International surveillance network for the enteric infections - *Salmonella*, VTEC O157 and *Campylobacter*

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1 Acknowledgements.

The Enter-net international Dedicated Surveillance Network (DSN) is funded by the European Commission Directorate General Health and Consumer Protection, Unit C3 – Health Threats, under the Public Health Programme of Community Action in the field of Public Health (2003-2008), Decision 1786/2002/EC.

The hub of the surveillance system is hosted by the Health Protection Agency, Centre for Infections in Colindale, London, UK.

The participants in the Enter-net international DSN are the microbiologists in charge of the National Reference Laboratories for *Salmonella*, Vero cytotoxin-producing *Escherichia coli* and *Campylobacter* infections, and the epidemiologists with responsibility for their national surveillance. Names and contact addresses of these are listed in section 13. However, these named individuals are only an element of the number of people contributing to the network. There are innumerable medics, scientists, laboratory technicians, epidemiologists and IT specialists working in each institute who provide support and input to the operation, development, and success, of the network. My thanks go to them as well.

The Enter-net surveillance hub would like to thank the Scientific Advisory Committee, all of the participants, and all their associated staff for their contribution to the Network, for providing data, information and a critique of this report.

Finally, I would like to thank Francine Stalham for maintaining the Enter-net databases, and working so hard to maintain the running of the network and the annual workshop.

Ian Fisher
On behalf of the Enter-net Project Team, Scientific Advisory Committee and all the Enter-net participants.
May 2007.

2 Executive Summary

Enter-net is the international dedicated surveillance network for the enteric pathogens, *Salmonella*, *E. coli* and *Campylobacter*. The three main threads of the network are to;

1. Create and maintain international databases of these pathogens,
2. Circulate urgent enquiries on unusual events occurring within the participants of the network, which will;
    a. Identify international outbreaks occurring,
    b. Facilitate the international investigation of such outbreaks, and
    c. Enable public health interventions on an international scale when such international outbreaks are identified.
3. Provide International Quality Assurance Schemes for *Salmonella* and *E. coli* sero- and phage typing and *Salmonella* antimicrobial susceptibility testing to ensure high-quality microbiology and microbiological results.

The need for such a network is evidenced by the growing practise of manufacturing, harvesting or production of foodstuffs in single manufacturing plants and the subsequent distribution of these products across large economic areas, or even around the globe. Should contamination by a foodborne pathogen occur the potential to spread this infection across borders is significant. A mechanism to rapidly identify, and respond to, events of international significance is essential and Enter-net provides this.

The creation of the international databases allows for trends in infections to be tracked and new and emerging health threats to be recognised in a multi-national setting. It allows for background levels of infection to be analysed to help recognise unusual events and provide valuable information when international outbreaks and clusters are identified.

This report concentrates on the surveillance activities undertaken by the Enter-net DSN, and the results thereof, and is a valuable resource for all involved in enteric disease surveillance.

Highlights of this report.

The incidence of salmonellosis is declining, although with over 140,000 laboratory-confirmed cases from 29 countries in 2005, this remains a major public health problem within Europe and other Enter-net participating countries.
Salmonella Typhimurium increased in 2005 from the numbers reported in 2004. This serotype has overtaken Enteritidis and became the most common serotype identified by the national reference laboratories in France and the Netherlands in this decade. In Italy it has been the most common serotype for some time.
Antimicrobial resistance is a known problem within enteric bacteria; this is increasing within *Salmonella* infections. Within the Enter-net database in 2000 35.2% of all non-typhoidal infections were resistant to at least one antimicrobial; by 2005 this had increased to 40.8%.
The total numbers within the Enter-net VTEC database rose by 31.6%. VTEC O157 is the most common single serogroup identified, and these rose by 13.9%, non-O157 serogroups rose by 60.5%. These serogroups are under-diagnosed and hence under-reported in the majority of countries, so the full importance of these is not being recognised.
Campylobacter infections have overtaken the number of *Salmonella* infections in the majority of countries and have a greater burden of illness within the community although outbreaks are rarely seen.
Travel is a known risk factor for enteric pathogens, this is demonstrated particularly in Scandinavian countries where travel-associated cases account for between 70-80% of cases where known. Travel association is often under-reported.

3 Introduction

Enter-net is a DSN that aims to sustain and develop international surveillance for three bacterial enteric pathogens, namely *Salmonella*, Vero cytotoxin-producing *E. coli* (VTEC or STEC as these are synonymous) and *Campylobacter*. It is a co-ordinated network involving both microbiologists and epidemiologists. Since its inception in 1993, it has steadily drawn in new participants from European and non-European countries. At present, Enter-net receives and collates data and information from 36 different countries.

