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Raymond L. Morter
Michigan State University

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Interpretation of Serological Tests for Leptospirosis

Raymond L. Morter, D.V.M.

Animal disease control and eradication programs are often based on serological diagnosis. The best example of such a program is that outlined for the control of brucellosis. Regulatory officials have established well-defined criteria for interpreting the results of the test and the subsequent management and disposal of affected animals. In recent years leptospirosis has been diagnosed in most species of livestock in this country. Serological evidence indicates that 3 to 25 percent of the swine and cattle tested have leptospiral serum antibodies. A number of testing procedures are currently being employed for detecting leptospiral antibodies. However, no standard procedure has been established as a routine diagnostic test.

Each laboratory is employing the test best suited to its facilities and needs. A macroscopic plate test, a rapid test requiring a minimum of technical training but lacking the sensitivity of the agglutination-lysis test, is employed in some laboratories. A commercially prepared, relatively stable, formalinized antigen is available for the plate test. A capillary tube test, which also employs a killed antigen, gives results comparable to the agglutination-lysis test with strongly positive sera.

Various modifications of the microscopic agglutination-lysis test, a very accurate and sensitive test, are employed by research laboratories in this country and Europe. Some type of dark field illumination is necessary to determine the results. Technical skill and training are necessary to properly evaluate the results. However, reproducible results are obtainable between workers in the same laboratory. The sensitivity of the agglutination-lysis test makes it possible to recognize the immune response 5 to 7 days after infection occurs. These early titers are found at serum dilutions of 1:100 and are considered very weak reactions. The titer increases very rapidly, and positive agglutination-lysis reactions have been observed in our laboratory in serum dilutions of 1:10,000,000 for 20 to 30 days after infection. The titer gradually declines but persists at high levels long after the agent is eliminated from the host. A positive reaction has been observed in swine serum at dilutions of 1:10,000 a year after acute infection and several months after the cessation of demonstrable renal shedding. The persistence of titers is typ-
ical of other species. Sufficient experimental evidence is not available to correlate the decline of titer with the termination of the urinary shedding, i.e., the chronic stage of leptospirosis during which the organisms are localized in the kidney. Urinary shedding persists up to 45 days in sheep, 90 days in cattle and probably not over 6 months in swine. Agglutination-lysis titers in serum dilutions of 1:10,000 or greater may only indicate a previous infection of a completely recovered animal.

Agglutination-lysis titers are found in much higher serum dilutions than brucella agglutination titers. The standards accepted for brucellosis control classify as reactors those animals evidencing a complete reaction in serum dilution of 1:100 for non-vaccinates and 1:200 for official vaccinates. Antileptospiral serum reacting at a dilution of 1:100 may indicate a very early infection or a declining titer in a fully recovered animal. An increase in titer, as shown by more than one test, indicates an active infection while a constant or decreasing titer indicates a chronic, convalescent or recovered animal. End point titers are necessary to make these determinations.

Determining the end point titer is necessary to identify the infecting serotype. Antigenically, the leptospirae are a complex group of organisms. Cross reactions occur between Leptospira pomona, Leptospira canicola and Leptospira icterohaemorrhagiae. Pathogenic strains of all three serotypes occur in this country. The homologous reaction, i.e., the reaction with an antigen of the same serotype as caused the infection, occurs at higher serum dilutions and persists for longer periods of time than do the cross or heterologous reactions. The public health aspects of L. canicola and L. icterohaemorrhagiae infections are probably more important than those of L. pomona infections making recognition of the serotype important. If vaccination procedures are to be employed in the control of an outbreak definition of the infecting serotype is imperative.

The practitioner is responsible for interpreting the results of serological tests for leptospirosis. Regulations for the control of leptospirosis have not been established. The standards accepted for the control of brucellosis cannot be transposed to the serological diagnosis of leptospirosis. Animals affected with brucellosis may be carriers for life and a correlation exists between positive reactions at serum dilutions of 1:100 or 1:200 and chronic infection. Leptospiral infected animals are carriers for a limited time and a correlation between the carrier state and serum titer lacks experimental proof. Serological tests aid in recognizing the infecting serotype. More than a single test of an animal can yield information regarding the stage of the disease. The diagnosis and management of leptospirosis can be abetted by utilizing the serological diagnostic tests.

REFERENCES