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**Author** Hobson, Lawrence B.

**Corporate Author**

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## Fat Assays for Dioxin

Dioxin, the toxic contaminant of Agent Orange, is retained in body fat but it has not been known how long it persists in human fat. Veterans who served in Viet Nam were sometimes in contact with dioxin when Agent Orange was used as an herbicide or defoliant. Batches of Agent Orange differed, however, in how much dioxin they contained, some having none at all, and there is no way to determine the content of any particular batch.

Aside from a very few armed forces personnel, troops were last exposed to Agent Orange about ten years ago. The fat of the men would contain very little, if any, dioxin so long after exposure even though the body concentrates the substance there. Earlier chemical methods would not be expected to detect the substance but recent advances in assay techniques make it possible to identify and measure very small amounts of dioxin—actually a few parts per trillion in the fat.

The Veterans Administration has undertaken a study to determine whether dioxin can be detected in Viet Nam veterans and in Viet Nam era veterans who did not serve in that country. To conduct this work, samples of body fat were removed surgically from 20 volunteers who reported exposure to Agent Orange in Viet Nam, from 10 volunteers who had not been there, and 3 Air Force volunteers (identified as "Ranch hand") with recent known exposure to Agent Orange. A highly skilled analytic chemist, without knowing the source of each sample, assayed the fat using a two-part method. The first part tentatively identified and measured the dioxin, specifically TCDD; the second identified the TCDD more certainly and measured it more precisely.

The methods used included careful extraction techniques, gaschromatography and mass spectrometry with stable isotope identification of the substance. The method as a whole is delicate, complicated, and still the subject of study in itself. At present, 3 parts per trillion can be considered the lower limit of detection.

The accompanying table summarizes the results as they are available today. "Final Results" are those for samples in which both parts of the assay have been completed; "Tentative Results" are for samples in which only the first part of the method has been done to date and they cannot be considered definite as yet.

As an additional check on the assay results, duplicate samples of some fat specimens have been sent to an Environmental Protection Agency laboratory that uses a somewhat different technique. No results are yet available from these assays.

The results to date have shown that the assay used can detect and measure dioxin in amounts as small as a few parts per trillion and that the substance can be found in some persons whose last exposure was ten years or more earlier. There is no evidence that the presence or the absence of dioxin in body fat correlates with symptoms or abnormalities that could be caused by the substance.

The study has made available an additional research tool that will be used in further studies of Agent Orange. Until ill effects can be correlated with the presence of dioxin, the assay has limited clinical usefulness. It demonstrates now only that a person has at some time had contact with substances containing dioxin. The contact may have occurred in fairly recent non-military circumstances, however, since dioxin is found in materials other than Agent Orange.

Final Results  
22 Veterans

	Viet Nam Service	No Viet Nam Service
Symptoms	3/12*	-
No Symptoms	<u>3/4**</u>	<u>1/6</u>
Total	6/16	1/6

Tentative Results\*\*\*  
12 Veterans

	Viet Nam Service	No Viet Nam Service
Symptoms	3/7	0/1
No Symptoms	<u>1/1</u>	<u>0/3</u>
Total	4/8	0/4

\* Numerator is number of veterans whose fat contained more than 2 parts per trillion above base line; denominator is total of veterans in group

\*\* All 3 of "positive" veterans were Ranch hand

\*\*\* Results of single unvalidated assay