SURVEILLANCE OF INFECTIOUS DISEASES IN ANIMALS AND HUMANS IN SWEDEN 2019

Chapter excerpt -

Tularaemia

SVA NATIONAL VETERINARY INSTITUTE
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Folkhälsomyndigheten PUBLIC HEALTH AGENCY OF SWEDEN
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Reporting guidelines: Reporting guidelines were introduced in 2018 for those 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. Development for 2019 has further improved the importing of content from Word to LaTeX. The method can now import text, tables and figure captions from Word, as well as the newly designed 'IN FOCUS' sections of some chapters. The tool is available as an R-package at GitHub (https://github.com/SVA-SE/mill/). This year the report was also built with a continuous integration pipeline on Microsoft's Azure DevOps platform, allowing every committed change to the content to be built and tested automatically. The report generation R-package and process was designed by Thomas Rosendal and Stefan Widgren. In 2019, figures and the final typsetting were done by Wiktor Gustafsson and Thomas Rosendal with contributions from the report authors.

Print: TMG Tabergs AB.

Suggestion citation: Surveillance of infectious diseases in animals and humans in Sweden 2019, National Veterinary Institute (SVA), Uppsala, Sweden. SVA:s rapportserie 64 1654-7098.

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Tularaemia

In 2019, the incidence of human cases of tularaemia in Sweden was higher than any of the past 50 years. The high incidence was also associated with an increase in the number of reported dead hares. Photo: Jaro Mikus/Shutterstock.

BACKGROUND

The bacterium *Francisella tularensis* is the causative agent of tularaemia, a disease affecting many animal species, including humans. Although many different animal species can be infected, tularaemia is typically found in hares and small rodents. There are several subtypes of *F. tularensis* of variable virulence. *F. tularensis* subsp. *holarctica* (type B) is the main subspecies responsible for human and animal infection in Europe. *F. tularensis* is capable of surviving for weeks at low temperatures in water, moist soil, or decaying plant and animal matter.

Humans become infected through a variety of mechanisms such as bites of infected insects or other arthropods, handling infected or dead animals, ingesting contaminated food or water, and inhaling aerosols of bacteria. Clinical disease is variable and dependent on the route of transmission. The age group of 40–79 years is the most affected in both sexes. Tularaemia may occur during the whole year, but elevated number of cases are commonly seen during late summer and early autumn.

Hares and other animals are probably infected by the same routes as humans even if it is difficult to prove. Lesions in the skin are difficult to find in furred animals, but in some hare cases the infection sites have been confirmed by finding still attached ticks and pathology corresponding to tularaemia. In hares with pneumonia a respiratory route might be suspected. In wildlife species that are more resistant to developing disease upon infection, e.g. carnivores and omnivores, *F. tularensis* has been found in lymph nodes in the jaw region suggesting infection through contaminated food or water.

Sweden has reported cases of tularaemia in humans and animals since 1931. Ever since the first Swedish tularaemia case was reported, endemic areas have been identified in northern and central Sweden.

The mountain hare and the European brown hare are the animal species in which tularaemia has most frequently been identified. Diseased animals have been found in the traditionally endemic areas in northern and central Sweden, as well as in regions south of these areas.

The annual numbers of reported human cases range from a few cases to more than 2700 cases in 1967.

DISEASE

Animals

In Swedish hares, and in many rodent species that die of tularaemia, a common pathological presentation of the disease is a disseminated multi-organ septicaemia. Some of

the hares have lesions corresponding to a somewhat more prolonged course of disease, but ultimately the infection resumes a more acute course ending in septicaemia. Carnivores and omnivores are animal species that develop no or mild disease. Studies of several species in Sweden and other countries have detected antibodies but no signs of disease.

Humans

Tularaemia can be manifested in different forms depending on the route of transmission and on the virulence of the organism. The ulceroglandular form is the most commonly diagnosed form and is more frequently seen than the typhoidal form. The pneumonic, oculoglandular and oropharyngeal forms are rarely diagnosed. In the ulceroglandular form, a local ulcer usually appears at the site of infection and the adjacent lymph nodes are enlarged. The general symptoms of tularaemia are high fever, headache and nausea.

LEGISLATION

Animals

Tularaemia is notifiable in animals (SJVFS 2013:23).

Humans

Tularaemia has been a notifiable disease since 1970 according to the Communicable Disease Act (SFS 2004:168) with the amendments of SFS 2013:634.

