

US EPA ARCHIVE DOCUMENT

# Why Do We Need Diagnostic Tests and Biomarkers for Pesticides?

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Reviewer Diagnosis and Management of Pesticide Poisonings 5<sup>th</sup>  
edition

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# What Does a Clinician Face?

- A farm worker comes in complaining of nausea, headache, weakness- got sick this morning while at work
  - Differential diagnosis:
    - Viral illness
    - Food poisoning
    - Hangover
    - Heat exhaustion
    - Medication reaction
    - Malaria
    - Pesticide poisoning
    - Green tobacco illness (if tobacco worker)
    - Pregnancy (if female)

# What Tools Exist for Diagnosis

<b>Condition</b>	<b>Diagnostic tools</b>	<b>Reliability</b>
Viral illness	Various antigen tests	Excellent
Food poisoning	History only	Poor
Hangover	History and physical exam	Good
Heat exhaustion	History and exam	Good
Medication reaction	History	Average
Malaria	Blood smear	Excellent
Pesticide poisoning	History	Poor
Green tobacco illness	History and conitine	Excellent
Pregnancy if female	Exam and urine/blood	Excellent

# What Do We Treat?

- In most cases of pesticide overexposure decontamination and symptomatic therapy are indicated
- Antidotes exist for only:
  - Cholinesterase inhibitors-Atropine and 2-pam
  - Rodenticides- Fresh Frozen Plasma and Vit K
  - Cyanide containing pesticides
  - Force alkaline diuresis for some herbicides
  - Some you would not treat and
    - you want to know which not to treat

# An Accurate Diagnosis Will Dictate More than Decontamination

- An accurate diagnosis leads to care and prevention
  - For the worker
    - Appropriate Treatment
    - A reliable report to the Worker Compensation System
    - Removing worker from further exposure and worse illness
    - Education about how to avoid future overexposures
  - In the workplace
    - Correcting workplace hygiene failures
    - Notifying worker protection system for enforcement and prevention
  - For the Nation
    - Result in a report to a surveillance system
    - May result in systemic change through 6(a)2

# Worker Compensation and Agricultural Workers

- Not all ag workers are covered
- Those that are covered may not know/don't use
- Where they are, they are usually the poorest of the poor
- They rarely have health insurance
- They use community clinics- That means federal dollars and no specialty care
- Worker Comp may be their only insurance



# The Importance of Diagnosis in Worker Compensation

- “Accurate diagnosis is important with all disease, but with occupational disease it is even more so because of medicolegal implications. These implications make it essential that physicians use the most specific methods available to determine the degree of probability that a particular disease or injury has resulted from occupational exposure. “

**Guide to Diagnosis of Occupational Illness** *JAMA*. 1966;196(3):297-298.

# Objective Findings are “extremely important” in Work Related Illness

Objective findings are extremely important to claim managers in their decision-making process. You should be as specific and detailed as possible in describing objective findings to assure that the claim manager is able to make appropriate adjudicative decisions as expeditiously as possible and your patient receives the benefits to which he/she is entitled. (See Occupational

# In Most Pesticide Overexposures

- There is no objective evidence
- No objective evidence- No claim

# How Does EPA Know There Is a Problem with a Chemical

- Clinical Reports from Clinicians
  - These are rare- Clinicians don't know how to diagnose pesticide illness
- Surveillance data
  - State systems
  - NIOSH SENSOR system
    - Both dependent on clinician reporting
- Poison Control Data
  - Mostly Clinician reports are biased toward children and exposures not poisonings
- 6(a)2 reports from Registrants
  - Dependent on clinician reports

# Incident Reporting Responsibility

## FIFRA 6(a)2

159.170

Information must be submitted which concerns any study that a person described in §159.158(a) has concluded, or might reasonably conclude, shows that a correlation may exist between exposure to a pesticide and observed adverse effects in humans. Information must also be submitted which concerns exposure monitoring studies that indicate higher levels of risk or exposure than would be expected based on previously available reports, data, or exposure estimates. Such information must be submitted regardless of whether the registrant considers any observed correlation or association to be significant.

159.184

- a) *General.* Information about incidents affecting humans or other non-target organisms must be submitted if the following three conditions are met:
- (1) The registrant is aware, or has been informed that a person or non-target organism may have been exposed to a pesticide.
  - (2) The registrant is aware, or has been informed that the person or non-target organism suffered a toxic or adverse effect, or may suffer a delayed or chronic adverse effect in the future.
  - (3) The registrant has or could obtain information concerning where the incident occurred, the pesticide or product involved, and the name of a person to contact regarding the incident.

# Diagnosis: The Weak Link



# HIPAA Exceptions

"(b) PUBLIC HEALTH.--Nothing in this part shall be construed to invalidate or limit the authority, power, or procedures established under any law providing for the reporting of disease or injury, child abuse, birth, or death, public health surveillance, or public health investigation or intervention.

