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The Norwegian Zoonoses Report 2017

Veterinærinstituttet
Norwegian Veterinary Institute

The Norwegian Zoonoses Report 2017

Content

Authors
Hannah J. Jørgensen[1], Kjell Hauge[2], Heidi Lange[3], Emily MacDonald[3], Trude Marie Lyngstad[3], Berit Heier[1]
[1]Norwegian Veterinary Institute
[2]Norwegian Food Safety Authority
[3]Norwegian Institute of Public Health

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Summary

In general, the occurrence of most zoonoses in 2017 in Norway has remained stable compared to previous years.

In humans the situation with respect to zoonoses was also favourable; the exception was *E. coli* (VTEC) for which the number of cases continued to rise. The increase observed in recent years can in part be explained by changes in diagnostic methods, but the development is of concern because the infection can cause serious disease.

Introduction

The Zoonosis Report is published annually in Norway in accordance with the requirements of the EU Council Directive 2003/99/EC. In addition, data on specified zoonoses in feed, animals and food are reported to the European Food Safety Authority (EFSA). Corresponding data from humans are reported to the European Center for Disease Control (ECDC). These two European institutions compile an annual European zoonosis report based on the received data:
(http://www.efsa.europa.eu/en/publications/advanced-search/?sub_subject=61616).

The Norwegian Veterinary Institute (NVI) is responsible for reporting of Norwegian data to EFSA, while the Norwegian Institute of Public Health (NIPH) reports Norwegian data to ECDC. The Zoonosis Report is written by the NVI in collaboration with the Norwegian Food Safety Authority (NFSA) and NIPH.

Origin of data

Humans

"The Norwegian Surveillance System for Communicable Diseases" (MSIS) was implemented nationally in Norway in 1975, and the NIPH is responsible for managing the system. The main purpose of MSIS is surveillance to describe trends and detect outbreaks of communicable diseases.

According to the Infectious Disease Control Act, all clinicians and laboratories that analyse samples from humans must report all cases of specified communicable diseases (at present 65 different diseases). All zoonoses described in this report, with the exception of toxoplasmosis, are notifiable.

Patients who have not travelled abroad during the incubation period for the diagnosed infection are classified as infected in Norway. Patients who develop the diagnosed infection abroad or shortly after returning home to Norway are classified as infected abroad. Patients for whom information regarding travel is not available are classified as «unknown origin» with respect to where the infection was contracted.

The District Medical Officer must notify the NFSA in cases where humans are believed to be infected from animals or food.

Feed, animals and food

Data that are presented in the Zoonosis Report, which are also reported to EFSA, are obtained through national surveillance programmes, projects, diagnostic investigations and various controls and inspections performed by public authorities and private companies. Two types of data are reported:

- Data on notifiable diseases (reported to the NFSA) and from public surveillance. Together, these data provide an overview of the Norwegian situation and any changes over time. The NFSA decides which surveillance programmes should be carried out and which infections are notifiable. The NVI assists with planning and practical work (e.g. laboratory analyses), and also contribute with data processing and reporting. Testing of animals and food for various zoonotic agents are also performed at the time of import and export. In addition, surveillance is carried out by the NFSA through pre-and post-mortem inspections in association with commercial slaughter.
- Data from diagnostic investigations and data from internal control systems of food-, and feed-producing companies are also included in the Zoonosis Report. All laboratories have an obligation to report any detection of notifiable diseases in animals to the NSFA. A large proportion of the laboratory diagnostics (including pathology) performed on animals in Norway is performed by the NVI. However, other laboratories than the NVI may also be used for diagnostic investigations, and therefore the reported data from diagnostic work are not complete. This is especially relevant for laboratory diagnostics of companion animals, because samples from these animals are often sent to laboratories abroad. Data from internal control of companies are not always available either. One exception is Salmonella-control in feed producing companies, where data from most of the performed internal control is made available and is presented in this report.

Notifiable diseases/agents in animal and humans are presented in Table 1.

Preventive and protective measures

Norway has strict regulations to prevent introduction and spread of certain infections in animals and humans.

Humans

When clusters of notifiable zoonoses are detected in humans, investigations are performed to trace the source of infection and measures to prevent new cases are implemented. In cases where food or animals are suspected to be the source, the NSFA is notified.

People employed in the food industry should not work while symptomatic with infections that may be transmitted through food. Before returning to work they should have two negative faecal samples after clinical improvement. For EHEC/VTEC/*S*. Typhi/*S*. Paratyphi/*S. dysenteriae* 1 the number of negative faecal samples should be three.

Feed, animals and food

According to the Food Act (Matloven), Food Business Operators are responsible for implementing appropriate measures to prevent the occurrence or spread of contagious disease in animals, and to notify the NFSA about any suspicion of a contagious disease in animals that has potential to cause significant negative consequences for society.

The Regulation on Notification of Diseases in Animals states that veterinarians and laboratories must notify the NFSA about specified animal diseases categorized as A-, B-, and C-diseases. In addition, there is a general duty to notify diseases in animals that:

- could cause death or serious disease in humans.
- could result in high numbers of animals becoming diseased or exposed to infection.
- could result in substantial economic losses for society.
- could cause other substantial consequences for society.
- are presumed not to exist in Norway or have an unexpected distribution.
- compromises animal health in an unexpected manner or in an unexpected fashion.

If a group A- or B-disease is detected in animals in Norway, restrictions will be imposed on the infected animal or animal holding, and efforts will be made to eradicate the infective agent. The imposed/recommended measures depend on animal species, management system, and the infective agent. In cases where a zoonosis is detected or suspected, the NFSA must notify the District Medical Officer if the infection has transmitted - or may transmit - to humans.

Companies that produce or sell food are themselves responsible for ensuring that the products they produce or sell are safe to consume. The NFSA follows up and inspects the food industry facilities to ensure that they exercise their responsibility. Food producers must also consider zoonoses in their internal control systems. In addition to the national surveillance programmes and various short-term projects initiated by the central office of the NFSA, the regional offices of the NFSA perform some sampling. However, the data from the regional office are not included in this report.

In total, 15 border inspection posts and 7 associated control centres in Norway perform control of foods and foodstuffs of animal origin that are imported from non EU and non-EEA-countries.

If a zoonotic agent is detected in a food or foodstuff, measures are carried out to prevent spread and to identify the source. The District Medical Officer must be notified, and if there is a risk that animals have been infected or may become infected, the NFSA must perform further investigations.

Table 1. Disease/agents included in the zoonosis report in 2017 and their status with respect to notifiability and existing surveillance programmes.

Disease/agent	Notifiability			Feed, animals and food
	Humans	Feed and food	Animals	Surveillance programme
Salmonellosis	Yes	Yes	Yes (B-disease)	Yes
Campylobacteriosis	Yes	No*	No**	Yes
Yersiniosis	Yes	No*	No	No
Listeriosis	Yes	No*	Yes (C-disease)	No
Pathogenic *E. coli*	Yes	Yes*	Yes*	Yes (not annually)
Tuberculosis	Yes	Yes	Yes (B-disease)	Yes
Brucellosis	Yes	Yes	Yes (A-disease)	Yes
Trichinellosis	Yes	Yes	Yes (B-disease)	Yes
Echinococcosis	Yes	Yes	Yes (B-disease)	Yes
Toxoplasmosis	No	No	Yes (C-disease)	No
Rabies	Yes	-	Yes (A-disease)	No
Q-fever	Yes	-	Yes (C-disease)	No
BSE og vCJD	Yes	-	Yes (B-disease)	Yes

* Some conditions are notifiable according to national regulation within specific areas. Otherwise, the food law contains a general obligation to immediately inform the competent authorities if there exists a risk or potential risk (to human, animal and plant health) of significant consequences to the society.
** The exception is broiler chickens during the summer season, because these are included in the surveillance programme, and measures are implemented if samples are positive.

Acknowledgements

NIFES, Geno, Norsvin and the feed industry are gratefully acknowledged for contributing with data for this report.

Salmonellosis

The disease and its transmission routes
There are more than two thousand variants of *Salmonella* bacteria. The most common symptom of infection is diarrhoea, both in humans and in animals, but healthy carriage is not uncommon. *Salmonella* are shed in faeces and the most important sources of infection are contaminated food, feed or water. It can also spread through direct contact with infected individuals.

