

Report on Zoonoses and Zoonotic Agents in Austria 2007



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2007



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We acknowledge the Kunsthistorisches Museum Vienna with special thanks for their interest and cooperation to provide us with pictures of paintings for this publication.



Foreword

The special significance that animals represent to humans has been expressed in art throughout the ages. The many roles of animals, either as farm animals that provide us with a source of food or clothing and an obedient workforce or as domestic animals used in hunting, as a personal companion or playmate or for entertainment and exhibitions, have been depicted in various paintings and scenes which express this relationship.

However, animals have also been identified as carriers for certain infectious diseases, and more importantly, as a new route of transmission: from animals to humans. These infectious diseases are referred to as zoonoses. Over the centuries, these pathogens caused widespread epidemics which could not be treated or contained and resulted in the deaths of millions of people. The bacterium which caused the Great Plague, *Yersinia pestis*, was transferred from fleas of rats to humans. However, through medical and veterinary advancements, as well as improvements in sanitation and hygiene, these zoonoses have largely died out within Europe. Today, the emphasis of surveillance has been placed on the transmission of zoonoses from animals to food intended for human consumption.

Therefore, it is of the utmost importance that consumers have access to information in regard to the prevalence of the most common pathogens, which cause food borne illness. The purpose of this brochure is to provide this information.

This year, the brochure has been produced together with the Kunsthistorisches Museum Vienna. The Kunsthistorisches Museum is one of the most architecturally significant museum-constructions from the 19th Century. Since its opening in 1891, the collections of the Kunsthistorisches Museum have become among the most important and spectacular in the world.

Paintings from the museum's vast collection have been provided to illustrate this year's brochure. The paintings have been coordinated to depict those animals or foods which are particularly associated with each of the zoonoses discussed in the brochure. This also serves to provide an additional insight to the social and cultural dimensions associated with zoonoses.

I am honoured that the Kunsthistorisches Museum Vienna could participate, together with the Austrian Agency for Health and Food Safety (AGES) and the Ministry for Health, Family and Youth, to help reduce the spread of food borne infectious disease.

Hofrat Prof. Dr. Wilfried Seipel, General Director of the Kunsthistorisches Museum Vienna



Introduction

The World Health Organization (WHO) defines zoonoses as „those diseases and infections which are naturally transmitted between vertebrate animals and man.“ Transmission may be either by direct contact with infected animals, consuming contaminated foods, particularly those of animal origin, or indirect contact, such as environmental contamination. Infants, the elderly, pregnant women and immunocompromised persons are known to be the most vulnerable to acquiring zoonoses.

Austria has had a long history of controlling zoonotic agents in livestock. Due to the successful implementation of surveillance programs, Austria's farm animals have been officially declared free of brucellosis and tuberculosis since 1999. Today, human infections caused by the gastrointestinal pathogens *Salmonella* and *Campylobacter* are the most prevalent zoonoses, most of them contracted by consuming contaminated food. In animals, these pathogens may appear asymptomatic, making them difficult to detect. As a result, unless food is prepared with great care, humans may contract an infection when consuming products derived from or having come in contact with infected animals or their excrements.

In recent years, new pathogens emerged and outbreaks of emerging zoonoses, such as Severe Acute Respiratory Syndrome (SARS, spreading from Asia) and West Nile Virus (in the USA) occurred. Also, bacteria that have long been known may have acquired new pathogenic features and cause severe disease, such as verotoxin-producing *Escherichia coli* (VTEC) strains. This pathogenic variant, of the otherwise harmless intestinal inhabitant *E. coli*, has repeatedly caused disorders dominated by bloody diarrhoea as well as the life-threatening haemolytic uraemic syndrome (HUS). Multiresistant pathogens, organisms resistant to antibiotics from more than 2 different classes which would typically be implemented in treatment, pose an additional risk to humans. Examples of such multiresistant organisms include *Salmonella* Typhimurium DT104, extended spectrum β -lactamase (ESBL)-producing strains and methicillin-resistant *Staphylococcus aureus* (MRSA).

The Austrian Agency for Health and Food Safety (AGES) supports the Federal Ministry of Health, Family and Youth (BMGF) and the Federal Ministry for Agriculture, Forestry, Environment and Water Management (BMLFUW) in their endeavours to monitor and control zoonoses.

Surveillance of zoonoses in Austria

Zoonoses surveillance systems are set up to collect information on the occurrence of zoonotic agents throughout all stages of the food production chain. Based on this information, measures to improve public health and to protect humans against zoonoses can be initiated.

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The annual Zoonoses Reports, forwarded to the EU Commission by each member state, disclose the results of each country's surveillance systems. The compiled Community Report can be downloaded from the website of the European Food Safety Authority (EFSA): http://www.efsa.europa.eu/EFSA/DocumentSet/Zoon_report_2006_en,0.pdf

Monitoring programs

Monitoring is the continuous collection of health or environmental data to observe changes in the prevalence (percentage of diseased or infected individuals in a population within a given period of time) of infection or disease within a population. Monitoring systems routinely observe, collect and evaluate information based on random sampling procedures. The actual data collected are then compared to the predetermined goals set in place by the EU Commission .

In 2004, the Department for Animal Health, Trade with Living Animals and Veterinary Legislation of the BMGFJ implemented various additional annual monitoring programs, which targets specific

pathogens in cattle, sheep, goats, pigs and poultry while also testing for antibiotic resistances. The random sampling plans were developed based on epidemiological principles.

Surveillance programs

The aim of zoonoses surveillance is to routinely collect, analyse and publish reports for all data that are relevant for the prevention and control of zoonoses along the food chain. According to the WHO, such programs are currently the most important tools to control what are called 'foodborne infectious diseases' and to combat notifiable epizootics (e.g. BSE, tuberculosis and rabies).

Austria officially declared free of certain epizootics

In Austria, the Veterinary Sections of the Consumer Health and Health Prevention Division of the BMGFJ define, based on EU legislation, which diseases are to be classified as notifiable epizootics in Austria. Awareness of the epizootic situation both in Europe and throughout the world enables health authorities to take prompt action, such as restricting trade with potentially infected animals, to prevent further spread of the pathogen.

At the European level, the trade with livestock and livestock products is strictly regulated. By implement-

ing programs for the control and surveillance of epizootics, EU member states can be granted a status referred to as “officially free” of certain epizootics (e.g. bovine tuberculosis or bovine brucellosis). To maintain this status, the veterinary agencies of the respective countries must carry out annual control and surveillance programs to fulfil EU requirements. Achieving the certified absence of epizootics keeps Austria’s livestock healthy and assures trading benefits for the Austrian agriculture.

Cooperation between specialities

Identifying emerging or re-emerging infectious diseases is a challenging task. It requires the intensive cooperation between experts of varied specialities, such as human and veterinary medicine, food hygiene, microbiology, and epidemiology. Information exchange among international experts is important for monitoring and to provide access to the most up-to-date techniques and methods.

National Reference Centres and Laboratories

During the course of the establishment of the European network for epidemiological surveillance of infectious diseases, Austria created

National Reference Centres in the field of human medicine. Each centre is responsible for a specific pathogen.

In the area of veterinary medicine and food analysis, National Reference Laboratories were set up based on the Zoonosis Act and the Food Safety and Consumer Protection Act (LMSVG).

Data collection

- In Austria, physicians and veterinarians must report all notifiable infectious diseases to the appropriate authorities. Reported cases are collected nationwide and published monthly by the Federal Ministry of Health, Family and Youth in journals specifically dedicated to either human (“BMGFJ Newsletter”) or animal health (“Amtliche Veterinärnachrichten”). Although the preliminary case numbers are available all year, they must be validated before the final report is published.
- Unless otherwise noted, the case numbers presented in this report refer to data published in the preliminary annual report.
- The responsible reference centres publish the numbers of microbiologically confirmed cases; these figures may differ from the case numbers notified to the Federal Ministry.

