Toxicological Profile for Atrazine

Chemical Formulation & Use Profile Atrazine (6-chloro-N-ethyl-N'-isopropyl-1,3,5-triazine-2,4-diamine) is a triazine selective control herbicide, used as a pre- and post-emergent on broadleaf and grassy weeds in fruit and vegetable crops and in lumber reforestation plantings. It effectively prevents photosynthesis in plants, thereby stopping growth and eventually causing death.[1] It is one of the two most widely used pesticides in the United States.[2] Commercially, atrazine is available in liquid, granular and powder formulations. It is similar in structure and mode of action to other triazines such as hexazinone and simazine.

Human Health Risk Summary

Acute Effects: If ingested, atrazine is likely to cause abdominal pain, diarrhea and vomiting.[3] If inhaled via airborne particulates, respiratory tract injury and increased risk of asthma may occur.[4] Atrazine is also toxic through dermal absorption and may cause skin reactions, such as rashes and allergic eczema.[5,6] The EPA has identified congestion of the heart, lungs and kidneys; low blood pressure; muscle spasms; weight loss; and, damage to adrenal glands as acute exposure toxicity endpoints.[7] Following acute, high oral dosing, test animals exhibited loss of muscle function, convulsions and behavioral disturbances.[8,9]

Chronic Effects: *Carcinogenicity*: Animal studies have linked atrazine to mammary tumors, leukemia and lymphoma.[10,11] In farming community epidemiological studies, atrazine exposure has correlated with higher incidences of ovarian, breast, testicular, stomach, brain and non-Hodgkin's lymphoma forms of cancer.[12,13,14,15,16] *Reproductive & Developmental Toxicity*: Both animal and human studies have indicated that atrazine is likely to be both a reproductive and developmental toxicant. Animal studies have shown that atrazine can cause premature birth; reduced birth weight; delayed bone development and sexual maturation; and growth retardation.[17,18,19] Epidemiological studies in humans have shown that exposure to atrazine from drinking water contamination is associated with premature birth; low birth weight; physical birth defects; and reduced semen quality.[20,21,22,23] *Organ Toxicity:* Atrazine has been shown to cause liver, kidney and heart damage in animals, and is therefore likely to cause the same in humans.[24] *Mutagenicity:* Several animal studies have linked atrazine to genetic damage, including, chromosome breaks and rearrangement; and, disrupted DNA repair and synthesis.[25,26,27] *Immunotoxicity:* Several studies in both animals and humans have indicated a direct association between exposure to atrazine and adverse effects on the immune system, including suppression of antibodies and autoimmune reactions.[28,29,30,31,32]

Ecological Hazard Summary

Environmental Fate: A major concern about atrazine is that it is highly persistent and mobile in soil environments, and extremely persistent in aquatic systems. Depending on soil conditions, atrazine can persist from several days to over a year.[33] In water systems, it can persist for weeks to years depending on conditions such as temperature, pH, movement, etc.[34] Atrazine does not bind to soil particles well, and is therefore likely to migrate into aquatic systems. Because of its widespread use, long persistence, and high mobility, atrazine is the most commonly detected pesticides in surface and ground water, and is often found in drinking water systems as well.[35,36] *Risk to Non-Target Flora & Fauna*: Atrazine can travel away from its use site via airborne dust particles, over-spray, and translocation by soil and/or water movement, and can consequently impact plants and animals in the natural environment. At very low concentrations atrazine can disrupt entire ecosystems by inhibiting photosynthesis and killing plants that offer protection and nutrients to animals.[37] Aside from general ecosystem disturbance, atrazine can be toxic to most aquatic and amphibious animals. Because atrazine is a potent disruptor of hormones, exposure has shown to have reproductive and developmental toxicity to numerous animal species, including fish, frogs, salamanders, and alligators.[38,39,40] Some of these toxicity endpoints include: reduced reproductive success, altered gender ratios, birth defects and behavioral disruptions.

Summary Atrazine and its associated compounds are of particular concern to human health and the environment, due to: 1) evidence of carcinogenicity, reproductive/developmental effects, organ toxicity, immune system effects, and genotoxicity to humans; 2) likely adverse effects to non-target plants and animals, specifically reproductive and developmental toxicity to aquatic and amphibious species; and 3) the extensive contamination of surface, ground and drinking water systems.

Common Commercial Names Aatrex, Purge II, Azinotox 500, Gesaprim, Alazine, Atred, Atranex, Atrataf.

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