Surveillance and control
Salmonellosis in humans is notifiable in Norway. From 2017, both Salmonella infections verified by PCR and/or culture are registered in MSIS. Infection in animals is listed as a group B-disease. Detection of *Salmonella* in feed or food must be reported to the NFSA.

Surveillance of *Salmonella* in feed, cattle, swine and poultry (live animals and animal products) started in 1995. Testing is performed in cases of disease, in relation to live animal import and as part of Salmonella control systems in feed production. Vaccination of animals against *Salmonella* is forbidden in Norway.

Results 2017

The number of reported cases of salmonellosis in humans (992) has slightly increased from 2016 (Figure 1). Information on the detected serotypes is presented in the Appendix.

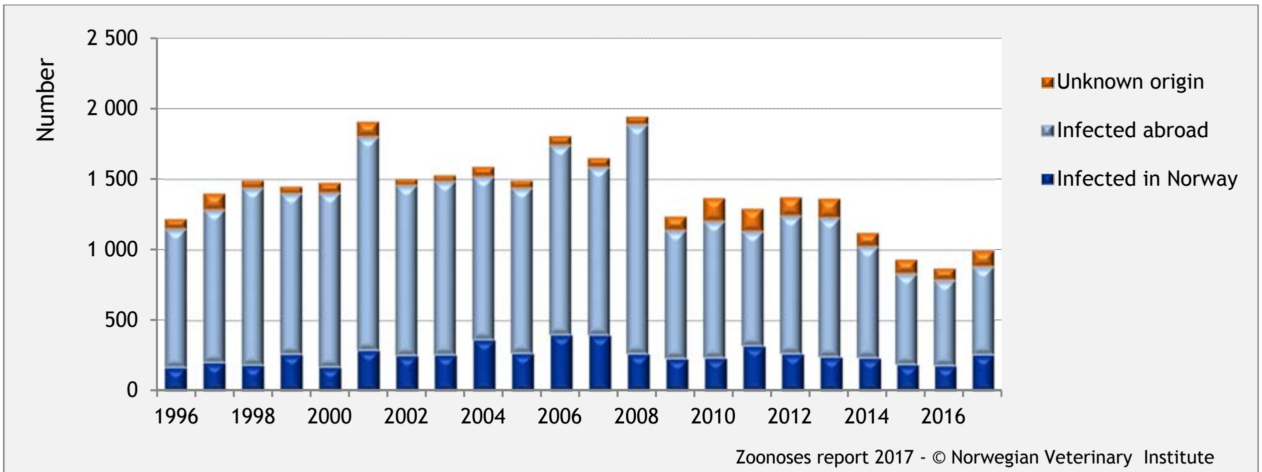

Figure 1. Reported cases of salmonellosis in humans. Data from MSIS.

One *Salmonella* positive poultry flock was detected through the surveillance programme. *Salmonella* was also detected in a lymph node from three swine and from one cow (Figure 2).

In addition, a few cases of salmonellosis were diagnosed in animals with disease. Details on *Salmonella* testing of feed, animals and food are shown in the Appendix.

Evaluation of the current situation

The number of salmonellosis cases in humans in 2017 was below the average for the past 10 years, maintaining the descending trend. More than 70% of the infected humans are reported to have contracted the infection abroad. The reduced prevalence of *Salmonella* in European poultry is presumed to contribute to the observed reduction. Data from outbreaks of salmonellosis indicate that a great variety of foods can be implicated. When infection is contracted in Norway, imported foods are more often implicated than foods produced in Norway.

In Norway, food-producing animals are very rarely infected with *Salmonella*. This is well documented in the surveillance program (Figure 2). *Salmonella diarizonae* is occasionally detected in Norwegian sheep. This *Salmonella* variant, is only rarely associated with disease in animals, and is not considered a public health threat. However, carcasses from which *S. diarizonae* is detected are not used for human consumption.

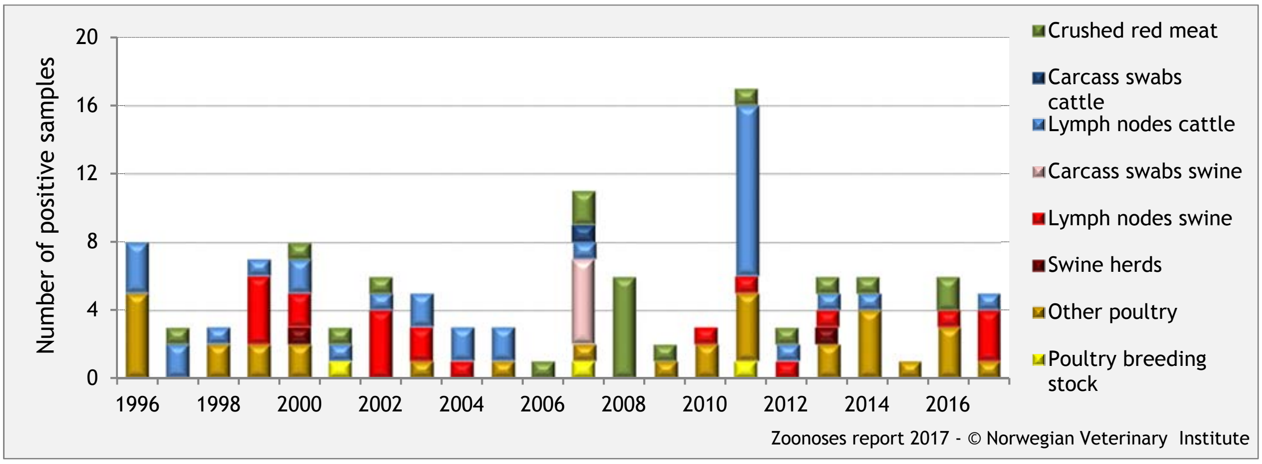

Figure 2. The number of positive samples in the *Salmonella* surveillance programme.

Salmonella is occasionally detected in dogs and cats and in reptiles in Norway. Infected pets may constitute a risk of infection for humans. In 2017, an exemption was made for 19 species on the general ban on import and marketing of reptiles in Norway. Reptiles frequently carry *Salmonella* and may pose a source of infection to humans. *Salmonella* Typhimurium can sometimes be detected from wild birds and hedgehogs in Norway. Contamination of food and water by these animals may lead to infection of humans.

Feed given to domestic animals in Norway is basically free from *Salmonella*, but *Salmonella* is sometimes detected in feed factories, especially those producing fish feed.

Continued surveillance of *Salmonella* in animals, feed and food is necessary for early detection, to facilitate control and to sustain the beneficial situation with respect to *Salmonella* in Norway.

Campylobacteriosis

The disease and its transmission routes

There are many *Campylobacter* variants, but *C. jejuni* and *C. coli* are the most important zoonoses. These are commonly found in the guts of healthy birds, and humans may contract the infection through contaminated food or water or by direct contact. Diarrhoea is the most common symptom of campylobacteriosis, but more severe disease may also occur.

Surveillance and control

Campylobacteriosis is notifiable in humans in Norway, but not in animals (except *C. fetus* in cattle). In humans, both campylobacter infections verified by PCR and/or culture are registered in MSIS.

Norway has a surveillance program for *Campylobacter* in broiler chickens. All flocks slaughtered between the 1st May and 31st October must be tested prior to slaughter. Carcasses from positive flocks must be heated or frozen prior to sale in order to reduce the potential for transmission to humans. Pasteurisation of milk and disinfection of water are other measures that prevent transmission of *Campylobacter* to humans.

Results 2017

In MSIS, 3,884 human cases were reported, of which 1,473 contracted the infection in Norway. For 704 of the cases place of infection was unknown. This is an increase compared to previous years. However, before 2017 cases verified only by PCR were not notifiable to MSIS and thus not reported. From 2017, all cases verified by PCR and/or culture are registered in MSIS. When comparing the number of positive cases for 2017 to positive cases verified by both culturing and/or PCR in 2015 and 2016, the numbers are similar (Figure 3).

A slight decrease in the proportion of positive broiler flocks was observed in 2017 compared to 2016. In total, 1,919 flocks from 521 farms were sampled. Of the positive flocks, 42.6% originated from 5% of the farms. In total, 20% of the farms delivered at least one *Campylobacter*-positive broiler flock.

In the diagnostic services at the NVI, *Campylobacter* was detected in samples from 37 cattle, four sheep, two pigs, 59 dogs and one cat. For details see the Appendix.

