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# Local response to infectious diseases facilitated by resources and preparedness

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The ability to effectively respond to a biological crisis hinges on successfully identifying the threat. While the World Health Organization was declaring the first influenza pandemic in 41 years, the Medical College of Wisconsin (Medical College) was developing tools to differentiate and diagnose the flu subtypes of patients in Milwaukee, which last year experienced 1 of the largest outbreaks of novel swine origin influenza virus (SOIV) in the country.

This outbreak of novel influenza A (H1N1) virus occurred in late April 2009, and the Medical College's Midwest Respiratory Virus Program (MRVP) responded with multiple assays and already developed, state-of-the-art technology newly created by Kelly J. Henrickson, MD, Professor of Pediatrics and Microbiology at the Medical College, and the Respiratory Virus Program team. One of these (FluPlex, a rapid multiplex, reverse transcription polymerase chain reaction enzyme hybridization assay) can simultaneously detect and distinguish between influenza A and B viruses and identify all influenza A virus subtypes that have infected humans. It additionally is able to delineate the human and

animal variants. The test was used to confirm the diagnoses of the first patients in Wisconsin infected with the 2009 H1N1.

In just the first 2 weeks of the Milwaukee outbreak, FluPlex correctly identified 206 clinical samples as positive or negative and correctly typed and subtyped viruses from the positive samples. Importantly, its accuracy was confirmed when results were compared with assays validated by the Centers for Disease Control and Prevention (CDC) and approved by the Food and Drug Administration (FDA).

Rapid and accurate detection is critical for initiating the appropriate public health response to emerging infectious diseases. With knowledge of H1N1 limited at the time of outbreak, the fast, effective and inexpensive tests developed by the MRVP allowed health care professionals at Froedtert Hospital and Children's Hospital of Wisconsin, and eventually elsewhere in the state, to better manage their patients and limit the virus's transmission.

Swift local surveillance is a key component to curbing an outbreak and potentially preventing an infectious disease from reaching epidemic or pandemic levels. Although the H1N1 virus became pandemic, efforts to quickly diag-

nose and treat infected patients likely decreased morbidity and mortality rates.

The latest efforts in Dr Henrickson's lab have been directed at automating the FluPlex test, which has met with initial success. This example of ongoing innovation demonstrates an academic medical center's ability to develop resources that benefit medicine and protect the public's well-being. We regard that ability as a responsibility, which is why the Medical College also supports a research resource whose programs focus on defense against infectious diseases.

The College's Center for Biopreparedness and Infectious Diseases (Center) was established in 2003 and continues to meet the need for developing diagnostics, therapies and vaccines to combat select agents and chronic and emerging infectious diseases. Directed by Dara Frank, PhD, Professor of Microbiology and Molecular Genetics, the Center emphasizes threats considered especially problematic for the future of Wisconsin and the nation.

Core faculty are engaged in research to address the mounting challenge of antibiotic resistance, to understand the mechanisms that enable bacterial survival

and proliferation in tuberculosis infection, to prevent hospital infections including ventilator-associated pneumonia, and to develop a successful vaccine for Lyme disease. Our efforts encompass global health, including novel research focused on design and testing of a vaccine to protect at-risk international populations from amebiasis.

Research in the Center is translational and patient-focused. In many cases, it is informed by clinical knowledge. Center investigators are building strong relationships with infectious disease clinicians, which keeps research on task with public needs and keyed in to new observations.

A clinician's window to the public is essential for timely

infectious disease response. In the last few years, it was community physicians who alerted researchers when methicillin-resistant *Staphylococcus aureus* (MRSA) began appearing in the general population, rather than remaining limited to hospitalized patients with compromised immune systems, for example. These reports created research opportunities to determine what changes allowed the organism to enter the community.

Such interactions form the essence of a local response network, the fundamental basis of which can be successful on a much larger scale. The Center is part of the Region V Great Lakes Regional Center of Excellence.

In this role, the Medical College pledges to grant access to our facilities in the event of a regional biological threat. If activated, the Center could arrange laboratory space, provide and run high containment labs, and interface with local or national agencies. We may securely store samples, as we have previously done, or even offer direct assistance for select bioagents and diseases in which our faculty have special expertise.

Our Center is reaching critical mass, and through informed research, coordination with clinical peers, and scientific innovation, we are poised to grow as a critical defense mechanism for the public against biological threats both natural and malicious.

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