AGES
Österreichische Agentur für Gesundheit
und Ernährungssicherheit GmbH

Bundesministerium für Gesundheit Familie und Jugend

Report on Zoonoses and Zoonotic Agents in Austria in 2006

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BUNDESMINISTERIUM FÜR GESUNDHEIT FAMILIE UND JUGEND

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Preface

Dr. Andrea Kdolsky
Federal Minister of
Health, Family and
Youth

Any disease or infection naturally transmissible from vertebrate animals to humans is classified as a zoonosis. Every year, several thousands of Austrians contract zoonoses caused by foodborne organisms, such as salmonellosis or campylobacteriosis. Despite the high standards of quality in Austrian food production, foodborne infection remains an important cause of morbidity and mortality. Even though combating zoonoses has become a serious challenge due to the development of multiresistant pathogens, considerable progress has been made – one case in point being salmonellosis. Over the past 4 years, the annual number of *Salmonella* cases in Austria has decreased by some 30%. In 2002, when the Austrian Agency for Health and Food Safety (AGES) was founded, there were still 8,403 reported cases. By 2006, the number had dropped to 5,379, a decrease reflecting the combined efforts of health authorities and the food production industry.

As food trade has become more international, the epidemiology of foodborne infection has become more complex. Also, the ways food is purchased, stored and prepared have changed substantially, and these changes may also have contributed to the increased incidence of certain types of foodborne infections.

In Austria, as in other member states of the European Union, the number of reported cases of campylobacteriosis and listeriosis has increased in recent years. It is therefore essential to make information on the safe storage and food preparation and on the prevalence of foodborne infections available to consumers to encourage them to take on their share of responsibility. This brochure addresses this important concern. Combating the increasing incidence of campylobacteriosis and listeriosis will also be an important task of my Ministry in coming years.

In response to increased European integration, this is the first Austrian Zoonosis Brochure to be published not only in German but also in English, making the facts and figures available to an even wider public. As Federal Minister of Health, I would like to thank all those who are dedicated to fighting and preventing foodborne zoonoses.

Dr. Andrea Kdolsky, Federal Minister of Health, Family and Youth

SALMONELLOSIS

LISTERIOSIS

TUBERCULOSIS

BRUCELLOSIS

TRICHINELLOSIS

VEROTOXIN-PRODUCING ESCHERICHIA COLI

CAMPYLOBACTERIOSIS

ECHINOCOCCOSIS

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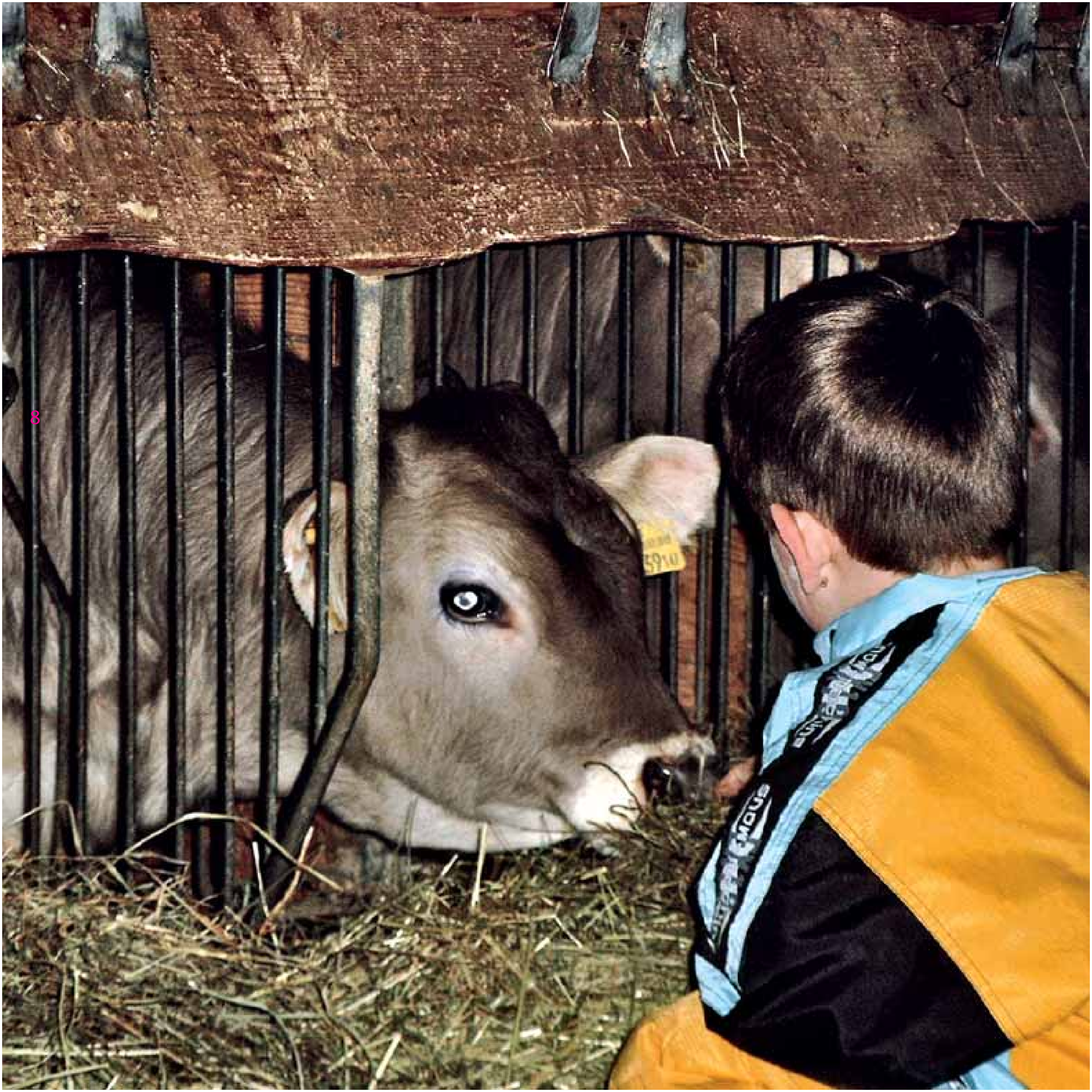


Introduction

Zoonoses are infectious diseases transmissible from animals to humans. Transmission may be by either 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. Owing 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 cause asymptomatic infection, 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 past years, new pathogens have emerged, and outbreaks of *emerging zoonoses,* such as Severe Acute Respiratory Syndrome (SARS, spreading from Asia) and West Nile Virus (in the USA), have been responsible for recent epidemics. Also, bacteria that have long been known may over time acquire new pathogenic features and cause severe disease, such as verotoxin-producing *Escherichia coli* (VTEC) strains. In recent years, 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 3 different classes usually effective against the same bacterial species, pose an additional risk to humans. Examples of multiresistant organisms are *Salmonella* Typhimurium DT104 and methicillin-resistant *Staphylococcus aureus*.

