

Glyphosate Causes Cancer

Is Monsanto Ready for the Consumer Response?

The International Agency for Research on Cancer (IARC) determined in March that the herbicide glyphosate, or Roundup (produced by Monsanto), is a potential cancer causing agent for humans, based on laboratory animal studies. The finding adds to the literature of adverse effects linked to glyphosate and has triggered a new round of calls to ban its use. Beyond Pesticides is calling for an end to glyphosate use and urging EPA to suspend its uses, while telling consumers to take steps to protect themselves and the environment from exposure to this harmful chemical. As the most widely used herbicide in the world, individuals are regularly exposed to glyphosate through contaminated food and its use on lawns and landscapes.



Glyphosate in Agriculture

According to the U.S. Geological Survey (USGS), an estimated 283 million pounds of glyphosate was sprayed across the country for agricultural use in 2012. Applications to corn and soybeans, a majority of which are genetically engineered to tolerate applications of glyphosate, accounted for over 70% of glyphosate's use. Studies show that glyphosate can metabolize in crops sprayed with the chemical, and persist in high levels in food products manufactured with glyphosate-contaminated crops.

A 2014 Government Accountability Office report found that neither the U.S. Department of Agriculture (USDA) nor the Food and Drug Administration (FDA) regularly test for residues of glyphosate in the food supply. However, shortly after IARC's determination, the U.S. Environmental Protection Agency (EPA) indicated to *Reuters* that, "Given increased public interest in glyphosate, EPA may recommend sampling for glyphosate in the future."

Home and Garden Applications

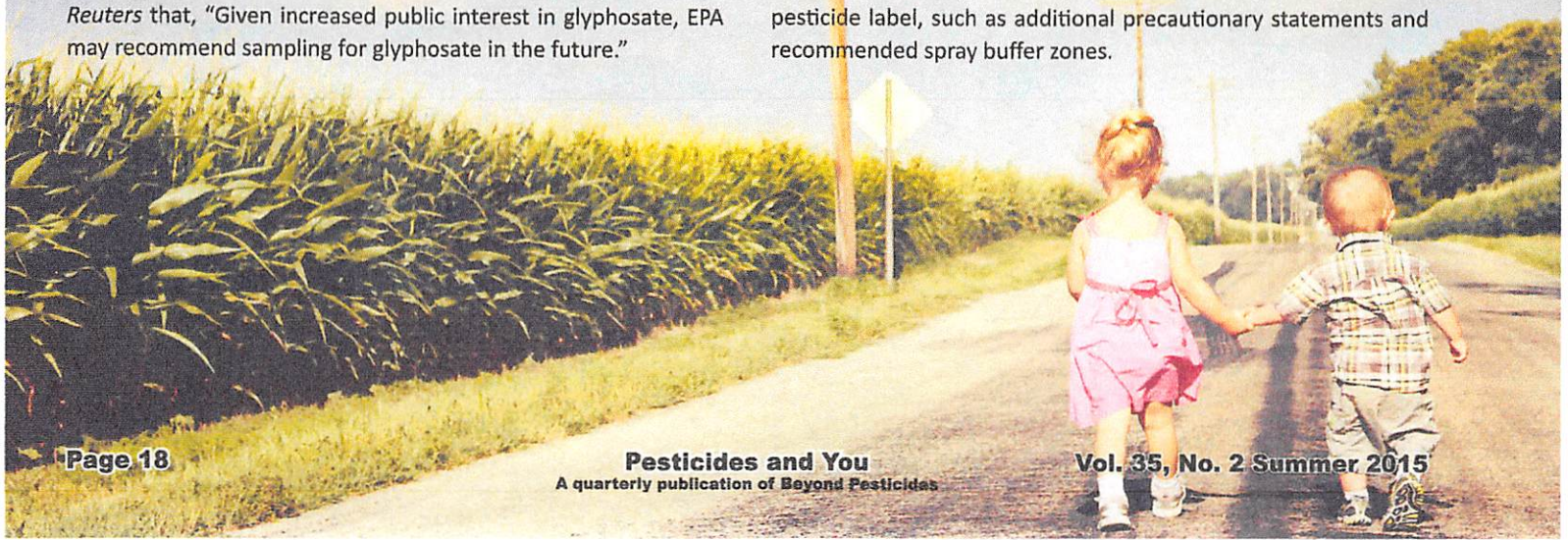
The frequency of glyphosate use in non-agricultural settings is second only to the herbicide 2,4-D. EPA estimates between 5-8 million pounds of glyphosate is sprayed each year for residential lawn and garden use, and 13-15 million pounds is applied by professional applicators on industrial, commercial, and government properties. Glyphosate-containing herbicides not only put those applying the product at risk, but may also endanger those nearby as a result of pesticide drift. Further, glyphosate-based herbicides bind to soil and remain on lawns an average of 47 days, though studies indicate the chemical may persist

