

VIETNAM AND AGENT ORANGE / DIOXIN RESEARCH: VIETNAMESE AND US COLLABORATIONS, 1968-2007

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Abstract

Agent Orange and other herbicides contaminated with 2,3,7,8-TCDD, or dioxin, were sprayed on about 15 % of the south of Vietnam during wartime between 1962 and 1971. Various locations have been identified beginning in the 1970s where humans, food and the environment have been and still are contaminated with TCDD from Agent Orange. Previous collaborative research and the current situation in Vietnam and possible public health action plans for remediation are discussed.

Introduction and Findings

Beginning in 1968, one of us, JDC, began study of Agent Orange exposure in Vietnam and certain medical conditions. In 1970, specimens of human milk and of food from Agent Orange sprayed areas in the south of Vietnam were collected by Vietnamese and US scientists and brought to Harvard University for analysis. These were the first dioxin analyses of biological specimens. Baughman and Meselson reported up to 1,850 ppt, lipid, of TCDD in human milk, the highest level recorded in milk to date, and very high levels of TCDD in fish¹.

Later investigations beginning in 1982 by two of us, JDC and AS, initiated an ongoing collaboration with Vietnamese scientists which exists to the present time. This work was coordinated in Vietnam at first by the 10-80 Committee, later through the Vietnam Red Cross, and most recently with the Center for Ecology and a Sustainable Environment. Key Vietnamese scientists included Profs Hoang Dinh Cau, Le Cau Dai, Hoang Trong Quynh, and Nguyen Thi Ngoc Phuong. Sampling of human tissue, food, wildlife and environmental samples began in 1982. Dioxin analyses were performed at a variety of cooperating laboratories by many chemists including Michael Gross², then of the University of Nebraska in the USA, Seppo Raisanen of Helsinki University, Finland³, John Jake Ryan of Canada⁴, and Olaf Pöpke⁵, Peter Fürst⁶, and Rainer Mailisch⁷ of Germany.

Sampling was performed in the north, middle and south of Vietnam⁸. Since Agent Orange was not used in the north, only very low levels of TCDD were found there; higher levels were found in the border area between what was North Vietnam and South Vietnam in the center of the country; elevated levels were also found in certain areas of the south of Vietnam. Levels of TCDD in humans appeared to be declining over time (Figure 1) with the exception of certain areas such as Bien Hoa (Figure 2). We recently detected very high levels, eg upto 400 + ppt, lipid, TCDD in blood of some residents of Bien Hoa near an airbase where Agent Orange was stored and spillage occurred. We also reported over 1,000,000 ppt of TCDD in soil. Fish, ducks and other sources of food were contaminated as was silt or sediment⁵. Other areas in Vietnam were also found to be contaminated but some areas in Bien Hoa were extremely contaminated and consumption of contaminated food continued at least through the time of sampling in the early 2000's.

Other toxic chemicals, not related to Agent Orange, were also detected in some humans and food. These included DDT and its metabolites, PCBs, chlorinated dibenzofurans and various pesticides⁶. Organophosphates are heavily used in agriculture today, all of which complicates health studies regarding possible associations between Agent Orange exposure and illness.

Others have observed similar findings^{9, 10} and currently the US EPA is working with Vietnamese scientists and others to analyze environmental samples, primarily soil, by high resolution gas chromatography-high resolution mass spectroscopy (gc-ms), the gold standard for congener specific dioxin analysis, and by CALUX biological screening methods developed by Michael Dennison, George Clark and others¹¹.

At present, approximately 6 areas of high TCDD contamination have been identified including Bien Hoa, Da Nang, and Phu Cat. The question of remediation is under active discussion within the Vietnamese government and with foreign experts. Approaches vary from expensive high temperature controlled incineration of contaminated soil, sediment and biota etc, to walling off the contaminated areas and not allowing food from these areas to be consumed. At present, the Ford Foundation has contributed \$500,000 US¹² towards this effort and the US government has promised \$400,000 to evaluate the situation and suggest possible remediation approaches¹³. Some cleanup has begun and some persons have been moved from their homes in contaminated sites to other locations.

In addition, a lawsuit has been filed in US courts by US lawyers on behalf of VAVA, a Vietnamese association concerned with persons believed to be victims of Agent Orange¹⁴. The lawsuit is slowly working its way up to higher levels of US courts on appeals. The lawsuit asks for monetary damages from the US companies such as Dow, to pay for medical care including health clinics, compensation for loss of work, and remediation of dioxin contaminated sites. There are many difficulties involved in this litigation: They include the long time since spraying occurred, whether dioxin in Agent Orange can be considered chemical warfare, whether compensation is legally due for damages done during war as well as defining who is a victim of Agent Orange. There are different definitions of victims. They include persons living in areas sprayed with herbicides including Agent Orange with the presumption of intake and increased dioxin body burden; they also can be considered persons ill from dioxin or herbicide exposure; they can include persons suffering from psychological as well as physical illness. Dioxins are known risk factors for a number of diseases including cancer, immune deficiency, endocrine disruption, nervous system damage, reproductive and developmental pathology, skin diseases, liver damage, elevated serum cholesterol and triglycerides, and death from ischemic cardiovascular damage with high exposure^{15, 16, 17}. However, exposure to dioxin and other risk factors will not cause damage in all persons. For example, while 80 % of lung cancers in the USA are from cigarette smoke, most smokers will not develop lung cancer. The same is true of dioxins. Having exposure above background levels does not cause ill health in every person, but rather increased illness on a population basis. With a rare disease, it can take large populations to find persons ill from the toxic chemical. Without elevated dioxin body burden, a person cannot be sick from dioxin exposure. However, TCDD half life of elimination is usually 7-11 years in humans so a low exposure during wartime might not lead to elevated blood TCDD level decades later¹⁸.

