State and Local Environmental Health Laboratories

“Good Data for Good Decisions”

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IT'S TIME AGAIN FOR EVERYONE'S LEAST FAVORITE GAME... FEAR OF THE WEEK!

TODAY, WE WELCOME JOHN SMIDDLESFORD, A DAIRY FARMER FROM WISCONSIN... JOHN, GIVE 'ER A SPIN!!
Overview

- Public Health Laboratories
- Environmental Laboratories
- Biomonitoring
- Preparedness
Environmental Laboratories
Detect, identify, & monitor contaminants
in people and the environment.
Core Capabilities of a PHL

- Disease Prevention, Control & Surveillance
- Reference & Specialized Testing
- **Environmental Health & Protection**
- Food Safety
- Emergency Preparedness
- Integrated Data Management
- Lab Improvement & Regulation
- Policy Development
- Research
- Training & Education
- Partnerships & Communication
Scope of Environmental Testing

- Organic compounds
- Inorganic compounds
- Radioactive chemicals
- Toxic environmental chemicals
- Environmental microbiology
Environmental Epidemiology and Surveillance in State Health Departments

• Diagnose and investigate environmental health problems and health hazards
• Monitor environmental and health status
• Inform and educate people about environmental health problems
• Evaluate effectiveness, accessibility and quality of environmental public health services
Mobilize community partnerships to solve environmental health problems

Research new and innovative solutions to environmental public health problems

Enforce laws and regulations to protect environmental public health and ensure safety

Develop policies and plans that support environmental public health efforts
Comprehensive laboratory support must be available to undertake epidemiological investigations, determine environmental trends and needs, inform the public, and protect the public from environmental hazards.
Food and Water Investigations

• Food borne investigations
  – PulseNet
  – Salmonellosis
  – Listeriosis
  – Chemical contamination of animal feed

• Water borne investigations
  – Cryptosporidiosis
  – Seafood advisories
  – Ground water contamination
What do these foods have in common with a "nut"?

- Raw almonds
- Tomatoes
- Peanut butter
- Cantaloupe
- Drinking water
- Jalapeno peppers
- Salami
- Eggs
- Ground turkey
Environmental Contamination

- Salmonellosis
- E. coli
- Campylobacteriosis
- Listeriosis
Impact of Drugs on Humans and the Environment

• Synthetic marijuana – Spice, K2
• Pharmaceuticals and prescription drugs
• Endocrine system disruptors
Biomonitoring

- Measurement of chemicals in the human body
- Established standard for assessing human exposure to chemicals
- Enhances linking exposure to possible health effects
- Used to make better decisions about how to protect people from disease, birth defects, or death related to chemical exposure
Detect, identify & monitor...
contaminants
. . .in people. . .
and the environment.
The Simple Model: Environmental Exposure to Disease
## Environmental Burden of Diseases

<table>
<thead>
<tr>
<th>Disease/Condition</th>
<th>Environmental Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>Carcinogens, environmental tobacco smoke, and metals</td>
</tr>
<tr>
<td>Birth Defects</td>
<td>Metals, solvents, dyes</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Indoor air, environmental tobacco smoke</td>
</tr>
<tr>
<td>Nervous System</td>
<td>Metals, solvents</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Air pollution</td>
</tr>
<tr>
<td>Endocrine Disorders</td>
<td>Many selected chemicals</td>
</tr>
<tr>
<td>Injuries</td>
<td>Incapacitating chemicals</td>
</tr>
<tr>
<td>Mental</td>
<td>Many suspected chemicals</td>
</tr>
<tr>
<td>Autoimmune</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

* Slide from Eric Sampson, CDC/NCEH/DLS 2004
The Old Way of Estimating Exposure

Mathematical modeling

- Water levels
- Air levels
- Soil/dust levels
- Food levels
- Nutritional status
- Lifestyle factors
- Personal habits
- Genetic factors
- Lung, intestine and skin absorption coefficients
- MANY OTHER FACTORS

Predicted levels of toxicants in people
An Improved Way

Instead of estimating, we measure levels of chemicals in people.
Biomonitoring
A Best Practices Report for State Legislators
Preparedness