The Austrian Agency for Health and Food Safety (AGES) supports the Federal Ministry of Health, Family and Youth (BMGFJ) 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

Zoonosis surveillance systems are set up to collect information on the occurrence of zoonotic agents throughout all stages of the food production chain. Based on these data, measures can be taken to protect humans against zoonoses.

The annual zoonoses reports forwarded to the EU by each member state detail the results of each country's surveillance activities. The compiled Community report can be downloaded from the website of the European Food Safety Authority (EFSA):

http://www.efsa.europa.eu/etc/medialib/efsa/science/monitoring_zoonoses/reports/zoonoses_report_ 2005.Par.0001.File.dat/ Zoonoses_report_2005.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) of infection at an early stage. Monitoring systems routinely observe, collect and evaluate information based on arbitrary or random sampling procedures. The data collected are checked against the defined targets.

In 2006, the Department for Animal Health, Trade with Living Animals and Veterinary Legislation of the BMGFJ again implemented a monitoring program targeting selected pathogens in cattle, sheep, goats, pigs and poultry as well as testing for antibiotic resistances. The random sampling plans were developed based on epidemiological principles.

Surveillance programs

The aim of zoonosis surveillance is to routinely collect, analyse and disseminate all data that are relevant for the prevention and control of zoonoses along the food chain. According to the World Health Organisation (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. Being aware of the epizootic situation both in Europe and throughout the world enables health authorities to take prompt prophylactic action, such as restricting trade with living animals to prevent pathogen spread.

At a European level, the trade with livestock and livestock products is strictly regulated. By implementing programs for the control and surveillance of epizootics, EU member countries can be granted a status referred to as "officially free" of certain epizootics (e.g. bovine tuberculosis or bovine brucellosis). To keep this status, the veterinary agencies of the respective countries must carry out annual control and surveillance programs to fulfil EU requirements. The aim of achieving certified absence of epizootics is to keep Austria's livestock healthy and to assure trading benefits for the Austrian agriculture.

Cooperation between specialties

Identifying emerging or re-emerging infectious diseases is a challenging task. Successfully tackling it requires the intensive cooperation between experts of varied specialties, such as human and veterinary medicine, food hygiene, microbiology, and epidemiology. New scientific developments require that established knowledge be well documented, understood and practiced. Thus, the international exchange of information plays an important role in the surveillance of zoonoses.

National Reference Centres and Laboratories

In the course of the establishment of the European network for epidemiological surveillance of infectious diseases, Austria established human medicine national reference centres, each responsible for specific pathogens.

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

A physician consulted by a patient with a notifiable infectious disease notifies the competent authority of the case. Data are collected nationwide and published monthly by the Federal Ministry of Health, Family and Youth in journals specifically dedicated to either human ("Mitteilungen der Sanitätsverwaltung") or animal health ("Amtliche Veterinärnachrichten"). At the beginning of each year, the preliminary case numbers from the previous year are published, amended in the course of the current year, and then approved.

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.

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 feedstuffs. In poultry, *Salmonella* infections are often not clinically manifest, and entire layer hen flocks may become permanent asymptomatic carriers capable of transmission. Transmission of the pathogen from an infected layer hen prior to egg deposition may cause some eggs to be contaminated, which, unless thoroughly cooked, 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 grow 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 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). Transmission to other foods (cross-contamination) can also occur through inadequately cleaned kitchen commodities, such as chopping boards, knives and towels, or through neglected washing of hands. Special attention should be paid to kitchen hygiene and sufficient refrigeration. Direct transmission of the pathogens from person to person (faecal-oral) is theoretically possible but will rarely happen due to the high dose of inoculum required for infection (minimum 1,000 microorganisms).

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. Depending on the number of ingested bacteria, many infections take a mild and asymptomatic course. In the elderly, dehydration and the resulting cardiovascular problems can lead to severe and life-threatening disease.

1.6 Diagnosis

Detection of the bacteria is done by culturing the causative organism from stool (faeces), or from 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. Usually, 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 poultry or eggs must be

cleaned with detergents and hot water. Fresh prepared meals which are not eaten at once should be left to cool down and immediately stored in the refrigerator.

People who are infected with *Salmonella* spp. are not allowed to work in any food-processing or food-serving establishment until they no longer shed these bacteria.

1.9 Serotyping and phage typing

Typing of all *Salmonella* isolates takes place in the AGES National Salmonella Reference Centre (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).

More than 2,500 *Salmonella* serotypes are known. In 2006, 78.8% of all serotypes isolated from humans in Austria were *S.* Enteritidis, and 11.7% were *S.* Typhimurium. The main PTs of *S.* Enteritidis in humans were PT4, PT8 and PT21.

	Number of isolates	Percentage
S. Enteritidis	4,238	78.8
S. Typhimurium	627	11.7
S. Infantis	38	0.7
S. Hadar	26	0.5
S. Newport	24	0.5
S. Saintpaul	24	0.5
S. Virchow	24	0.5
S. Thompson	23	0.4
S. Agona	22	0.4
S. Bovismorbificans	18	0.3
S. Kentucky	18	0.3
Other serotypes or non-typeable isolates	297	5.4
Total	5,379	100.0

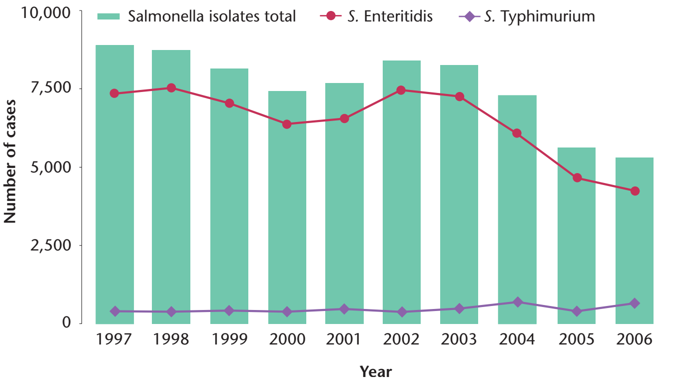
Table 1
The 10 most frequent *Salmonella* serotypes in humans in Austria in 2006

1.10 Salmonellosis in Austria in 2006

Humans

In 2006, 5,379 human *Salmonella* isolates were typed by the National Reference Centre. The rate of incidence of 65.1 cases/100,000 population was 4% lower than in 2005. The number of *Salmonella* isolates has decreased by approximately 35% since 2002. However, in 2006, an increase in *S.* Typhimurium isolates was noted, which was mainly due to nationwide foodborne outbreaks caused by *S.* Typhimurium DT46 and DT41. In 2006, the number of reported salmonellosis cases was 4,985, for the first time moving salmonellosis from the most to the second most frequently reported cause of food poisoning in Austria, the most common having been campylobacteriosis with 5,156 notified cases.

