

SURVEILLANCE OF INFECTIOUS DISEASES

IN ANIMALS AND HUMANS IN SWEDEN 2022

*Chapter excerpt:
Trichinellosis*



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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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Trichinellosis

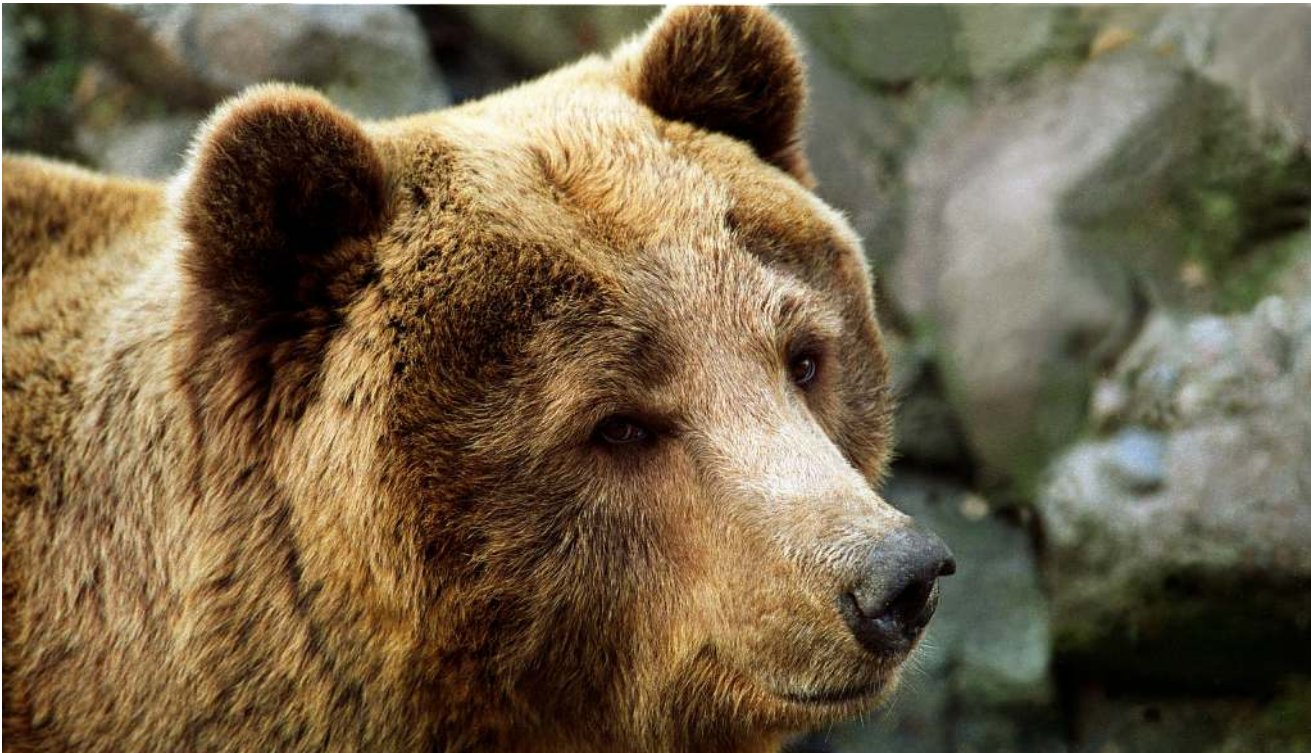


Figure 57: All bears delivered to game handling establishments, and most hunted bears consumed in private households, are tested for *Trichinella*. In 2022, the parasite was found in 2 out of 476 tested bears. Photo: SVA.

BACKGROUND

Trichinellosis is caused by parasitic nematodes of the genus *Trichinella*. The parasites can be hosted by different mammals including domestic pigs and horses, but the main reservoirs are wild carnivores and omnivores. Humans typically acquire the infection by eating raw or inadequately heated infected meat or meat products, for example cold-smoked, fermented sausages. In the gut, the *Trichinella* larvae develop into adult worms and mate. After mating, the female releases new larvae which penetrate the intestinal mucosa and travel via the bloodstream to various organs and muscles. In striated muscle cells the larvae may survive in an encapsulated form for years. There are several *Trichinella* species of which *T. spiralis* is the most widespread and most common in domestic pigs and as a cause of human disease.

In Europe today, trichinellosis is a rare disease that occurs predominantly in a few countries, mainly Bulgaria and Romania but also other countries such as Italy and Croatia have reported several cases during the last five years. Human cases are often associated with food-borne outbreaks and thus the reported numbers of cases fluctuate between years, but without any significant increase or decrease during the period 2017–2021. Most outbreaks are caused by meat/meat products from pigs, but wild boar meat is also an important source of infection. *Trichinella spiralis* followed by *T. britovi* are the dominant causes of human disease. According to EU legislation all slaughtered pigs, horses and

wild boars should be tested for *Trichinella*, with the possible exemption for pigs raised under controlled housing conditions (EU 2015/1375). While many EU Member states have not detected any infected pigs since long back, positive cases occur in others. For example, in 2021 positive pigs were reported from Romania, Poland, Croatia, France, Spain and Finland. These infected pigs were all free-range and backyard pigs reared in rural regions.

