



R.E.D. FACTS

Pesticide Reregistration

Etridiazole (Terrazole®)

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. To implement provisions of the Food Quality Protection Act of 1996, EPA considers the special sensitivity of infants and children to pesticides, as well as aggregate exposure of the public to pesticide residues from all sources, and the cumulative effects of pesticides and other compounds with common mechanisms of toxicity. The Agency develops any mitigation measures or regulatory controls needed to effectively reduce each pesticide's risks. EPA then reregisters pesticides that meet the safety standard of the FQPA and can be used without posing unreasonable risks to human health or the environment.

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 before November 1, 1984, be reregistered to ensure that they meet today's more stringent standards.

When a pesticide is eligible for reregistration, EPA explains the basis for its decision in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for reregistration case 0009, etridiazole (Terrazole®).

Use Profile

Etridiazole is a fungicide used to control damping-off, root rot and stem rot caused by *Pythium* and *Phytophthora*. It is used on golf course turf, cotton and nursery ornamentals, non-bearing citrus, non-bearing coffee, and mixed with potting soil for greenhouse use. It is also used as a seed treatment on barley, beans, corn, cotton, peanuts, peas, sorghum, soybeans, safflower and wheat. Seven states hold special local need registrations for use in tobacco transplant floatbeds.

Formulations include dust, wettable powder, emulsifiable concentrate, and granules.

Etridiazole is applied by planter with spray attachments, groundboom, chemigation, low- and high-pressure handwand, push-type and tractor-drawn spreader, and mixed with seed in a planter box before planting.

Regulatory History

Etridiazole was first registered as a pesticide in the U.S. in 1962. EPA issued a Registration Standard for etridiazole in September 1980 (PB81-126716). The Registration Standard required the submission of product chemistry, toxicological and ecological effects data. Data Call-In notices were issued on June 24, 1992, February 18, 1993, and October 13, 1995, and required the submission of product chemistry, ecological effects and fate, residue chemistry, and exposure data.

Currently, 26 etridiazole end-use products are registered to 5 companies, including 3 wettable powders, 8 emulsifiable concentrates, 8 granulars, 4 flowables, and 3 dusts. The registrants have requested voluntary cancellation of the four dry flowable end-use products and one granular product. Seven states hold special local need [Section 24(c)] registrations for Uniroyal's 35% wettable powder for use in tobacco transplant floatbeds.

Human Health Assessment

Toxicity

Etridiazole generally has been shown to have low to moderate acute oral, dermal and inhalation toxicity. It is an eye irritant and a skin sensitizer. Toxicity Categories, which range from I (most toxic) to IV (least toxic), were III or IV for etridiazole.

The FQPA safety factor was reduced to 1x for the acute dietary assessment because available data provided no evidence of increased susceptibility in rats or rabbits to pre- and/or postnatal exposure to etridiazole. Consequently, the acute Population Adjusted Dose (PAD) is numerically equivalent to the Reference Dose (RfD).

As the result of acute exposure from a single dose, etridiazole has been shown to cause reduced fetal body weights, decreased viability and external and skeletal malformations in rabbit fetuses. These effects were seen at the same dose at which maternal toxicity occurred, indicating no increased susceptibility among developing fetuses over that of the parent. On a chronic basis, the organ most sensitive to toxicity is the liver, which can result in, among other things, increased liver weight, cellular changes, and tumor formation.

Etridiazole is classified as a Group B2, Probable Human Carcinogen. The unit risk, or Q_1^* , based on the occurrence of thyroid follicular cell combined adenomas/carcinomas in male rats, is $3.33 \times 10^{-2} \text{ (mg/kg/day)}^{-1}$ in human equivalents. A carcinogenicity study in a second species is required to confirm the Agency's estimates of cancer risk.

Dietary Exposure and Risk

Etridiazole is not registered for use on any food crops; however, residues could be present in food as a result of seed treatment use. It is also used on imported tomatoes. Tolerances or maximum residue limits have been established for corn (field) grain, fodder and forage, cottonseed, eggs, milk, strawberries, tomatoes and wheat, and fat, meat and meat byproducts of cattle, goats, hogs, horses, poultry and sheep (see 40 CFR 180.370). EPA has reassessed the tolerances for corn (field) grain, fodder and forage, cottonseed and wheat grain, forage and straw, and found that they are acceptable. The tolerance for strawberries will be revoked because this use is no longer being supported by the registrant. The tolerances for the livestock commodities (fat, meat and meat byproducts of cattle, goats, hogs, horses, poultry and sheep) will be revoked because available data suggest they are not necessary (i.e., finite residues of etridiazole are not expected to occur in these commodities as a result of consuming treated feed). New tolerances are needed for etridiazole residues in/on the following raw agricultural commodities: cotton gin byproducts, peanut nutmeat and hay, sorghum grain and forage, barley grain and hay, safflower seed, legume vegetables (succulent or dried), and foliage of legume vegetables. All new tolerances will be set at 0.1 ppm.