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1. Salmonellosis

Salmonellosis is an infectious disease caused by *Salmonella* species; motile, rod-shaped bacteria which can affect both animals and humans. In Europe, most human salmonellosis cases are caused by the serotypes *S. Enteritidis* and *S. Typhimurium*.

1.1 Occurrence

Salmonellosis occurs worldwide, and it has diverse modes of transmission. Farm animals can become infected by eating contaminated feedingstuffs. In poultry, *Salmonella* infections often do not manifest with clinical symptoms. It is possible that entire laying hen flocks may become permanent asymptomatic carriers capable of transmission. Transmission of the pathogen from infected laying hens prior to egg deposition may cause some eggs to be contaminated, which, unless thoroughly cooked, can pose a threat to human health. In environments of high humidity and temperature, the pathogen can migrate through thin or defective faeces-covered egg shells. *Salmonella* generally grows at temperatures between 10–47 °C and are not killed by deep-freezing. A sure way of eliminating the pathogen is by heat treatment at temperatures above 70 °C for at least 15 seconds.

1.2 Reservoir

Domestic and farm animals (particularly poultry), reptiles and wild animals (birds).

1.3 Mode of transmission

The transmission of *Salmonella* occurs mainly through consumption of raw food of animal origin (eggs, poultry, meat and milk). Homemade products containing raw eggs, such as tiramisu, mayonnaise, creams and ice cream, can also be contaminated with *Salmonella*.

Raw or insufficiently cooked meats (e.g. poultry, minced meat or raw sausage) present a risk for cross-contamination if, during the food manufacturing process, they are mixed with other products that are not going to be cooked prior to consumption (e.g. salads). Cross-contamination can also occur through inadequately cleaned kitchen equipment, such as chopping boards, knives and sponges, or in situations where hand washing was neglected. Special attention should be paid to kitchen hygiene and refrigeration of high risk foods. Direct transmission of the pathogens from person to person (faecal-oral) is also possible although it requires a high dose of inoculum for infection (minimum 1,000 micro-organisms).



1.4 Incubation period

6–72 hours, usually 12–36 hours.

1.5 Symptoms

Symptoms include nausea, diarrhoea, fever, vomiting, cardiovascular problems and abdominal cramps. Normally, the symptoms last only for a few hours or days. Although it depends on the number of ingested bacteria, many infections take a mild and asymptomatic course. In the elderly, dehydration and the resulting cardiovascular burden can lead to a life-threatening situation.

1.6 Diagnosis

Detection of the bacteria is done by culturing the causative organism from stool (faeces), blood or pus. A test for specific antibodies in blood is of no relevance.

1.7 Therapy

In the absence of risk factors, patients with uncomplicated gastroenteritis caused by *Salmonella* infection should not be treated with antibiotics because antibiotic treatment can prolong the period of bacterial shedding. Typically, supportive therapy with fluid replacement is sufficient.

1.8 Preventive measures

Foods, especially meat, poultry, eggs and fresh pasta, should be well-cooked and should not be stored at room temperature longer than necessary. After handling raw poultry, it is essential to wash hands before doing other kitchen work. Liquid from defrosting meat should be poured into the sink and rinsed off with hot water immediately. All cooking areas and equipment which were in contact with raw meat or eggs must be cleaned with detergents and hot water. Fresh prepared meals which are not eaten at once should be left out to cool down, but should be stored in the refrigerator immediately after the item has reached room temperature.

People who are infected with *Salmonella* spp. are not allowed to return to work in any food-processing or food-serving establishment for the entire duration of their illness.

1.9 Serotyping and phage typing

Typing of all *Salmonella* isolates takes place in the AGES National Reference Centre for Salmonella (NRZS) in Graz. Serotyping is done according to the Kauffmann-White scheme. Bacteriophages are used to further group *S. Enteritidis* isolates into phage types (PT) and *S. Typhimurium* into definitive types (DT).

Currently, more than 2,500 *Salmonella* serotypes are known. In 2007, 76.8 % of all serotypes isolated from humans in Austria were *S. Enteritidis*, and 8.7 % were *S. Typhimurium*. The main PTs of *S. Enteritidis* in humans were PT4, PT8 and PT21.

Table 1 The 10 most frequent *Salmonella* serotypes in humans in Austria in 2007

	Number of isolates	Percentage
<i>S. Enteritidis</i>	3,110	76.8
<i>S. Typhimurium</i>	354	8.7
<i>S. Indiana</i>	53	1.3
<i>S. Virchow</i>	39	1.0
<i>S. Infantis</i>	36	0.9
<i>S. Hadar</i>	31	0.8
<i>S. Braenderup</i>	27	0.7
<i>S. Newport</i>	23	0.6
Monophasic <i>Salmonella</i> Group B (1,4,5,12:i:-)	22	0.5
<i>S. Thompson</i>	18	0.4
Total	4,050	100



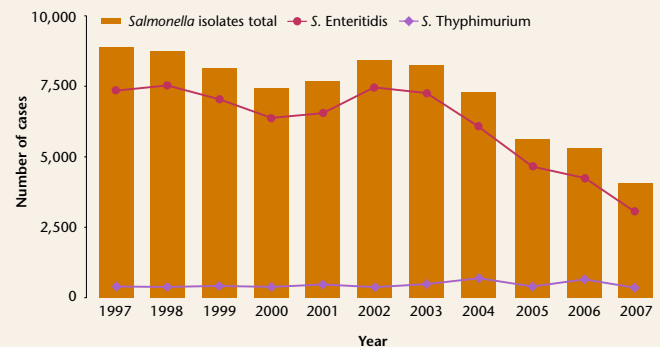


1.10 Salmonellosis in Austria in 2007

Humans

In 2007, 4,050 human *Salmonella* isolates were typed by the National Reference Centre. The incidence of 49 cases/100,000 population was 25 % lower than in 2006. The number of *Salmonella* isolates in the previous years has decreased by 52 % since 2002 which had 8,405 isolates. The decrease in the number of *S. Enteritidis* isolates is primarily responsible for the reduction in the number of *Salmonella* cases in 2007 (2006: 4,238; 2007: 3,110 human isolates; a reduction of 26.6 %). However, thus far, there is no recognizable trend in the reduction of *S. Typhimurium* (2003: 476; 2004: 697; 2005: 385; 2006: 627; 2007: 354). In 2007, salmonellosis was the second most common cause of food borne illness in Austria with 3,587 reported cases. The most common cause of food borne illness remains campylobacteriosis with 6,077 notified cases.

Figure 1 Number of microbiologically confirmed salmonellosis cases in Austria between 1997 and 2007



Comparison between Austria and the EU in 2006

The Austrian incidence of notified salmonellosis cases of 57.9/100,000 population is higher than the EU average¹ of 34.6/100,000 population. However, the EU average incidence for salmonellosis is lower than the EU average incidence of campylobacteriosis (51.6/100,000 population), making *Campylobacter* spp. the most frequently identified causative pathogens of bacterial gastroenteritis in Europe.

¹ The Community Summary Report 2006, *The EFSA Journal* (2007), 130. Data relating to EU-25

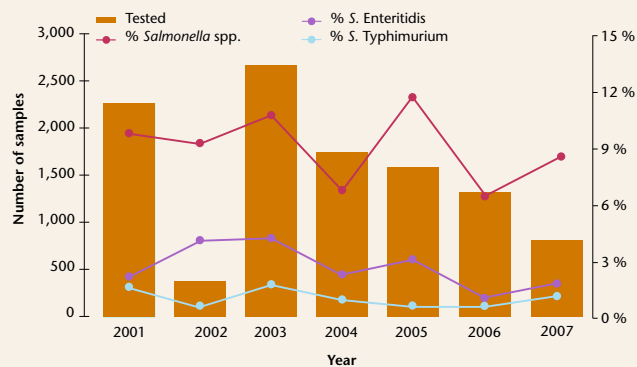
Food and food products

The revision and sampling plans of the Federal Ministry of Health, Family and Youth specify the number of food enterprises (restaurants, dairies, retail outlets etc.) and foodstuffs in each province that must be tested in a given year. During these inspections, food processing procedures are assessed and samples are taken.

