Why regulators conclude glyphosate safe while IARC, alone, claims it could cause cancer?

In March, the World Health Organization’s International Agency for Research on Cancer (IARC), issued a statement (also published in The Lancet) that re-classified glyphosate as “probably carcinogenic to humans”. It was a surprise to some in the scientific community because every major regulatory agency had determined that glyphosate, an herbicide often paired with genetically modified crops, was not carcinogenic. In fact, it’s lethal dosage measure is about that of common table salt. So why how did IARC reach such a classification? According to the IARC summary—the full report has not yet been released and may not be for months—because of:

Limited evidence of carcinogenicity in humans for non-Hodgkin lymphoma. The evidence in humans is from studies of exposures, mostly agricultural, in the USA, Canada, and Sweden published since 2001. In addition, there is convincing evidence that glyphosate also can cause cancer in laboratory animals.

Anti-GMO groups jumped on the report, led by anti-GMO crusader, NaturalNews.com, acting as point in a global campaign to ban glyphosate, which is better known as Monsanto’s Roundup (although it is widely sold in generic form).

In response to a recent International Agency for Research on Cancer report, which found that the Monsanto herbicide glyphosate “probably” causes cancer in humans, a cohort of international doctors is now petitioning the European Union Parliament, the EU Commission, and several other health and food safety authorities to take action by banning the use of this prolific chemical.

The website for Moms Against Monsanto declared that “Top Medical Journal, WHO Confirm: Monsanto’s Flagship Product Probably Causes Cancer.” Not to be outdone, Common Dreams declared “Glyphosate, Favored Chemical of Monsanto & Dow, Declared ‘Probable’ Source of Cancer for Humans.” Anti-GMO NGOs have been relentlessly flogging this report since. Even more scientifically oriented publications couldn’t resist overstepping in characterizing the review.

Scientific American declared “Widely used herbicide linked to cancer.” The science magazine had earlier published a post quoting a study by Gilles-Éric Séralini in an article entitled “Weed-Whacking Herbicide Proves Deadly to Human Cells.”

Some countries even took the IARC report to heart enough to suspend uses of glyphosate.

Comparing apples and Roundup

Does glyphosate pose a genuine danger to humans? The mainstream press has tried to separate the scare from the science, but it’s been a challenge because of the confusion of what IARC was evaluating.
and scientists in general assess the potential hazards and risks of chemicals. IARC does not evaluate actual human risks—a fact widely misunderstood by the public in general. Regulatory agencies do that. Rather, IARC looks at what is called “hazards”.

Note the focus of the IARC review. Quoting Nature’s summary:

The IARC review notes there is limited evidence for a link to cancer in humans. Although several studies have shown that people who work with the herbicide seem to be at increased risk of a cancer type called non-Hodgkin lymphoma, the report notes that a separate huge US study, the Agricultural Health Study, found no link to non-Hodgkin lymphomas. That study followed thousands of farmers and looked at whether they had increased risk of cancer.

But other evidence, including from animal studies, led the IARC to its ‘probably carcinogenic’ classification. Glyphosate has been linked to tumours in mice and rats — and there is also what the IARC classifies as ‘mechanistic evidence’, such as DNA damage to human cells from exposure to glyphosate.

Like glyphosate, almost anything can present a hazard, from the sun to chemicals to everyday foods like coffee depending upon exposure. British based Sense About Science just issued an explainer on the glyphosate controversy to help dispel the fog of confusion about what this review actually means. What is IARC, it asks?

The IARC is an agency of the World Health Organization (WHO) which aims to identify causes of cancer. It brings together groups of scientists to review scientific evidence in order to recognise chemicals, physical and biological agents, and lifestyle factors that can cause cancer in humans.

The IARC do not carry out a risk assessment but rather assess the potential of an agent to be carcinogenic. It does not take into consideration how much of or how commonly a risk it poses in the real world.

We’ve translated the IARC’s carcinogen list into something you can read here. Warning: You might be shocked…

What’s been overlooked is that the classification that IARC assigned glyphosate—a “2A, Probably carcinogenic to humans”—is the same classification the organization gave to grapefruit juice, fruits (including apples), and working the night shift. At least glyphosate didn’t rate a “1, carcinogenic to humans,” so it’s not as dangerous as sunlight, sunlamps, oral contraceptives, Chinese style salted fish and alcoholic beverages, among a long list.

