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**From :** Michael Ginevan [redacted]  
 "Newton, Michael" [redacted], Deborah Watkins [redacted], Nathan Karch [redacted]  
**To :** [redacted], Michael Ginevan [redacted], [redacted]  
 [redacted], Jaclyn Petrello [redacted], Bonnie Sceurman [redacted]  
**Subject :** RE: Data on liquid contact and probable dose of phenoxyx and TCDD resulting from aerial spraying in Vietnam  
**Date :** Fri, 15 Apr 2005 07:42:16 -0700  
**Attachment(s) :** 1 file(s)/document(s) | Total File Size: 32K

Hi All,

I attach a simple exposure analysis I did awhile ago. It looks like Mike and I are pretty close together in our estimates. Since I did mine de-novo and Mike's is 20 years old, I think this is encouraging.

Mike Ginevan

-----Original Message-----

**From:** Newton, Michael [mailto:[redacted]]  
**Sent:** Thursday, April 14, 2005 5:20 PM  
**To:** Deborah Watkins; Nathan Karch; Michael Ginevan; [redacted]

[redacted] Jaclyn Petrello; Bonnie Sceurman  
**Subject:** Data on liquid contact and probable dose of phenoxyx and TCDD resulting from aerial spraying in Vietnam

Greetings, All;

The attached Expert Report I prepared for the class action suit in the '80s contains an analysis of routes of exposure for troops in VN. I just did a bit of clean-up on the table of actual dosages, and the margins of safety explained in the text have changed somewhat. If one updates the NOELs, one can re-calculate the MOSSs to conform with current thinking. I wanted you all to get a look at the way things appeared 20 years ago.

Even though the NOELs may have changed, the calculations of contact are derived from information I published in 1982, with Norris, based on actual measured dosages on skin of male and male workers with 900 cm<sup>2</sup> of skin contact with saturated emulsions of 2,4,5-T esters ranging through the array of concentrations one might put in an aircraft. Total contact with skin was far greater at the highest concentrations than would have occurred anywhere in VN under aerial sprays.

Please note work by Lavy et al in two pieces of work that demonstrate the difficulty of dislodging residues from foliage in recently treated areas:

Lavy, T. L., L. A. Norris, J. D. Mattice and D. B. Marx 1987 Exposure of forestry ground workers to 2,4-D, picloram and diclorprop. Environ. Toxicol. Chemistry 6:2009-224

Lavy, T. L., J. S. Shepard and d. C. Bouchard 1980 Field worker exposure and helicopter spray pattern of 2,4,5-T. Bull Environm. Contam. Toxicol. 24:90-96

<http://webmaila.juno.com/webmail/8?block=1&msgList=00002jk0&folder=Inbox&destFolder=In...> 5/16/2005

Harris, S. A., K. R. Solomon and G. R Stephenson 1992 Exposure of homeowners and bystanders to 2,4-dichlorophenoxyacetic acid (2,4-D) Env. Sci. & Health. Part B. Pesticides, Food Contaminants and Agricultural Wastes. 27(1):23-38. (Note 15 refs)

The above three bits of work make very clear that a deposit of phenoxy applied just enough in advance of contact to dry residues moderately was enough to make 2,4-D, 2,4,5-T, diclorprop and picloram virtually immobile under rubbing contact unless vegetation green stains show up on the intercepting surface. No info about TCDD there.

Weber et al (1989) did a very nice job of showing that TCDD penetrates through all the layers of skin very poorly even with a very high loading per unit of surface. That paper is:

Weber, W. D., Zesch, A. and Rozman, K 1991 Penetration, distribution and kinetics of 2,3,7,8 tetrachlorodibenzo-p-dioxin in human skin in vitro. Archives Toxicol. 65:421-428

I think the case can be made that my estimates of penetration greatly overstate the expected penetration of TCDD through the skin of soldiers if one works backwards from the doses Weber et al used and quantities penetrating in the next 15 hours. We can't forget that he applied it in acetone, which would be a great penetrant, whereas our observations with phenoxy esters were that a very small percentage passes through the skin.

Hope this helps. I have copies of all except the Harris paper.

Mike

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## Files & Documents



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Exposure calc  
gine... (32KB)

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Attorney work product privileged and confidential

## Exposure calculation

*Fact I. Application rate is 3 gallons per acre so:*

1 Acre=4046.856422 square meters

1 gallon = 3.785412 liters = 3785.4 cc.

AO Application rate = 3 gallons per acre = 2.8 cc / m<sup>2</sup>

*Fact II. Dioxin concentration*

Assume a very high dioxin level = 20 ppm. We have seen drums if AO above 20 ppm but most are below 1 ppm.

*Fact III. Surface areas*

Surface area – 1.2 m<sup>2</sup> (95<sup>th</sup> percentile whole body less trunk and feet; that is short sleeves, short pants, shoes only ) or 0.26 m<sup>2</sup> (hands and head only.) This would be a pretty uncomfortable outfit in a jungle, and a hands and head scenario is more likely. Note also that surface area is quite a bit smaller for Vietnamese, but dose per unit body weight will not go down as much because Vietnamese are lighter.

*Fact III. Exposure*

Specific gravity of AO: 1.285 kg/l or 1.285 gm/cc

Exposure –  $2.8 \text{ cc/m}^2 \times 1.285 \text{ gm/cc} \times 1.2 \text{ m}^2 \times 2 \times 10^{-5} = 8.63 \times 10^{-5} \text{ gm} = 86.3 \text{ ug}$ .  
Application rate      Specific gravity      body area      dioxin conc.

If 3% uptake [note to all, is this realistic?], 2.6 ug (86.3 x 0.03).

So exposure is 2.6 ug / 70 kg or 0.037 ug/kg or 37 ng/kg.  
dioxin intake      body weight

*Fact IV. Conservatism*

Dioxin typically 20x or more less in AO (e.g. <1 ppm not 20 ppm)

Surface area more like 0.26 m<sup>2</sup>. (head and hands only)

Forest canopy intercepts 86%-97% of AO. Assume ground level 10x lower than nominal application rate

Exposure about 1000 x less (20x dioxin in AO; 10 x ground vs canopy; 5 x short sleeves and short pants vs. head and hands only) if more realistic assumptions are used. So a more likely exposure is 37 pg/kg. If we assume that all of the TCDD is sequestered in fat, we have 185 pg/kg or 0.185 pg/gm (0.185 ppt). If only 10% body fat, 0.370 ppt still real low. Conclusion: even a couple of exposure episodes are minimal exposure.