In 2007, the following foodstuffs tested positive for *Salmonella* spp.:

8.3 % of raw chicken meat samples (4/48);
 4.8 % of raw turkey meat samples (4/84);
 8.9 % samples from raw unspecified poultry (54/604). In 2007, there were no positive samples in cooked poultry or ready-to-eat products (0/45). *Salmonella* was found in 1.7 % of raw beef samples (2/116) and 1.3 % of raw pork samples (9/717). Overall, there was no *Salmonella* found in 2,477 samples of milk, milk products and cheeses that were tested. Of the two table egg samples (2/323) found positive for *Salmonella*, both were *S. Enteritidis*.

Figure 2 Number of samples tested according to the revision and sampling plan for poultry (products) and detection (%) of *Salmonella* spp., *S. Enteritidis* and *S. Typhimurium* in Austria between 2001 and 2007. (In 2007, *S. Infantis* was the most common serotype identified in 1.9 % of the cases)





Animals

In order to measure *Salmonella* prevalence in turkey flocks and slaughtered fattening pigs across Europe, each group was assigned a one year baseline study with a randomised sampling plan. Samples were taken in all member states. In Austria, 202 turkey flocks and 617 fattening pigs were tested. The survey revealed that the prevalence of *Salmonella* spp. in Austrian turkey flocks was only slightly lower than the average

prevalence in the European Union while the prevalence of *Salmonella* spp. in fattening pigs was significantly lower than the average prevalence in the EU. The proportion of positive samples of the two most relevant *Salmonella* serotypes among the animals was very low. A comparison of the prevalence in Austria and the EU is shown in Figures 3a and 3b.

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Figure 3a Prevalence of *Salmonella* spp., *S. Enteritidis* and/or *S. Typhimurium* in turkey flocks in the EU and in Austria in 2007

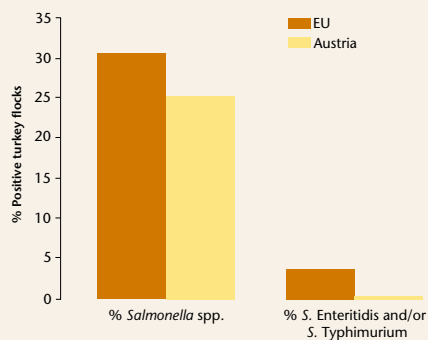
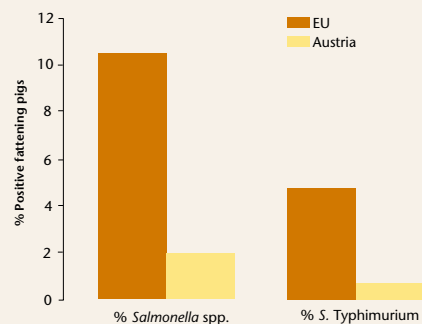


Figure 3b Prevalence of *Salmonella* spp. and *S. Typhimurium* in fattening pigs in the EU and in Austria in 2007





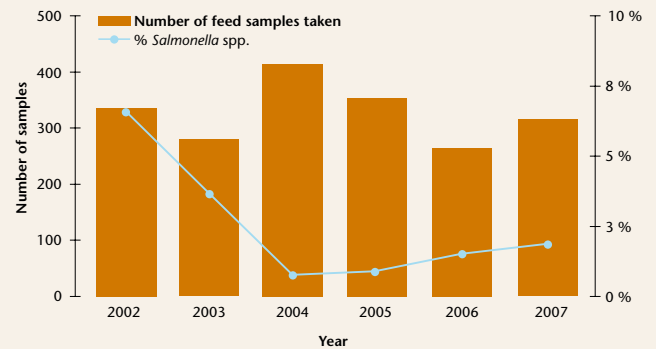
Feeding stuff

In Austria, all feeding stuffs are subject to continuous monitoring. The samples are collected from farms, slaughterhouses, feed producers and retailers. Both prefabricated feeding stuff mixtures and single ingredients are officially tested.

In 2007, 6 of the 313 (1.9 %) feed samples tested were found positive for *Salmonella* spp.

Figure 4 shows the percentage of samples positive for *Salmonella* spp. from the past few years.

Figure 4 Number of feed samples taken in Austria between 2002 and 2007 and percentage of *Salmonella*-positive samples







2. Campylobacteriosis

Campylobacteriosis is an infectious disease caused by *Campylobacter* species. These bacteria in the shape of small curved rods are sensitive to low pH environments and are destroyed by pasteurisation. The most common species are *C. jejuni* and *C. coli*.

2.1 Occurrence

Campylobacteriosis occurs worldwide and mainly during warm seasons. Besides *Salmonella*, *Campylobacter* is the most important causative agent for bacterial enteric disease in humans. In 2007, *Campylobacter* was, for the second time, the most frequently notified foodborne infectious disease in Austria. This trend is likely to continue in coming years.

2.2 Reservoir

The carriage rate of *Campylobacter* spp. is high in poultry, pigs, cattle, birds and pets, including dogs and cats. In animals, these pathogens are natural intestinal inhabitants rarely causing enteric disease.

2.3 Mode of transmission

Campylobacteriosis in humans is generally a food-borne infection. Inadequately cooked poultry, minced meat and raw milk are considered to be the main sources of foodborne infection. Special attention should be paid to food safety in the food preparation process to avoid cross-contamination between raw meat and other foods. Direct transmission from person to person (faecal-oral) has rarely been observed.

2.4 Incubation period

2–5 days, depending on the amount of ingested bacteria.

2.5 Symptoms

Abdominal cramps, watery to blood-stained diarrhoea, headache and fever can occur for 1–7 days. The Guillain-Barré syndrome, a disease of the peripheral nervous system, is a rare complication of campylobacteriosis.

2.6 Diagnosis

Campylobacteriosis is diagnosed by isolation of *Campylobacter* spp. from stool specimens.



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2.7 Therapy

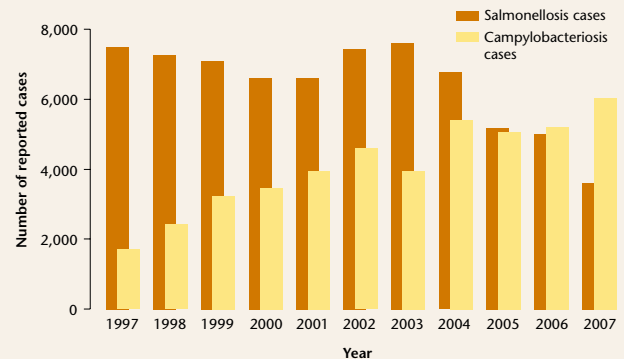
The disease is usually self-limiting and therapy which addresses rehydration and electrolyte balance is sufficient. Antibiotics are occasionally used to treat infants, patients with fever and those who are immuno-suppressed.

2.8 Campylobacteriosis in Austria in 2007

Humans

In 2007, 6,077 cases of campylobacteriosis were reported. In 2007, the incidence increased to 73.4 cases/100,000 population in comparison to 60.7/100,000 population from the previous year. This incidence indicates that *Campylobacter* is the most common foodborne illness in Austria. The steady increase of campylobacteriosis since 1997, shown in the figure below, may be a result of improved diagnostic and reporting standards rather than a true increase in prevalence of *Campylobacter* spp. in animals and food.

Figure 5 Number of reported cases of campylobacteriosis (1997–2002, number of notified cases) compared to the number of salmonellosis cases in Austria between 1997 and 2007





Comparison between Austria and the EU in 2006

The incidence of reported human campylobacteriosis cases in Austria of 60.7/100,000 population is higher than the EU average² of 46.1/100,000 population. In addition, the EU average incidence of campylobacteriosis clearly exceeds the EU average incidence of salmonellosis (34.6/100,000 population), making *Campylobacter* the most common foodborne pathogen in the European Union.

