



# R.E.D. FACTS

## Pesticide Reregistration

# Picloram

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered years ago be reregistered to ensure that they meet today's more stringent standards.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency imposes any regulatory controls that are needed to effectively manage each pesticide's risks. EPA then reregisters pesticides that can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA announces this and explains why in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for reregistration case 0096, picloram acid and its three derivatives, triisopropanolamine picloram (TIPA-salt), isooctyl/ethylhexyl picloram (IOE), and potassium picloram (K-salt), referred to collectively as "picloram".

## Use Profile

Picloram is a systemic herbicide used to control deeply rooted herbaceous weeds and woody plants in rights-of-way, forestry, rangelands, pastures, and small grain crops. It is applied in the greatest amounts to pasture and rangeland, followed by forestry. Picloram acid is a manufacturing use product with no end uses. The TIPA-salt and K-salt have food and feed uses, and are applied pre- or post-emergence as a ground or aerial broadcast or spot treatment. The IOE derivative is registered for non-food uses only. Picloram products have no household or residential uses.

All picloram products are classified as Restricted Use pesticides based on hazard to nontarget plants, and may be applied only by or under the direct supervision of certified applicators. Use practice limitations for the TIPA-salt include a prohibition against applying through any type of irrigation system, observation of a 30-day preharvest interval for forage/fodder, and observation of a 7-day pregrazing interval. The IOE includes prohibitions against contaminating water intended for irrigation or domestic purposes, application to snow or frozen ground, and application

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near desirable trees if injury from potential transfer through roots cannot be tolerated. The K-salt includes prohibitions against application through any type of irrigation system, grazing or feeding forage from treated areas for 2 weeks after treatment, or harvesting hay from treated grain fields.

## **Regulatory History**

Picloram was first registered as a pesticide in the U.S. in 1964. EPA classified picloram as a Restricted Use pesticide in 1978 as a result of recurring reports of phytotoxicity to economically important crops caused by contamination of water supplies.

EPA issued a Registration Standard for picloram in March 1985 imposing a maximum level of the manufacturing impurity hexachlorobenzene (HCB) in technical picloram of 200 ppm, and requiring additional studies including testing for nitrosamines. The sole registrant completed this testing; no nitrosamines were detected in picloram products, and the level of HCB is certified to be less than 100 ppm. EPA issued a picloram Final Reregistration Standard and Tolerance Reassessment document in May 1988. Currently, two picloram manufacturing use products and seven end-use products are registered.

## **Human Health Assessment**

### **Toxicity**

In studies using laboratory animals, picloram generally has been shown to be of moderate to low acute toxicity. Picloram and its derivatives are only slightly toxic by the oral and dermal routes and have been placed in Toxicity Categories III and IV (the lowest of four categories) for these effects. However, picloram acid is highly toxic and the three derivatives are moderately toxic by the inhalation route (Toxicity Categories I and II). Picloram and derivatives cause moderate eye irritation (Toxicity Category III). Most are not skin irritants (Toxicity Category IV, except IOE in Category III). The three derivatives are skin sensitizers while picloram acid is not.

In a subchronic toxicity study using rats, picloram caused changes in the liver. A dog dietary study resulted in decreases in body weight gain, food consumption, liver weights and several enzymes. In two dermal toxicity studies using rabbits, picloram caused skin irritation, redness, and swelling. A study using rats resulted in increased liver and kidney weights. A study using rabbits resulted in increases in levels of several blood components. A study using rats resulted in liver effects, increased liver and kidney effects, and decreased body weight gain.

A chronic toxicity study using dogs resulted in increased liver weight. A chronic/carcinogenicity study using rats resulted in chronic toxicity in males only and no evidence of carcinogenicity. A study using mice also resulted in no evidence of carcinogenicity. Based on these studies, picloram was classified as a "Group E" chemical--one showing evidence of non-carcinogenicity for humans. Subsequently, picloram IOE was found to bear

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structural similarity to di(2-ethylhexyl)phthalate or DEHP, which has been found to cause cancer in rodents. EPA included this information in assessing picloram's risks to workers.