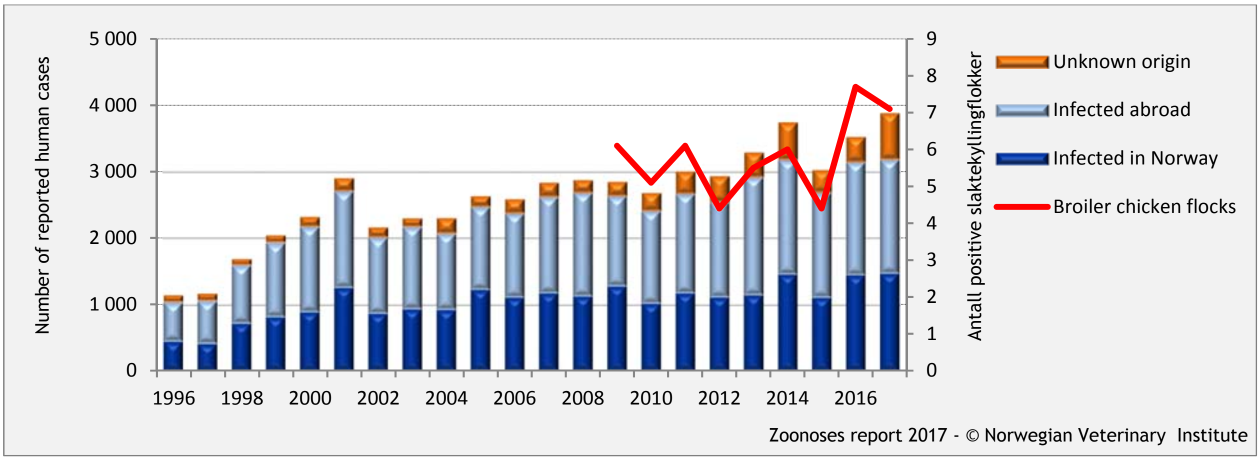

Figure 3. The number of reported cases of campylobacteriosis in humans (data from MSIS) and the percentage of positive broiler flocks (sampled between 1st May and 31st October).

Evaluation of the current situation

Campylobacteriosis is the most commonly reported zoonosis in humans in Norway. More than half of the cases are reported as infected abroad. Annually, about 1,400 persons contract the infection in Norway.

Case-control studies have shown that the most common source of campylobacteriosis in Norway is drinking untreated water at home, in holiday homes or in nature. Eating or preparing poultry and barbeque meals have also been identified as risk factors for infection. There have not been any studies conducted that have demonstrated a link between eating beef or lamb and campylobacteriosis despite a considerable prevalence of *Campylobacte*r in these animals in Norway. However, one study showed that eating inadequately heat-treated pork was associated with an increased risk of *Campylobact*er infection. Studies have also shown that direct contact with domestic animals (cattle, sheep, poultry, dogs and cats) is associated with an increased risk of campylobacteriosis in humans.

The prevalence of *Campylobacter* in broilers has been low in Norway (3-7% of slaughtered flocks) compared to other countries. The measures implemented in Norway to reduce *Campylobacter* in chicken meat are presumed to have had a positive effect on public health. It is, therefore, of concern that the proportion of positive broiled flocks has increased in the last two years (2016 and 2017). A few farms seem to deliver a high proportion of the positive flocks.

Yersiniosis

The disease and its transmission routes

Certain serogroups of the bacteria *Yersinia enterocolitica* can cause disease in humans, for which the most common symptom is diarrhoea. Swine are considered to be the main source of these disease-causing variants. The most common sources of human infection are contaminated food and water.

Yersinia pseudotuberculosis is a different bacterium that may cause disease in humans and animals.

Surveillance and control

Yersiniosis in humans is notifiable, while detection of *Y. enterocolitica* in animals is not. There is no surveillance for this bacterium in animals or food in Norway. Because healthy swine can be carriers, contamination of carcasses may occur at slaughter. Good hygiene at slaughter reduces this risk.

Results 2017

The number of reported cases of yersiniosis (67) has remained on the same level as previous years (Figure 4). Most cases were caused by *Yersinia enterocolitica,* while *Y. pseudotuberculosis* was detected in four patients.

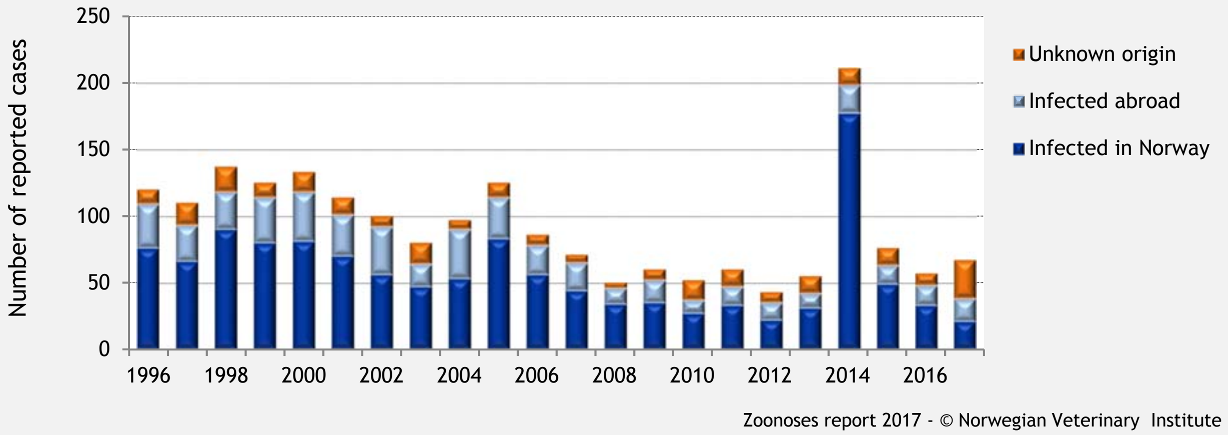

Figure 4. The number of reported cases of yersiniosis in humans. Data from MSIS.

In the diagnostic services at the Norwegian Veterinary Institute, *Y. enterocolitica* was detected in a hedgehog.

Evaluation of the current situation

Most yersiniosis cases in humans in Norway are sporadic and have been infected domestically. In 2014, there was a significant increase in the number of reported cases due to an outbreak in a military camp and the civilian population.

Y. enterocolitica is presumed to be prevalent in swine and the bacteria cannot be eliminated from swine flocks. During the 1990s routines for improved slaughter hygiene were implemented and this has contributed to reducing the number of human cases of yersiniosis.

Listeriosis

The disease and its transmission routes
Listeria monocytogenes occurs naturally in the environment and is mainly pathogenic for pregnant women, the elderly and people with a compromised immune system. Occasionally babies may be born with listeriosis. The infection can cause fever, abortion, meningitis and septicaemia. The main route of infection is contaminated food or water. In animals, listeriosis causes central nervous disease (meningitis), and abortion. Feed is the mains source of infection in animals.

Surveillance and control
Listeriosis in humans is notifiable. In animals it is categorised as a group C-disease. Detection of *L. monocytogenes* in animals usually does not result in any measures. Detection of *L. monocytogenes* is included as part of the control system in the manufacture of certain food products.

The upper limit *for L. monocytogenes* in ready-to-eat foods is 100 cfu/g and 0 cfu/ml in products intended for small children or persons with certain medical conditions. If the upper limit is exceeded, the food must be withdrawn from market and measures must be implemented to avoid further contamination. Dietary advice is available for persons in risk groups; www.matportalen.no and www.fhi.no

Results 2017

Seventeen cases of listeriosis were reported in humans in 2017 (Figure 5).

