

Monsanto

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4 January 1984

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ATTORNEY WORK PRODUCT
ATTORNEY-CLIENT PRIVILEGE

Dear Mr. Ferguson:

This letter is in reply to your December 23, 1983 letter requesting information on the uncertainties in past 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) analyses.

In response to your question as to why the measured levels of 2,3,7,8-TCDD may be too high, the following could be postulated:

- 1) Compounds, whether 2,3,7,8-TCDD or some other compound, eluting from a chromatographic column must be detected in some fashion. The flame ionization detector (FID) as specified in the Dow method or the thermal conductivity detector (TCD) as used at Nitro (see 22 February 1983 memo, comment - Tab 1 notebook page 055409) are known as "universal" detectors. By that I mean they respond (detect) a very broad range of compounds. This is in sharp contrast to the more recently used and more sophisticated mass spectrometer detector which is very compound specific. Therefore, in the analyses using an FID or TCD the chromatographic peak measured as 2,3,7,8-TCDD could be totally due to or contain admixtures of a wide variety of other compounds to which these "universal" detectors would respond, in all cases giving a higher than actual value for the 2,3,7,8-TCDD concentration. Current technology involves the extensive use of cleanup steps (e.g., acid/base washes, column cleanups) which remove a large portion of these interferences even when a more selective (i.e., mass spectrometer) detector is being used. These were not used in the early dioxin analysis technology and this probably represents the major source

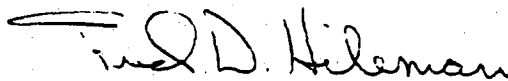
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of high results from the 1960-70 dioxin analysis methodology.

- 2) Artifactual formation of the 2,3,7,8-TCDD could occur as a result of the sample preparation or analysis. In other words 2,3,7,8-TCDD not originally present in the 2,4,5-T could be produced at some step in the analysis. One way to eliminate this possibility is to also analyze some 2,4,5-T known to be free of 2,3,7,8-TCDD with every batch of samples to serve as a blank. This was not routinely done at this early time period. Any artifactual 2,3,7,8-TCDD formation could result in high 2,3,7,8-TCDD results relative to the true concentration in the original product.
- 3) If TCDD isomers other than 2,3,7,8-TCDD were present (which is unlikely in 2,4,5-T) they would most likely not be resolved with the chromatographic columns and conditions used in the Nitro analyses. This represents a specialized example of case 1) above and simply points out that all or most of the 22 TCDD isomers would most likely have been in a single peak creating an unrealistically high value for the 2,3,7,8-TCDD concentration. At the present time very sophisticated, and very long capillary chromatographic columns with high resolving power, are used to uniquely separate 2,3,7,8-TCDD from the other TCDDs. The ability to do this with assurance involves having all 22 isomers available to establish column elution characteristic and daily column performance evaluations to insure that the separation efficiency is maintained.

Hopefully, these very hurried comments will assist you in your preparations. Please feel free to contact me if you have any further questions.

Sincerely,



Fred D. Hileman

FDH:bd

cc: Thomas M. Bistline
St. Louis, E2ND

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