In order to fulfil its aim, Enter-net is working to achieve the following objectives:

- Improved completeness and timeliness of data collated on human *Salmonella*, Vero cytotoxin-producing *E. coli* and *Campylobacter* infections.
- Incorporation of the new Member States into the Enter-net DSN so that all EU countries are contributing to the international surveillance network.
- Improved recognition and response to potential threats to health arising from foodstuffs contaminated with *Salmonella*, VTEC, *Campylobacter* and other foodborne pathogens if appropriate.
- Facilitation of international outbreak detection and investigation, or widely distributed national outbreaks, of bacterial enteric pathogens through the rapid exchange of information and strains.
- Harmonisation of the surveillance of antimicrobial resistance in *Salmonellas* through repeat calibration studies. Extended surveillance of antimicrobial resistance by inclusion of other antimicrobials and by identification of resistance mechanisms where appropriate.
- Development of the routine external quality assurance (EQA) of *Salmonella* and VTEC sero- and phage-typing and of other virulence factors as appropriate by national reference laboratories through extending the existing ring-trial arrangements. Development and implementation of an EQA scheme for DNA profiles based on pulsed-field gel electrophoresis (PFGE).
- Continued promotion, facilitation and extended collaborative international research on typing enhancements to enteric surveillance within the EU through the PulseNet Europe Work Package as part of MED-VET-NET, and antimicrobial susceptibility testing (AST) of human enteric bacteria.
- Development of a consensus on standards for national participation in international surveillance against which the performance of Enter-net participants and co-ordinators can be assessed.
- Strengthening global surveillance of these infections through collaboration with the WHO and the European non-EU countries, Australia, Canada, Japan, New Zealand, South Africa, and other countries as appropriate.
- Development of international databases of fully characterised enteric bacteria isolates obtained through ad hoc and routine examination of foodstuffs.
- Extension of the range of pathogens surveilled to include the collection, collation and EU-wide analysis of data on *Campylobacter* infections.

This report presents an analysis of the *Salmonella*, VTEC and *Campylobacter* data received by Enter-net from EU and other partner countries for the year 2005.

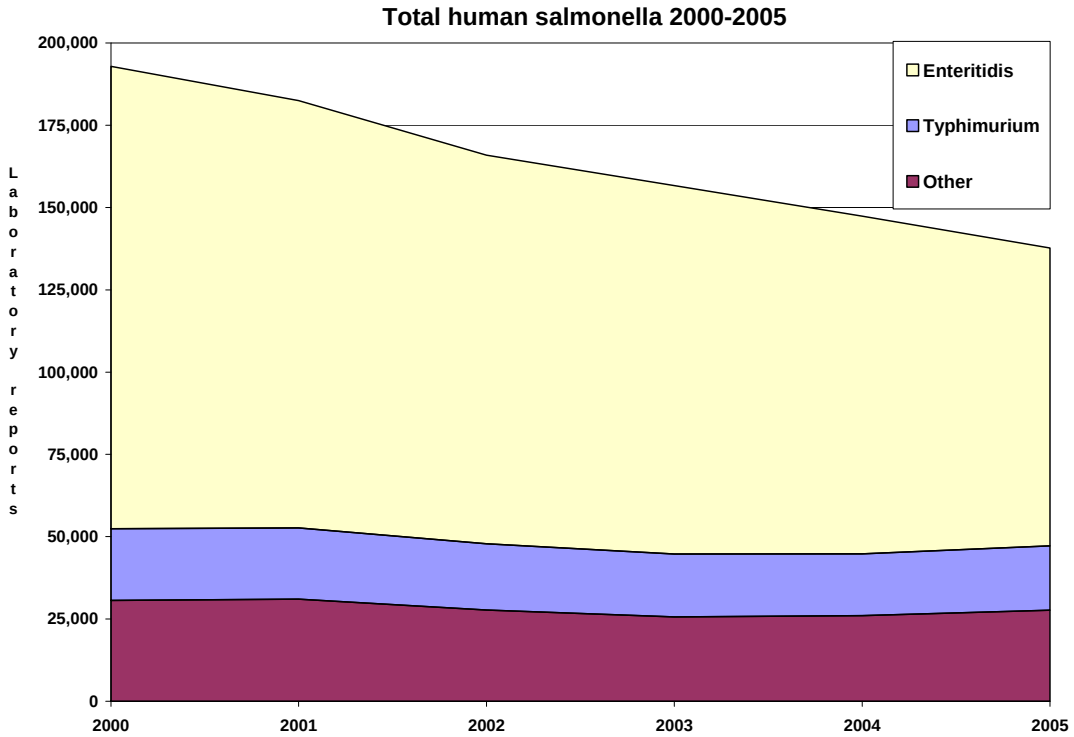
4 Summary results from the Enter-net databases.

