Impact of Pesticide Exposure on Cognition and Health in Children

Patricia Moulton, Ph.D. & Thomas Petros, Ph.D.
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Center for Rural Health

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  – Community Development & Technical Assistance
  – Native American Health
  – Rural Health Workforce
  – Rural Health Research
  – Rural Health Policy
• Web site: http://medicine.nodak.edu/crh
Pesticide Research Team

UND Faculty
Thomas Petros
Patricia Moulton
Ric Ferraro
Sally Pyle
Sue Offutt
Steve Hawthorne
Ruth Paur

CDC Pesticide Laboratory
Dana Barr
Charles Dodson
Ralph Whitehead

Phlebotomists
Sandie Antonson
Kristi Grove
Tara Johnso
Dawn Korynta
Naomi Sterf
Tara Waldal

Graduate Students
Holly Dannewitz
Matt Garlinghouse
Shyla Muse
Matthew Myrvik
Anna Marie Carlson
Jason Douglas
Patrick Kerr
Karyn Plumm
Kristi Sather
Caitlin Schultz
Jen Short

Undergraduate Students
Cassandra Lee
Silje Lynne
Ashley Olson
Bethany Reuter
Christine Wegner
Catherine Woell

What are Pesticides?

• Herbicides
• Insecticides
• Rodenticides
• Fungicides
Pesticide Exposure and Children

Pesticide Exposure and Cognitive Ability in Children
Objectives of Current Study

1. Examine the impact of chronic routine exposure to pesticides on cognitive and motor performance in children between 7 and 12 years of age, including memory performance, executive function performance, motor performance, and performance on school-related achievement tests.

2. Measure the concentration of several pesticides and cholinesterase in the blood or urine in children between 7 and 12 years of age and examine associations between pesticide and cholinesterase concentration and cognitive and motor performance.

Red River Valley
# Participants

**Pesticide Group** = 64 children and their parents living on or next to an active farm or field

**Control Group** = 64 Children and their parents living at least one mile from an active farm or field

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# Measurements - Children

## Physiological

- Height and Weight
- Blood and Urine: pesticides, cholinesterase, trace minerals

## Motor

- Grooved Pegboard Test
- Benton Visual Retention Test
- Finger Tapping Test
- Hand-eye Coordination Test

## Cognitive

- WISC-IV
- CVLT-C
- Verbal Fluency Test
- CPT
- WCST
- WIAT- 2nd ed: Reading & Listening Comprehension
## Measurements - Parents

<table>
<thead>
<tr>
<th>Cognitive</th>
<th>Behavioral</th>
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<tbody>
<tr>
<td>WAIS-III Vocabulary &amp; Block Design</td>
<td>CBCL</td>
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<tr>
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<td>ADHD Rating Scale-IV</td>
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<table>
<thead>
<tr>
<th>Nutritional Status</th>
<th>Developmental</th>
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<tbody>
<tr>
<td>NIH Diet History Questionnaire</td>
<td>Tanner Pubertal Development Test</td>
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<td>Food Security module</td>
<td>Developmental Milestones</td>
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<tr>
<td>24-Hour Dietary Recall</td>
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<thead>
<tr>
<th>Environmental</th>
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<tbody>
<tr>
<td>Pesticide use and exposure questionnaire</td>
<td></td>
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<tr>
<td>Surveys on family and child medical history,</td>
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<td>sleep, occupation, income, education level</td>
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## Measurements - Teachers

<table>
<thead>
<tr>
<th>Behavioral</th>
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<tr>
<td>Teacher Report Form for CBCL</td>
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<tr>
<td>Teacher Report Form for ADHD Rating Scale-IV</td>
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Preliminary Results

Child Demographics

- Average Age: 9.22 for Pesticide, 9.44 for Control
- Average Grade: 3.39 for Pesticide, 3.56 for Control
Cholinesterase Concentrations

Child IQ Composite Scores
Verbal Comprehension Scores

- Comprehension: 9.86, 11.01
- Vocabulary: 9.75, 10.72
- Similarities: 9.67, 11.17

Perceptual Reasoning Scores

- Matrix Reasoning: 10.47, 10.97
- Picture Concepts: 10.88, 11.03
- Block Design: 10.96, 10.84
Working Memory Scores

- Letter-Number Sequence
  - Pesticide: 10.54
  - Control: 9.7

- Digit Span
  - Pesticide: 9.69
  - Control: 9.66

Processing Speed Scores

- Symbol Search
  - Pesticide: 8.72
  - Control: 8.55

- Coding
  - Pesticide: 9.61
  - Control: 10.54
Parents Estimated Full Scale IQ

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<tr>
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<th>Estimated Full Scale IQ</th>
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<tbody>
<tr>
<td>Pesticide</td>
<td>106.06</td>
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<tr>
<td>Control</td>
<td>107.05</td>
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Exposure Reduction Strategies

- Get informed at the National Pesticide Information Center at npic.orst.edu and at Toxtown toxtown.nlm.nih.gov.
- Co-exist by using universal precautions and preventing contact between chemicals and children.
- Replace chemicals with safer ones or use toxic chemicals as a last resort.
- Follow manufacturer’s instructions to help reduce overall exposure.
For more information contact:

Center for Rural Health
University of North Dakota
School of Medicine and Health Sciences
Grand Forks, ND 58202-9037

Tel: (701) 777-3848
Fax: (701) 777-6779

http://medicine.nodak.edu/crh

Connecting resources and knowledge to strengthen the health of people in rural communities.