# SURVEILLANCE OF INFECTIOUS DISEASES IN ANIMALS AND HUMANS IN SWEDEN 2019

## Chapter excerpt -
## Yersiniosis

SVA NATIONAL VETERINARY INSTITUTE
Jordbruksverket Swedish Board of Agriculture
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.

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# Yersiniosis

## BACKGROUND

The genus *Yersinia* is associated with human and animal diseases and was first identified in the late 19th century and classified into its own genus in the mid-20th century. Two enteropathogenic species of the genus are zoonotic: *Yersinia enterocolitica* and *Yersinia pseudotuberculosis*. Pigs are considered the main reservoir of *Y. enterocolitica*. *Yersinia* bacteria are widespread in nature, among which nonpathogenic strains are most frequent. The most common human pathogenic bioserotype is *Y. enterocolitica* 4/O:3.

Wild animals, especially rodents and birds are considered the principal reservoir of *Y. pseudotuberculosis*. Both *Y. enterocolitica* and *Y. pseudotuberculosis* are frequently found in pig tonsils and porcine intestinal contents. Infections caused by *Y. enterocolitica* are thought to be foodborne and pigs are considered the main source of infection. The sources and vehicles of *Y. pseudotuberculosis* infections in humans are not well understood but infections caused by consumption of contaminated carrots and iceberg lettuce have been described in Finland. *Yersinia* bacteria are killed by heating (pasteurisation and cooking) but can grow at refrigerator temperature and in vacuum and modified atmosphere packaging.

During 2014–2015, a survey of the presence of *Y. enterocolitica* on Swedish finishing pig farms was conducted, involving 105 farms. A herd-level prevalence of 30.5% was found, and the identified bioserotypes were *ail* gene (attachment-invasion locus gene) positive 4/O:3 and 2/O:9, which are considered to be human pathogens. These results indicate that the Swedish domestic pig population has a *Y. enterocolitica* status similar to other pig producing countries in Europe. In 2016, a longitudinal study of 8 previously positive pig herds was conducted. All herds were still positive for *Y. enterocolitica* in at least one of the samples collected, indicating that *Yersinia* is persistent in positive pig production chains.

Human yersiniosis in Sweden is primarily a domestic infection.

## DISEASE

### Animals

Pigs are asymptomatic intestinal carriers of pathogenic *Y. enterocolitica* and *Y. pseudotuberculosis*. Infection with *Y. pseudotuberculosis* in other animals may vary from asymptomatic to severe mesenteric lymphadenitis and lead to septicaemia and death. *Y. enterocolitica* has occasionally been isolated from cats and dogs with diarrhoea.

### Humans

*Y. enterocolitica* causes gastrointestinal symptoms in humans ranging from mild self-limiting diarrhoea to acute mesenteric lymphadenitis, which might be difficult to differentiate from appendicitis. *Y. pseudotuberculosis* causes primarily abdominal pain, fever headache and erythema nodosum, a skin reaction. The infection can be complicated by long-term sequelae including reactive arthritis, uveitis and glomerulonephritis (kidney disease).

## LEGISLATION

### Animals

*Y. enterocolitica* and *Y. pseudotuberculosis* are not notifiable in animals.

### Food

Detection of *Y. enterocolitica* and *Y. pseudotuberculosis* in food is not notifiable.

### Humans

Yersiniosis (isolation or identification by PCR of *Y. enterocolitica* (other than biotype 1A) or *Y. pseudotuberculosis* from a clinical sample) is notifiable according to the Communicable Disease Act (SFS 2004:168 with the amendments of SFS 2013:634). Diagnosis of yersiniosis by serology is not notifiable.

In 2012, the case definition for notification of yersiniosis was revised. The previous case definition stated that human pathogenic *Yersinia* was notifiable. In 2013 it was clarified that infection with *Y. enterocolitica* biotype 1A was not notifiable. Notification was also extended to include both culture and PCR identification.

## SURVEILLANCE

### Animals

Active surveillance for *Yersinia* was not conducted during 2019, but some materials were submitted for routine health examinations or because of clinical disease.

### Food

No official control programme exists for *Yersinia spp*. National and local authority may perform sampling as a part of extended official controls or targeted projects. Sampling may be performed by food business operators, but analysis results are not normally reported to the authorities.

### Humans

The surveillance in humans is based on identification of the disease by treating physician and/or by laboratory diagnosis (i.e. passive surveillance). Both treating physicians and laboratories are obligated to report to the regional and national level to enable further analyses and adequate intervention measures.