One aspect of the Enter-net DSN project is to create, and maintain, international databases of Salmonella and VTEC infections. These databases enable the monitoring of trends and analysis of background rates of infections during outbreak alerts. Data within the databases are from the National Reference Laboratories (NRL) from the participating countries, and may not include details on all cases notified to the national surveillance institutes and systems within each country. Below are some summary results from the Enter-net databases.

4.1 *Salmonella* surveillance data trends.

The *Salmonella* database for 2000-05 includes data from 26 countries in the Enter-net DSN. More countries provide data to the live database, but these have provided retrospective data from 2000. Overall the number of cases of *Salmonella* infections has reduced from 192,887 cases in 2000 to 137,692 in 2005 (a reduction of 28.6%). The main serotype affected was *Salmonella* Enteritidis, which fell from 140,488 to 90,508 (down 35.6%), *Salmonella* Typhimurium fell from 21,787 to 19,551 (down 10.3%), other serotypes also went down from 30,612 to 27,633 (down 9.7%). Of note is that although Typhimurium fell over the course of the six years it increased by 4.3% between 2004 to 2005. Similarly the other serotypes increased by 6.1% between 2004 and 2005, having also increased by 1.6% in 2004 as compared to 2003. As the number of cases of salmonellosis isolated by the NRLs are known to be less than the number occurring within the community, salmonellosis remains a significant public health burden.

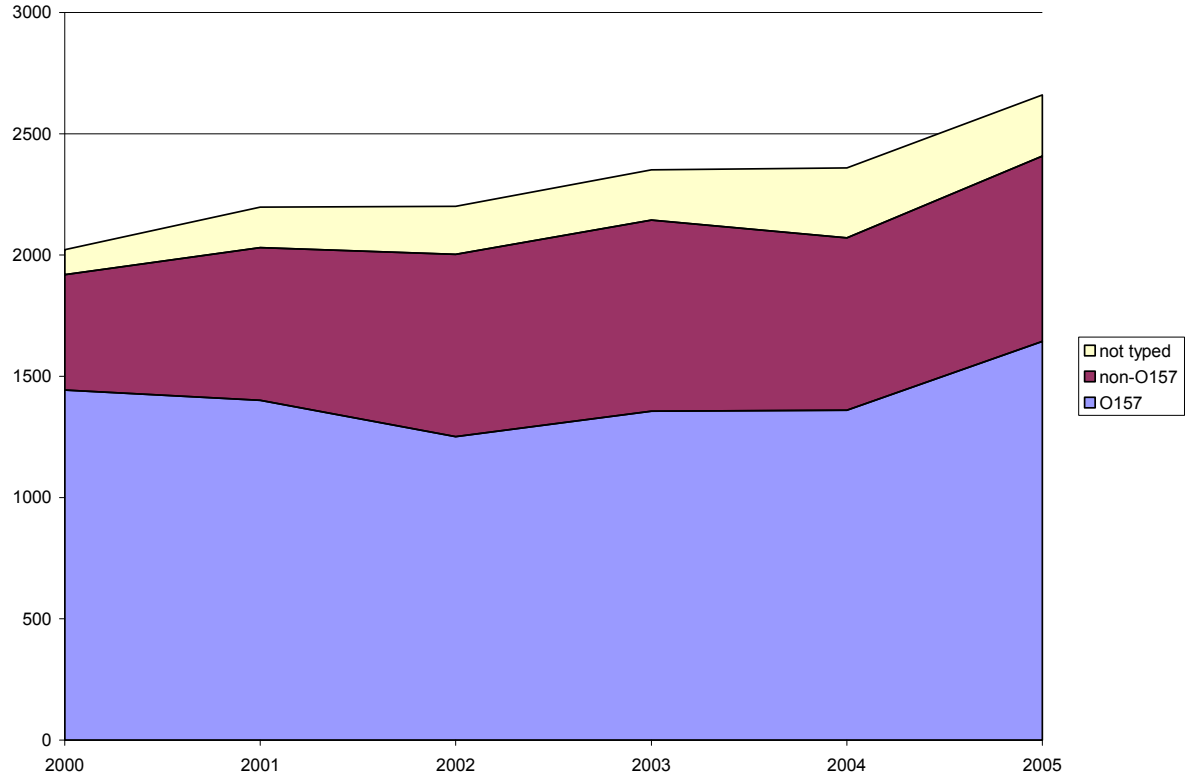
Graph Trends of salmonellosis 2000-05 (data from 26 countries)



4.2 VTEC surveillance data trends.

There are data from 21 countries for the years 2000-05 in the VTEC database, and unlike *Salmonella* infections the trend is upwards. There were 2,660 cases in 2005 compared with 2,022 cases in 2000 (a rise of 31.6%). VTEC O157 is the most common single serogroup identified, and this rose from 1,443 to 1,644 cases (an increase of 13.9%) however non-O157 serogroups are also being recognised and they rose from 476 to 764 cases (up 60.5%). O157 VTECs increased by over 284 cases between 2004 and 2005, although a significant number of these (circa 200) can be attributed to the outbreak in Wales in September 2005.

