



# CENTER FOR TRUTH IN SCIENCE

*Seeking integrity in the pursuit of scientific knowledge.*

## Glyphosate Issue Primer

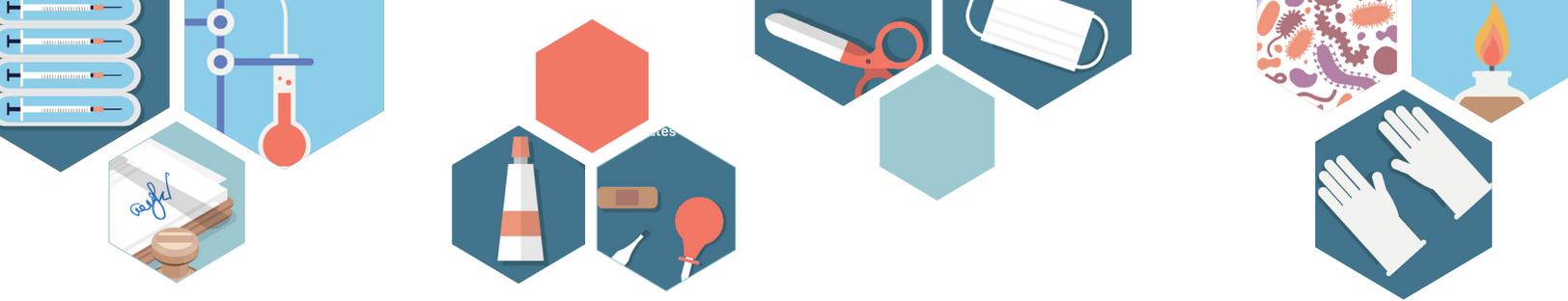
### Overview

Glyphosate, a glycine derivative, is a non-toxic, non-selective systemic herbicide intended to be applied directly to plant foliage. It is one of the most widely used herbicides in agriculture, forestry, industrial weed control, lawn, garden, and aquatic environments—more than 750 products are currently for sale in the United States containing glyphosate.

Glyphosate has been safely used for decades and is one of the most researched herbicides in the world, with more than 800 studies conducted over 40 years to confirm its safety. Regulators in the U.S. and across the globe have consistently concluded that glyphosate is safe for humans and the environment. However, there has been a focus of concern regarding a possible link between glyphosate exposure and cancer, specifically non-Hodgkin's lymphoma. To date, more than 18,000 lawsuits surrounding the use of glyphosate have been filed nationwide resulting in hundreds of millions in settlements.

### Fast facts

- Glyphosate, a glycine derivative, is a non-toxic, non-selective systemic herbicide intended to be applied directly to plant foliage.
- It is best-known as the active ingredient in Roundup-branded herbicides, and is one of the most widely used herbicides in agriculture, forestry, industrial weed control, lawn, garden, and aquatic environments.
- More than 750 products are currently for sale in the United States containing glyphosate.
- EPA scientists performed an independent evaluation of available data for glyphosate and found: “no risks of concern to human health from current uses of glyphosate” and “no evidence that glyphosate causes cancer in humans.”
- More than 18,000 lawsuits surrounding the use of glyphosate have been filed nationwide resulting in hundreds of millions of dollars in settlements.



## Timeline

**1950:** Glyphosate discovered by Swiss chemist Henry Martin, who worked for the Swiss company Cilag.

**1970:** Glyphosate independently rediscovered in the USA by John E. Franz who worked for Monsanto.

**1974:** Glyphosate registered for use as a pesticide with the EPA, specifically as a herbicide to kill annual broadleaf weeds and grasses that compete with crops.

**1996:** Monsanto introduces the glyphosate-resistant soybean.

**1996:** The first documented case of glyphosate-resistant weeds is reported in Australia, near Orange, New South Wales.

**1996:** The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended by the Food Quality Protection Act (FQPA) of 1996, mandates the continuous review of existing pesticides.

**1998:** Monsanto introduces glyphosate-resistant corn. Glyphosate resistant soybeans and corn, commonly referred to as "Roundup Ready" crops, have become ubiquitous in American agriculture with 93% of soybeans, 82% of cotton, and 85% of corn planted engineered to be glyphosate resistant. The real cost of agricultural production radically declines ([the price of soybeans](#) per bushel in 1970 is roughly the same as today, not accounting for inflation, which works out to [\\$1 in 1970 being worth about \\$6.64 in 2020](#)). This means that for the same amount of money agricultural production employing glyphosate-based herbicides has increased nearly 7 times.

**2006:** Farmers association [reports](#) 107 species of weeds have developed glyphosate resistance.

**2006:** The EPA implemented the registration review program pursuant to FIFRA and will review each registered pesticide every 15 years to determine whether it continues to meet the FIFRA standard for registration.