for nearly six months in certain soils, long after the small yellow flags telling children and pets to stay off are removed. USGS found that glyphosate is widespread in the environment, and in particular it is commonly detected in surface waters.

Current Regulations

EPA is in the process of conducting a review of glyphosate on a 15-year cycle, and is set to release its preliminary risk assessment in 2015. Although the agency has already indicated that it will require measures to mitigate the rising tide of resistant weeds in agriculture, such a management plan would have very little impact on the health of farmworkers and the environment, and continue to present a risk to consumers through residues on food and in home and garden use.

EPA conducts its chemical reviews in close cooperation with Canada's Pest Management Regulatory Agency, which recently released its reevaluation decision on glyphosate for public comment. The agency stopped far short of meaningful action on the chemical, choosing instead to address risk through changes in the pesticide label, such as additional precautionary statements and recommended spray buffer zones.



“Probable” carcinogen: what does that mean for my health?

It’s easy for consumers to say, and no doubt many activists have heard, the refrain that “everything causes cancer.” Often this statement is used as a reason to brush-off needed action on industrial contaminants –after all, we’re exposed to hundreds of environmental chemicals each day, so why worry about a “probable” carcinogen, the ranking IARC has given to glyphosate?

Rather than throw our collective hands up, the prospect of recurring chemical exposure should rally us to address these health concerns and seek out alternatives when credible and respected scientific agencies make such determinations. A look into IARC’s evaluation process showcases the gravity of these classifications. IARC employs a “strength of evidence” assessment, basing the carcinogenicity of a chemical on whether it is capable of increasing the occurrence of malignant growths, reducing their latency (time between exposure and the onset of cancer), or increasing the severity or multiplicity of such growths. Prior to classifying a chemical, 17 experts from 11 countries analyzed scientific studies and data for approximately one year before meeting together in a Working Group in an attempt to reach a consensus evaluation. Consideration is given to exposure data, studies of cancer in humans, studies of cancer in experimental animals, and mechanistic and other relevant data.

[Note: cancer ratings are based on studies of laboratory animals, since we do not test chemicals on humans. In some cases there is epidemiologic evidence, often from workplace data that links chemical exposure to a cancer effect. However, since the point of testing is to inform regulatory decisions to prevent exposure to carcinogens, glyphosate’s cancer ranking as the highest possible rating for carcinogenicity in humans based on laboratory data is extremely meaningful.]

Chemicals are placed into one of four categories:

- **Group 1: Is Carcinogenic to Humans**
Sufficient evidence of carcinogenicity in both humans and experimental animals,
- **Group 2:**
 - (A) **Probably Carcinogenic to Humans**
Limited evidence of carcinogenicity in humans; Sufficient evidence of carcinogenicity in experimental animals
 - (B) **Possibly Carcinogenic to Humans**
Limited evidence of carcinogenicity in humans; Less than sufficient evidence of carcinogenicity in experimental animals
- **Group 3: Not Classifiable as to its Carcinogenicity in Humans**
Inadequate evidence of carcinogenicity in humans; limited evidence of carcinogenicity in experimental animals
- **Group 4: Probably not Carcinogenic to Humans**
Evidence suggests lack of carcinogenicity in humans and experimental animals

Glyphosate falls in IARC’s group 2A classification

Human data available to IARC was based on research conducted since 2001. “Case-control studies of occupational exposure in the USA, Canada, and Sweden reported increased risks for non-Hodgkin lymphoma that persisted after adjustment for other pesticides,” according to IARC’s article in *The Lancet Oncology*. In its monograph, the agency notes that EPA previously classified glyphosate as a possible carcinogen in humans based on studies that show tumors in mice, yet in 1991, the agency changed its classification to evidence of non-carcinogenicity in humans after a re-evaluation of the study. IARC used both EPA’s report and more recent data in its conclusion that there was sufficient evidence of the carcinogenicity of glyphosate in experimental animals.

