Zoonoses in Modern Medical Practice

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Zoonoses are infections transmitted by animals to man. Of the more than 50 such infections that are clinically significant, several are discussed in the articles by McIntosh and Madhavan and by Meyer and Adar in this issue of the Journal (pp. 7-13). These include brucellosis, leptospirosis, relapsing fever, Colorado tick fever, toxoplasmosis, psittacosis, and echinococcosis. The McIntosh and Madhavan article reviews the experience at Henry Ford Hospital with 60 patients, while the article by Meyer and Adar reports on an unusual case of echinococcosis of the spine and retroperitoneum that occurred at Haim Sheba Medical Center in Israel.

Zoonoses are animal infections that can be transmitted to man. They may result from direct contact with infected animals, from eating contaminated meat, or from contact with an intermediate host. Although at least 160 such infections exist worldwide, only a third of those are clinically important. The nonspecific nature of many of these illnesses makes it essential that the physician be aware of the patient's travel history, hobbies, and exposure to animals in evaluating acute, unexplained fevers. This issue of the Journal contains two reports on zoonoses at two modern hospitals. McIntosh and Madhavan review the experience at Henry Ford Hospital with 61 patients (pp. 7-10), and Meyer and Adar report on an unusual case of echinococcosis that occurred at Haim Sheba Medical Center in Israel (pp. 11-13).

McIntosh and Madhavan summarize the experience at Henry Ford Hospital with a variety of zoonoses, including brucellosis, leptospirosis, relapsing fever, Colorado tick fever, toxoplasmosis, psittacosis, and pasteurellosis.

The Centers for Disease Control reported 219 cases of brucellosis in 1979 (1), a marked reduction from the 3,500 cases reported in 1950. Incidence varies from state to state, and most cases occur in areas where livestock is raised. Working age adults with frequent animal contact, particularly farmers, veterinarians, and meat packers, are at the highest risk of exposure and infection. Also, the consumption of unpasteurized dairy products, such as imported cheeses, accounts for 9% of cases acquired in the United States (2). In animals, the disease is restricted to the gastrointestinal tract. In humans, various syndromes have been described, including unexplained fever, nonspecific musculoskeletal syndromes, visceral granuloma, spondylitis, pneumonia, pyelonephritis, perinephric abscess, orchitis, endocarditis, and meningoencephalitis. At Henry Ford Hospital, patients with brucellosis presented with fever, fatigue, malaise, cephalgia, and hepatosplenomegaly. All had occupational histories compatible with the diagnosis.

Leptospirosis is another rare clinical entity which may be encountered in inner city hospitals. Spirochetes of the genus Leptospira infect a wide variety of wild and domestic animals. Dogs are the major source of infection in this country, while rats are the most common source elsewhere in the world. Man becomes infected either by direct contact with infected animals or by contact with water or soil contaminated with the infected urine. Sewer workers, farmers, abattoir workers, and workers in rice and sugar cane fields have a high risk for exposure and disease (3). As is true for brucellosis, leptospirosis at a subclinical level may occur in persons with frequent animal contact. Those with frequent exposure who develop acute illness are more likely to have a milder illness without jaundice. Leptospirosis with jaundice, called Weil's disease, is more severe and is associated with a 10% mortality. Fortunately, this form accounts for only 5% to 10% of cases.

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Leptospirosis is initially characterized by fever, myalgia, and headache, which persist for approximately one week and may be confused with the “flu”. During this first phase, the leptospira can be cultured from blood and cerebrospinal fluid. This is followed by the “immune” phase of the illness, which involves intense headache, meningeal signs, nausea, and vomiting. At this point, the organisms can no longer be isolated. Diagnosis is based on agglutination titers.

Colorado tick fever and relapsing fever are two fascinating, tick-borne diseases encountered in the United States. These are well illustrated by the case histories described by Mcintosh and Madhavan.

Colorado tick fever is caused by an orbivirus carried by a tick (Dermacentor andersoni) found in the mountainous areas of Colorado, Wyoming, Montana, Idaho, and Utah, as well as parts of South Dakota, New Mexico, California, Oregon, Washington, Alberta, and British Columbia. Chipmunks, squirrels, and other small rodents serve as reservoirs. Anyone coming into contact with ticks in an endemic area may develop the illness, which is characterized by prolonged viremia. The virus lives within the human red cell where it appears to be protected from humoral defenses. After an incubation period of three to six days, the patient suddenly begins to experience fever, chills, and lethargy. More than 50% of patients will exhibit a biphasic fever (4), as in the Ford Hospital case. A rash may be present, which makes it difficult to differentiate it from Rocky Mountain spotted fever. However, this is a self-limiting disease in which patients recover completely without specific treatment. Because the manifestations of this illness are so nonspecific, diagnosis depends either on viral isolation or serology. The virus may be demonstrated by fluorescent antibody staining of washed erythrocytes.