## RESULTS

### Animals

Samples tested for *Yersinia* at SVA during 2019 included 60 samples from mostly zoo and laboratory primates and rodents. *Y. enterocolitica* was isolated from 3 primates,

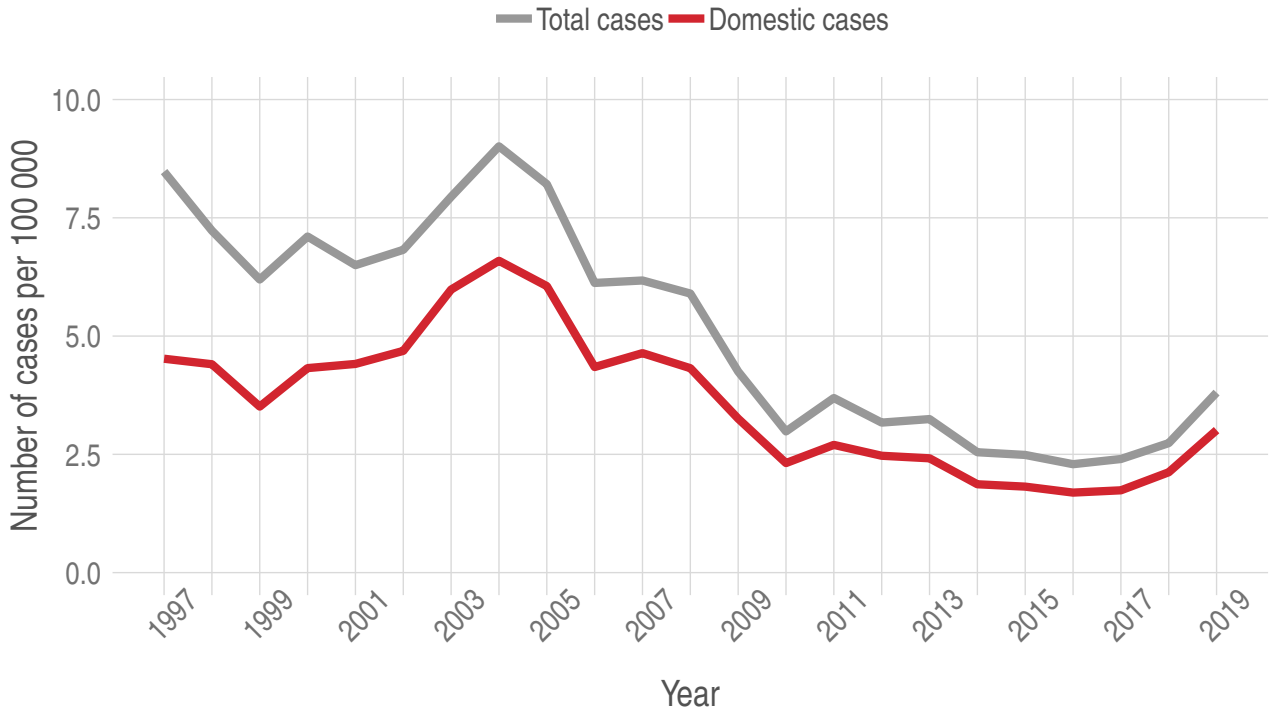


Figure 32: Notified incidence (per 100 000 inhabitants) of human cases of yersiniosis in Sweden, 1997–2019.

*Y. pseudotuberculosis* from 1 primate, *Yersinia* spp. from 1 rodent and *Y. enterocolitica* in a domestic finishing aged pig as an incidental finding at postmortem.

### Food

In 2019, national and local authorities took 14 samples from different types of food. No sample was positive for *Yersinia* spp.

### Humans

During 2019, 393 cases were reported (3.8 cases per 100 000 inhabitants). This is the highest incidence in ten years. The proportion reported as infected in Sweden increased from around 75% previous years to near 80% of the cases (Figure 32).

Similar to previous years, the incidence was high among children younger than five years. The incidence was 9.5 (cases per 100 000 inhabitants) for infants and 5.1 for children 1–4 years old, compared to 3.8 for all cases. In 2019, the incidence was also high among persons 15–39 years old (5.5) due to two large outbreaks that particularly affected people of these ages.

Yersiniosis follows a minor seasonal variation with the highest number of cases infected in Sweden during the summer. However, during 2019, the majority of cases were reported during spring with one peak in March and one in May where two larger outbreaks were identified (Figure 33). For the majority of cases species was reported, with 307 being *Y. enterocolitica* and eight *Y. pseudotuberculosis*.

The majority of yersiniosis cases are considered to be sporadic. However, *Yersinia* spp. is not part of the national microbial surveillance programme in Sweden. Therefore, there is no national monitoring of circulating subtypes and a limited ability to capture cross-regional outbreaks.