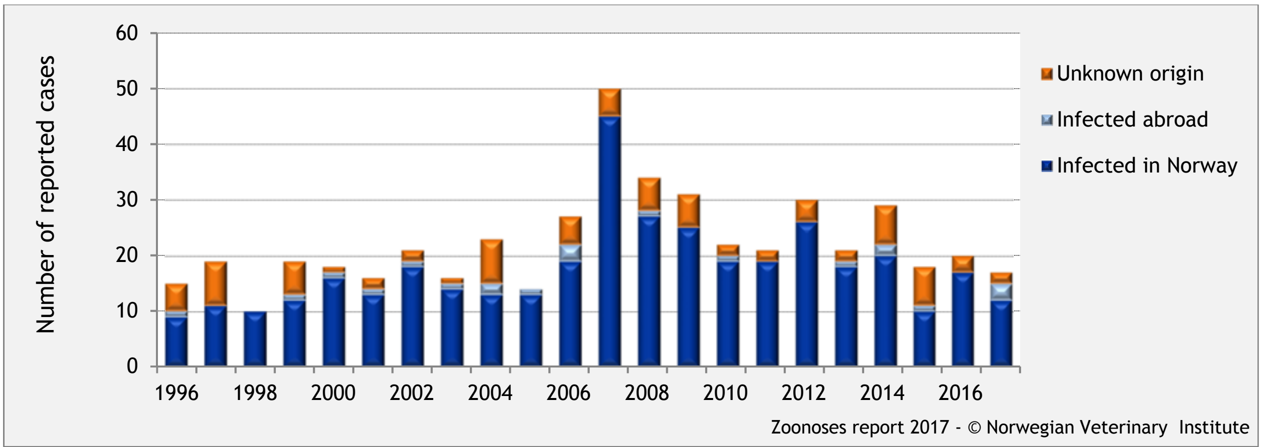

Figure 5. The number of cases of listeriosis in humans. Data from MSIS.

The National Institute of Nutrition and Seafood Research (NIFES) examined 136 samples of seafood for *L. monocytogenes* and one sample from an imported fish product was positive, but had less than 100 cfu/g. At the NVI, *L. monocytogenes* was detected in diagnostic samples from 15 sheep, four goats, and one bovine foetus.

Evaluation of the current situation

There are few reports of listeriosis in both humans and animals in Norway, but when it does occur the infection can have severe consequences. Therefore, it is important that manufacturers of ready-to-eat foods have proper routines in place for preventing *Listeria* in their products, and systems for traceability and withdrawal of products from the market in cases where *L. monocytogenes* are detected. Farmers, especially sheep farmers, must ensure that feed is of good quality in order to reduce the risk of listeriosis in animals.

Verotoxin producing *E. coli* (VTEC)

The disease and its transmission routes

Escherichia coli are normal inhabitants of the intestines of humans and animals. Some variants of these bacteria may produce verotoxins (also called shigatoxin). The toxin-producing *E. coli* variants are called VTEC or shigatoxin producing *E.coli* (STEC), and can cause serious disease and bloody diarrhoea in humans (hence the term EHEC - enterohaemorrhagic *E. coli*). Transmission can occur via food or water or by direct contact with animals

Surveillance and control

EHEC and diarrhoea-associated haemolytic uremic syndrome (HUS) are notifiable in humans. Detection of VTEC in animals is not notifiable but the NFSA should be informed so that measures can be considered. There is no routine surveillance of VTEC in animals or food, but several screening studies have been performed.

VTEC should not be found in ready-to-eat foods and detection of these bacteria in such foods would lead to withdrawal of the product from the market. Good hygiene and proper routines at slaughter reduces the risk of contamination of meat with VTEC.

Results 2017

The number of reported EHEC cases in humans (n=405) continues to increase (Figure 6), but the number of cases developing HUS continues to be low (2-5 cases/year). At least 50% of the cases in 2017 were diagnosed with low-virulent VTEC.

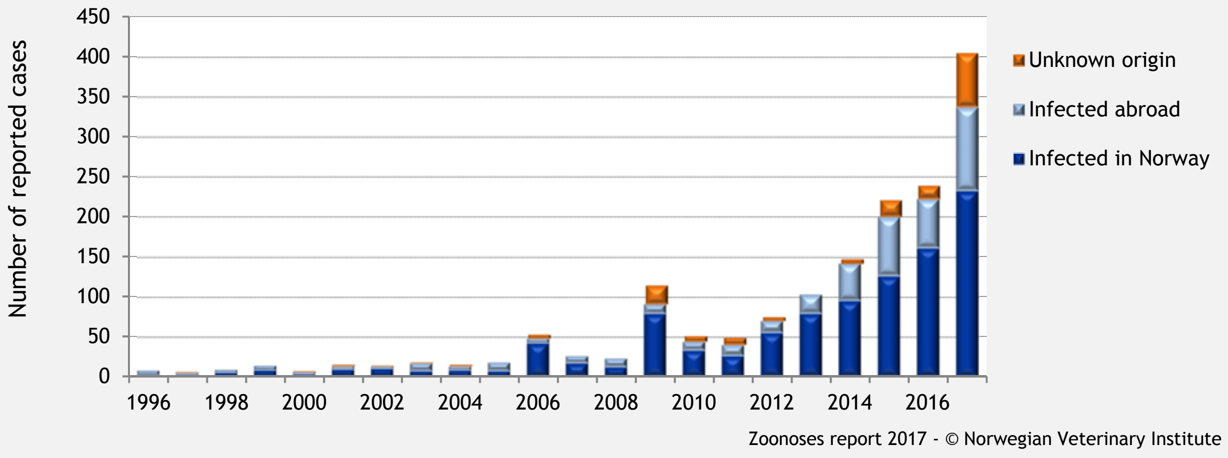

Figure 6. The number of reported cases of EHEC (enterohaemorrhagic *E. coli*) in humans. Data from MSIS.

During the investigation of four sporadic human EHEC infections in 2017, 16 samples were collected, primarily of animal origin, and sent for analysis at the NVI. All were negative for pathogenic *E. coli.*

Evaluation of the current situation

The occurrence of EHEC-infections in humans is increasing. More than half of the cases have been infected in Norway. However, the increase is likely associated with the introduction of culture independent diagnostics (PCR) as a routine in primary diagnostics and the fact that more patients than before are investigated for VTEC. Several major medical microbiological laboratories are investigating all submitted fecal specimens for several different pathogens, including VTEC. Previously, analysis for VTEC was only performed based on defined clinical or epidemiological indications.

Many different variants of VTEC may occur in animals. It is therefore important to follow up human disease cases with sampling of relevant food stuffs and animals in order to gain knowledge on possible sources of infection.

Tuberculosis

The disease and its transmission routes
Tuberculosis is caused by species in the *Mycobacterium tuberculosis*-complex. As a zoonosis, *Mycobacterium tuberculosis* subsp. *bovis* (*M. bovis*), which causes bovine tuberculosis, is the most important. This bacterium is mostly found in cattle. Humans are usually infected by drinking unpasteurised milk. Tuberculosis in humans is usually caused by *M. tuberculosis subsp. tuberculosis* (*M. tuberculosis*) which is transmitted between humans in microscopic airborne droplets. Humans may also transmit tuberculosis to animals. Tuberculosis can cause an array of symptoms depending on the affected organ system, but symptoms from the respiratory system are most common. Tuberculosis is a chronic infection in both animals and humans.

Surveillance and control
Tuberculosis in humans is notifiable in Norway. Persons in higher-risk groups are offered BCG vaccination. Tuberculosis caused by *M. bovis* and *M. tuberculosis* in animals is categorised as a group B disease, while detection of other mycobacterial species are group C.

Norway is free of bovine tuberculosis, and this is acknowledged in the EEA agreement where Norway is declared as officially free. Vaccination of animals against tuberculosis is forbidden in Norway. All animals, except poultry, are inspected for tuberculosis at commercial slaughter. Any suspicious findings will be examined further. Tuberculin testing is performed on all breeding bulls and breeding boars at semen collection facilities, imported animals, and in cases where tuberculosis is suspected or must be excluded. Animals with a positive tuberculin test will be euthanized and further examined. The NFSA have a surveillance program for *M. tuberculosis* in cattle and deer.

Results 2017

In total, 261 cases of tuberculosis in humans were reported in 2017. Three of these were caused by *M. bovis* and all three cases were born abroad.

All cattle, sheep, goats, swine and horses commercially slaughtered were examined *post mortem*. In addition, 82 breeding pigs and 175 breeding bulls were tuberculin tested. As part of diagnostic testing, samples from three pigs, one alpaca and one horse were tested for mycobacteria. All the samples were negative for tuberculosis/mycobacteria. For details see the Appendix.

Evaluation of the current situation

M. bovis infection in humans is rarely reported in Norway. Less than 1% of the reported human tuberculosis cases in the last 5-10 years were caused by *M. bovis,* and these patients were either infected abroad or many decades ago in Norway. Since the mid 1990s, the number of tuberculosis cases caused by *M. tuberculosis* has increased in Norway due to immigration, but for the last 4 years (since 2013) the number has decreased.

