SURVEILLANCE OF INFECTIOUS DISEASES IN ANIMALS AND HUMANS IN SWEDEN 2020

Chapter excerpt -
Leptospirosis

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Cover: Juvenile mink in hand. Photo: Elina Kähkönen

Reporting guidelines: Reporting guidelines were introduced in 2018 for those chapters related to purely animal pathogens. The guidelines build on experiences from several EU projects, and have been validated by a team of international experts in animal health surveillance. The aim is to develop these guidelines further in collaboration within the global surveillance community and they have therefore been made available in the form of a wiki on the collaborative platform GitHub (https://github.com/SVA-SE/AHSURED/wiki). Feel free to contribute!

Layout: The production of this report continues to be accomplished using a primarily open-source toolset. The method allows the source text, produced by authors, to be edited independently of the template for the layout which can be modified and reused for future reports. Specifically, the chapter texts, tables and captions are authored in Microsoft Word and then converted using pandoc and R to the LaTeX typesetting language. Most figures and maps are produced using the R software for statistical computing and the LaTeX library pgfplots. Development for 2020 has further improved the importing of content from Excel files to automatically build figures in the pgfplots LaTeX library. The tool is available as an R-package on GitHub (https://github.com/SVA-SE/mill/). The report generation R-package and process was designed by Thomas Rosendal, Wiktor Gustafsson and Stefan Widgren. In 2020, final typsetting was done primarily by Wiktor Gustafsson with contributions from the report authors.

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Leptospirosis

BACKGROUND

Several species of the spirochaetal bacterium *Leptospira* can cause leptospirosis. All mammals including humans are susceptible to one or several *Leptospira* serovars.

Leptospirosis occurs worldwide but the dominant serovars vary by region. Cattle and pigs are considered to be reservoirs for *L.* Hardjo and *L.* Pomona, respectively. Serovars known to infect and cause clinical disease in dogs include *L.* icterohaemorrhagiae, *L.* Canicola, *L.* Grippotyphosa, *L.* Pomona, *L.* Sejroe and *L.* Australis. These are all serovars also known to infect and cause disease in humans.

Serovars that can cause disease in horses include *L.* icterohaemorrhagiae, *L.* Grippotyphosa, *L.* Pomona and *L.* Bratislava.

Seropositivity to *Leptospira* spp other than *L.* Pomona are occasionally confirmed in Swedish pigs, mostly to an indigenous serovar of *L.* Sejroe, *L.* Bratislava and *L.* icterohaemorrhagiae.

Sporadic cases of seropositivity towards the indigenous strain of *L.* Sejroe in cattle have also been recorded.

Between 1994 and 2006 sampling and testing for antibodies to *L.* Hardjo and *L.* Pomona in cattle and pigs respectively, was performed each year and after 2006 every third year. The commercial cattle and pig populations in Sweden are considered free from *L.* Hardjo and *L.* Pomona based on only negative results from this surveillance system.

Surveillance in other animal species including dogs and horses is passive only.

DISEASE

Animals

L. Hardjo is one of several pathogenic serovars and is associated with disease in cattle, sheep, goats and horses. In cattle, infections may be acute or chronic; asymptomatic, mild or severe. Acute disease is more often seen in calves. Disease in adults may go unnoticed, because the early clinical signs of fever and depression are often transient and mild. Infected herds may have problems with abortions, decreased fertility and decreased milk yield as well as increased mortality in calves.

The clinical signs in sheep and goats are similar to those in cattle. Both sheep and cattle can act as asymptomatic reservoir hosts.

Leptospira infections in pigs may also be asymptomatic or may give rise to reproductive failure. In piglets, fever, gastrointestinal disorders and jaundice may be present.

The clinical presentations in dogs infected with *Leptospira* range from subclinical to severe clinical illness and death; liver and/or kidney affection as well as varying degrees of vasculitis is typical. A peracute pulmonary form with high mortality rate is not uncommon.

In horses, most infections are subclinical and when clinical signs are present, they resemble those seen in dogs. Late abortions and recurrent uveitis have also been described.

