Environmental Health—Waterborne

Assignment Description

The Division of Environmental Health Protection (DEHP) is located in the Center for Environmental Health (CEH) of the New York State Department of Health (NYSDOH). DEHP houses most of the Center's regulatory programs that minimize environmental health threats. Some of the programs protect the population at large, such as public drinking water supplies, food safety in restaurants and sanitation/fire safety in hotels. Other programs target populations needing specific interventions to prevent illness, such as preventing lead poisoning and promoting migrant worker health.

The Division contains two Bureaus and one Unit: The Bureau of Water Supply Protection (BWSP), Bureau of Community Environmental Health and Food Protection (BCEHFP) and the Field Coordination Unit. BWSP includes two programs in CDC EHS-Net Water (Research and Practice). The Fellow and primary mentor will be based in the BWSP which is composed of six sections: Design, Operations, Residential Sanitation and Recreational Engineering, Information Systems/Compliance, New York City Watershed, and Certification. The Fellow will have the opportunity to interact with the staff of these programs at meetings and for specific projects.

Dr. Lloyd Wilson will be the primary mentor for the Fellow, and he is Coordinator of Special Projects and Research, Bureau of Water Supply Protection (BWSP). His responsibilities are focused on emerging public water supply issues that require development of expertise and coordination of several organizational units. Topics of current concern that the Fellow could be exposed to include Marcellus Shale Natural Gas development, emerging contaminants (e.g. hexachrome, pharmaceuticals), PCB contaminated sediments from the Hudson River, and water quality in general. He represents the department in many committees such as the Water Management Advisory Council, New England Interstate Water Pollution Control Commission, Great Lakes Basin Advisory Council, Association of State Drinking Water Administrators and serves as a program advisor to the New York State Energy Research and Development Agency (NYSERDA) Environmental Monitoring and Evaluation Program (EMEP). The fellow will have the opportunity to participate in any of these activities. The focus will be on the issues on HABs for which Dr. Wilson leads a multi-unit task force to develop drinking water and regulated beach response protocols.

Dr. David M. Dziewulski will be the secondary mentor for the CSTE Applied Epidemiology Fellow. He is a Research Scientist (Microbiologist) in the Bureau of Water Supply Protection and has directed CDC EHS-Net water activities since 2005. The CSTE Fellow could take a co- lead or develop a sub-task on evaluating the existing surveillance systems for determining the association between HAB events and emergency department syndrome. The Fellow could also play a key role in sub-tasks researching/refining the use of various tools used to evaluate the vulnerability of small water systems to contamination or the vulnerability of healthcare facilities to the occurrence of legionellosis.

The fellow is expected to interact with both Drs. Dziewulski and Wilson on a daily basis, and thus the distinction between primary and secondary mentor is more of a formality than a reflection of their role. Both are expected to be significantly involved in working with the fellow.

Day-to-Day Activities

The CSTE Fellow will be fully integrated into Department's and the Division of Environmental Health Protection's daily activities. That includes a 7.5 hour work day (37.5 hrs/week) with generous vacation, personal, and sick leave. The CSTE Fellow's anticipated day-to-day activities may include (depending on Fellow interest and projects chosen):

Key activities:

- Statistical data analysis related to primary project/interests;
- Writing reports, scientific papers, and material for newsletters;
- Preparing scientific and public presentations, including material for conferences;
- Developing/presenting scientific posters;
- Working with CSTE Fellowship Primary Mentor and Secondary Mentor on most work days, with scheduled meetings to review progress bi-weekly;
- Participating in CDC Environmental Health Specialist Network update conference calls;
- Participating in weekly regional epidemiology summaries (statewide);
- Participate in and understand the data gathering needs of the CDC National Outbreak Reporting System (NORS);
- Attending training classes on public health emergency preparedness;
- Attending training classes on Project Management and statistical packages;
- Directing SUNY at Albany SPH graduate student work to assist in CSTE Fellow projects;
- Providing lectures to SUNY at Albany SPH public health epidemiology/environmental graduate courses;
- Working with local health departments, hospitals, and nursing homes (including investigations);
- Interacting with scientists and engineers on special projects or tracking that requires geographic information systems (GIS);
- Work with the State Drinking Water Information System (SDWIS)
- Interact with Regional Offices, local health departments and water operators including participating on conference calls and collaborating with other scientists on legionellosis issues;
- Training specialists (engineers, scientist and sanitarians) in protocols for the environmental response to legionellosis in healthcare facilities and in the community;
- Become familiar with and use, when appropriate, the NYSDOH Outbreak Management Solution (OMS) for logging and tracking outbreaks in New York State;
- Participate in Interagency meetings coordinating programs;
- Participate in stakeholder groups (water management advisory council);
- Attend public meetings;
- Attend training for water operator certification courses;
- Opportunity to attend sanitary survey courses for ground water and surface water;
- Attend regularly scheduled Bureau meetings.

