

Toxicological Profile for Glyphosate

Chemical Formulation & Use Profile Glyphosate, best known commercially as “Roundup” is the isopropylamine salt of N-(phosphonomethyl) glycine. It is a non-selective post-emergence herbicide for controlling weeds in agriculture (cropped and non cropped), forestry, rights-of-way and aquatic systems. It is generally distributed as water-soluble concentrates and powders, and is one of the most often used pesticides worldwide.¹ Glyphosate disrupts plant growth and eventually causes death by inhibiting amino acid synthesis.²

Human Health Risk Summary

Acute Effects: Some formulations of glyphosate have been shown to cause extreme irritation of the skin and eyes, such as blurred vision, burning eyes, rashes and skin blisters.³ Other symptoms reported following acute exposures, include: nausea, sore throat, dizziness, gastrointestinal and respiratory tract injuries.^{4,5}

Chronic Effects: *Carcinogenicity:* Though evidence that glyphosate causes cancer is yet to be established, several animal and human epidemiological studies have indicated a potential correlation. In these studies, there was an indication that glyphosate may increase the risk of non-Hodgkin’s lymphoma, multiple myeloma, pancreatic, thyroid and testicular cancers.^{6,7,8,9} *Reproductive & Developmental Toxicity:* Glyphosate exposure has been associated with several manifestations of reproductive and development impairment in both animals and humans. In animal studies, high dose or prolonged exposures have resulted in skeletal malformations, disrupted organ development, and reduced sperm volume and quality.^{10,11,12} In human epidemiological studies, exposure to glyphosate has been connected to an increased rate of miscarriage, reduction in sex hormone production, and disruptions to endocrine system development.^{13,14,15} *Mutagenicity:* Several studies on both animals and humans have suggested that exposure to glyphosate can cause chromosomal aberrations, DNA breaks, and other genetic mutations.^{16,17,18}

Ecological Hazard Summary

Environmental Fate: Glyphosate tends to bond strongly to soil particles, and therefore will not appreciably leach from terrestrial systems to aquatic environments. However, it may be translocated to surface water from drift following aerial application or from movement of soil particles by wind, erosion, or storm runoff; and, has been frequently been detected in surface water nation-wide.^{19,20,21} Glyphosate is moderately to highly persistent with a half life of approximately 60 days in soil,²² though depending on soil conditions, it may persist for at least six months.²³ In aquatic environments, its half-life is expected to be from several weeks to several months.²⁴

Risk to Non-Target Flora & Fauna: Because of drift from inappropriate application methods, as well as offsite movement from wind and rain, glyphosate poses a considerable risk to non-target plant and animal species. Studies have shown that a significant amount of spray applications drift off-site (from 14% to 78%).²⁵ It has been documented to affect plants 130 feet away, and residues have been detected up to 1,300 feet downwind.^{26,27} Glyphosate has been shown to disrupt the immune systems and cause genetic abnormalities in fish.^{28,29} Similarly, it has been shown to cause genetic, developmental and reproductive mutations in amphibians.^{30,31,32}

Toxicity of Inert Ingredients Commercial glyphosate products (such as Roundup) are composed of an active ingredient (approximately 40% of the solution) and other ingredients (approximately 60% of the solution). Some of these “surfactants” or “adjuvants” include: polyethoxylated tallowamine (POEA), isopropylamine, and diethanolamide. Each of these compounds has been shown to exhibit toxicity at much higher levels than glyphosate alone. For example, POEA has been shown to be three times as acutely toxic to humans as glyphosate alone.³³ One surfactant commonly used in Rodeo (similar to Roundup) was found to be 100 times more toxic to aquatic invertebrates than glyphosate alone.³⁴ Other inert ingredients have been shown to be genotoxic, carcinogenic, teratogenic and disruptive to reproductive function in both humans and animals.^{35,36,37,38}

Summary Glyphosate and commercially available products containing this compound are of particular concern to human health and the environment, due to: 1) some evidence of carcinogenicity, reproductive/developmental toxicity, endocrine system toxicity, and genetic toxicity to humans; 2) potential adverse effects to non-target plant and animal species due to overspray, drift, and translocation; and 3) the potentially severe impact of many of its additives such as POEA, which have been identified as extremely hazardous to both humans and animals.

Common Commercial Names Roundup, Roundup Pro, Roundup Ultra, Rodeo, Sting, Accord.

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