Humans

Leptospirosis in humans ranges from asymptomatic or mild influenza-like illness to a severe infection with renal and hepatic failure, pulmonary distress and death.

LEGISLATION

Animals

Since 2004, leptospirosis is a notifiable disease on laboratory confirmation in Sweden (SJVFS 2013:23), in all animal species concerned. Single serologically positive samples are reported. Reporting is not serovar specific *i.e.*, to which serovar or serovars antibodies are detected is not reported.

Based on the legislation on testing of animals (SFS 2006:806), the Swedish Board of Agriculture can decide to initiate an epidemiological investigation in case of clinical disease consistent with leptospirosis in animals.

Humans

Leptospirosis in humans is notifiable according to the Communicable Disease Act (SFS 2004:168 with the amendments of SFS 2013:634).

SURVEILLANCE

Animals

Active surveillance in cattle and pigs is at present performed every third year. The aim is to demonstrate freedom from *L.* Hardjo in cattle and *L.* Pomona in pigs. Animals sampled for export and in breeding centres adds to the active surveillance.

All serological analyses included in the active surveillance are performed at the National Veterinary Institute. The diagnostic test used for *L.* Hardjo is an indirect ELISA (PrioCHECK® *L.* Hardjo, Antibody detection ELISA, Lelystad, Holland) for both serum and bulk milk samples. Positive serum samples are further tested with MAT (Microscopic agglutination test) with results reported as positive at 1:100 or above. For positive or doubtful ELISA results on bulk milk samples, an investigation is carried out in the herd and additional individual samples are taken. Antibodies against *L.* Pomona are analysed using the microscopic agglutination test (MAT) with results reported as positive at 1:100 or above.

The surveillance in cattle is based on serum and bulk milk samples selected by systematic random sampling from the surveillance programme for bovine viral diarrhoea virus (BVDV) and evenly distributed throughout the sampling period. See chapter on BVDV (page 22) for details on sampling and population. The surveillance was designed using a between-herd design prevalence of 0.2%, a within-herd design prevalence of 40% (based on anticipated prevalence in naïve herds) and a risk of introduction of 1 in 50 years. In domestic pigs, the active surveillance is based on samples collected for the abattoir sampling part of the surveillance

As for other animal species, most *Leptospira* infections in horses are subclinical. Recurrent uveitis has been described as one of several clinical manifestations, and in 2020, three of four reported seropositive Swedish horses were sampled as part of investigations of chronic uveitis. The fourth horse was asymptomatic. Photo: Bengt Ekberg/SVA.

carried out by Farm & Animal Health for porcine reproductive and respiratory syndrome (PRRS). See chapter on PRRS (page 66) for details on sampling and population. The surveillance was designed using a between-herd design prevalence of 0.5%, a within-herd design prevalence of 40% and a risk of introduction of 1 in 25 years.

The surveillance in other animals including dogs and horses is passive and consists of mandatory reporting of positive results from onsite tests detecting antibodies used at veterinary clinics, PCR-positive samples, and seropositivity confirmed at laboratories, including titers as low as 1:100 regardless of serovar. Furthermore, all positive results are reported regardless of whether clinical suspicion of disease is present or if previous vaccination might be the cause of the detected antibodies. Serum samples submitted to the National Veterinary Institute for MAT-testing are currently routinely tested for *L.* icterohaemorrhagiae, *L.* Canicola, *L.* Grippotyphosa, *L.* Bratislava, *L.* Saxkoebing, *L.* Sejroe, *L.* Automnalis.

Humans

Notification of human cases is mandatory, and surveillance is based on identification of the disease by a treating physician or by laboratory diagnosis. Both are obligated to report identified cases to the regional and national level to enable further analyses and adequate intervention measures.

RESULTS

Animals

No active surveillance was performed in cattle and pigs during 2020. See previous reports for surveillance results from 2019 and earlier.

In dogs, 48 *Leptospira*-positive laboratory analyses were reported, of which 41 (85%) were from the National Veterinary Institute. In 16 individual cases blood and/or urine samples submitted for PCR-analyses were positive, and seven of these also had positive serological results. In comparison, 30 *leptospira*-positive laboratory analyses were reported in 2019, of which 20 (60%) from the National Veterinary Institute.

