Measuring Pesticide Exposure and Health Effects in Preschool Children

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Reduction of Pesticide Exposure

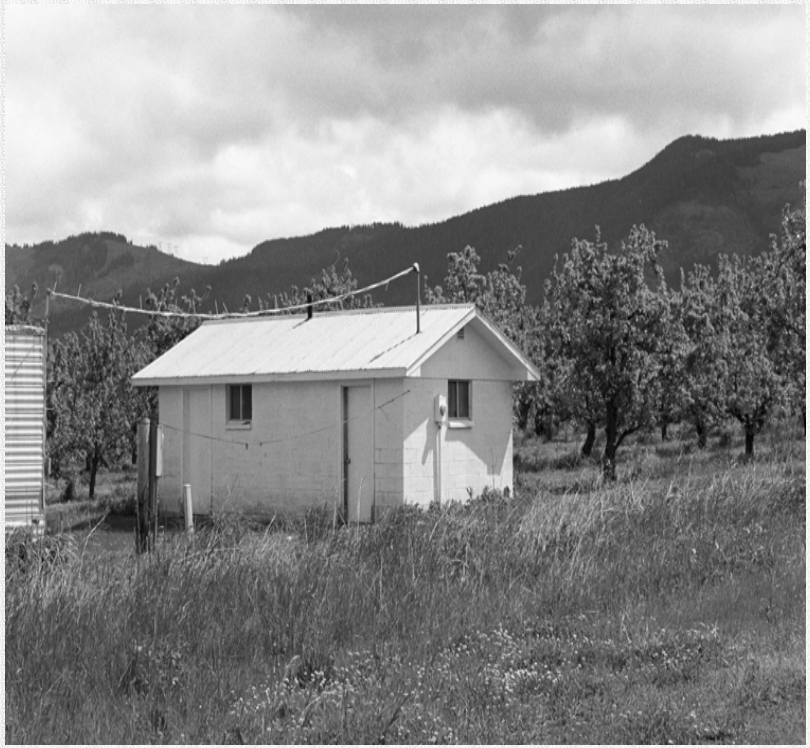
Since 1996 OCDC and OHSU have worked together to examine migrant children's chronic exposure to organophosphate pesticides. We have focused on:

- **Exposure pathways**:
  - How are the children exposed?
  - How can we measure exposure?
- **Health effects**:
  - How can we measure health effects?
- **Interventions**:
  - How can we reduce exposure?

How are children exposed to pesticides?

Latino children of agricultural workers are at risk:

- Close proximity of homes to fields
- Take home exposure



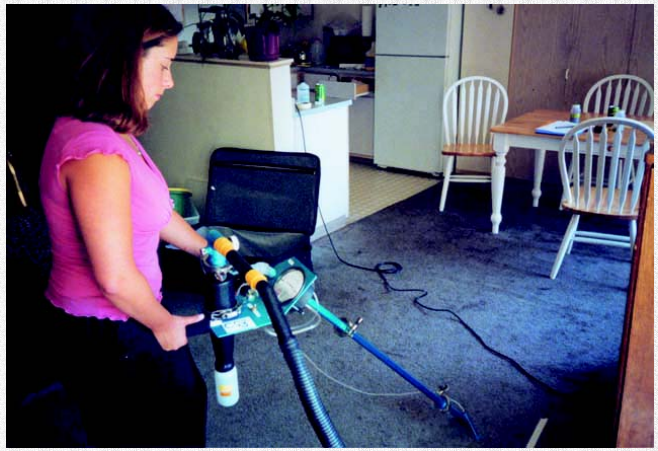
How are children exposed to pesticides?

Children are exposed in several ways:

- Transfer from hands to mouth
- In food and water
- Skin absorption
- Air

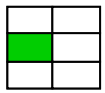
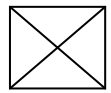
How can these pathways of exposure be measured?

Measure levels of pesticides on:



- floor dust at home
- soil outside homes
- on outdoor toys
- in cars
- floor dust at MHS day care centers
- on hands of children
- in samples of urine from children and their parents

