DATA EVALUATION RECORD

STUDY IDENTIFICATION:

Huckins, J. N., and Petty, J. D. 1983. Dynamics of purified and industrial pentachlorophenol in fathead minnows. Arch. Environ. Contam. Toxicol. 12: 667-672.

Pruitt, G. W., Grantham, B. J., and Pierce, R. H., Jr. 1977. Accumulation and elimination of pentachlorophenol by the bluegill, *Lepomis macrochirus*. Trans. Am. Fish Soc. 5:462-465.

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TYPE OF STUDY: (165-4) Accumulation in fish.

CONCLUSIONS:

EFGWB concludes that these studies do no fully satisfy the 165-4 data requirements, and can only be considered supplemental at this time. The study by Pruitt et al. does not appear to be salvageable. The study by Huckins and Petty does appear to be salvageable with the submission of additional data.

Huckins and Petty determined that fathead minnows exposed to industrial composite and purified pentachlorophenol concentrated pentachlorophenol residues by 284 and 174 times, respectively, as determined by whole body sampling. The levels varied from 7.3 to 14.2 g pentachlorophenol/g whole body composites. Pentachlorophenol breakdown products, pentachlorophenyl-β-glucuronide and pentachloroanisole, were detected in fish tissues. Pentachlorophenol and its metabolites were rapidly eliminated from fish tissue during the depuration phase. The specific areas needing additional data are:

1. The levels of pentachlorophenol and its metabolites must be determined in fish edible tissues, viscera, and water for each sampling period.

2. The pH, and levels of dissolved salts and oxygen of the water the fish were held in should be determined.

3. The Pentachlorophenol Task Force is reminded that FIFRA requires that the registrant possess or have access to the raw data used in or generated by a study.

Pruitt et al. determined that fish concentrated pentachlorophenol by 10 to 350 times, depending upon the tissue. Liver had the greatest concentration (35 g/g), followed by digestive tract (21 g/g), gills (6 g/g), and muscle (1 g/g). Pentachlorophenol was rapidly eliminated from fish tissue during the depuration phase, although detectable levels still existed after 16 days of depuration. The specific areas needing additional data are:

1. The identity and levels of pentachlorophenol metabolites must be determined in fish whole body, edible tissues, viscera, and the water the fish are held in.

2. The exposure concentration must not exceed 10% of the 96 hour LC_{50}. This study was conducted at 38% of the LC^{50}.

3. The exposure period should be at least 28 days. The exposure period of this study was 16 days.

MATERIALS AND METHODS:

Huckins and Petty study - Fathead minnows were exposed to 50 g/L of purified and industrial composite pentachlorophenol (95% unlabeled pentachlorophenol and 5% ^{14}C pentachlorophenol) for 31 days. Fish were then transferred to control aquaria for a 14 day elimination phase. Whole body fish samples were taken on 3,5,7,14,21, and 31 days of exposure, and 3,5,7, and 14 days of elimination. Water samples were taken every 3.5 days during the exposure period and counted directly by liquid scintillation counting (LSC). Fish tissue eluates were counted by LSC, and radioactive residues in fish tissues were determined with a Biological Materials Oxidizer. Solvent eluates were purified with gel permeation chromatography, examined for polar conjugates by silica gel chromatography, and the polar unknowns were characterized by mass spectroscopy.

Pruitt et al. study - Bluegill were exposed to 0.1 ppm pentachlorophenol (LC_{50} 0.26 ppm) for 16 days. After 16 days fish were transferred to clean water and held for 16 additional days, with the water being changed every 24 hours. Muscle and combined gill, liver, and digestive tract samples were analyzed for pentachlorophenol on day 1,2,4,8 and 16 of exposure and recovery periods. Separate analyses of samples of gills, liver, and viscera for pentachlorophenol were made on days 4,8, and 16 of both the exposure and recovery periods. Whole body samples were not taken. The water the fish were held in was not sampled. Pentachlorophenol levels were determined by gas chromatography. Neither fish tissues or water were analyzed for pentachlorophenol breakdown products.

REPORTED RESULTS:

Huckins and Petty study - Concentrations of pentachlorophenol in whole body samples of fish exposed to pure pentachlorophenol plateaued well before the end of the 31 day exposure period

(Table 1), and the mean levels ranged from 7.3 to 8.7 g/g. Residues of pentachlorophenol in whole body samples of fish exposed to industrial composite pentachlorophenol also plateaued early (Table 2), and the mean levels ranged from 7.6 to 14.2 g/g. Fish from the pure pentachlorophenol and industrial composite pentachlorophenol exposures concentrated pentachlorophenol to a maximum of 284 times on day 3.5, and 174 times on day 14, respectively. Residues of pentachlorophenol dropped rapidly during the depuration phase of both studies, reaching <0.1 g/g in 14 days. Residues of pentachloroanisole ranged from <0.05 to 0.2 ug/g (Table 1). Residues of pentachlorophenyl-β-glucuronide ranged from <0.05 to 1.9 ug/g (Table 1) in fish exposed to pure pentachlorophenol. In fish exposed to industrial composite pentachlorophenol the residues of pentachlorophenyl-β-glucuronide ranged from <0.1 to 1.3 g/g. Pentachloroanisole was not detected in fish exposed to industrial composite pentachlorophenol.

Pruitt et al. study - Fish accumulated pentachlorophenol in various tissues from 10 to 350 times the exposure concentration. The greatest concentration (35 g/g) occurred in liver tissue, followed by viscera (21 g/g), and muscle (1 g/g) (Table 3). In all tissues pentachlorophenol residues increased through day 8, and then decreased through day 16. After 16 days of depuration fish tissues still contained pentachlorophenol residues. The liver contained 0.6 g/g, followed by viscera at 0.13 g/g, gills at 0.08 g/g, and 0.03 g/g in muscle (Table 4).

DISCUSSION:

Both studies demonstrated that pentachlorophenol readily accumulates in fish tissues, concentrating from 10 to 350 times above exposure levels. In both studies pentachlorophenol readily dissipated from fish tissues during depuration. However, higher levels existed in tissues at the conclusion of depuration in the study by Pruitt et al., possibly because exposure levels were twice as high (0.1 ppm) than in the study by Huckins and Petty (0.05 ppm). Both studies were incomplete. Huckins and Petty only did whole body determinations of pentachlorophenol and its metabolites, and Pruitt et al. did not analyze for pentachlorophenol metabolites in any of the samples.