Leptospirosis in Cattle and Swine

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Leptospira pomona highly magnified, the organism that causes leptospirosis in cattle and swine. Courtesy H. E. Rhoades and A. E. Vatter.
LEPTOSPIROSIS HAS BECOME a major concern to the nation’s livestock industry. The disease is widespread in cattle and swine throughout the country. Animals having only the mildest form of the disease may abort; in severe cases, they may die rapidly. In 1952, 1953, and 1954, more than three thousand cattle and swine herds in 92 Illinois counties were tested for leptospirosis at the Diagnostic Laboratories of the College of Veterinary Medicine by the serum agglutination-lysis test. Seventy-seven counties were found to have infected herds.

Of the cattle and swine herds tested, about one out of every three reacted positively. Of the individual animals tested, about one out of every six reacted positively. Here are the exact results of that study.

<table>
<thead>
<tr>
<th>Herds</th>
<th>Number tested</th>
<th>Number positive</th>
<th>Percent positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>2,656</td>
<td>814</td>
<td>30.6</td>
</tr>
<tr>
<td>Swine</td>
<td>868</td>
<td>242</td>
<td>27.8</td>
</tr>
<tr>
<td>Individual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>animals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>26,037</td>
<td>4,319</td>
<td>16.5</td>
</tr>
<tr>
<td>Swine</td>
<td>7,812</td>
<td>1,453</td>
<td>18.5</td>
</tr>
</tbody>
</table>

In Illinois, leptospirosis was first identified in 1947. The incident involved the death of several cows, and occurred after 20 Hereford cows, brought from a southwestern state, were added to a herd of 13 native animals. No doubt, cases of leptospirosis occurred in Illinois much earlier than 1947, but not enough was known about the disease before this time to identify it accurately.

**What are the dangers?**

The dangers of leptospirosis are many. To the public in general, the disease is a health problem. To the farmer in particular, the disease means losses in livestock and livestock production.

Some of these losses may be abortion or premature birth of young, decreased or abnormal milk, poor weight gains or stunting, and death. And where the recent tests show that leptospirosis in cattle and swine is widespread in Illinois. (Fig. 1)
disease exists, there is always the danger of other animals becoming infected.

**What causes leptospirosis?**

Various species of leptospires can cause the disease. But the species that commonly causes leptospirosis in cattle and swine is *Leptospira pomona*, or *L. pomona* for short. It is a spiral-shaped, threadlike bacterium with hooked ends (see cover).

**Are leptospires resistant?**

Leptospires are very sensitive to heat and can be destroyed quite easily by pasteurization temperatures. These bacteria cannot stand drying either, or the alternate freezing and thawing of winter. Soap and the common household antiseptics will kill them if they are applied directly to the organisms. Disinfectants that can be used in dilution with water are:

- Bichloride of mercury (diluted 1 to 1,000)
- 2-percent phenol solution
- 3.5-percent compound cresol solution
- 2-percent formalin
- 1-percent lye solution

To disinfect barns and stables, the manure, straw, and hay must first be cleaned out. Such cleaning serves two purposes: it exposes the leptospires directly to the disinfectant so that they can be destroyed, and it puts contaminated materials in the pasture, where drying or alternate freezing and thawing will kill them.

**How is the disease spread?**

Animals contract leptospirosis from infected urine. When the disease is *acute*, the organisms are present in the blood, the urine, and in many of the tissues and organs of the diseased animal. When the disease is *chronic*, the organisms are localized in the kidneys and are discharged in the urine. The chronic cases are the most serious spreaders of the disease because they show no visible symptoms and are usually overlooked. However, they continue to discharge live organisms for several weeks and even months after "recovery."

Direct contact with infected urine and indirect contact with urine-contaminated materials, such as bedding, poorly drained pastures, ponds, or slow-moving streams, are the most common ways the disease is spread. Inhalating infected urine droplets from the air, which happens when animals are closely quartered and urinate on concrete floors, is another way of becoming infected.

It is thought that a single leptospire can produce infection. Infection usually occurs through the mucous membranes of the eyes, nose, and mouth, though the bacterium can also enter the body through slight cuts of the skin. Once in the blood stream, tissues, or organs, the bacterium may multiply rapidly.
Infected hogs are one of the most dangerous carriers of the disease. When hogs become infected, they often show no signs of illness. In this way, they not only perpetuate the disease, but expose cattle as well. Cattle too can be dangerous carriers, especially if they have a chronic form of the disease. They too may appear healthy but be carriers of the disease. Introduced into a herd, such animals may infect nearly all susceptible animals. Infection may recur in succeeding crops of calves and pigs through direct contact with the urine of chronically infected animals or exposure to urine-contaminated feed and water.