Graph Trends of VTEC 2000-05 (data from 21 countries)



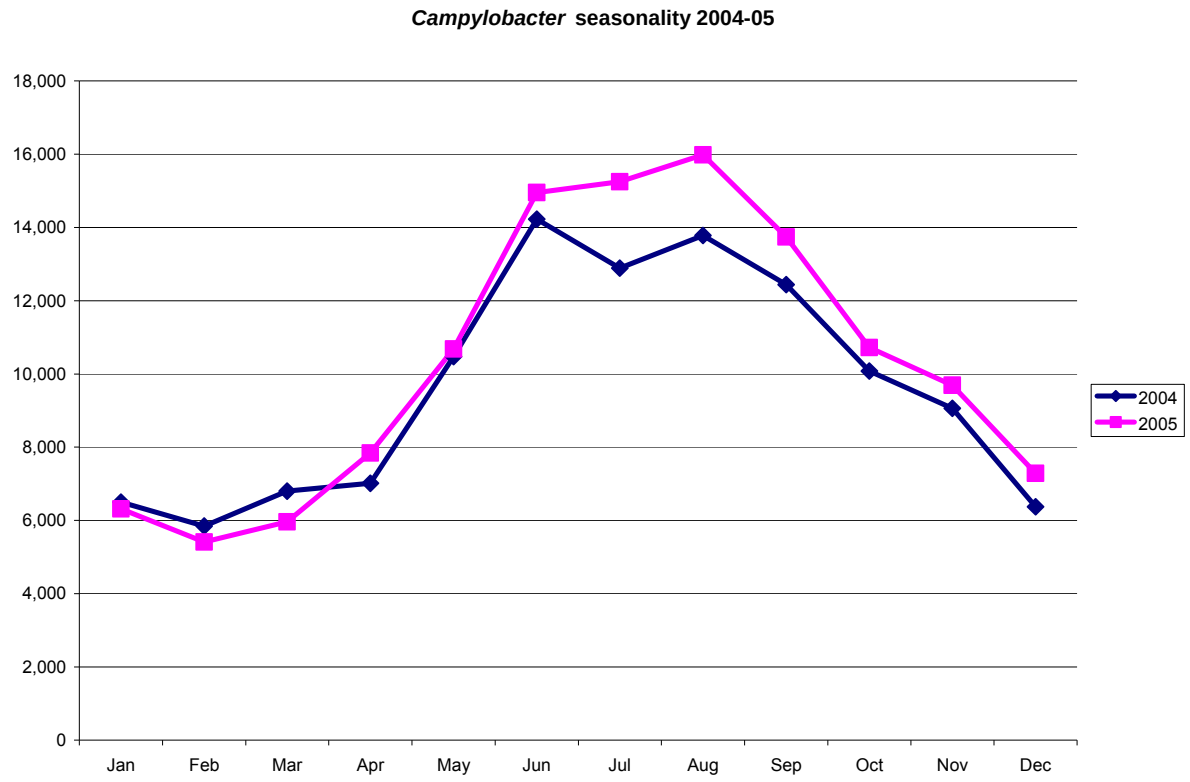
4.3 *Campylobacter* surveillance data.

Campylobacter surveillance was only introduced into Enter-net in 2004, hence retrospective data are not fully available, although some countries have provided this within their country text. Unlike *Salmonella* and VTEC infections it was agreed that a database of individual isolates would not be created, instead aggregated data are collected on a quarterly and annual basis. The aggregated data include species (where done), seasonality, age and gender breakdown, any travel associations, and information on antimicrobial susceptibility testing results.

In total there were 131,984 cases of *Campylobacter* infection reported to Enter-net during 2005. Species differentiation and antimicrobial susceptibility testing are not routinely undertaken by all countries, however, where further characterisation did take place, *Campylobacter jejuni* was the predominant species identified and several countries reported resistance to fluoroquinolones as an emerging problem.

From the 20 countries which have provided data for 2004 and 2005, there was an increase in cases from 122,921 in 2004 to 131,524 in 2005 (+7.0%). As can be seen from the graph with the exception of the first quarter of the year every month in 2005 was higher than the same month in 2004.

