

DIOXIN AND THE ENVIRONMENT IN VIETNAM

HOANG TRONG QUYNH

In order to discover all operations of Southern National Front for Liberation Military, destroy the crops and weaken the resistant of Southern people, from 1962 to 1971, US had carried out the herbicide spraying on the forests, the rice fields, the gardens, along the riverbanks, around the US-Vietnam military installations. The herbicides consist of Agent Pink, Green, Purple, Orange, White, and Blue. The herbicides had different names because the producers painted each colour around each drum that contained the chemical to kept away the mistake when used them.

In 2003, J. M. Stellman verified the preserved records about the spraying and other documents and found out that the quantity of sprayed herbicides and the dioxin contents in herbicides was much higher than it was as the comments before. Therefore, the amount of dioxin sprayed by US from 1962 to 1971 was able to reach the number of 600 kg (1), different from what we thought before that it was 170 kg. However, the number of 600 kg might still be much lower than the reality because in many cases, the military commands used the boats, armoured cars, spray units to spray herbicides to defoliate two sides of the roads, river or around the military installations to ensure reducing the injured US-Vietnam troops. Every commander wanted to protect his team, so they ordered to spray indiscriminately. US General E. R. Zumwalt revealed the truth when answered the Newsweek reporter: "...in 1968, when I was commander in Cuu Long river plain, our injured number was 6% a month. It means, in each month, a soldier

had 70% of possibility to be injured or killed. Viet Cong came near to the riverbanks and shot us in the distance of 3 or 4 m. The defoliation caused by Agent Orange pushed them 1 km back and our injury was reduced to 1% a month" (2).

Moreover, in the process of transporting the drums and pouring the herbicides into the spray units, an amount of herbicides, sometimes was very big, strewed on land and polluted the environment seriously. That way of indiscriminate spraying and dumping Dioxin on land were hardly recorded in the preserved files. For the evidence, in March 1970, at Bien Hoa airport, in a herbicide storage, the substance scattered on the airport court in about more than 28,425 litres of Agent Orange (3), equivalent to about 0.370 kg of Dioxin.

Apart from the herbicides mentioned above, US used also the suffocating, tearing substance named CS in the amount of 9,000,000 kg and insecticide named Malathion in the amount of 3,000,000 kg (4).

The consequences caused by chemicals US used in the war are very considerable. So far, it is nearly a half of century since US began spraying the chemicals on Southern of Vietnam, in some provinces such as Song Be, Binh Phuoc, Tay Ninh, Dong Thap, Thua Thien Hue, there are still a big amount of CS drums that piling up at the edge of the forest, at the communal house in the village, at old schools. The covers of these drums have been rusting, CS substance still comes out and causes tearing and hot in the eyes of people who come near. Every year, some people become blind because CS comes to the

eyes too much. Nevertheless, due to lack of land for raising animals, growing plants, they still come there to do business even they know that the land is very dangerous.

More serious is the consequences of dioxin in herbicides because dioxin is the most poisonous substance up to now.

The average content of dioxin in soil of 14 positive samples out of 54 samples in Tay Ninh is 14 ppt (1.2-38.5ppt), of 4 positive samples out of 6 samples in Thua Thien Hue is 8.6 ppt (4.4-17ppt), of 1 positive sample out of 11 samples in Binh Duong is 6 ppt, of 2 positive samples out of 9 sample in Ho Chi Minh city is 31 ppt (3- 59 ppt), of 1 positive samples out of 2 sample in Ben Tre is 19.5 ppt (ND - 39 ppt). Besides, 10 samples in Dong Thap, 4 in Tien Giang, 4 in Vinh Long, 4 in Soc Trang, 4 in Ca Mau all are ND (5).

Those results show that dioxin in sprayed herbicides when fallen down on the land, it was swept away to everywhere by flood and rain. Therefore, dioxin can be found in the areas that are not in the spraying bands. For example, the content of dioxin of 1 in 3 samples of the mud at Thi Nghe canal that flows in Ho Chi Minh city where wasn't sprayed is 190 ppt (6).

Especially in some areas, the contents of dioxin are unexpectedly high. For instance, at Bien Hoa airport, there are some samples with the contents of 1,100,000 ppt, 860 ppt, 177 ppt, 98 ppt. At the A So airport in A Luoi district, Thua Thien Hue, there are some samples with the contents of 897 ppt and 110 ppt (6). The cause is the US military commanders sprayed indiscriminately and let it strewed.

