations



Here, we also observe that the percentage of birth defects increased after the decade 60's – the spraying time.

There was a delay of occurrence of abnormal pregnancy outcomes – may be due to the persistance of Dioxin in the environment and women's body.

2. Surveys

a. Survey in exposed (Thanh Phong village) and non-exposed (commune No. 10 HCMC) areas

	Thanh Phong Village (exposed)		*Ward 10, District 1, Ho Chi Minh City*				
			Exposed		*Non-exposed*		
Congenital malformations	**81/7327**	**1.1%**	16/294	5.4%	**29/6090**	**0.4%**	**P<0.001**
In-utero mortality	**39/7327**	**0.8%**	01/294	0.34%	**2/6090**	**0.02%**	**P<0.001**
Miscarriage	**587/7327**	**8.01%**	49/294	16.7%	**243/6090**	**3.43%**	**P<0.001**
Hydatidiform moles	**54/7327**	**0.73%**	11/294	3.74%	**26/6090**	**0.38%**	**P<0.001**
Abnormal fetal death	**914/7327**	**12.47%**	84/294	27.2%	**311/6090**	**4.64%**	**P<0.001**

We observe that the percentage of all abnormal pregnancy outcome among exposed people is significantly higher (at least 3 fold) to non-exposed ones.

b. Rate of birth defects and hydatidiform moles in the North and the South of Vietnam

(Nguyen Thi Ngoc Phuong et al.; Nguyễn Cận et al.)

	South Vietnam		**North Vietnam**		
	Thanh Phong Village *Exposed (+)*	**Ward 1 District 1 Ho Chi Minh City** *Exposed (+)*	**My Van** *(plain)*	**Hai Hau** *(coastal)*	**Mai Chau** *(highland)*
Congenital malformations (%)	**1.1%**	**0.4%**	**0.45%**	**0.39%**	**0.68%**
Hydatidiform moles (%)	**0.73%**	**0.38%**	**0.09%**	**0.03%**	**10%**

The percentage of birth defects and hydatidiform moles is higher in the South of Vietnam – at Thanh Phong village – an exposed area than in the other places – in the North of Vietnam – non-exposed

c. Survey on abnormal pregnancy outcomes at 2 rural districts (Sa Thầy and Ngọc Hồi) in KONTUM province – Vietnam (2004)

Children' condition at birth	**Sa Nghia (E+)**	**Ro Koi (E+)**	**Bờ Y (E+)**	**Dak Su (E+)**	**Ngokbay (E-)**	**Total**
Congenital Malformations	**70**	**32**	**43**	**21**	**17**	183
Normal	**384**	**700**	**661**	**402**	**744**	2891
Total	454	732	704	423	761	3074

Pregnancy outcomes	**4 researched villages (Exp+)**	**Ngokbay village (Exp-)**	**Total**
Deformed fetus	168	17	185
Normal fetus	2732	744	3740
Total	2900	761	3661

OR = 3,65 (2,16 < OR < 6,25): the difference is statistically very significant.

3. Analysis of human tissues, blood and breast milk

3a. Agent Orange and the Vietnamese: The persistence of elevated Dioxin levels in Human tissues

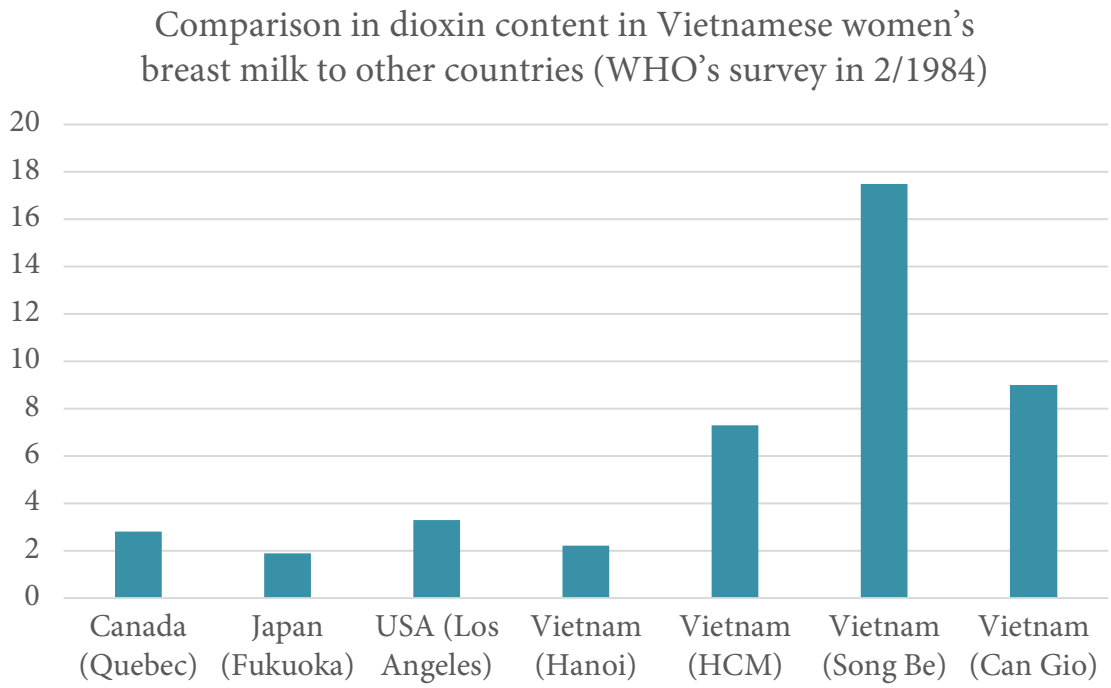
(Arnold Schecter, MD, MPH; Le Cao Dai, MD; Le Thi Bich Thuy, MPH; Hoàng Trong Quynh, MD; Dinh Quang Minh, MD; Hoang Đinh Cau, MD; Pham Hoang Phiet, MD; Nguyen Thi Ngoc Phuong, MD; John D. Constable, MD; Robert Baughman, PhD; Olaf Papke, MS; J.J. Ryan, PhD; Peter Fürst, PhD; Seppo Räisänen, PhD.)