Food and food products

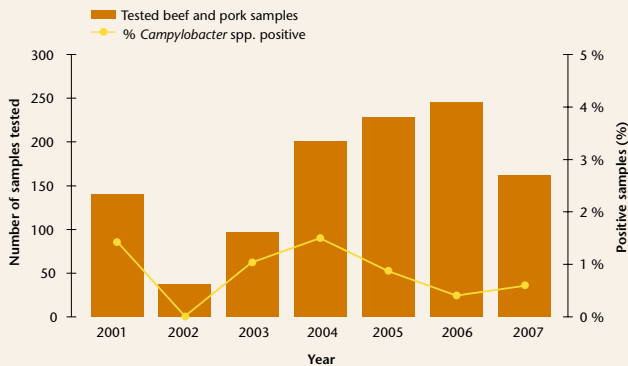
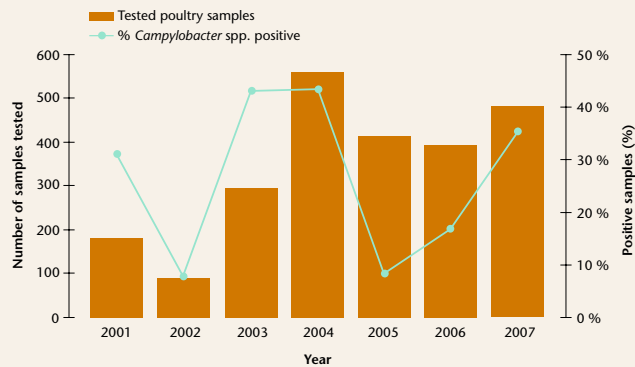
In 2007, 487 raw poultry samples were tested in Austria. Of these, 176 (36.1 %) tested positive for *Campylobacter*. Thus, the proportion of *Campylobacter*-positive samples in this food category doubled again in comparison to previous years. (2005: 9.3 %; 2006: 18.3 %; 2007: 36.1 %). There was only one out of 143 (0.7 %) pork samples which tested positive for *Campylobacter*. There was no positive test result in the 20 cattle samples.

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² The Community Summary Report 2006, *The EFSA Journal* (2007), 130. Data relating to EU-22

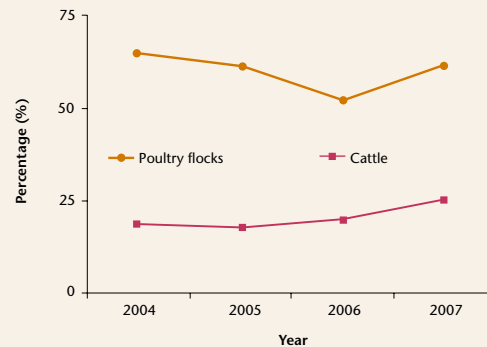
Figures 6 a and b Poultry, beef and pork samples tested for *Campylobacter* spp. in Austria between 2001 and 2007



Animals

In 2004, a nationwide monitoring system on the trends of *Campylobacter* prevalence and antimicrobial resistance in poultry, bovine animals and pigs was implemented in accordance with the National Regulation on Monitoring Programs for Selected Zoonoses and Antibiotic Resistances (BGBl. II Nr. 81/2005). The sampling was carried out from January to December 2007 and was based on a randomized sampling plan. Overall, the intestinal contents of 911 slaughtered cattle were tested for *Campylobacter* species. 231 (25 %) of the samples tested were positive. In poultry, 88 flocks were tested, of which 54 (61 %) were positive. No pigs were tested in 2007.

Figure 7 Prevalence of *Campylobacter* in faeces samples of slaughtered cattle and poultry flocks in Austria, 2004 to 2007







3. Brucellosis

Brucellosis is an infectious disease caused by *Brucella* (*B.*) species. These short, non-motile, non-spore-forming, rod-shaped bacteria occur worldwide. They are sensitive to heat and most disinfectants.

3.1 Occurrence

B. melitensis primarily affects sheep and goats in Mediterranean countries. In humans, infection with *B. melitensis* is referred to as Malta Fever. *B. abortus* causes abortion in cattle and Bang's Disease in humans. *B. suis* is uncommon in Europe and is found mainly in pigs and hares.

3.2 Reservoir

Infected farm animals (cattle, goats, sheep and pigs).

3.3 Mode of transmission

Transmission to humans typically takes place via contaminated food (raw milk and milk products) or through direct contact with infected animals or their secretions. Direct transmission from person to person has rarely been observed (in isolated cases, via breast feeding or blood transfusion).

3.4 Incubation period

Usually 5–60 days.

3.5 Symptoms

Up to 90 % of all *Brucella* infections are subclinical, i.e., they are only detectable by demonstration of specific antibodies in the blood of infected persons, reflecting a successful immune response. At the beginning of acute brucellosis, symptoms are often vague and can include fatigue, low-grade fever, headache and arthralgia. After a short asymptomatic interval, flu-like symptoms return with a night-time rise in temperature up to 40 °C also frequently associated with low blood pressure and swelling of the liver, spleen and lymph nodes. The disease can heal spontaneously or remain chronic with recurrent fever.

3.6 Diagnosis

For bacterial testing, diagnosis should be based on multiple blood samples, such as during a bout of fever or before the initiation of antibiotic therapy. The identification of specific antibodies found in the blood is the most common diagnostic method to identify the bacteria. Bone marrow, urine, and other tissues may also be used to detect the bacteria.

3.7 Therapy

Treatment with antibiotics.

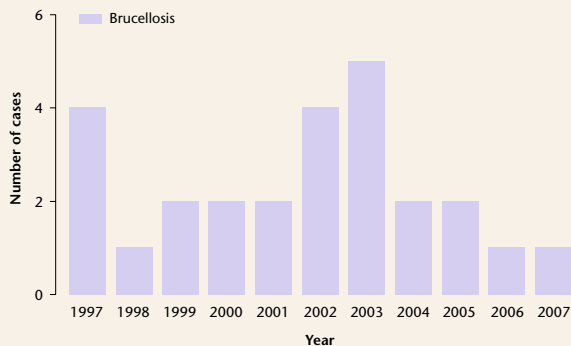
3.8 Brucellosis in Austria in 2007

Humans

Brucellosis in humans occurs only sporadically. In 2007, there was one documented case of brucellosis in Austria; an immigrant worker, who is thought to have contracted the infection during a visit to his native country.



Figure 8 Number of human brucellosis cases in Austria between 1997 and 2007



Comparison between Austria and the EU in 2006

The incidence of notified human brucellosis cases in Austria is $<0.1/100,000$ population, which is lower than the EU average³ of 0.2 cases/100,000 population. The Officially Brucellosis Free (OBF) status has been granted to Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Luxembourg, the Netherlands, Slovakia, Sweden, the United Kingdom, Norway, Switzerland, certain provinces in Italy and the Azores.

³ The Community Summary Report 2006, *The EFSA Journal* (2007), 130. Data relating to EU-20

Food and food products

Because Austria has been declared brucellosis-free, food is not tested for *Brucella* spp.

Figure 9 Number of serologically tested holdings of cattle and small ruminants and number of positive holdings in Austria between 2002 and 2007



Animals

Austria's susceptible animal population was officially declared free of *B. abortus* in 1999 and free of *B. melitensis* in 2001, earning the status OBF (Officially Brucellosis Free) and OBmF (Officially *Brucella melitensis* Free).

Bovine brucellosis (*B. abortus*):

Based on the Austrian Bang's Disease Regulation ("Bangseuchen-Untersuchungsverordnung 2004"), 20 % of cattle holdings, that keep cattle older than 2 years, must be serologically tested in each Austrian province. In 2007, none of the 161,413 cattle tested (from 26,730 cattle holdings) showed antibodies against *B. abortus*.





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Bovine and caprine brucellosis (*B. melitensis*):

In 2001, the European Commission declared Austria officially free of *B. melitensis* (OBmF). To keep this status, Austria has to demonstrate annually and with a confidence level of 95 % that fewer than 0.2 % of sheep and goat holdings are infected.