Dioxin exists for long time in the shadow and in mud. An example given is 2 samples in one areas (Ta Bat-A Luoi) in 1990 and 1999 hardly change: 12.8 ppt (8.5-17ppt, n=2) and 11.9 ppt (4.3-35ppt, n=10) (6).

On the other hand, in the areas that the soil is cultivated regularly, and dioxin is usually in from 1cm to 10cm deep so it is easily decomposed. For example, in A Luoi district, dioxin in forest is 147ppt, in the cultivated fields is 4.2 ppt (7). So, in the cultivated field, dioxin reduced 94%. Theoretically, cultivation makes dioxin go to the surface of soil and it will be decomposed by sunlight. The research in laboratory shows that, when dioxin is exposed in UV wave, the disintegration rate is 92-98% (8).

Dioxin, moves with the flow, can adhere to the mud in the bottom of pool, lake or marsh. In 1990, the people in A Luoi district dug the ponds for fish raising. At first, there was not dioxin at the bottom of the ponds because the ponds were 3-4 m deep. Dioxin moved from the edge and around the ponds followed the rain flows. After 9 years, the mud at the bottom of the ponds accumulated with the dioxin content of 5.6ppt (1.8-8.5ppt) (6).

As for animals, in 1970, when US was spraying herbicides, Baughman R. W. discovered that the content of dioxin in fish in Dong Nai river was 810 ppt. 16 years later, it was 1986, when we had the condition to detect dioxin in animals' bodies then the contents in general were relatively low. The contents of dioxin in animals in Binh Duong province is: fish 0.6 ppt, chicken 4.1 ppt, chicken egg 0.16 ppt; in Ho Chi Minh city: pig 2.08 ppt, chicken egg 0.2 ppt (6).

In the areas that the contents of dioxin are higher in soil then it is also higher in some animal samples. For example, in A Luoi, fish *fat* 17.1 ppt (1.9-51 ppt, n=7), *muscle* 0.4ppt, *liver* 1.1 ppt; duck *fat* 67 ppt, chicken 15 ppt, toad 56 ppt. These animals have high contents of dioxin because they were raised wandering in the contaminated areas. These wandering animals went to the pools, sewages or muddy areas to feed themselves so that they got high contents of dioxin. For example, around the old airport A So

in A Luoi, Thua Thien Hue, the fish in the ponds had dioxin accumulation in fat of 18.2 ppt after 8 months. It means that bioaccumulation factor of fish/mud is $18.2/5.6=3.25$ (7).

In 1970, Baughman R.W. and J.D Constable found out in milk of a woman in childbirth living in Tan Uyen district, Binh Duong province, where was the temporarily occupied area and was sprayed strongly, the content of dioxin was 1.450 ppt.

In 1984 (24 years latter after US started spraying herbicides), Arnold Schecter collaborated with the committee 10-80 to analyze the adipose tissues of the patients who underwent the operations in Cho Ray, Binh Dan, Phu San hospitals where collected the patients from all around the Southern. The results showed that there were 97 out of 120 patients infected with dioxin. It means there were 81 out of 100 people infected with dioxin (9). Among the ways to be infected, besides getting spraying directly from the aircrafts, the infection through food chain is also very important. In the time of spraying from 1962 to 1971, there were 3 women who lived in Ho Chi Minh where was not sprayed but the contents of dioxin in adipose tissue are 10 ppt, 5.2 ppt and 4.2 ppt while the others' is 2 ppt. That thing indicates that these women in childbirth had infected with dioxin through food chain (9).

In 1998 (36 years latter after US started spraying herbicides), Hatfield collaborated with the committee 10-80 to analyze the mixed blood of the people living in A Luoi-Thua Thien Hue. It showed that the contents of dioxin in the mixed blood of males who were born after US stopped spraying was 21 ppt (n=50), of females was 12 ppt (n=50) (7). The research at Bien Hoa airport indicated the similar results that there was a high contents of dioxin in the bodies of the people born after ceasing spraying like in soil and food (10). So that, dioxin penetrates into human body mainly through food chain, if we

supply the people living in the polluted areas with fresh food then we can solve the problem of dioxin infected in humans.

That is, we can see, soil and mud is the storage of dioxin sprayed by US before. Animals contact the contaminated soil and infected with dioxin. Then, people eat contaminated food and infected in turn.

Movement of dioxin in the natural environment after US stopped spraying happen as follows:

Soils and Mud to Animals to Humans

However, geographical condition affects profoundly the sustainability, direction, and velocity of dioxin in environment.