In Vietnam a number of epidemiological studies have been performed. Some suggest congenital malformations associated with Agent Orange¹⁹. These studies are not generally accepted by Western scientists as being more than suggestive²⁰. A large NIH study was funded to study this matter but the study was discontinued after a short trial period because of differences of opinion on scientific issues between the American researchers, the US National Institutes of Health (NIH) which funded the study, and Vietnamese researchers. French and Vietnamese investigators studied and published on the possible relation between Agent Orange and choriocarcinoma, hydatidiform mole and liver cancer. These publications did not find an association between the herbicide and the illnesses studied²¹. Doubtless, future studies in Vietnam should find the same association between dioxin and health found in other countries.

At present, the Vietnamese government has been in the process of reorganizing the official agency responsible for Agent Orange work in Vietnam. The former 10-80 Committee has become a part of the Ministry of Health and its primary role has been replaced by the Committee 33, based in Hanoi. The Vietnam military is taking a major role in remediation efforts. The Committee 33 is funding some health studies in Vietnam, but few if any with scientists from outside of Vietnam. Over the past few decades there have been Japanese, French, US, German and Russian

studies on Agent Orange in Vietnam with Vietnamese researchers. At present, research-even practical public health research-is perhaps of necessity being given a somewhat lower priority than addressing the issues of keeping dioxin contamination from the population and compensating persons suffering from health problems believed by some Vietnamese authorities to have been caused by Agent Orange.

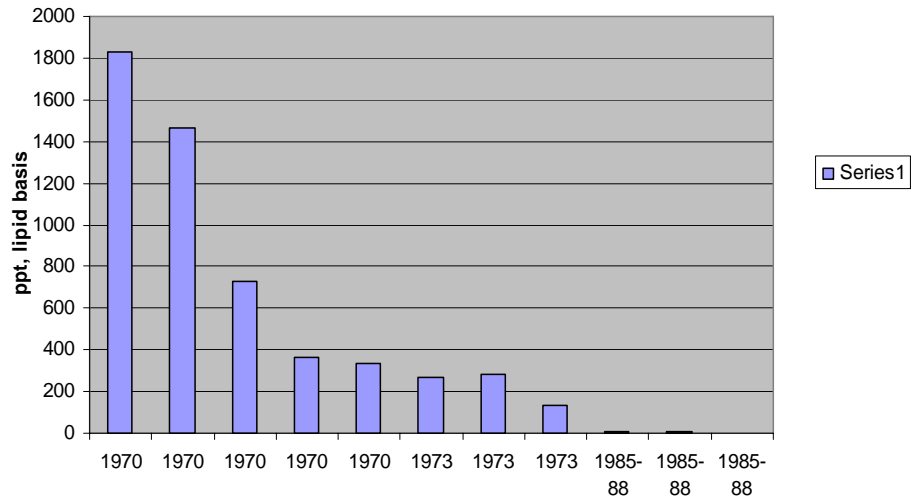
Acknowledgments

We thank the many Vietnamese who have collaborated in these studies, either as volunteers or as scientists. Generous and sustained funding from the CS Foundation is also gratefully acknowledged.

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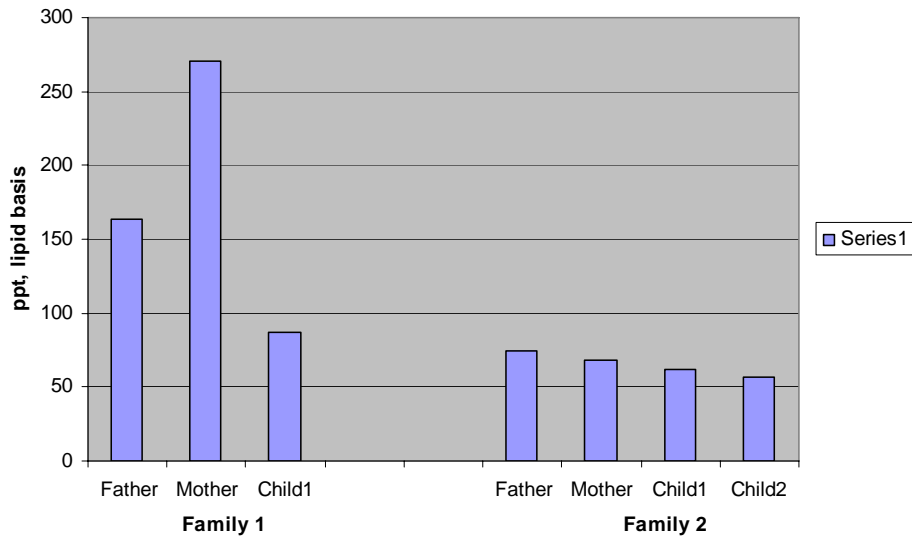
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Figure 1: Decrease in human tissue levels of TCDD in Vietnamese over time after Agent Orange spraying ended in 1971



After Schechter et al. 2001. Recent Dioxin Contamination from Agent Orange in Residents of a Southern Vietnam City, JOEM 43 (5):435-443

Figure 2: Recent TCDD blood levels in members of two families living in Bien Hoa, Vietnam



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