

CONSEQUENCES OF CHEMICAL WARFARE IN VIETNAM

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THE VICTIMS OF AGENT ORANGE/DIOXIN)**

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I. AN OVERVIEW OF US CHEMICAL WARFARE IN VIETNAM

1. The toxicants used

It is common knowledge that in the Vietnam War the US forces sprayed more than 111,000 tons of toxic chemicals between 1961 and 1971. This was the biggest chemical warfare. and also the first war of eco - destruction in the world history.

Roughly 65 toxic chemicals were used, including those are already prohibited to be used as military poisons by international conventions and laws of various nations such as dioxin, hexachlorobenzen,

chlordane, dieldrin, 2,45T, DDT...

2. Principal toxic chemicals used

There were three main toxic chemicals sprayed in the Vietnam War that included more than 92.000 tons of Agent Orange, Agent White and Agent Blue, corresponding to 84% quantities of toxic chemicals used in Vietnam

Table 1: Major toxicants Employed By the United States In Vietnam

Descript ion	Composition	Physical propertie s	Applicatio n	Area sprayed (ha)
Agent Orange; 44 mil. liters or 57.0 tons	Two-component mixture in weight proportion (1.124:1) of 2,4,5-T (545.4 kg/m ³) and 2,4-D (485,1 kg/m ³), containing 2,3,7,8-TCDD (3.83 g/m ³)	Liquid soluble in oil but not in water, specific weight 1,285 kg/m ³	28,06 l/ha, of which 15,31 kg/ha 2,4,5-T; 13,61 kg/ha 2,4-D in acid equivalent ; 107 mg/ha dioxin	1,6 mil
Agent White; 20 mil. liters or 22.8 tons	Two-component mixture in weight proportion (3.882:1) of tri-isopropanolamine salt of 2,4-D	Liquid insoluble in oil, specific weight 1,150 kg/m ³	28,06 l/ha; 6,73 kg/ha 2,4-D and 1,82 kg/ha picloram in acid equivalent	0,6 mil

	(239.7 kg/m ³) and picloram (64.7 kg/m ³)			
Agent Blue; 8 mil. liters or 10.7 tons	Two-component mixture in Liquid insoluble weight proportion (2.663: 1) in oil, specific of natricacodylate and weight 1310 cacodylic acid (371.46 kg/m ³ kg/m ³) containing arsenic	Liquid insoluble in oil, specific weight 1,310 kg/m ³	28,06 l/ha; 10,42 kg/ha in acid equivalent , containing 5.66 kg/ha arsenic	0,3 mil

It can be seen from this table 1 that a huge amount of Agent Orange - 45, 68 million liters or 59,000 tones, was sprayed at a concentration of 28.06 liters or 21 kg per hectare [1] [4].

The used doses of these toxicants were many times higher than those are permissible and hence they are poisons For instance, the amount of 2,4 (a component of Agent Orange and Agent White) used was 13,61 kg/ha corresponding to 24 times higher than the permissible level (0,57kg/ha). The LD50 applied to dog is normally 100ppm and a white mouse - 375 ppm [2][10].

The more significant fact was that these substances

contained a great amount of extremely harmful residues. In Agent Orange, there was dioxin, the most toxic element ever produced by our human beings,

In Agent Blue, there was arsenic a long-time known poison

In Agent White, there was hexachlorobenzene another toxicant

Dioxin and hexachlorobenzene were persistent organic pollutants (POPs).

3. Dioxin toxicity.

Dioxin is the most toxic substance ever produced by man. It is even more poisonous than all other military ones, such as Yperit, Tabun and Sarin.

LD 50 of dioxin for a monkey is 70 ppb while LD50 of Sarin is only 83 and Tabun 208.

Because of its high level of toxicity, the permissible maximum dose for exposed persons is very small. The World Health Organization (WHO) provides that the permissible dose of dioxin is 1 - 4 pg/per one kg of body weight and in one day time. Therefore, the permissible dose for a person of 50 kg of body weight may be at maximum 50 - 200 pg/in

one day. The U.S estimation of dioxin toxicity is even higher, hence its Environment Protection Agency (EPA) determines the permissible dose is 0.006 pg, 160 times less than that is stated by WHO.