Graph Seasonality of campylobacteriosis 2004-05



It is interesting to note that despite the fact that campylobacteriosis is the most frequently reported bacterial cause of infectious intestinal disease in many countries; outbreaks of *Campylobacter* infection are rare. Of the small number of outbreaks reported to Enter-net most were confined to households.

4.4 Burden of illness.

It is not possible to compare rates of infection directly between countries as the systems are very different (these are described in section 6 – surveillance systems, and section 7 – microbiological methods). The table below gives a feel for the relative burden of *Salmonella*, VTEC and *Campylobacter* within each country; although it should be noted that even within countries the surveillance systems can be very diverse.

Table Infection rates by country per 100,000 of the population

Country	Pop[n]	Salmonella		VTEC		Campylobacter	
		Number	Rate	Number	Rate	Number	Rate
Austria	8.0	5,565	69.56	59	0.74	5,093 (6,287*)	63.4
Australia	20.1	8,240	40.39	NS	NS	NS	NS
Belgium	10.5	4,894	46.61	52	0.50	6,879	65.51
Bulgaria	7.9	303	3.84	NS	NS	NS	NS
Canada	32.2	6,096	18.89	796	2.47	1,411	4.37
Cyprus	0.7	64	9.14	0	0.0	NS	NS
Czech Republic	10.2	32,171	315.40	NS	NS	30,268	296.75
Denmark	5.5	1,806	32.84	160	2.91	3,677	66.85
E&W	52.8	13,062	24.73	954	1.81	46,298	87.69
Estonia	1.3	313	24.08	19	1.46	124	9.54
Finland	5.2	2,489	47.87	21	0.40	4,002	76.96
France	60.0	6,089	10.15	108	0.18	2,048	3.41
Germany	82.6	52,245	63,3	1,162	1,4	62,114	75,3
Greece	11.0	1,317	11.97	0	0.0	NC	---
Hungary	10.1	7,820	77.40	5	0.05	8,288	82.06
Iceland	0.3	NS	NS	NS	NS	NS	NS
Ireland	3.9	357	8.71	125	3.19	1,803	43.95
Italy	57.4	3,702	6.45	18	0.03	341	0.59
Japan	127.8	1,341	1.05	1,576	1.23	211	0.17
Latvia	2.3	640	27.83	0	0.0	0	0.0
Lithuania	4.2	2,023	48.17	NS	NS	NS	NS
Luxembourg	0.5	204	40.80	11	2.20	320	64.00
Malta	0.4	99	24.75	5	1.25	96	24.00
Netherlands	16.1	1,388	13.20	54	0.34	3,765	43.20
New Zealand	3.9	1,421	36.44	92	2.36	NS	370.30
Norway	4.5	1,528	33.96	18	0.40	2,631	49.70
Poland	38.6	20,254	52.47	0	0.0	47	0.12
Portugal	10.1	724	7.17	15	0.15	NS	NS
Romania	22.3	135	0.61	0	0.0	0	0.0
Scotland	5.1	1,135	22.25	176	3.26	4,581	89.82
Slovakia	5.6	12,248	220.30	61	1.09	2,203	39.34
Slovenia	2.0	1,549	80.70	9	0.45	1,088	54.40
South Africa	45.1	1,768	3.92	0	0.0	NC	---
Spain	41.1	6,180	15.02	15	0.04	338	0.82
Sweden	8.9	3,582	40.25	364	4.09	6,811	76.53
Switzerland	8.1	1,107	13.67	18	0.22	NS	NS