In 2007, 14,074 blood samples from sheep and goats from 1,638 holdings were tested in Austria. Seven animals, from 2 of the 1,638 (0.12 %) herds, showed an increased serum titre upon serological examination; however, positivity could not be confirmed microbiologically.







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4. Listeriosis

Listeriosis is an infectious disease caused by *Listeria* (*L.*) *monocytogenes*, a short, non-sporeforming, rod-shaped bacterium.

4.1 Occurrence

The pathogen is widely distributed in the environment, from sewage water to soil and plants. Food products of animal origin, such as raw milk, soft cheese, pâté, smoked fish and raw meat, can become contaminated during the production process (e.g. during milking or slaughter). The bacterium is commonly found in food-processing plants, where it is potentially becoming a 'domestic pathogen' that is difficult to eliminate. Unlike most other zoonotic bacteria, *L. monocytogenes* can multiply in low-temperature environments, such as refrigerators.

4.2 Reservoir

Ruminant animals (especially cattle, sheep and goats) and contaminated production facilities.

4.3 Mode of transmission

Transmission generally occurs through eating contaminated food, in particular dairy products, ready-to-eat meat and fish products. The bacteria have also been found in a variety of raw produce. Transmission among humans has rarely been observed (nosocomial infection of neonates). Infection through direct contact with carrier animals is rare.

4.4 Incubation period

3–70 days, usually 3 weeks.

4.5 Symptoms

In healthy adults, the infection with *L. monocytogenes* is mild, although some may develop diarrhoea. However, in immuno-compromised individuals, such as neonates, the elderly and patients with chronic diseases the infection may spread to the nervous system. Symptoms include: intense headaches, high fever, muscle aches and sometimes nausea, diarrhoea, stiff neck, confusion, and loss of balance. Severe cases may develop meningitis or may result in death.

In pregnant women, the infection is mostly asymptomatic, however, infection can lead to miscarriage, stillbirth, premature delivery, or infection of the newborn. Infected infants often develop meningitis.

4.6 Diagnosis

Listeriosis is confirmed by culturing the infectious agent from blood, cerebrospinal fluid, pus or stool.

4.7 Therapy

Treatment with antibiotics. Despite specific therapy, up to 30 % of clinical cases of listeriosis end fatally.

4.8 Preventive measures

The compliance with common kitchen hygiene rules is important to avoid infections with *L. monocytogenes*.

Rules to minimise the risk of foodborne infections include:

- Thoroughly cooking of meat and fish dishes
- Boiling of raw milk before consumption
- No consumption of raw minced meat

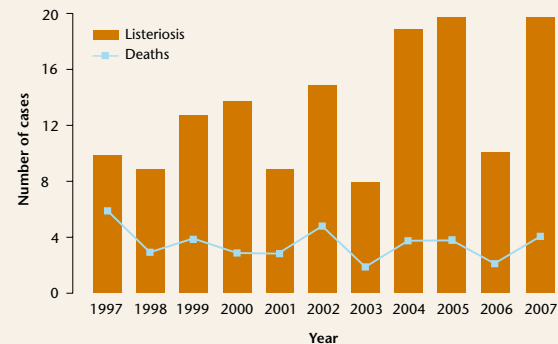
Regular hand washing (before and after preparation of meals) is an important basic measure of protection against pathogens. Fruits, vegetables and salads should be washed properly before eating. The preparation of meat and raw vegetables should be done with separate kitchen equipment or at separate times. Work surfaces should always be cleaned thoroughly after use. During storage in the refrigerator, freshly cooked meals should be covered to avoid later contamination.

4.9 Listeriosis in Austria in 2007

Humans

In 2007, 20 human cases of listeriosis were reported. Listeriosis is considered to be a rare infectious disease in Austria, with a 2007 incidence rate of only 0.24/100,000 population. In 2007, the case fatality ratio was 20 % (4 of 20 patients died).

Figure 10 Microbiologically confirmed cases of listeriosis and fatal outcomes in Austria between 1997 and 2007





Comparison between Austria and the EU in 2006

The incidence of notified human listeriosis cases in Austria is 0.1/100,000 population, which is below the EU average⁴ of 0.3/100,000 population.

⁴ The Community Summary Report 2006, *The EFSA Journal* (2007), 130. Data relating to EU-25





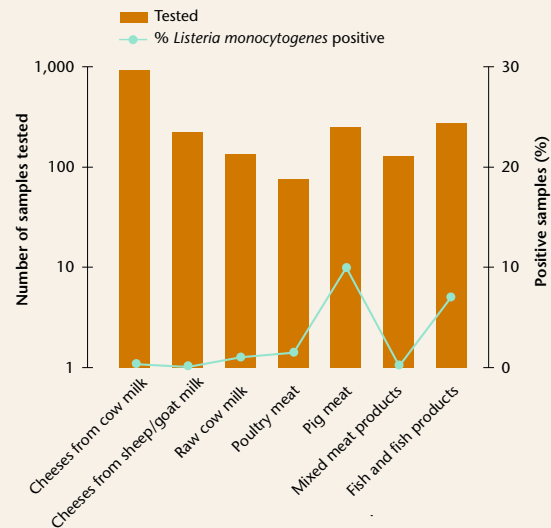
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Food and food products

The revision and sampling plans of the Federal Ministry of Health, Family and Youth (BMGFJ) specify the number of food enterprises (restaurants, dairies, retail outlets, etc.) and foodstuffs in each province that must be tested in a given year.

In 2007, *L. monocytogenes* was found in the following food items: cheese from cow milk: 0.3 % of samples (3/974) (with less than 100 colony forming units per gram (cfu/g)); cheese from sheep or goat milk: 0 % of samples (0/226); raw cow milk: 0.7 % of samples (1/134); cooked pork products 8.5 % (22/246) (with one sample containing more than 100 cfu/g); poultry meat 1.3 % (1/77) of samples tested positive; mixed meat products 0 % (0/133) of samples; and fish and fish products (including smoked fish): 6.7 % of samples (18/283) tested positive for *L. monocytogenes*.

Figure 11 Foods of animal origin tested for *Listeria monocytogenes* in Austria in 2007







5. Trichinellosis

Trichinellosis, also called trichinosis or trichiniasis, is an infectious disease caused by the larvae of the roundworm species *Trichinella spiralis*, also referred to as trichina worm.

5.1 Occurrence

Trichinellosis occurs worldwide as a mammalian zoonosis that occurs independently of climate conditions. It is an uncommon infectious disease in Europe.

5.2 Reservoir

Wild boars, domestic pigs and horses

5.3 Mode of transmission

The infestation starts through ingestion of raw or undercooked meat containing encapsulated *Trichinella* larvae. Through the actions of digestive enzymes in the gut, the larvae are released and, within a few days, develop into small worms in the mucosal cells of the upper small intestine. After mating, the female worms can deposit up to 1,500 larvae. The juvenile larvae penetrate the intestinal mucosa and travel through the blood-

stream to reach the muscles, where they form cysts that may stay alive for years. Preferred tissues are oxygen-rich muscles such as those of the diaphragm, neck, jaw, shoulder girdle and upper arm.

5.4 Incubation period

The incubation period is generally between 5 and 15 days, depending on the number of ingested *Trichinella* larvae. Even though data on the number of ingested larvae required to cause clinical infestation in humans vary, more than 70 larvae are needed to initiate infestation of a host. Transmission from person to person has not been documented.

5.5 Symptoms

The severity of the disease depends on the number of ingested larvae and the immune defence status of the affected person. When a large number of larvae is ingested, gastrointestinal disorders, such as diarrhoea and vomiting, can occur within the first week, followed by fever, chills, swelling of the eyelids, headache and muscle pain.



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5.6 Diagnosis

The presumptive diagnosis can be confirmed by determination of specific antibodies in the blood of the patient or by biopsy of infested skeletal muscle tissue.

5.7 Therapy

Infected patients normally recover without complications simply with bed rest and the aid of an analgesic or antifebrile medication. However, more severe infections are treated with anthelmintic (anti-worm) medication.

