

**CONCENTRATION OF DIOXIN IN BLOOD SAMPLES
TAKEN FROM PATIENTS TREATED AT MILITARY HOSPITAL 103, HANOI, VIETNAM**

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Introduction

Dioxins are the most toxic chemical known to science. Once dioxins have entered the body, it can damage to different organs and systems. Many scientists believe that there should not be any permissible level of dioxin absorption in people. This study started with blood samples taken from 49 patients suspectedly affected by toxic chemicals/dioxin who registered their treatment at the military hospital 103. The samples were analyzed in the Eurofins center in Germany. With the analysis results, it is concluded that:

- Dioxins are only found in patients living in or around dioxin contaminated hot spots.
- There are 03 blood samples having 2,378 – TetraCDD concentration at more than 10ppt (representing 6,12% of total sample size) and those samples also come from patients living in dioxin contaminated hot spots.
- Dioxins were not found in blood samples of those patients who were exposed to dioxin during the Vietnam war but now live in the North of Vietnam.

Scientists believe that dioxins can cause various complicated damages to human organisms, including cancer, heart attack, respiratory disorders, mental illness, blood diseases, reproductive system diseases, immunodeficiency, birth defects etc. Dioxins are highly toxic: once dioxins have entered the body, they remain inside for a long time because of their chemical stability and their ability to be absorbed by fat tissue. Their half-life (T_{1/2}) in the body is estimated to be between 7.1 and 11.3 years. According to published information in Vietnam, it is said that from 1961 to 1971, the US Army sprayed about 44 million litres of Agent Orange which contained between 170 and 360 kilogram of dioxins. Agent Orange has severely destroyed the environment and caused serious health problems to people living in the affected areas [4,5,6,7]. Stellman[8] estimates that there are about 2,1 to 4,0 million people in Vietnam who were exposed to toxic chemicals/dioxins during the Vietnam war.

It is obvious that the number of people exposed to toxic chemicals/dioxins in Vietnam is huge and they have been suffering from different illnesses caused by dioxins. They need extensive cares and treatment. In Vietnam, there has not been any specialized medical faculty or hospital dedicated solely to patients exposed to toxic chemicals/dioxins. Therefore, the author and his colleagues started a study namely: "Concentration of dioxin in the blood of patients treated at Military Hospital 103". This study is a step forward to understand the stability of dioxins in the people who are believed to be victims of toxic chemicals/ dioxins.

Materials and methods

Study objects:

Participants of this study are 49 people who are evidenced to be exposed to toxic chemicals/dioxins, coming from 4 provinces and cities: Thai Binh, Ha Noi, Da Nang and Dong Nai. Those people were divided into 2 groups: the dioxins contaminated hot spots group (Danang and Dong Nai) and the Northern area group (Thai Binh and Ha Noi)

Study location and timeframe

Study location: Military hospital 103

Study timeframe: From April 2009 to April 2010

Study methodology:

- Study design
 - Selection of 49 patients from basic survey and primary health examination through systematic documentation during their treatment at Hospital 103.
 - Selection criteria: Participants were chosen from the list of people who are currently receiving

government's financial support for toxic chemicals/dioxins victims and are having illness(es) related to toxic chemicals/dioxins.

- Study methodology:

Step 1: Conduct survey on veterans/people who are or used to be exposed to toxic chemicals/dioxins

Step 2: Conduct interview based on the designed survey. Conduct primary health examination by specialized medical doctors.

Step 3: Diagnosis and treatment

- Comprehensive clinical diagnosis

- Conducting normal tests

- Taking blood samples, following protocols developed by Eurofins, Germany, and sending samples to Eurofins for dioxins analysis.

Sample analysis and data processing

All data recorded at Military Hospital 103 were processed and analyzed using SPSS program, version 11.5.

Results and discussion

1. General characteristics

Table 3.1: Distribution of study objects by gender, location and age

Location Gender, age	Contamination hot spots (1)		Northern area(2)		p ₁₋₂
	Quantity	Ratio	Quantity	Ratio	
Male	25	51.02	22	44.90	
Female	1	2.04	1	2.04	
Total	26	53.06	23	46.94	>0,05
< 50 yrs old	6	12.24	2	4.08	
51 - 60 yrs old	17	34.69	14	28.57	
61 - 70 yrs old	3	6.12	7	14.29	
Total	26	53.06	23	46.94	

Ages are as by March 2010.