Figure 1
Number of microbiologically confirmed salmonellosis cases in Austria between 1997 and 2006



Comparison between Austria and the EU in 2005

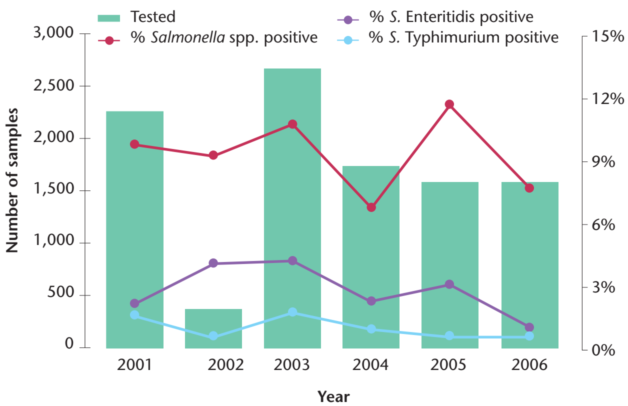
The Austrian incidence rate of notified salmonellosis cases of 62.9/100,000 population is much higher than the EU average[1] of 38.2/100,000 population. The European incidence rate for salmonellosis is lower than the incidence rate of campylobacteriosis (51.6/100,000 population), making *Campylobacter* spp. the most frequently identified causative pathogens of bacterial gastroenteritis in Europe.

[1] The Community Summary Report 2005, *The EFSA Journal* (2006), 94. Data relating to MS-24

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 taken.

Figure 2
Number of samples tested according to the revision and sampling plan for poultry (products) and detection (in %) of *Salmonella* spp., *S.* Enteritidis and *S.* Typhimurium in Austria between 2001 and 2006



In 2006, the following foodstuffs tested positive for *Salmonella* spp.:

6.2% (49/795) of raw poultry samples; 4.9% (12/246) of cooked poultry samples; 14.5% (11/76) of turkey samples; and 1.1% (4/356) pork samples. Overall, 2,759 samples of milk, milk products and cheeses were tested.

Salmonella spp. were isolated from two samples (1 ice cream and 1 cheese made from raw or low-heat treated cow milk). Of 1,711 table eggs examined, 48 samples (2.8%) were positive for *Salmonella* spp., with 47 samples containing *S.* Enteritidis and 1 sample containing *S.* Duisburg.

Animals

Across Europe, the main sources of human *Salmonella* infections are table eggs from contaminated layer hen flocks.

To measure *Salmonella* prevalence in broiler flocks across Europe, a one-year baseline study with a randomised sampling plan was performed in all member states. In Austria, 365 flocks were tested. The survey revealed that the prevalence of *Salmonella* spp. in Austrian broiler flocks was more than 4 times lower than the average prevalence in the European Union. A comparison of the prevalence in Austria and the EU is shown in Figure 3.

Feeding stuffs

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

In 2006, 4 of the 264 feed samples tested were found positive for *Salmonella* spp.

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

Figure 3
Prevalences of *Salmonella* spp., *S.* Enteritidis and *S.* Typhimurium in broiler flocks in the EU and in Austria

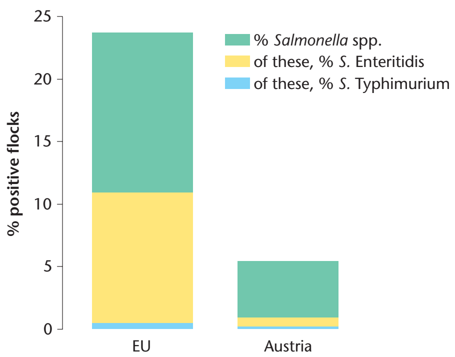
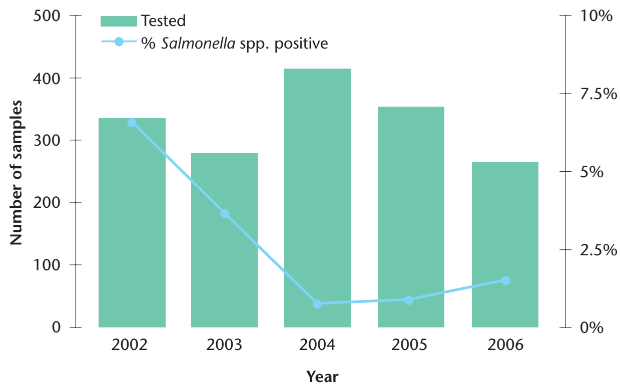


Figure 4
Number of feed samples taken in Austria between 2002 and 2006 and percentage of *Salmonella*-positive samples.



2 CAMPYLOBACTERIOSIS

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

2.1 Occurrence

Campylobacteriosis occurs worldwide and mainly during warm seasons. Next to *Salmonella, Campylobacter* is the most important pathogen causing foodborne enteric diseases in humans. In 2006, campylobacteriosis (ahead of salmonellosis) was the most frequently notified foodborne infectious disease in Austria, and 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, such as dogs and cats. In animals, these pathogens are natural intestinal inhabitants rarely causing enteric disease.

2.3 Mode of transmission

Campylobacteriosis in humans is mainly a foodborne infection. Inadequately cooked poultry and minced meat along with raw milk are thought to be the main sources of foodborne infection. Special attention should be paid to hygiene 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, can rarely occur as a complication of campylobacteriosis.