Presence of organophosphate pesticides in the home environment

Family ID	Car Swab	Soil	Toy	House Dust	Floor Swab	Hand Swab
1						
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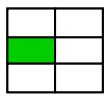
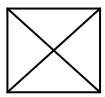
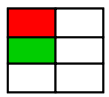
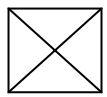
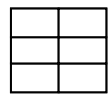
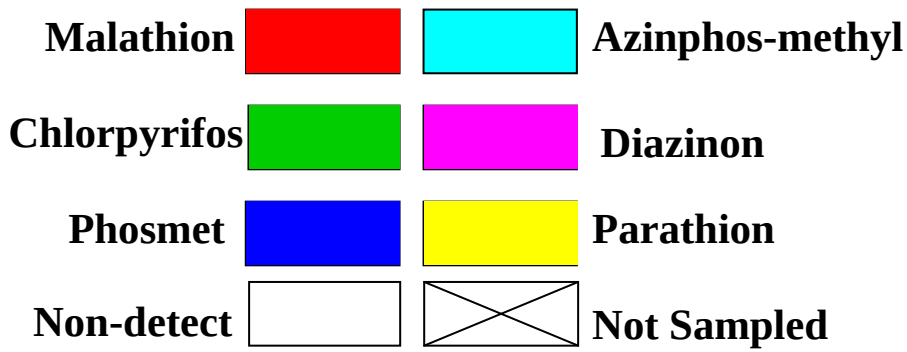
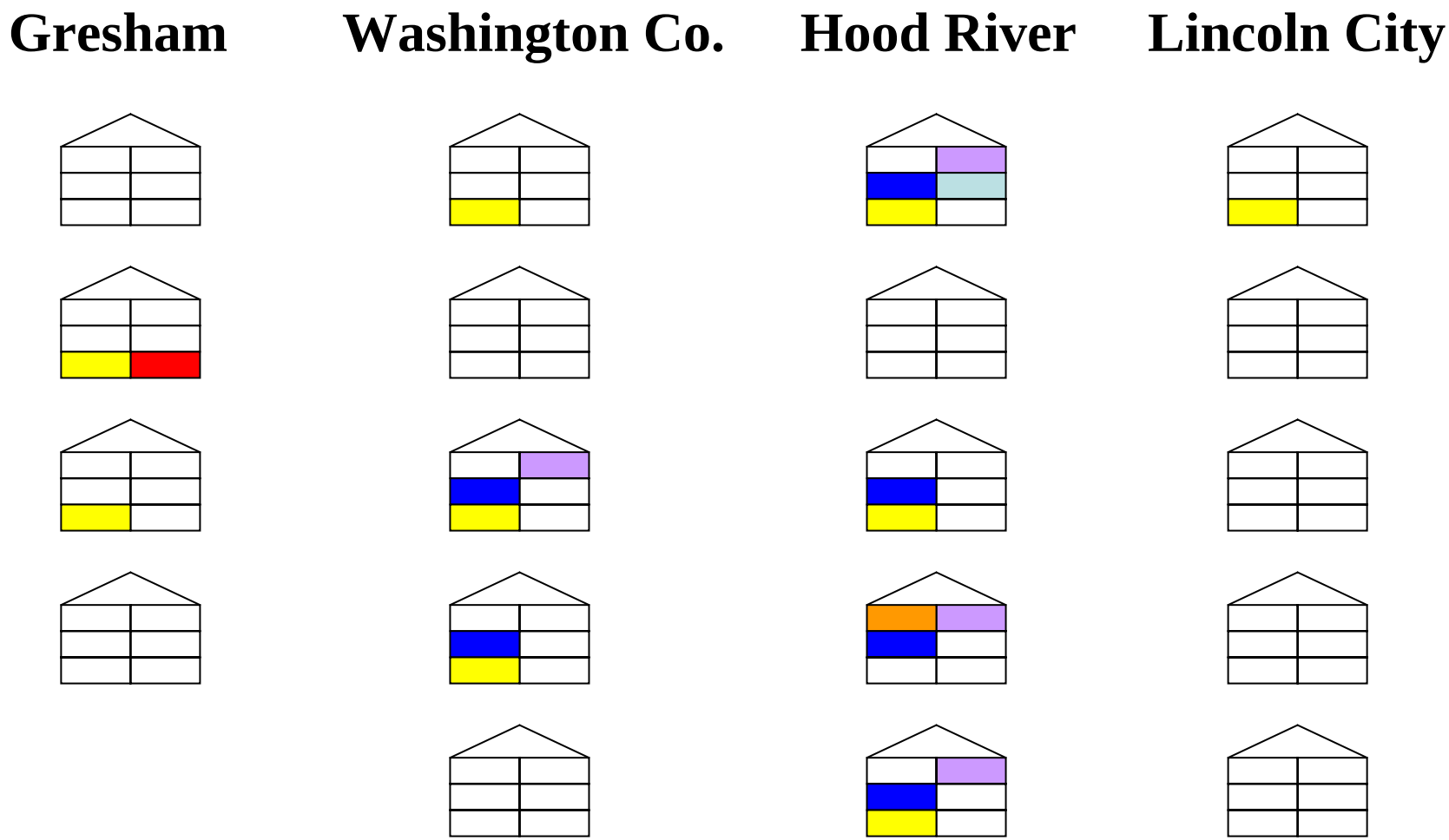
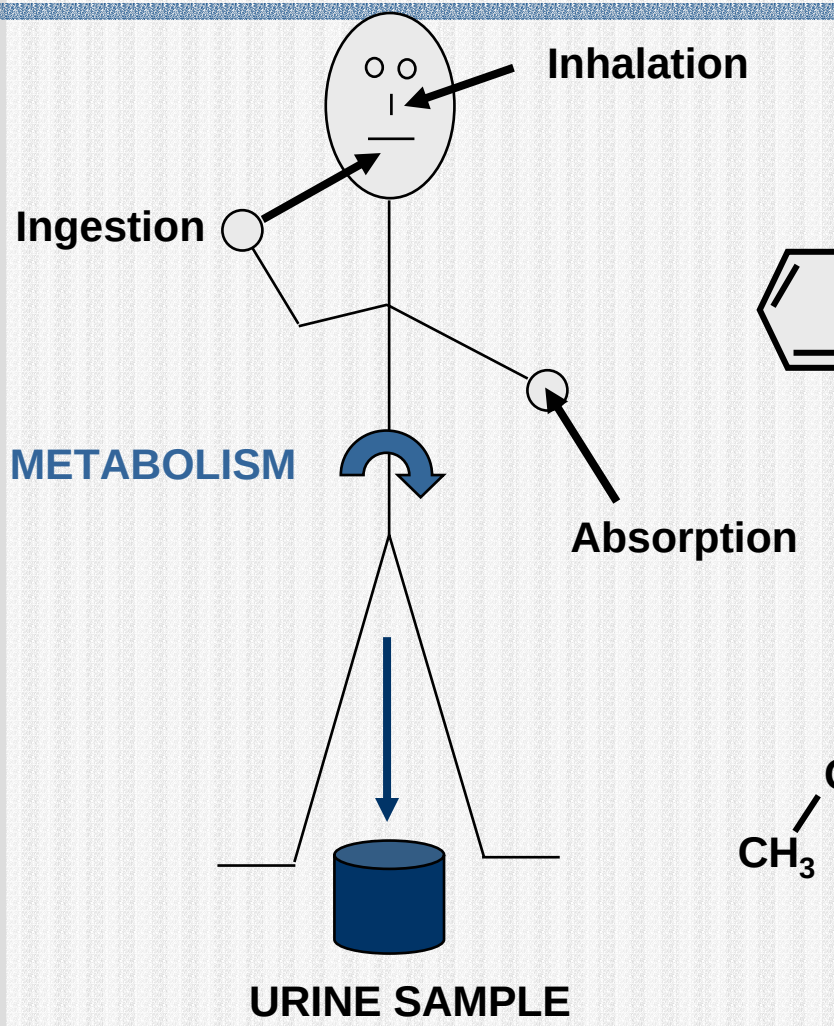
10						