Corollary Activities:

- Become familiar with the laboratory methods used for the particular task or sub-tasks that are chosen and developed;
- Participate in a Comprehensive Performance Evaluation (CPE) to assess the performance of a drinking water treatment plant.
- Attend training designed to give Professional engineers involved in public health Continuing Education credits;
- Learn and participate in Federal/State rulemaking process;
- Review draft legislation;
- Learn about hydrofracking and natural gas development;
- Participate in watershed protection meetings;
- Participate in Agency Poster Day, Participate in School of Public Health Poster Day
- Attending scientific conferences within NYS, the region including the annual Northeast Epidemiology Conference;

Potential Projects

About 45% of NYS is within the Great Lakes Basin, providing opportunity for work with a Great Lakes Focus. The potential project includes opportunities to fulfill the CSTE Fellow assignment deliverables, including surveillance system evaluation, conducting an outbreak investigation, bioterrorism/emergency preparedness and response, designing an epidemiologic study to address a health problem, designing/refining a questionnaire or other data collection tool, creating databases, using statistical software, interpreting findings from epidemiologic studies, recommending control measures and prevention programs, communication through written field investigation and surveillance reports, preparing a manuscript for publication, oral presentations, risk communication, understanding public health law and HIPAA, obtaining IRB training and certification, learning the essential public health functions, appreciating the diversity of how epidemiology is used in different program areas, and effectively negotiating cultural sensitivity issues.

Dr. Wilson as a mentor and as a Bureau manager will provide many opportunities for the fellow to participate in other projects besides the main focus on harmful algal blooms (HAB). HABs are a Center wide focus for which Dr. Wilson leads a task force to develop NYSDOH response protocols. These protocols are for the drinking water and bathing beach regulatory programs within the Division of Environmental Health Protection. Respectively, the Division is comprised of the Bureau of Water supply Protection and the Bureau of Community Environmental Health and Food Protection. The intern, as they desire, will have the opportunity to participate in all of Dr. Wilson's activities including but not limited to the EHS-Net Water Cooperative Agreement managed by Dr. Dziewulski. Outside of EHS-Net, Dr. Wilson is involved in studies of PCBs in Hudson River water, unconventional natural gas development, climate change, pharmaceuticals in drinking water, and drinking water quality issues in general. He has participated in large scale efforts to understand the link between ambient air pollution and asthma visits to emergency rooms, and another effort looking at PCB exposure and neurological health outcomes. He

has also participated in the syndrome surveillance program and the study of small, state-regulated groundwater systems.

Dr. Dziewulski has been managing the EHS-Net Water Cooperative Agreement since its inception in New York State in 2005. As part of the grant, NSYDOH has developed assessment tools for small groundwater systems, examined methods for confirming disinfection and are working on a tool for assigning baffle factors to tanks and vessels for disinfection. The CSTE Fellow could take the lead on evaluating the existing syndromic surveillance systems for determining the association between HAB events, or other circumstances involving water quality or infrastructure issues, and emergency department syndromes. The Fellow could also play a key role in researching/refining the use of various tools used to evaluate the vulnerability of small water systems to contamination or the vulnerability of healthcare facilities to the occurrence of legionellosis. A separate EHS-NET agreement includes the ability to participate in practice tasks such as interventions related to legionellosis.

Other staff involved in HAB work projects who likely will collaborate with the Fellow include:

- Mr. James Hyde has a MS in aquatic ecology and more than 21 years of experience in lake and reservoir management and watershed protection. He is also the principle investigator for a CDC cooperative agreement Harmful Algae Bloom (HAB) grant from 2009 and 2013 and still very involved in the various HAB efforts with the DOH and other agencies. He has authored/co-authored numerous other publications and reports.-
- Mr. Eric Wiegert, works in the Department's recreational water programs at the BCEHFP. He has 19 years of experience in environmental health protection programs and currently manages the Department's Great Lakes Restoration Initiative and the Beaches Environmental and Coastal Health EPA grant projects for ambient recreational water quality. He also served as a co-PI on the Department's HAB grant and assists with projects to develop and expand use of molecular detection methods of pathogen indicators. He is an integral member of the Department's HAB workgroup.
- Mr. David Nicholas, MPH, is an Epidemiologist with the Bureau of Community Environmental Health and Food Protection (BCEHFP) with over 10 years of experience in investigating and reporting outbreaks. He has been serving as an EHS-Net Coordinator for New York State for 8 years and has been working on EHS-Net activities for 9 years. Mr. Nicholas coordinates foodborne disease outbreak investigations, assists with waterborne disease outbreak investigations and is the National Outbreak Reporting System (NORS) Reporting Site Administrator for New York State and therefore reports foodborne and waterborne disease outbreaks for the State to the CDC.

