Space Renovation Completed

Investigators and research staff within university settings often must labor within office space that is constrained or not well-designed. This renovation provides infectious diseases faculty with seven new offices and 27 spacious, work space cubicles oriented to foster a collaborative space. The teleconference center provides users with the ability to connect with colleagues locally and across the globe.

Project management was provided by Pamela Guevarra-Johnson. The Fisher Center occupants are truly grateful for the opportunity to work in a modern, well-designed facility, made possible by the extraordinary generosity of Sherrilyn and Ken Fisher.

Photos courtesy of Cho Benn Holback + Associates.

Approximately 6,000 square feet of former anatomy labs, classrooms and offices have given way to newly renovated research space for the Sherrilyn and Ken Fisher Center for Environmental Infectious Diseases. The Center is located on the second floor of the Pre-Clinical Teaching Building on the East Baltimore Campus of Johns Hopkins University. Personnel moved into the area in September 2013, immediately enjoying the new office and teleconference facilities. Center personnel have expressed much satisfaction with the renovations designed by the award-winning architectural firm of Cho Benn Holback + Associates. Using bright colors of lime green and cobalt blue, the Center was designed to be an open, contemporary office environment.

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Mission Statement
The Sherrilyn and Ken Fisher Center for Environmental Infectious Diseases is dedicated to the clinical research of environmental pathogens which improves the diagnosis and treatment of these infections.
A brief media splash arose this past August when the Centers for Disease Control (CDC) issued a press release suggesting that more than 300,000 cases of Lyme disease occur annually in the United States. Although these are at best indirect numbers ascertained from insurance billing data, it does point to the fact that the number of reported cases (20,000-30,000 annually) is perhaps only 10% of actual. Most public health officials are not surprised at this discrepancy since underreporting is well known to occur with all notifiable infectious diseases. Though this study has not yet been published, other evidence also suggests that over the last two decades, *Borrelia burgdorferi* has widened its geographic range beyond the traditional boundaries of New England, the Mid-Atlantic and upper Midwest United States. These numbers give a different luster to what is already the most common vector-borne infection in North America.

What these figures do not purport is that these are untreated cases of Lyme disease in the numbers discussed, which has been a common misinterpretation of the CDC information by some journalists. Yet, even though Lyme disease remains a mostly regional infection as contrasted to a respiratory infection such as influenza, it does speak to a clearly credible need to improve efforts at prevention.

Given the complex life cycle of the bacteria *Borrelia burgdorferi* that includes not only ticks but mice, deer, birds among other animals with humans as an inadvertent host—there are many potential scenarios that could be explored. Efforts to decrease infection acquired in the outdoors have been examined including a home yard application with a pesticide (also known as an acaricide in this case, commercially available granular deltamethrin) compared to sham, but this innovative study failed to show impact at decreasing human infection. Clever deer feeding stations that force the animals to rub past acaricide-impregnated rollers do decrease tick numbers, but no one knows how this translates to impact upon Lyme disease. Even such universal, common-sense recommendations regarding personal tick inspections, use of DEET or other tick repellants clearly are insufficient to solely staunch the numbers of infection.

Protection through immunization is the most logical choice, and an FDA-approved vaccine (LYMÉrix) was available from 1998-2002. This agent did protect by about two-thirds, but the manufacturer withdrew the vaccine due to poor sales following allegations of safety concerns. There are a number of new, candidate vaccine approaches that industry or academic investigators are researching, though it’s unclear if the hurdles including efficacy, regulatory and economic will be overcome.

With vaccination a distant goal, accurate identification and treatment remains a cornerstone. Some approaches currently under investigation with the support of the Fisher Center including Dr. Megan Reller’s development of a multiplex PCR to examine a number of tick-borne infections as well as collaboration with Dr. Ying Zhang and colleagues in the Bloomberg School of Public Health to investigate whether diagnostics based on T-cell assays may be more sensitive in detecting early Lyme disease than current antibody testing. Improved approaches to Lyme disease have been relatively slow in coming but this is not unique with bacterial infections generally despite modern innovations.

### Fisher Center Discovery Program 2014 Awards

The second grant cycle of the Fisher Center Discovery Program (FCDP) yielded 16 submissions focusing on clinical or translational research related to environmental infectious diseases. The Fisher Center Discovery Program Board, composed of five senior JHU faculty members, reviewed each application resulting in six proposals receiving financial support ranging from $30,000 to $50,000. These funds will permit JHU faculty members to engage in pilot research or research that may lack traditional funding mechanisms.

An event to honor the 2014 FCDP awardees was held December 16, 2013 in the newly renovated Fisher Center on the main JHU School of Medicine campus in East Baltimore. The event let awardees, Board members, and Fisher Center staff to meet and mingle in an informal setting. The Fisher Center is pleased to offer these grants which may assist with career development of young JHU faculty.
The bacterium *Staphylococcus aureus* can cause allergic inflammatory responses through production of staphylococcal enterotoxins, which are superantigens. It is unknown whether the presence of *S. aureus* in the environment stimulates an immune response or respiratory inflammation in people. We will study the homes and health of children and adults who have asthma to assess if superantigen-producing staphylococci are common in the homes of asthmatics and if the presence of these bacteria are associated with symptoms of asthma. This research has the potential to change clinical approaches, perhaps through targeted home environmental interventions, to improve health.

Lyme disease is an inflammatory process initiated by infection with the tick-borne bacteria *Borrelia burgdorferi*. We do not understand why people respond differently to this infection nor do we have a good understanding of all the immune factors that are essential for complete recovery. Lyme disease is increasing in incidence and spreading geographically in the Mid-Atlantic and North East region. The CDC now estimates that there are over 300,000 new cases each year making Lyme disease the leading vector borne disease in the US. Our hypothesis is that individual differences in the immune response to the infection is an important factor in how patients recover and this is the focus of our proposed study.

Worldwide there are estimated to be 164.7 million episodes of shigellosis per year (14,000 annually in the US) with the greatest disease burden in children under 5 years of age. Alarmingly a recent study in rural Bangladesh found that 10% of drinking wells sampled had *Shigella* bacteria present. The primary aim of this prospective cohort study is to conduct evaluation of environmental transmission of the *Shigella* using Pulsed-field gel Electrophoresis to determine if groundwater is a transmission route for *shigella* infection in humans. Through this study in rural Bangladesh interventions will be developed to reduce diarrhea morbidity and mortality in children under 5 years of age.

Although antibiotics have saved countless lives, their use is not benign and can result in the emergence of multi-drug resistant organisms. Children who develop infections with these organisms have very poor outcomes because there are no available antibiotics to treat their infections. Once introduced into the hospital environment these organisms can spread rapidly from patient to patient. We are proposing to develop and validate an easy to use decision tree to determine which children are at risk for carrying these organisms. Once developed, we are hoping to disseminate our decision tree to institutions across the country.
Recent Publications

A Systematic Review of Borrelia burgdorferi Morphologic Variants Does Not Support a Role in Chronic Lyme Disease, authored by Drs. Paul Lantos, Paul Auwaerter, and Gary Wormser. Published January 2, 2014 in Clinical Infectious Diseases.