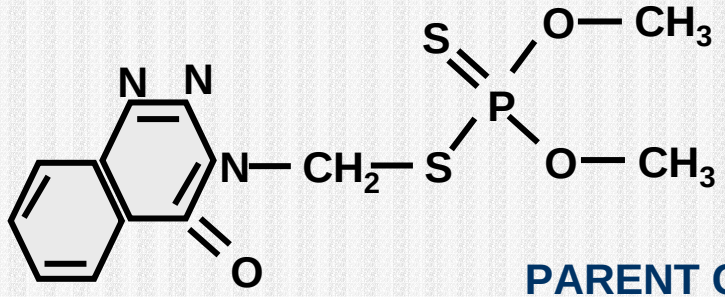


Occurrence of Pesticides in Carpet Dust



Example of pesticide and metabolites

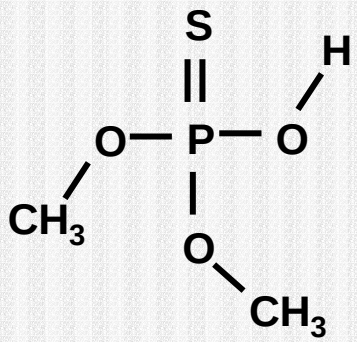




PARENT COMPOUND

Azinphos Methyl

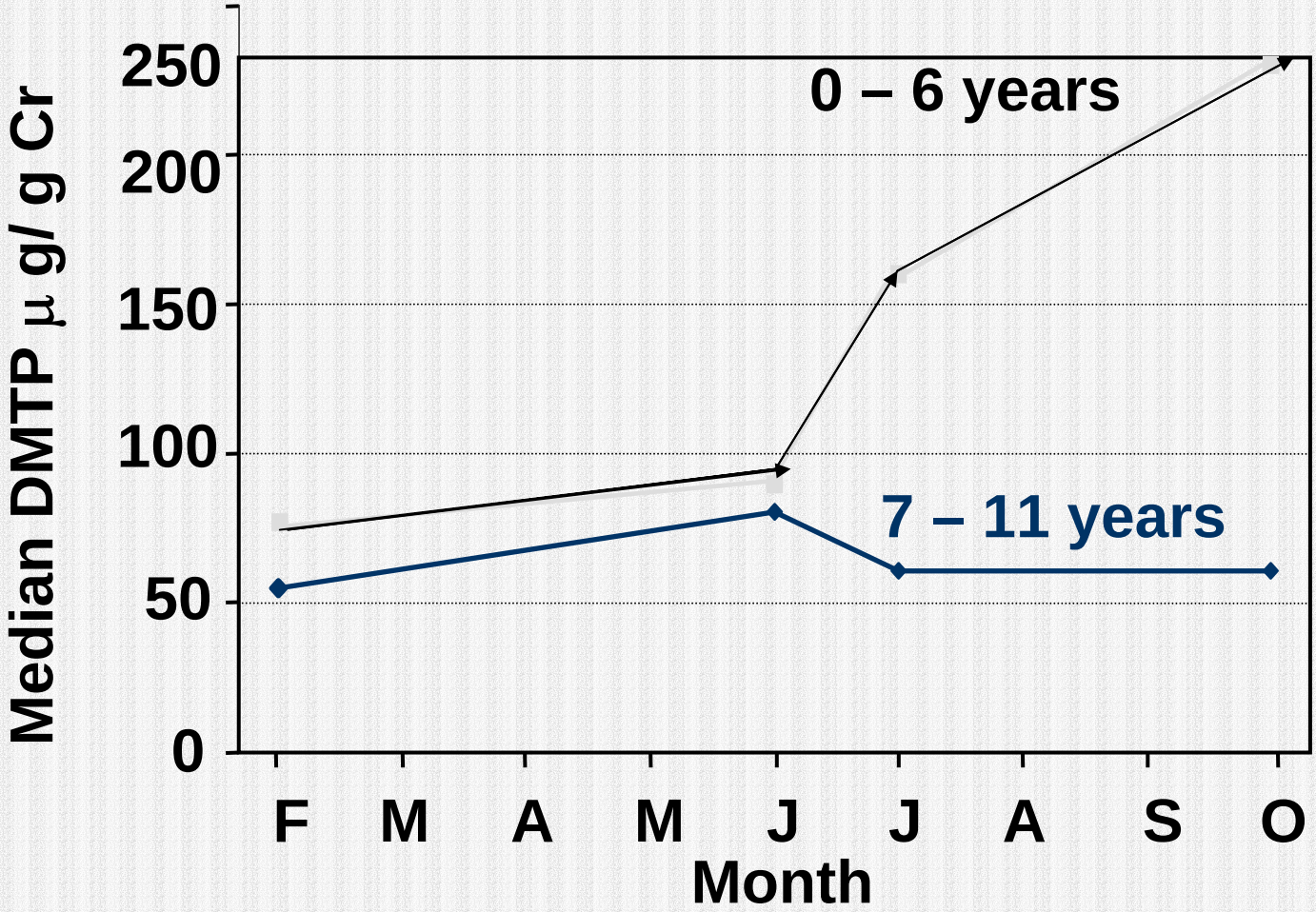
METABOLISM



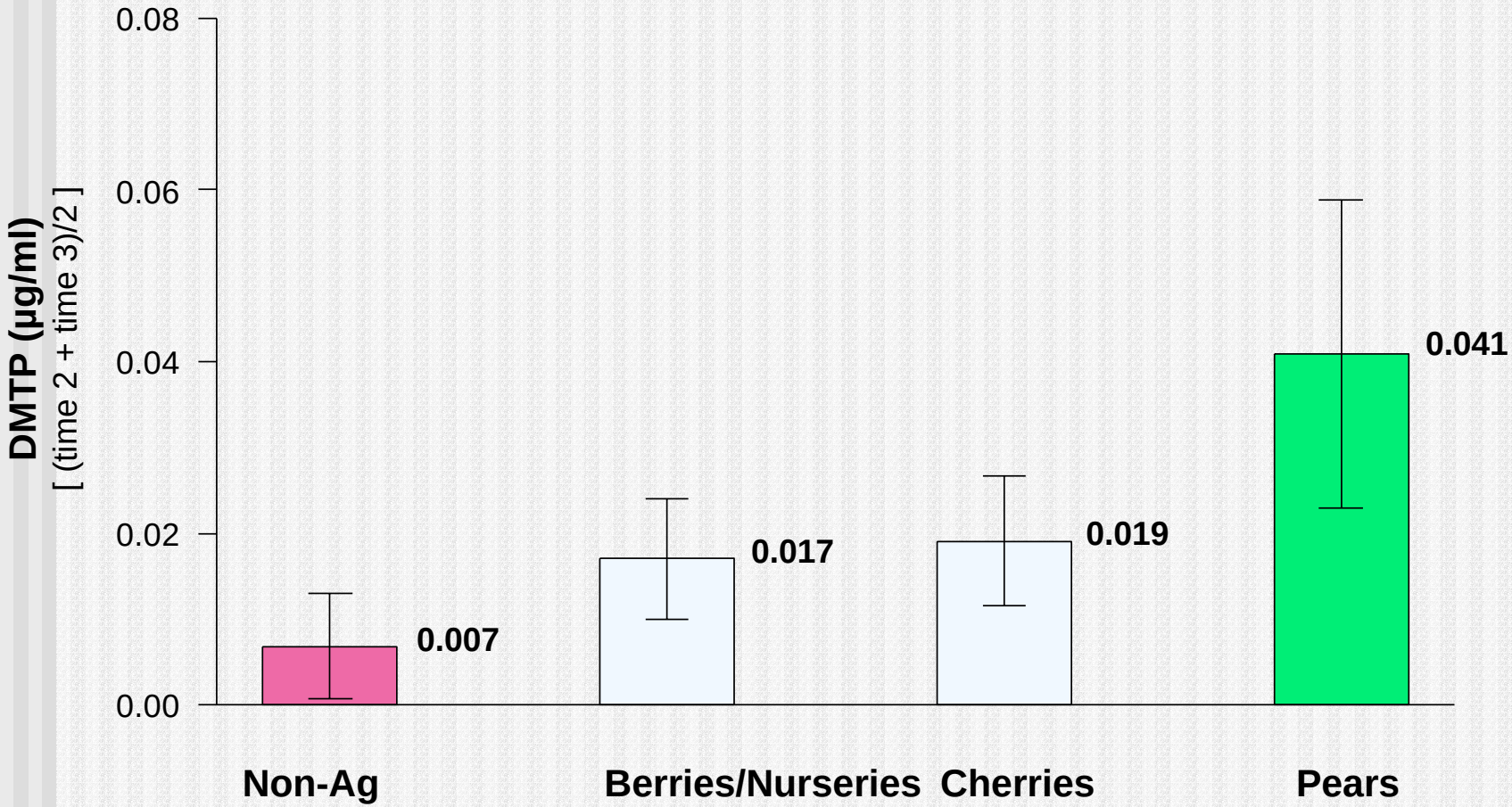
LEAVING GROUP

Dimethylthiophosphate
"DMTP"

Metabolite concentrations in children



Urinary Metabolite Community Comparison: Preschoolers



What does this mean?

- What amounts of pesticides are in places where the children spend their time?
- Do the levels change across the work season?
- Are the urine metabolite levels correlated with levels in dust at home, outdoors, and at the MHS centers?
- Are there ways that we can reduce children's exposure to pesticides?
- Are there health effects?

Health Effects

Pesticides are designed to damage nerves in insects and have the same effect in humans

Tests of the nervous system (memory and attention) are used to study health effects of pesticides in agricultural workers

How do we know if your nervous system is affected by pesticides?

- Give tests of memory and attention to people exposed to pesticides
- Compare these test results to test results of people who are not exposed to pesticides
- If the people exposed to pesticides have worse performance on the tests, we conclude that the pesticides caused that difference
- Find out if those with worst performance have higher levels of pesticides

Poisoning and Repeated High-Level Exposures

Neurobehavioral tests used in adult populations with environmental and occupational pesticide exposures

Tests can reliably detect adverse nervous system effects of OP pesticides in adult humans

Adapt these tests to assess children

Neurobehavioral Testing in Children

Adapt tests developed for adults

- Computerized tests from BARS and other non-computerized tests
- Token dispenser

