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Erskine V. Morse
Iowa State College

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What You Should Know About Leptospirosis

Erskine V. Morse, D.V.M., Ph.D.

THE LEPTOSPIROSES are infectious and contagious diseases of wild and domestic mammals. Nearly 80 serotypes or species of *Leptospira* have been identified throughout the world as being responsible for one form or another of leptospirosis. There are probably 8 or 10 serotypes currently recognized in the United States. There is little doubt that in time more will be found in our domestic animal populations. The most important members of the genus *Leptospira* present in Iowa are: 1. *Leptospira pomona*, the cause in more than 98 percent of our livestock leptospirosis outbreaks. 2. *Leptospira icterohemorrhagiae*, the etiologic agent found in "rat lepto" and the cause of Weil's disease in man, and 3. *Leptospira canicola*, the "dog type" which is the cause of canine Stuttgart disease. All three serotypes may infect cattle, swine, sheep, horses and dogs as well as man. *L. canicola* and *L. icterohemorrhagiae* seldom infect domestic livestock, while *L. pomona* human infections are rarer than those due to *L. canicola* and *L. icterohemorrhagiae*. One should stress to clients and physician associates that porcine and bovine *L. pomona* infections are not responsible for Weil's disease. Weil's disease of man is caused only by *L. icterohemorrhagiae*, the "rat type."

Leptospirosis (*L. pomona*) has been found in all agricultural areas of this country. The disease is exceedingly prevalent in Iowa. It is a serious economic problem causing over \$100,000,000 loss in cattle each year in the United States.

Dr. Morse is professor and Associate Director of the Veterinary Medical Research Institute, Iowa State College, Ames, Iowa.

Decreased lactation, loss of carcass value, stunting of young stock and death are commonly observed. It is estimated that 2-4 percent of the cattle and swine are now infected and perhaps 10 to 25 percent have been infected within the past five years.

THE ETIOLOGIC AGENT

All leptospirae are morphologically identical. They are spirochete-like bacteria, actively motile, 5-12 microns long and resemble miniature strands of fine wool because of their numerous coils or spirals. They cannot be viewed with the conventional types of microscope (bright field), but can be seen with darkfield illumination. They do not grow on the usual bacteriological media. Their cultivation is not a routine matter for most diagnostic laboratories. The presence of leptospirae is seldom proved in materials submitted for examination because of difficulty in demonstrating the agent by staining procedures and its isolation in the common bacteriological media available.

Leptospirae will produce infection in guinea pigs, hamsters, embryonated hens' eggs and certain exotic laboratory animals. Isolation of the microorganism is accomplished by inoculating laboratory animals or special media with infected tissues, blood, urine or milk. Any procedure for isolation of leptospirae is time-consuming, requires technically trained personnel, special equipment and is definitely an expensive operation.

SPREAD OR TRANSMISSION

Most outbreaks of *L. pomona* infection are observed in swine or cattle although

natural cases have been reported in dogs, horses, sheep and goats. Interspecies (cattle to swine) as well as intraspecies (cattle to cattle) transmission occurs quite readily.

Leptospirae are eliminated from the body primarily in urine. The microorganisms are found in all tissues, blood and milk during the incubation and acute (febrile) phases of the disease. Contaminated water, feed and bedding serve to spread the infection to susceptible animals. Crowding of livestock and close contact tend to rapidly disseminate the infection from animal to animal. This results in the "explosive" outbreaks which incur as high as 95 percent morbidity. Following the acute (hyperpyretic) phase of leptospirosis, the leptospirae localize in the renal tubules and the carrier state follows. Considerable numbers of the agent are shed in the urine. The excretion of leptospirae may last for 3 months in cattle and for as long as one year in hogs. However, the majority of animals remain "leptospirae shedders" for less than 60 days. The carrier state is most difficult to prove or disprove bacteriologically. This situation makes control of the disease extremely difficult. The urinary leptospiral shedder appears to be entirely normal just as does the chronic brucellosis infected cow or sow.

SYMPTOMS OR SIGNS OF LEPTOSPIROSIS

Six to 12 days after exposure a high fever (104-107°F) is usually observed for cattle. Swine may not have an elevated temperature. Experience with experimentally infected feeder pigs has shown that about 50 percent will have a mild fever (104-105°F). Cattle may appear depressed accompanied by loss of appetite; such is generally overlooked in swine. Milk production may virtually cease, and the secretion may be thick, yellow and contain blood. Milk flow may not return to the normal lactation level following a severe infection. The urine of infected cattle may be bloody or coffee colored and contain albumin. Icterus

is seen in some cattle. Jaundice and abnormal urine are not usually observed for infected swine.