Bovine tuberculosis, *M. bovis* infection in cattle, was eradicated in Norway in 1963, but was detected in one area in the 1980s. This was most probably transmission from an infected human. Tuberculosis in animals caused by M. *tuberculosis* is rare in Norway and was last reported in a dog in 1989.

Import of live animals, especially camelids like llama and alpaca, to Norway is associated with a risk of introducing *M. bovis* to the Norwegian animal population. Foreign farm labourers could potentially also present a risk of introducing *M. bovis* and *M. tuberculosis* to Norwegian animals.

Brucellosis

The disease and its transmission routes
Brucellosis is caused by *Brucella* bacteria, of which *B. abortus* (cattle), *B. melitensis* (sheep), and *B. suis* (pigs) are the most important zoonotic species. *B. canis,* which causes disease in dogs, is less pathogenic for humans.

Brucellosis may cause sterility and abortion in animals. In humans, fever is the most common symptom. The bacteria are shed in milk, and humans are usually infected through consumption of unpasteurised milk and products made from unpasteurised milk.

Surveillance and control
Brucellosis in humans is notifiable and brucellosis in animals is listed as a notifiable group A-disease.

The surveillance program for *Brucella* includes blood tests from cattle that have aborted and annual blood testing of a sample of the sheep and goat population. In addition, breeding bulls and boars and imported animals are tested. Vaccination of animals against brucellosis is forbidden in Norway.
Norway is officially free of brucellosis according to the EEA agreement.

Results 2017

Three cases of brucellosis in humans were reported. All three were infected abroad.

In the surveillance programmes, 127 cattle from 48 herds, 9,017 sheep from 3,444 flocks, 1,712 goats from 61 herds were tested. *Brucella* spp. were not detected. In addition, 2,081 swine, 447 cattle, nine sheep, five camelides, and 16 dogs were tested for other reasons. All samples were negative. Fourteen dogs were tested for *B. canis* in association with two cases of clinical suspicion, and four dogs were tested for export. *B. canis* was not detected in any of the samples. For details see the Appendix.

Evaluation of the current situation

In humans, brucellosis is rare with only 0-4 reported cases per year, most of which have been infected abroad. Some have been infected domestically from laboratory work or from eating products purchased abroad that were made from unpasteurised milk.

Bovine brucellosis was eradicated from Norway in 1953 and brucellosis in sheep, goats and pigs has never been detected in Norway. *B. canis* has been detected in Sweden, but not in Norway.

Trichinellosis

The disease and its transmission routes
Trichinellosis is caused by small round worms, called *Trichinella.* Animals and humans may be infected through consumption of raw or poorly heat treated meat containing larvae. In the intestines, the larvae grow into adult worms and reproduce. Adult females set free larvae that move away from the intestines to muscle tissue. The most common symptom of trichinellosis is muscle pain, but the disease can also take more serious forms. Raw or poorly heat treated meat is the main source of infection.

Surveillance and control
Trichinellosis in humans is notifiable, and in animals it is a group B-disease. All carcasses of pigs and horses are checked for the presence of *Trichinella* at slaughter. Positive carcasses will be destroyed. Predator animals that are hunted/slaughtered and used for consumption (eg. wild boar or bear) should also be tested for *Trichinella.*

Results 2017

No cases of Trichinellosis were reported in humans.

All commercially slaughtered pigs and horses were tested for *Trichinella*, of which none were positive. For details see the Appendix.

Evaluation of the current situation

Trichinellosis in humans is very rare in Norway. The last case was reported in 1996, and the last case infected in Norway was reported in 1980.

Trichinella in domestic animals in Norway was last reported in two pig herds in 1994, and before that the last report was in 1981. *Trichinella* may be found in wild animals, and the parasite may transmit to domestic animals kept outside such as swine and horses.

Echinococcosis

The disease and its transmission routes
Echinococcus granulosus and *E. multilocularis* are small tape worms that can cause serious disease in humans. The parasites have their adult stage in the intestines of predators (eg. fox and dog), and parasite eggs are shed in faeces of these hosts (definitive host). Other animals (intermediate host) are infected through ingestion of the eggs. In the intermediate host the eggs hatch to larvae that migrate and encapsulate in cysts in various organs. The intermediate host must be eaten by a definitive host for the parasite to develop further into adult stages. It is the larval cysts in the intermediate host, e.g. in humans, that cause disease. Humans may be infected through eating fruit and berries contaminated with eggs or through direct contact with infective definitive hosts (e.g. dogs).

Surveillance and control
Echinococcosis in humans is notifiable in Norway and in animals it is a group B disease. Intermediate hosts for E*. granulosus* (eg. reindeer and cattle), are examined at slaughter. Since 2006, hunted red foxes have also been examined for *E. multilocularis*. This surveillance was intensified in 2011 when the parasite was detected in Sweden.

Dogs entering Norway must be treated for *Echinococcus* before arrival. Regular anti-parasitic treatment of dogs is also recommended in areas with reindeer.

Results 2017

Five cases of echinococcosis in humans were reported, and all five had contracted the infection abroad.

In the surveillance program for *E. multilocularis*, 495 foxes and 11 wolves were examined, and *E. multilocularis* was not detected in any of them. All commercially slaughtered cattle, sheep and pigs were examined for *Echinococcus post mortem*, and no cases were identified. For details see the Appendix.

Evaluation of the current situation

Echinococcosis has never been a public health problem in Norway. In humans between 0 and 5 cases are reported annually of which all cases have been infected abroad.

E. granulosus was common in reindeer in northern Norway until the 1950s. Systematic treatment of shepherd dogs and reduced feeding of these dogs with raw meat and offal was effective and the parasite is now very rare in reindeer. It was last detected in 1990 and 2003. In cattle, *E. granulosus* was last reported in 1987.

E. multilocularis has never been detected in main-land Norway. However, it was recently detected in Sweden, and surveillance of red foxes is now intensified in Norway in order to rapidly detect the parasite should it be introduced to Norway. Since 2002, 5,037 red foxes have been tested, and all were negative.

It is essential that dog owners follow regulations on antiparasitic therapy when entering Norway from abroad. Echinococcosis occurs in dogs in southern Europe, and the infection may be introduced to the Norwegian population of intermediate and definitive hosts via untreated, imported dogs or dogs returning with their owners after holidays abroad. *E. multilocularis* is endemic in Svalbard in sibling vole (*Microtus levis*) and the Arctic fox (*Vulpes lagopus*). Dogs and people in Svalbard are therefore at risk.

Toxoplasmosis

The disease and its transmission routes
Toxoplasma gondii is a single celled parasite that has its adult stage in the cat (definitive host). The parasite is shed in faeces and intermediate hosts (e.g. sheep, human, rodents) are infected through contaminated food or water or by direct contact with contagious cats. Humans can also be infected through consumption of inadequately heat treated meat. Healthy adults will usually not become sick from toxoplasmosis. However, if women contract the infection for the first time during pregnancy, it may result in abortion or harm the foetus.

Surveillance and control
Toxoplasmosis is not notifiable in humans or animals in Norway.

The NFSA provides dietary advice to persons in risk groups (www.matportalen.no). Every year some animals are tested for *T. gondii* due to disease, abortion or in association with import/export. Testing of cats for *T. gondii* is not considered necessary.

Results 2017

As part of the diagnostic work at the NVI, two sheep, three goats were tested serologically for *T. gondii,* and one sheep was positive.

Evaluation of the current situation

T. gondii is prevalent in Norway, but is less prevalent than in southern Europe. It has been estimated that 90% of Norwegian women are susceptible to infection, and that 2 in 1,000 pregnant women contract the infection for the first time during pregnancy. The parasite is estimated to transmit to the foetus in approximately 50% of these cases.

T. gondii is prevalent in several mammals in Norway, in particularly cats and sheep. In an investigation of lambs in the 1990s, 18% of the tested lambs had antibodies against *Toxoplasma,* and positive animals were found in 44% of the tested flocks. Similarly, in a study performed between 2002 and 2008, 17% of tested goats were antibody-positive, and positive animals were found in 75% of the tested herds. In another study, performed in the 1990s, 2.6% of pigs for slaughter were antibody positive.

Wild deer may be infected with *T. gondii.* In a serological study of 4,300 deer hunted between 1992 and 2000, 34% roe deer, 13% elk, 5% hart deer and 1% reindeer were antibody positive.