No maximum residue limits for etridiazole have been established by Codex for any agricultural commodities.

The only population subgroup for which an acute dietary endpoint of concern was identified from etridiazole is females 13-50 years old. However, acute dietary exposure from food for that subgroup is 1% of the acute PAD [Population Adjusted Dose, or the acute Reference Dose (RfD), the amount believed not to cause adverse effects from one day consumption, adjusted to reflect a 1x FQPA Safety Factor]. Therefore, acute dietary risk is not a concern.

For the general U.S. population and three subgroups, exposure from food represents 11-31% of the chronic PAD, the amount believed not to cause adverse effects if consumed daily over a 70-year lifetime. Exposure for the most highly exposed subgroup, children 1-6 years old, represents 31% of the cPAD; for the general U.S. population, exposure is 14% of the cPAD. Therefore, chronic non-cancer dietary risk from food is not a concern.

The cancer dietary risk from food is not of concern for the general U.S. population. The carcinogenic risk estimate for etridiazole is 1.6×10^{-7} , which is a level the Agency considers to be negligible for excess lifetime risk.

Acute and chronic risks from ground water are not of concern. Results from Tier 1 SCIGROW modeling, which represents an upper-bound estimate of the concentration that might be found in ground water from the typical use of etridiazole on golf courses, indicate that levels of etridiazole in ground water are

not likely to exceed 0.93 ppb. This is below the cancer and non-cancer DWLOCs for all population subgroups, and thus is not of concern.

Acute and chronic non-cancer risks are not of concern for surface water. Results from Tier 1 GENEEC modeling, which represents an upper-bound estimate of the concentration that might be found in surface water from the typical use of etridiazole on golf courses, indicate that peak, or acute, concentrations of etridiazole in surface water are not likely to exceed 230 ppb, and chronic concentrations are not likely to exceed 32.3 ppb. These concentrations are below the cancer and non-cancer DWLOCs for all population subgroups, and thus are not of concern.

Cancer risks from surface water are of concern. Results from Tier 1 GENEEC modeling for turf use indicate that the predicted 56-day average expected environmental concentration (EEC) of etridiazole in surface water is 32.3 ppb. This exceeds the chronic cancer DWLOC for the general population of 1 ppb and is of concern. This chronic surface water EEC could not be refined because the Tier 2 model, PRZM/EXAMS, is not appropriate for modeling turf use. Results from PRZM/EXAMS modeling for cotton indicate that the 36-year mean EEC of etridiazole in surface water is 0.05 ppb and is not of concern.

Residential and Non-occupational Exposure and Risk

There are no residential uses of etridiazole. The only non-occupational exposure expected is to golfers on treated golf courses. Short-term exposure to treated golf courses results in a margin of exposure of 17,000 and cancer risk estimate of 8.9×10^{-7} , neither of which is of concern.

Aggregate Exposure and Risk

Sources considered for aggregate exposure are food, drinking water, and exposure to treated golf courses. Acute and chronic non-cancer aggregate risks are not of concern. The cancer aggregate risk from exposure to food and treated golf courses is 1.1×10^{-6} , which slightly exceeds a level the Agency considers negligible, without including exposure from drinking water. Further, estimated cancer risk from drinking water alone exceeds a level the Agency considers negligible. Thus, aggregate cancer risk is of concern.

Occupational Exposure and Risk

Based on current use patterns, handlers (mixers, loaders, and applicators) may be exposed to etridiazole during normal use of all formulation types. Of particular concern are risks associated with use of the dry formulations, including wettable powder, dust and granules, with maximum personal protective equipment (PPE). Further, greenhouse workers may be exposed while handling treated potting soil.

For some golf course worker scenarios, cancer risk estimates are in the 10^{-5} to 10^{-6} range with maximum PPE. Under EPA's Non-Dietary Cancer Risk Policy, the Agency considers risks of 10^{-6} or lower to be not of concern and carefully

examines risks in the range of 10^{-4} to 10^{-6} and seeks ways of reducing risks prior to reregistration.

FQPA Considerations

Tolerances with amendments and changes specified in the RED document meet the FQPA safety standard for the general population. EPA's water modeling indicates potential dietary concerns for cancer from residues in drinking water (surface water source) associated with use on golf course turf.

For risk assessment purposes, the Agency has not assumed that etridiazole has a common mechanism of toxicity with any other chemical(s).