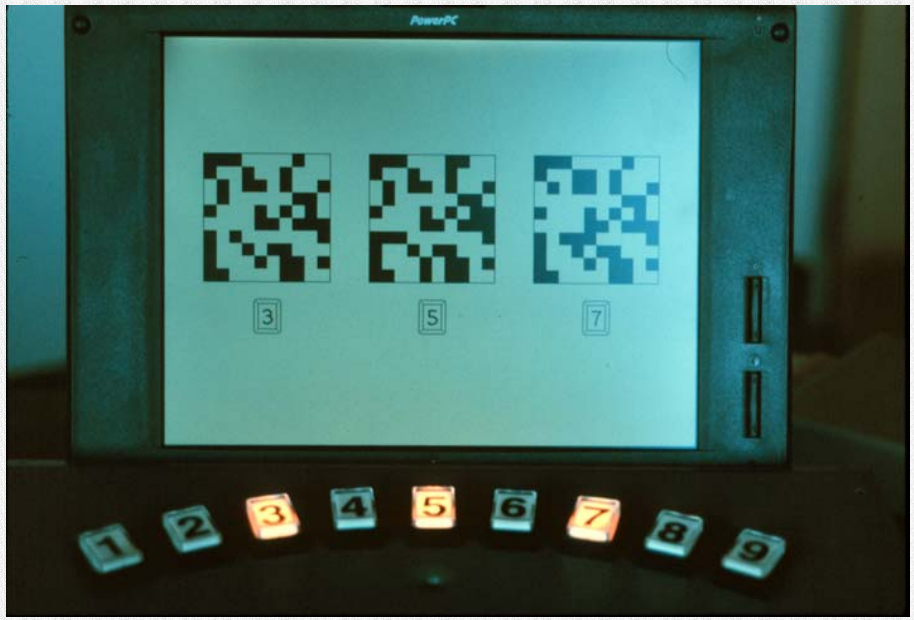
Pilot Studies

- Do they finish the test?
- How did they perform?

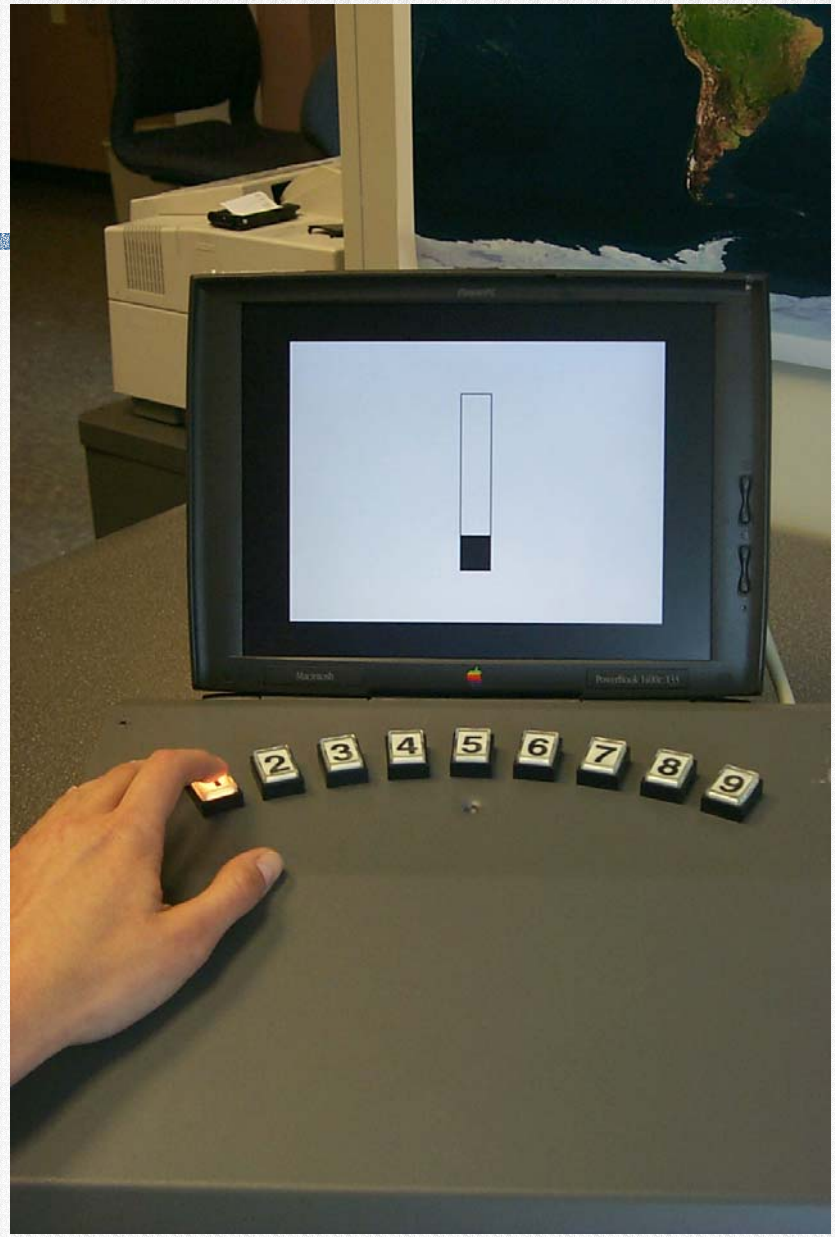
Abilities Being Tested

- Memory
- Attention
- Dexterity
- Response Speed
- Hand-Eye Coordination
- Dual Processing

Match-To-Sample



Finger Tapping



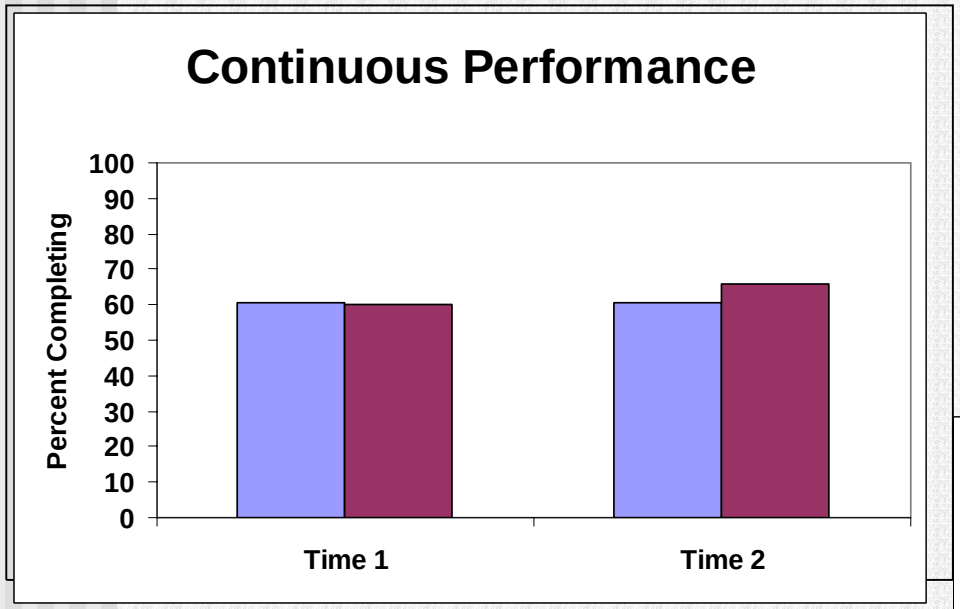
Object Memory Test

Pegboard

Who did we test?