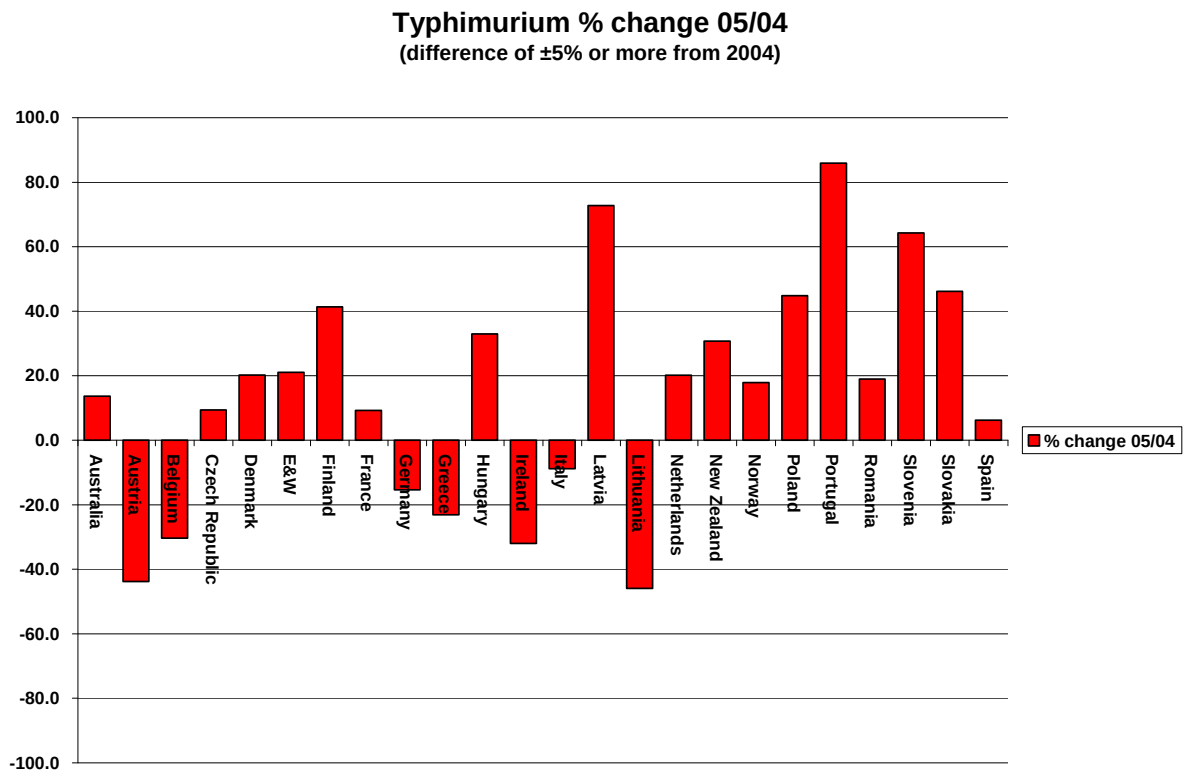
NS – No information or data submitted
NC – Data not collected
* Total of laboratory confirmed cases

5 Selected results from the Enter-net databases

Analysis of the data received by Enter-net over the past few years has revealed important changes in the epidemiology of both *Salmonella* and VTEC infections across Europe.

5.1 *Salmonella* Typhimurium

During the period 2000-05 *Salmonella* Typhimurium fell from 21,787 cases to 19,551 (down 10.3%), however it increased by 4.3% from 2004 to 2005. This was not seen by every country; where comparable data are available 23/31 (74.2%) of countries saw an increase. The figure below shows a selected number of countries that identified more than 50 cases of *Salmonella* Typhimurium in 2005, and had a difference of 5% or more on the previous year. There is no obvious geographical clustering between the countries that showed an increase or between those with a decrease. This serotype has overtaken Enteritidis and become the most common serotype identified by the national reference laboratories in France and the Netherlands in this decade. In Italy it has been the most common serotype for some time. Early indications from the *Salmonella* database for 2006 indicate that this overall increase may be continuing.



5.2 *Salmonella* antimicrobial resistance

Analysis of the antimicrobial resistance data received from nine countries that have supplied data for all years between 2000 and 2005 (Table), has revealed a significant increase in the proportion of non-typhoidal *Salmonella* isolates that are resistant to at least one antimicrobial. In 2000, 35.2% of all non-typhoidal isolates were resistant to at least one antimicrobial, by 2005; this proportion had risen to 40.8%.

Table Non-typhoidal antimicrobial susceptibility results 2000-05

Year	Sensitive	(%)	Resistant*	(%)	MDR#	(%)	Total
2000	12,625	64.83	4,734	24.31	2,114	10.86	19,473
2001	11,851	59.45	5,808	29.13	2,276	11.42	19,935
2002	12,039	60.33	5,694	28.53	2,222	11.14	19,955
2003	12,696	60.43	5,436	25.88	2,876	13.69	21,008
2004	23,085	63.32	9,372	25.71	3,999	10.97	36,456
2005	20,648	59.21	8,917	25.57	5,309	15.22	34,874

*Isolates resistant to between one and three antimicrobials
#Isolates resistant to ≥ four antimicrobials

Of particular concern is the significant increase in the number of isolates with multi-drug resistance. This increased from 10.9% in 2000 to 15.2% in 2005.