Dioxin is powerfully persistent in our environments. Several studies have been conducted by world scientists on the sustainability of dioxin. Its sustainability is determined according to its half-life (time for dioxin to disintegrate half of its amount). Dioxin's half-life in the soil is very long, according to D.J Paustenbach (1992) and R.K Puri (1989, 1990), on the surface layer, it's half life fluctuates between 9 - 25 years, for other deeper layers - from 25 - 100 years, respectively.

Dioxin's half-life in human body is about 7 - 10 years. According to Prof. Schecter (U.S), a person may be found with dioxin in his/her blood after 35 years of getting contaminated.

Dioxin is very persistent in environment and in man and in combination with its characteristics of resonant harms, hence, at any level, dioxin may still cause harms. At 1 ppt, pregnancy may be

effected, at 5 ppt cancer may be generated and at 50 -70 ppb man may be killed.

Due to requirements of war needed by the U.S Government and for purposes of maximum profits intended by chemical companies, the temperature applied to production of Agent Orange in 1960s was pushed up very high and hence generating high levels of dioxin. It's average level was 13 ppm while sometimes this might reach 140 and 2000 ppm.

Accordingly , Agent Orange/dioxin is considered as a war poison. It is impossible to talk about Agent Orange without mentioning 2,4,5-T and dioxin in it. Because of Agent Orange was the a mixture of various definite substances, and quite different from other substances used in agriculture with respect to dose , proportion, composition of ingredients and level of dioxin . Therefore, Agent Orange should be considered as an extremely toxicant and harmful substance.

II. Present status of Dioxin in Natural Environments of Vietnam

Agent Orange used by the U.S in the Vietnam War and manufactured in the 1960s contained dioxin

contaminant (2,3,7,8 - TCDD) with fluctuating concentrations ranging from ppb levels - to ppm ones. According to data reported by Westing [4] and other scientists participating in the 1983 International Conference held in Ho Chi Minh City [5], an estimated amount of 170 kg of dioxin was sprayed in South Vietnam resulting in an average concentration of 25 pg per gram of soil. According to Stellman, et.al., [1] the average concentration of TCDD in Agent Orange was 13 ppm. Based on Stellman's report, Dwernychuk calculated the total amount of dioxin sprayed in South Vietnam was 600 kg [6].

Various prestigious scientists and laboratories in the world, including those in Germany, France, Japan, Netherlands, Canada and Russia have more or less participated into analyzing dioxin in samples taken from different sprayed areas of South Vietnam. In Vietnam, there have been also laboratories that in cooperation with their foreign counterparts successfully analyzed dioxin in those samples too, such as those of the Vietnam-Russia Tropical Research Centre, the VH1 laboratory at Hanoi National University , the Physico-chemical Analytical Centre in HCM City and the analytical laboratory under Committee 10-80.

Up to the present time, Vietnamese departments have analyzed more than 2000 samples of soil and sediment, and surveyed nearly all sprayed provinces in South of Vietnam and certain number of unsprayed areas in Vietnam for comparison [7]. The results of this effort may enable us to draw out certain preliminary conclusion on the persistency of dioxin in general and in certain areas as follows:

The level of dioxin contamination caused by the U.S military's use of Agent Orange during the war was the highest one in the world; with time and Vietnam's conditions of high tropical humidity, this level has been substantially decreased. However, in areas where former U.S military storages were located, this level is still very high, specifically,

- a. In Mekong Delta, the greatest rice producing and exporting center of our country, the samples analyzed did not show traces of dioxin.
- b. In former U.S military bases where storages were situated and Agent Orange was fed into aircrafts, such as Bien Hoa, Danang and Phu Cat air bases, the persistency of this poison is now still substantially high, possibly high up to 1 million ppt - 1.000 times more than the

permissible level stipulated by the U.S. From these "hot spots", one may find high level persistency of dioxin in areas around or nearby them. Having analyzed data collected from hot spots, scientists working for the Vietnam-Russia Tropical Center, Prof. Olaf Paepke (FDR) and T. Boivin (Canada) determined that isomer 2,3,7,8-TCDD occupied 90% - 99% of total level of 17 toxic isomers of PCDD and PCDF. This confirms that dioxin existing in these areas has derived from war Agent Orange.