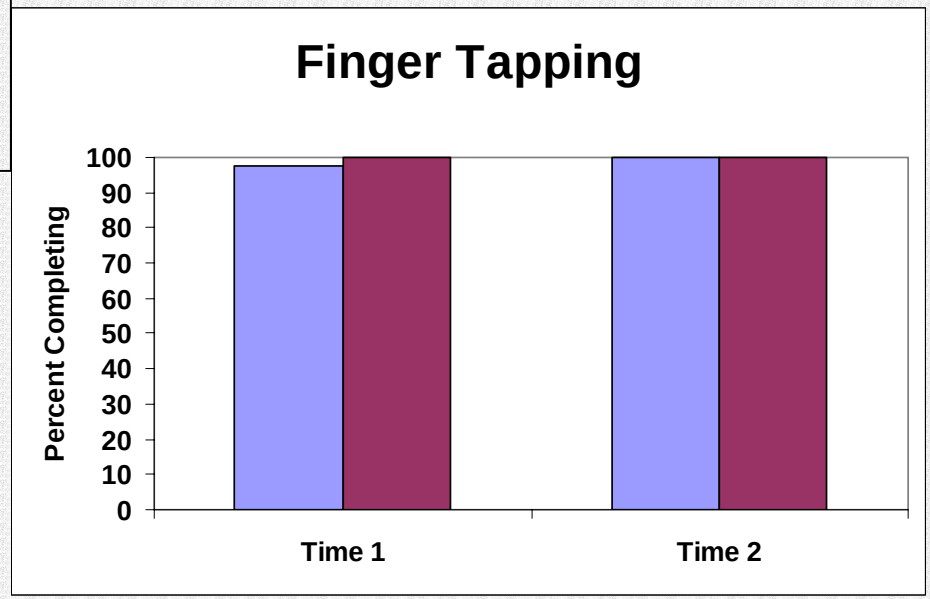
- **Young children (4-5 year-olds)**
  - More vulnerable to exposure (play/hand-to-mouth behavior)
  - Old enough to complete test battery
- **Agricultural groups**
  - Children of farmworkers
  - Recruited from two communities in Oregon and North Carolina
- **Non-Agricultural groups**
  - Match on age, education, culture
  - Parents NOT working in agriculture