5.8 Preventive measures

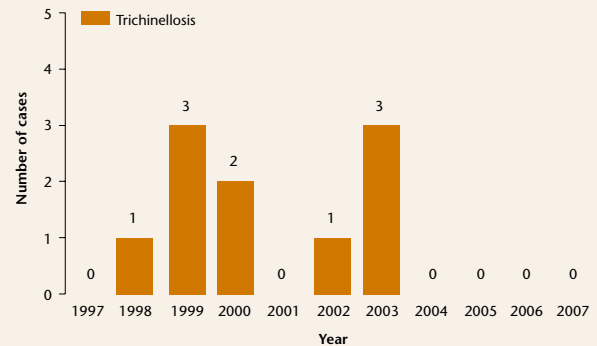
The most important preventive measure is the mandatory inspection of carcasses of possible host animals to detect encapsulated larvae. Heating meat to over 70 °C and freezing below -15 °C for a longer period of time will kill the parasite. Smoking, pickling and drying are insufficient for inactivating the larvae.

5.9 Trichinellosis in Austria in 2007

Humans

All trichinellosis cases reported to Austrian health authorities in the past three decades were imported into the country due to recent travel. In 2007, there were no reported cases of trichinellosis in humans.

Figure 12 Number of trichinellosis cases in Austria between 1997 and 2007



Comparison between Austria and the EU in 2006

In 2006, there was no case of trichinellosis reported in Austria. The average EU⁵ incidence is 0.4 cases/100,000 population.

Food and food products

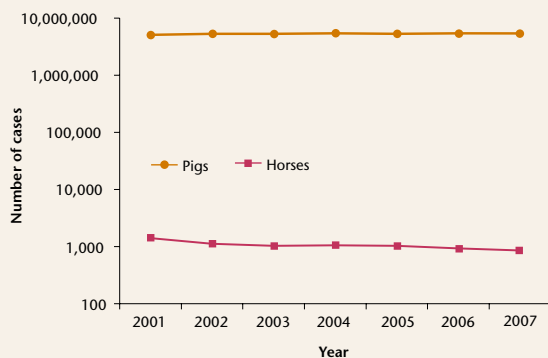
In 2007, carcasses of 5,410,886 pigs and 781 horses underwent the official meat inspection. There were no positive samples found with *Trichinella* larvae.

Animals

Industrially raised pigs are normally free of *Trichinella* because they do not have the opportunity to feed on *Trichinella*-infested fresh meat. Wild boars are potential *Trichinella* carriers.

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Figure 13 Number of carcasses officially inspected for *Trichinella* in Austria between 2001 and 2007; no specimen taken was found positive



⁵ The Community Summary Report 2006, *The EFSA Journal* (2007), 130. Data relating to EU-11



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6. Echinococcosis

Echinococcosis is an infectious disease caused by larvae of the *Echinococcus* tapeworm genus. The two species relevant for Europe are *E. multilocularis*, the causative pathogen of alveolar echinococcosis, and *E. granulosus*, the causative organism of cystic echinococcosis.

6.1 Occurrence

E. multilocularis mostly occurs in the northern hemisphere (Central and Eastern Europe, areas in the former Soviet Union, Turkey, Japan, USA and Canada). *E. granulosus* occurs worldwide, with clusters in the Mediterranean region and in the Balkan states.

6.2 Reservoir

E. multilocularis: Intermediate hosts: small rodents

Definitive hosts: foxes

E. granulosus: Intermediate hosts: sheep, pigs, cattle

Definitive hosts: dogs

6.3 Mode of transmission

E. multilocularis ("fox tapeworm"):

The 2–3 mm long five-segmented worms live mainly in the small intestines of foxes. Every 1–2 weeks, the final segment of each tapeworm, which contains up to 500 eggs, detaches and is released into the environment via the host's faeces. If these

contaminated faeces are ingested by adequate intermediate hosts (rodents), the eggs hatch and release larvae invading the host's intestinal mucosa and reaching the inner organs, especially the liver, via the bloodstream. Here they develop into alveolar cysts infiltrating the liver tissue like a malignant tumour. Within these cysts, numerous small "heads" develop. When definitive hosts (foxes) ingest infected rodents, these heads develop into adult tapeworms within the foxes' intestines.

E. granulosus ("dog tapeworm"):

The 3–6 mm long adult worms live mainly in the small intestines of dogs. Every 1–2 weeks, the final segment of each tapeworm, which contains up to 1,500 eggs, detaches and is released into the environment via the host's faeces. These contaminated faeces are ingested by adequate intermediate hosts (sheep, pigs and cattle) during grazing. The eggs develop into larvae, which penetrate the intestinal mucosa and reach the liver and other organs (e.g. lungs, heart and spleen) via the bloodstream. Here they develop into hydatid cysts forming thousands of small "heads". When definitive hosts (dogs) ingest or are fed with cyst-containing tissue from an intermediate host, the heads develop into adult tapeworms in the dog's intestines.

Humans may become infected via accidental ingestion of tapeworm eggs present in the faeces of affected definitive hosts.

6.4 Incubation period

Alveolar echinococcosis: 5–15 years

Cystic echinococcosis: months to years

6.5 Symptoms

Alveolar echinococcosis: The most common symptoms are pain in the upper abdomen, icterus, fatigue, weight loss and an enlarged liver caused by tumour-like growth of the parasitic tissue.

Cystic echinococcosis: Frequent symptoms are pain in the right upper abdomen due to encapsulated cysts in the liver, which may be up to 30 cm large. The lungs are less frequently affected, characterized by breathing difficulties and coughing.

6.6 Diagnosis

Alveolar echinococcosis: Imaging procedures, such as sonography, X-ray or computed tomography can reveal changes in the liver tissues, the structural appearance of which varies and which may present as calcifications. The presumptive diagnosis can be confirmed by evidence of specific antibodies in the patient's blood.

Cystic echinococcosis: Imaging procedures show cyst formation in the affected organs. To confirm the presumptive diagnosis, the blood is tested for specific antibodies.

6.7 Therapy

Alveolar echinococcosis: Treatment requires resection of the affected parasitic tissue. This, however, can generally only be achieved in the first stage of an infection. Therefore, therapy generally consists of a combination of surgical and medical treatment.

Cystic echinococcosis: The aim is the complete excision of the cysts. In most cases, surgical treatment is combined with anthelmintic therapy.

6.8 Preventive measures

Echinococcus eggs tolerate low temperatures and can therefore stay infectious for months. Dehydration and high temperatures kill eggs within a short period of time.

To avoid an infestation with *E. multilocularis*, the following preventive measures should be taken: Wash your hands after collecting wild-grown berries, mushrooms or wood in the forest and after contact with foxes or fox furs.

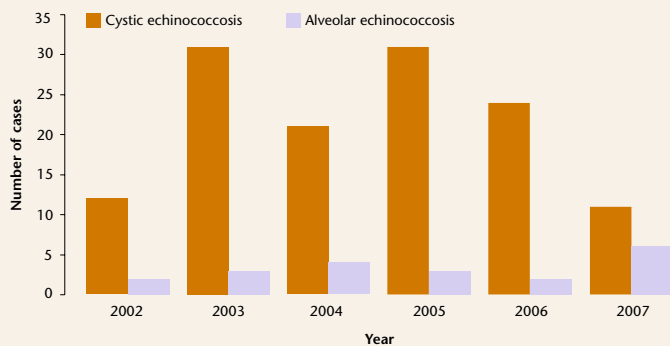
To avoid infestation with *E. granulosus*, dogs should undergo regular de-worming treatment and should not be fed with entrails from slaughtered sheep.

6.9 Echinococcosis in Austria in 2007

Humans

In 2007, 6 cases of alveolar echinococcosis, and 11 cases of cystic echinococcosis in humans were diagnosed. Most cases of cystic echinococcosis were presumably acquired abroad.

