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April 6, 1995

Dr. David Tollerud, Chairman
Committee to Review the Health Effects in
Vietnam Veterans of Exposure to Herbicides
Institute of Medicine
National Academy of Sciences
2101 Constitution Avenue
Washington, DC 20418

Dear Dr. Tollerud:

Thank you for the invitation to attend your committee's public meeting on April 21, 1995. I do not plan to attend, but do wish to participate in future scientific meetings on this topic, and am sending this letter in the hope that it may be of some use to your committee at this time.

First, should you wish me to serve on your committee, I would be pleased to do so. I have worked on Agent Orange and dioxin exposure assessment and health issues for over a decade and have conducted US veteran Agent Orange studies as well as Agent Orange and dioxin studies in Vietnam beginning in 1984. I have conducted research in Vietnam 11 times since 1984 and plan to return next in May, 1995.

Second, you may find my new book, *Dioxins and Health*, Ed. A. Schecter, Plenum Publishing Corp., NYC, 1994, to be helpful to your committee. We attempted to summarize, in chapters written by senior dioxin scientists, what is known at this time concerning

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dioxins, related chemicals, and health. A copy of this book was recently sent to your committee, to the attention of Dr. Stoto.

Third, you may find the recent (1994) EPA Draft Dioxin Reassessment, including the health as well as exposure volumes, to be of considerable use. Also, the EPA dioxins and wildlife interim report (EPA/600/R-931055), published separately one year before the general EPA dioxin reassessment, may be quite helpful.

In addition, my colleagues and I published an article (enclosed) on dioxins in the US food supply in *Environmental Health Perspectives* late last year. It documents the amounts of dioxins and dibenzofurans ingested in food by the general US population. This also documents that the general population is exposed on a daily basis to a certain level of dioxins. It implies that epidemiology studies must compare populations with various levels of exposure, since there are currently no Americans who are not exposed to dioxins.

You may also find our article on dioxin levels in the Vietnamese, from Agent Orange and other sources, "Agent Orange and the Vietnamese: The Persistence of Elevated Dioxin Levels in Human Tissues," *American Journal of Public Health*, April 1995, Vol 85, No. 4, pp. 516-522, Schecter et al. (galley enclosed), to be of use. It documents intake of TCDD from Agent Orange in some Vietnamese in the south of Vietnam. It shows that there is a large population in Vietnam of men, women and children who have been exposed to Agent Orange for a considerable period of time and also a large, unexposed population. This is consistent with recommendations of the previous and recent IOM-NAS Agent Orange Committee's recommendation for considering the feasibility of Agent Orange health research in Vietnam. For your reference, I am also including a copy of my presentation to the previous IOM-NAS Committee with this letter, in the belief that it is still relevant to the issue at hand.

Recently, in an effort to explore possible mechanisms for male-mediated adverse reproductive outcomes following Agent Orange and dioxin exposure, dioxin and dibenzofuran congeners have been identified in three pooled samples of semen from American Vietnam

veterans (enclosure). This study was an attempt to see if such compounds do exist in semen of American veterans and others. Dioxin transfer from male to female, with possible effect on the egg or zygote, was hypothesized by Z. Stein and M. Hatch as a possible mechanism which might possibly lead to congenital malformations in the children born to male Vietnam veterans. With exposure of women to dioxins and related compounds, there is clear evidence of reproductive and developmental damage, as demonstrated by Masuda, Kuratune and others for Yusho in Japan, and by Rogan, Shu, Guo and others for Yu-cheng in Taiwan. There have also been related studies in the US.

Research published in the past 5 to 10 years on dioxins, dibenzofurans and the loosely related dioxin-like PCBs -- much of which is reviewed in my book *Dioxins and Health* -- suggests a number of human health consequences from the dioxins, with sufficiently high exposure, including cancer promotion, cancer initiation, cancer mortality involving a number of organ sites, neurological damage including behavioral and cognitive impairment (Yu-cheng), immune deficiency, endocrine disruption, liver damage, elevated serum lipids, skin disorders and other effects. The levels of dioxins in human tissues in the general population and the levels needed to cause these effects in genetically sensitive persons needs further research.

Exposure assessment has moved forward to a considerable extent by the ability to measure dioxins, dibenzofurans, and dioxin- and non-dioxin-like PCBs in human tissues. Along with a careful medical and exposure history, such laboratory tests, although relatively expensive and subject to medical interpretation, can be extremely useful in the hands of an experienced and knowledgeable occupational medicine physician in evaluating possible exposure and individual or group risk of adverse health consequences from dioxin and Agent Orange exposure. Relative elevation of TCDD can sometimes be used, with a careful medical history and examination, in such efforts. I feel such testing should be offered to Vietnam veterans and their physicians, as part of a comprehensive medical evaluation for Agent Orange exposure. I believe that such analyses should be performed by a World Health Organization certified laboratory, at no cost to the veteran or to his or her physician. For

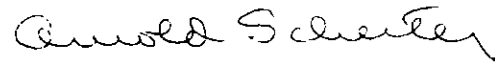
further information on this subject, I would refer you to the review chapter (Chapter 14) that I wrote on exposure assessment in the book, *Dioxins and Health* (enclosed). I would also refer you to the work done at CDC by Drs. Patterson and Needham, as well as blood dioxin exposure assessment done by Dr. Fingerhut and colleagues for their NIOSH studies of dioxin-exposed workers, including their cancer mortality study published in the *New England Journal of Medicine*. The New Jersey, Massachusetts and Michigan Agent Orange studies of Vietnam veterans, performed and published by Kahn for New Jersey and Schecter for Massachusetts and Michigan, also documented the usefulness of dioxin measurements in blood and fat tissue, under certain conditions.

In Vietnam, there is an organized scientific effort to study the health effects of Agent Orange and its dioxin contaminant. These researchers would have much to offer your committee and you may wish to invite several of them to meet with your committee. I would suggest Prof. Le Cao Dai of Hanoi Medical School and Dr. Phiet of Ho Chi Minh Medical School, as well as Dr. Nguyen Ngoc thi Phuong of Tu Du Obstetrics and Gynecology Hospital in Ho Chi Minh City. These scientists have held, and published proceedings from, several Vietnamese-based international and national dioxin conferences. They also have published some articles in western scientific journals. They believe there is some suggestive evidence of increased cancers and also congenital malformations and other health findings possibly related to Agent Orange exposure. In my judgement, these and related studies should be redone with American and Vietnamese scientists working together in order to either confirm or refute these preliminary results.

The National Institute of Environmental Health Sciences, with the World Health Organization, is planning a trip of senior scientists to Vietnam to review Vietnamese work, meet scientists and visit medical institutions for evaluation of possible future research. Your committee might wish to send one or two members on this trip, currently scheduled for early May, 1995. This trip may also consider other causes of ill health following Vietnam service, in addition to the effects caused by Agent Orange and dioxin.

I would be happy to help in any way I can. I am also enclosing a c.v. that includes a bibliography. If your committee would like any additional articles, please let me know which ones are of interest.

Sincerely yours,



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Ccc: Adm. Elmo Zumwalt