Percentage completing tests



Agriculture

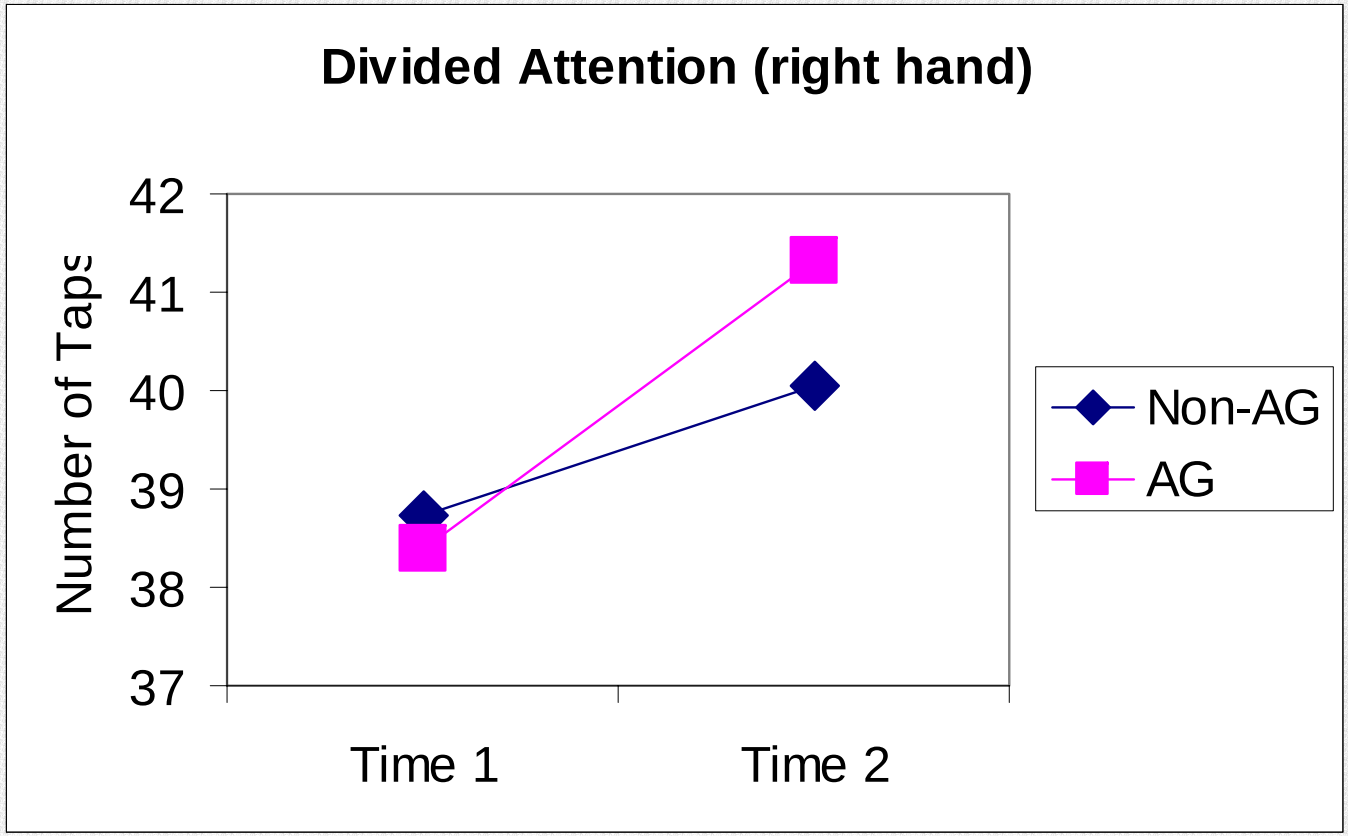
Non-Agriculture



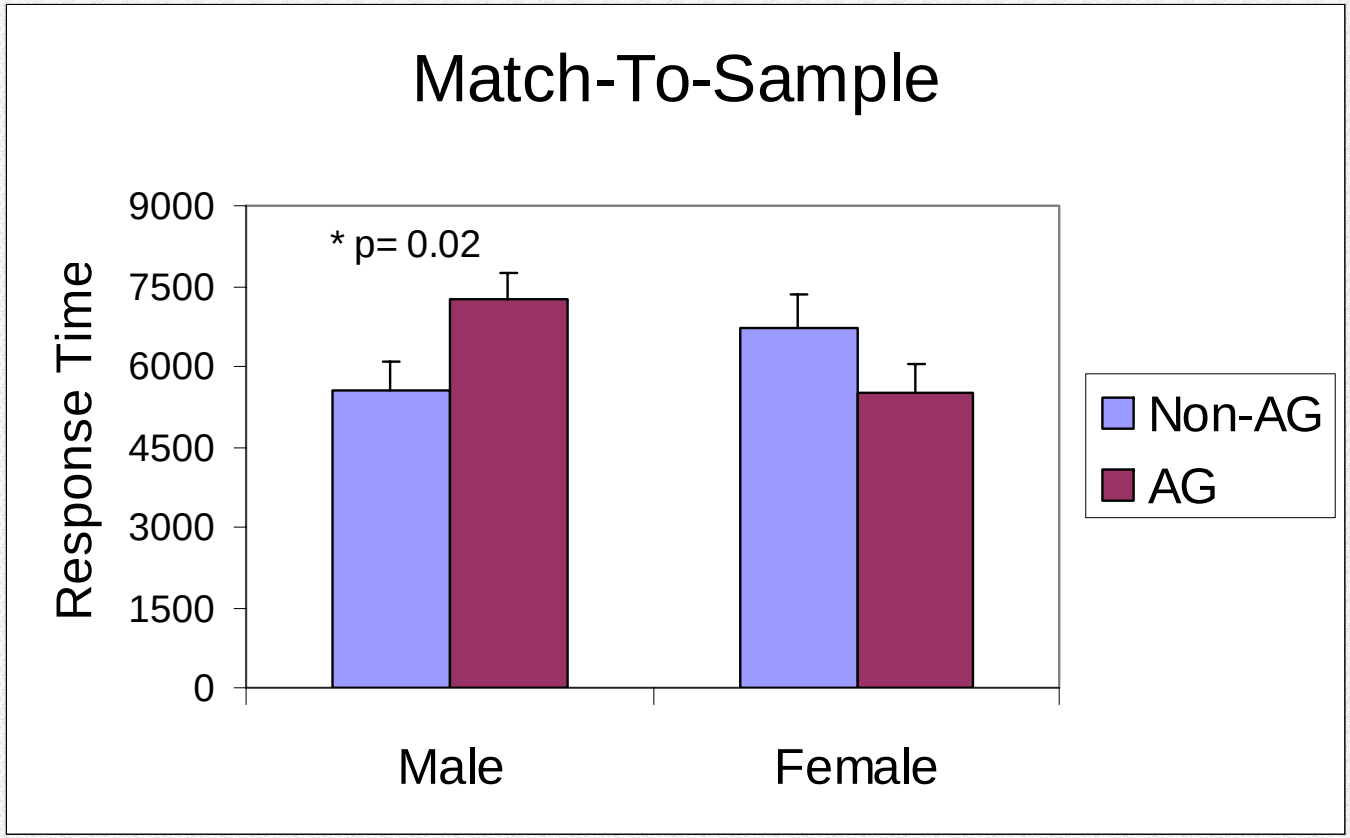
Outcome Data

- Many things impact performance
  - Age
  - Education (mother's)
  - Gender
  - School Experience/Computer Experience
- Need to include these variables in analyses
- Learning Effects

Learning Effects



Gender Differences



Results - Still in Progress

- Differences across time show a learning effect
- Differences across communities needs to be further explored
  - Differences in communities
  - Reduce the number of outcome measures
- Examine relationship between performance data and metabolites

