ChemicalWATCH Factsheet

DIAZINON

What is Diazinon?

Diazinon is an organophosphate insecticide; common trade names include Spectracide™, Knoxout™, Basudin™. It is the fifth most commonly used pesticide used by homeowners, with two to four million pounds used annually.

Diazinon originated with Ciba-Geigy in 1952. Various diazinon formulations are widely used in agriculture and for structural pest control, besides being used on lawns, and home gardens. Important target pests for diazinon applications include cockroaches, aphids, scales, mites, ants, crickets, fleas and ticks, flies, and grubs, and in the Western U.S. yellow jackets. Diazinon may be found in formulations with a variety of other pesticides. Depending on form, the EPA has classified diazinon as a toxicity class II or III pesticide, based on a scale of I to IV, I being the most toxic class.

Health Effects

Diazinon is a moderately acutely toxic broad-spectrum insecticide, with a LD_{50} of 350 to 400 mg/kg for humans. Like other organophosphate pesticides, diazinon affects the nervous system through the inhibition of AchE, an enzyme needed for proper nervous system function. Diazinon is easily absorbed through the skin, and is synergistic with other chemicals (meaning that the two together are more toxic than either alone), including pyrethrins and certain chemicals used in pharmaceuticals.

Exposure to diazinon may cause headache, dizziness, profuse sweating, blurred vision, nervousness, nausea, vomiting, reduced heart beat, stomach cramps, diarrhea, loss of coordination, slow and weak breathing, fever, loss of consciousness, coma, uncontrollable twitching, loss of reflexes, loss of sphincter control and death. It can cause irritation to the eyes and skin, and sensitization has been reported in animal tests, though there are some questions as to whether this is due to the "inert" ingredients in tested formulations.

Repeated exposure to low doses may cause muscle twitching, anorexia, malaise, depression, irritability, confusion, anxiety, and dizziness. Damage to the pancreas has developed in some people and in laboratory animals exposed to large amounts of diazinon.

Diazinon is a mutagen. Long-term exposure may damage the developing fetus or cause birth defects, nerve damage and/or liver damage. It has been shown to cause birth defects in chick embryos (parrot beak, abnormal feathering, and development of disproportionately small limbs). These effects are thought to occur because of diazinon's ability to inhibit the synthesis of pyridine nucleotides, and possibly also the amino acid tryptophan. A two generation reproductive study in rats showed that diazinon exposure affected both mothers and offspring. Diazinon caused increased numbers of still births and neonatal deaths in beagle dogs and birth defects in pigs.

In 1999, the Health Effects Division, Office of Prevention, Pesticides and Toxic Substances, EPA, reported that "diazinon is one of the leading causes of acute reactions to insecticide use reported as poisoning incidents in the U.S." The Health Effects Division also stated that there were 11,808 unintentional residential diazinon exposures reported to Pest Control Centers from 1993-1996. EPA's now defunct Pesticide Incident Monitoring System (PIMS) reported 903 diazinon related human poisonings between 1966-1980. In the 1980's, there were 126 reports of Spectracide™ pressurized container explosions in 27 states.

Ecological Effects

Diazinon is highly toxic to bees. It has been known for some time that birds, especially grazing fowl like ducks and geese, are highly susceptible to diazinon poisoning, as are predatory or parasitic insects and mites, soil microbes, fish and aquatic invertebrates.

According to the *Prince George's Journal* diazinon caused the deaths of 14 ducks in September of 1997 in Virginia. The ducks were found dead in a small pond and sent to laboratories were Robert D. Pritchett, chief of Alexandria's Environmental Health Department stated to the *Journal* that the ducks died from "acute poisoning from the pesticide diazinon."

Diazinon has been linked to hundreds of reports of bird kills due to diazinon application on golf courses and sod farms. These reports in the 1980's involved over 23 species in at least 18 states. Diazinon poisoning also caused more than 700 Atlantic brant in New York and over 85 wigeon on a golf course in Bellingham, WA to die. Due to the large number of die offs of birds that congregated on golf courses and sod farms, EPA canceled registration of diazinon in these areas in 1988.

Although diazinon use on golf courses and sod farms has been cancelled, bird mortalities continue to occur due to exposure to diazinon used on other outdoor areas. The preliminary risk assessment released in 2000 for diazinon states that around 300 incidents of wildlife mortality, mostly birds, have been documented in the EPA, Office of Pesticide Program, Environmental Fate and Effects Division's Ecological Incidents Database (EIID), from diazinon use, which is about 10% of all ecological incidents in the database. The preliminary risk assessment also stated that there is "a trend of steadily increasing numbers of incidents over the years."

The preliminary risk assessment for diazinon reported that the endangered species level of concern are exceeded for wildlife, aquatic life and terrestrial plants in semi-aquatic areas for all currently registered uses and application rates of

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diazinon.

Environmental Fate

In soil, degradation occurs by hydrolysis and microbial degradation, with a half-life between 14 and 80 days. Diazinon can move through the soil and contaminate groundwater. It is moderately persistent in water. Diazinon was detected in surface water in 24 states and the District of Columbia and in 54 wells in the state of California alone. The U.S. Geological Survey data show that "diazinon is the most commonly found insecticide in surface water nationally."

Residues are taken up by plants and metabolized, while some remain behind on the surface. These residues should dissipate in a few days to a week. Bacterial enzymes can speed the breakdown of diazinon in soil and have been used in treating emergency situations such as spills.

It has been reported that some forms of the compound can be degraded to more toxic forms. This transformation may occur in air, particularly in the presence of moisture, and by ultraviolet radiation.

Diazinon was one of five pesticides found to be able to concentrate in fog droplets in California agriculture areas. In April 1995, the U.S. Geological Survey began a study to determine the occurrence and temporal distribution of 49 pesticides and pesticide metabolites in air and rain samples from an urban and an agricultural sampling site in Mississippi. The study found that every rain and air sample collected from the urban and agricultural sites had detectable levels of multiple pesticides. Diazinon was found to have the highest concentration in the urban air site. It has also been found in at least 18 of the 1,430 National Priorities List (Superfund) sites identified by the EPA.

Metabolism and excretion rates for diazinon are relatively rapid. The half-life of diazinon in animals is about 12 hours. The product is passed out of the body through urine and in the feces. Cattle exposed to diazinon may store the compound in their fats for two weeks. Application of diazinon to the skin of cows resulted in trace amounts in milk 24 hours after the application.

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Diazinon *chemicalWATCH* Factsheet Bibliography

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