Rabies

The disease and its transmission routes
Rabies is caused by a lyssavirus, and the infection manifests itself as a neurological disease. The virus transmits though bites, or from exposure of open wounds to saliva from rabid animals. The incubation period is usually 1-3 months but may be longer. Untreated rabies is fatal. In Europe, classic rabies and bat rabies are caused by different virus. Bat rabies in Europe has a much lower zoonotic potential than classic rabies.

Surveillance and control
Rabies is notifiable both in humans and in animals (group A disease). A vaccine is available for people who are traveling to high risk areas for extended periods. The vaccine is also used in combination with anti-serum to treat people who may have been exposed to rabies.

Animals with rabies will be euthanized, and measures will be implemented to stop further spread. From the 1st January 2012, dogs and cats imported from EU and EEA countries are only required to be vaccinated against rabies. Previously, a blood test to prove sufficient antibody titres was also mandatory. For dogs and cats imported from non EU non EEA countries, both a rabies blood test and proof of antibody titre is required.

Results 2017

Rabies was not detected in humans in Norway in 2017.

Two dogs, two cats and one Svalbard reindeer were tested for rabies at the NVI. Rabies infection was not detected in any of them. The cats and dogs were imported and had developed neurological symptoms. For further information see the Appendix.

Evaluation of the current situation

In rare cases, bat rabies may transmit from bats to other warm-blooded animals, including humans. Therefore, care is advised when handling bats, and any bite from a bat should be consulted with a doctor. It is not considered necessary to start vaccinating animals in Norway due to the detection of bat rabies in 2015.

Classic rabies has never been detected in mainland Norway, but it has been detected in Arctic fox, reindeer and seals in Svalbard. The last detection was in 2011-2012 and before that 1999. It is important that persons living in or traveling to Svalbard are aware that rabies may occur among wild animals and take necessary precautions.

Dogs imported to Norway without vaccination may confer a risk of introducing rabies. In a study performed at the NVI in 2012, approximately 50% of dogs imported from Eastern Europe had most likely not been properly vaccinated. Illegal import of dogs to Norway poses a threat to human and animal health due to the risk of introducing rabies to the country.

Q-fever

The disease and its transmission routes
Q-fever is caused by the bacteria *Coxiella burnetii*, and is mainly associated with ruminants. However, humans and other animals may also become infected and sick. The bacteria are shed in urine, faeces, foetal fluids, placenta and foetal membranes, and can survive for extended periods in the environment. Transmission is airborne via aerosols. In animals, infection results in weak offspring, abortions, infections of the placenta and uterus. In humans *C. burnetii* may cause influenza-like symptoms and rarely more serious disease.

Surveillance and control
Q-fever in humans has been notifiable in Norway since 2012, and is a group C-disease in animals. Animals with clinical signs of Q-fever must not have contact with animals from other herds/farms and the NFSA may impose restrictions on animal holdings where infection is confirmed or suspected.

From 2012, samples collected in the surveillance programme for *Brucella abortus* in cattle have also been tested serologically for *C. burnetii*. The programme involves passive clinical surveillance, and blood samples from cattle with an abortion in the second half of the pregnancy are analysed.

Results 2017

Four cases of Q-fever in humans were reported. Three cases had contracted the infection abroad and one case had an unknown place of infection.

At the NVI, blood samples from a total of 145 cattle, 102 sheep, 19 alpaca and three buffalo were tested serologically for *C. burnetii*, and all samples were negative. Nineteen of the sheep were tested to rule out domestic zoonotic transmission to an infected person. All the samples were negative. For further information see the Appendix.

Evaluation of the current situation

Q-fever is not currently a problem for human or animal health in Norway. The infection became notifiable in humans in 2012, and since then 12 cases have been reported. Of these, eleven cases were infected abroad and one case had an unknown place of infection.

Q-fever has not been detected in Norwegian animals. Screening studies were performed in 2008 (460 bovine dairy herds and 55 bovine meat herds), in 2009 (349 goat herds and 45 bovine herds) and in 2010 (3289 bovine dairy herds). Since then, testing has been performed on imported animals and as part of diagnostic testing of sick animals.

BSE and vCJD

The disease and its transmission routes
Bovine spongiform encephalopathy (BSE, mad cow disease) in cattle and Creutzfeldt-Jacob disease (CJD) in humans are transmissible spongiform encephalopathies (TSE). These fatal diseases cause spongy degeneration of the brain and spinal cord. The infective agents are prions, protein structures without DNA. A form of CJD, variant CJD (vCJD) was first described as the cause of death in a person in the UK In 1995. The disease was suspected to be caused by consumption of beef containing the prion associated with classic BSE.

Other TSE-diseases that do not transmit between animals and humans have also been described, such as atypical BSE in cattle, scrapie in sheep, sporadic CJS in humans and chronic wasting disease (CWD) in deer.

Surveillance and control
Surveillance for BSE started in Norway in 1998, and includes testing of imported animals and their offspring, emergency slaughtered cattle, cattle with defined clinical signs at slaughter and a sample of routinely slaughtered cattle. All small ruminants with scrapie are tested to rule out BSE.

At slaughter, specified risk material (SRM) is removed from cattle and small ruminants.
It is forbidden to use protein from animal (including fish protein) in feed for ruminants. Norway banned the use of bone meal in ruminant feed in 1990.

Results 2017

Two cases of sporadic CJD were reported in humans.

In total, 6 812 cattle were tested, and all were negative for BSE.

Evaluation of the current situation

The situation with respect to classic BSE is favourable in Norway, largely due to restricted and controlled import of live animals and bone meal, as well as the surveillance program for BSE. In addition, strict regulations on heat treatment of and use of bone meal are in place.

Antimicrobial resistance

Infections with antimicrobial resistant bacteria can be difficult to treat. Resistant bacteria may be zoonotic and transmit through direct or indirect contact, including through food. One example of this is methicillin resistant *Staphylococcus aureus* (MRSA). The latter was previously mainly associated with humans, but is now also found in animals, particularly swine, and may transmit from animals to humans directly or indirectly.

Surveillance and control

Infection and carriage of MRSA in humans is notifiable in Norway. In addition, selected microbes from certain infections, and their resistance profiles, are reported annually to the NORM surveillance programme for antimicrobial resistance in human pathogens.

In 2000, Norway implemented a surveillance programme for antimicrobial resistance in pathogens from animals, feed and food (NORM-VET). In 2013, a separate surveillance program for MRSA in swine was established. Norway has chosen a strategy to eradicate MRSA from swine, and therefore detection of MRSA in any production animal is reported to the NFSA.

Results 2017

The prevalence of antibiotic resistant bacteria is still low in both humans and animals in Norway compared to other European countries. Details on detection of selected pathogens in humans and animals and their antimicrobial resistance profiles are presented in the annual NORM/NORM-VET report.

The surveillance programme in 2017 did not detect any pig herds with LA-MRSA CC398. However, MRSA CC7, CC130 and CC425 were detected in one multiplier herd and in two farrow-to-finish herds, respectively. MRSA was not detected in any of the genetic nucleus herds, nor in the central units of the sow pool herds. In total, 826 herds were included in the survey, of which 85 were genetic nucleus or multiplier herds, 12 herds were the central units of sow pool herds, and 729 were herds with more than 10 sows.

From 1,312 human clinical samples included in the NORM surveillance protocol, only 10 blood culture isolates tested positive for MRSA (0.8%). The majority of the MRSA cases were reported from wound infections. The prevalence of MRSA among non-invasive *S. aureus* isolates was 1.2%. Additionally 1,529 carriers of MRSA were notified to MSIS, which was a reduction of 8% from 2016. The results indicate a relatively stable rate of MRSA notifications with a slight decreasing number of infections and colonisation from 2016.

All *Salmonella* spp. isolates from animals and 82.5% of *C. jejuni* isolates from broiler flocks were susceptible to all antimicrobial agents tested. Resistance to the quinolones ciprofloxacin and nalidixic acid were the most frequently identified resistance determinants.

The frequency of multidrug resistance (MDR) in human clinical isolates of *Salmonella* spp. was 8.0%. Antimicrobial resistance was more prevalent among the *S.* Typhimurium-group (including *S. enterica* serovar 4,[5],12:i:-) than in other serovars. For infections acquired in Norway resistance to tetracycline had increased for this serovar from 2016. Among domestically acquired *C. jejuni* infections, 74.2% of the isolates were susceptible to all tested antibiotics. Resistance to quinolones, tetracycline and macrolides all decreased from 2016.