"(c) STATE REGULATORY REPORTING.--Nothing in this part shall limit the ability of a State to require a health plan to report, or to provide access to, information for management audits, financial audits, program monitoring and evaluation, facility licensure or certification, or individual licensure or certification.

# The Link Is Weaker Still

## Health Insurance Privacy and Portability Act (HIPPA)

- What will this do to surveillance?
- You can't share privileged medical information without patient permission
- If You Do:

"(b) PENALTIES.--A person described in subsection (a) shall--

"(1) be fined not more than \$50,000, imprisoned not more than 1 year, or both;

"(2) if the offense is committed under false pretenses, be fined not more than \$100,000, imprisoned not more than 5 years, or both; and



# We Need Diagnostic Tests to Prevent Future Illness

- **The promise of biomonitoring**
  - The availability and application of biomonitoring or diagnostic tests permits the early identification of exposure induced illness before it becomes severe
  - This applies both to individuals and populations
  - In Short:
    - Identify individual illness in the preclinical state
    - Identify population illness in the pre-epidemic phase

# Epidemiological Studies

## Exposure Assessment is the Weak Point

- “The substantial weak points of numerous epidemiological studies of pesticide-related health effects are **problems faced in exposure assessment**, small numbers of exposed subjects, a limited number of studies focused on the majority of cancers, and difficulties in estimating critical windows of exposure. “
- If we want good science, we must have markers for exposure
- Int J Occup Med Environ Health. 2006;19(3):152-69. Exposure to pesticides and childhood cancer risk: has there been any progress in epidemiological studies? Jurewicz J, Hanke W.

# TOXICITY TESTING IN THE 21ST CENTURY A VISION AND A STRATEGY

Committee on Toxicity Testing and  
Assessment of Environmental Agents

*NATIONAL RESEARCH COUNCIL OF THE  
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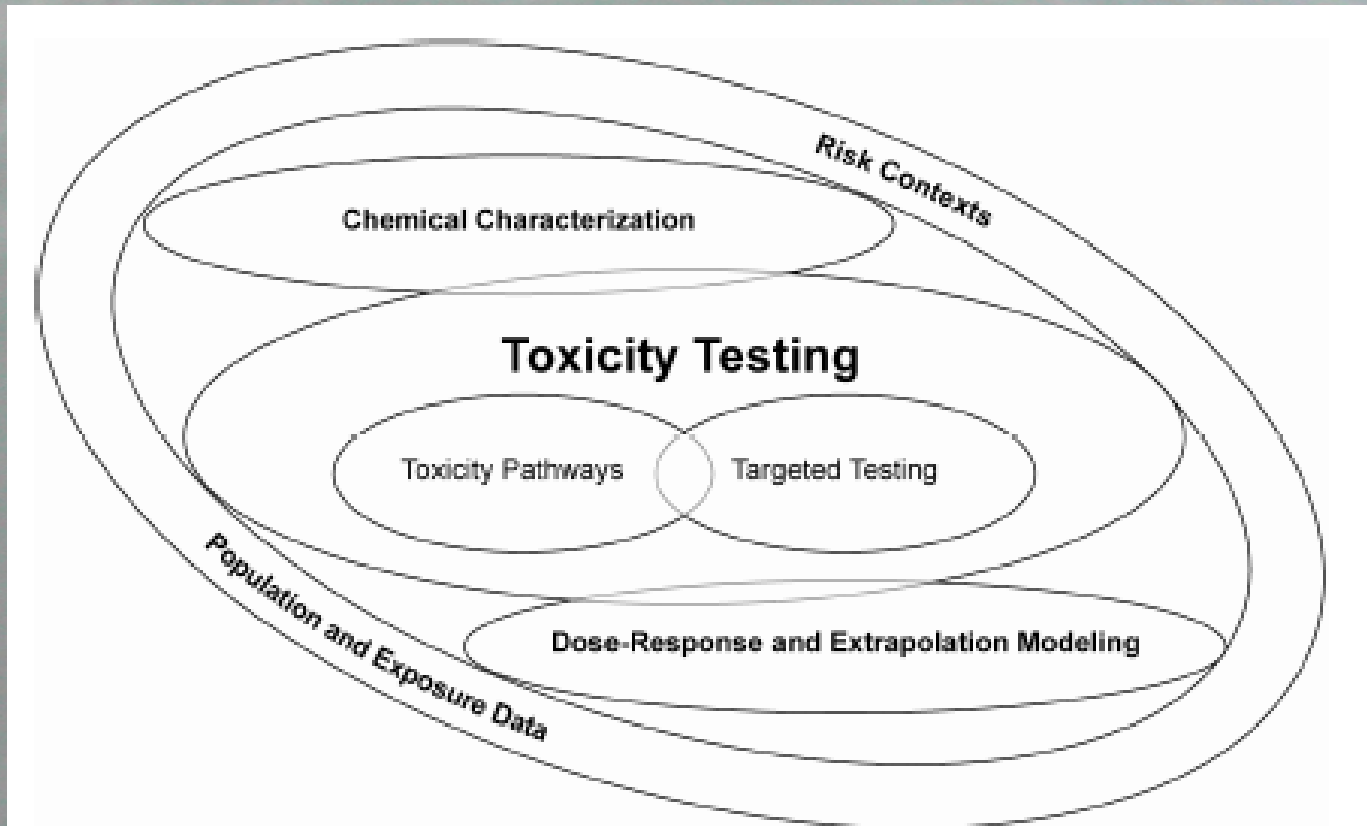
**[www.nap.edu](http://www.nap.edu)**