III. After-effects exerted by chemical warfare on environments.

The U.S undertook first war of ecological annihilation in the history of mankind in Vietnam. Nearly 14 million hectares of natural resources were exposed to sprayings. The combination between eco-toxicants and napalm bombs led to the destruction of nearly 3 million hectares of natural forests, and the disappearance of nearby 90 million cubic meters of timber and the destruction of substantial tropical jungles, land forests and mangroves which were very rich in biological plurality, including botanical species, animal species and soil. Various international scientists

have noted that only after decades, even hundred of years, their recovery may be seen.

The destruction of eco-environments has impacted directly on the sources of subsistence needed by the Vietnamese people and hence badly effecting human health of millions of persons. It may be well said that Agent Orange dioxin twice may badly effect our health. (Prof. Furukawa Hisao, Japan)

IV/ After-effects of eco-toxicants on human health.

Whether intentional or not intentional, Vietnam became in fact a colossal laboratory with millions of people exposed to toxicants used by Americans. As said by J. M. Stellman, there were about 4.8 million exposed persons and possibly about 3 millions of whom have become victims.

According to preliminary data collected in certain provinces, among victims, half were civilian and 85% of households had two and more victims, 3% - five ones.

In this war, the U.S unquestionably intended to attack civilians. It used 4.7 million liters for

destroying 33.339 hectares of crops and directly spraying on 3.138 hamlets/villages while overwhelmingly effecting 20.585 ones [1]. To poison civilians and destroy crops of population became one characteristic of this chemical warfare conducted by the U.S in Vietnam (during the First World War, there were 1.3 million victims of chemical poisoning, 91,000 deaths but most of whom were combatants).

Dioxin in human bodies of victims.

In parallel with the construction of domestic laboratories, Vietnam has cooperated with various international laboratories, such as Axys of Canada; Ergo (Eurofin) of FDR, Academy of Sciences of Russia, in analyzing bio - samples. We would like to present herein analytical data of blood and fat-tissue samples taken from 50 persons (1999 - 2001) by A. Schecter (U.S) and Olaf Paepke (FDR).

Most of these persons were and are living now in "hot spots". Dioxin levels in their fat and blood were found at 1.9 ppt to 413 ppt, the average figure was 76,68 ppt while in pooled blood samples collected in Hanoi were shown 2 ppt average. According to the French scientists, P. Vermeulin

and F. Gendreau [9], if in blood dioxin level was 4 ppt, even 1 ppt, this should be considered as unusual and risky for human health and thus the above-mentioned victims should also need urgent and considerate health care.

The Government of Vietnam has conducted surveys and collected initial data on the health status of million of victims as a basic for setting forth policies and schemes for providing aids to them in their daily life Several Vietnamese scientists have been involved in conducting epidemiological studies on thousands of victims (at least 50,000), certain number of them were selected for clinical examinations and medically follow-up records.

Based on the results of surveys conducted by Vietnamese in close collaboration with international scientists of Russia, Canada, the U.S or of Japan, etc., coupled with those have been recorded by international researchers, especially by those scientists from the United States and the Federation of Russia, we may reach a conclusion that Agent Orange/ dioxin is possible to force anyone to suffer a decrease in immunity, disorders in endocrine system, loss of adaptability and cancers. Many people even go further to say that

dioxin may effect genes. Consequently, these said grounds have shown us the way to determine that the frequency of usual and spreading diseases and percentage of deformed descendants among the Agent Orange-exposed persons reaches higher than that of those who have resided in the unexposed areas. This also enables us to further confirm the list of dioxin-related diseases acknowledged by the IOM of the U.S Academy of Sciences.

Now, in the following context, we would like to talk about the results of our researches in Vietnam.

1. The scientists form the Military Medical Institute conducted an epidemiological study on 47,893 active soldiers and veterans and their families, including their family trees, in 8 provinces and cities, 28,817 of whom being subject to pre-historically-recorded exposure, while the remaining, 19,097, being not. The first results showed the distinction between two groups with statistical significance and high validity in view of soft tissue sarcoma, Hodgkin, lympho-sarcoma, peripheral nervous disorder, respiratory cancer, lung cancer, prostate cancer, liver cancer and diabetic.

The proportion of congenially-deformed F1 offspring belonging to the group with prehistorically-recorded exposure to toxic chemical/dioxin corresponded to 2.95% (20.296/77.816) of children while the pooled group - 0.74% (452/99038).