Environmental Assessment

Environmental Fate

Etridiazole is a mobile compound with moderate persistence and high volatility. At the relatively low application rates for cotton, ornamental plants and seed treatment, it is not expected to pose risks for surface or ground water. However, the application rates for golf course turf are 50 times higher than for the other crops. Because etridiazole is stable to hydrolysis and aqueous photolysis, it may persist for considerable periods of time in the aquatic environment.

Ecological Effects

Etridiazole use on golf course turf is a concern, given the relatively high application rates for turf and the likelihood of golf course runoff to move toward surface water.

On an acute basis, etridiazole is practically non-toxic to birds, slightly toxic to mammals, moderately toxic to fish and aquatic invertebrates, and highly toxic to non-target aquatic plants. Available data indicate that the degradate 3-dichloromethyl-5-ethoxy-1,2,4-thiadiazole is highly toxic to aquatic organisms.

In-furrow application to cotton presents no acute risks to birds, mammals, fish or aquatic invertebrates. However, acute risks are a concern for aquatic plants. Chronic risks from use on cotton are a concern for birds; however, no acceptable chronic mammalian data were available, so a chronic risk assessment for mammals could not be conducted. Use on golf course turf results in acute risks for birds, mammals, fish, aquatic invertebrates and aquatic plants. Chronic risks are a concern for birds and aquatic organisms. There are risks to federally listed endangered and threatened birds, mammals, aquatic plants and freshwater and estuarine fish and invertebrates from single and multiple applications of etridiazole to turf. Chronic effects seen in laboratory studies include significant reproductive effects in birds and limited growth in fish. As previously indicated, a chronic risk assessment for mammals could not be conducted due to a lack of data.

Risk Mitigation Dietary Risk

To address the cancer risk from drinking water associated with golf course use, the registrant has agreed to immediately remove use on fairways from product labels, thus limiting use to tees and greens, to reduce the maximum application rate to 3.8 lbs ai/A, increase the minimum interval between applications to 10 days, and reduce the maximum amount allowed to be applied per season to 9.6 lbs ai/A. These measures result in chronic surface water EECs of approximately 5 ppb. While this still exceeds the cancer DWLOC for the general population of 1 ppb, the Agency does not believe this is a risk of concern because: 1) the EECs were derived from a screening level model and are likely to be an overestimate; and 2) the DWLOC of 1 ppb was derived using protective exposure assumptions about amount of food consumed and residue levels, which likely resulted in the DWLOC being underestimated.

In addition to the above measures, the registrant plans to submit data to demonstrate that surface water concentrations are not a concern and a second cancer study to confirm the Agency's estimate of the carcinogenic potential of etridiazole. If water data show that exposure is not of concern, and the second cancer study shows no increased carcinogenic potential above that already estimated, then fairway use may be returned to product labels. If either water data shows risks of concern from drinking water or the cancer study shows increased carcinogenic potential, the registrant has agreed to voluntarily cancel the use on fairways.

Aggregate Risk

With the removal of fairway use, the cancer risk estimate from exposure to treated golf courses is 1.2×10^{-7} . When exposure from food is added, the cancer aggregate risk for an adult golfer is 2.8×10^{-7} , which is not of concern. The estimated surface water concentration after removal of fairways and reductions in rate, frequency and amount applied per season is 5 ppb, which exceeds the cancer DWLOC of 1 ppb. However, the Agency does not believe this represents a risk of concern, as discussed above under Dietary Exposure and Risk.

Occupational Risk

Risks to workers will be mitigated by the following:

- N** The mitigation measures discussed above that address drinking water risks (remove fairway use from labels, reduce application rate, frequency and poundage applied per season) will also mitigate worker risks.
- N** Elimination of several application methods for granular products
- N** Cancellation of the granular product registered for use on golf course turf, and all dry flowable products
- N** Use of organic vapor respirator for all handlers except when applying in-furrow to cotton

-
- N Use of closed systems for all seed treatment
 - N Reduction of application rates for treatment of potting soil
 - N Use of ventilation during indoor use

Occupational margins of exposure and cancer risks taking into account these mitigation measures are not of concern.

Ecological Risk

The ecological risk estimates associated with turf assume use on golf course tees, greens and fairways. As indicated above, the registrants have agreed to delete fairway use from product labels, thereby reducing the area treated by approximately 88%, and to reduce the maximum application rate, the frequency of application, and the maximum amount applied per acre per season. These reductions will greatly minimize the potential for exposure. In addition, by prohibiting use on fairways, the fairways themselves will act as buffer zones between treated tees/greens and surface water areas. Therefore, the Agency believes that removal of fairway use from product labels in the interim period during which additional data are developed is appropriate to mitigate these risks.