The research in Vietnam shows that dioxin affects the health of population. Congenital defect in Doc Binh Kieu commune, Dong Thap province is 1.76%, higher than it is in other countries (Japan 0.82%, India 0.76%) (11), intrauterine growth retardation, ovoviviparous, nursing cell cancer, antenatal mortality, newly born mortality, all these are higher incidences compared to the group of women who gave birth in the time before the war (12). The higher rate is statistically significant for the cases of reproductive complication among the women whose husbands used to participate in the Southern battlefield (13). Study from the Center of Disease Control (CDC) in Atlanta – USA has shown that during the first five years after demobilization from Army the mortality rate of American Veterans in the Vietnam War is higher than that of American Veterans in other countries. The diseases are: cancer, circulatory disorders, mental crisis (leading to death by traffic accidents, suicide, murder...). Some newspapers and US public opinion consider that the death is caused by contamination of dioxin during the Vietnam war.(14) In 1997, International Agency for Research on Cancer (IARC) announced that TCDD was a substance

cause cancer in human. US Environment Protection Agency (USEPA) suggested a rearrangement about the same reason causes disease in a draft (15).

Each country dealt with the dioxin accidents in their own way follows the specific situation. In general, it was considered a frightful disaster and was warned throughout the world when it happens. Millions of millions dollars were spent treating the dioxin accidents in Times Beach and Missouri-US (1971), in Seveso –Italy (1976), in Binghamton, New York –US (1981). When contamination of dioxin happened in a food manufactory in Belgium (1999), the minister of the Ministry of Health had to resign. Meanwhile the representatives of the chemical companies, who used to produce more than 600 kg dioxin for US aircrafts sprayed on the heads of ten millions of innocent Vietnamese people, had made millions of people infected, got dangerous diseases, or died of diseases, said that there isn't enough evidence.

Nowadays in Vietnam, dioxin is not dispersed like in the first time. It accumulates in small areas such as in Bien Hoa, A Luoi, Da Nang, Tra Noc, etc. Treating with the soil there means splitting up the source of dioxin into the second link of food chain.

An example of soil treatment in Bien Hoa:

Bien Hoa town has an airport used to be the base for US troops sprayed herbicides.

At this airport, in 1979, more than 28,425 litres of Agent Orange strewed on the court of the airport.

The land got serious pollution. 1,100,000 ppt dioxin was measured on the floor of an old storage in year 2000.

Trung Dung precinct is separated with the airport by a barbed wire fence.

When it rains or flood, the water from the airport flows into all houses, the pools, floors, and wells are flooded.

Examine: Mud in Bien Hung pool
114-117 ppt (year 2000)

Fish 65 ppt (year 2003)

Duck 276-331 ppt (year 2003)

Chicken 8-15 ppt (year 2003)

Toad 56 ppt (year 2003)

95% of blood samples of 43 people, who eat fish, duck, chicken raised in the polluted land, drink the underground water contaminated with dioxin, show the content of dioxin of 413 ppt. This is a poor precinct, the people have to work hard for living, and they have to raise animals by themselves.

On the contrary, Thanh Binh precinct is 3 km far from the airport's fence, the water from the airport cannot flow to this area, the people do not use water in wells, they use water from central water supply system. In this precinct, there is not vegetable garden, fishpond, no raising. The food is bought from other places.

Examine: Fish 0.22 ppt (year 2003)

Chicken 0.034 ppt (year 2003)

Pig 0.86 ppt (year 2003)

Cow 0.82 ppt (year 2003)

Blood of human 3.4-5.7 ppt (year 2003)

In 2004, at Trung Dung precinct, the pools, lakes, wells were filled, soil grader made the road higher, fill the ponds, lakes, so it made the dioxin deeper into the ground. On the new ground, multiple dwellings were built. The people come here to live and use supply water, use food from other places. It is likely that dioxin will reduce like in Thanh Binh precinct.

The suggestions to deal with dioxin pollution:

1. Destroy dioxin by cultivating, digging the land around the hamlets, communes to move the dioxin from the underground to the surface and let it in the sunlight for a time before growing plants.

2. In rural areas, in dry season of every year, drain pond, catch fish and let it expose to light for a time.

3. Isolate the polluted areas to protect animals and people from using those places.

4. Don't let the animals contact the polluted soils by raising chicken, duck, pig in cage; direct buffalo and cow, don't let them wander.

5. For the polluted areas, the model of Trung Dung precinct in Bien Hoa city can be applied.

To do all these, a capital is required and that is obligation of chemical companies, who produced herbicides used by US in the war.

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