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Exposure to Glyphosate, Chemical Found in Weed Killers, Increased Over 23 Years

Analyzing samples from a prospective study, University of California San Diego School of Medicine researchers found that human exposure to glyphosate, a chemical widely found in weed killers, has increased approximately 500 percent since the introduction of genetically modified crops.

“The data compares excretion levels of glyphosate and its metabolite aminomethylphosphonic acid in the human body over a 23-year time span, starting in 1993, just before the introduction of genetically modified crops into the United States,” said Paul J. Mills, PhD, UC San Diego School of Medicine professor of Family Medicine and Public Health and director of the Center of Excellence for Research and Training in Integrative Health.

Glyphosate is a key ingredient in the herbicide brand Roundup. Use of this herbicide has increased approximately 15-fold since 1994, when genetically modified “Roundup Ready” glyphosate-tolerant crops were introduced. Historically, it is used on genetically modified soy and corn, but it is also sprayed on a substantial portion of wheat and oats grown in the U.S., said Mills.

“Our exposure to these chemicals has increased significantly over the years but most people are unaware that they are consuming them through their diet.”

In a paper published in the journal *JAMA* on October 24, Mills and a team of researchers compared urine excretion levels of glyphosate and aminomethylphosphonic acid (AMPA) in 100 people living in a Southern California community who provided samples during five clinic visits that took place between 1993 to 1996 and 2014 to 2016. Samples were extracted from the [Rancho Bernardo Study of Healthy Aging \(RBS\)](#), a prospective population-based investigation started by Elizabeth Barrett-Connor, MD, Distinguished Professor of Family Medicine and Public Health at UC San Diego School of Medicine and a co-author of the study.

“What we saw was that prior to the introduction of genetically modified foods, very few people had detectable levels of glyphosate,” said Mills. “As of 2016, 70 percent of the study cohort had detectable levels.”

Of study participants with detectable amounts of these chemicals, the mean level of glyphosate increased from 0.203 µg/L in 1993-1996 to 0.449 µg/L in 2014-2016. The mean level of AMPA went from 0.168 µg/L in 1993-1996 to 0.401µg/L in 2014 to 2016.

In July, glyphosate was listed by California as a carcinogen. As exposure to this chemical has increased, interest in how much risk it poses to human health and what exposure levels are safe has become a topic of ongoing debate.

There are few human studies on the effects of glyphosate, but animal studies demonstrate that chronic exposure to glyphosate-based herbicides can have adverse effects, said Mills. The authors point to other studies in which consistently feeding animals an ultra-low dosage of glyphosate resulted in liver disorders similar to nonalcoholic fatty liver disease in humans.

Mills said there is an urgent need for studies to thoroughly examine the impact on human health of the increasing exposure to glyphosate from the foods people eat.

The [Herbicide Awareness & Research Project](#), an ongoing UC San Diego research program through which individuals can get their glyphosate level determined, will be looking more deeply into the RBS study to examine potential longitudinal associations with glyphosate exposure and clinically-relevant outcomes.

“The public needs to be better informed of the potential risks of the numerous herbicides sprayed onto our food supply so that we can make educated decisions on when we need to reduce or eliminate exposure to potentially harmful compounds,” said Mills.

Co-authors include: Izabela Kania-Korwel, John Fagan, Linda K. McEvoy, and Gail A. Laughlin, UC San Diego.

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