What are the symptoms?

Symptoms may appear in swine and cattle of any age, although they are most glaring in young calves and pregnant cows and sows. Within even a single herd, symptoms can be light or not apparent at all, or they can be quite severe. Some of the severer symptoms are icterus (yellow mucous membranes of the eyes and mouth), hemoglobinuria (blood-colored urine), and anorexia (loss of appetite). Animals showing such symptoms may die rapidly.

In severe cases, depression, loss of appetite, high temperature, anemia, and weight loss are common. In lactating animals, milk production drops sharply, and the udder secretes a thickened, yellowish, blood-tinged fluid. In calves and adult cattle, blood is often passed in the urine; in hogs, bloody urine is passed less often. Calves may die as early as 12 hours after the first symptoms appear; older cattle, 2 to 8 days later. Hogs usually recover. Animals that recover from acute leptospirosis need a long period of convalescence because they usually remain weak, anemic, and stunted for a long time. The kidney infection may persist for some months.

In moderate cases, animals may refuse to eat, be mildly depressed, lose weight, and have a rather high fever for 2 or 3 days. Dairy cattle may produce very little milk, or the udder may become flabby and secrete a thickened, yellowish fluid. Death seldom occurs, but complete recovery may take a long time. The animal does not show need for medical attention. In beef or swine herds on pasture, the illness would probably be overlooked if abortions did not occur.

In mild cases the disease may escape attention altogether. But even in the mildest form of the disease, abortions may occur. Sows usually abort 2 to 4 weeks before term; cows, at any stage of pregnancy.

Veterinarians who observed 125 cattle herds and 54 swine herds that reacted positively to blood tests reported the following symptoms and the frequency of their appearance:
Can other animals be infected?

Leptospirosis due to *L. pomona* has been contracted by animals as well as by human beings. Physicians in other countries know the disease as it occurs in man as *swineherd's disease*, because it is contracted by persons who are in close touch with infected swine. In the United States, people in rather related occupations have been infected with the disease. These include herdsmen, packing-house workers, a veterinarian, a laboratory-animal caretaker, as well as persons who have swum in urine-contaminated water.

Horses may get periodic ophthalmia or moon blindness — a chronic form of the disease — from *L. pomona*. In one instance, 10 blind horses were blood-tested for leptospirosis and 8 of them reacted positively. Some other investigators have suggested that horses may also get the acute form of leptospirosis similar to that found in cattle.

Sheep too can be infected by *L. pomona*. So far, only one outbreak of leptospirosis in sheep has been reported in the United States. This outbreak occurred in a flock of ewes maintained on an Illinois farm where, earlier, calves had been infected by leptospirosis. The disease in this instance was characterized by weight loss, abortions, and death.

Dogs can be infected by *L. pomona*, but this happens only seldom. Actually, other species of leptospires — *L. canicola* and *L. icterohemorrhagiae* — are found in most cases of canine leptospirosis.

How can diseased cattle and swine be treated?

In all suspected cases, a veterinarian should be consulted so that the disease can be diagnosed correctly and proper treatment administered.

Treatment is usually helpful in the early stages of the acute form of the disease, and is essential if a high rate of mortality, especially in cattle, is to be prevented. Treatment consists of blood transfusions, antibiotics, and general care.

For chronically infected carriers, antibiotics are not very effective. Massive doses of penicillin, streptomycin, aureomycin, terramycin, bacitracin, both singly and in combination, were given to cattle that reacted positively to blood tests. Though repeated blood tests were made following these treatments,
the animals continued to react positively.

**How can the disease be prevented?**

The best way to prevent leptospirosis is to avoid introducing infected animals into a healthy herd. Good management should require that animals be blood-tested for leptospirosis before they are bought. It is less expensive to keep the disease out of a herd than to eliminate it after the herd has become infected. It may even be advisable to raise replacements from the farm herd rather than to run the risk of importing the disease.

**Postmortem lesions**

Autopsy of fatally afflicted animals suffering from acute leptospirosis usually shows hemorrhages and some icterus in the tissues and organs. The spleen may be enlarged. The kidneys are usually swollen and may have white spots. Hemoglobin may be present in the urine and other body fluids.