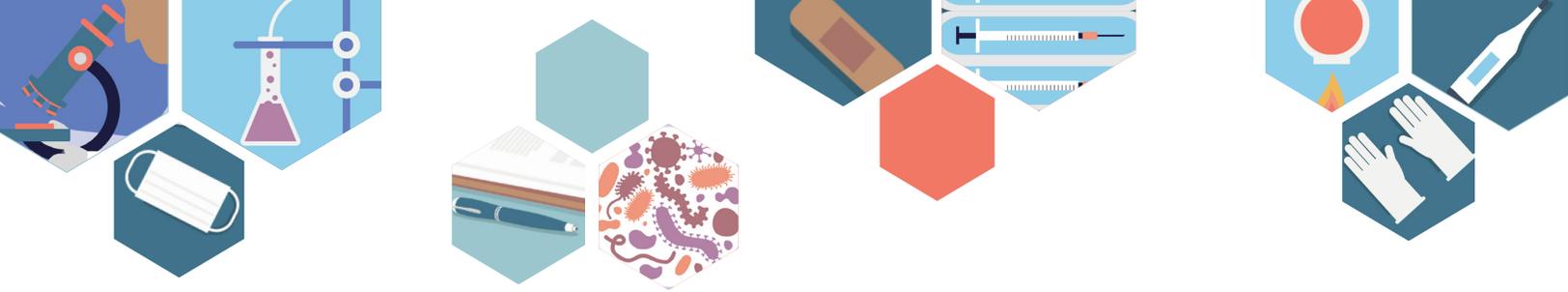
**2010:** 7 to 10 million acres in the U.S. are infested with glyphosate-resistant weeds, [about 5%](#) of the 170 million acres nationwide planted with corn, soybeans, and cotton.

**2015-2017:** The International Agency for Research on Cancer (IARC) of the World Health Organization (WHO) reports that glyphosate is "probably carcinogenic to humans." Another expert WHO group, the Joint Meeting of Pesticide Residues (JMPR) disagrees, as do expert bodies from around the world, including The U.S. Environmental Protection Agency (EPA). None of these other expert groups find much if any evidence of carcinogenicity. Nevertheless, a wave of lawsuits follows the IARC's ruling.

**2016:** Dewayne "Lee" Johnson files a Roundup cancer lawsuit against Monsanto, the first case of its kind to proceed to trial, alleging his non-Hodgkin lymphoma was caused by exposure to Roundup (glyphosate).

**2019:** Alva and Alberta Pilliod allege in their lawsuit against Monsanto that exposure to Roundup caused both of them to develop non-Hodgkin lymphoma. On May 13, 2019, an Alameda, California jury returned a \$2.055 billion verdict in favor of the Pilliods, ordering Monsanto to pay \$55 million in compensatory damages and \$2 billion in punitive damages.

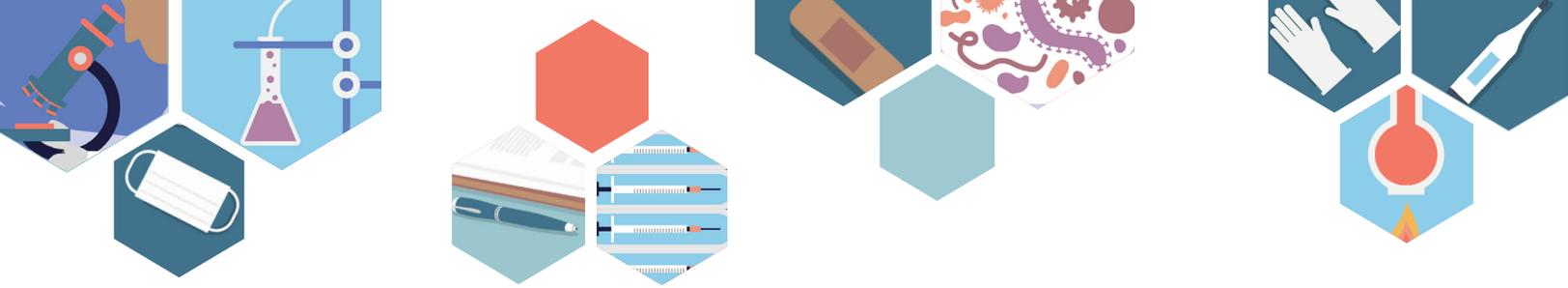




## How Glyphosate is regulated in the U.S.

Every pesticide and herbicide undergoes at least 120 different health, safety and environmental tests that must be completed and reviewed before it can be registered by the EPA for production, sale and distribution. The process of registration and reregistration requires addressing the following concerns and questions at a minimum, and generally takes between 8 to 9 years for registration and several years for reregistration:

