

SURVEILLANCE OF INFECTIOUS DISEASES

IN ANIMALS AND HUMANS IN SWEDEN 2022

*Chapter excerpt:
Leptospirosis*



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Cover: A cultivation of *Salmonella* at the Public Health Agency of Sweden.
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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 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 to the LaTeX typesetting language using a custom package written in the R software for statistical computing. The package uses the pandoc document conversion software with a filter written in the lua language. Most figures and maps are produced using R and the LaTeX library pgfplots. Development for 2022 has focused on generalising the R package to accommodate conversion into formats other than LaTeX and PDF, with a focus on markdown files which can be published as HTML websites using the Quarto publishing system. The report generation R package and process was designed by Thomas Rosendal, Wiktor Gustafsson and Stefan Widgren.

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Leptospirosis

BACKGROUND

Several species of the spirochetal 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*.

Leptospira may be transmitted directly between animals or environmentally (i.e., indirectly). The bacteria do not multiply outside the host but may survive for long periods in the environment.

Seropositivity to *Leptospira* spp. other than *L. Pomona*

are occasionally confirmed in Swedish pigs, mostly to an indigenous strain of *L. Sejroe*, *L. Bratislava* and *L. Icterohaemorrhagiae*. Occasional serological reactions to the indigenous strain of *L. Sejroe* have also been recorded in Swedish cattle.

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.

Vaccination of dogs against severe disease caused by leptospirosis in dogs was previously rare, but during the last few years this has become more common in the southern parts of the country due to a suspected increase in clinical cases in dogs. The vaccination status is not always known, and this may influence some of the laboratory results.

The majority of human cases have during the last decade been infected outside Sweden during leisure activities in contact with water.



Figure 25: Serum samples from dogs are routinely tested for several *Leptospira* serovars. Twenty-one positive analyses were reported in 2022. However, the basis for reporting was temporarily changed during parts of 2021 and 2022, leading to fewer reports. Therefore this number cannot be compared with previous periods. Photo: Ivana Rodriguez Ewerlöf.

DISEASE

Animals

Leptospira 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

Leptospirosis is a notifiable disease in Sweden based on single laboratory confirmation of either presence of the bacteria using PCR or presence of antibodies (positive serological titres) (SJVFS 2021:10), in all animal species concerned. Reporting is not serovar specific i.e., to which serovar or serovars antibodies are detected is not reported. However, during parts of 2021 and 2022 the interpretation of the basis for reporting was temporarily changed with single serologically positive samples mainly, but not consistently, being left unreported. The number of reported positive analysis for this reporting period can therefore not be compared with previous years.

Humans

Leptospirosis in humans is notifiable according to the Communicable Disease Act (SFS 2004:168 with the amendments of SFS 2022:217).

SURVEILLANCE

Animals

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

All serological analyses included in the active surveillance are performed at the National Veterinary Institute (SVA). The diagnostic test used for *L. Hardjo* is an indirect ELISA (PrioCHECK® *L. Hardjo*, Antibody detection ELISA, Thermo Fisher Scientific, Lelystad, Netherlands) 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 analysed. Antibodies against *L. Pomona* are analysed using the microscopic agglutination test (MAT) with results reported as positive at 1:100 or above.

Cattle samples analysed using MAT are tested for the serovars *L. Hardjo*, *L. Sejroe* and *L. Istrica/ Sejroe*.

Pig samples analysed using MAT are tested for the serovars *L. Pomona*, *L. Icterohaemorrhagiae*, *L. Istrica/ Sejroe*, *L. Bratislava* and *L. Tarassovi*.

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 (BVD) and evenly distributed throughout the sampling period. See chapter on BVD (page 24) 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 carried out by Farm & Animal Health for porcine reproductive and respiratory syndrome (PRRS). See chapter on PRRS (page 71) 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 number of samples and herds needed is calculated yearly taking the outcome of the surveillance in previous years into account.

In species other than pigs and cattle the surveillance is purely passive.

Serum samples from dogs submitted to SVA for MAT testing are currently routinely tested for *L. Icterohaemorrhagiae*, *L. Canicola*, *L. Grippotyphosa*, *L. Bratislava*, *L. Saxkoebing*, *L. Sejroe*, *L. Autumnalis*, *L. Istrica/ Sejroe*, *L. Australis* and *L. Pomona*.

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

During 2022, 1424 serum and bulk milk samples from cattle and 402 serum samples from pigs were analysed in active surveillance. All samples from pigs were negative, and in cattle one bulk milk sample turned out positive in the screening ELISA and the herd was investigated by analysing new bulk milk and serum samples. These samples were negative for antibodies to *Leptospira* and it was concluded that the herd was free of *Leptospira*.

As part of the passive surveillance, one pig herd that was sampled due to reproductive failure was serologically positive to serovars *L. Icterohaemorrhagiae* and *L. Bratislava*.

In dogs, in total 21 *Leptospira*-positive laboratory analyses were reported. Due to the above-mentioned change in the interpretation of the basis for reporting during parts of 2021 and 2022, the number of reported analyses cannot be compared to previous years. In 2021 in total 15 *Leptospira*-positive laboratory analyses were reported, and in 2020 the number was 48.

No positive laboratory results in horses were reported during 2022. One serologically positive sample from a horse was however analysed at SVA during 2022. The result was due to the temporary change in basis for reporting not reported. In comparison, one positive sample from an imported horse was reported during the previous year, and no positive sample results from horses were recorded at SVA during 2021.

Humans

In 2022, two cases of leptospirosis were reported. One case had acquired the disease in Asia and the other in Central America.

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.

L. Hardjo and *L. Pomona* have never been confirmed in the commercial cattle and pig populations in Sweden during the surveillance programme that has been in place since 1994 and the results of the active surveillance in 2022 confirm this freedom of disease at the specified level.

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*.

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. Autumnalis*. 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. Seropositivity to leptospiral serovars in Swedish dogs has for several years been thought to be underreported. The changes in basis for reporting during 2021 and 2022 lowered the number of reported cases further. One additional challenge is the fact that the acute nature of illness, and high mortality rates in many canine cases where leptospirosis is the most likely cause of acute illness makes it difficult for the veterinarians to collect relevant samples for analyses, including samples both for PCR- and serology analyses. Several reports to the SVA describe the death of dogs either prior to sampling, or shortly after. In the latter case prior to seroconversion and development of the distinct rise in titres required for diagnosis. Few cases of human infections are reported each year and the majority are travel-associated. The primary diagnosis for human cases is mainly based on serology.

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