2. Blood samples analysis results

Table 3.2: Blood sample analysis results with regards to dioxins and 3 other 3 dioxin isomers

Location Parameters		Dioxin contaminated hot spots (n=26)	Northern area (n=23)	Total (n=49)
23478-PentaCDF	X± SD	5.48±2.72	3.57±1.01	4,59±2,30
2378-TetraCDF	X± SD	0	0,04±0,22	0,02±0,15
OctaCDD	X± SD	215,6±181,64	55,26±23,48	140,3±154,8
2378-TetraCDD	X± SD	4,04±4,01	0	2,14±3,54
	not found	4	23	27
	<6,5ppt	16	0	16
	6,5-9ppt	3	0	3
	>10ppt	3	0	3

When analyzing 2378-CDD in the blood samples, the results showed that: Concentration of 23478-PentaCDF in the blood samples taken from patients living in/nearby the contaminated hot spots is 5.48±2.72, but 2378-TetraCDF was not found while OctaCDD is 215,6±181,64. In addition, the results received from analyzing blood

samples of patients living in the Northern area showed that concentration of 23478-PentaCDF is 3.57 ± 1.01 ; 2378-TetraCDF is 0.04 ± 0.22 and OctaCDD is 55.26 ± 23.48 . It is now more than 40 years after the Vietnam war and concentration of CDD and CDF has been decreasing.

Among 49 blood samples analyzed, there are 03 samples with concentration of 2,3,7,8-TetraCDD higher than 10ppt, 03 samples with level of concentration from 6.9 to 8.9 ppt, 10 samples with level of concentration from 2.1 to 6.5ppt, 06 samples with level of concentration from 1 to 2ppt and 27 samples which appeared to be 2,3,7,8-TetraCDD free. The samples with high concentration of 2378-TetraCDD and 2378-TetraCDD are mostly from patients living in the "contaminated hot spots" for a long time. Those are areas that are still contaminated with toxic chemicals/dioxins as a remnant of the Vietnam war. The analysis also showed that there is a significant discrepancy in the level of concentration of 2378-TetraCDD in the two study groups ($p < 0.05$). In addition, the analysis showed that 2378-TetraCDF was only found in the blood samples taken from the group of patients living in the North of Vietnam.

Table 3.3: TEQ in the blood samples.

Parameters		Lipid content (g)	WHO-PCDD/F-TEQ (1998) exclusive LOQ	WHO-PCDD/F-TEQ (1998) inclusive LOQ	WHO-PCDD/F-TEQ (2005) exclusive LOQ
Location					
Contaminated hot spots (1)	X± SD	0,12±0,027	15.95±10.34	16.46±9.91	15.01±9.94
	n	26	26	26	26
North of Vietnam (2)	X± SD	0,12±0,022	3.635±1.49	5.687±1.23	2.922±1.37
	n	23	23	23	23
Total	X± SD	0,12±0,024	10,17±9,76	11,4±9,0	9.339±9.46
	n	49	49	49	49
Comparative	p ₁₋₂	>0,05	<0,05	<0,05	<0,05

To comprehensively measure the toxicity of dioxins and dioxins-like, such as Polychlorophenyl(PCB), naphthalen, Polychlorophenol and other compounds, toxic equivalency (TEQ) is used.

The analysis showed that there are 15 samples out of 49 samples having TEQ >10ppt, according to standards WHO-PCDD/F-TEQ(1998) exclusive LOQ, WHO-PCDD/F-TEQ(1998) inclusive LOQ, and WHO-PCDD/F-TEQ(2005) Inclusive LOQ. Samples having high TEQ come from patients living in the "contaminated hot spots".

CDD enters into body by direct contact or exposure to toxic chemicals/dioxin at the contaminated hot spots. This conclusion is in line with many scientists' assumption that only direct contact or exposure to toxic chemicals/dioxins would result to high levels of CDD. According to Wolfe and Associates (1994), the level of CDD in the blood samples taken from soldiers participating in the Ranch-hand campaign from 1962-1971 ranged from 10 to 521ppt.

As mentioned above, the half-life (T_{1/2}) of dioxins is from 7.1 to 11.3 years. Therefore, concentration of dioxin at the analysis time would help calculate the concentration at the time people actually contacted with /exposed to toxic chemicals/dioxins (if the exact time is known).

The concentration of dioxin in blood of patients (veterans) living in the "contaminated hot spots" is still higher than the permissible level, but not found in the blood samples taken from veterans living in the North of Vietnam. Therefore it would be assumed that dioxin has been gradually eliminated in the human body. Only people who were extremely exposed to dioxin in the Ranch-Hand campaign (1961-1971) and/or were recently re-exposed to dioxins would have been affected and that explains why the concentration of dioxins in blood of some patients is still high [3].

The analysis also showed that some blood samples have CDD/CDF above the permissible level. This creates more concerns because not only does dioxin exist in the studied patients but so do CDD/CDF and that contributes to higher TEQ.

3. Conclusions

Based on analysis results of blood samples taken from 49 people suspectedly affected by toxic chemicals/dioxins by Eurofins Center, Germany, the author and colleagues make the following conclusions:

- Dioxins were only found in patients living in or surrounding dioxin contaminated hot spots.
- There are 03 blood samples having 2,378 – TetraCDD concentration at more than 10ppt (representing 6,12% of total sample size) and those samples also come from patients living in dioxin contaminated hot spots.
- Dioxins were not found in blood samples of those patients who were exposed to dioxin during the Vietnam war but now live in the North of Vietnam.

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