Project:

New York was one of 10 state health departments to receive a CDC sponsored cooperative HAB grant, and NY the sole state with a strong drinking water element in their work plan. The specific goals of this grant were to develop our laboratory capacity to perform HAB identification and HAB toxin analysis, and to put programs in place to document blooms, describe potentially related human and animal health

effects, and develop outreach materials and response protocols for the protection of recreational users and drinking water systems. This work involved working closely with other agencies, particularly DEC and their citizen volunteer lake monitoring program, and we are still very involved in DEC's ongoing EPA funded HAB efforts.

The focus of the proposed fellowship is to work specifically on the harmful algal bloom issue with a focus on the Great Lakes Basin to see if a current method of tracking illness can detect an adverse health signal related to the occurrence of harmful algal blooms and exposure through drinking water and recreational use of surface waters. The fellow will be responsible for evaluating different datasets to see if a health signal can be detected. The fellow is also expected to use their epidemiological expertise to help in methodology development on how a signal may be detected and is expected to complete such. Dr. Wilson and Dr. Dziewulski have interacted with many epidemiologists in the Department of Health and will work with the fellow to collaborate with them if the fellow so desires. The fellow will also have the opportunity to participate in environmental sampling to characterize potential exposures. Given the fellow will be located in the Division that is a fully functioning regulatory program overseeing public drinking water and recreational water use, the fellow will have the opportunity to learn and explore many different aspects of regulatory programs. We believe our position is very unique in that we reside in a core public health regulatory program and we have the expertise, resources and opportunity to interact with health staff in the field and with peers in academia /research. In short, we are offering placement in an organization that has expertise in many different fields and we are used to working collaboratively among units, increasing the potential for a very fulfilling fellowship.

The NYSDOH in 2011 formed an internal workgroup, chaired by Dr. Wilson, that produced a protocol for responding to HABs at regulated beaches and an interactive self-guided software program was developed for use by Local Health departments for implementation of the protocol. The program has developed response protocols that are continually evolving and one area that is missing is the linkage of human health to HABs. The fellow project is to help address this deficiency.

The proposed fellowship is to trace symptomology associated with drinking water systems using multi-use lakes and surface water sources for drinking water that are subject to HAB occurrence. Using a currently developed protocol, syndrome data will be extracted from emergency department surveillance (EDSurv) and evaluated with a Cumulative Summation (CuSum) method as applied to the defined hazard period to determine alert signals. This work will assist in refining the current protocol to help with signal detection for HAB events and to determine if the appropriate detection sensitivity exists. This could be done by:

- Updating and refining the list of syndromes that represent exposure to toxins;
- Manipulating the period used for CuSum;
- Evaluating buffer periods for CuSum;
- Examining population locations (adjacent zip codes), population size and signal strength for both cases and controls;
- Researching additional methods to associate effects of transient exposures (e.g. case crossover);
- Methods suggested by the fellow.

The current protocol used for recreational water quality events could be applied to the evaluation of HAB and/or a new protocol could be developed to determine if blooms (transient exposures) generate a detectable adverse health signal (acute effects) in local emergency rooms. This is a great challenge because individuals using recreational water disperse to their homes in surrounding communities which can dilute the syndrome signal. Further, the number of well-defined events may be limited. In addition, as noted above, a list of syndromes needs to be developed that best represents the diverse symptomology that occurs with these events (e.g. everything from skin rash to gastrointestinal problems). A possible alternative is to examine multi-use water bodies where recreational water is also used as a drinking water source (after treatment). With a sentinel population present there may be some ability to detect a signal. The existing protocol must be refined and updated. As noted, alternative methods also need to be examined. Prospective monitoring will be done on a select current event (or events.

