SURVEILLANCE OF INFECTIOUS DISEASES IN ANIMALS AND HUMANS IN SWEDEN 2020

Chapter excerpt - Yersiniosis

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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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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 destroyed by heating (pasteurisation and cooking) but can grow at refrigerator temperature and in vacuum and modified atmosphere packaging.

The latest information from 2014–2015, indicates that the prevalence of *Y. enterocolitica* in the Swedish domestic pig population (30.5% of herds) is similar to the other pig producing countries in Europe. Human yersiniosis is primarily a domestic infection and normally about three quarters of the cases are reported to be infected in Sweden.

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.

SURVEILLANCE

Animals

Active surveillance for *Yersinia* was not conducted during 2020, 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

In 2020, *Y. pseudotuberculosis* was isolated at SVA from 17 wild animals (14 hares, 1 fallow deer, 1 roe deer, 1 pigeon), three pet animals (2 cats and 1 dog) and from four zoo animals (2 primates, 1 antelope, 1 rodent). *Yersinia* spp. was detected from one moose.

Food

In 2020, no samples taken by national and local authorities were analysed for *Yersinia*.

Humans

During 2020, 220 cases were reported (2.1 cases per 100 000 inhabitants). This is the lowest incidence since at least 1997. The proportion reported as infected in Sweden was 78% while travel-associated infections were a record low 13% of the cases (Figure 38).

Like previous years, the incidence was high among children younger than five years. The incidence was 4.4 (cases per 100 000 inhabitants) for infants and 5.8 for children 1–4 years old, compared to 2.1 for all cases. In 2020, the incidence was also higher than average among persons 15–29 years old (3.3).

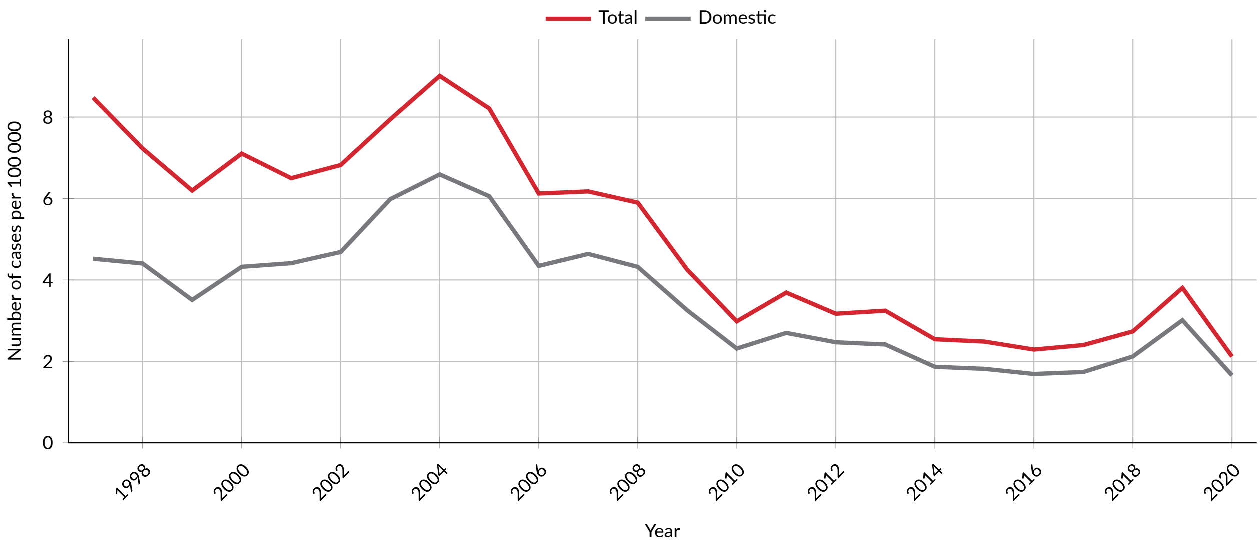

Figure 38: Notified incidence (per 100 000 inhabitants) of human cases of yersiniosis in Sweden, 1997–2020.

IN FOCUS: Yersinia — what you detect and how to detect it

Yersiniosis in humans has been on the rise in Sweden the last few years, after a historical decrease in cases. Notification of laboratory confirmed cases includes the species *Y. pseudotuberculosis* (YP) and *Y. enterocolitica* (YE), however excluding the biotype (BT) 1A of YE which does not cause typical yersiniosis but may be the cause of milder gastrointestinal symptoms in humans. Pork, and products thereof, have been the main source of *Y. enterocolitica*. In recent years, however, several outbreaks of YE and YP have occurred with contaminated vegetables such as lettuce and spinach as the probable cause.