• Laboratory response networks
• Biologic, chemical, radiologic agents
• Post 911 anthrax release – “White powder outbreak”
• Response to natural disasters
  – Hurricanes (Katrina, Rita, Irene)
  – Deepwater Horizon Oil spill
  – Japanese earthquake and radiation release
• 2002 Winter Olympics
• Standardized Reagents & Controls
• Agent-Specific Protocols
• Lab Referral Directory
• Secure Communications
• Electronic Laboratory Reporting
• Training & Technology Transfer
• Proficiency Testing
CHEMICAL TERRORISM

blood
Hydrogen Cyanide
Hydrogen Sulfide
Anthrax Bacillus
Cyanogen Chloride

Syrinx
- Vertigo
- Tachycardia
- Tachypnea
- Cyanosis
- Flu-like symptoms
- Non-specific neurological symptoms

Indicative Tests
- Increased anion gap
- Metabolic acidosis
- Narrow pCO2 difference between arterial and venous samples

nerve
Sodium Nitrate
Sodium Cyanate

Syrinx
- Dizziness, disorientation
- Epilepsy
- Nausea
- Vomiting
- Paralysis

Indicative Tests
- Increased anion gap
- Metabolic acidosis

blister
Sulfur Mustard

Syrinx
- Itching
- Erythema
- Yellow blisters
- Flu-like symptoms
- Delayed eye irritation

Indicative Tests
- Thiodiglycol present in urine

choking
Phosgene

Syrinx
- Upper respiratory tract irritation
- Rhinitis
- Coughing
- Choking
- Delayed pulmonary edema

Indicative Tests
- Decreased pCO2
- Decreased pO2

metal
Dimethylmercury

Syrinx
- Cough
- Metallic taste
- CNS effects
- Shortness of breath
- Flu-like symptoms
- Visual disturbances

Indicative Tests
- Prostigmin
- Blood mercury
- Urine mercury

Call Poison Control 24/7 For Treatment Information
1-800-222-1222
* Call the MSH Clinical Chemistry appropriate specimen collection, packaging and shipping information at 612-677-8763
AFTER REGULAR HOURS CALL MSH AT 612-677-5414
Summary

• PHLs keep our population healthy and productive.
• The mission of PHLs is to protect the public & to support regulation.
• Their complex testing requires highly-trained staff, sophisticated instrumentation and specially-designed facilities.
Summary

• Biomonitoring answers constituent questions about whether they have been exposed to potentially harmful chemicals.

• During the past decade, state and local environmental laboratories have greatly enhanced their ability to detect agents of terrorism and mass destruction.

• Our laboratories are truly first responders to environmental threats.
Public Health Laboratories: Protecting the Nation’s Health
2012 APHL All-Hazards Preparedness Report

May 2012

What is a Public Health Laboratory?

Public Health Laboratories operate as a first line of defense to protect the public against diseases and other health hazards. Working in collaboration with other arms of the nation’s public health system, public health laboratories provide clinical diagnostic testing, disease surveillance, environmental and radiological testing, emergency response support, applied research, laboratory training and other essential services to the communities they serve.

Every US state and territory, as well as the District of Columbia, has a central public health laboratory that performs testing and other laboratory services on behalf of the entire jurisdiction. In addition, most states have local public health laboratories, ranging in size from large metropolitan laboratories with hundreds of scientists to small rural laboratories with one or two staff.

At the state level, public health laboratories help formulate public policies, develop new methods to detect and combat infectious disease and environmental pollutants and toxins, regulate private medical and environmental laboratories, and perform other essential services to protect residents’ health and well-being. At the federal level, state public health laboratories are an important part of a national network of laboratories that support response to national emergencies and incidents involving food, disease, environment, and agriculture.

Many state public health laboratories also perform environmental testing. In some states the environmental and public health laboratory are the same laboratory and are often within the state health department, providing analytical testing support for numerous state programs including drinking water, wastewater, solid waste, air quality, etc. In other states, the environmental laboratory is separate from the public health lab and is part of the department of environmental quality or natural resources. However, one common feature within these laboratories is the commitment of laboratory personnel to keeping the environment safe and protecting public health.

Turn over for a list of APHL member laboratories
“Take interest, I implore you, in those sacred dwellings which are designated by the expressive term: laboratories. Demand that they be multiplied; that they be adorned. These are the temples of the future...temples of well being and happiness. There it is that humanity grows greater, stronger, better.”

Louis Pasteur