SURVEILLANCE

Animals

Surveillance in animals is passive. It is based on voluntary submission of animals found dead or euthanised by hunters and the general public. Detection is based on PCR or immunohistochemistry of the animal sample. Laboratories are required to report identified tularaemia cases in animals to the authorities.

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. For laboratory verification of the infection, serology, PCR and isolation of the bacteria are used.

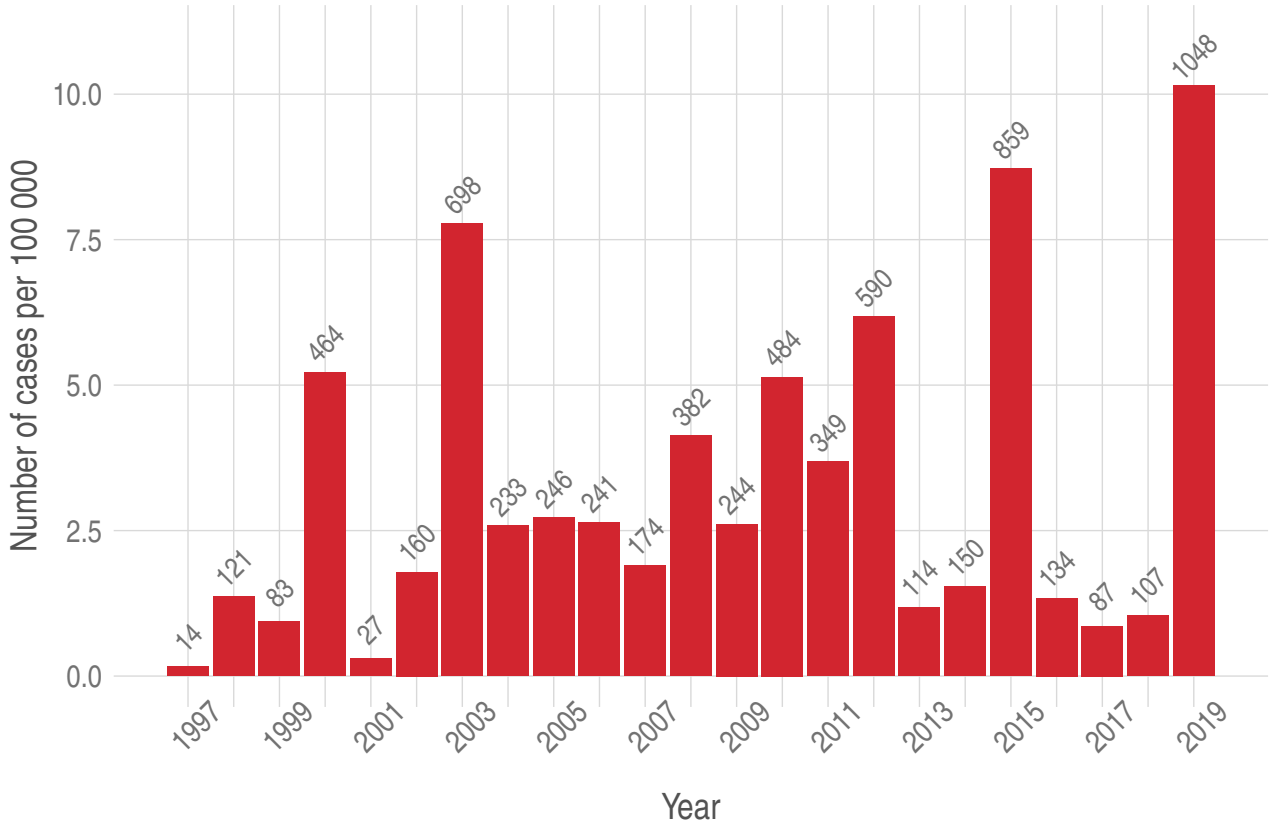

Figure 29: Incidence of notified human cases of tularaemia in Sweden 1997–2019. Bars indicate the incidence per 100 000 inhabitants and adjacent numbers the total number of cases reported.

IN FOCUS: The 2019 tularaemia outbreak

In the summer and autumn of 2019, Sweden experienced its largest outbreak of tularaemia in over 50 years. The beginning of the outbreak was noticed at the end of July in the County of Gävleborg, where residents of or visitors to the town of Ljusdal started to seek health care with fever and swollen lymph nodes. At the beginning of August an increasing number of cases with tularaemia were also registered in the neighboring Counties of Dalarna and Örebro in central Sweden. At the same time, SVA noticed an unusually large number of reports about dead hares from across the country. Tularaemia had been detected in several of the hares.