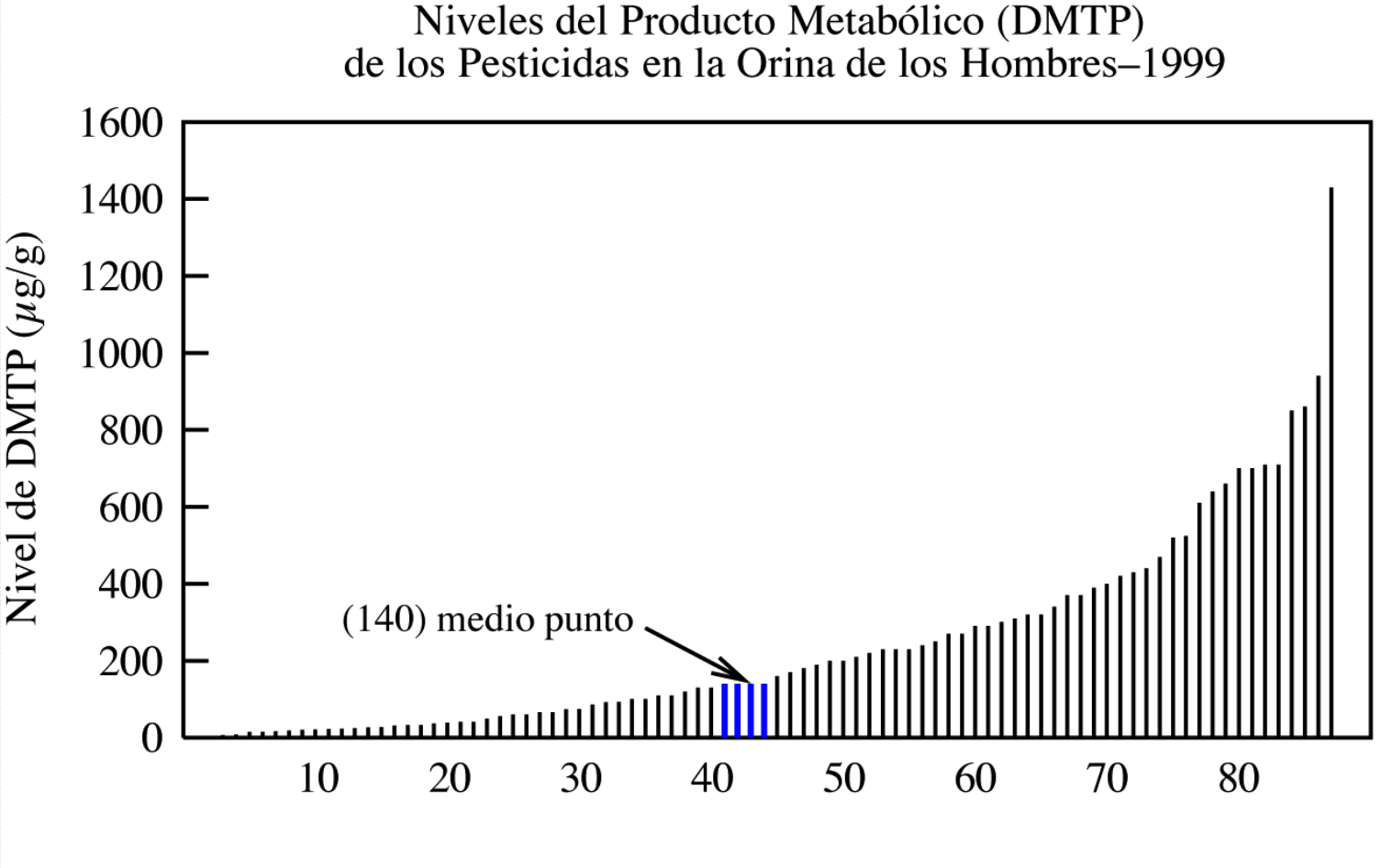
How can we reduce exposure?

- Risk Communication
  - Community Based Participatory Research
  - Scientists, OCDC, Parents, Growers
  - Share results with community
- Identify practices that reduce exposure in the homes
  - Deep Cleaning
  - Video

Developing Risk Communication

- Analyses completed in lab
- Research team decides what to share with community
- Descriptive and culturally appropriate format developed
  - research team and community partner
- Reviewed by advisory board
  - scientists, farmworkers, growers
- Changes incorporated into message
- Share with community

Metabolite levels (DMTP) in Urine of Male Farmworkers



Presence of organophosphate pesticides in the home environment

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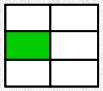
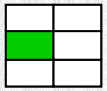
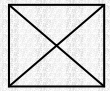
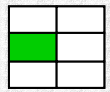
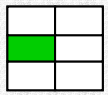
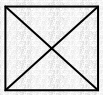
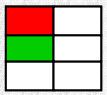
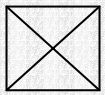
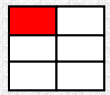
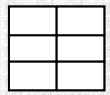
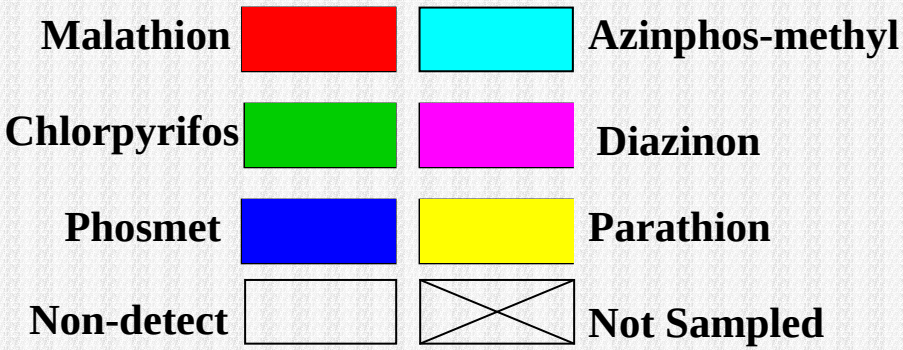
1						
7						
10						



Un Lugar Seguro Para Sus Niños
(A Safe Place for Your Children)

- Video describing how to protect children and reduce potential pesticide exposure in home
  - Take boots off
  - Wash work clothes seperately
  - Wash toys
  - Clean floor
- Distributed to Oregon Migrant Head Start Centers
- Government of Oaxaca, Mexico translating into indigenous dialects

Study Team

- Linda McCauley
- Jennifer Scherer
- William Lambert
- Joan Rothlein
- Juan Muniz
- Alys Tamulinas
- Michael Lasarev
- Alejandra Zavala
- Kent Anger

- CROET at OHSU

- Juanita Santana
- Rachelle Travers
- Jacki Phillips
- OCDC and Migrant Head Start Centers

- Tom Arcury
- Sara Quandt
- Tony Marín
- Julie Early
- Wake Forest University

Websites

- http://www.ohsu.edu/croet/aghealth/
- http://www.ocdc.net/
- http://home.att.net/~angerk