Episode Title: Discussions on Glyphosate

Summary: Glyphosate, or better known as Roundup, is a controversial weed killer. Is it safe? Let's hear from Kaci Buhl, the Co-Chair of the Pesticide Educational Resources Collaborative, on the current state of knowledge about glyphosate.

Expert: Kaci Buhl

Episode Quote:

*"Just like with any pesticide product always **follow the label** and **lower exposure is lower risk.**"*

– Kaci Buhl PERC, Professor, Oregon State University in the College of Ag Sciences

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Transcript

00:10 A Proctor

Welcome to the FarmSafe Podcast brought to you by the Great Plains Center for Agricultural Health. In the blink of an eye, an injury can change your life and your farm forever. During each episode, we share first-hand stories and real-life tips for making safer and healthier decisions while on the farm.

Today, we have the privilege of sitting back down with Kaci Buhl, a pesticide expert who gave us some pesticide safety and handling tips an episode ago. Today, we are expanding on our previous interview with a new niche topic, glyphosate use.

Kaci, welcome back. Would you introduce yourself to our new listeners?

00:51 K Buhl

Thank you. I'm Kaci Buhl. I work at Oregon State University in Environmental and Molecular Toxicology where my primary responsibility is to train pesticide applicators, both before they're licensed and after they get licensed. I also work on the national project, called the Pesticide Educational Resources Collaborative, or PERC, which makes lots of educational resources available to applicators around the nation.

A Proctor

Fantastic! Thank you. And again, welcome back. Would you mind explaining what glyphosate is?

01:21 K Buhl

All right. Glyphosate is a weed killer, herbicide chemical, that has some pretty unique characteristics. It was developed and first registered in the 70s. It's known as an organophosphorus chemical, but it's not chemically related to the organophosphate insecticides— that's a common misconception. It works on a broad range of plants because it attacks the shikimic acid pathway, which is pretty universal in plants.

01:48 A Proctor

Thank you. I know when I was growing up, we had glyphosate in the garage just stored on the ground of the garage. What are reasons that someone may select glyphosate over a different herbicide?

02:00 K Buhl

Well, glyphosate has a couple things going for it. #1, it is broad spectrum activity, so it attacks both broad leaf plants and grassy plants and the sedges. So, having that broad activity makes it different from a lot of other herbicides that target either grassy species or broad leaf species. It's relatively cheap, it's relatively immobile. And the last reason I'll mention why someone would choose glyphosate is because it has that systemic activity where it can move several inches or feet from the shoots of a plant down to the roots of a plant, which makes it much more capable of attacking perennial weed species than other contact-style herbicides.

02:40 A Proctor

OK. So, it sounds like there's quite a few reasons somebody could consider using glyphosate over another herbicide, specifically finances. Things are expensive. You want to go with an effective product at the lowest cost.

K Buhl

Yes, and no other herbicide has all four of those characteristics.

A Proctor

To my understanding, glyphosate can be a hot topic in agriculture due to controversy surrounding the product's safety. What has caused it to become so controversial and elicit such strong emotions in people?

03:10 K Buhl

That's a really good question. Glyphosate was associated early on with its initial manufacturer, Monsanto. Monsanto, as a company doesn't exist anymore. It was purchased by Bayer some years ago. I think the public sentiment about the corporate behavior of Monsanto was transferred to, "if we don't like that, then we also don't like it's chemical, glyphosate." Now glyphosate is now owned by Bayer, but it kind of became famous at the same time as genetic modification was taking off in the 90s. Genetic modification to withstand glyphosate was one of the first genetic modifications to really take off in the marketplace. So, those people who were against genetically modifying our crops were also against glyphosate, even though they're kind of different issues, different topics. It was kind of wrapped into that other controversy. So now we have two controversies that are kind of associated with glyphosate, and then the next one is just that it is the most widely used herbicide in the nation and in the world. There are places in the United States that are treated with more than 100 lbs of active ingredient, glyphosate, per square mile. Quite a few places in the United States, according to the USGS. Anything that was applied to our landscape in those numbers at that volume is worthy of attention and scrutiny.