Abortions are common in cows and sows. This may be the only sign noted in the swine herd. The abortion rate in pregnant animals varies from 10 to 90 percent. The majority of abortions occur in the last trimester of gestation. Some severely infected animals die. Generally, losses are greatest in young stock. Hogs may show no symptoms other than abortions and birth of moribund litters. A fair percentage of any animal species involved in an outbreak will remain asymptomatic.

DIAGNOSIS

1. Leptospirosis can be detected by isolation of the agent employing special bacteriological techniques. Few laboratories attempt isolation procedures as they are not practical on a routine basis.

2. Serological tests will indicate infection. Unfortunately these tests, and there are a number, will not indicate whether leptospirosis is currently present and active or whether the disease had occurred several years previously. For this reason, only blood samples from **symptomatically positive** herds should be sent to the laboratory for serological examination. A complete herd history should accompany each set of samples.

At present standardization of the various serological procedures is being undertaken by several organizations. Through research and intensive study it is hoped that test results will be made more meaningful to all concerned.

TREATMENT

Therapy is probably more prophylactic in nature rather than specific. Good nursing care, supportive measures and symptomatic treatment are definitely indicated. Specific therapy is directed toward elimination of the renal carrier state and not at alleviation of symptoms. For hogs, 500 grams of chlortetracycline or oxytetracycline in a ton of feed (Baker *et al.*, *Vet. Med.*, 52, 103: 1957), has offered promise if fed for approximately 14

days. A single intramuscular injection of 10 to 20 mg./lb. of body wt. of streptomycin was found to eliminate leptospiuria in infected hogs (Locco *et al.*, J.A.V.M.A., 132, 251-253: March 15, 1958). The feeding of chlortetracycline, 0.5 mg./lb. body wt. day for 1 week prior to and 14 days after experimental exposure to *L. pomona*, prevented leptospiuria in calves (Ringgen *et al.*, J.A.V.M.A., 133, 214-215: Aug. 15, 1958). A routine, inexpensive and easily administered therapy has still to be found for leptospirosis.

Vaccination with killed *L. pomona* cells is widely practiced. Insofar as is known *L. pomona* bacterin will not protect animals against infections due to other leptospiral serotypes, viz. *L. icterohemorrhagiae*, etc.

Vaccines may be most valuable for use under the following circumstances:

1. On range where the stock are not crowded.
2. For cattle when the disease appears in swine on the same farm or **vice versa**.
3. For bred heifers when separated on pasture lots from the main infected herd.
4. In noninfected herds when leptospirosis is present on adjacent farms with common surface drainage.
5. For herds into which frequent replacements or additions are made.
6. For show stock 3 weeks prior to shows.
7. For young stock to be kept as breeding animals and maintained either away from or with infected animals.

FURTHER EVIDENCE OF THE ANTI-LEPTOSPIRAL EFFECT OF MILK: ELECTRON MICROSCOPIC STUDIES.

The presence of a natural antileptospiral agent in milk found in investigations under the dark-ground microscope and by animal experiments has been confirmed by studies with the electron microscope.

The electron micrographs showed that the lytic effect occurred rapidly: 45 minutes after mixing the milk with leptospira the protoplasm cylinder had been damaged while the other components of the organism, the axial filament, was un-

CONTROL OF LEPTOSPIROSIS

1. Isolate sick animals. Keep from healthy stock if possible.
2. Burn or bury contaminated bedding or fodder.
3. Burn or bury aborted fetuses, afterbirths and dead animals.
4. Do not feed abnormal milk to calves, swine, poultry, dogs or cats. Pasteurize milk for human consumption—this should be a routine procedure on every farm all the time.
5. Reduce the rat and mouse population.
6. Keep out stray dogs.
7. Fence off marshes and slow moving streams. Water is one of the most effective means of transmission.
8. Initiate therapy and vaccination to fit the local situation.

CONCLUSIONS

There is a number of pressing problems regarding leptospirosis facing the veterinary profession today. The mechanism of infection, duration of the carrier state, persistence of blood titers, significance of serological cross reactions, vaccinal immunity, efficacy of "practical" therapy and wildlife reservoirs all need further scrutiny, elaboration and elucidation. The better understanding and advancement will become available only through concerted research effort. The facts, as they become available, can then best be disseminated to our practitioners by the extension service veterinarians of Iowa State College. Just such a program is currently being contemplated. *End*

changed. After 24 and 40 hours at room temperature only the axial filaments surrounded by protoplasm masses were seen.

There was no difference in the effect on virulent and non-virulent mutants or on different serotypes of leptospira.

The lytic effect of immune serum in certain dilutions forming lysis balls has been shown. Repeated attempts to cultivate leptospira from these shining spherical masses were not successful.

Kirschner, L., Maguire, T., and Bertaud, W. S. The British Journal of Experimental Pathology. 38:357-361 August, 1957.