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M E M O R A N D U M

TO: Chuck Andrews, Branch Chief **HSM-99019**
Worker Health and Safety Branch

FROM: Sally Powell, Senior Environmental Research Scientist **[original signed by S. Powell]**
Worker Health and Safety Branch

DATE: October 14, 1999

SUBJECT: EFFECT OF CHANGES TO THE DISTRIBUTION OF AMBIENT AIR CONCENTRATIONS ON THE DISTRIBUTION OF LIFETIME EXPOSURES TO 1,3-DICHLOROPROPENE

Dow AgroSciences (Dow) has requested that DPR modify the permit conditions for 1,3-dichloropropene (1,3-D) to reduce the buffer zone for tree and vine applications from 300 to 100 feet. Dow justified the change based on the distribution of long-term ambient air concentrations having upper percentile concentrations lower than those used in DPR's risk assessment (Department of Pesticide Regulation, 1997). Dow believes that the original air distribution used in DPR's risk assessment may be used as a benchmark, such that any lower air concentrations may be assumed to produce acceptable risks. To examine the statistical validity of this logic, I simulated the exposure distributions that would result if the original air concentrations were modified in several ways. Since risk is a simple multiple of exposure, it is only necessary to look at the effect on exposure.

I reran the original exposure assessment with several different modifications to the original, or benchmark, air concentration distribution. Three modifications involved multiplying the air concentrations by a constant value (2.0, 1.5 and 0.5). The fourth modification was the distribution Dow modeled as the result of doing tree and vine applications with a 100-ft buffer. The fifth was a modification to the Dow tree and vine distribution, with concentrations equal at the low end and higher at the high end, though still lower than the benchmark DPR concentrations. The benchmark and the last two modified air concentration distributions are given in Table 1 and shown in Fig. 1.

The result of multiplying the benchmark air concentrations by any constant was to multiply the resulting exposures by the same constant.

The nonlinear changes to the benchmark air distribution resulted in qualitatively similar changes to the exposure distributions (Fig. 2), but the actual numeric changes were not proportional (Table 2). For example, at the 95th percentile of the air distributions, the Tree & Vine and Modified Tree & Vine air concentrations are 44 and 70 %, respectively, of the Benchmark concentration. However, at the 95th percentile of exposure, the LADDs for Tree & Vine and

Modified Tree & Vine are 60 and 76 %, respectively, of the Benchmark LADD. Also note that while the Benchmark and Tree & Vine air distributions crossed at the 60th percentile, the resulting exposure distributions cross at about the 50th percentile. Note also that the Tree & Vine and Modified Tree & Vine air distributions are identical up to the 70th percentile, while the corresponding exposure distributions diverge below that point.

I would recommend that DPR carry out the exposure simulation for any new air distribution that Dow may present, unless it is strictly a multiple of the benchmark distribution. The new exposures may then be evaluated directly, rather than relying on a comparison of air concentrations. A new exposure simulation can be done very quickly, since the computer program is already in place.

Reference

Department of Pesticide Regulation. 1997. Risk assessment of 1,3-dichloropropene. January 10, 1997. Sacramento, CA.

Table 1. Air concentration distributions used as input to exposure simulations.

	1,3 dichloropropene concentration (µg m^{-3})		
Percentile	Benchmark	Tree & Vine	Modified Tree & Vine
0.0001	0.07	0.15	0.15
0.01	0.09	0.20	0.20
0.1	0.12	0.31	0.31
0.2	0.15	0.34	0.34
0.3	0.20	0.36	0.36
0.4	0.26	0.38	0.38
0.5	0.33	0.40	0.40
0.6	0.43	0.43	0.43
0.7	0.57	0.44	0.44
0.8	0.76	0.46	0.50
0.9	1.05	0.51	0.73
0.95	1.25	0.55	0.88
0.99	1.51	0.70	1.06
0.999	1.71	0.85	1.28
0.9999	1.89	0.95	1.51

