

# Applied Research in Public Health Laboratories

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# Public Health Laboratories

*From Wikipedia, the free encyclopedia*

- **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
- **Provide** diagnostic testing, disease surveillance, applied research, laboratory training and other essential services
- Every US state and territory has a central public health laboratory and many have local public health laboratories that range in size from large municipal labs to small rural labs

# State Public Health Laboratories



## Primary Diagnostic Tests

**1900**

- Tuberculosis
- Rabies
- Parasites
- Diphtheria

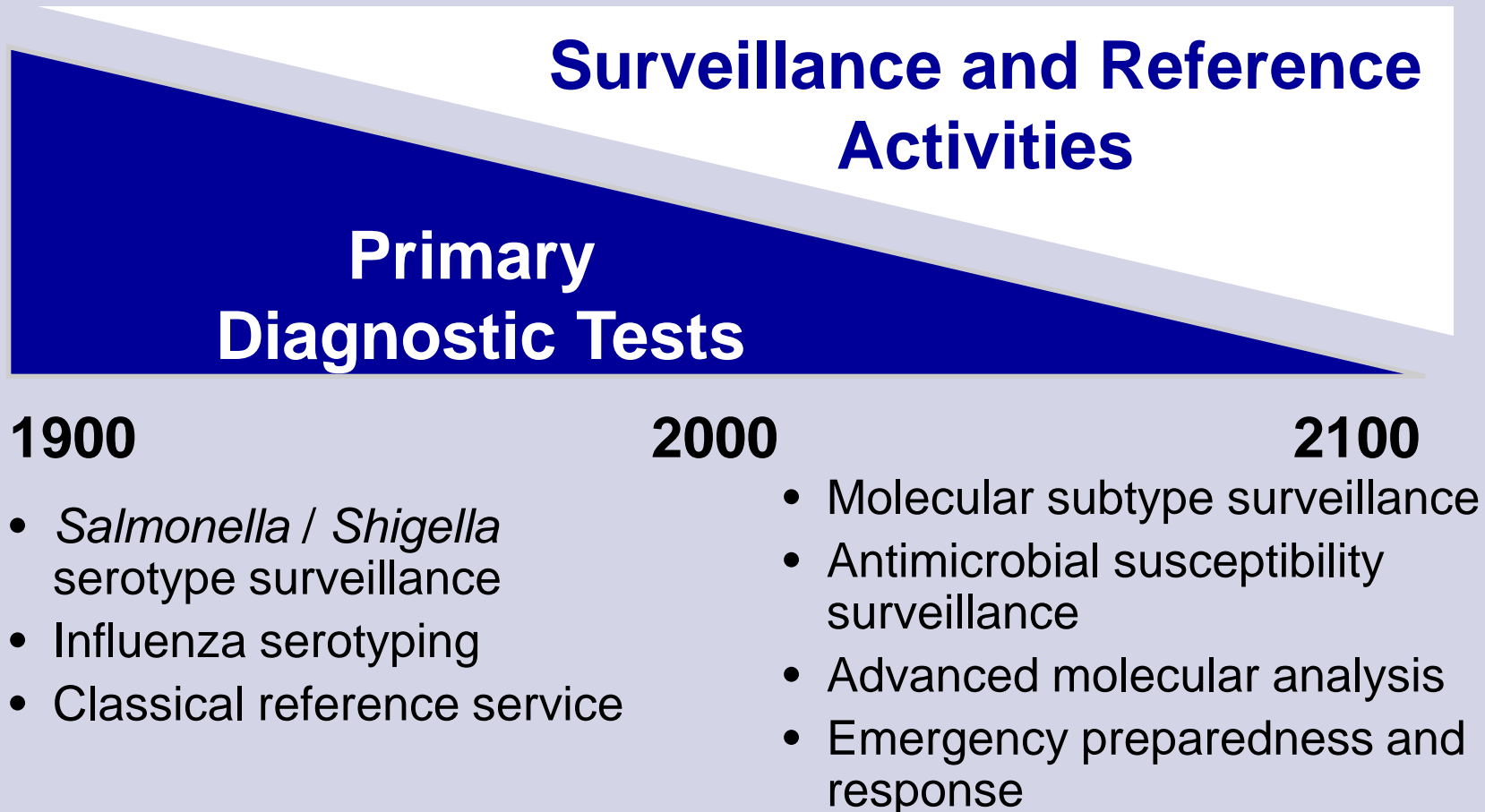
**2000**

- Diarrheal diseases
- Routine cultures
- Sexually transmitted diseases

**2100**

- Rare diseases
- New diseases

# State Public Health Laboratories



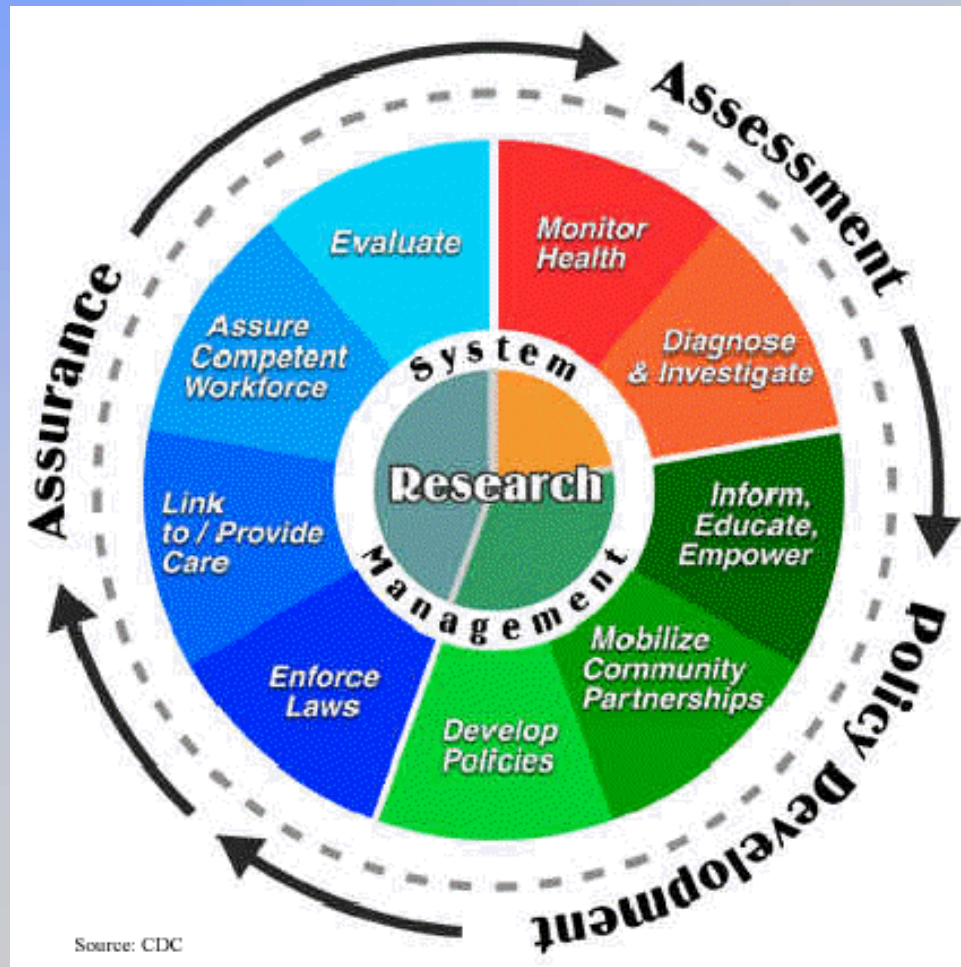
# Research

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- Is one of the 10 essential services of public health
- Is one of the 11 core functions of a public health laboratory
- Can be difficult to distinguish from public health practice
- Is an important component of our public health preparedness and response capabilities

# The Essential Services of Public Health



Research for new insights and innovative solutions to health problems is one of the essential services of public health

# Core Functions of Public Health Laboratories

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- Disease Prevention, Control and Surveillance
- Integrated Data Management
- Reference and Specialized Testing
- Environmental Health and Protection
- Food Safety
- Laboratory Improvement and Regulation
- Policy Development
- Emergency Response
- Training and Education
- Partnerships and Communication
- ***Public Health Related Research***