The following weeks the number of cases increased rapidly, and by the end of the month over 650 people had fallen ill, mainly in the Counties of Dalarna and Gävleborg (Figures 30 and 31). Reports of disease symptoms from these two regions indicated infection through insect bites. Mosquito sampling near a golf course in the aforementioned town of Ljusdal revealed findings of *Francisella tularensis*.

It was not until the last week of September that the disease counts were back to normal for the season. Tularaemia cases in both humans and hares were, in addition to the endemic areas in northern and central parts of Sweden, found far south (Figure 30). The number of examined and diagnosed hares depends on people finding and submitting carcasses for examination. Statistics in humans are more reliable since most affected humans probably will seek health care. It can be assumed that the geographic distribution of cases and peaks in the number of cases would be roughly similar for hares and humans if all hares were found and examined.

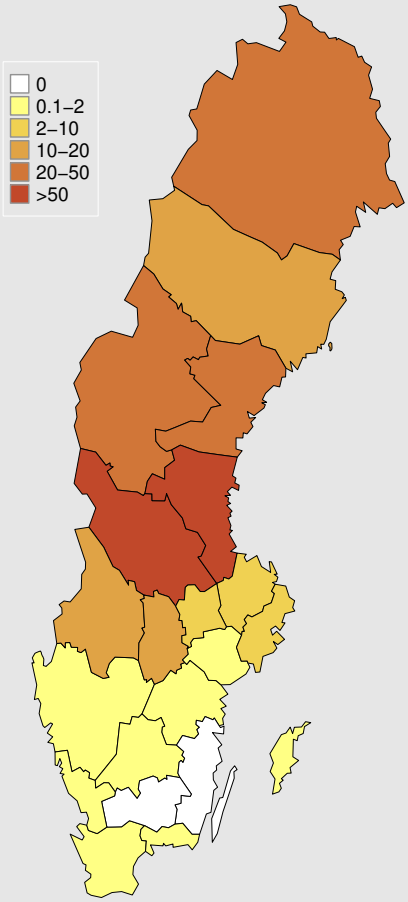

Figure 30: Incidence of reported human tularaemia cases by County in Sweden 2019. The colour scale represents the number of cases per 100 000 inhabitants.