There is no evidence that picloram and its salts and ester are associated with significant reproductive or developmental toxicity. A study using rabbits resulted in reduced maternal weight gain. In five studies using rabbits and rats, there was no evidence of developmental toxicity at any dose level, though some signs of maternal toxicity were observed. In a reproduction study using rats, effects to the kidneys, urine, and body weight gain were observed at the high dose. Picloram shows no evidence of causing mutagenicity.

### **Dietary Exposure**

People may be exposed to residues of picloram through the diet. Existing tolerances or maximum residue limits which have been reassessed and found adequate include grain, forage, and straw of barley, oats, and wheat; milk; eggs; fat, meat, kidney, liver, and meat by-products of cattle, goats, hogs, horses, and sheep; and fat, meat, and meat by-products of poultry (please see 40 CFR 180.292). Sufficient data also are available to determine the adequacy of established food/feed additive tolerances for barley, oat, and wheat milled fractions (excluding flour) listed in 40 CFR 185.4850 and 40 CFR 186.4850.

In reassessing picloram tolerances, EPA has found that both an existing tolerance for forage grasses and a proposed new tolerance for hay grass need to be raised to a higher level. A tolerance must be proposed for wheat grain dust, and established tolerances for flax seed and straw should be revoked since this use is not registered. International Codex MRLs are neither established nor proposed so compatibility with U.S. tolerances is not an issue.

EPA has assessed dietary risks considering chronic dietary exposure and risk to picloram per se, and to the impurity HCB. The exposure/risk estimates for picloram are extremely low. The Anticipated Residue Concentration (ARC) for the U.S. population as a whole represents only 0.5% of the Reference Dose (RfD), an amount believed not to cause adverse effects if consumed daily over a 70-year lifetime. The most highly exposed subgroup, non-nursing infants less than one year old, has an ARC which represents 1.9% of the RfD. This low fraction of the allowable RfD is considered to be an acceptable dietary exposure risk.

The HCB upper-bound cancer exposure/risk estimate, performed only for the U.S. population as a whole, produced an ARC risk estimate of  $6.7 \times 10^{-7}$ . This level of risk, which is likely a substantial overestimate, generally is considered negligible.

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## **Occupational and Residential Exposure**

Based on current use patterns, handlers (mixers, loaders, and applicators) may be exposed to picloram during applications in agriculture and forestry, on pastures and rangelands, along rights-of-way, and in other non-crop areas. Because of picloram's use patterns, post-application activities and exposure generally are not expected. No picloram products are registered for homeowner use or have residential applications.

Since there is an exposure risk for handlers of picloram via the dermal and inhalation routes during normal use, EPA conducted an occupational exposure assessment. For the twelve major exposure scenarios identified, Margins of Exposure (MOEs) for workers range from 111 for backpack/knapsack application to 42,000 for groundboom application. The risk to picloram handlers, therefore, is considered minimal.

Due to the HCB impurity in picloram and the structural similarity of the IOE to DEHP, EPA also conducted a cancer risk assessment for picloram handlers. The estimated excess cancer risk to agricultural workers from HCB based on picloram use patterns and exposure by the dermal and inhalation routes is between  $4.19 \times 10^{-5}$  and  $1.07 \times 10^{-7}$ . The excess cancer risk for workers from exposure to the IOE is  $8.6 \times 10^{-5}$ . These estimates are considered worst-case; actual exposure and risk may be lower.

Although entry into treated areas soon after application is expected to be rare given picloram's typical use patterns, EPA has determined that entry should not be permitted immediately following application. The Agency therefore is requiring a 12-hour restricted entry interval (REI) for picloram uses that are within the scope of the Worker Protection Standard for Agricultural Pesticides (WPS), and a prohibition on entry until sprays have dried for uses outside the scope of the WPS.

Also, the MOEs for handlers are acceptable in some use scenarios only with chemical-resistant gloves. Therefore, the minimum, baseline personal protective equipment (PPE) for all WPS and nonWPS uses of picloram is chemical-resistant gloves.