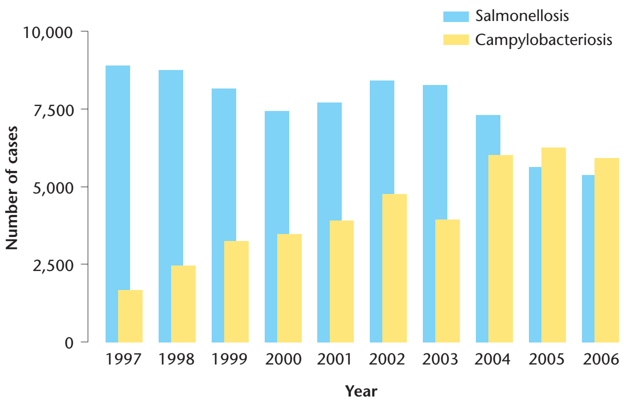
2.6 Diagnosis

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

2.7 Therapy

The disease is usually self-limiting and therapy which equalizes the body's water and electrolyte balance is sufficient. Infants and patients with high temperature or immunosuppressed persons can be treated with antibiotics.

Figure 5
Number of microbiologically confirmed cases of campylobacteriosis (1997–2002, number of notified cases) compared to the number of salmonellosis cases in Austria between 1997 and 2006



2.8 Campylobacteriosis in Austria in 2006

Humans

In 2006, 5,165 cases of campylobacteriosis were notified, and 5,921 *Campylobacter* infections were microbiologically confirmed. Even though the number of confirmed infections has slightly decreased since last year, campylobacteriosis is still the most frequently reported foodborne infectious disease in Austria with an incidence

rate of 71.6 cases/100,000 population. The steady increase of campylobacteriosis since 1997 shown in the graph below mainly seems to be a result of improved diagnostic and reporting standards rather than a real increase in prevalence of *Campylobacter* spp. in animals and food.

Comparison between Austria and the EU in 2005

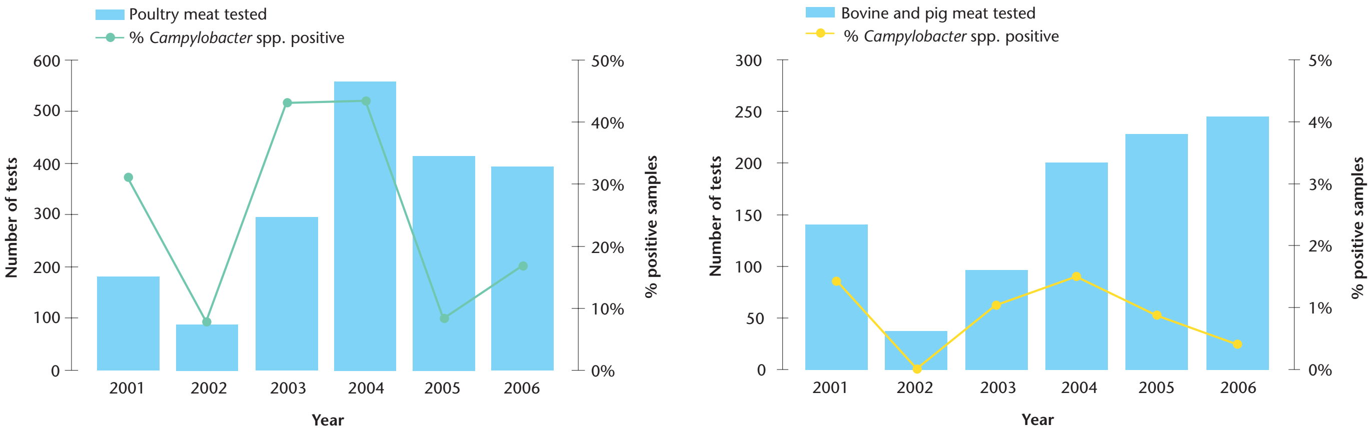
The incidence rate of reported human campylobacteriosis cases in Austria of 61.7/100,000 population is clearly higher than the EU average[2] of 51.6/100,000 population. In turn, the EU incidence of campylobacteriosis clearly exceeds the EU incidence of salmonellosis (38.2/100,000 population), making *Campylobacter* the most common foodborne pathogen in the EU.

Food and food products

In 2006, 366 poultry samples were tested, and 67 (18.3%) of these samples were *Campylobacter*-positive. Thus, the proportion of *Campylobacter*-positive samples in this food category was twice that in 2005 (2005: 9.3%). Also, the pathogen was detected in only 1 of 93 tested pork samples and in none of 103 tested beef samples.

2 The Community Summary Report 2005, *The EFSA Journal* (2006), 94. Data relating to MS-22

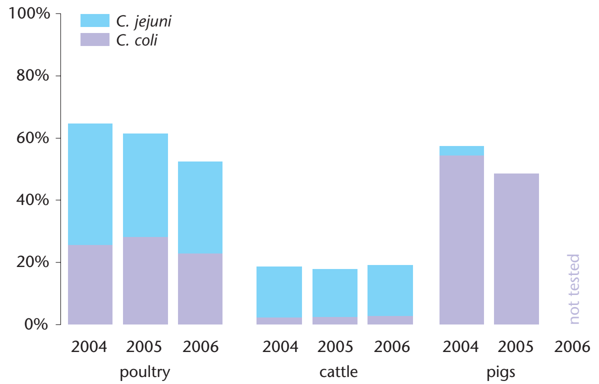
Figures 6 a and b
Poultry, cattle and pig meat samples tested for *Campylobacter* spp. in Austria between 2001 and 2006



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). In 2006, sampling was carried out from 16 January to 17 November based on a randomized sampling plan. Overall, the intestinal contents of 1,329 slaughtered cattle were tested for *Campylobacter* species, and 258 (19%) of samples tested positive. In poultry, 598 flocks were tested, 315 (52%) of which were positive. No pigs were tested in 2006.

Figure 7
Detection of *Campylobacter jejuni* and *C. coli* in faeces samples of slaughtered cattle and pigs and slaughter batches of poultry in Austria between 2004 and 2006



3. BRUCELLOSIS

Brucellosis is an infectious disease caused by *Brucella* 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 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 symptom-free interval, flu-like symptoms with a night-time rise in temperature up to 40°C are observed, 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

Diagnosis by culture should be based on multiple blood samples, ideally taken during a bout of fever and before the initiation of antibiotic therapy. Bone marrow, urine, and other tissues are also used to detect the bacteria. Testing blood for specific antibodies is the most widely used diagnostic method.