Evaluation of the current situation

The increasing occurrence of antimicrobial resistance in bacteria is a serious threat to human and animal health globally. Thanks to restricted use of antibiotics in animals and controlled use in humans, antimicrobial resistance is lower in Norway than in most other European countries. However, the situation is threatened by the high use of antibiotics globally, increased human travel, import of food and spread of antibiotic resistant pathogens in food production.

Resistant pathogens may spread through healthy carriers. MRSA was most likely first introduced to Norwegian swine production through foreign labourers carrying the bacteria, and subsequently spread further through movement of live animals. From swine, MRSA may transmit back to humans through direct or indirect contact. This form of transmission is difficult to control, and in this respect MRSA is an example of a modern challenge in infection control in Norwegian food production. In cases where MRSA is found in dairy herds, it is advised not to drink unpasteurized milk from the farm.

Foodborne outbreaks

An outbreak is either defined as more cases than expected of a specific disease within a defined geographical area and time period, or as two or more cases of a disease with a common source of infection. In 2005, the NIPH and the NFSA introduced a web-based system for reporting outbreaks, Vesuv. The system is used by specialist- and municipal health services and the NFSA to notify outbreaks. The following types of outbreaks are notifiable through Vesuv: outbreaks of conditions that are notifiable in MSIS; outbreaks associated with food or water; outbreaks caused by particularly serious infections; very large outbreaks; and outbreaks in healthcare institutions. The four last categories also include outbreaks of conditions that are not notifiable in MSIS.

The purpose of investigating foodborne outbreaks is to stop the outbreak, implement control measures and prevent future outbreaks. The District Medical Officer is responsible for coordinating investigation and response to outbreaks in his/her municipality. Proper outbreak investigation requires cooperation between local and central health authorities, the NFSA and other relevant authorities.

Results 2017

In 2017, the NIPH received 36 notifications through Vesuv of possible or confirmed foodborne outbreaks outside health institutions. In total, 496 persons were reported to have become sick in these outbreaks. The number of affected persons in each of the outbreaks varied between 2 and 61(median 8). The most common infective agent was Norovirus (7 outbreaks) followed by *Campylobacter* and enterohaemorrhagic *E. coli* (EHEC) (3 outbreaks each). In 15 of the outbreaks, the causative agent was not identified (Figure 7).

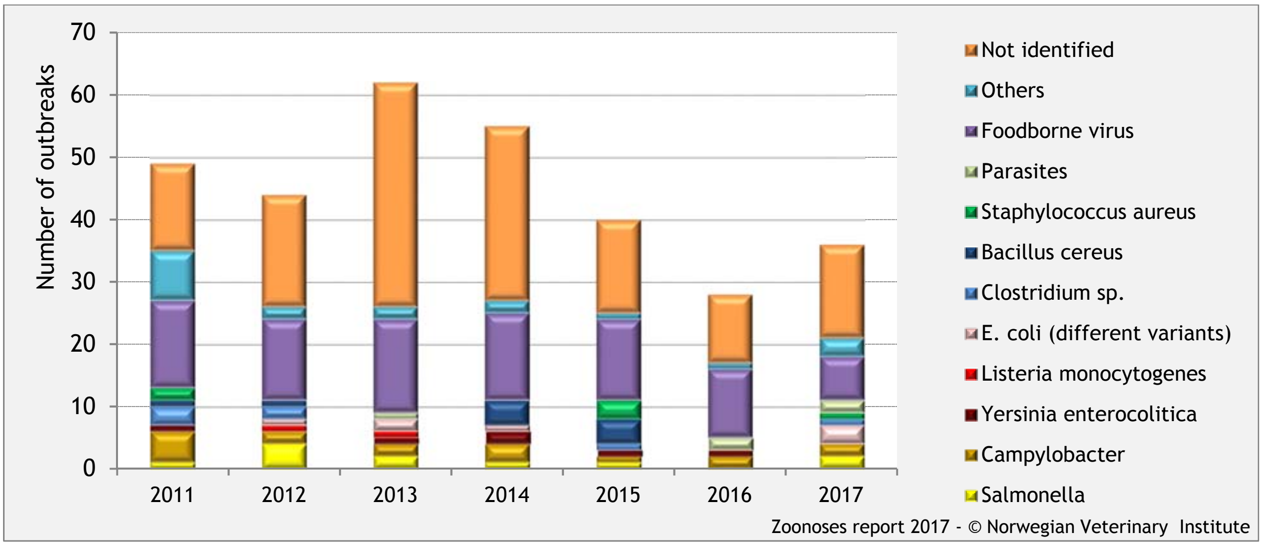

Figure.7. The number of reported outbreaks where an agent was verified or strongly suspected.

Appendix Tables 2017

Table 1. Human population of Norway per 1st January 2017 (from statistics Norway).

Age group	Female	Male	Total
0 - 9	303 138	304 698	607 836
10 - 19	309 871	327 532	637 403
20 – 29	347 413	366 532	713 945
30 – 39	344 395	363 989	708 384
40 – 49	357 670	377 398	735 068
50 – 59	332 246	348 479	680 725
60 – 69	285 657	286 665	572 322
70 – 79	209 158	192 372	401 530
80 – 89	105 795	72 265	178 060
90 -	31 905	12 787	44 692
Total	**2 627 248**	**2 652 717**	**5 279 965**

Table 2. Animal population of Norway in 2017.

Animal species - category	Number*		
	Herds /flocks	Animals	Slaughtered animals
Cattle - total	13 800[a]	884 000[a]	298 000[b]
Dairy production	8 150[a]	219 000[a]	
Meat production	5 400[a]	93 500[a]	
Other stock	13 800[a]	750 000[a]	
Sheep - total	14 400[a]	2 380 000[a]	1 376 000[b]
Sheep >1 year	14 400[a]	950 000[a]	
Goats - total	1 030[a]	43 900[a]	28 600[b]
Dairy goats	300[a]	36 000[a]	
Swine - total	2 130[a]	834 000[a]	1 648 000[b]
Breeding pigs	1 130[a]	47 100[a]	
Slaughter pigs	2 000[a]	478 000[a]	
Chickens (*Gallus gallus*)			
Grandparent stock – egg producers	3 (4)[c1]		
Parent stock – egg producers	7 (11)[c1]		
Parent stock – broiler	97 (136)[c1]		
Laying hens	550 (814)[c]		
Broilers	596 (4 361)[c]		65 518 000[d]
Turkey, goose and duck			
Parent stock	9 (19)[c1]		
Meat production	72 (289)[c]		
Horse			210[b]
Reared deer	91[e]	7 900[e]	

* Numbers are rounded: For numbers between 100 and 1000 nearest 10; between 1 000 – 10 000 nearest 100, between 10 000 and 100 000 nearest 1 000 and for numbers >100 000 nearest 10 000.
[a] Figures from the registry of production subsidy per 01.05.2017 (new registration system from 2017), Norwegian Agricultural agency.
[b] Figures from Statistics Norway (Public meat inspection. Carcasses approved for human consumption. Number of animals).
[c] Figures from the surveillance programme for Salmonella.
[d] Figures from the Norwegian Agriculture Agency (based on delivery for slaughter).
[e] Figures from the Norwegian Agriculture Agency – per 01.05.2017.
[1] Production flocks only.

Table 3. The eleven most common *Salmonella* serovars found in humans in Norway in 2017.

Serovar	Place of infection			Total
	Norway	Abroad	Unknown	
S. Enteritidis	56	198	28	282
S. Typhimurium	54	50	15	119
S. Typhimurium monophasic variant	34	59	10	103
S. Stanley	9	31	3	43
S. Newport	6	26	3	35
S. Java	2	29	2	33
S. Agona	7	15	2	24
S. Infantis.	3	11	0	14
S. Kentucky	0	11	3	14
S. Saintpaul	5	7	1	13
S. Chester	4	5	1	10
S. Virchow	2	6	2	10
Others	71	174	47	292
Total	253	622	117	992

Table 4. Human cases of campylobacteriosis distributed by county. From 2017 both cases verified by PCR and/or culturing are notifiable to MSIS and included in the table. PCR positive cases are also included for 2015 and 2016.