When IARC comes to a determination of what may cause cancer, it combs through existing literature (which does raise the risk of cherry-picking studies that satisfy your point of view). But it’s assessing the hazard of a chemical. A hazard assessment simply states that a certain chemical, environmental element
or behavior is somehow related to cancer. It’ll then note whether something “is,” “is probable” or “is possible”, or “isn’t,” so far as we know.

What a hazard evaluation does not tell you is how likely you are to get cancer. That’s the domain of a risk assessment, which will use the same words—“is,” “probable” and “possible”—but in a different way. Here’s a very informative video explainer by Andrew Maynard, director of the Risk Innovation Lab at Arizona State University, that covers how IARC makes its hazard assessments:

**Risks versus hazards**

While a hazard just shows you that “somebody out there linked this to cancer,” a risk measures how likely you are going to come into contact with this hazard. So, in the case of apples and pears, IARC looked at the existence of amygdalin, or formaldehyde, both of which are considered class 1 carcinogens and occur naturally in apples. But apples contain 22 parts per million of formaldehyde, far below amounts necessary to cause cancer. In short, dose matters.

Likewise, a report trumpeted by Moms Across America, for example, claimed the existence of glyphosate in mother’s milk, but it was not actually a study and has been challenged by many scientists, most recently by researchers at Washington State University.

Most foods do contain certain chemicals that are associated with toxicity. But each chemical has a dosage curve showing how much ingestion is needed to cause harm, and most foods contain very low doses of these toxins. As the US Centers for Disease Control and Prevention states,

> Just because we can detect levels of an environmental chemical in a person’s blood or urine does not necessarily mean that the chemical will cause effects of disease.

This explains why IARC, a WHO subsidiary, can issue reports on cancer hazards, while the World Health Organization itself declares that the IARC study does not indicate a need for more regulation of glyphosate. In fact, several other government agencies, including the German government and (so far) US Environmental Protection Agency, have issued statements on the doses of glyphosate that cause harm and the low cancer risk of the popular and targeted weed-killer:

- The German Federal Institute for Risk Assessment re-examined data on glyphosate and declared that “the available data do not show carcinogenic or mutagenic properties of glyphosate nor that glyphosate is toxic to fertility, reproduction or embryonal/fetal development in laboratory animals.” The institute did find toxicity that originated from surfactants and other co-formulants used in the making of some glyphosate products.
- The EPA and other US agencies have considered glyphosate’s cancer risk to be low (the EPA declared glyphosate as noncarcinogenic in 1991), but the EPA is currently reviewing the chemical for weed resistance as well as other properties.
Sense About Science and other groups maintain that even as a hazard evaluation, IARC badly botched its job.

**Scientists** have criticised the IARC glyphosate assessment for numerous reasons:

- The selection of literature for reviewing was unbalanced and data has been ‘cherry picked’
- No new scientific evidence was included in this evaluation
- This classification is based mostly on animal studies and the report states that there is limited evidence of carcinogenicity in humans
- It contradicts the conclusions of several national regulatory agencies around the world that have reviewed the large body of glyphosate research and deemed it a safe herbicide

**…The dose makes the poison**

It’s important to remember that any chemical, whether natural or synthetic can hurt us if we consume too much of it. The dose is the crucial factor.

The responsibility of IARC and similar organizations doing hazard evaluations is to review the scientific literature (or sometimes conduct their own limited research) to classify the potential theoretical dangers that a chemical could pose—but not in real world usage. Then, it’s up to regulatory agencies using risk metrics to compare what’s known about toxic exposure levels of the hazard with actual exposure in humans or animals. It’s this assessment that informs us whether something might pose genuine health dangers, such as cancer.

So what does science tell us about glyphosate? It’s not carcinogenic and is safe as used. If you question that based on the IARC hazard study, perhaps you should consider advocating bans of grapefruits, apples or night shift work.

*Andrew Porterfield* is a writer, editor and communications consultant for academic institutions, companies and non-profits in the life sciences. *He is based in Camarillo, California. Follow [@AMPorterfield](https://twitter.com/AMPorterfield) on Twitter.*