5.3 VTEC

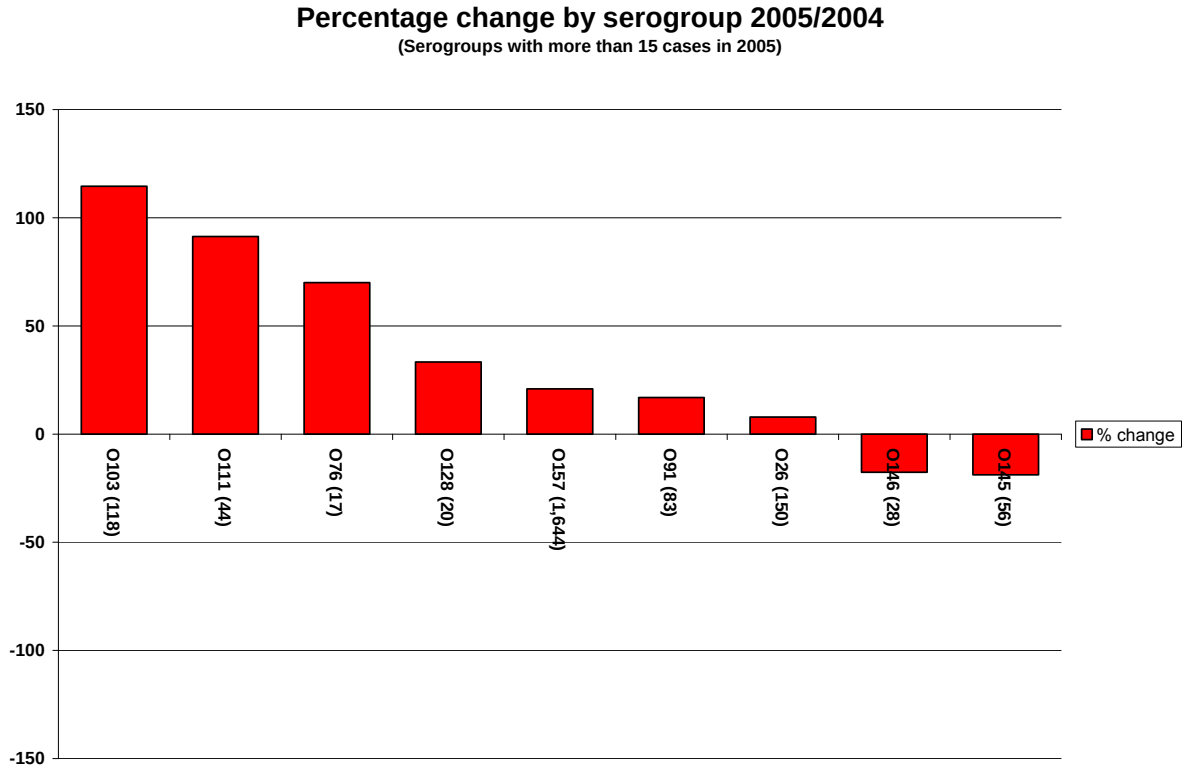
There are 4,641 VTEC cases from 26 countries in the database for 2005. Serogroup O157 is the predominant group with almost two-thirds of the cases (Table).

Serogroup	Frequency	%
O157	2,937	63.3
O26	169	3.6
O103	123	2.7
O91	83	1.8
O145	57	1.2
O111	45	1.0
O146	29	0.6
O128	22	0.5
O55	18	0.4
O76	17	0.4
Non-O157	537	11.6
Untyped/untypable	254	5.5
Other	350	7.5
Total	4,641	100.0

As was reported in 2004, there is a significant difference between the reporting of O157 versus non-O157 cases in continental and non-continental Europe. In 2005, 50% or over of all VTECs were reported as non-O157 infections in Austria, Denmark, Germany, Italy, Luxembourg, Norway, Slovenia and Switzerland.

Changes between 2005 and 2004.

Data for the 21 countries that have provided comparable both 2005 and 2004 are presented below. Of the nine serogroups with more than 15 cases reported in 2005, seven of them have increased compared with 2004.



5.3.1 Clinical manifestation of VTEC cases.

Although clinical information is not often readily available for laboratory confirmed cases, reviewing the results for VTEC infections in 2005 shows that for O157 VTECs the proportion of cases with bloody diarrhoea or HUS is higher than those infected with strains of non-O157 VTEC.

Clinical manifestation	O157	Non-O157	Not typed
Diarrhoea	29.43%	69.18%	77.65%
Bloody diarrhoea	39.71%	10.04%	10.59%
HUS	21.71%	15.77%	8.24%
Asymptomatic	9.14%	5.02%	3.53%
Grand Total	100.00%	100.00%	100.00%

5.4 Campylobacter.

5.4.1 Age and gender.

Overall the gender breakdown shows slight bias towards males rather than females. Where the age and gender are known there are 1.12 males to each female. Of note is the fact that the ratio for those under the age of 15 is 1.33:1, and the ratio for those over 15 is only 1.05:1, and in the over 65s there are more females than males. The majority of cases occur in the 15-64y age group.

