

Question re dioxin levels

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An Associated Press article by Paul Recer, appearing in the Sunday, December 26, 2004 edition of the Arizona Republic, compared the dioxin level measured (in one test) in Viktor Yushchenko, with that of Vietnam War era veterans exposed to Agent Orange.

The article stated "it is unlikely if many, if any, Americans absorbed the dose Yushchenko ingested". It then went on to describe Yushchenko's dioxin level as "100,000 units per gram of blood fat"; it then gave estimates from "studies" conducted years after the war's end, of dioxin levels in veterans ranging from 5 parts per trillion to 20 parts per billion.

Well, 100,000 to 1 certainly sounds bigger than 5 out of a trillion or 20 out of a billion: but it is obvious to me that these measurements do not use the same measurement scale and that they are therefore incommensurate. The comparison would be quite misleading to those who lacked the scientific/mathematical literacy necessary to realize that these figures represent two different measuring scales. At the same time, it can be expected that most readers lack the technical medical background necessary to convert these figures into a single commensurable measurement scale, permitting a meaningful comparison between them. I myself lack this specialized knowledge.

How many parts per X does "100,000 units per gram of blood fat" represent? Alternately, how many units per gram of blood fat does 20 parts per billion represent?

Also, are these studies merely models using assumptions (without actual measurements of dioxin levels) about the exposure of "the typical" Vietnam veteran under specific conditions? Do these studies rule out the possibility of much higher exposures among vets than these studies suggest, given conditions that may or may not have been exceptional? How does one measure the "likelihood" of such exposures, and to what concept of probability does this conform?

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Obviously studies conducted years after a war cannot measure contemporary levels, so to the extent that these studies incorporated actual measurements at all, these would have been some sort of residual levels (in organ tissues?) and then used more assumptions to retroactively model the levels years earlier. Or perhaps it merely examined existing unrepaired organ or other tissue damage and made similar assumptions and retroactive modeling. How reliable are such indirect methods (whatever those might be), when recent newspaper reports gave widely varying contemporary measurements of Yushchenko's dioxin level using different tests with varying methodologies, and suggested that even with such direct and recent measurements, obtaining an accurate measurement of Yushchenko's dioxin level required the work of a rare specialist lab to verify the quantification?

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