3.7 Therapy

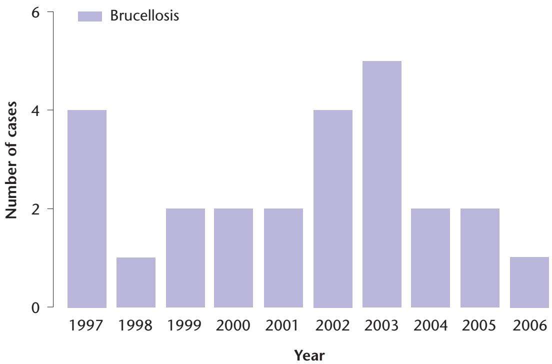
Treatment with antibiotics.

3.8 Brucellosis in Austria in 2006

Humans

Brucellosis in humans occurs only sporadically. In 2006, there was one documented case of brucellosis in an immigrant worker who is thought to have contracted the infection during a vacation in his native country.

Figure 8
Number of human brucellosis cases in Austria between 1997 and 2006



Comparison between Austria and the EU in 2005

The incidence rate of notified human brucellosis cases in Austria is <0.1/100,000 population, which is below the EU average[3] of 0.2 cases/100,000 population. The Officially Brucellosis Free (OBF)

status for bovine herds 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 2005, *The EFSA Journal* (2006), 94. Data relating to MS-22

Food and food products

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

Animals

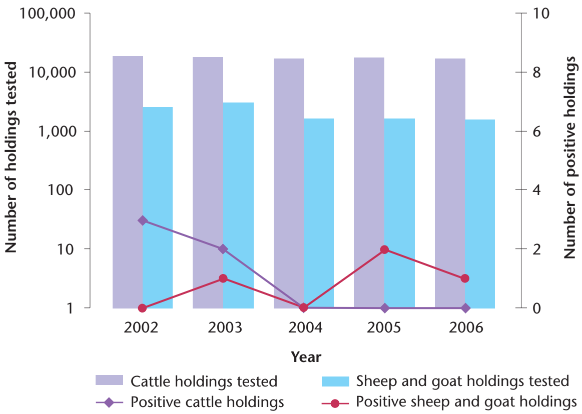
Austria was officially declared free of *B. abortus* in 1999 and free of *B. melitensis* in 2001, holding the statuses OBF (Officially Brucellosis Free) and OBmF (Officially *Brucella melitensis* Free).

Bovine brucellosis *(B. abortus):* Based on the Austrian Bang's disease regulation ("Bangseuchen-Untersuchungsverordnung 2004"), all bovines older than 2 years from 20% of all cattle holdings in each Austrian province were serologically tested in 2006. None of the 202,316 cattle tested (from 17,050 bovine herds) showed antibodies against *B. abortus.*

Ovine 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 2006, 11,372 blood samples from sheep and goats from 1,551 holdings were tested in Austria. Four animals of 1 of the 1,551 (= 0.06%) herds tested positive on serological examination; however, positivity could not be confirmed microbiologically.

Figure 9
Number of serologically tested holdings of cattle and small ruminants and number of holdings testing positive in Austria between 2002 and 2006



4. LISTERIOSIS

Listeriosis is an infectious disease caused by *Listeria monocytogenes*, a short, non-spore-forming, rod-shaped bacterium.

4.1 Occurrence

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

Consumption of contaminated foods of animal or vegetable origin is the main transmission route. Transmission among humans has rarely been observed (nosocomial infection of neonates). Infection through direct contact with carrier animals is unusual.

4.4 Incubation period

3 – 70 days, usually 3 weeks.

4.5 Symptoms

In healthy adults, the infection with *L. monocytogenes* mostly does not cause disease, even though some may develop diarrhoea. In immunocompromised individuals, such as neonates, the elderly and patients with chronic diseases, sudden intense headache, high fever, nausea and vomiting can occur. In pregnant women, the infection is mostly asymptomatic; however, infection of the unborn child may result in preterm or still birth. 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
- Boiling of raw milk before consumption
- No consumption of raw minced meat

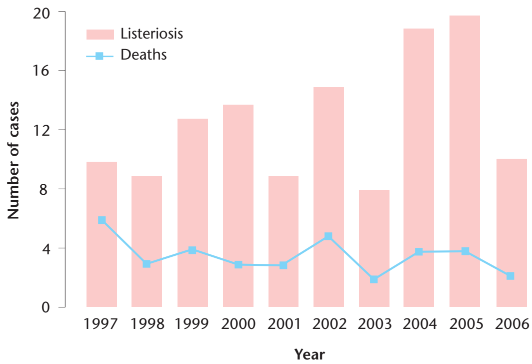
Regular washing of hands (before and after the preparation of meals) is an important measure of protection against pathogens. Fruits, vegetables and salads should be washed properly before eating. The preparation of meat and raw vegetables should be done with separate kitchen facilities or at separate times. These working facilities 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 2006

Humans

In 2006, 10 human cases of listeriosis were notified, one of which involved a pregnancy. This low number illustrates that listeriosis is a rare infectious disease in Austria, with a 2006 incidence rate of only 0.1/100,000 population. The death rate was 20% in both 2006 (2 of 10 patients died) and 2005 (4 of 20 patients died).

Figure 10
Microbiologically confirmed cases of listeriosis and fatal outcomes in Austria between 1997 and 2006



Comparison between Austria and the EU in 2005

The incidence rate of notified human listeriosis cases in Austria is 0.1/100,000 population, which is below the EU average[4] of 0.3/100,000 population.

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 2006, *L. monocytogenes* was found in the following food items: cheese from cow milk: 0.5% of samples (5/926); cheese from sheep milk: 15.6% of samples (7/45); various sorts of meat: 5.4% of samples (11/463 in poultry, 28/299 in pork and 12/174 in beef); fish and fish products (including smoked fish): 4.4% of samples (20/459).