Detection and isolation of YE and YP from samples from human faeces, food, environment, and animals can be challenging. It is complicated by the poor selectivity of the current methods, low levels of YE/YP (especially in food and environmental samples) and competing background flora including other species of *Yersinia* and avirulent variants. It is estimated that approximately 30 percent or more can be lost during cultivation. During the last ten years in Sweden there has been a transition process for the clinical microbiological laboratories from cultivation-based detection methods to molecular-based using PCR panels, a process that is still ongoing. In animals, YP causes an infection that can vary from asymptomatic to severe. Generally, detection of YP from a clinically diseased animal is easier due to higher levels of the bacteria than in an asymptomatically infected animal or in food and environmental samples. To reach detectable levels of pathogenic YE or YP in food, environmental and animal samples, long incubation periods (up to 21 days) may be needed, since this is often done by enrichment in culture broth at 4 °C employing the psychrotrophic ability of YE and YP. Also, same methods may not be optimal for detection of both YE and YP, or even different strains of YE.

The PCR panels used in clinical microbiology can often be used as a first screening method for pathogens to be targeted for cultivation. However, depending on the epidemiological setting further isolation attempts are not necessarily being made and it is the PCR finding that is notified. Depending on PCR panel and target genes used, the outcome of what types of *Yersinia* that are detected varies. The target genes can be situated on the chromosome or on the virulence plasmid of *Yersinia*. The chromosomal marker gene *ail* is one of the most used for detection of both YE and YP in human, food, environmental and animal samples. It excludes YE BT1A, with few exceptions; meaning only notifiable yersiniosis cases are reported. *VirF* also excludes YE BT1A, however this target is situated on the virulence plasmid which can be lost during cultivation. Other common targets that are used are *invA* and *ystB*, chromosomal genes that are also present in YE BT1A.

It is important to have awareness when reporting and communicating results on what variants that can be detected or not detected within the specific system used, in addition to the diagnostic challenges on the food and veterinary side.

Yersiniosis follows a minor seasonal variation with the highest number of cases infected during the summer. However, during 2020, such seasonal trend was reversed with the highest number of reported cases during the first quarter, a decline during the summer months and a smaller increase during the autumn (Figure 39). As the large majority of *Yersinia* cases are usually domestic (Figure 38), travel restrictions after the first months of the year due to the pandemic explain only a small part of this pattern. Instead, there was a large decrease in domestic cases, mainly from April to September, that is behind the deviating seasonal pattern. This decrease is most probably related to the COVID-19 pandemic, but the impact of specific factors related to behavioural changes, societal restrictions and reduced health care visits remain to be investigated. For the majority of cases species was reported, with 143 being *Y. enterocolitica* and twelve *Y. pseudotuberculosis*.

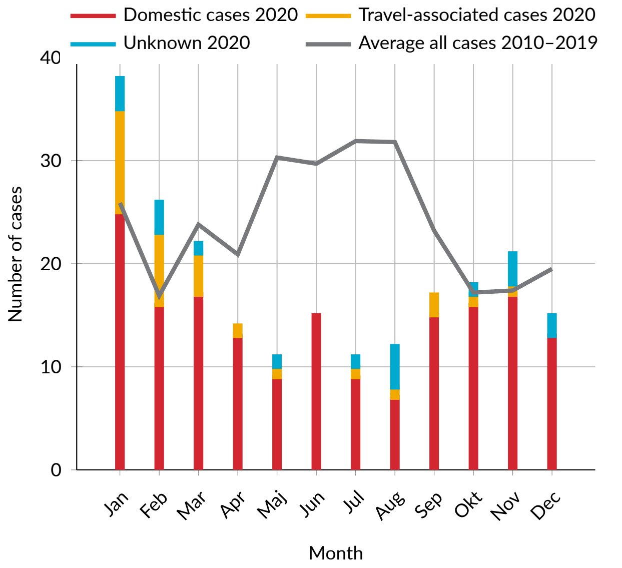

Figure 39: The monthly number of notified cases of yersiniosis of domestic, travel-associated and unknown country of origin in 2020 and the mean monthly number of all cases in 2010–2019.

The majority of yersiniosis cases are considered 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

No outbreaks in humans were identified during 2020.

DISCUSSION

In the beginning of the 2000s, the number of reported cases of yersiniosis decreased not only in Sweden but also in the other European countries. This decrease occurred without any active interventions in the food chain. In recent years, this trend has been broken with increases both in 2018 and 2019. However, the decreasing numbers for 2020 are difficult to assess due to the impact of the pandemic.

Yersiniosis in humans is considered foodborne and most infected cases are of domestic origin. Outbreaks in humans are rarely detected but most recently in 2019 outbreaks due to imported leafy greens were notified. Most infections are considered 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, for example, in the Swedish-Danish outbreak in 2019. In 2020, more cases of yersiniosis in hares (caused by *Yersinia pseudotuberculosis*) were detected but the reasons for this are unclear. Recent information on the prevalence of enteropathogenic *Yersinia* in Swedish production animals is lacking, the most recent in 2015. Similarly, recent studies in Swedish food have not been done. 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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