Trends in Exposure to 2,4-D and Glyphosate-Based Herbicides and Associations with Birth Outcomes in a Midwest Birth Cohort

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Presenter Disclosures

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1. The following personal financial relationships with commercial interests relevant to this presentation existed during the past 24 months:

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Results of Two Studies

• 2,4-D Exposure Study.
• Nested case control study of associations between herbicide exposure and preterm birth.
What is 2,4-D?

• Phenoxy herbicide contained in more than 600 products with agricultural and non-agricultural applications.

• Water soluble and non-persistent environmentally and biologically.

• In the Agricultural Health Study (1993-1997), farmers were highly exposed pre- and post- application (72% and 100%).

• Spouses and children also had high rates of exposure (41% and 62%).

• Exposure found to be common in non-agricultural contexts.
Changes in Herbicide Use Since 1996

Percent Acres Treated with Glyphosate

https://doi.org/10.1186/s12940-021-00815-x
Impact on Use of 2,4-D

Percent Acres Treated with 2,4-D

- Soybeans
- Cotton

Pounds Applied of 2,4-D

- Soybeans
- Cotton

https://doi.org/10.1186/s12940-021-00815-x
2,4-D Exposure Study

- 6 NHANES Cycles:
  - 2001-2002
  - 2003-2004
  - 2007-2008
  - 2009-2010
  - 2011-2012
  - 2013-2014

- 14,395 participants with 2,4-D biomarker data

- Exposure: Average pounds of 2,4-D applied

- Outcome categories based on the highest LOD across all cycles:
  - Low Exposure: below the LOD in any cycle
  - High Exposure: above the LOD in all cycles
Results

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nuMoM2b
Nested Case Control Study

nuMoM2b:
NIH Funded
Birth Cohort Study

Focused on
Midwestern
Study Sites

Biomarkers of
exposure to
herbicides in
first trimester
urine samples

preterm birth
cases, controls
What Exposures?

Herbicide Products:
• Glyphosate
• Glufosinate

Environmental Degradates:
• Aminomethylphosphonic Acid (AMPA)
• 3-(methylphosphinico)propionic acid (3-MPPA)
Limitations

• Single biomarker measurement
• Single exposure window
• Relatively small sample size
Research Context

• PEES – Indiana
• PROTECT – Puerto Rico
• TIDES – Multicenter (CA, MN, WA)
• nuMoM2b – Multicenter (OH, IN, IL)
Conclusions

• Herbicide use is up and expected to continue to rise.
• Herbicide exposure appears to be increasing.
• Mounting evidence of reproductive impacts.
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References

Photo Attribution