04:27 A Proctor

OK. So, it sounds like glyphosate came to be at an unfortunate time, with controversy surrounding Monsanto and then also genetic modification.

04:37 K Buhl

That's right. It's mode of action against the shikimic acid pathway, that's a pathway for protein synthesis that humans don't use, mammals don't use at all. It has very low acute toxicity to mammalian systems. It was kind of seen as a magic discovery that was so low in toxicity and had such broad activity.

04:58 A Proctor

The EPA, The Environmental Protection Agency, says that glyphosate is unlikely to be a human carcinogen, and the IARC (International Agency for Research on Cancer), says that glyphosate is probably carcinogenic to humans. At the Great Plains Center for Agricultural Health, we have done a deep dive into the basis for these decisions, which I will try and highlight from our team here:

In March of 2015, the International Agency for Research on Cancer (the IARC) classified glyphosate and glyphosate-based herbicides as "probably carcinogenic to humans," giving it the category of 2A. This means that there is limited evidence in human studies about the carcinogenicity of glyphosate, although there is a positive association observed for non-Hodgkin lymphoma in people. IARC did not find that there is sufficient evidence in experimental animals that glyphosate causes cancer; it also found that mechanistic data provided strong evidence of both chromosomal damage and oxidative stress, both in experimental animals and in human tissue. It is important to understand that the IARC's evaluation considered studies examining multiple formulations of glyphosate– including glyphosate-based herbicides and its major metabolite, AMPA. This assessment considered uses of exposure.

The EPA's 2017 evaluation of glyphosate, however, identified that they supported the conclusion that glyphosate is "not likely to be carcinogenic to humans." These assessments seemed to focus on the public exposure to glyphosate predominated by oral ingestion like food, water, and children accidentally exposing themselves from hand to mouth behavior. It also incorporated findings of the US Ag Health Study examining solid and non-solid tumors in pesticide application in farming communities, similar to the IARC.

However, the main differences between the IARC and the EPA reviews center on the differences in genotoxicity *studies considered in these evaluations: the EPA evaluated only studies of "technical" or "pure" glyphosate, where IARC included glyphosate-based herbicides that often contain a substantial amount (up to 25%) of compounds other than glyphosate in these mixes. We have provided a fairly good review article in the supplemental materials for this podcast for those that want to dig deeply into this point.*

We also see that the EPA's assessment identified the issue of the mandatory pesticide labeling. How important is following the label with respect to the EPA's cancer determination?

07:40 K Buhl

When the US EPA made its determination, it actually added a little bit at the end. They determined it unlikely to be a human carcinogen when used ***according to the label***. That's a really important caveat. They kind of assume that licensed applicators follow the label. They don't make the same assumption for non-licensed users, like folks who just kind of pick it up and think it's just like a fertilizer that you don't have to follow the label. It certainly is a pesticide— herbicides are pesticides, and you do have to follow the label.

A Proctor

Does the difference in rulings impact the agricultural communities' trust in health agencies?

08:19 K Buhl

It's not uncommon, since the ruling in 2015 for me to get questions like, "where can I get independent information about glyphosate and its risks?" Perhaps they don't trust the information coming out of the EPA because it disagreed with IARC. Conversely, I've heard others say they disagree with IARC because it doesn't agree with the EPA. In fact, that's not true. They don't disagree with each other. The IARC determination is saying yes, it can cause cancer under high exposure circumstances. There's nothing sinister in that disagreement. But I do think there's a perception of something sinister going on. But it's not just among the agricultural communities, it's even in the non-ag communities where certain communities have taken this step to try to ban glyphosate for use in public spaces.

09:05 A Proctor

Something that I've heard a lot regarding pesticide use since I entered the world of agricultural safety and health is **"The label is the law."** And you mentioned this a little bit when talking about the agencies' rulings that glyphosate is less likely to be carcinogenic when it's applied following the label.

Can you explain what this saying really means and how this relates to glyphosate?

