

Glyphosate is the main chemical component in many non-selective herbicides used to kill broad-leaved, grass and sedge species. It has been registered for use in the United States since 1974, and is manufactured largely by Monsanto Co. under the trade names Round-Up, Rodeo, and Accord.

According to the U.S. Environmental Protection Agency (EPA), glyphosate is the “most used conventional pesticide in the United States.” Estimated annual use rose to over 100 million pounds per year in 2001, and glyphosate is recognized as the second most commonly used pesticide in both agricultural and non-agricultural applications (industrial, commercial, forestry, and privately-owned lands) in the U.S.: twenty-five million applications are made yearly on lawns and in yards.

Although Monsanto claims that glyphosate is low in toxicity and environmentally friendly, these statements are widely debated within the scientific community.

False Research

The EPA has twice caught scientists deliberately falsifying results at research laboratories hired by Monsanto to study glyphosate.

In 1983, the EPA revealed that Industrial Biotest Laboratories (IBL) routinely falsified results of their 1971 research performed on glyphosate. Tests performed at IBL included eleven out of nineteen total chronic toxicology studies on glyphosate; studies instrumental in its retaining registration in 1974.

In 1991, the EPA alleged that Craven Laboratories, another lab hired by Monsanto to study the effects of glyphosate, had falsified test results. Several methods were used, including manipulation of equipment and notebook entries.

Lasting Effects on Human Health

Contrary to the claims of the manufacturer, both independent and governmental research has shown that glyphosate takes a serious toll on human and animal health. These studies suggest Rodeo, Round-Up, Accord, and other products containing glyphosate are linked to **cancer, reproductive problems such as reduced sperm counts, increased numbers of dead or abnormal sperm and miscarriages, harmful changes in blood chemistry, and genetic mutations**. Despite these research results, governmental regulating agencies have failed to remove these products from the market, and Monsanto continues to market their herbicides as benign.

- A recent Swedish study showed that people with occupational exposure to glyphosate have a threefold higher risk of hairy cell leukemia, a form of the cancer non-Hodgkin's Lymphoma.
- Canadian farmers' use of glyphosate was associated with miscarriage and premature birth in their families.
- In Red River Valley, Minnesota, farm children with Attention Deficit Disorder (ADD) were over three times more likely to have parents who used glyphosate herbicides than children without ADD.

- A case study from the University of California reports a student athlete who experienced abnormally frequent menstruation when competing at tracks where glyphosate had been used.
- Pregnant rats given glyphosate in drinking water showed enzyme alterations in the livers, hearts and brains of their fetuses.
- In mice injected with glyphosate, chromosome and DNA damage both increased.

- Mice and rats given glyphosate in a long-term study showed excessive cell division in the urinary bladder and inflammation of the stomach lining.
- Rats given glyphosate got tumors in the kidney, testicles, pancreas and liver, as well as thyroid cancer.
- Calves exposed to small amounts of glyphosate herbicides developed diarrhea and loss of appetite. At large doses (790 mg/kg per day for seven days), pneumonia was observed and a third of the calves died.

Illegal Advertising

Monsanto has twice been caught breaking the national pesticide law against false advertising.

In 1996, the New York Attorney General required the company to stop making patently false claims about glyphosate in advertisements. Monsanto had marketed their products as being “safer than table salt,” and degrading “soon after application.” In fact, glyphosate herbicides were the eighth most common cause of pesticide illness in agricultural workers in California between 1998 and 2000.

In 1998, the EPA made a similar determination about these advertisements, but no action was taken against the company, as it had taken the Environmental Protection Agency two years to classify the ads.

Glyphosate is also poisonous to humans and animals in an immediate sense. When people swallow glyphosate, breathe it, bathe in or drink contaminated water, or get glyphosate on their skin, they can experience a wide range of reactions, including those that can complicate existing conditions:

- Burning of eyes or skin
- Blurred vision
- Headache
- Intestinal pain and vomiting
- Skin or eye lesions
- Diarrhea
- Difficulty breathing
- Heart palpitations
- Elevated blood pressure
- Excess fluid in the lungs
- Clouded consciousness
- Destruction of red blood cells
- Dizziness
- Numbness
- Swelling and blistering of the genitals
- Swollen eyes or face
- Blisters or rash
- Burning in chest and throat

Glyphosate-containing herbicides are more toxic to animals and humans than pure glyphosate, likely because of the combinations of additional toxic components, such as surfactants and both active and inert ingredients. Despite this, there are no publicly available laboratory studies of the carcinogenicity of glyphosate herbicides in comparison to pure glyphosate. However:

- Glyphosate-containing herbicides are more potent mutagens than pure glyphosate.
- A glyphosate herbicide, but not unadulterated glyphosate alone, caused a decrease of 90% in the production of sex hormones in the testicles of male mice.
- A glyphosate herbicide is 20 - 70% times more toxic to fish than glyphosate itself.
- A “synergistic interaction between glyphosate and the inert ingredients in Roundup” delayed the first cell division in sea urchin embryos by inhibiting the activity of an enzyme involved in cell division, and by inhibiting protein synthesis in the embryo.

Critical Effects of Glyphosate on Fish

Alaska has an economic and cultural dependence on the welfare of salmon and other fish species, so it is particularly vital for Alaskans to know that glyphosate, and even more so glyphosate herbicides, are acutely toxic to fish.

The toxicity of glyphosate, which is most potently dangerous to younger fish, increases as water temperature rises. Ironically, the use of glyphosate causes water temperatures to increase for several years following treatment, as the herbicide kills shading vegetation. This is significant in more than one way for salmon, as juvenile salmon require cold water to thrive under even normal environmental circumstances.

The effects of glyphosate on fish have been documented using rainbow trout, which exhibited erratic swimming and labored breathing, effects which can increase the risk that fish will be eaten, as well as affecting ability to feed, migrate, and reproduce.

Effects of Glyphosate on Non-Target Plants

- Many living things cannot process nitrogen, a basic element of life on earth, in its common form. Instead they use rare nitrogen compounds created by processes called nitrogen fixation and nitrification, carried out by bacteria on nodules on the roots of plants like alder, clover, and legumes. At a concentration corresponding to typical application rates, glyphosate reduced by 70% the nitrogen-fixing nodules on clover planted 120 days after treatment.
- Glyphosate has been found in lettuce planted five months after treatment, as well as in barley planted four months after treatment.
- The World Health Organization reported “significant residues on wheat after pre-harvest use.” Bran contained two to four times the amount found on whole grains, residues which were not lost in the baking process.
- Plant susceptibility varies widely with species: some wildflowers are nearly a hundred times more sensitive than others, and some perennial plants, when subjected to sublethal doses, show damage with symptoms lasting several years.
- The degradation of glyphosate leads to metabolites which can persist in soil for up to three years.
- The presence of glyphosate causes the production of phytoestrogens in legumes, which mimic the role of reproductive hormones in mammals after being consumed.
- Canadian research indicates that plants serving as important wildlife food sources are significantly impaired by the use of glyphosate. “Severe” to “very severe” damage was recorded for 46% of the food species eaten by moose.

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ACAT researcher Katie Bryson based this report largely on a 15-page scientific article written by Caroline Cox and published by the Northwest Coalition for Alternatives to Pesticides in the *Journal of Pesticide Reform* vol.18, no.3, fall 1998 (updated 2002). You may request a copy of the full article and other sources by contacting Alaska Community Action on Toxics at (907) 222-7714.