County	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Østfold	65	52	34	63	52	66	71	44	73	61
Akershus	101	88	92	91	108	120	157	123	142	122
Oslo	88	130	109	113	136	103	154	120	109	106
Hedmark	43	55	39	39	28	50	52	42	58	55
Oppland	66	49	33	69	68	60	72	57	66	93
Buskerud	48	66	42	48	63	60	65	63	68	79
Vestfold	72	51	57	42	51	42	79	48	186	100
Telemark	33	41	25	37	39	34	50	35	55	45
Aust-Agder	20	13	9	18	20	14	33	14	23	26
Vest-Agder	20	22	27	45	34	41	54	33	40	48
Rogaland	158	163	149	177	124	169	130	124	166	196
Hordaland	128	179	131	136	128	115	156	122	148	181
Sogn & Fjordane	20	44	25	45	24	27	27	26	20	30
Møre & Romsdal	41	65	56	54	36	47	73	34	35	68
Sør-Trøndelag	108	122	92	85	115	95	117	94	98	115
Nord-Trøndelag	36	41	40	28	31	29	34	27	42	33
Nordland	34	42	32	47	31	46	60	47	42	44
Troms	34	34	15	25	20	23	55	43	57	52
Finnmark	11	23	12	13	6	6	19	12	21	19
Total	**1 126**	**1 280**	**1 019**	**1 175**	**1 114**	**1 147**	**1 458**	**1 108**	**1 449**	**1 473**

Table 5. Foodborne outbreaks.

Agent	2011	2012	2013	2014	2015	2016	2017
Salmonella sp.	1	4	2	1	1		2
Campylobacter sp.	5	2	2	3	1	2	3
Yersinia sp.	1		1	2	1	1	1
Listeria monocytogenes		1	1				
Escherichia coli (VTEC)		1	2	1		1	3
Clostridium sp.	3	2			1		1
Bacillus cereus	1	1		4	4		
Staphylococcus enterotoxin	2				3		1
Parasites			1			2	2
Virus	14	13	15	14	13	11	7
Other	8	2	2	2	1	1	1
Unknown	14	18	36	28	15	11	15
Total	**49**	**44**	**62**	**55**	**40**	**29**	**36**

Table 6. *Salmonella* in feed and feedstuff 2017.

Category	Number tested*	Number positive
Feedstuff		
Cereal grain	144	0
Corn	435	0
Rape	832	0
Soya	2 806	0
Sunflower	6	0
Legume seeds etc.	24	2
Tubers, roots etc.	61	0
Other plant based feedstuffs	75 (10)	6
Meat based feedstuff	410 (10)	8
Marine based feedstuff	95	0
Feed		
Domestic animals (cattle, swine, poultry)	50 (73)	0
Fish	3 232 (72)	4
Fur animals	147	0
Environmental samples in factories producing feed and feedstuff	17 433	141

* Total numbers are presented, in brackets the number of samples collected by Authorities.

Table 7. *Salmonella* in animals 2017.

Category	Number* tested	Number* positive	Comment
Chicken – surveillance - breeding flocks	151	0	
Chicken – surveillance – layer flocks	814	1	*S. diarizonae*
Chickens – surveillance – broiler flocks	4 361	0	
Chicken flocks – other samples	20	0	
Turkey, ducks, geese – surveillance - breeding flocks	19	0	
Turkey, ducks, geese – surveillance - meat flocks	289	0	
Turkey, ducks, geese – other samples	6	0	
Cattle – surveillance – animals	3 149	1	*S.* Typhimurium
Cattle – diagnostics - herds	105	0	
Sheep – diagnostics - herds	25	6	*S. diarizonae*
Goats- diagnostics - herds	9	0	
Swine – surveillance – slaughter pigs - animals	1 744	1	*S.* Typhimurium
Swine – surveillance – sows - animals	1 482	2	*S.* Typhimurium, *S.* Umbilo
Swine – surveillance – breeding herds	82	0	
Swine – diagnostics - herds	24	1	*S.* Typhimurium
Horse – diagnostics - herds	15	0	
Dogs - diagnostics	185	2	S. Stanley, S. Saintpaul
Cat - diagnostics	34	0	
Rabbit	4	0	
Mink - herds	1	0	
Alpaca – animals, import	19	0	
Alpaca- herds - diagnostics	3	0	
Buffalo – animals, import	7	0	
Animals/birds/zoo birds/zoos	21	0	
Various wild animals	23	3	*S.* Typhimurium, *S.* Enteritidis
Wild birds	17	3	*S.* Typhimurium

* Units for numbers are given in the first column.

Table 8. *Salmonella* in food 2017.

Category	Number sampled	Number positive
Cattle – swab of carcass - surveillance	3 121	0
Swine - swab of carcass - surveillance	3 198	0
Meat scrapings (cattle, swine. sheep) - surveillance	3 170	0
Fish – Norwegian - NIFES	60	0
Fish – Imported - NIFES	116	0
Shellfish- Norwegian - NIFES	35	0

Table 9. Selected zoonoses in animals in 2017. *Salmonella* is presented in separate tables.

Infection/agent	Category	Number tested	Number positive	Comment
Campylobacteriosis	Broiler chicken flocks - surveillance	1 919	136	May - October
	Cattle - diagnostics	134	37	C. jejuni
	Sheep - diagnostics	15	4	C. jejuni
	Goat - diagnostics	5	0	
	Swine - diagnostics	12	2	C. coli
	Horse - diagnostics	1	0	
	Dog - diagnostics	173	59	C. upsaliensis (44), C. sp.(7), C. jejuni (8)
	Cat - diagnostics	31	1	C. jejuni
Tuberculosis	Cattle – tuberculin testing	175	0	
	Swine – tuberculin testing	82	0	
	Swine - diagnostics	3	2	M. avium subsp. hominissuis
	Alpaca – surveillance	1	0	
	Horse - diagnostic	1	0	
Brucellosis	Cattle - surveillance	127	0	
	Cattle – breeding animals, export	447	0	
	Sheep – surveillance	9 017	0	
	Sheep – export, trade	9	0	
	Goat - surveillance	1 712	0	
	Swine – breeding stock	2 081	0	
	Dog	18	0	Suspicion of disease (14), export (4)
	Alpaca - import	19	0	
	Lama - import	2	0	
Echinococcosis	Fox - surveillance	495	0	
	Wolf - surveillance	11	0	
	Cattle, small ruminants, swine, horse	All slaughtered*	0	
Toxoplasmosis	Sheep - diagnostics	2	1	
	Goat - diagnostics	3	0	
Rabies	Dog – diagnostics	2	0	
	Cat - diagnostic	2	0	
	Svalbard reindeer - diagnostic	1	0	
Trichinellosis	Pig and horse	All slaughtered*		
Q-fever	Cattle - import	1	0	
	Cattle - surveillance	144	0	
	Sheep - import	12	0	
	Sheep - surveillance	72	0	
	Sheep - diagnostic	18	0	
	Alpaca – import	19	0	
	Buffalo - import	7	0	
BSE	Cattle	6 812	0	

* Commercial slaughter (for animal population see Table 2.).

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The Norwegian Veterinary Institute is a national research institute that operates in the fields of animal and fish health, food safety and feed hygiene; its primary task is to provide the authorities with independently generated knowledge.

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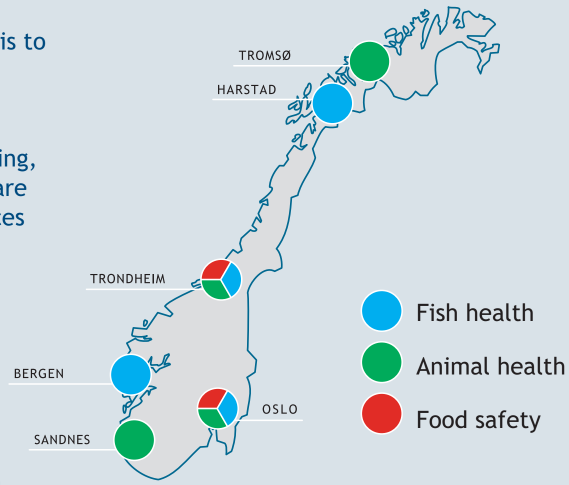

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Oslo
postmottak@vetinst.no

Trondheim
vit@vetinst.no

Sandnes
vis@vetinst.no

Bergen
post.vib@vetinst.no

Harstad
vih@vetinst.no

Tromsø
vitr@vetinst.no

www.vetinst.no

Veterinærinstituttet
Norwegian Veterinary Institute