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INNOVATIVE RESEARCH WILL IMPROVE UNDERSTANDING OF LYME AND OTHER TICK-BORNE DISEASES

The National Research Fund for Tick-borne Diseases, Inc. (NRFTD), the nation's only non-profit organization dedicated primarily to funding scientific research in the rapidly expanding field of tick-borne diseases, today announced the awarding of four research grants totaling \$240,000 under its 2006 Pilot Project Grant Program. Leo J. Shea III, Ph.D., NRFTD National Chairman, states "The objective of this program is to accelerate the advancement of scientific knowledge regarding tick-borne diseases and to translate these advances into improved health for patients who suffer from them."

"Lyme disease and other tick-borne illnesses are a growing public health threat, yet little work is being done to understand the complexities posed by these potentially serious diseases," said Catherine F. Morrissey, NRFTD Research Board Chair. "Our program is an expedited funding initiative designed to support cutting edge research with the greatest potential to advance scientific discovery." Grant winners are selected following a rigorous peer-review process by the NRFTD's distinguished Scientific Advisory Board using guidelines akin to those established by the National Institutes of Health. In addition to selecting projects that adhere to the highest standards of quality, the likelihood that a project's results will lead to additional long term funding by the National Institutes of Health, National Science Foundation or other scientific or biomedical agencies is strongly considered. "The winning grants promise to provide important scientific information as well as jumpstart even bigger studies," Morrissey noted.

Dr. Wayne Hynes of Old Dominion University has been awarded a grant to study the role of defensins in the innate immune response of ticks. Defensins are small antimicrobial proteins that kill bacteria by attacking and destroying their surface membranes. While the immune system of dog ticks contains defensin, it is not detectable in deer ticks, and it may be that the presence of this protein accounts for the inability of dog ticks to transmit *Borrelia burgdorferi*, the spirochetal bacterium that causes Lyme disease. Dr. Hynes will conduct experiments to investigate whether inactivating the gene encoding the defensin protein in dog ticks will allow this species to transmit the Lyme disease spirochete. Understanding the role of defensins in tick immunity will allow for comparisons with vertebrate defensins, possibly providing scientists with strategies to augment human innate immunity to *Borrelia*.

Also studying Lyme disease will be Dr. Brian Stevenson of the University of Kentucky College of Medicine, who will investigate how antigenic variation in *Borrelia burgdorferi*'s surface membranes enables persistent infection in animal hosts. Bacteria from the *Borrelia* genus are capable of varying their outer surface proteins to avoid destruction by animal immune systems. This process has been noted in *Borrelia hermsii*, an agent of relapsing fever, which contains a protein known as Vmp (variable major protein). In *Borrelia burgdorferi*, the variable antigenic protein is called VlsE ((Vmp-like sequence, expressed) and it is believed to play a crucial role in *B. burgdorferi*'s ability to survive in animals. Throughout mammalian infection, the DNA sequence of *B. burgdorferi*'s *vlsE* gene changes constantly as the pathogen "reshuffles" its surface proteins; identifying the mechanism by which this occurs could lead to important novel therapies in the treatment of Lyme disease.

Another important, potentially fatal tick-transmitted disease is human granulocytic anaplasmosis (HGA), caused by a bacterium called *Anaplasma phagocytophilum*. This organism will be studied by Dr. Jason Carlyon, also of the University of Kentucky. After being transmitted to animals, *A. phagocytophilum* invades certain white blood cells called

neutrophils. The susceptibility of neutrophils to *A. phagocytophilum* is controlled by molecular interactions between the bacterium and host neutrophils: the bacterium contains “keys” (known as adhesins) that interact with “locks” (receptors) on the neutrophil’s surface. Identifying the specific adhesins and receptors involved in this process will provide scientists with new targets for HGA therapies and vaccines.

The final grant recipient is Dr. Patricia Holman from Texas A&M University’s College of Veterinary Medicine and Biomedical Sciences, who will study *Babesia microti*, yet another important tick-transmitted pathogen. *B. microti*, a protozoan microbe that invades red blood cells, is the causal agent of human babesiosis, an infection that can cause severe fevers, jaundice and even death in susceptible individuals. No test exists for this organism in donated blood or organs, so transfusion or transplantation-associated cases, some fatal, have occurred. Dr. Holman will develop methods to culture the *B. microti* parasite and investigate the interaction between one of its surface antigens, called “apical membrane 1” (AMA-1) and human red blood cells. This work will aid in designing drug therapies and vaccines by providing a target for interrupting the invasion process.

About the National Research Fund for Tick-Borne Diseases, Inc.

The NRFTD is a nonprofit, tax exempt organization devoted strictly to raising funds in support of scientific research on tick-borne diseases. It aims to advance scientific understanding of these complicated infections by sponsoring innovative research at premier institutions throughout the world.

The NRFTD was founded in 1999 to address the complex and critical research questions raised by thousands of patients afflicted with emerging tick-borne diseases, including Lyme disease, relapsing fever, anaplasmosis, babesiosis, bartonella and ehrlichiosis. The need for answers has grown markedly as Lyme disease continues to spread throughout the country and as other tick-borne infections have been recognized as public health threats.

For more information about the NRFTD, or to make a tax-deductible donation, please visit www.nrftd.org.