From preventive medicine to population health: The research agenda of the Wisconsin State Laboratory of Hygiene

Charles Brokopp, DrPH, Wisconsin State Laboratory of Hygiene; Ronald Laessig, PhD†,
Department of Population Health Science, University of Wisconsin
School of Medicine and Public Health, Madison, Wis.

The Wisconsin State Laboratory of Hygiene (WSLH) has been Wisconsin’s public health laboratory and part of the University of Wisconsin-Madison (UW-Madison) for 106 years. It has evolved from doing a few hundred tests “to support public health” to becoming a unique player in the Department of Population Health Science and UW-Madison’s research, teaching, and service missions. As a 21st century world-class laboratory, its research commitments, capabilities, and contributions are wide and varied. Here, we describe selected WSLH activities and capabilities that are relevant to research in population health. A complete list of the WSLH research, teaching, and outreach activities related to our UW-Madison mission is available at http://www.slh.wisc.edu/dotAsset/12497.pdf.

Newborn Screening
Beginning with screening a blood sample from each of Wisconsin’s newborns (70,000/year) for 47 disorders, WSLH conducts population-based studies. In 2008, WSLH became the first laboratory in the world to screen newborns for severe combined immunodeficiencies (SCID or “bubble boy disease”). Our research includes method development, logistical studies of implementation and referral to the local health care system, defining the population normal range and incidence rate, automating cost-effective screening, and creating quality assurance algorithms. Screening for other conditions such as DiGeorge syndrome, cytomegalovirus infection, and Fragile X syndrome are being developed.

Environmental Health Monitoring
WSLH safeguards the health of citizens while conducting a variety of groundbreaking studies in environmental health, industrial hygiene, occupational health, and chemical terrorism. As a state-of-the-art facility, WSLH makes its highly sensitive technologies available for collaboration and support of other researchers.

Inductively coupled plasma emission–mass spectrometry (ICP-MS) has been used to measure cadmium and other metals in urine and blood that can be correlated with breast cancer and possibly other cancers.

High-resolution liquid chromatography-tandem mass spectrometry in serum samples has been used to detect polybrominated biphenyls (flame retardants) and thyroid disease in serum. Correlation with environmental exposures defines the etiology of the diseases and contributes to biomonitoring data on Wisconsin residents.

Epidemiology Studies
Epidemiologic tools convert clinical, environmental, and laboratory data into useful information. As the capabilities of the laboratory evolve, so too must our ability to provide and use the laboratory information that is available to today’s public health community and scientific researchers.

Industrial Hygiene/Occupational Health Monitoring and Investigations
WSLH collects data during on-site safety surveys as part of ongoing monitoring of our state’s working environments and following occupational accidents and illnesses, fatalities, and workers’ compensation claims. These data provide unique opportunities for epidemiological investigations of workers in Wisconsin.

Outbreak Investigations
New laboratory technologies such as pulsed field gel electrophoresis (PFGE) and a host of molecular techniques have enabled WSLH to be the first laboratory in the nation to identify the source of E coli O157:H7 in the 2006 “Spinach outbreak.” WSLH was among the first to alert the nation to drug-resistant influenza virus, and the role of human papilloma virus (HPV) as a leading cause of cervical cancer. WSLH was the lead labora-

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ory in identifying the source of the world’s largest single point source outbreak (the Milwaukee cryptosporidium incident) which affected over 400,000 citizens were affected. WSLH is currently conducting research projects on influenza, microbial resistance, Lyme disease, human papilloma virus, and microbial source tracking.

During 2007-2008, the WSLH staff published 93 peer-reviewed papers, presented over 70 professional presentations and 151 course lectures, and obtained extramural funding for 30 research projects.

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References
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