# Research vs Public Health Practice

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- Public Health Practice
  - Collection and analysis of identifiable health data by a public health authority
  - Purpose is to protecting the health of a particular community
  - Benefits and risks are primarily designed to accrue to the participating community
- Research
  - Collection and analysis of identifiable health data by a public health authority
  - Purpose is to generate knowledge
  - Benefits those beyond the participating community who bear the risks of participation

# Characteristics of Research and Public Health Practice



- Voluntary participation
- Focused on interests of individuals while balancing communal value of research
- Requires IRB approval and informed consent if identifiable private data is collected

- May involve persons who did not specifically volunteer
- Focused on populations while respecting rights of individuals
- IRB approval not usually required
- Conducted by government entity with legal authorization and duty to perform activity to protect health

# PHL Participation in Public Health Related Research

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- The ability of PHLs to participate in research activities varies from state to state
- Most PHLs have only a limited ability to conduct research
- Barriers to research include
  - Lack of specific authorization
  - Competing priorities
  - Personnel expertise
  - Availability of resources and support
  - Lack of collaborative opportunities

# Wadsworth Center, NY

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- Notable among state health laboratories for its commitment to research
- Legacy of its namesake director Augustus B. Wadsworth, who urged his staff to pursue original investigations
- Research funding administered by Health Research, Inc. a non-profit corporation affiliated with NY DOH and Roswell Park Cancer Institute
- Sources of funding include Federal agencies, not-for-profit foundations and commercial entities

# Wadsworth Statutory Authority

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- “The commissioner shall establish and maintain one or more laboratories with such expert assistants and such facilities as are necessary for routine examinations and analyses, and for **original investigations and research** in matters affecting public health. The laboratories shall be known as the Wadsworth center for laboratories and research.”

# Landmark Wadsworth Center Achievements

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- Developed first system of standardized laboratory analysis for the diagnosis of human disease
- Identified and isolated cardiolipin, the first chemically defined antigen used in the standard test for syphilis
- Discovered Nystatin, the first safe and effective antifungal antibiotic
- Isolated and characterized Coxsackie virus
- Developed the use of vaccinia virus as a vector to express selected pathogenic genes and as a therapeutic vector

# Typical Public Health Related Research Conducted in PHLs

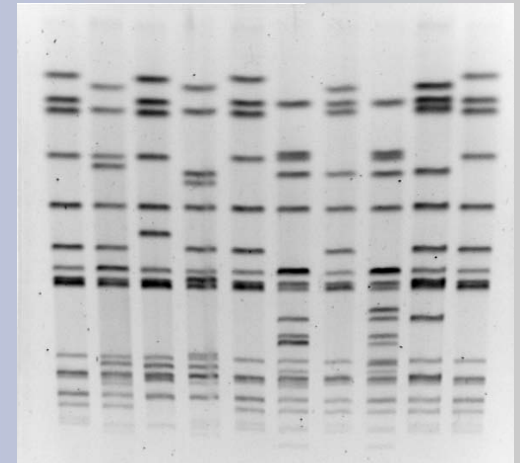
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- Evaluation and implementation of new technologies and analytical methods to support surveillance and response
- Research to improve laboratory testing and development of new methods
- Applied studies
- Research in areas of interest to the public health community

