ChemicalWatch Factsheet

A Beyond Pesticides/ NCAMP Factsheet

Mecoprop

First registered in 1964, MCPP or mecoprop is available as the acid, the potassium, diethanolamine, or dimethylamine salt, or the isooctyl ester. Several manufacturers produce a variety of formulations. Some products are herbicide/fertilizer mixtures, and many contain pesticidal combinations, often including other phenoxy herbicides such as 2,4- D, dicamba, MSMA and MCPA. Like these herbicides, MCPP disrupts normal cell division.

EPA estimates that 1-6 million pounds are used annually, applied for post-emergent control of broadleaf weeds such as prostate chickweed, stitchwort, ground ivy, knowtweed, clover, and plaintain. The vast majority of usage, 96%, is on turf, including lawns, sport turf, and commercial sod production. A small percentage, 1-4%, is used in noncrop areas such as rights-of-way, drainage ditch banks and forest site preparation. Application methods include ground spreaders or sprayers, and pressurized hose-end sprayers, as well as aerial application for specific non-cropland sites.

In preparing the 1989 Reregistration Document, EPA found significant data gaps for MCPP acid and the registered salts and ester in the areas of toxicology, ecological effects, environmental fate, and product and residue chemistry. Toxicology studies have been submitted on MCPP acid but not for the salts or ester. These studies are felt to be adequate for the potassium salt. However, the diethanolamine and dimethylamine salt as well as the isooctyl ester are more complex molecules and may have different toxicological properties. Thus, separate toxicology data is required.

MCPP can be absorbed across the gut, lung and skin. Phenoxyherbicides are generally not significantly fat storable and excretion occurs almost entirely by way of the urine. The acute systemic toxicity of MCPP acid is relatively low, with a rat oral LD50 = 558 mg/kg. However, direct contact can cause significant and persistent eye irritation, corneal opacities, and iritis, prompting a label signal word change from "caution" to "warning." Testing has shown no evidence of dermal irritation, but dermal sensitization testing remains an outstanding requirement.

Studies to assess other long-term health effects such as the potential to cause cancer, chronic health effects, or reproductive effects are not required because mecoprop has no food use registration.

Kidney damage was observed in a sub-chronic study. Rats were fed doses of 3,9, and 27 mg/kg MCPP acid for 90 days. Kidney effects were observed for both sexes at 9 and 27 mg/kg, with the No Observable Effect Level (NOEL) = 3 mg/kg.

Mutagenicity testing in bacterial systems is negative, however, chromosomal aberrations were observed in a mammalian study. A dose-dependent increase in sister chromatic exchange (SCE) was seen in Chinese hamsters after a single oral MCPP dose of 470 and 3800 mg/kg.

Some adverse reproductive effects were seen in one of two studies. A study in rats to determine MCPP's ability to cause birth defects involved doses of 20, 50, or 125 mg/kg/ day of MCPP acid on days 6-15 of gestation. At the high dose, increased intra-uterine deaths, decreased crown-rump lengths, and an increased incidence of delayed or absent ossification of the sternum were reported with no maternal effects observed. No

chemicalWATCH Stats:

Chemical Class: Chlorophenoxy acid or ester
Use: Selective herbicide for post-emergence control of broad-leaved weeds
Toxicity rating: Slightly toxic
Signal Words: Caution, Warning
Health Effects: Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential
Environmental Effects: MCPP readily leaches in soil but quickly biodegrades.

fetotoxidty or birth defects were observed in a similar study on rabbits exposed to 12, 30, or 75 mg/kg/ day.

Determination of MCPP's developmental effects -raises concern for workers or homeowners who mix, load, and apply mecoprop or enter areas where MCPP may have been applied. EPA calculated the risk for commercial and homeowner uses. Exposure estimates were compared to the NOEL for birth defects to determine the margin of safety (MOS). The MOS ranged from 50-7100, depending upon use and protective equipment. An MOS less than l00 is not considered acceptable. Homeowner MOS ranged from 610-2100, but it was noted the risk "may be underestimated because homeowners typically wear only minimal clothing during pesticide treatment." Citing limitations in the exposure data utilized in these calculations, EPA is requiring additional studies to refine the exposure estimates to better assess risk. This will include dermal absorption studies, foliar and soil dissipation studies to assess exposure from re-entry to treated areas, and consideration of dermal and inhalation toxicology data when it is available. No interim risk reduction measures were imposed. The re-entry period is the minimum "until spray has dried or the dust has settled."