### **Human Risk Assessment**

Picloram generally is of moderate to low acute toxicity but causes inhalation toxicity (Toxicity Category II). Picloram is classified as a "Group E" chemical--one showing evidence of non-carcinogenicity for humans. However, it contains the impurity HCB which is classified as a "B<sub>2</sub>" probable human carcinogen. In addition, picloram IOE is structurally similar to DEHP, which has been found to cause cancer in rodents. EPA considered this information in assessing picloram's risks.

People may be exposed to residues of picloram through their diets since a number of food and animal feed crop uses are registered. However, dietary exposure and risk are extremely low. There is no reason for concern regarding chronic dietary exposure to picloram at this time.

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Risks to picloram handlers (mixers/loaders/applicators) are considered minimal, and worst-case cancer risks to workers are not unacceptable (in the  $10^{-5}$  to  $10^{-7}$  range). To minimize risks to handlers, EPA is requiring use of minimal, baseline PPE (chemical-resistant gloves). To minimize potential reentry exposure risks, EPA is establishing restrictions on entry to treated areas.

## **Environmental Assessment**

The principal environmental risks of picloram relate to contamination of surface and ground water, and damage to nontarget terrestrial plants including crops adjacent to areas of application via runoff or drift. Such damage to plants also may emanate from more distant areas where ground water is used for irrigation or is discharged into surface water. Nontarget plants adjacent to areas of application may be exposed to concentrations of picloram many times the levels that have been associated with toxic effects. In addition, EPA has concerns related to endangered terrestrial mammals and endangered aquatic animals.

### **Environmental Fate**

Picloram is highly soluble in water, resistant to biotic and abiotic degradation processes, and mobile under both laboratory and field conditions. It is stable to hydrolysis and anaerobic degradation, and degrades very slowly with half-lives ranging from 167 to 513 days. Its major route of dissipation appears to be leaching.

Although no ground water monitoring studies have been submitted to EPA, available data indicate that picloram has very high potential to leach to ground water in most soils. As of 1992, picloram had been detected in ground water in 10 states, at concentrations up to 30 ppb.

Picloram is extremely mobile. Nearly 100% of the chemical leached but none of it degraded over a three-year period in a University of Arkansas study. Given its high persistence, it appears unlikely that picloram will degrade once it reaches ground water, even over a period of several years.

### **Environmental Fate Assessment**

Picloram is among the most mobile of currently registered pesticides. In some soils, it is nearly recalcitrant to all degradation processes. Picloram has been detected in ground water in 10 states, to date. However, it generally does not pose a threat to human health at the levels detected.

Concerns are related principally to effects on nontarget plants, which may be exposed to picloram by drift or runoff from areas of application, or by irrigation with contaminated surface or ground water. Aquatic plants also may be exposed to picloram via runoff, drift, or discharge of contaminated ground water into surface water.

EPA is concerned about degradation of water quality in picloram use areas. Eventual contamination of ground water is virtually certain in areas where picloram residues persist in the overlying soil. Once in ground water, picloram is unlikely to degrade, even over a period of several years.

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Picloram also has a high potential to contaminate surface water by runoff from use areas. The EPA Office of Drinking Water's STORET database indicates that picloram has been reported in 420 of 744 surface water samples. EPA does not have data from monitoring of picloram in surface water. However, picloram is regulated by the Safe Drinking Water Act (SDWA) and water supply systems are required to sample for it.

### **Ecological Effects**

Picloram and its derivatives are practically nontoxic to birds, mammals, and honeybees on an acute oral basis. Picloram acid and the K-salt are moderately toxic to freshwater fish and slightly toxic to freshwater invertebrates. The TIPA salt is slightly toxic to freshwater fish and marine/estuarine mollusks and practically nontoxic to marine crustaceans. Picloram salt is slightly toxic to marine/estuarine mollusks and invertebrates. Additional studies are required.

Picloram is extremely phytotoxic as well as persistent and prone to leach to ground water in all soil types. A number of additional plant, fish, invertebrate, and marine/estuarine effects studies are required as confirmatory data.

