POSTDOCTORAL RESEARCH PROGRAM
NATIONAL EXPOSURE RESEARCH LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
Cincinnati, OH

Detection Methodology for Waterborne *Toxoplasma gondii* Oocysts

PROJECT # NERL 2004-02

A research project is available through the Postgraduate Research Program at the U.S. Environmental Protection Agency (EPA), National Exposure Research Laboratory (NERL) in Cincinnati, Ohio. Under the guidance of a research mentor, the participant will gain educational benefits through involvement in developing a specific, sensitive, and practical method to assess the levels of *Toxoplasma gondii* oocysts in water samples.

BACKGROUND: *Toxoplasma gondii* is an obligate intracellular protozoan parasite whose primary hosts are feline species. Within the feline, reproduction of this organism takes place primarily with the gut. Sexual recombination results in oocysts that are passed in the feces of the feline. An uninfected feline may become infected by consuming infective oocysts, or by consuming animal tissue containing tissue stages of this parasite. In non-feline secondary hosts, the host may become infected by consumption of oocysts from the feline litter, or by consumption of the tissue stages of the parasite from uncooked, or undercooked meat. These parasites then pass through the gut wall, infecting white blood cells of the secondary host. Eventually, the parasites settle in the tissues of the secondary host, causing focal lesions. It is possible that small herbivores in nature, such as mice, are the predominant secondary hosts, thus serving as a reservoir of infection for felines, and widening the distribution of the parasite. Humans may also act as an accidental secondary host. In a secondary host with an intact immune system, these lesions are contained by the immune response of the secondary host. If the secondary host loses its ability to generate an immune response, the parasite then will escape from the tissue cyst, and form focal lesions. These lesions are commonly formed in the brain or the retina, resulting in encephalitis or blindness. If a woman becomes infected during the first trimester of pregnancy, there is the possibility that the fetus may become infected. A transplacentally infected fetus may exhibit symptoms ranging from no observable symptomology to blindness, hydrocephaly, or death. Traditionally this disease was thought to arise in the United States, principally from the consumption of undercooked meat, or through unsanitary handling of feline litter. However, there have been outbreaks of human disease in Brazil, Canada, and Panama, which have been epidemiologically attributed to consumption of oocyst-contaminated water supplies.

Published reports indicate that molecular assays are available for clinical diagnosis of *Toxoplasma*. The research procedure to be developed will evaluate these molecular techniques for their suitability for detecting *Toxoplasma gondii* oocysts in unfiltered water. The traineeship will afford a postgraduate the opportunity to gain significant knowledge and experience in the design and testing of methods for detection of protozoan oocysts in water. The postgraduate will benefit from the analytical laboratory techniques applied in this project as this project will involve application of advanced technologies from a variety of disciplines and synthesis of these technologies into a cohesive testing method.

QUALIFICATIONS: Applicants must have received a doctoral degree in parasitology or a closely related discipline within the three years prior to the desired starting date; or completion of all requirements should be expected prior to the starting date. This requirement may be waived for an exceptional candidate who received a postdoctoral degree more than three years prior to the desired start date, but who wishes to change fields and receive training the field of environmental parasitology. For such a candidate, a background in parasitology is desirable. The organism that is the focus of this project should be considered a potential biohazard, and may have serious sequelae for individuals who are or who become immune-compromised, or for women who become infected during pregnancy. Individuals in these groups should seriously consider these risks before applying for this research project. Applicants must be able to conduct research independently without direct supervision. U.S. citizenship or lawful permanent resident status is preferred. The program is open to all qualified individuals without regard to race, sex, religion, color, age, physical or mental disability, national origin, or status as a Vietnam era or disabled veteran.

The participant will be selected based on academic records, recommendations, research interests, compatibility of background and interests with research programs and projects at NERL, and the availability of funds, staff, programs, and equipment. The appointment is full-time for one year and may be renewed upon recommendation of NERL and subject to availability of funds. The participant will receive a monthly stipend based on research area and prior experience. The participant must show proof of health and medical insurance.

The Postgraduate Research Program for NERL is administered by the Oak Ridge Institute for Science and Education. ***Please reference Project # NERL 2004-02 when calling or writing for information.*** For additional information and application materials contact: Postgraduate Research Program/NERL, Attn: Betty Bowling, Science and Engineering Education - MS 36, Oak Ridge Institute for Science and Education, P.O. Box 117, Oak Ridge, Tennessee 37831-0117, Phone: (865) 576-8503 FAX: (865) 241-5219, e-mail: bowlingb@orau.gov.