The reasons for samples being submitted to the National Veterinary institute include clinical suspicion of acute disease as well as sampling of clinically healthy dogs and horses due to export requirements or suspected leptospirosis in other animals in the household.

Leptospira infection was suspected in aborting sows in one pig herd. The sows were serologically negative when sampled two weeks after abortion and it was concluded that the abortions were not caused by infection with *Leptospira.*

Four premises with horses seropositive to *Leptospira* spp (*L.* icterohaemorrhagiae, n=3; *L.* grippotyphosa, n=1) were reported during 2020. Three concerned singles cases of imported horses from Germany or Spain that were sampled as part of investigations of chronic uveitis. In one instance

seropositivity was confirmed at a health check of asymptomatic Swedish horses.

Humans

In 2020, no cases of leptospirosis were reported. In previous years, the majority of cases reported have been acquired abroad. The absence of travel-associated cases in 2020 might at least partly be explained by less travelling due to the COVID-19 pandemic.

DISCUSSION

Leptospirosis occurs worldwide, but the predominant serovars vary by geographic region. The disease is an important zoonosis as well as being associated with reproductive losses in livestock causing significant economic costs worldwide.

The commercial cattle and pig populations in Sweden are considered free from *L.* Hardjo and *L.* Pomona based on only negative results from the surveillance system since 1994. Seropositvity to *Leptospira* spp other than *L.* Pomona are occasionally confirmed in Swedish pigs, mostly to an indigenous serovar of *L.* Sejroe, *L.* Bratislava and *L.* icterohaemorrhagiae, and sporadic seropositive cases of the indigenous strain of *L.* Sejroe in cattle have also been recorded.

Several *Leptospira* serovars have been shown to be present in Swedish dogs by detection of seropositivity to *L.* icterohaemorrhagiae, *L.* Canicola, *L.* Grippotyphosa, *L.* Bratislava, *L.* Saxkoebing, *L.* Sejroe *and L.* Automnalis. Serovars including *e.g*. *L.* Bratislava and *L.* Grippotyphosa have also been detected in wild rats caught in Swedish cities in research studies, a further indication of presence of leptospiral serovars in Sweden.

Currently, all positive MAT results in dogs are reported without knowledge of vaccination status, travel history and whether clinical disease is suspected or not. Furthermore, in clinical cases, paired samples (sometimes three samples) are needed for diagnosis as the immune response providing specific antibodies to the causing serovar often is delayed. A negative result is common during the acute phase of illness, as is cross reactions leaving the causative serovar unidentified. As all laboratory diagnostics must be paid for by the dog owner there is a lack of such paired samples. In addition, not all dogs survive the infection and autopsies are rare due to the cost to the owner as well as the emotional aspect.

The number of samples sent to laboratories abroad, and to what extent possible positive results are being reported or not by the referring veterinarians, is currently unknown. Furthermore, an onsite ELISA test not distinguishing between different serovars is available and is currently used in several small-animal hospitals and clinics. Positive onsite test results are mentioned during phone calls to the National Veterinary Institute from clinically active small animal veterinarians, including during 2020. However, no such cases were reported during 2020, indicating underreporting. Reliable data on underreporting is however lacking.

In short, seropositivity to leptospiral serovars in Swedish dogs is currently probably underreported and data on seropositivity can neither be compared to or between previous years. Furthermore, prevalence of clinical disease in Swedish dogs due to leptospiral infection is currently not reflected in the surveillance data and not readily available.

Further studies are however warranted, as the number of suspected clinical cases according to regular out-reach contacts from the National Veterinary Institute to veterinary small animal hospitals and clinics continue to rise, indicating a possible increase in exposure- but confirmatory data is lacking. There is currently no available system to aid in reporting and evaluating suspicion of Leptospiral infection as the true cause of disease in clinical cases. Information on presence or absence of clinical disease or results from any confirmatory laboratory investigations carried out is currently not included in the data reported.

The reporting procedures and challenges in horses are largely the same as in dogs.

Few cases of human infections are reported each year and the majority are travel-associated.

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