The Heartland Study
Supporting Children's Health in the Heartland - and Beyond

www.heartlandstudy.org
Why the Heartland Study?

- Resistant weeds are driving steep increases in herbicide use on corn and soybeans in the Midwest – doubled since 2003!
- 2,4-D and dicamba -- two older high-risk herbicides -- account for much of the recent increase, with more growth to come.
- Epidemiological and biomonitoring data suggest prenatal herbicide exposures can cause adverse reproductive and birth outcomes.

- Widely used herbicides may be triggering heritable epigenetic changes that impair development or increase the risk of adult-onset disease.

**Epigenetics** = changes in gene expression caused by environmental or behavioral factors that can make an individual, or their offspring, prone to certain diseases or other health problems.
A Broader Impact?

Conventional, GE-based weed management system technology on major row crops is failing, and most everyone paying attention knows it. But what comes next?

Heartland Study science could help inform actions by farmers, political leaders, and federal agencies when, and if, efforts to mitigate known public-health threats gain traction.
Where:
13-State Study Region

Our Scientists

The Heartland Study is made up of doctors and scientists who came together around a shared concern that herbicide exposure may be affecting pregnancy outcomes, children's development, and even future generations.

The 12 state Midwest Region plus Arkansas, where resistant weeds have led to heavy reliance on ExTendimax seeds.
Heartland Study (HS) Goals

• Track changes in Midwestern herbicide use – all 18 metrics!

• Conduct a hospital-based research project across the 13-state Heartland Study area that will:
  • Measure herbicide levels in the urine and blood of 2,000 pregnant women living in the Midwest.
  • Track herbicide levels in babies born to women enrolled in the HS, and children’s development through at least age 3.
  • Determine whether relatively high herbicide exposures are associated with more frequent or more serious adverse reproductive outcomes, developmental problems, or epigenetic changes.
Study Design

**CLINICAL RESEARCH**

2,000 mother-infant pairs will be enrolled in the HS at ~8 hospitals across the Midwest.

HS biosamples and data will track pregnancy outcomes, birth defects, and children’s development. Focus on IQ, ADHD, autism, motor skills.

**RESEARCH COLLABORATIONS**

HS is supporting multiple research partners advancing the science accessible to study the health impacts of herbicide use.

Topics include herbicide use, trends in human exposure, microbiome impacts, and epigenetic changes.

**OUTREACH & COMMUNICATIONS**

Utilize modern and effective tools to publish and share science on the health impacts of herbicide exposure.

Promote alternative weed management strategies to help guide and drive weed management system change.
Research Collaborations

Global Glyphosate Study

• Support the Global Glyphosate Study (GGS) at the Ramazzini Institute in Italy, a worldwide leader on environmental toxicity.

• HS-funded work at the Ramazzini includes addition of a common, US Roundup formulation with POEA surfactants in all three components of the GGS – animal cancer bioassay, genotoxicity assays, reproduction/development studies.

Epigenetic Markers of Glyphosate Exposure

• In animal studies, glyphosate exposure has been linked to heritable epigenetic changes and disease in offspring.*

• Kings College team will identify epigenetic markers possibly linking glyphosate to adult-onset disease.

• Biospecimens from Heartland Study mother-infant pairs will be securely stored so that future scientists can use HS samples and data to study for epigenetic impacts.

*See “Glyphosate: A Gene Changer”
https://prezi.com/view/aNO8OS8MIE2hn98yDCuV/
More Research Collabs

**Herbicide Biomonitoring**

- Partner with CDC, NHANES, and other public and private partners to identify, access, and test stored urine samples.
- Apply the latest analytical methods to measure key, HS herbicides (glyphosate, dicamba, 2,4-D, glufosinate) in frozen urine and blood samples collected since the early 1990s, as well as HS mother-infant pairs, to establish levels and trends in human exposures.

**Herbicide Use**

- Analyze USDA herbicide use data to better understand trends and future projections.
- Identify weed management system alternatives, and their impacts on herbicide use and exposures in humans.
Help Grow the Heartland Study

We are 100% privately funded – foundations and individuals.

Please help us assure that the HS is able to tap cutting-edge scientific tools in our search for ways to keep moms and babies healthy, alongside prosperous farms and farmers throughout the Midwest.

Donate at heartlandstudy.org/donate