“There were several studies. There was sufficient evidence in animals, limited evidence in humans and strong supporting evidence showing DNA mutations ... and damaged chromosomes,” said Aaron Blair, Ph.D., chair of the IARC Working Group and a scientist emeritus at the National Cancer Institute, in an interview with *Reuters*.

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International Agency Research on Cancer



**World Health
Organization**

Take Action!

Consumers should not have to wait for federal regulators to act in order to address glyphosate use and contaminated foods in their community. Take the following five steps, all of which can be started immediately, to reduce glyphosate use for you, your family, and our communities at-large.

Tamp Down on Roundup

1) Buy organic foods.

Because organic standards, with few exceptions, do not allow the use of any toxic synthetic pesticides in food production, buying organic is the only surefire way to prevent glyphosate in your diet. Choosing organic also means buying into an agricultural system that protects farmworkers, prevents water contamination, and safeguards wildlife.

2) Stop the use of lawn care products like Roundup, which contain glyphosate.

You don't need to be an organic farmer or master gardener to manage your lawn without the use of pesticides and herbicides like Roundup. Alternative practices are available to help create conditions where weeds do not become a significant problem, and new least-toxic herbicides are available to help with your transition to organic, or in those increasingly rare instances when weeds do get out of control. See Beyond Pesticides' Lawns and Landscapes resources for assistance: www.beyondpesticides.org/lawn.

3) Voice your concerns about glyphosate to your local grocery and home improvement store, and encourage them not to sell products containing or sprayed with glyphosate.

Forward-looking home improvement stores are already starting to ditch lawn care pesticides like Roundup in favor of least-toxic alternatives. Tell your local hardware stores to stop selling glyphosate-based herbicides (and that aisle filled with pesticides, while you're at it!).

Your grocery store should also hear about your concerns with glyphosate-sprayed crops. Let them know that food laced with a probable carcinogen is not acceptable for you or your family's health.

While both these retailers might say they can't control the sourcing of their products, make sure your message gets to managers, who will report back to owners or corporate headquarters.



March Against Monsanto protest outside of White House in May 2015. Monsanto is the leading producer of glyphosate. Photo Courtesy Ford Fischer/News2Share www.news2share.com

4) Join with other concerned residents in your community and work toward a resolution prohibiting toxic lawn care herbicides from being used in your town.

Starting a movement isn't easy, but it is amazing how quickly you can pick up steam with the right information to the right local leaders, and a group of committed individuals. See Beyond Pesticides' fact sheet on how to *Start Your Own Local Movement* [<http://beyondpesticides.org/documents/MovementFactsheet.pdf>] for the basics you'll need to begin your campaign to stop the use of glyphosate in your community.

5) Write letters and sign petitions to EPA, USDA, and other elected officials.

Although signing a petition against glyphosate [<http://bit.ly/StopGlyphosatePetition>] like the one Beyond Pesticides has created is a simple step, after you take action we encourage you to craft your own unique letter to your local, state, and federal representatives, as well as officials at EPA and USDA. Let them know that you're not okay with a carcinogen on our lawns and in our food.

For help completing these actions, please don't hesitate to contact Beyond Pesticides at info@beyondpesticides.org or by calling 202-543-5450.

A World Without Glyphosate

As we consider the end of the herbicide glyphosate (Roundup), the question that comes to mind is what will replace it. Of course, there are replacement products that are available for people and communities considering the shift away from toxic pesticide products. But, the long-term solution requires the adoption of organic systems that focus first on practices and prevention and, only second and as a last resort, on alternative products. Predictably, and regardless of the International Agency for Research on Cancer's classification for glyphosate, this question of alternatives to the weed killer has been emerging because of widespread weed resistance to glyphosate.