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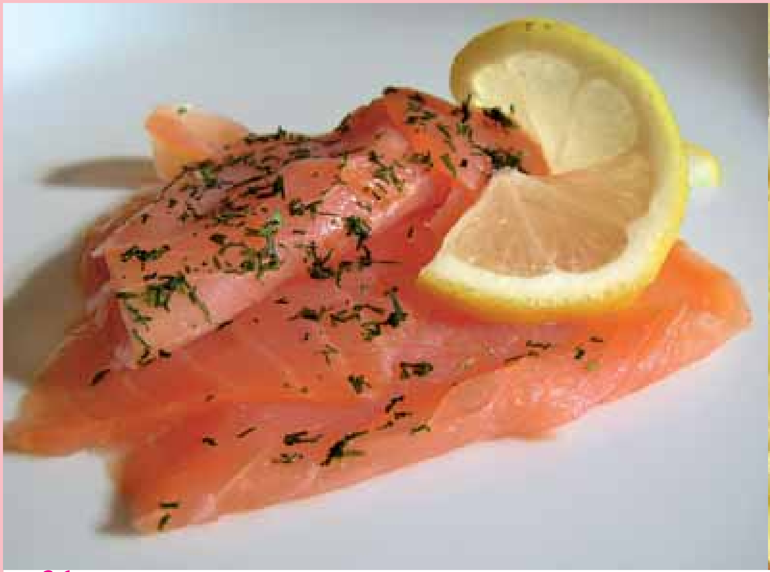
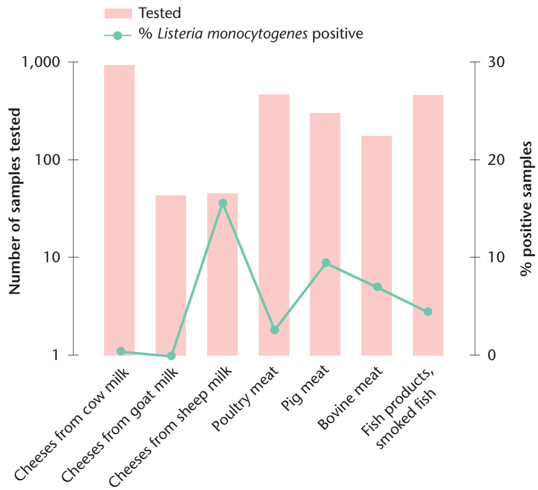
[4] The Community Summary Report 2005, *The EFSA Journal* (2006), 94. Data relating to MS-23



Overall, one fish sample and one sample of cheese made from pasteurized cow milk exceeded the maximum allowed concentration of *L. monocytogenes* (100 colony forming units per gram). Because samples exceeding the maximum allowed concentration are considered a direct threat to human health, these products were withdrawn from the market.

Figure 11
Foods of animal origin tested for *Listeria monocytogenes* in Austria in 2006



5. TRICHINELLOSIS

Trichinellosis, also called trichinosis or trichiniasis, is an infectious disease caused by 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. Today, it is infrequently found 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 begin to deposit up to 1,500 larvae. The juvenile larvae penetrate the intestinal mucosa and travel through the bloodstream to reach the muscles, where they form cysts that can 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 infection in humans vary, around 70 larvae appear to be sufficient to cause an infection. Transmission from person to person is not possible.

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.

5.6 Diagnosis

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

5.7 Therapy

Slightly infected patients normally recover without complications simply with bed rest and the aid of an analgesic or antifebrile. 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 it below –15°C for a longer period of time will kill the parasite. Smoking, pickling and drying are insufficient for irreversibly inactivating the larvae.

5.9 Trichinellosis in Austria in 2006

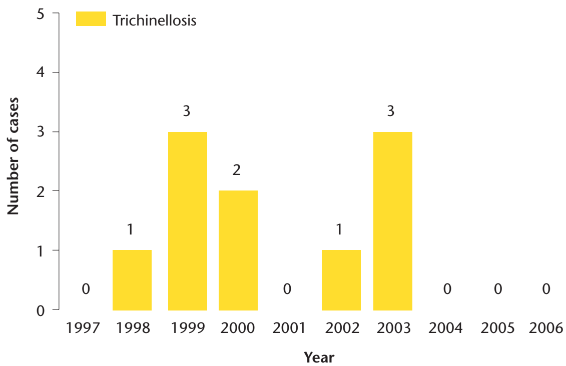
Humans

All cases of trichinellosis notified to Austrian health authorities in the past three decades were imported. In 2006, no single case of trichinellosis in humans was reported.

Comparison between Austria and the EU in 2005

In 2005, no single case of trichinellosis was reported in Austria. The EU incidence rate[5] is 0.1 cases/100,000 population.

Figure 12
Number of trichinellosis cases in Austria between 1997 and 2006



[5] The Community Summary Report 2005, *The EFSA Journal* (2006), 94. Data relating to MS-22

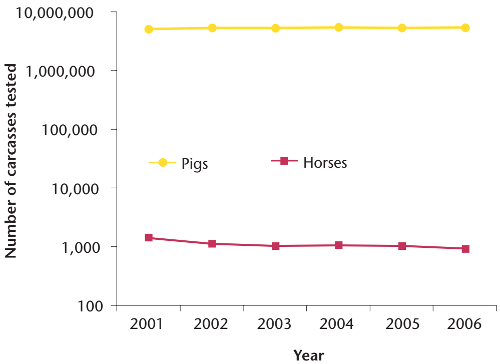
Food and food products

In 2006, carcasses of 5,361,710 pigs and 915 horses underwent the official meat inspection, with none of the specimens testing positive for *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.

Figure 13
Number of carcasses officially inspected for *Trichinella* in Austria between 2001 and 2006; no specimen taken was found positive



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 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, through 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 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, with lung involvement characterized by breathing difficulties and cough.

6.6 Diagnosis

Alveolar echinococcosis: Imaging procedures, such as sonography, lung 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: Again, 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 aims towards complete resection of the 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 treatment and intake of medications.

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 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. Also, thoroughly wash collected berries and mushrooms before eating.

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 2006

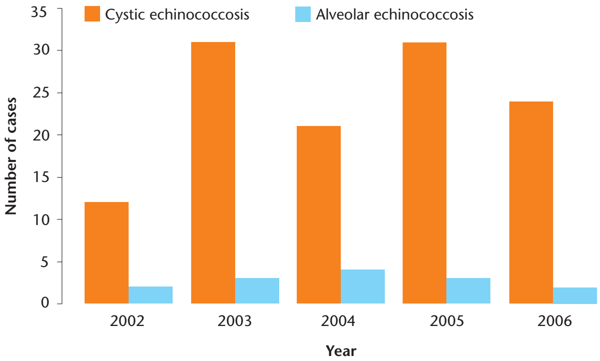
Humans

In 2006, 2 cases of alveolar echinococcosis and 24 cases of cystic echinococcosis in humans were diagnosed. Most cases of cystic echinococcosis were presumably acquired abroad.

Comparison between Austria and the EU in 2005

In 2005, 9 cases of echinococcosis were notified in Austria, yielding an incidence rate of 0.1/100,000 population, which is similar to the EU average[6] of <0.1 cases/100,000 population.

Figure 14
Cases of echinococcosis (cystic and alveolar) in Austria between 2002 and 2006



Food and food products

During mandatory meat inspection, every carcass of possible intermediate hosts is examined for *Echinococcus* cysts. In 2006, no infestation with *Echinococcus* 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.