### **Ecological Effects Risk Assessment**

Picloram poses very significant risks to nontarget plants. Estimated concentrations of picloram in the environment are hundreds to thousands of times the "level of concern" at which 25% of seedlings fail to emerge. Although data requirements are not fulfilled for aquatic plants or animals, estimated picloram exposures exceed levels of concern for endangered fish and mollusks. Endangered terrestrial mammals also encounter exposures which are likely to exceed levels of concern.

## **Risk Mitigation**

To lessen risks of picloram to nontarget plants and ground and surface water, EPA is requiring the following risk mitigation measures and programs.

### **Application Modifications**

- EPA is lowering application rates and imposing limits on the number and frequency of applications for all use patterns --
  - The broadcast rate for range and pasture use and the spot treatment rate will be lowered.
  - The forestry use rate and frequency will be lowered.
  - The rights-of-way use rate will be lowered.
- Picloram will remain classified for Restricted Use and may be identified as a candidate for State Management Plans.
- EPA is requiring spray drift mitigation language including an Aerial Drift Reduction Advisory, as well as ground water, surface water, and phytotoxicity advisory language on all picloram product labeling.

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### **Monitoring and Other Programs**

- The registrant, DowElanco, has committed to conduct a state ground water monitoring/surveillance plan. The results will determine whether additional data are required or appropriate regulatory action is necessary.
- The registrant has committed to provide support to the Heritage programs in six states with the highest use of picloram. These programs map and monitor sensitive habitat in 48 states to help protect endangered species.

### **Registrant Stewardship**

- The registrant has instituted a strict product distribution system which includes a mandatory training program for all picloram distributors.

### **Benefits**

- EPA conducted a cursory benefits analysis and found that picloram is an extremely effective herbicide at relatively low rates. To achieve the same control, a combination of alternatives would have to be used at higher rates.

### **Endangered Species Protection Program**

- EPA will address picloram's risks to endangered plants, mammals, and aquatic species through the Endangered Species Protection Program, when it goes into effect.

### **Additional Data Required**

EPA is requiring the following types of additional generic studies for picloram to confirm its regulatory assessments and conclusions. Please see the RED document for a more detailed list.

- Toxicity to marine/estuarine fish, mollusk, and shrimp;
- Early life stage - fish;
- Bluegill and rainbow Acute LD<sub>50</sub>;
- Invertebrate toxicity (*Daphnia magna*);
- Aquatic plant growth (marine diatom, algae);
- Seed germination/emergence;
- Vegetative vigor;
- Estimation of dermal or inhalation exposure at outdoor sites for mixer/loaders and applicators using the hand cannon or backpack/knapsack equipment;
- Ground water surveillance/monitoring.

The Agency is also requiring product-specific data including product chemistry and acute toxicity studies, revised Confidential Statements of Formula (CSFs), and revised labeling for reregistration.

### **Product Labeling Changes Required**

All picloram end-use products must comply with EPA's current pesticide product labeling requirements, and with the following labeling requirements. For the complete text of labeling changes required, please see the picloram RED document.

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### **Reduced Use Rates and Increased Intervals**

Labels must be amended to reflect the following changes in maximum application rates and treatment intervals:

- Broadcast rate for range and pasture is lowered from current maximum of 2.0 lb. to 0.5 acid equivalent per acre (ae/A) for control of broadleaf weeds and woody plants. For control of noxious weeds, broadcast application of up to 1.0 lb. ae/A may be used annually. Spot treatment will be lowered to a maximum of 1.0 lb ae/A with no more than 50% of an acre being treated. Spot treatments and broadcast treatments can be applied during the same growing season only if the total amount applied does not exceed 1.0 lb. ae/A per annual growing season.
- Forestry use rate is lowered from maximum of 2.2 lbs. ae/A to 1.0 lb. ae/A for spot and broadcast treatment. Use is allowed only once every 2 years.
- Rights-of-way use rate is lowered from a maximum of 2.2 lbs. ae/A to 1 lb. ae/A annually.

### **Personal Protective Equipment (PPE) for Handlers**

The minimum (baseline) handler PPE for all WPS and nonWPS uses of picloram is chemical-resistant gloves. Remaining PPE for handlers is to be based on the toxicity of the end-use product.

