

## Is Glyphosate a Carcinogen? And Bacon too!

By Scott Oneto, Farm Advisor, University of California Cooperative Extension

Last year, the International Agency for Research on Cancer (IARC) made a determination that glyphosate...the active ingredient in Roundup® and other similar herbicide products...“is **probably** a human carcinogen.” IARC placed the herbicide in its 2A...probable human carcinogen...group along with other compounds such as grapefruit juice, apples, UV light, red meat, some occupations including hair dressers and those jobs that include working a night shift. IARC’s determination of listing glyphosate as a probable carcinogen was based on “limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals.”

*How does IARC make a determination?* IARC has a team of scientists from around the world that searches through existing literature to evaluate scientific research that has been conducted on a specific chemical, product, occupation, etc. It is important to point out that IARC’s conclusions are based on assessing the hazard. A hazard assessment simply states that a certain chemical, environmental element or behavior is somehow related to cancer. IARC will then make a determination whether something “is,” “is probable,” “is possible,” or “isn’t,” carcinogenic. This type of hazard evaluation does not tell you how likely you are to get cancer. That’s done by a risk assessment, which will use the same words—“is,” “probable” and “possible”—but in a very different way. Risk is a measure of toxicity and exposure. A certain product may be very carcinogenic but if you are not exposed to it or if you are exposed to at very low levels, your risk of getting cancer will be low.

Take bacon and other processed meats. IARC recently classified these as category 1, “carcinogenic to humans.” Does this mean we should all stop eating hot dogs, salami and bacon? Perhaps, if this is all you ate. But when consumed in moderation, your exposure is low, conversely your risk is low.

In response to the IARC decision on glyphosate, California Environmental Protection Agency’s Office of Environmental Health Hazard Assessment (OEHHA) published a notice announcing its intent to list the herbicide as a carcinogen under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Prop 65). Prior to doing this, OEHHA announced a public comment period. The comment period for this decision closed this past October. OEHHA’s decision is forthcoming.

Reaction to the IARC determination and the potential Prop 65 listing was significant. People on both sides of the fence...pesticide advocates and pesticide opponents...were asking the question, *Should we stop using glyphosate?* In order to answer this question, it’s valuable to consider the following...

First, IARC’s determination of “limited evidence” of human carcinogenicity was based on information provided by epidemiological studies. These studies used questionnaires given to farmers and their families in North America and Europe to look for a link between chemical exposure and cancer. Epidemiological studies can reveal if there’s a positive association...or correlation... between exposure to the agent and cancer, but they can’t be used to determine the cause of the cancers. They also can’t completely rule out other explanations such as chance or bias. Additionally, these studies have limitations such as the accuracy of self-reported information and the effect that exposure to other

substances...including other pesticides...might have on cancer incidence. In short, these types of studies can identify a correlation, but they don't establish a direct link or causality.

IARC's determination was also based on "sufficient evidence" of carcinogenicity in lab animals, but not all of the studies in the assessment revealed a carcinogenic link. Only four of the seven chronic feeding studies used in the IARC assessment found a relationship between glyphosate and cancer. One of those studies...a 24-month feeding study where kidney tumors in mice were determined to be glyphosate-related...was re-evaluated by the USEPA in 1991. When the USEPA first reviewed this study in 1985, they were in agreement that the observed renal kidney tumors were caused by glyphosate exposure. However, the later re-evaluation cast doubt on the statistical significance of the researcher's initial conclusion. Eventually, it was the judgment of the reviewing pathologists that the kidney tumors were not treatment-related. The IARC pathologists, however, did not agree with the USEPA's conclusion and included this study in their 2015 assessment.

Toxicological risks must be assessed by looking at both toxicity...or in this case carcinogenicity...and exposure. The assessment cannot be made solely by asking the question, *is the substance a carcinogen?* While several of the animal feeding studies in the IARC assessment demonstrated a positive relationship between glyphosate exposure and cancer, the concentrations in those tests were higher than what an herbicide applicator would experience in the field. Even if one ignores the fact that oral exposures are highly improbable for applicators, the dosages themselves are atypical for actual herbicide use scenarios. Depending on the study that's examined, the tumor-causing dosages were from 30 to 30,000 parts per million. Using these dosages, a man weighing 175 pounds would have to drink more than a quarter tablespoon to slightly more than 1 gallon of herbicide every day for 2 years to have an exposure that's equivalent to that of the lab animals'.

As more research is done, it's a certainty that many more substances...some of which we are commonly exposed to in everyday life...will be identified as carcinogens. The recent inclusion of bacon and other processed meats on IARC's Group I list for known human carcinogens is evidence of this. When considering these types of determinations, it's critical to remember that the amount and duration of exposure must also be considered, not just the fact that the chemical made it "on the list." Perhaps the best advice regarding this fact can be found on the website of the American Cancer Society. *Even if a substance or exposure is known or suspected to cause cancer, this does not necessarily mean that it can or should be avoided at all costs. For example, estrogen is a known carcinogen that occurs naturally in the body. Exposure to ultraviolet (UV) radiation from sunlight is also known to cause cancer, but it's not practical (or advisable) to completely avoid the sun. (American Cancer Society website 2015).*

As to the question, *should we stop using glyphosate?* the answer...yet again...leads us back to exposure. If exposure is low, risk will also be low. I am a strong advocate for non-chemical weed control strategies, but I also like to have access to a wide assortment of tools in the toolbox and believe that herbicides do have a place in agriculture.

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**Prop 65 Warning Sign:** One important disadvantage of this sign is that it alerts you to the presence of a carcinogen or reproductive toxicant, but it provides no information on the level of exposure that puts you at risk.