Additional concern is raised regarding the presence of highly toxic impurities in MCPP products. MCPP contains a chlorinated cyclic component. EPA has found that chemicals with such a structure may have been produced under conditions that lead to the formation of chlorinated dibenzo-p-dioxins or dibenzofurans as accidental byproducts. The most famous dioxin, 2,3,7,8 TCDD, is known to cause cancer, birth defects, fetotoxicity, and a skin condition known as chloracne. It can be lethal to aquatic species, birds, and some mammals. In addition, the amine salts of MCPP may become contaminated by carcinogenic nitrosamines under certain conditions of manufacture and storage. In response to this, EPA issued a 1987 data call in (DCI) on the manufacturing process and storage to determine the degree of impurity formation.

EPA has received acceptable environmental fate studies only for MCPP acid. Experiments show MCPP acid is stable to hydrolysis, photodegrades slowly with a half-life of 83 days under artificial light, and is very mobile in sand, sandy loam, silt loam, and silty clay loam soils. EPA is not requiring groundwater monitoring studies, but if the requested environmental fate studies indicate MCPP or its degradates remain in water and leach significantly, a monitoring study will be required.

Studies on fish indicate low-level bioaccumulation of MCPP acid in fish with bioconcentration factors of 1.2,5.5 and 3.0 X in edible tissue, nonedible tissue, and whole fish, respectively during 28 days of exposure at 1 ppm. Maximum levels in edible tissue were 1.3 ppm. At 21 and 28 days post treatment, residues were found to be 0.23-0.24 ppm. EPA finds the observed levels of bioaccumulation or virtually no significance.

Avian studies for MCPP acid report an LD50 of 700 mg /kg in bobwhite quail, suggesting slight acute toxicity to avian species. Additional avian dietary data are required for MCPP dimethylamine salt and diethanolamine salt and isooctyle ester. Available freshwater fish toxicity studies indicate MCPP acid has low acute toxicity to freshwater fish (rainbow trout LC50 124 ppm). Data is needed for warm water species and effects of the other MCPP products.

There is no acceptable data on acute effects on freshwater aquatic invertebrates. Given that MCPP formulations are used in drainage ditch-banks and that MCPP is a major herbicide used on turf, significant runoff to estuarine/ marine environments may be expected. No studies on estuarine and marine organisms have been submitted for review or are there acceptable data for toxicity to nontarget plants. For those formulations used in drainage ditch-bank application, EPA is requiring aquatic plant testing utilizing a variety of algae, diatom, and weed species. There is no data to indicate whether MCPP or any formulations containing it may affect nontarget insects or endangered plant or animal species.

According to EPA's reregistration plan, all data to support registration of MCPP pesticides will be in, reviewed, and ready for reregistration decisions in fiscal year 1992.

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Since 1996, the formulations of end use products have been converted from the racemic form to the single isomer composition. As of fall 2007, all formulations are expected to be converted to the enriched isomer: mecroprop-p acid. The Reregistration Eligibility Decision (RED) for mecoprop was completed in August 2007. This document classified mecoprop as "suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential." However, there is limited data for evaluation of the carcinogenicity of mecoprop to animals or humans. Mecoprop was also listed in Toxicity Category I as a severe eye irritant.

EPA's ecological risk assessment identified exposures that may pose ecological risks and has identified mitigation measures to reduce risk such as rate reductions and labeling amendments. Exposure to mecoprop would be primarily occupational by dermal contact with the herbicide and treated surfaces and inhalation and ingestion of spray droplets.

Mecoprop readily biodegrades in soil. Reported half-lives generally range from 3 to 21 days. Mecoprop is very mobile in soil and has been detected in groundwater samples in Europe, however, mecoprop was not detected in any of the 460 wells sampled in California, Indiana, Maine, Montana and Texas between 1984 and 1990 according to EPA's Pesticides in Ground Water Database.

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