09:27 K Buhl

Certainly. When we say, "The label is the law" in the United States, that means the whole risk assessment process for that chemical results in label statements. So, if the risk assessment finds that there's a risk to applicators, you might find a requirement for gloves, goggles, or a respirator. If the risk assessment finds that there is a risk for grazing animals after an application. Then you'll find grazing restrictions on the label. In that way, we make every label sort of specific to the product in a way that is intended to keep the user and the environment safe while using that product. The standard of safety is, quote, *"a reasonable certainty of no harm."*

10:10 A Proctor

OK, so when in doubt, always just follow the label on the back of the product that you're using.

K Buhl

That's right. Actually, it is legally required not just for licensed applicators, but for unlicensed applicators—our moms and pops that use pesticides around the house—are also bound to follow that label. You're probably notice if you pick one up, there's a statement on every pesticide label that says, "it's a violation of federal law to use this product in a manner inconsistent with its labeling." As soon as you start to use a product in a manner that's inconsistent with the label, you're operating outside the risk assessment. All of a sudden you cannot be assured of a reasonable certainty of no harm; you might be exposing yourself to a higher level of exposure than is intended or than was under the level of concern.

10:57 A Proctor

OK. Any other important labeling warnings important to protect the public from glyphosate exposures?

11:04 K Buhl

Requirements on the label that really drive down exposure are things like a plant back restriction after applying something like glyphosate. Maybe there's a period of time that you have to wait before you plant seeds in that soil. There's typically a very short one, if any, for glyphosate. Pre-harvest intervals are intended to let the pesticide break down in the field before you harvest the product and put it in storage. Each one of those requirements is so important to keeping the pesticide residue low at levels below concern. That's why it's not optional, you have to follow those label restrictions and if you don't, you can end up with residues on your crop that make it unsellable.

A Proctor

OK. Are there any environmental health concerns with using glyphosate?

11:47 K Buhl

Glyphosate was practically non-toxic to birds and fish. However, there is a surfactant that's known to be used widely in glyphosate products called POEA, and that additive is known to have major impacts on amphibian communities in particular.

12:05 A Proctor

So, I guess when considering all of the controversy that surrounds pesticides, but specifically glyphosate, what recommendations do you have for consumers who are at the grocery store and they know a little bit about pesticides, but they're still a little apprehensive about them. What recommendations do you have for them to put their minds at ease about the products that they're buying and consuming?

12:28 K Buhl

In keeping with recommendations from the FDA, I would recommend a widely diverse diet where you get fruits and vegetables, meats and dairy and all your fiber from a wide variety of sources. That way if any specific source had a high level of residue. It's not overrepresented in your diet. Avoiding any specific type of produce that, if it reduces your intake of produce, is a bad idea.

A Proctor

That's a good rule of thumb. Is there anything else you would like to add about glyphosate safety handling?

13:00 K Buhl

Just like with any pesticide product always follow the label and lower exposure is lower risk. As a landscape manager or a decision maker, when you're thinking about whether or not to use glyphosate, one of the factors you have to consider is how your customers or your clients, the users of the land, may consider the risk. But also consider the impacts of alternatives. If you decide that you're going to remove weeds by hand along a fence line, for example, take into account the increased risk of back injury and skin cancer caused by the additional labor that you're inputting in that space. So, make sure you're considering all the risks as you make your decisions. And don't be afraid to do some extra education and engagement with your customers to find out what those concerns really are and address them verbally, so you don't have to just kind of live with the specter of the concern. Don't run from the data because the data is what backs up everything we do.

A Proctor

Thanks again, Kaci. We have appreciated your time on the podcast, and we will remind our listeners to check out the resources with this episode, and to read and follow the label when using pesticides.

We want to hear from you. Share your stories about health and safety issues on the farm, about injuries that have made you change the way you work, or about the ways you keep yourself and others safe on your farm. Also, let us know if there’s questions you have or topics that you want to hear about on the air. You can visit our website, gpcah.org or email us.

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Episode Resources

- Revised Glyphosate Issue Paper: Evaluation of Carcinogenic Potential, EPA
- Genotoxicity of Glyphosate-Based Herbicides, Charles M. Benbrook
- IARC Monographs On the Identification of Carcinogenic Hazards to Humans

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