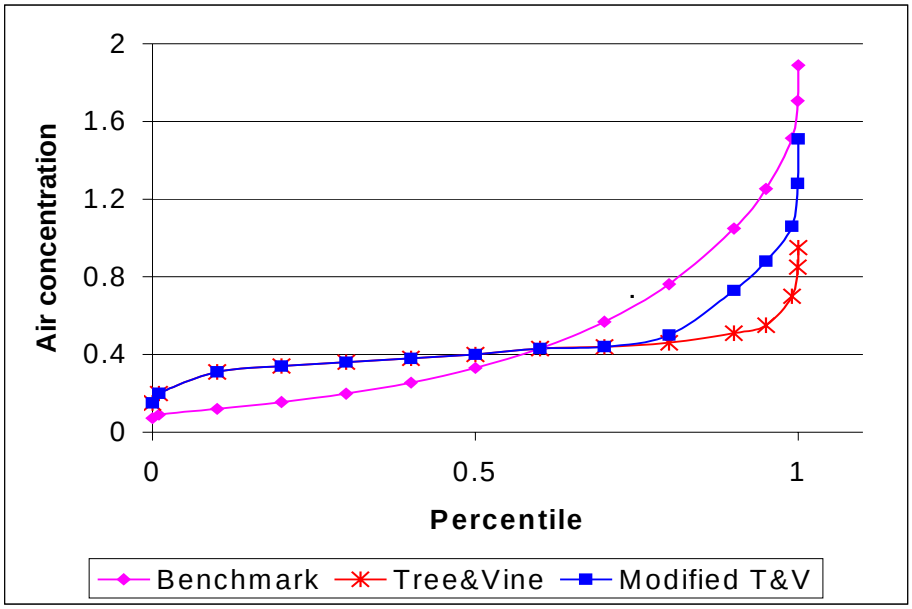

Fig. 1. Air concentration distributions used as input to exposure simulations.

Table 2. Exposure distributions resulting with modified air concentrations.

	Lifetime Average Daily Dose with 70-year Exposure (µg/kg-d)		
Percentile	Benchmark	Tree & Vine	Modified Tree & Vine
0.01	0.03857	0.06541	0.06841
0.10	0.06264	0.09029	0.09398
0.20	0.07924	0.10183	0.10613
0.25	0.08718	0.10682	0.11206
0.30	0.09425	0.11137	0.11720
0.40	0.11084	0.11974	0.12643
0.50	0.12895	0.12802	0.13664
0.60	0.14991	0.13637	0.14740
0.70	0.17656	0.14577	0.16067
0.75	0.19456	0.15156	0.16867
0.80	0.21473	0.15828	0.17858
0.90	0.27431	0.17674	0.21070
0.95	0.32265	0.19332	0.24451
0.99	0.42210	0.22914	0.31802
0.999	0.53290	0.28839	0.40447

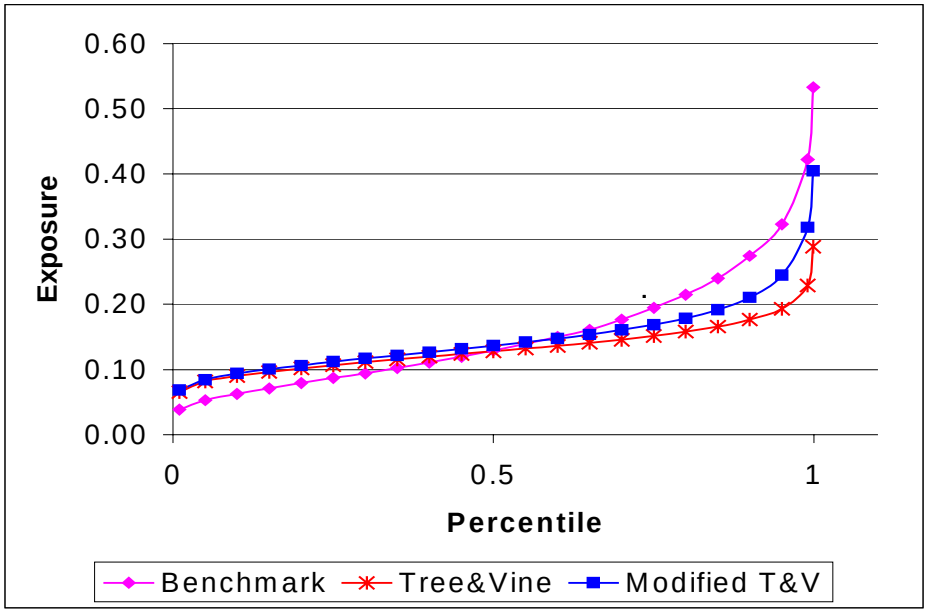

Fig. 2. Exposure distributions resulting from the air distributions in Fig. 1.