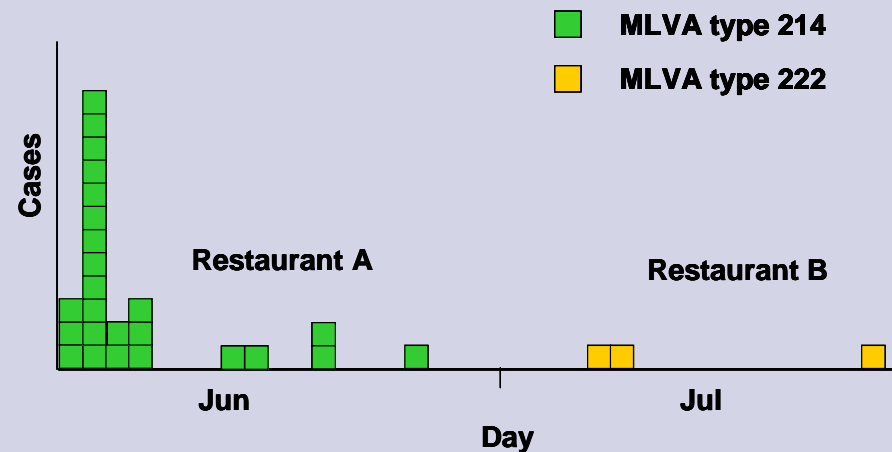
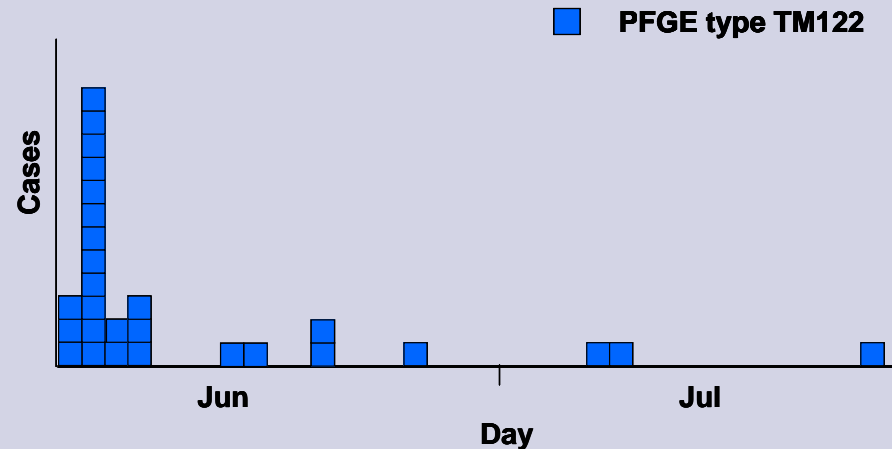
# DNA Fingerprinting of *Salmonella*

- DNA fingerprinting is important for outbreak detection and investigation
- Rapid and efficient communication of results via PulseNet is key to early detection, investigation, and intervention
- CDC funded development of a new fingerprinting method to improve outbreak response



# DNA Fingerprinting of *Salmonella*

- MDH developed novel DNA fingerprinting method for *Salmonella*
- New method was faster and more discriminatory
- Method currently ready for implementation in additional PHLs



# Novel Pathogens of Diarrheal Disease



- MDH participated in research study with University of Maryland to enhance causative agents of diarrheal disease
- Case-control study, funded by CDC cooperative agreement

- Methodology that was developed was also used to investigate outbreaks for which no cause had been identified

# Outbreaks of Unknown Etiology

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- Number of previously unidentified outbreaks (n=101) with a significant pathogen identified: **57%**
- Identified several unique or previously under-recognized pathogens as causative agents of disease
- More method development and testing needed to identify cause of 44 outbreaks that remain unresolved

# Detection and Identification of Perfluorochemicals (PFCs)



- MDH implemented advanced methodology for detection of PFCs in water and human samples
- Made possible by dual-use provisions of CDC Level 1 chemical terrorism funding and funding from the Minnesota legislature
- Enabled rapid situation assessment and successful biomonitoring pilot study authorized by Minnesota statute

# Pilot Study Results and Impact

- PFC levels in study communities were elevated compared to US general population
- Blood levels of PFCs expected to decrease due to actions taken to remove PFC from drinking water
- Advisory Panel has recommended follow-up study to monitor PFC levels over time



# Benefits of the Capability and Capacity to Conduct Public Health Related Research

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- Improved responsiveness through the ability to rapidly answer questions of public health importance
  - Emerging diseases
  - Emerging environmental contaminants
- Intellectual stimulation keeps employees interested, motivated, and flexible
- Provides opportunities to build and improve laboratory networks and collaborative interactions with academic, state, and federal partners

# Summary

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- The distinction between research and public health practice can be difficult to make, however public health related research is an important tool in understanding and responding to threats to human health and warrants additional discussion on when and how to implement this core public health function.