Additional Data Required

Three chronic studies submitted in support of reregistration were unacceptable and must be repeated: a chronic oral toxicity study in dogs; a multigeneration reproduction study in rats, modified to measure thyroid function due to a concern for endocrine disruption; and an oncogenicity study in the mouse.

EPA is also requiring the following additional studies for etridiazole to confirm its regulatory assessments and conclusions:

- N UV/Visible Absorption
- N Crop field trials to support tolerance for imported tomatoes
- N 21-day dermal toxicity
- N 28-day inhalation toxicity
- N Dermal penetration
- N Applicator dermal and inhalation exposure: indoors

If fairway use is returned to product labels in the future, the following data will also be required:

- N Estuarine/marine fish and invertebrate acute toxicity using the degradate 3-DCMT
- N Freshwater fish and invertebrate acute toxicity using the degradate 3-Carb-T
- N Freshwater invertebrate acute toxicity using the degradate 3-DCMT

The Agency also is 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

All etridiazole end-use products must comply with EPA's current pesticide product labeling and with the following. For a comprehensive list of labeling amendments, please see the etridiazole RED document.

- N** All end-use product labels registered for use on golf course turf must state explicitly that use on fairways is prohibited.
- N** Application by hand-held broadcast spreader (belly grinder), push-type spreader, power dust blower and dispersal by hand is prohibited. As a result, the granular end-use product registered for golf course use will be cancelled.
- N** The maximum application rate for golf course tees and greens may not exceed 3.8 pounds active ingredient per acre (lbs ai/A) per application.
- N** The maximum amount applied to golf course tees and greens may not exceed 9.6 lbs ai/A/year.
- N** The interval between applications to golf course tees and greens may not be less than 10 days.
- N** For all handlers, chemical-resistant gloves and an OV respirator are needed, unless applying in-furrow to cotton. When applying in-furrow to cotton, applicators need only baseline attire (a long-sleeved shirt and long pants, shoes and socks).
- N** In addition to chemical-resistant gloves and an OV respirator, handlers of the wettable powder formulation, except when applying dry to potting soil, need: coveralls over long-sleeved shirt and long pants, socks, and chemical-resistant gloves and footwear.
- N** In addition to chemical-resistant gloves and an OV respirator, handlers of the emulsifiable concentrate formulations who are participating in high-pressure handwand sprayer applications need: coveralls over long-sleeved shirt and long pants, socks, chemical-resistant gloves and footwear, and a chemical-resistant apron when mixing, loading, or cleaning equipment.
- N** Ventilation is needed for all indoor use.
- N** Closed systems will be used for seed treatment.
- N** The maximum application rate for the 3% ai granular product will be reduced to 12 oz./cu.yd. The maximum application rate for the 5% ai granular product will be reduced to 8 oz./cu.yd.

Regulatory Conclusion

The use of currently registered products containing etridiazole in accordance with approved labeling will not pose unreasonable risks or adverse effects to humans or the environment. Therefore, all uses of these products are eligible for reregistration. However, use on golf course fairways is of concern. Although the use is not being cancelled at this time, products may not be marketed for this use

until additional data are available that will enable a better understanding of the risks. Etridiazole products will be reregistered once the required confirmatory generic data, product specific data, CSFs, and revised labeling are received and accepted by EPA. Products which contain active ingredients in addition to etridiazole will be reregistered when all of their other active ingredients also are eligible for reregistration.

For More Information

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for etridiazole during a 60-day time period, as announced in a Notice of Availability published in the *Federal Register*. To obtain a copy of the RED document or to submit written comments, please contact the OPP Public Regulatory Docket (7502C), US EPA, Ariel Rios Building, 1200 Pennsylvania Avenue NW, Washington, DC 20460, telephone (703) 305-5805.

Electronic copies of the RED and this fact sheet are available on the Internet. See <http://www.epa.gov/REDS>.

Printed copies of the RED and fact sheet can be obtained from EPA's National Service Center for Environmental Publications (EPA/NSCEP), PO Box 42419, Cincinnati, OH 45242-2419, telephone 1-800-490-9198; fax 513-489-8695.

Following the comment period, the Etridiazole (Terrazole[®]) RED document also will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 1-800-553-6847, or 703-605-6000.

For more information about EPA's pesticide reregistration program, the Etridiazole (Terrazole[®]) RED, or reregistration of individual products containing etridiazole (Terrazole[®]), please contact the Special Review and Reregistration Division (7508C), 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 Pesticide Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, from 6:30 am to 4:30 pm Pacific Time, or 9:30 am to 7:30 pm Eastern Standard Time, seven days a week. Their internet address is <http://ace.orst.edu/info/nptn/>.