### **Entry Restrictions for Occupational-Use Products (WPS Uses)**

EPA is establishing a 12-hour restricted entry interval (REI). PPE required for WPS-permitted early entry into treated areas that involves contact with anything that has been treated, such as plants, soil, or water, is: coveralls, chemical-resistant gloves, socks, and shoes.

### **Entry Restrictions for Occupational-Use Products (NonWPS Uses)**

For nonWPS uses of picloram, EPA is requiring the following:

"Do not enter or allow others to enter the treated area until sprays have dried."

### **Application Restrictions**

"Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application."

### **Engineering Controls**

"When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the WPS..., the handler PPE requirements may be reduced or modified as specified in the WPS."

### **User Safety Requirements**

"Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions exist for washables, use detergent and hot water. Keep and wash PPE separately from other laundry."



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### **User Safety Recommendations**

"Users should wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet."

"Users should remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing."

### **Precautionary Statements**

Because picloram salts and ester are skin sensitizers, the following statement is required in the "Hazards to Humans (and Domestic Animals)" section on end-use product labeling:

"Prolonged or frequent repeated skin contact may cause allergic reactions in some individuals."

### **Respirator**

If the acute inhalation toxicity of the end-use product is in Category I or II, a respirator is required for pesticide handlers. The following type of respirator is appropriate to mitigate picloram inhalation concerns:

"A dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C)."

### **Spray Drift Labeling**

The following language must appear on the label of each product that can be applied aerially:

"Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions."

"The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees."

"Where states have more stringent regulations, they should be observed."

"The applicator should be familiar with and take into account the information covered in the Aerial Drift Reduction Advisory."

### **Aerial Drift Reduction Advisory**

Please see the picloram RED document for the text of this Advisory, which must be contained in product labeling.

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### **Ground Water Advisory Statements**

The following ground water advisory language must be placed on all picloram labels:

"This chemical is known to leach through soil into ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination."

### **Surface Water Advisory Statements**

The following surface water advisory language must be placed on all picloram labels:

"This chemical can contaminate surface water through spray drift. Under some conditions, picloram may also have a high potential for runoff into surface water (primarily via dissolution in runoff water) for several months post-application. These include poorly draining or wet soils with readily visible slopes toward adjacent surface waters, frequently flooded areas, areas over-laying extremely shallow ground water, areas with in-field canals or ditches that drain to surface water, areas not separated from adjacent surface waters with vegetated filter strips, and areas over-laying tile drainage systems that drain to surface water."

### **Phytotoxicity Advisory Statements**

The following phytotoxicity advisory language must be placed on all picloram labels:

"This pesticide is toxic to some plants at very low concentrations. Non-target plants may be adversely affected if pesticide is allowed to drift from areas of application."

### **Precautionary Hazard Statement**

Labeling should include the following:

"Do not apply this product to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark."

## **Regulatory Conclusion**

Picloram and its derivatives can be used without causing unreasonable adverse effects to humans or the environment. Therefore, all uses of products containing picloram acid and its derivatives are eligible for reregistration, conditional upon implementation of the mitigation measures specified in the picloram RED document.

Picloram products will be reregistered once the required product-specific data, revised Confidential Statements of Formula, and revised labeling are received and accepted by EPA.

## **For More Information**

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for picloram during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To

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obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field Operations Division (7506C), Office of Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703-305-5805.

Electronic copies of the RED and this fact sheet can be downloaded from the Pesticide Special Review and Reregistration Information System at 703-308-7224. They also are available on the Internet on EPA's gopher server, *GOPHER.EPA.GOV*, or using ftp on *FTP.EPA.GOV*, or using WWW (World Wide Web) on *WWW.EPA.GOV*.

Printed copies of the RED and fact sheet can be obtained from EPA's National Center for Environmental Publications and Information (EPA/NCEPI), PO Box 42419, Cincinnati, OH 45242-0419, telephone 513-489-8190, fax 513-489-8695.

Following the comment period, the picloram RED document also will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-487-4650.

For more information about EPA's pesticide reregistration program, the picloram RED, or reregistration of individual products containing picloram, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 8:00 am and 8:00 pm Eastern Standard Time, Monday through Friday.