Background

The widespread use and reliance on glyphosate, and the simultaneous reductions in the use of sustainable weed management practices, has resulted in glyphosate-resistant weeds. In regions of the U.S. where Roundup-Ready (glyphosate-tolerant) crops dominate, there are now evolved glyphosate-resistant populations of economically-damaging weed species. Growers of GE cotton in 2014 asked for an emergency use of the herbicide propazine due to weed resistance across three million acres. The request was denied by EPA because public exposure to triazine herbicides (propazine's chemical cousin with atrazine and others) in the aggregate already showed unacceptable risk levels. Pursuing sustainable alternatives can prevent the pesticide treadmill that results from the use of GE crops and pesticides like glyphosate. Ecological pest management strategies, organic practices, and solutions that are not chemical-intensive are the most appropriate and long-term solution to managing unwanted plants or weeds.

Common Glyphosate Uses

An organic, feed-the-soil approach to the growing of plants, including turf, is the most sustainable and cost-effective. With this systems approach in organic lawns, landscapes, and agriculture, we enhance soil health, beneficial bacteria and fungi in the soil, natural nutrient cycling, crop rotation, and incorporate organic compatible management practices and products.

Agriculture

The Roundup-Ready crops (soy, corn, canola, alfalfa, cotton, sorghum) can all be grown organically and, in fact, are a part of the \$40 billion organic industry that continues to grow. Shifting to newer herbicide-tolerant varieties, such as those that are now tolerant of the herbicide 2,4-D (Enlist Duo), only postpones resistance while exposing people and the environment to another cancer causing agent that is also an endocrine disruptor.

Lawns and Landscapes

The principles of organic are available for all of glyphosate uses: fence lines, utility poles, sidewalks, driveways, garden beds, roadsides and medians, rights-of-way, and parks. For all these current uses, there are either opportunities for mechanical removal (goats, flame and steam weeding, hand pulling), mulching systems and cultural practices (landscape fabric, high mowing, hedgerows, or organic compatible products (horticultural vinegar, herbicidal soaps, essential oils, corn gluten meal).

Please see Beyond Pesticides' page www.beyondpesticides.org/lawn for more information on alternatives to glyphosate.

Monsanto and the Industry Response

In response to the IARC cancer finding on glyphosate, Monsanto has objected strenuously. Monsanto's official position: "The 2A classification does not establish a link between glyphosate and an increase in cancer. "Probable" does not mean that glyphosate causes cancer and IARC's conclusion conflicts with the overwhelming consensus by regulatory bodies and science organizations around the world, like the U.S. EPA, which concluded that there is evidence of non-carcinogenicity." There no doubt will be industry supported efforts to undercut the finding of this respected scientific body of the World Health Organization. An assessment by the German Federal Institute for Risk Assessments (BfR), which takes the non-carcinogen position, is based almost solely on industry science and classified industry reports provided to it by the Glyphosate Task Force, an industry consortium led by Monsanto. Three scientists on Germany's scientific panel on pesticides work for the pesticide industry. BfR and IARC's findings have been released during a pivotal time, as a decision on whether to extend the license for glyphosate's use in Europe is currently pending, and these studies are sure to be incorporated into the decision making process. Meanwhile, glyphosate is being taken off the shelves by companies across Europe and member states are calling for the European Union to ban the chemical.

Glyphosate Under the Gun

World Health Organization Weighs In

by ANDRÉ LEU

The Lancet Oncology, the world's premier scientific journal for cancer studies, recently published a paper by the World Health Organization's International Agency for Research on Cancer (IARC) that has classified glyphosate (the active ingredient in Roundup) as a "probable carcinogenic," outlining several scientific studies showing that it causes a range of cancers including non-Hodgkin's lymphoma, renal cancers, skin cancers and pancreatic cancer.

Seventeen independent experts, with no conflicts of interest, from 11 countries met in March at the IARC headquarters in France to assess the carcinogenicity of tetrachlorvinphos, parathion, malathion, diazinon and glyphosate. All of these chemicals were given classifications for their ability to cause cancer based on published peer-reviewed scientific studies.