In the chronic stage of leptospirosis, the kidneys are usually mottled or white-spotted (Fig. 2). Upon microscopic examination of kidney sections, evidence of a chronic, localized, or diffuse nephritis may be observed. Organs other than the kidneys usually appear quite normal.

**Diagnosis**

A diagnosis of leptospirosis based on history, symptoms, and autopsy findings should be confirmed by laboratory examination. Laboratory tests may include animal inoculation and bacteriologic, histopathologic, and serologic examinations. The serologic examination will promptly ascertain the presence or absence of the disease in a herd, and is less time-consuming.
The leptospirosis blood test used by the Diagnostic Laboratories of the College of Veterinary Medicine is the serum agglutination-lysis test. This test identifies antibodies in blood serum which are specific for *L. pomona*, and can be used to detect infected animals as well as carriers.

The antigen for the test consists of 5- to 7-day-old motile cultures of *L. pomona*. For routine testing, 4 serum dilutions are used: 1:10; 1:100; 1:1,000; and 1:10,000. The tests are conducted by placing 0.1 milliliter of each serum dilution and 0.1 milliliter of the culture in a small serological tube. The serum-antigen mixtures are then allowed to incubate at room temperatures for approximately 4 hours. The individual tubes are examined by viewing small drops of the mixture through a microscope equipped with special dark-field illumination at a magnification of 180. A serum is designated negative when the leptospires remain uniformly spread through the field in all dilutions, as in the antigen control (Fig. 3).

A serum is designated positive when approximately one-half or more of the leptospires have agglutinated or lysed, or both, in one or more of the serum dilutions (Fig. 3).

To avoid false or misleading findings, the test must be properly controlled and skilfully employed by trained personnel.

**Differential diagnosis**

The symptoms of acute leptospirosis may be confused with plant or chemical poisoning, with other infectious diseases of the kidneys, or with mastitis of bacterial origin. The symptoms of the chronic form may be confused with malnutrition, parasitism, or, when abortion occurs, with brucellosis, vibriosis, or trichomoniasis.

The agglutination-lysis test is negative when leptospires remain uniformly spread throughout the microscopic field (left); positive when leptospires are agglutinated or lysed (center). In the positive reaction (right), complete lysis has occurred, and the globule (granular degeneration products) is all that remains of the leptospires. (Fig. 3)
How Leptospirosis Can Be Controlled

When leptospirosis strikes a herd of cattle or swine, the following control measures should be adopted at once to check the spread of infection and reduce losses:

1. Consult a veterinarian to obtain a correct diagnosis.
2. Isolate the acute cases.
3. Inspect the herd daily for further evidence of the disease.
4. Give acute cases blood transfusions and antibiotic therapy.
5. Pasteurize all milk intended for human and animal consumption to prevent possible transmission of milk-borne leptospirosis.
6. Prevent urine contamination of feed and water supplies. Streams and surface waters are readily contaminated by urine from carrier animals, and should not be used as sources of water.
7. Maintain cattle, swine, and other domestic animals separately on the farm. Remember that swine play a significant role in spreading the disease.
8. Blood-test all animals on the farm to see if they have leptospirosis.
9. Vaccinate all susceptible animals in the herd with leptospirosis vaccine if the disease is diagnosed after the first few abortions or clinical cases. The vaccine may delay or stop the spread of the disease. If, however, symptoms of the disease have appeared for 3 or more weeks, the vaccine will probably do little to prevent further losses. If infection remains active in vaccinated herds, the animals should be revaccinated every 6 months until no new cases appear.
10. Retain and rebreed aborting sows and cows, as the animals acquire a strong resistance to the disease. The size of the herd, environmental conditions, and the number of susceptible replacements born or added to the herd will determine the period of time required for the disease to subside. A program of wholesale test and slaughter of infected animals is not recommended at this time.
11. See that bulls and boars used for breeding are blood-tested for leptospirosis, unless the herds are infected.
12. Use extreme caution when buying replacement stock. Only healthy animals should be added to leptospirosis-free herds. Susceptible animals may become sick when introduced into an infected herd. Do not buy or sell animals for breeding from a leptospirosis-infected herd.
13. Guard against infection to yourself and your family. Do not drink unpasteurized milk, and avoid both direct and indirect contact with the urine of animals.