- 1. Product Chemistry:** What are the basic chemical characteristics of the pesticide? This includes things such as product identity and composition, color, odor, viscosity, melting/boiling point range, solubility in polar and non-polar solvents, vapor pressure, studies on stability in normal and elevated temperatures, oxidation/reduction potential, reactivity profiles (when exposed to other substances the compound may encounter), flammability, rate of degradation or decomposition, corrosive characteristics, etc.
- 2. Product Performance:** Is the pesticide/herbicide effective against what it claims to control? Studies must show the efficacy of the product on controlled samples.
- 3. Hazard to humans and animals:** How toxic is it? What is the potential for health effects at levels of performance known to be effective? Multiple toxicity studies measure the risks and hazards to people, domestic and wild animals. Tests are conducted for oral, skin, eye and inhalation exposure over varying periods of time.
- 4. Hazard to Non-target Organisms:** Research is conducted to determine if the pesticide/herbicide will put wild-life or unintended plant life at risk at levels of performance known to be effective.
- 5. Post-Application Exposure:** How much exposure will workers have who enter an area after treatment with the new chemical? Data may include the decomposition time of a pesticide/herbicide. Tests may measure the transfer of pesticides/herbicides from a treated surface onto skin.
- 6. Applicator/User Exposure:** Studies assess how much exposure people will have that are distributing the pesticide/herbicide.
- 7. Spray Drift Evaluation:** Does the pesticide/herbicide “drift”? Compound specific studies test what size of spray droplets are needed to minimize overspray and unintended contamination.
- 8. Environmental Fate:** What happens to the pesticide/herbicide in the environment? Research is conducted to determine how fast a pesticide will decompose and the potential for movement into the surrounding landscape and water supply.
- 9. Residue Chemistry:** How much pesticide/herbicide residue is left on a crop after it is used in accordance with the label instructions? Data compiled in this phase of research is used to determine and enforce residue limits on crops.



A minimum of six divisions of the EPA evaluate the data packet created in the above process including: Biological and Economic Analysis, Biopesticides and Pollution Prevention, Health Effects, Field and External Affairs, Antimicrobial, and Environmental Fate and Effects. Only one in 139,000 chemicals makes it from the development in a lab to the consumer market.

Since glyphosate's inception, the EPA has reviewed and assessed its safety and uses, including undergoing a "registration review," a program that re-evaluates every registered pesticide/herbicide on a 15-year cycle. [A 2016 review document](#) from the EPA cited several recent studies that concluded glyphosate is not likely carcinogenic to humans.

After registration is completed, the chemical is continually monitored and companies are required to report adverse effects to the EPA. Appropriate information on glyphosate is included in the label with directions to follow the label for safe and effective use. However, even after registration with the EPA and appropriate labeling for sale, individual states can require further review and approval. New York, Florida and California in addition to other states, for example, all have agencies that re-review the same material considered by the EPA, and may require additional studies or information. This can take an additional two to six months.

In 2013, at the EPA's request and in preparation for risk assessment, the Joint Glyphosate Task Force, a consortium of glyphosate registrants, created a "[Use Summary Matrix](#)," intended to summarize all use sites being supported as part of registration review and outline important application parameters such as maximum single and yearly application rates.

On September 27, 2018, the EPA received a petition from the Environmental Working Group (EWG), Ben & Jerry's Homemade, Inc., Happy Family Organics, MegaFood, MOM's Organic Market, National Co+op Grocers, Nature's Path Foods Inc., One Degree Organic Foods USA, Inc., and Stonyfield Farms, Inc (EWG et al.). The petitioners requested that the EPA reduce tolerance of glyphosate in or on oats from 30 ppm to 0.1 ppm and modify labels to explicitly prohibit preharvest use of glyphosate on oats.

Pursuant to this petition, the EPA issued an "interim registration review decision." In this review, EPA again failed to identify any human health risks from exposure to glyphosate at levels of performance known to be effective.

The agency did find potential ecological risk to mammals and birds, but these risks were expected to be limited to the application areas. The EPA also identified potential risk to terrestrial and aquatic plants from off-site spray drift, consistent with glyphosate's use as an herbicide. As such, the EPA issued new guidelines for spray drift management, herbicide resistance management, and modified product labeling requirements to be more consistent. Labels now have maximum application parameters, restrictions on aquatic use, and clarify procedures for rotational crop timing. If any of these standards are violated, a report can be filed through the EPA's [pesticide hotline](#). Complaints are investigated by the EPA's Criminal Enforcement Division.

## The Center's Focus

The Center for Truth in Science seeks to determine if there is conclusive, consistent scientific evidence that demonstrates a link between exposure to glyphosate and the development of cancer or other chronic illnesses.

The Center also seeks to examine the potential economic impact of government-imposed limits or bans on the use of glyphosate.