Diagnostic Tools: Challenges and Possibilities

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Diagnostic Tools Workshop

- **Goal:** Gather information on critical diagnostic needs, the current state of the science, and the research needs for and feasibility of developing diagnostic tools to identify exposure to a specific chemical/level.

Diagnostic Tools Workshop

- Held on October 4th
  - Open to the public
- Two formal presentations
  - Dr. Matt Keifer – University of Washington
    - *The Need for Diagnostic Tools for Pesticide Overexposure: A clinician's two cents*
  - Dr. Dana Barr – CDC
    - *The Role of Diagnostic Tools in Informing Current and Future Exposure and Risk Assessments*
- Roundtable discussion

Roundtable Discussion

- Participants representing diverse sectors
  - Medical community
  - CDC/NIOSH
  - Industry
  - Farmworkers Justice
  - FDA
  - EPA Office of Research and Development

What are the challenges faced by clinicians? (1)

- Symptoms are diffuse and non-specific
  - Just because a pesticide-exposure occurred does not mean it is linked to the illness
- Disincentive to diagnose pesticide-related illnesses
- Not a widely known network of medical toxicologists that clinicians could contact
- Worker's compensation issues
- Simple, cost-effective diagnostic tools not available

What are the challenges faced by clinicians? (2)

- Correlating exposures to specific biological effect
- Obstacles for human testing
- Need better dose-response, route of exposure, and pharmacokinetic in humans
  - No good information on the relationship between human exposure and animal exposure (*i.e.,* we don't have a common test matrix such as blood or urine from animal studies)

What tests/diagnostic tools are used by clinicians?

- Primarily use differential diagnosis
- Measure cholinesterase inhibition for OPs and carbamates
- Measure urinary metabolites
- Skin patch testing
  - Not readily available or understood by most physicians

Treatments: How do clinicians choose treatment options?

- Primarily treat the symptoms and remove from work
  - Few antidotes for pesticides exist
- If cholinesterase inhibitor is culprit, then treat with atropine
- If overexposure to a rodenticide, then treat with Vitamin K
- If overexposure to paraquat, then treat with bentonite
- Decontamination with charcoal or Fuller's earth

Treatments: Are they effective?

- Decontamination and removal from exposure is effective
- For OPs, atropine and protopam are usually effective
- Vitamin K is usually effective for rodenticide overexposure
- For paraquat overexposure, treatment is usually not effective
- Aggressive supportive care is most effective

Treatments: Would treatment change if we had better diagnostic tools?

- In the case misdiagnosis as “non-pesticide” related illness, new tools could correct diagnosis and allow for more appropriate treatment
- Earlier screening with simple tools would lead to more timely treatment
- In critical care conditions, treating the symptoms. Better diagnostic tools would not be helpful
  - These patients may serve as sentinel population for alerting to possible overexposure to a broader population

How would new diagnostic tests inform the Agency's risk assessment?

- Increased accuracy of surveillance and/or incident data
- Greater awareness of pesticide-related illnesses would help refine default assumptions
- May help inform the Agency's risk management/mitigation decisions

What organizations can contribute to the development of these tests?

- CDC
- Industry and stakeholders
- National network of agricultural centers, academia, Children's Centers
- Migrant and community clinics
- Legal establishment
  - Worker's compensation
- Health care system

Possibilities

- Improve health care system
- Improve the Worker's compensation system
- Establish a better medical toxicology information network as a resource
- Clearly define the difference between diagnostic tools and biomonitoring
- Use emerging technologies (*e.g.,* metabolomics)
- Don't limit this work to pesticides other chemicals should also be considered