[6] The Community Summary Report 2005, *The EFSA Journal* (2006), 94. Data relating to MS-20

7. TUBERCULOSIS *due to Mycobacterium bovis*

Tuberculosis (TB, consumption) leads the statistics for lethal human infectious diseases worldwide. The most common pathogen of tuberculosis in humans is *Mycobacterium tuberculosis*, a non-motile, rod-shaped bacterium. *M. bovis* and *M. caprae* are responsible for bovine tuberculosis and for only about 1% of all human tuberculosis cases in Austria.

7.1 Occurrence

Tuberculosis is prevalent worldwide, especially in Africa, 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, particularly 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 air-borne droplets released through the coughing and/or sneezing of infective carriers. In 80% of the patients, TB manifests in the lungs (pulmonary tuberculosis), but 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".

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 "closed", or non-infectious, 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, breathlessness, 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 prove an infection without symptoms, 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.

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 quite slowly and can rest in tuberculous granuloma for a long time, a long treatment duration is required, increasing the risk for the development of antimycobacterial resistance. In the case of confirmed tuberculosis, the patient has to be treated with a combination therapy including several specific antibiotics, including several specific antimycobacterial drugs. The treatment period is long (several months) in order to avoid potential relapse.

7.8 Preventive measures

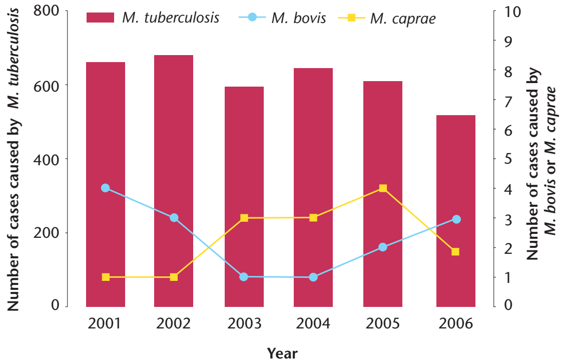
Because there is no effective vaccine against tuberculosis, the most important measure is to identify infected persons and to treat them effectively. After making a diagnosis of tuberculosis, it is essential to actively search for those who have potentially been exposed to the patient (e.g. family, circle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

7.9 Tuberculosis in Austria in 2006

Humans

The number of laboratory-confirmed cases of tuberculosis in humans has declined over the past years. In 2006, 516 infections with *M. tuberculosis* were confirmed, compared to only 3 cases with *M. bovis* and 2 cases with *M. caprae*.

Figure 15
Number of human tuberculosis cases by causative agent in Austria between 2001 and 2006



Comparison between Austria and the EU in 2005

In 2005, 6 human cases of tuberculosis caused by *M. bovis* or *M. caprae* were notified in Austria, compared with 119 cases reported Europe-wide.[7]

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, Switzerland and certain provinces in Italy.

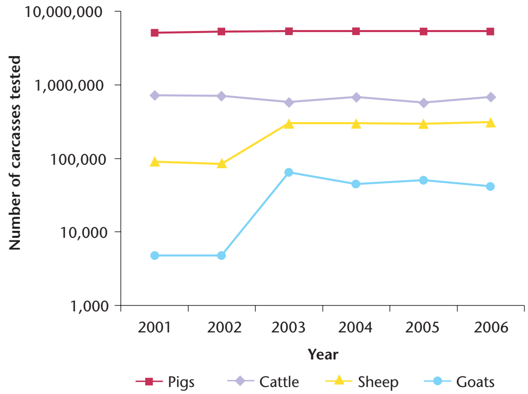
Food and food products

In 2006, no case of tuberculosis was detected in slaughtered cattle, sheep, goats and pigs. 2002 was the last year in which infected cattle were found in the course of meat inspection, when *M. caprae* was confirmed microbiologically in 22 of 55 animals from a holding in Western Austria.