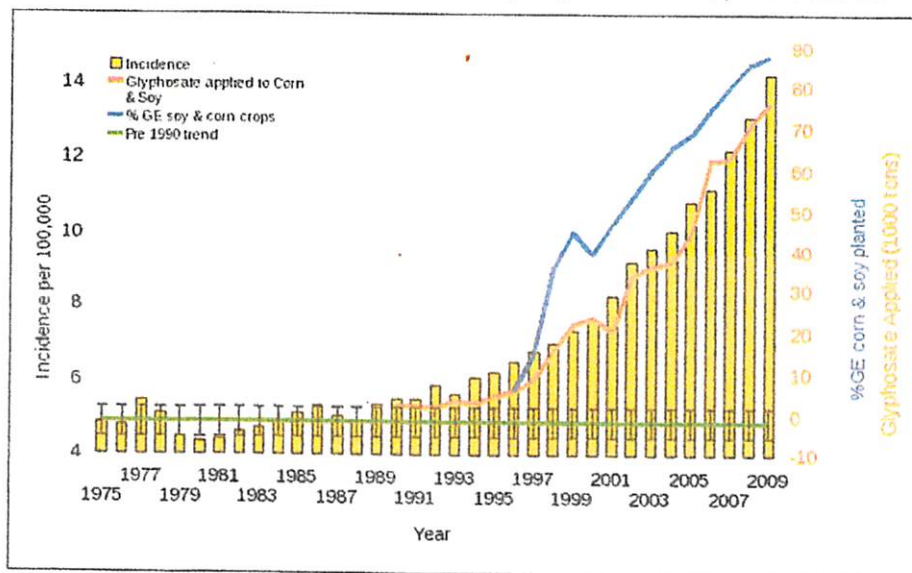
Glyphosate, the most common herbicide in the world, was given the second highest classification of 2A. IARC has five classifications for the carcinogenicity of substances:

- Group 1: Carcinogenic to humans
- Group 2A: Probably carcinogenic to humans
- Group 2B: Possibly carcinogenic to humans
- Group 3: Unclassifiable as to carcinogenicity in humans
- Group 4: Probably not carcinogenic to humans

Group 1 is for substances like tobacco, alcohol and benzene, cases where numerous scientific studies show that they cause cancer in humans. Only around 100 substances of more than 900 studied have been placed in this category.

THYROID CANCER INCIDENCE RATE (age adjusted)

Plotted against glyphosate applied to U.S. corn & soy crops ($R=0.988$, $p<=7.612e-09$) along with %GE corn & soy crops $R=0.9377$, $p<=2.152e-05$



SOURCES: USDA; NAAS; SEER

Group 2A is for substances where there is sufficient evidence of causing cancer in animals and limited studies in humans. According to IARC the 2A classification was because of "strong mechanistic evidence; for malathion and glyphosate, the mechanistic evidence provided independent support of the 2A classification based on evidence of carcinogenicity in humans and experimental animals."

There are other scientific studies linking glyphosate to breast cancer, thyroid cancer and liver cancers. Several animal and human studies have shown that glyphosate can cause cell damage, gene mutations and chromosomal aberrations. These types of genetic damage can be the precursors of cancer. A study published in 2004 found that glyphosate-based herbicides caused cell-cycle dysregulation. According to the researchers, "Cell-cycle dysregulation is a hallmark of tumor cells and human cancers. Failure in the cell-cycle checkpoints leads to genomic instability and subsequent development of cancers from the initial affected cell." The researchers tested several glyphosate-based

pesticides and found that all of them caused cell-cycle dysregulation.

A case-controlled study published in March 1999 by Swedish scientists Lennart Hardell and Mikael Eriksson showed that non-Hodgkin's lymphoma (NHL) is linked to exposure to a range of pesticides and herbicides, including glyphosate.

Research published in the peer-reviewed scientific journal *Food and Chemical Toxicology* in 2013 found that glyphosate at residue levels commonly found in people caused a five- to thirteenfold increase in the multiplication of estrogen-sensitive human breast cancer cells. This is a significant study as around 80 percent of breast cancers are estrogen-sensitive. Combined with the study showing that glyphosate causes cell-cycle dysregulation, it means that if precancerous damage causes an estrogen-sensitive breast tumor to develop, the cancer will rapidly multiply.

A peer-reviewed study into glyphosate and human health by Swanson et al. (I am one of the co-authors) found strong statistical correlations between the rapid increase in glyphosate and GMO crops and 22 diseases in the

United States, including cancers of the liver, kidney, bladder/urinary system and thyroid. Researchers also found correlations between pancreatic cancer incidence and deaths from acute myeloid leukemia.