	Sprayed Areas (n = 896)			Unsprayed Areas (n = 144)		
	Blood (n = 716)[a]	Milk (n = 90)[b]	Adipose (n = 90)[c]	Blood (n = 82)[d]	Milk (n = 36)[e]	Adipose (n = 26)[f]
Weighted mean	12.6	7.5	14.7	2.2	1.9	0.6
Minimum	3.4	ND (1)	ND (2)	ND (1)	ND (1)	ND (1)
Maximum	32	17	103	2.9	2.1	1.4

Note. ND = not detected, with detection limits in parentheses.
[a]13 pools, n = 50; 2 pools, n = 33.
[b]6 pools, n = 2; 4 pools, n = 3; 6 pools, n = 4; 1 pool, n = 7; 1 pool, n = 8; 1 pool, n = 12; 1 pool, n = 15.
[c]90 individual analyses.
[d]1 pool, n = 32; 1 pool, n = 50.
[e]1 pool, n = 2; 2 pools, n = 3; 1 pool, n = 28.
[f]16 individual analyses; 1 pool, n = 10.

Range and Weight Mean (Lipid Basis, Parts per Trillion) of 2,3,7,8_TCCD in Human Blood, Milk, and Adipose Tissue Samples from Area Sprayed with Agent Orange (Southern and Central Vietnam and Unsprayed Areas (Northern Vietnam), 1984 to1992

3b. Dioxin content in breast milk of women living in a number of countries



3c. Dioxin persistence in exposed human body

In 2006 (45 years after Dioxin spreading and 36 years after the cease of Dioxin spreading), 6 fat samples from 6 people were sent to Olaf Papke's laboratory and the results were as below:

- **2** were exposed in war time, and moved to HCM City from 1975: **7 – 7.8 ppt**
- **1** was in Quang Ngai before, moved to Sa Thay – Gia Lai (Agent Orange sprayed area) in 1976: **3.7 ppt**
- **3** lived in Sa Thay – Gia Lai before 1976: **2 – 3 ppt**

Source: Vietnam Association for Victims of Agent Orange/ Dioxin

4. International studies:

4a. In total, 22 studies including 13 Vietnamese and nine non-Vietnamese studies were identified. *The summary relative risk (RR) of birth defects associated with exposure to Agent Orange was RR = 1.95 [95% confidence interval 1.59–2.39]*, it means that nearly 2 times.

Sub-group analyses found that the magnitude of association tended to increase with greater degrees of exposure to Agent Orange, rated on intensity and duration of exposure and dioxin concentrations measured in affected populations.

(Anh D Ngo, Richard Taylor, Christine L Roberts and Tuan V Nguyen International Journal of Epidemiology 2006;35:1220–1230)

4b. About the Ranch Hands research:

- When the concentration of dioxin increased, diabetes also increased, and became more severed (47% of the cases) with the higher dioxin concentration.
- Ranch Hand veterans had the risk of heart diseases to more than **26%**, as compared with the normal population.
- Higher arterial hypertension and stroke risks with higher dioxin concentration.

5. Recognition of the US government about the Agent Orange issues:

Public Law 102-4, Agent Orange Act of 1991:

The relation recognition process had been identified on a clear basis, between military services and the **pathologies of American Veterans due to exposure to herbicides used in Vietnam**. Moreover, the law has confirmed there has been **enough conditions for veterans's compensation.**

Institute for Research on Medical Consequences - Compensation Policy for the American Veterans