# Toxicity Testing in the 21st Century

## National Research Council

- Population based exposure data and biomonitoring are critical to success of the new paradigm
- Knowing what happens in the human population through biomonitoring and exposure assessment is the means of validating assumptions based on the new paradigm

# Population and Exposure Data, a Critical Component of the National Research Council Toxicity Testing in the 21<sup>st</sup> Century



**FIGURE S-1** The committee's vision for toxicity testing is a process that includes chemical characterization, toxicity testing, and dose-response and extrapolation modeling. At each step, population-based and human exposure data are considered, as is the question of what data are needed for decision-making

# Government Accountability Office Report, August 2009

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GAO

United States Government Accountability Office  
Report to Congressional Requesters

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April 2 009

## BIOMONITORING

### EPA Needs to Coordinate Its Research Strategy and Clarify Its Authority to Obtain Biomonitoring Data



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GAO-09-353

# What the GAO Found: EPA Made Limited use of Biomonitoring Data in Risk Assessments

GAO recommends that EPA develop a comprehensive research strategy to improve its ability to use biomonitoring in its risk assessments; establish an interagency task force to coordinate federal biomonitoring research; and determine the extent of its legal authority to obtain biomonitoring data under TSCA, asking Congress for more authority if necessary. EPA agreed with the first two recommendations and did not disagree with the third, but provided substantive comments on its implementation.

GAO addressed TSCA  
but

The GAO did not address  
the EPA's authority to  
require biomonitoring data  
under FIFRA

FIFRA gives broad authority to the  
Administrator to require different  
kinds of data from a registrant

# EPA Took Over Protecting Workers from Pesticides in 1975

United States Court of Appeals, District of Columbia Circuit.

“We agree and hold that EPA has the authority to promulgate rules regulating farmworker exposure to pesticides and by so doing has preempted the Secretary of Labor from acting.”

“Nothing in this (Act) shall apply to working conditions of employees with respect to which other Federal agencies . . . exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety or health.” OSH Act of 1970

**Case:** Organized Migrants in Community Action, Inc. v. Brennan, 520 F.2d 1161 (D.C. Cir. 1975).



Pesticides are released into the worker's environment:

We need to know when they are in the worker's body

- EPA fought to protect workers
- EPA won

## 1972 FIFRA Amendments

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"There can be no question but that the bill (the Federal Environmental Pesticide Control Act of 1972) requires the Administrator to require that the labeling and classification of pesticides be such as to protect farmers, farm workers, and others coming in contact with pesticides or pesticide residues."

-- Senate Committee on Agriculture and Forestry

# What OSHA Does

- 34 standards include worker monitoring components (includes 13 Carcinogens)
- Most standards covering chemicals have exposure assessment in some form
- OSHA general approach
  - Trust but verify- ie. measure exposure, measure levels in the body, engineer controls, train/inform workers, set, measure and enforce exposure limits
- EPA's general approach
  - Count incidents from passive surveillance systems and act on that information, provide PPE to workers, train/inform workers. Establish entry intervals.

# Diagnosis with NEW Chemicals

- We need the tools because we don't know what the overexposure looks like.
  - In most cases information comes from ingestions in children or suicides
  - These are extreme and contaminated models
    - Dosages are very high
    - Children are different
    - Suicidal patients are not workers
- Frontline providers need these tools to deal with new chemicals and old.

# Why do we Need Diagnostic Tests and Specific Biomarkers

- To improve clinical decision making
  - To initiate antidote use (if available)
  - To get workers the care they deserve (Worker Comp)
  - To make the workplace safer
  - To Improve training of clinicians in the diagnosis of overexposures
- To improve EPA's decision making
  - To enhance decisions regarding pesticides 6(a)2 and other surveillance systems
  - To protect human populations
  - To protect other exposed workers
- To monitor new chemicals and limit harm early
- To validate new toxicity testing paradigm
  - Part of the NRC vision for 21<sup>st</sup> cent Toxicity Testing
- To improve the science around the health effects of pesticides
  - Exposure assessment is the weakest link in environmental and occupational epidemiology
- Can EPA Do it? Under FIFRA they can.