Glyphosate use has increased dramatically since the introduction of Roundup Ready GMO crops. Since the introduction of GE seeds in 1996, the amount of glyphosate used on crops in the United States has increased from 27 million pounds in 1996 to 250 million pounds in 2009. Dr. Charles Benbrook, research professor at the Center for Sustaining Agriculture and Natural Resources, Washington State University, showed that there was a 527 million pound (239 million kilogram) increase in herbicide use in the United States between 1996 and 2011.

There are numerous studies linking glyphosate to multiple diseases, not just cancer. Some of the most concerning are many studies showing that it causes birth defects, adversely affects a large range of metabolic pathways and causes intestinal diseases such as botulism, salmonella, Crohn's disease, celiac disease, gluten intolerance and damage to key organs including the kidneys and liver. If you want more information on this, read my book *The Myths of Safe Pesticides*, which contains examples of scientific studies showing the numerous negative health effects of glyphosate.

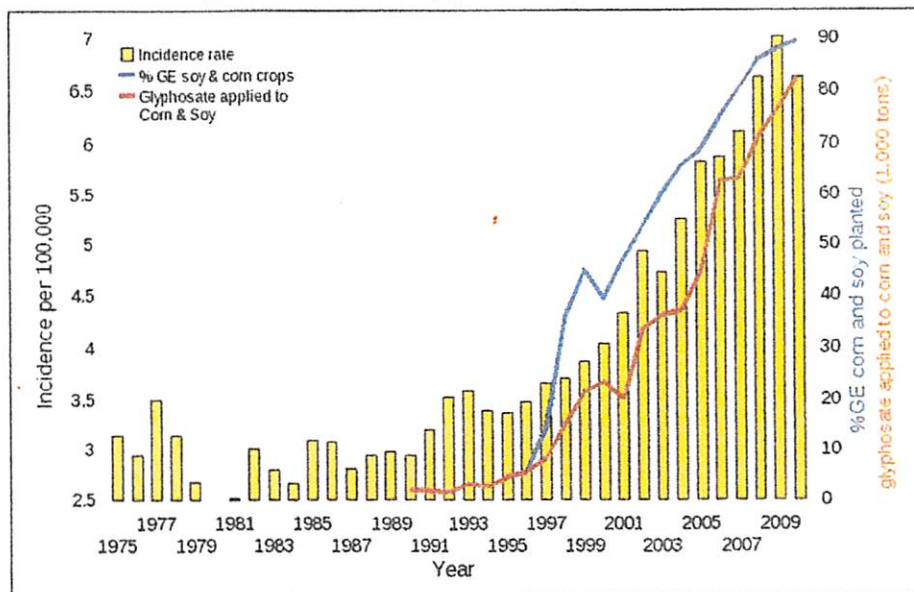
According to Reuters, March 24, 2015, Monsanto, the manufacturer of Roundup, is trying to put pressure on IARC to retract its findings on the basis that the scientific studies they used were "invalid." The company is seriously concerned as banning or restricting glyphosate would result in billions of dollars lost, and they will do everything to discredit this study by the world's most reputable authority on cancer.

Many in the scientific community feel the only studies that should be invalid are the ones provided by Monsanto, as they present a conflict of interest over the peer-reviewed studies conducted by independent scientists and researchers published in reputable journals.

It is good to see a credible scientific body using these independent scientific

URINARY/BLADDER CANCER INCIDENCE (AGE ADJUSTED)

Plotted against % GE corn and soy ($R=0.9449$, $p<=7.1e-06$) and glyphosate applied to corn and soy ($R=0.981$, $p<=4.702e-09$)



SOURCES: USDA; NASS; SEER. COURTESY OF DR. NANCY SWANSON

studies over the non-peer reviewed "commercial in confidence" studies provided by the manufacturers. Regulators such as the U.S. EPA tend to only use the manufacturers' studies rather than studies by independent researchers. These studies by the manufacturers are rarely available to the public as they are commercial in confidence. Concerned people in Europe are still fighting to get a copy of Monsanto's commercial in confidence study that was used by the European Union to increase the minimum risk levels (MRLs) for glyphosate.