- 1994 - First report: having evidence to recognize **Hodgkin's disease, porphyria cutanea tarda, multiple myeloma, and respiratory cancers** enable to be paid for the compensation.
- Update 1996: having evidence to recognize **prostate cancer,** legislative authority for certain benefits and services for male Vietnam American Veterans' children with the **birth defect spina bifida.**
- First recognized pathologies to have relation with in-war Agent Orange spread areas, in accordance with US Medical Institute:
    - Chloracne
    - Porphyria cutanea tarda
    - Acute or subacute peripheral neuropathy
    - Hodgkin's disease and non-Hodgkin's Lymphoma
    - Soft-tissue sarcoma
    - Multiple myeloma
    - Chronic lymphocytic leukemia
    - Parkinson's Disease
    - Atherosclerotic cardiovascular disease
    - Hairy cell & other B cell leukemia
    - AL amyloidosis
    - Some congenital malformations on Vietnam war participated female veterans' children:

- Achondroplasia
- Cleft lip and Cleft palate
- Congenital heart diseases
- Clubfoot
- Esophagus and intestinal atresia (narrowing or incomplete)
- Hip dysplasia
- Hirschprung's disease (congenital megacolon)
- Hydrocephalus due to aqueductal stenosis
- Hypospadias (Incomplete penile urethra)
- Imperforate anus
- Neural tube defects
- Pyloric stenosis
- Syndactyly (fused fingers and toes)
- Tracheoesophageal fistula
- Undescended testicle
- Williams syndrome

Example of a case of Chloracne:

Picture 2. In 2004, President of Ukraina Yushchenko was infected with severed Chloracne from consuming an amount of TCDD – which is a highly toxic dioxin contained in Agent Orange.

At present, the United States Department of Veterans Affair has compensated for US veterans participated in Vietnam war whose health status were affected by Agent Orange exposure in service time in Vietnam.

The United States Department of Veterans Affair (USDVA) approved the "assumed exposure" regulation – to control the amount of compensation, which meant that, if an US veteran had been in Vietnam, likely to **be exposed the Agent Orange, had the right to receive the compensation,** if the disease he is affected is in the compensation list sanctioned by the US DVA.

– This approach actually admitted that there could be an existed relationship between exposure and health consequences.

- However, US government officials is still not willing to admit that researches/observations in Vietnam; they still deny the study results and always tell that they were not reliable enough to conclude that the herbicides used by the USA affected to human's health.
- If this "relationship" is accepted for the American veterans in the view of the US DVA, **why this is not accepted for the Vietnamese victims** having the **same signs of diseases** that they are also affected by the exposure to Agent Orange/Dioxin?
- And why does the US side keep insisting on demanding more scientific proofs on this issue so as to accept compensating, and US chemical companies to accept petitions for justice for the Vietnamese Victims of Agent Orange?
- Or, is it because of the concerns on the responsibility in front of public opinion and the fear of compensating for many human's generation?
- Admiral Zumwalt, whose son, an American Vietnam Veteran, died of cancers and whose grandson was born with birth defects, after analyzing many studies on Agent Orange/Dioxin, made a statement before the Subcommittee of Human Resources of the US Congress in June 1996 saying that "the only right decision the members of the US Congress can make is to recognize that Agent Orange/Dioxin can cause a wide range of diseases, illnesses and birth defects. So that, the American Vietnam Veterans should be correctly compensated"
- The American Public Health Association in its 2007 policy statement on Agent Orange recognized the responsibility of the US government and chemical companies to alleviate the harm caused by their use of Agent Orange/dioxin in recommending that, "...the US government and involved chemical companies provide resources for the disabled…provide medical and nursing services for those harmed by Agent Orange; develop community support organizations, including health care and educational and chronic care services… for American and Vietnamese people harmed…[and] remediate or attempt to clean up those areas of in Vietnam that still contain high levels of dioxin."

(APHA Policy # 20075).

II. RECOMMENDATIONS:

1. Researches from Vietnam and the world have proved the cause – effects relationship between the Agent Orange/ Dioxin exposure and congenital malformations and some other pathologies, at least based on the diseases' list which has been admitted by the United States Department of Veterans Affairs.

   There is no need to do more research to prove the cause – effects relationship between Dioxin exposure and pathologies on human beings anymore!!

2. Currently, we need to study on the solution for recovering the environment and people's health and Vietnamese's reproductive health in general.
3. Strengthen the cooperation between the two governments to:
    - Clear the toxins as fast as possible at 28 hot spots in Vietnam;
    - Assist in caring, eliminating the toxins from victims' bodies, provisioning – curing the pathologies those are relevant to Dioxin exposure.
    - Assist in rehabilitation, occupation training, helping the victims to integrate into community, and to have a good quality of life.
    - **US chemical companies need to take responsibilities for the Agent Orange/Dioxin consequences on human's health in Vietnam, and to the world over as well.**

Victims of Agent Orange/Dioxin in Vietnam are the most heavily exposed to dioxin in the world. Commensurately, their suffering is also the most severe. The victims and their families face extremely difficult living conditions due to their illnesses and birth defects – consequences of Agent Orange/Dioxin exposure. The Vietnamese government, people, and particularly, the Vietnam Association for Victims of Agent Orange/Dioxin, and other NGOs in Viet Nam have done a lot to support those affected, materially and morally. But, due to our limited financial resources, we can not fully meet their needs, as much as we hope to. The victims who suffer from cancers are dying every day. They can not wait any longer for justice!