Editorial

Emerging Need for Parasitology Education: Training to Identify and Diagnose Parasitic Infections

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Parasitic diseases are among the most common chronic infections in the world's poorest persons and have a tremendous impact on global health. According to the World Health Organization parasitic diseases result in tremendous morbidity and mortality worldwide.¹ Even with increased global awareness and increased allocation of resources from governmental and major philanthropic organizations worldwide, the incidence of parasitic diseases continues to increase with the poorest nations disproportionately impacted.

The control of parasitic diseases requires healthcare professionals to accurately identify the causative agents and requires them to have sufficient knowledge of parasite life cycles, transmission, and treatment. Without these skills and knowledge, attaining global control of parasitic diseases will continue to remain distant.

With the increase in globalization and the breakdown of international barriers through travel and trade, there is an increasing need for healthcare providers who are qualified in the laboratory identification of parasites and clinical diagnosis of their diseases. In spite of the relative availability of funding and educational resources in the United States, parasitic diseases are underdiagnosed and misdiagnosed. Frequently, healthcare providers do not have sufficient knowledge to clinically identify parasitic infections in any or all of their diagnostic stages. Therefore, healthcare providers make presumptive diagnoses rather than relying on definitive laboratory diagnoses. Consequently, patients are often treated for the incorrect parasite or are incorrectly diagnosed as having a parasitic infection.

In our laboratory over the past six months, we have identified parasitic infections in four persons that were misdiagnosed. Three of them had a chronic parasitic infection that persisted for more than two years.

The first case involved a 28-year-old woman missionary from Mozambique who came to our laboratory with nausea, lower abdominal pain, and frequent bowel movements over the past two years. While in Mozambique, she was diagnosed and treated for malaria and giardiasis without accompanying laboratory diagnosis. However, the treatments exacerbated her chronic symptoms. When she returned to the United States for treatment she was told that she had irritable bowel syndrome (IBS) without having a stool examination or being offered treatment for IBS. Examination in our laboratory of her stool showed chronic and heavy microsporidial enteritis with infection by either *Encephalitozoon hellem* or *Encephalitozoon cuniculi* as we reported in this journal.²

The second case involved a 27-year-old woman diagnosed with multiple sclerosis (MS) in June 2009. Because of high-dose corticosteroid treatment of an MS relapse, she had a flare-up of previously diagnosed gastroesophageal reflux disease with hiatal hernia. She experienced prolonged severe upper abdominal pain and underwent an esophagogastroduodenoscopy in October 2009 to rule out any underlying gastrointestinal problems, including ulceration. A mid-esophageal lesion was seen and a biopsy specimen was obtained. The pathologist's report of the biopsy specimen indicated the presence of a parasite egg suggestive of the oriental lung fluke *Paragonimus westermani*. During November 2008, the patient attended a seven-day medical mission trip to Honduras but had no travel-related illness or pulmonary symptoms. She had been a vegetarian since 1995 and had never eaten crab, crayfish, or any other intermediate host of *P. westermani* since then.

The patient brought the biopsy slide to our laboratory for further investigation. Microscopic examination determined that the egg was a pollen spore, possibly from slide contamination. Negative fecal and sputum samples obtained by the patient's physician substantiated these findings. The esophageal lesion was likely caused by repeated bedtime use of a non-steroidal anti-inflammatory drug to reduce the influenza-like side effects of her interferon beta-1a treatment for MS.

The third and fourth cases involved young women who were given a diagnosis of chronic giardiasis. Both women had extensive travel experiences in developing countries over the past two years. The third case involved a 24-year-old woman (medical student) who spent the summer of 2008 in India. Upon return to the United States, she gradually became ill with foul smelling chronic diarrhea, stools that floated, abdominal cramping, bloating, nausea, and dehydration. She experienced substantial weight loss during the past two years. She sought treatment from multiple healthcare providers and spent several thousand dollars for treatments. She was given a presumptive diagnosis of a viral infection, IBS, and celiac disease. During the summer of 2009, one healthcare provider treated her with a single dose metronidazole that temporarily reduced the severity of her symptoms. Examination of her stool in our laboratory showed the heaviest case of *Giardia lamblia* infection that we have ever observed. She is presently being treated with an appropriate metronidazole regimen and is gaining weight. Her other symptoms are also improving.

The fourth case involved a 19-year woman (Israeli soldier) who spent time in Honduras on a mission trip in 2008. Her symptoms were identical to those reported for the third case and had experiences with multiple healthcare providers. She too was misdiagnosed as having IBS and celiac disease. She is currently being treated by a military physician with metronidazole.

Presently, in the United States, many infectious diseases are either undiagnosed because of the lack of access to health care

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or are misdiagnosed because of inadequate training of health-care providers. It is imperative that medical institutions and health-care providers, both public and private, are properly trained to diagnose and treat emerging and reemerging infectious diseases.

Training of health-care providers, including physicians, physician assistants and nurses, for the identification and treatment of infectious diseases must begin in professional school and continue throughout post-graduate education and into clinical practice. This training can be accomplished through participation in continuing medical education courses, attending local meetings and international symposia, and reading current literature from professional journals and internet resources.

In professional school and post-graduate training, there are ample opportunities to develop hands-on skills through a variety of experiences, including microbiology and infectious diseases courses, wet-laboratory experiences, workshops, and through volunteering at free clinics and on mission trips. These valuable experiences will complement the students'

education in the basic and clinical sciences and will provide them with the knowledge and experiences to combat the globalization of infectious diseases.

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