Regulators need to use transparent systems based on studies published in open journals because we have a right to know what data is being used to make the decisions on the safety of chemicals, rather than the current closed system that can be seen as collusion between regulators and manufacturers.

Since the introduction of GE seeds in 1996, the amount of glyphosate used on crops in the United States has increased from 27 million pounds in 1996 to 250 million pounds in 2009.

Testing of glyphosate is a recent occurrence, and it is still not included in food pesticide residue studies such as the recent one published by the

USDA. Glyphosate and its degradation product, aminomethylphosphonic acid (AMPA), have been detected in the air, surface water, soil and sea water. These studies show that glyphosate and AMPA persist in the soil and water, and the amounts detected are increasing over time with increasing agricultural use. Glyphosate was frequently detected in water, rain and air in the Mississippi River basin with concentrations as high as 2.5 µg/L in agricultural areas in Mississippi and Iowa.

Because glyphosate is in air, water and food, humans are likely to be accumulating it in low doses over time. Glyphosate residues of up to 4.4 parts per million (ppm) have been detected

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phar. Still, he added, "There is hope; there's always hope."

In closing the conference, Eric Olson, senior strategic director for health and food at the Natural Resource Defense Council in Washington, D.C., said he held the most hope for the power of our individual stories partnered with strong science. "Teach around stories," Olson advised. Individuals who have been directly affected by issues will have the most powerful voices for policy change.

Melinda Hemmelgam, M.S., R.D., a.k.a. the "Food Sleuth," is a registered dietitian and award-winning writer, speaker and radio host based in Columbia, Missouri. She and her photographer husband created F.A.R.M.: Food, Art, Revolution Media – a Focus on Photography to Re-vitalize Agriculture and Strengthen Democracy, to increase awareness, appreciation and advocacy for organic farmers. Tune into Food Sleuth Radio at: www.kopn.org. Reach Melinda at: food-sleuth@gmail.com.

RESOURCES

Children's Environmental Health Network:

www.cehn.org

"Little Things Matter"

video: www.youtube.com/watch?v=E6KoMAbz1Bw

Pesticide Action Network of North America:

www.panna.org

What's on My Plate: www.whatsonmyfood.org

shows which pesticide residues are likely to be on our food.

A Generation in Jeopardy:

"How pesticides are undermining our children's health & intelligence:"

www.panna.org/publication/generation-in-jeopardy

U.S. Dietary Guidelines:

www.health.gov/dietaryguidelines/2015-scientific-report

The Myths of Safe

Pesticides by André Leu, available from Acres U.S.A.: www.acresusa.com/the-myths-of-safe-pesticides

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in stems, leaves and beans of glyphosate-resistant soy, indicating uptake of the herbicide into plant tissue. Reports from Germany of glyphosate in the urine of dairy cows, rabbits and humans ranged from 10-35 ppm. According to the study, "chronically ill humans had significantly higher glyphosate residues in urine than healthy humans." Furthermore, glyphosate residue levels in the tissues of the kidneys, liver, lung, spleen, muscles and intestines of the dissected cows were comparable to those found in the urine. This means that glyphosate is not being passed through the urine without affecting the organism and that meat and dairy are an additional source of dietary glyphosate for humans. Glyphosate has been found in human breast milk and is able to cross the placenta and damage human placental cells, raising massive concerns about its effects on the fetus and newborn children – one of the most vulnerable groups to minute levels of chemicals.

The classification of glyphosate with the second highest level of carcinogenicity by IARC means that its

RESOURCES

"Carcinogenicity of tetrachlorvinphos, parathion, malathion, diazinon, and glyphosate," *Lancet Oncology* 2015, published online March 20, 2015

The Myths of Safe Pesticides

by André Leu, Acres U.S.A.

Swanson, N L, Leu, A, Abrahamson, J and Wallet, B, **Genetically engineered crops, glyphosate and the deterioration of health in the United States of America,** *Journal of Organic Systems*, 9(2), 2014

widespread use in GMO crops, as a crop desiccant, in orchards, food production, in children's playgrounds, sidewalks, roadsides and in home gardens needs to stop. It is time this highly dangerous chemical was banned.

Farmer, author and international speaker and organic advocate André Leu is president of International Federation of Organic Agriculture Movements (IFOAM), www.ifoam.bio.



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