### Outbreaks

Two larger outbreaks were identified in 2019 and both mainly included cases in the age group 15–39. In the first outbreak, an unusual increase of cases of *Y. enterocolitica* and *Y. enterocolitica* O3 biotype 4 was identified. Isolates were sent in to the PHAS for typing using WGS and the majority of isolates formed a tight cluster within sequence type (ST) 18. The outbreak sequence was shared internationally and Denmark reported a match and informed PHAS that they had identified an increase of cases during the same time period. A case-control study was conducted in both countries that indicated an association of cases with the consumption of a fresh vegetable. Specifically, in the Danish case-control study, there was a clear link to fresh spinach from a specific large retail store. A trace-back investigation was conducted and a common producer of fresh spinach was identified supplying both the Danish and Swedish markets via different wholesalers. In total, 57 cases were identified where 37 came from Sweden. The second outbreak was identified immediately after the spinach related outbreak (Figure 33). The majority of cases in this outbreak were reported in May. In total, 30 cases, and all isolates formed a cluster within the same bioserotype of *Y. enterocolitica* as the first outbreak. However, no source could be identified in this second outbreak. Both outbreaks identified a recent challenge with the primary diagnostics of yersiniosis. PCR panels for analysis of bacterial gastroenteritis does not always separate those *Yersinia* that require mandatory notification, *i.e.* those regarded as pathogenic to humans, from the ones that are not notifiable.

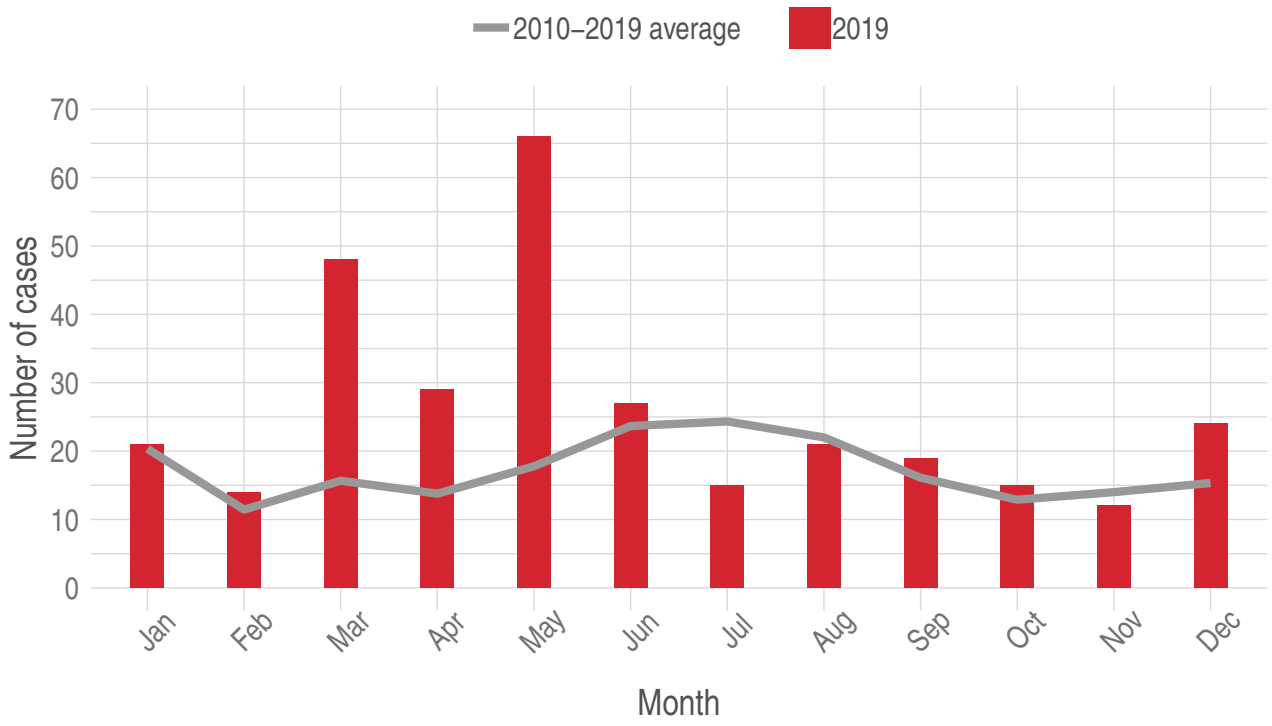


Figure 33: The domestic human case count of yersiniosis by month during 2019 and the mean number of cases per month over the past 10 years illustrates the March and May outbreak peaks during 2019.

## DISCUSSION

Since the beginning of the 2000s, the number of reported cases of yersiniosis has decreased not only in Sweden but also in the entire EU. This decrease has occurred without any active interventions in the food chain. The last couple of years, however, the number of cases in Sweden has started to rise again. It remains to be seen if this increase is due to random outbreaks or is the beginning of a new trend with increasing number of cases.

Yersiniosis in humans is considered foodborne and most infected cases are of domestic origin. Outbreaks are rare, and most infections seem to be sporadic but under-reporting may be considerable. Case-control studies suggest that consumption of pork products is a risk factor, however vegetables should be considered as a route for transmission as shown in the Swedish-Danish outbreak in 2019. Good agricultural practices, as well as, good slaughter hygiene and good manufacturing practices in food processing are essential for control of *Yersinia*.

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