THE HARTWELL FOUNDATION

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Ellen F. Foxman, MD, Ph.D.

Assistant Professor
Department of Laboratory Medicine

Yale University

Novel Diagnostic Test to Reduce Antibiotic Overuse

Antibiotic overuse is emerging as an urgent health threat of particular importance for children. A recent study revealed that 47 million unnecessary antibiotic prescriptions are given out per year in the US, with rates for children about three times higher than adults. The vast majority of these prescriptions are for acute respiratory infections, the most common illnesses of childhood — sore throat, ear infection, and sinus infection. Unnecessary antibiotic use is detrimental to public health in general but is particularly harmful to children in two ways. First, antibiotics disrupt the body's normal, healthy bacteria with growing evidence that repeated use contributes to development of chronic diseases such as allergies, asthma, and diabetes. Second, antibiotic overuse drives the emergence of antibiotic-resistant bacteria. Currently, antibiotic-resistant bacteria cause two million hospitalizations and 23,000 deaths per year in the U.S. which is expected to grow exponentially if current antibiotic overuse practices continue. A contributing factor to the overuse of antibiotics is the inability of doctors to distinguish between viral infections versus bacterial infections, particularly the 70-90% of upper respiratory tract infections that are viral-only and therefore not susceptible to antibiotics, versus the less prevalent bacterial-only infections. While rapid tests are available for some viruses, testing for one or two specific viruses can easily miss the relevant virus. Moreover, a large panel of tests for different viruses would be costly and inefficient, if not just impractical on a large-scale deployment. To address this need, I propose a robust, quick screening test for a unique biomarker of virus infection that can be performed readily at the point-of-care, which if positive would support a clinical decision not to prescribe antibiotics. However, rather than detecting features specific to individual viruses (e.g., viral proteins or viral genomes), I propose to sample the site of infection with a respiratory swab to identify the airway *host response* to viral infection. It is a strategy based upon my preliminary observations that even a single protein biomarker can distinguish an airway infection as viral-only or bacterial-only. Using this approach, I will confirm biomarker reliability by evaluating and comparing host response patterns in a cohort of pediatric patients in good health to those with uncomplicated common cold symptoms or with confirmed viral and/or bacterial otitis media. If I am successful and my test for a unique viral marker of airway respiratory infection is reduced to clinical diagnostic practice, it will promote a decline of prescribed antibiotic use among children. As a standard of care, it would reduce the emergence of antibiotic-resistant bacteria, preserve or prolong the effectiveness of many life-saving antibiotics and potentially, contribute to a reduction in the latent sequalae of chronic disease among this susceptible population of children.