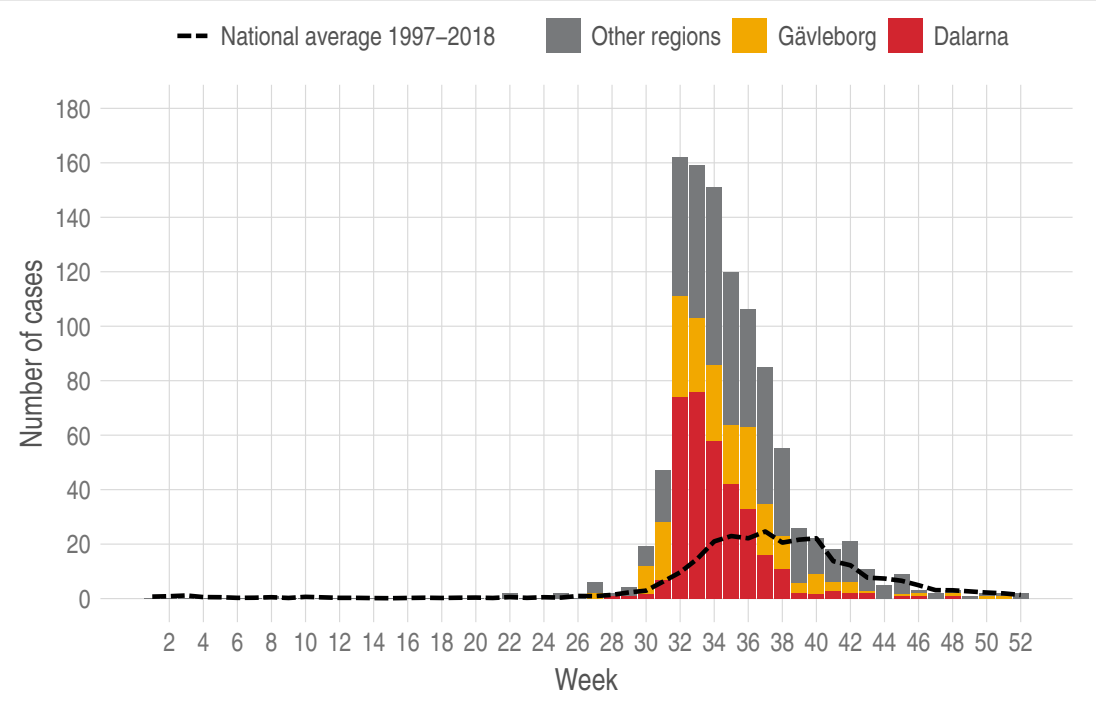

Figure 31: Number of reported human cases per week in 2019 and as an average 1997–2018. For 2019, data for the Counties of Dalarna and Gävleborg are highlighted in red and yellow, respectively.

RESULTS

Animals

In 2019, 128 European brown hares and 48 mountain hares were examined. Due to a tularaemia outbreak during summer and autumn, the number of reports of dead hares and the number submitted for examination were much higher during 2019 compared to years with no outbreaks. *F. tularensis* subsp. *holarctica* was detected in 27 European brown hares and 31 the mountain hares. They all died of an acute disease spread to several organs, quickly leading to death due to septicaemia. The number of tularaemic hares started to slowly increase in July, a peak appeared during August and September followed by a decline in October. The highest number of cases originated from the counties Norrbotten (12 cases), Västerbotten (5 cases), Jämtland (9 cases), Dalarna (6 cases) and Stockholm (5 cases). In the remaining counties where tularaemia was found, the number of cases ranged from one to three. The only counties with no tularaemia diagnosed in hares were Kalmar, Kronoberg, Skåne and Gotland. This could be compared to the outbreak year 2015 when tularaemia was diagnosed in 31 hares, the majority of which originated from an outbreak area in Norrbotten.

Humans

In 2019, 1048 human cases of tularaemia were reported, ten times more than 2018 (n=107) and a higher number than the outbreak year 2015 (n=859) (Figure 29). Of the cases, all but eight were reported as infected in Sweden. For the population as a whole, the incidence was 10.1 per 100 000 inhabitants. However, as in previous years, there were considerable regional differences with a larger proportion of cases in the central and northern parts of the country. The reasons behind the annual and regional fluctuations observed are not known.

More men (54%) than women were reported to be infected in 2019, which is in accordance with previous years. The incidence of tularaemia was highest in the age group 40 years and older, which is also similar to previous years. The uneven distribution among age groups and sexes might partially be attributed to the demographic distribution of people who work or practice leisure activities outdoors in high risk rural areas.

During 2019, the incidence was highest in the County of Dalarna with 116 cases per 100 000 inhabitants, followed by the County of Gävleborg with 81 cases per 100 000 inhabitants. A number of other Counties also reported many disease cases and an incidence of more than ten cases per 100 000 inhabitants was seen in western Svealand and the whole of Northern Sweden. For all cases except eight, Sweden was designated as country of infection.

During the first half of 2019, only a few cases were reported. The number of cases started to increase in July and peaked in August. A rapid decline was seen in September, which was followed by a more subdued decline during the last months of the year.

DISCUSSION

Tularaemia has been endemic in northern and central Sweden at least since the early 20th century with a marked annual variation. Years with high numbers of cases are often followed by periods when the disease is virtually absent. There is no obvious explanation for these fluctuations. Probably, variations in population sizes of host animals and insect vectors that can transmit infection to humans play a major role which in turn is influenced by factors such as predators, diseases, weather and climate.

During the last two decades, the epidemiology of tularaemia has changed and the number of reported cases in humans and animals, mainly hares, infected south of the previous endemic region is increasing. Since the information on diseased and dead hares is dependent on voluntary reporting and submitting animals for investigation the true numbers are not known. However, the reporting and submissions were remarkably high during 2019 and hares diagnosed with tularaemia were found in most counties, including the south of Sweden. Based on the geographical and temporal distribution of submitted hare cases it can be assumed that the geographic distribution of cases and peaks in number of cases is roughly similar for hares and humans.

The reservoir for the bacterium between outbreaks has not been clearly identified. In some countries, outbreaks of tularaemia in animals have been associated with a rise in rodent and hare populations, but this has not been confirmed in Sweden. The epidemiological role of the hare as a possible carrier of *F. tularensis* is unclear.