Additional methodological evaluation would involve a retrospective and limited prospective study examining the association of NYSDOH problem alert (PA) information with syndromic data in the Emergency Department Syndromic Surveillance System (EDSurv). This will afford an opportunity to critically test the application of CuSum, and other methods (see bullets above), to associate syndrome with an exposure in the environment.

The NYSDOH Center for Environmental Health electronically posts Problem Alerts (PA) that describes drinking water issues throughout the state. These problems most often involve loss of water, main failures, insufficient supply, loss of disinfection, power loss, and other infrastructure or operational issues that may compromise a public water system. NYSDOH also has a program in the Center for Community Health that collects syndrome data from emergency departments statewide in EDSurv. These latter data are supplied on a voluntary basis and do not involve diagnoses of any kind; primary patient complaints are logged according to syndrome and NYSDOH Bureau of Water Supply is predominantly interested in tracking the occurrence of vomiting/nausea and diarrhea. By tracking classes of PA involving water problems by zip code and examining the database of syndrome reports from hospitals in the same zip codes, it is anticipated that the occurrence of underlying waterborne disease related to these problem events may be uncovered.

Preliminary studies have been completed and the program focus will turn toward specific problem alerts from the past that are strong candidates for the occurrence of low level disease. The retrospective work would involve defining a hazard periods for existing problem alert reports (i.e. select events) from 2005 through 2010. Retrospective work involving water system outages due to hurricane Irene, tropical storm Lee and storm conditions along the Lake Ontario and Lake Erie shores along New York also will be considered for examination. This work will help refine the current protocol and to determine if the appropriate detection sensitivity exists. As with the HAB task, prospective monitoring will be done on select current events.

Summary Tasks:

- Assemble information that combines events with syndromic signals in emergency rooms using a preliminary protocol. Graphic presentation of both possible and unlikely events will be needed to demonstrate signal difference and/or strength.
- Through literature review, and the review of previous work at NYSDOH, determine alternate evaluation methods that would help discriminate an authentic syndromic signal (peak) from noise above a baseline during the period of a water event.
- Assist in recommending changes in the overall protocol.
- Consider the use of SPARCS data to refine or confirm detection of alert signals.
- A final report summarizing the results will be a final deliverable.

Both the HAB and Problem Alert tasks use the Statewide Planning and Research Cooperative System (SPARCS) data, that includes diagnoses and treatments for both outpatient and inpatient cases could help refine or confirm detection of GI signals due to water quality or infrastructure issues.

It should be noted that the proposed fellowship also offers the opportunity to participate in field monitoring and surveillance of HABs in support of the on-going NYSDOH efforts that were previously funded by CDC. This monitoring might be able to provide additional support for exposure data for comparison to the syndrome surveillance data. New funds for monitoring have been obtained through the Epidemiology and Laboratory Capacity cooperative agreement between our NYSDOH epidemiology partners and CDC. The focus will be to look at HABs in the Great Lakes Basin and the associated toxin microcystin (maybe anatoxin and others too). This work could continue our efforts related to the development of response protocols for drinking and recreational waters as it relates to identifying toxin risks, monitoring priorities, treatment needs and optimization, and the potential use of qPCR and other novel laboratory methods in this work. Another potential output is related to characterizing the role of HABs in creating disinfection by-product (trihalomethanes and haloacetic acids) risks in potable water supplies. NYS is well suited to do this work in that there are over 400 public water supplies using surface water and many of these including some major metropolitan areas (e.g. Buffalo, Rochester) are within the Great Lakes Basin.

In summary, this fellowship should result in information that will help address the growing concern about HABs and their toxins, as related to climate change and water quality including increased eutrophication, taste and odor issues, HABs and their toxins, and more disinfection by-products in treated (disinfected) drinking water. This project will provide data to help water supplies, beach operators and the NYSDOH address these concerns. The work requires expertise in many fields and good analytical equipment, all available at NYSDOH.

Preparedness Role.

The CSTE Fellow will have the opportunity to complete FEMA study courses on the Incident Command System and participate in drills and exercises that occur periodically throughout the state. BWSP staff work on emergency preparedness in coordination with the State Office of Emergency Management along with the Office of Health Emergency Preparedness within the Office of Public Health (see

organization chart). The CSTE Fellow will have the opportunity for training and assisting with preparedness projects. Activities may include tabletop exercises with local officials, emergency responders and water suppliers.

Assignment Location:	New York State Department of Health Albany, NY
Mentor:	Lloyd Wilson, PhD, MA, BA Research Scientist IV
Mentor:	David Dziewulski, PhD, BS Research Scientist IV