Two forms of relapsing fever occur in man: the epidemic form that is louse-borne and rarely seen in this country, and the tick-borne, which both patients exhibited. The responsible agents are spirochetes of the genus Borrelia, which are transmitted by soft ticks of the genus Ornithodoros (1). These soft ticks inhabit walls in log cabins, and they characteristically feed at night. For this reason, infected persons may not recall being bitten. The patient will experience sudden fever with shaking chills, headache, myalgia, and lethargy. The initial episode is self-limiting and lasts three to six days. However, after an asymptomatic period of seven to ten days, the fever will recur. The severity of the symptoms tends to diminish with each relapse (5).

Psittacosis is another zoonosis that has been forgotten since the “discovery” of Legionnaires’ disease. Psittacosis is caused by the intracellular parasite Chlamydia psittaci. The organisms are shed in bird excreta, and humans become infected through exposure to infected birds. Many reported cases have been traced to exotic birds which are kept as pets. This disease is also a hazard to workers in poultry processing plants, and in the United States the major reservoir is the turkey (6). The primary route of infection is inhalation of the organism into the lungs followed by hematogenous spread.

The clinical course of patients with psittacosis varies considerably. The disease may resemble an influenza-like illness, an atypical pneumonia, or an extremely severe syndrome with high fever, pneumonia, lethargy, and confusion. In Ford Hospital patients, headache and nonproductive cough were the most common complaints. It is impossible to distinguish psittacosis from nonbacterial pneumonias clinically, and routine laboratory tests and cultures are not particularly helpful. Depending on the series, up to 20% of patients may give no history of bird exposure (1). Although chlamydiae will be present in the sputum and blood of infected patients for the first two weeks of illness, isolation requires tissue culturing that is not widely available.

Toxoplasmosis is a zoonosis that has been gaining increasing recognition in the United States due to the possibility of intrauterine infection during pregnancy and to its rising incidence in immunocompromised patients. The transmission of this disease from domestic cats to humans has received a great deal of publicity. While Toxoplasma gondii infects many animals, members of the cat family are the definitive hosts. The cat is the only animal known to shed an infective form (the oocyst) in the stool. Although humans can become infected by exposure to infected cat feces, they are just as likely to be infected by exposure to other infected animals. Toxoplasma cysts form in the tissues of other infected animals, including the muscles of sheep, swine, cattle, and horses. Since these cysts are highly resistant to gastric digestion, they remain in the raw meat from these animals. Humans can become infected if they eat the raw meat. In fact, in the Ford Hospital experience with seven cases of acute toxoplasmosis, only one patient had contact with domestic cats, while five had a clear history of frequently eating raw meat.

It is extremely common for patients to be seropositive and to have a chronic, asymptomatic infection with Toxoplasma gondii. Kirck and Remington estimate that 50% of the American population is asymptomatically affected (7). In the normal host, symptomatic illness most commonly presents as lymphadenopathy which is often localized. It may or may not be accompanied by a mild mononucleosis-like illness with fever and malaise. Dorfman and Remington have concluded that the histologic changes in the
lymph nodes are very distinctive (8), and an experienced pathologist should be able to make the diagnosis of acute toxoplasmosis on the basis of the specially stained histologic sections alone. In contrast to its relatively mild course in otherwise healthy individuals, toxoplasmosis in the immunocompromised host is characterized by encephalitis, pneumonitis, and myocarditis, and may be rapidly fatal.

Congenital toxoplasmosis is the result of an acute infection that occurs during pregnancy. The likelihood of an infant being affected is highest if the acute illness takes place during the third trimester, but the severity of the illness is greatest in infants exposed during the first trimester. The range of sequelae for infants is wide and unpredictable. An infant may appear perfectly normal at birth but proceed to develop retinochoroiditis, blindness, and retardation. Patients may present with retinochoroiditis as the only manifestation of illness, with characteristically bilateral lesions. It almost always reflects congenitally acquired disease.

Echinococcosis, as reported in the Meyer and Adar paper (pp. 11-13), is a disease of the sheep-raising world. Patients are infected by eating food contaminated by feces of the infected carrier, usually a sheep dog. Ova are excreted and harbored in the duodenum of the intermediate host (sheep, occasionally man) and spread through the intestinal wall into the portal circulation. The disease occurs primarily as a multiloculated cyst of the liver, sometimes on the lung and, very rarely, to other organs. Several organs may be the site of hydatid cysts, including the kidney, heart, vertebrae, skeletal muscle, and brain, but primary spread to the retroperitoneum, like that in the case reported here, is unusual. Surgical removal may be a formidable task in such instances; marsupialization and formalin injections are used, but the cysts may recur.

References