

ABSTRACT

The herbicide glyphosate has rapidly become the most commonly used agricultural chemical. Worldwide glyphosate use rose more than 12-fold in the last two decades, from 150 million pounds in 1995 to nearly 2 billion pounds in 2014. Recent epidemiologic research suggests that exposure to glyphosate may lead to negative pregnancy outcomes, especially pre-term birth. Despite glyphosate's widespread use and potential toxicity, very little research exists to quantify human exposure to this chemical. The purpose of this study is to measure long-term glyphosate exposure in pregnant women and determine how much of that exposure comes from agricultural and dietary sources. We hypothesize that living near glyphosate-treated agricultural fields and consuming conventional diets results in higher glyphosate exposure. We recruited 40 women from whom we will collect over 1,400 urine samples throughout their pregnancies. We will measure each sample's glyphosate level to evaluate its potential relationship with residential proximity to agriculture and dietary choices. Here, we aim to describe challenges and opportunities in conducting human subjects research in a vulnerable population of low-income pregnant women -- particularly during a global pandemic. Challenges included revising recruitment and sample collection protocols to eliminate "in person" contact; developing new processes to adapt to major heat waves that could potentially damage samples; and maintaining contact with hard-to-reach populations who were often dealing with housing insecurity. Opportunities included the collection of real-world data; the chance to provide food and financial assistance to study participants; and -- perhaps surprisingly -- the potential to build unique connections and relationships with those participants.

BACKGROUND

- The weed-killer glyphosate is the single most commonly used agricultural chemical in the world
- Available data on glyphosate exposure levels in human populations is extremely limited
- Previous research (Silver et. al., 2021) suggests that pregnant women may be a particularly vulnerable population, as glyphosate exposure during pregnancy has been linked with preterm births



HYPOTHESES

- Pregnant women who live closer to agriculture experience increased glyphosate exposure.
- Consumption of an "organic" diet (grown without use of most synthetic pesticides, including glyphosate) can reduce glyphosate exposure among pregnant women.

METHODS OVERVIEW

This study included 40 pregnant women living in rural and agricultural regions of Idaho who were recruited during their first trimester. We will collect up to 36 individual spot urine samples (over 1,400 samples total) throughout their pregnancies in order to estimate longitudinal glyphosate exposure. Our methodology involved the following:

- Recruitment
- Sample collection
- Lab work
- Dietary intervention



RECRUITMENT

- Participants were recruited through a partnership with Women, Infants and Children (WIC) clinics
- Informed consent were obtained (in Spanish or English, as appropriate)
- Questionnaires determined demographics and general pesticide exposure
- Initial urine samples were obtained

Certain aspects of our recruitment process were hindered by the Covid-19 pandemic.

- Inability to meet in person resulted in decreased connection with subjects
- The recruitment process had to be conducted through phone calls made from a vehicle outside participants' houses as well as YouTube videos.

**What does this look like?
Check out one of our
YouTube videos here:**



IN-LAB ANALYSIS

- Analysis included measuring various features of each sample, such as their specific gravity; keeping track of sample collection on a chain of custody; and recording all information in a locked database.
- Aliquots were stored for future testing by the CDC as well as potential future analysis



DISCUSSION

Challenges

- Changes to various processes and phases of the study were necessary due to the Covid-19 pandemic as well as unexpected heat waves in the summer
- Maintaining contact with populations who were dealing with housing insecurity, family complications, etc.
- Working with corporations such as Albertsons to conduct parts of the study
- Traveling to often remote locations, and sometimes to stores or gas stations in order to make contact with participants
- Navigating texting; being able to maintain subject participation without overwhelming participants

Opportunities

- We successfully recruited 40 study participants and thus far have collected over 350 weekly samples, and 531 daily samples, for a total of 881 samples
- Opportunity to provide food and financial aid to study participants in the form of gift cards and Albertsons' groceries
- Crafted unique human connections and relationships with study participants as well as other individuals involved in the process of this study

Jun 27, 2021 1:03 PM

Thank you so much for all the gift cards and the formula!! 🙏🙏🙏
❤️❤️ Really appreciate it, it's lot of help!! So grateful!!!

1:03 PM

BIOLOGICAL SAMPLES

Design: Collect urine samples from participants living across southern Idaho, from Fruitland to Burley. This involved driving to participants' homes at a daily to weekly frequency to collect urine samples, which participants would leave outside in coolers.

Considerations

- Sudden heat waves may alter glyphosate levels
- Need to connect with vulnerable populations dealing with challenges such as food and housing insecurity
- Navigating real time communication with participants



DIETARY INTERVENTION

- Participants consumed a conventional diet, non-organic diet for a week and an organic diet for a week
- Participants received an allowance of \$150/week and used Albertsons' accounts created by our research team with which they ordered the diet-specific food
- Food purchases were confirmed by our team and compliance was further monitored with a "food diary"
- During this intervention, sample collection was conducted daily and we navigated complications in food orders and deliveries.
- Interim Progress: During this part of the study, we collected 531 out of a max possible 546 daily samples for a 98% compliance rate.

