DATA EVALUATION REVIEW

I. Study Type: Hydrolysis

II. Citation:

Tamma, Rama V. and Samuel P. Cohen. 1989. Hydrolysis of 2,4-D In Aqueous Solutions Buffered at pH 5, 7, and 9. Submitted by Industry Task Force on 2,4-D Research Data. Performed by Center for Hazardous Materials Research, Pittsburgh, PA. MRID 41007301.

III. Reviewer:

Name: James A. Hetrick, Ph.D. James A. Hetrick 18 SEP 1995
Title: Soil Chemist
Organization: Environmental Chemistry Review Section #1
EFGWB/EFED/OPP

IV. Approved by:

Name: Paul J. Mastradone, Ph.D. Paul J Mastradone 18 SEP 1995
Title: Section Chief
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V. Conclusions:

This study provides acceptable data on the hydrolysis of 2,4-dichlorophenoxyacetic acid (2,4-D). The data fulfill the Hydrolysis (161-1) data requirement for 2,4-D. No additional data are needed at this time.

Radiolabeled 2,4-D acid, at 21 μg/ml, was stable ($t_{1/2}$ 1 to 2 years) in pH 5, 7, and 9 buffer solutions. The reported data indicate 2,4-D should not hydrolyze under normal environmental conditions.

VI. Materials and Methods:

Aliquots (99.0 ml) of sterile buffer solution (pH 5, phthalate; pH 7, phosphate; and pH 9, borate) were amended with a isotopic diluted 2,4-D stock solution (specific activity=25 mg a.i. ml^{-1}, isotopic dilution ratio (non-labeled/labeled)=23, radiopurity of labeled 2,4-D= 99.24%, purity of nonlabeled 2,4-D 99.6%) to produce a solution concentration of 21 μg a.i. ml^{-1}. (Note: The water solubility of 2,4-D acid is 9000 μg ml^{-1}.) Aliqouts of the buffer solutions were dispensed into 2 ml borosilicate vials, and then were incubated in the dark at a temperature of 24.9°C. At specific sampling times, solution samples were taken for chemical analyses.

Analytical

Soluble residues were separated using an HPLC equipped with an C18 micropore column (25 cm x 4.6 mm particle size) and a linear gradient solvent system of 0.1% trifluoroacetic acid (TFA)/water and 0.1% (TFA)/ acetonitrile; UV and radioactive flow detectors set at 280 nm. Soluble residues from selected samples were also separated using one dimensional TLC with a benzene:ethyl acetate:acetic acid (86:10:4 v:v:v) solvent system. The separated residues were identified using co-chromatography with 2,4-D and 2,4-dichlorophenol. The limit of detections of the HPLC and HPLC radiotrace were 0.05 and 0.03 $\mu g\ ml^{-1}$, respectively. The

VII. Study Author's Results and/or Conclusions:

A. The material balance of radioactivity ranged from 98 to 101% of the applied [^{14}C]-2,4-D (Table 2).

B. The extrapolated hydrolysis half-life of 2,4-D was 1 to 2 years in pH 5, 7, and 9 buffer solutions (Figure 4). These data indicate 2,4-D acid should not hydrolyze in natural environments. [Reviewer Note: The reported hydrolysis half-lives should not be used for quantitative exposure estimates because there were estimated by data extrapolation.]

VIII. Reviewer Comments:

A. Confirmatory identification of [^{14}C]-residues was conducted using one dimensional TLC. One dimensional TLC is generally not accepted as a confirmatory identification method because pesticide residues with similar polarities may co-chromatograph together and therefore appear as a single compound. Because 2,4-D acid is stable to hydrolysis and hence no hydrolytic degradates were formed during the study, EFGWB believes one dimensional TLC provides sufficient information in this case on the identification of parent 2,4-D acid. In future studies, the identification of residues should be conducted with a least two analytical methods (i.e., 2-D TLC, GC/MS, and HPLC). (Reviewer Note: The use of 1-D TLC as a confirmatory identification method appears to be a deviation from the original study protocol.)

B. EFGWB believes the reported hydrolysis half-lives of 2,4-D should not be used for quantitative exposure estimates because there were estimated by data extrapolation.

C. The reviewer agrees with the author's results and conclusion.

2,4-D EFED Review

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