Figure 14 Cases of echinococcosis (cystic and alveolar) in Austria between 2002 and 2007



Comparison between Austria and the EU in 2006

In 2006, 26 cases of echinococcosis were reported in Austria, yielding an incidence rate of 0.3/100,000 population, which is higher than the EU average⁶ of <0.1 cases/100,000 population.

Food and food products

During mandatory meat inspection, every carcass of possible intermediate hosts is examined for *Echinococcus* cysts. In 2007, no *Echinococcus* infection was diagnosed during routine meat inspection.

Animals

In Austria, dogs are generally free of the tapeworm *E. granulosus*. Foxes infected with *E. multilocularis* are mainly found in Vorarlberg and the Tyrol, but have also been found in other provinces.

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⁶ The Community Summary Report 2006, *The EFSA Journal* (2007), 130. Data relating to EU-23



7. Tuberculosis due to *Mycobacterium bovis*

Tuberculosis (TB, consumption) leads the statistics for lethal human infectious diseases worldwide. This infectious bacterial disease is caused by *Mycobacterium (M.) tuberculosis*, a non-motile, rod-shaped bacterium, which most commonly affects the lungs. *M. bovis* and *M. caprae* are responsible for bovine tuberculosis and account for only about 1 % of all human tuberculosis cases in Austria.

7.1 Occurrence

Tuberculosis is especially prevalent in sub-Saharan Africa, South-East-Asia and Latin America. The risk of infection is particularly high for persons in close direct contact with patients with “open”, i.e., infectious, tuberculosis. An alarming increase of tuberculosis caused by multi-drug resistant strains, i.e. those resistant to the antimycobacterial drugs isoniazid and rifampicin, has been observed in recent years.

The bacteria can be inactivated through pasteurisation (temporary heating to over 70 °C), but not by dehydration or refrigeration.

7.2 Reservoir

Humans are the only relevant reservoirs for *M. tuberculosis*. For *M. bovis* and *M. caprae*, humans, cattle and occasionally goats and wild ruminants (e.g. deer) are reservoirs.

7.3 Mode of transmission

Whether tuberculosis develops depends on the frequency and intensity of exposure, the amount of inhaled or orally ingested pathogens, and the health status of the affected person.

The infection starts with inhalation of small airborne droplets released through the coughing and/or sneezing of infectious carriers. In 80 % of the patients, TB manifests in the lungs (pulmonary tuberculosis), however, it can also affect other organs. In open pulmonary tuberculosis, the bacteria have access to the respiratory tract.

Transmission through ingestion of raw (unpasteurised) milk from infectious cattle is possible, but of little importance in Austria, as its cattle livestock are “Officially Tuberculosis Free”.



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7.4 Incubation period

The incubation period can last from months to many years.

7.5 Symptoms

Within 3–6 weeks after airborne infection, small foci of inflammation form in the lungs in response to the presence of bacteria; these lesions develop into small encapsulated lumps (tubercle). This form is referred to as “non-infectious” or “closed” tuberculosis as it is not contagious because no pathogens are emitted. An active case of TB starts with the common symptoms of an influenza-like infection, e.g. fever, fatigue, loss of appetite, weight loss and concentration difficulties. If the respiratory tract is affected, cough, dyspnea and bloody sputum can occur.

Miliary tuberculosis occurs when the bacteria spread into the lungs and into other organs via the bloodstream. In such cases, tuberculous meningitis can also develop.



7.6 Diagnosis

Tuberculin skin test: To verify an asymptomatic infection, the tuberculin skin test (Mendel-Mantoux method) can be used. This test assesses the immunological reaction of the patient to components of cultured mycobacteria. A positive test result can be obtained 6 weeks after an infection with mycobacteria. In addition, an Interferon-Gamma-Release-Assay has been used as a blood test, which replaces this skin test method.

Imaging procedures: Chest radiographs will reveal the characteristic changes in lung tissues. However, X-ray examination alone is not sufficient to distinguish between tuberculosis and other pulmonary diseases.

Bacteriological diagnosis: A positive culture test result confirms the diagnosis of tuberculosis. The advantage of bacteriological diagnosis is the possibility to test the pathogen for resistance to different antimycobacterial drugs (resistance testing).

7.7 Therapy

Because mycobacteria proliferate slowly and can rest in tuberculous granuloma for an extended period of time, long treatment duration is required. There is an increased risk for the development of antimycobacterial resistance due to inconsistent or partial treatment. In confirmed cases of tuberculosis, the patient must be treated with a combination therapy including several specific antibiotics, known as antimycobacterial drugs. The treatment period is long (approximately 6 months) in order to avoid potential relapse of the disease.

7.8 Preventive measures

Because there is no effective vaccine against tuberculosis, the most important measure is to identify infected persons and to treat them effectively. After making a diagnosis of tuberculosis, it is essential to actively search for those who have potentially been exposed to the patient (e.g. family, circle of friends, co-workers) in order to detect secondary cases at an early stage.

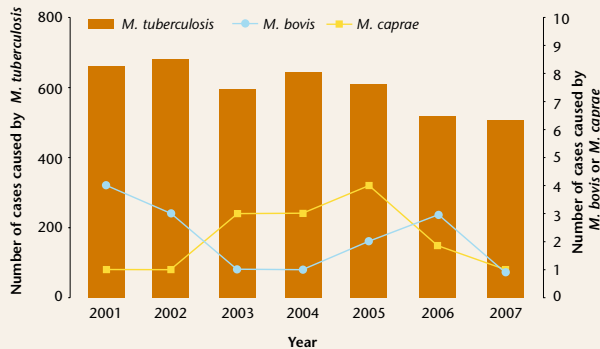


7.9 Tuberculosis in Austria in 2007

Humans

The number of laboratory-confirmed cases of tuberculosis in humans has declined over the past years. In 2007, 507 infections with *M. tuberculosis* were confirmed, one case with *M. bovis* and one case with *M. caprae*.

Figure 15 Number of human tuberculosis cases by causative agent in Austria between 2001 and 2007



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Comparison between Austria and the EU in 2006

In 2006, 3 human cases of bovine tuberculosis were reported in Austria. One case was caused by *M. bovis* and two cases were caused by *M. caprae*. This can be compared with 117 cases of *M. bovis* reported Europe-wide⁷. *M. caprae* was not reported EU-wide.

The “Officially Tuberculosis Free” (OTF) status for bovine herds is currently held by Austria, Belgium,

the Czech Republic, Denmark, Finland, France, Germany, Luxembourg, the Netherlands, Slovakia, Sweden, Norway and certain provinces in Italy.

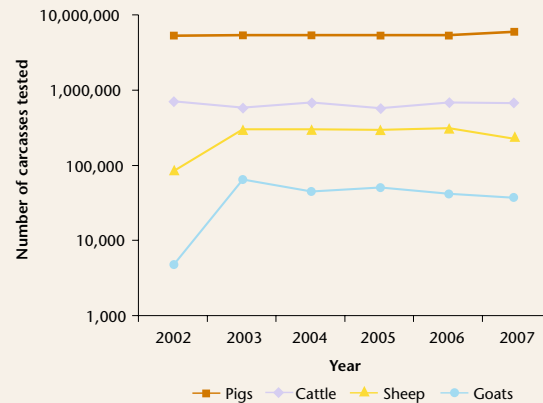
Food and food products

In 2007, no case of *M. bovis* was detected in slaughtered cattle, sheep, goats and pigs. *M. caprae* was found in one cattle holding in Austria.

Animals

Since 1999, Austria has held the “Officially Tuberculosis Free” (OTF) status. The investigation for tuberculosis is part of the mandatory meat inspection process.

Figure 16 Number of slaughtered livestock inspected for tuberculosis in Austria between 2001 and 2007; *M. caprae* was diagnosed in one cattle holding



⁷ From the Euro-TB Year Report 2006; Data relating to EU-21





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8. Verotoxin-producing *Escherichia coli* (VTEC)

Verotoxin-producing *Escherichia (E.) coli* (VTEC) are mostly motile, rod-shaped bacteria characterised by their ability to produce special toxins. Based on their variable antigen structures, *E. coli* are classified into different serotypes, the most important and common one being *E. coli* O157:H7. *E. coli* bacteria are sensitive to heat but survive in frozen food and acid environments. The term Shiga toxin-producing *E. coli* (STEC) is used synonymously with VTEC.

