Pesticide Exposure, Intelligence and Children: Preliminary Results
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Center for Rural Health
• Established in 1980, at the University of North Dakota School of Medicine and Health Sciences in Grand Forks, ND
• Focuses on:
  – Education, Training, & Resource Awareness
  – Community Development & Technical Assistance
  – Native American Health
  – Rural Health Workforce
  – Rural Health Research
  – Rural Health Policy
• Web site: http://medicine.nodak.edu/crh
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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
Pesticides in North Dakota

Participants

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

Control Group = 68 Children and their parents living at least one mile from an active farm or field

Research participants needed for a study examining the impact of pesticides on cognition in children ages 7-12.

Call Dr. Patrice Moultan at 701-777-6781 for more information.
## 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
- Wechsler Intelligence Scale for Children-IV
- California Verbal Learning Test for Children
- Verbal Fluency Test
- Continuous Performance Test
- Wisconsin Card Sorting Test
- Wechsler Individual Achievement Test- 2nd ed- Reading & Listening Comprehension

## Measurements- Parents

### Cognitive
- Wechsler Adult Intelligence Scale-III
  - Vocabulary & Block Design

### Behavioral
- Child Behavior Checklist
- ADHD Rating Scale-IV

### Nutritional Status
- NIH Diet History Questionnaire
- Food Security module
- 24-Hour Dietary Recall

### Developmental
- Tanner Pubertal Development Test
- Developmental Milestones

### Environmental
- Pesticide use and exposure questionnaire
- Surveys on family and child medical history, sleep, occupation, income, education level
Measurements - Teachers

Behavioral

Teacher Report Form for Child Behavior Checklist
Teacher Report Form for ADHD Rating Scale-IV

Preliminary Intelligence Test Results
### Child IQ Composite Scores

<table>
<thead>
<tr>
<th></th>
<th>Pesticide</th>
<th>Control</th>
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</thead>
<tbody>
<tr>
<td>Processing Speed Index</td>
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<tr>
<td>Working Memory Index</td>
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<tr>
<td>Perceptual Reasoning Index</td>
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<tr>
<td>Verbal Comprehension Index</td>
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### Verbal Comprehension Scores

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<tr>
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<tr>
<td>Vocabulary</td>
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Perceptual Reasoning Scores

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<td>Matrix Reasoning</td>
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<tr>
<td>Picture Concepts</td>
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<tr>
<td>Block Design</td>
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</table>

Scaled Scores

Working Memory Scores

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Letter-Number</td>
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<tr>
<td>Sequence</td>
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</tr>
<tr>
<td>Digit Span</td>
<td>9.66</td>
<td>10.54</td>
</tr>
</tbody>
</table>

Scaled Scores
## Processing Speed Scores

- **Symbol Search**
  - Pesticide: 9.61
  - Control: 10.54

- **Coding**
  - Pesticide: 8.55
  - Control: 8.72

### Scaled Scores
- Pesticide
- Control

## Parents Estimated Full Scale IQ

- **Pesticide**
  - Estimated FSIQ: 107.71
  - SES: 33.46

- **Control**
  - Estimated FSIQ: 108.19
  - SES: 32.44
Preliminary Biological Measurements

Cholinesterase Concentrations

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<thead>
<tr>
<th></th>
<th>ACHE</th>
<th>PChE*</th>
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<tbody>
<tr>
<td>Pesticide</td>
<td>4.38</td>
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<td>Control</td>
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<td>Adult Blood Bank Donors</td>
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**Acute Pesticide Analysis (Means)**

<table>
<thead>
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<td>2,4-D</td>
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<tr>
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<td>Deet</td>
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**Acute Pesticide Analysis (Corrected Means)**

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Preliminary Conclusions

• A decrease in IQ was found in children living in areas of a great amount of pesticide use.
• This decrease was independent of parents IQ and their socio-economic status.
• There is evidence of exposure to pesticides based on acute urine measurements.
• Once the chronic blood pesticide measurements are available we will have a clearer picture.

For more information contact:
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