In Sweden, *Trichinella* has been monitored at slaughter in domestic pigs since the beginning of the 20th century. From 1970–1990 sporadic cases were detected in domestic pigs, but since 1994 there has not been any positive pigs. The parasite is endemic at a low level in Swedish wildlife. The species most often detected in wild boars are *T. britovi* and *T. pseudospiralis*, while the freeze-resistant *T. nativa* is dominating in wild carnivores, especially those from the northern part of the country. In contrast, *T. spiralis* has been a rare finding in Swedish wildlife during the last decade.

In humans, the disease is extremely rare in Sweden and detected human cases are usually infected abroad. Since 2004 only seven human cases with confirmed infection with *Trichinella* have been reported; all except one (in 2013) were infected abroad.

DISEASE

Animals

Animals rarely develop a clinical infection, although both pigs and rodents can exhibit clinical signs.

Humans

In humans, the disease can range from subclinical infection to fatal disease. The incubation period varies from 5–15 days. Symptoms initially involve diarrhoea and abdominal pain and later muscle pain, fever, oedema of the upper eyelids and photosensitivity. Intestinal stages of the disease respond well to treatment. Cardiac and neurological complications may occur 3–6 weeks post infection. *Trichinella* is not transmitted between humans.

LEGISLATION

Animals

Trichinella is notifiable in animals according to SJVFS 2021:10. Official controls for *Trichinella* in meat is regulated by Commission Implementing Regulation EU 2015/1375 of 10 August 2015.

Humans

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

SURVEILLANCE

Animals

Testing for *Trichinella* is part of routine meat inspection for domestic pigs, horses, wild boars and other animal species that can become infected. Since 2014, Sweden applies reduced testing of domestic pigs from holdings officially recognised to apply controlled housing conditions (EU 2015/1375). The risk of *Trichinella* infection in pigs from such production sites is considered as negligible and only certain categories of pigs are required to be tested. In Sweden, all carcasses of breeding sows and boars sent for slaughter are examined, while fattening pigs originating from controlled holdings are not obligated to test for *Trichinella*. Pig production sites without controlled housing conditions should test all their slaughtered domestic pigs. The digestion method (ISO 18743:2015) is the only method applied in testing for *Trichinella*.

All slaughtered horses, and all wild boars and bears delivered to game handling establishments, are tested for *Trichinella*. Also, most hunters test wild boars and bears consumed in private households. In addition, to monitor the

occurrence of *Trichinella* in the environment several species of wild animals are tested for *Trichinella*, including foxes, lynxes, wolves, wolverines, badgers and birds of prey. Testing of *Trichinella* in animals was performed by five laboratories during 2022.

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

In 2022, the number of tested pigs from controlled housing conditions were 61 527 breeding sows, 489 boars and 1 722 200 fattening pigs. In addition, 490 326 slaughtered pigs (all categories) from uncontrolled housing conditions were tested. The number of slaughtered and tested horses was 1095. *Trichinella* was not detected in domestic pigs or horses.

Trichinella spp. was detected in 6 out of a total of 113 803 (0.005%) wild boar samples and also in 2 bears, 5 lynx and 2 wolves, see Table 29. These figures are based on results from examination of samples from animals submitted to game handling establishments (13 208 wild boars and 181 bears) as well as samples submitted for testing by private hunters. In addition, samples were taken from selected wildlife species (primarily carnivores) sent to the National Veterinary Institute (SVA) within the general surveillance programme for wildlife diseases.

Humans

No human case of trichinellosis was reported in 2022.

DISCUSSION

Trichinellosis is extremely rare in Swedish food-producing animals and a majority of the few human cases detected during the last decades were infected abroad. The *Trichinella* situation in the Swedish animal population seems to be stable. *Trichinella* occurs in wild carnivores and wild boar but the risk of getting *Trichinella* from domestic pigs and horses is negligible.

Table 29: Findings of *Trichinella* in wild animals in 2022.

Animal species	No. samples	No. positives	Percentage (%)	<i>T. britovi</i>	<i>T. nativa</i>	<i>T. pseudospiralis</i>	<i>T. spiralis</i>	<i>Trichinella</i> sp.
Badgers	6	0	0.00%	-	-	-	-	-
Bears	476	2	0.42%	-	2	-	-	-
Beavers	11	0	0.00%	-	-	-	-	-
Lion	1	0	0.00%	-	-	-	-	-
Lynx	110	5	4.55%	-	5	-	-	-
Red fox	162	0	0.00%	-	-	-	-	-
Seals	8	0	0.00%	-	-	-	-	-
Wild boars	113 803	6	0.005%	5	-	-	-	1
Wolves	32	2	6.25%	1	1	-	-	-
Total	-	15	-	6	8	-	-	1