The proportion of congenially-deformed F2 offspring belonging to the group with prehistorically recorded of exposure to toxic chemical/dioxin showed corresponding to 2.69% (3,045/113,211), while the pooled group - only 0.82% (812/99,038). Infants with bone deformities occupied 23.31%, with nervous system - 16.85%, with face and other sensitive organs - 15.59%. Noteworthy was a high percentage of infants with multi-deformities, reaching 16.44%.

These figures related to congenial deformities confirm the connection between dioxin exposure and deformities suffered by F2 offspring.

2. In researching 912 households with 4,165 members in Nam Dong (Thua Thien - Hue), who were exposed to chemical sprayings in comparison with 8,853 households or 25,843 persons living in Hai Phong City, after taking and testing blood samples from

426 persons of Bien Hoa and 136 others of Da Nang (connected to hotspots), 377 persons of Thua Thien - Hue (sprayed area), 445 persons in Hai Phong and 191 others in Hanoi, scientists from the Medical University of Hanoi decided to make the following important comments:

It is clear that the frequency of sisterly chromosome disorder and chromosomal exchange of those persons exposed to toxic chemical /dioxin were likely higher than that of pooled group.

3. The analysis of genes of five family trees has shown that the mutation in gene 53, and gene Cyp 1A1 occurring in veterans household with pre-historical record of toxic chemical/dioxin exposure, especially those were changes in amino acid that was connected with certain cancers. This analysis also found 21 mutations in gene p53, 99 in Cyp 1A1, and 27 in AhR. This is a new findings on genetic mutations connected closely with dioxin that was tested in the Institute of Biological Technologies of Vietnam.

4. Our scientists from the HCM City Medico-pharmacy University have conducted surveys on 13,660 households with 39,283 persons living in 16

communes selected from 5 districts of Dong Nai province; 5,000 households in 4 precincts of Bien Hoa City, 3,653 households with 17,509 persons living in Nam Dong district of Thua Thien - Hue. This study resulted in showing that there was a connection between birth deformities, blastomycosis, prostate cancer, multiple myeloma, Hodgkin, sarcoma, larynx cancer and certain other chronic diseases.

From certain results brought about by this study, it is possible to draw out the following comments.

With great scope of study, in combinations with classical clinical examination and modern techniques (analysis of genes, immuno-chromosome, dioxin quantification and GC/MS), and by way of conducting comparisons between the exposed-group and the unexposed-group, especially taking notes of family-tree issue, the Vietnamese scientists have confirmed the nature of sickness/deformities inflicted on the people with pre-historical record of toxic chemical/dioxin exposure. The illnesses or diseases of these people were falling in the list presented by the IOM of the U.S Academy of Sciences.

Additionally, the most noteworthy remark is the proportion of birth defects in F1 offspring and F2 offspring. This proportion was extremely high and significantly different with respect to statistics as compared with group unexposed to toxic chemical/dioxin.

V. Requirements in overcoming consequences

The Government of Vietnam has applied various advocacies and measures in all three fronts to overcome this chemical war's legacies: eco-rehabilitation, health care for victims and arising social issues. However, grave war consequences remain being prolonged until 21st century. The most outstanding tasks are nevertheless focused on (1) taking care of our victims' health, who constitute the poorest strata in our society; (2) detoxifying as soon as possible "hot spots" that until now remain important sources of directly contaminating and hurting our people. The Vietnamese scientists have confirmed the following views that have enjoyed support from various international conferences and scientists, such as W. Dwernychuk (Canada); A.H. Westing and J. Constable (U.S); G. Sofronov (Russia); O. Paepke (FDR); F. Hisao (Japan) and P. Vermeulin (France).

1. Agent Orange/ dioxin has imposed serious and prolonged impacts on human health of exposed persons and on eco-environments of Vietnam.
2. While there is still a need to do more research on the after- effects of this chemical warfare, the first priorities should be given to the health care of our victims.

Under the present conditions, apart from efforts exerted by people and Government of Vietnam, the Vietnam Association for Victims of Agent Orange/dioxin and all Vietnamese victims earnestly call upon the assistance of the international community and demand the U.S Government should with practical action fulfill its responsibility and its share in resolving chemical warfare's legacies left behind by it to the Vietnamese people and at the same time hopefully that the Government of the Republic of Korea, Australia, New Zealand and the U.S will design proper policies towards their own victims.