8.1 Occurrence

E. coli are bacteria which belong to the normal intestinal flora of warm-blooded animals, including humans. However, Verotoxin-producing *E. coli* is one pathogen type that can cause severe diarrhoea in humans.

8.2 Reservoir

Ruminants (cattle, sheep and goats) and wildlife animals (deer).

8.3 Mode of transmission

Transmission of the bacteria is mainly through the ingestion of the following foods: raw minced beef, pâté, salami, raw milk or foods of plant origin grown on soil fertilized with bovine manure (e.g. sprouts).

Infections transmitted through person-to-person contact also play an important role, especially in social areas, such as kindergartens or senior residences. People have also gotten infected by swallowing lake water while swimming, from petting zoos and other animal exhibits, and poor hygiene practices. The infectious dose is very low (approx. 100 organisms).

8.4 Incubation period

2–8 days, usually 3–4 days.

8.5 Symptoms

The disease starts with watery to bloody diarrhoea, accompanied by severe nausea, vomiting and abdominal pain. In most cases, the illness is self-limiting and ends within 8–10 days. In infants, the elderly and people with compromised immune systems, severe secondary diseases may develop that may be accompanied by life-threatening conditions, such as the haemolytic uraemic syndrome (HUS). The toxins bind to receptors on the host cell walls and damage them, leading to microvascular lesions and, subsequently, to renal failure, reduced urine output, anaemia, low platelet counts, intradermal haemorrhage, and neurological changes.

8.6 Diagnosis

The bacteria can be detected from stool cultures or identified through specific antibodies found in the blood.

8.7 Therapy

Antimicrobial treatment is contraindicated because the bacteria may produce more toxins under the influence of antibiotics, thus increasing the possibility of complications. Treatment includes rehydration and correction of electrolyte imbalance if necessary. If severe secondary diseases (e.g. HUS) develop, hospitalization and haemodialysis may be necessary.

8.8 Preventive measures

Food-safety precautions: Because many types of farmed animals are possible reservoirs for VTEC bacteria, practicing good hygiene at all stages of production, processing, storage, transport and retail of food products is of great importance. For example: regular hand washing after contact with animals and before preparation of meals.

Precautions during food processing: Persons infected with VTEC are not permitted to work in food production facilities as long as they are shedding the pathogen. This also applies to kitchen employees, e.g. for restaurants, cafeterias, hospitals and children's homes.

8.9 VTEC infection in Austria in 2007

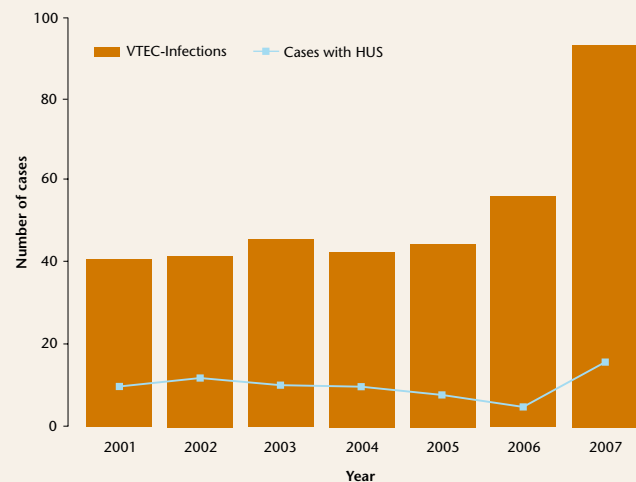
Humans

In 2007, VTEC was diagnosed 93 times. In 16 cases, patients developed severe complications including haemolytic uraemic syndrome (HUS).

Comparison between Austria and the EU in 2006

The incidence of confirmed cases of human VTEC infection in Austria is 0.5/100,000 population, i.e., less than half the EU average⁸ of 1.1/100,000 population.

Figure 17 Number of VTEC infections and secondary HUS in Austria, 2001 to 2007



⁸ The Community Summary Report 2006, *The EFSA Journal* (2007), 130. Data relating to EU-22

Food and food products

The revision and sampling plans of the Federal Ministry of Health, Family and Youth (BMGFJ) specify the number of food enterprises (restaurants, dairies, retail outlets etc.) and foodstuffs in each province that must be tested annually.

In 2007, VTEC were detected in 3 of 269 meat samples tested (1 sample of goulash meat intended to be eaten cooked and 2 samples of mixed minced meat). There were 4 serotypes involved: O135:H4, O22:H8, O22:H40, O91:H21. None of the 112 samples of raw cow, sheep, and goat milk tested positive for VTEC.



Animals

In 2004, a nationwide monitoring system on the trends of VTEC prevalence in bovine animals, sheep and goats was implemented in accordance with the National Regulation on Monitoring Programs for Selected Zoonoses and Antibiotic Resistances

(BGBl. II Nr. 81/2005). In 2007, sampling was carried out from January to December 2007. Laboratory analysis of the intestinal content of 44 slaughtered calves revealed one animal positive for 2 serotypes (VTEC O150:H- und VTEC O150:H30). Of the 48 faeces samples from sheep, 2 stool samples tested positive for Verotoxin but could not be isolated microbiologically.

Figures 18 a and b: Meat and meat products as well as milk and milk products (cow, sheep, goat) tested for VTEC and results in Austria from 2001 to 2007

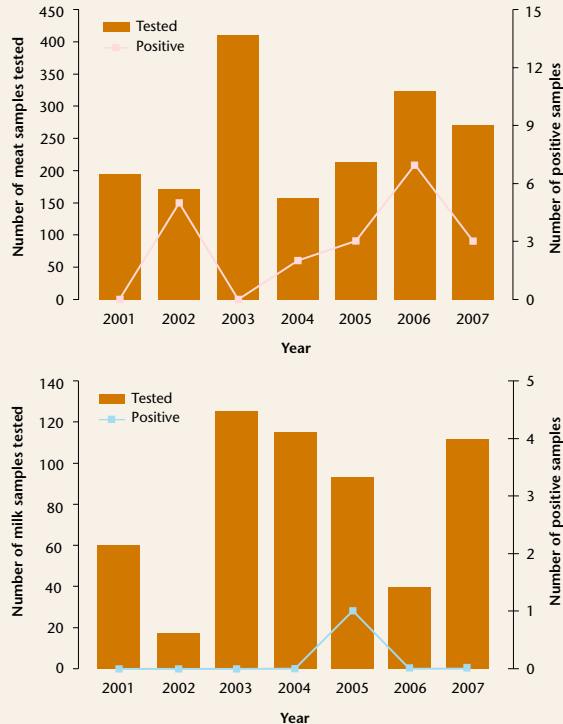
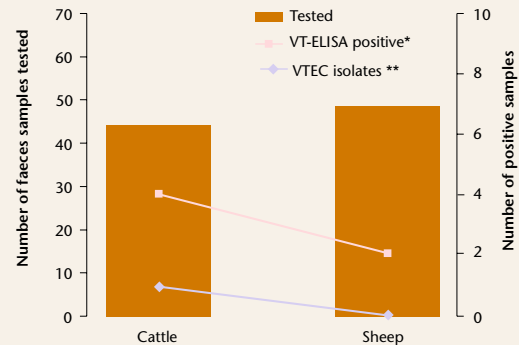


Figure 19 Number of cattle and sheep faeces samples tested and number of VTEC-positive samples in 2007



* VT-ELISA-positive: Verotoxin identified in faeces sample after enrichment

** Isolates: Verotoxin-producing *E. coli* cultivated from a faeces sample



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Medical University Graz
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GG_750: Cornelis Saftleven, Scheune mit Geschirr reinigender Magd und Ziegen, in 1630/1635
GG_3534: Roelant Savery, Orpheus unter den Tieren, in 1625/1628
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