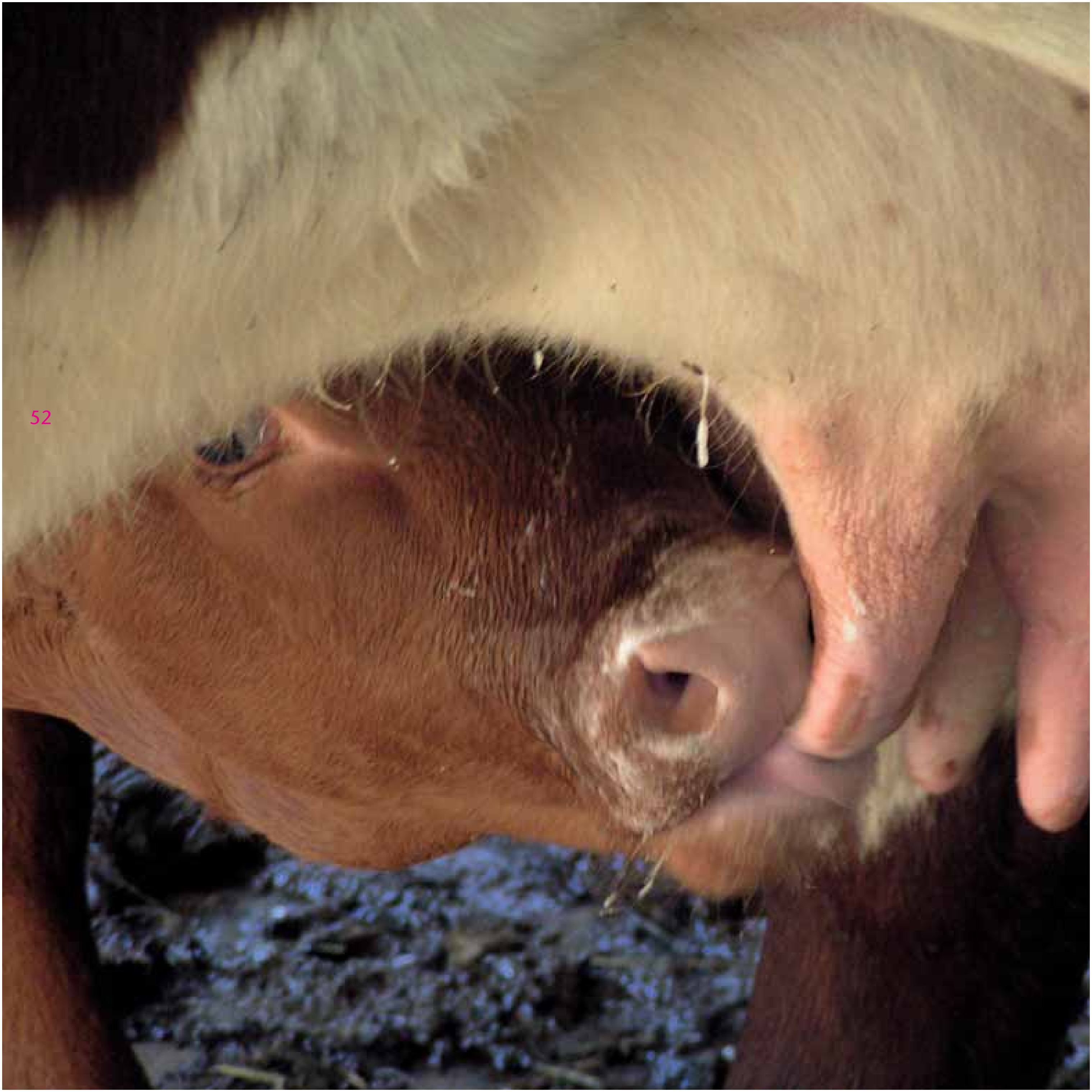
Animals

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 2006; no tuberculous changes were identified



[7] The Community Summary Report 2005, *The EFSA Journal* (2006), 94. Data relating to MS-17



8. VEROTOXIN-PRODUCING *Escherichia coli* (VTEC)

Verotoxin-producing *Escherichia 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* are pathogens that can produce severe diarrhoea in humans.

8.2 Reservoir

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

If infection is suspected on clinical grounds, the diagnosis is based on detection of the bacteria by culturing from stool or by determination of specific antibodies in blood.

8.7 Therapy

Antimicrobial treatment is generally contra-indicated, because the bacteria may produce more toxins under the influence of antibiotics, thus increasing the rate of complications. Correction of dehydration and electrolyte imbalances is sufficient. If severe secondary diseases (e.g. HUS) develop, treatment on an intensive care unit and haemodialysis may be necessary.

8.8 Preventive measures

Food-related 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. Washing hands after contact with animals and before preparation of meals is a must.

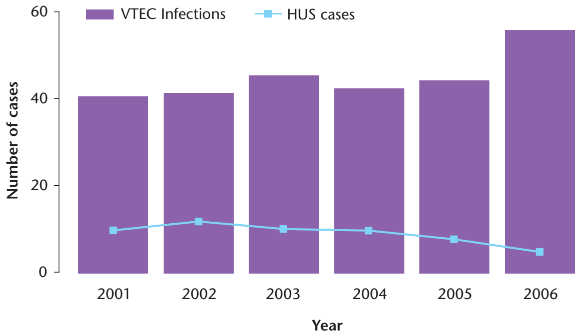
Precautions in the food processing industry: Persons infected with VTEC are not allowed to work in food production as long as they are shedding the pathogen. This also applies to kitchen employees, e.g. for restaurants, cafeterias, hospitals and children's homes.

8.9 VTEC infection in Austria – 2006

Humans

In 2006, VTEC was diagnosed 56 times. Among these 56 cases, 5 patients developed haemolytic uraemic syndrome (HUS).

Figure 17
Number of VTEC infections and secondary HUS in Austria between 2001 and 2006



Comparison between Austria and the EU in 2005

The incidence of confirmed cases of human VTEC infection in Austria is 0.6/100,000 population, i.e. half the EU average[8] of 1.2/100,000 population.

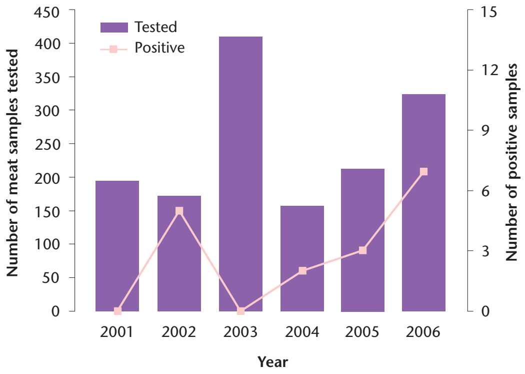
Food and food products

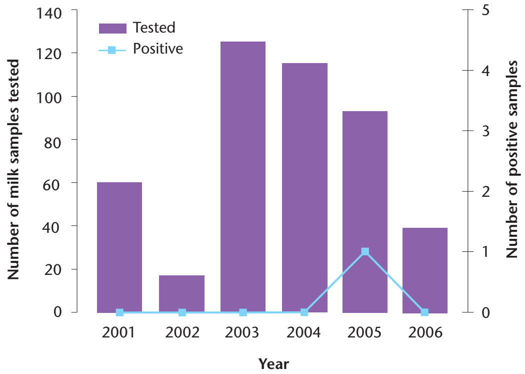
The revision and sampling plans of the Federal Ministry of Health, Family and Youth (BMGFJ) specify the number of food enterprises (restaurants, dairies, retail outlets etc.) and foodstuffs in each province that must be tested annually.

In 2006, VTEC were detected in 7 of 324 meat samples tested (5 samples of bovine meat intended to be eaten cooked and 2 samples of mixed minced meat). None of the 39 samples of raw cow, sheep, and goat milk was tested positive for VTEC.

[8] The Community Summary Report 2005, *The EFSA Journal* (2006), 94. Data relating to MS-18

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 between 2001 and 2006

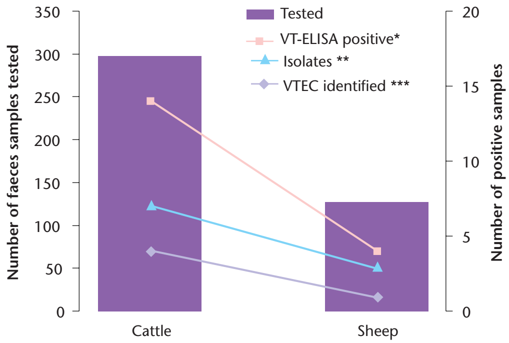




Animals

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 2006, sampling was carried out in animals at slaughter from 16 January to 17 November. VTEC was isolated from 4 of the 297 cattle faeces samples and from 1 of the 127 sheep faeces samples tested.

Figure 19
Number of cattle and sheep faeces samples tested and number of VTEC-positive samples in 2006



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

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

*** VTEC harbouring the *eae* gene, molecular biologically confirmed


ARIZONA

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