Campylobacter

		Male		Female		Not known		Totals	
Age Band		Freq	%	Freq	%	Freq	%	Freq	%
	0-11m	2,477	1.9	1,950	1.5	30	0.0	4,457	3.4
	1-5y	10,065	7.6	7,899	6.0	111	0.1	18,075	13.7
	6-14y	7,405	5.6	5,182	3.9	65	0.0	12,652	9.6
	15-64y	41,677	31.6	38,708	29.3	360	0.3	80,745	61.2
	65y+	6,463	4.9	6,985	5.3	55	0.0	13,503	10.2
	Not known	231	0.2	172	0.1	2,149	1.6	2,552	1.9
	Total	68,318	51.8	60,896	46.1	2,770	2.1	131,984	100.0

5.4.2 *Campylobacter* Outbreaks.

It is interesting to note that despite the fact that campylobacteriosis is the most frequently reported bacterial cause of infectious intestinal disease in many countries; outbreaks of *Campylobacter* infection are rare. Of the small number of outbreaks reported to Enter-net most were confined to households.

6 Surveillance systems

6.1 Austria

In Austria confirmed and suspected cases of bacterial foodborne disease are notifiable by law. The physician consulted has to report notifiable diseases to the local health authority (Bezirksverwaltungsbehörde) within 24 hours. Since February 2002, the human microbiological laboratories are also obliged to notify all positive results. These reports are forwarded to the state health authority (Landessanitätsdirektion) and submitted monthly to the Ministry of Health, Family and Youth.

6.2 Australia

Data provided to Enter-net on human *Salmonella* infections in Australia are derived from the National Enteric Pathogens Surveillance System (NEPSS), which is operated by the Microbiological Diagnostic Unit – Public Health Laboratory at the University of Melbourne on behalf of the Commonwealth, States and Territories.

NEPSS is a laboratory–based system which integrates data generated by *Salmonella* typing and reference laboratories throughout Australia.

NEPSS data contribute to, and complement, data in the National Notifiable Diseases Surveillance System (NNDSS) which is based on collation of data arising from State and Territory jurisdictional notification processes.

6.3 Belgium

Data on human salmonellosis cases were obtained from 182 clinical laboratories via a surveillance system which is updated weekly.

Few laboratories routinely examine stools for VTEC, data are only collected by a small sentinel network.

Data on *Campylobacter* were collected from the network of sentinel laboratories. In Belgium, this network includes 60% of approved laboratories (110/182) and tests about 68% of all samples for *Campylobacter*.

6.4 Bulgaria

No data or information provided.

6.5 Canada

The National Enteric Surveillance Program (NESP) is a close to real time surveillance system that monitors short-term fluctuations in the number of enteric infections, thus enabling the quick detection of outbreaks. Statistically significant increases are highlighted and supplemented with epidemiological information where available through the Centre for Infectious Disease Prevention and Control (CIDPC). Response and follow up activities to such highlighted events are then initiated and organised by epidemiologists.

NESP is also supplemented with other surveillance initiatives such as PulseNet, Food Safety and Zoonoses Teleconferences and ad-hoc outbreak teleconferences. Technological improvements such as the PulseNet Discussion Board, automatic submission of PFGE patterns and the WEB-based NESP will improve the timeliness of event recognition and response even further.

6.6 Cyprus

In Cyprus salmonella has been a mandatory notifiable communicable disease since 1983 and campylobacter and VTEC since January 2005. Physicians are obliged by law to report individual cases to the Unit for Surveillance and Control of Communicable Diseases at the Medical and Public Health Services of the Ministry of Health of Cyprus.

6.7 Czech Republic

Data collection and processing is carried out using the EPIDAT program (based on the EPI-INFO system). EPIDAT was created by the Regional Public Health Service of Central Bohemia to ensure the notification, registration and analysis of morbidity due to infectious diseases. It extends the previous Information System of Transmissible Diseases of the Computer Technique Department of the Regional Public Health Institute in Ostrava that had been in use between 1982 and 1992. Since 1993, EPIDAT has been used nationwide by all public health services and currently is part of the National Health Information System and forms the basis of local, regional and national surveillance of infectious diseases. Throughout the years, the program has been adapted to users' needs and available equipment.

EPIDAT is a health information system based on notification by attending physicians and those within the public health service. It comprises personal data on patients and individuals at risk, it is governed by legislation on the protection of personal data in health information systems. The system consists of several interdependent sections allowing data entry at District level and data coding and transmission to the Regional level and to the National Institute of Public Health, where major analyses for different periods are conducted. Data are entered continuously, data export is performed at weekly intervals, transmissions are executed by e-mail, and outputs are prepared weekly. The input and output files are referred to the National Institute of Public Health, where access rights are dealt with. The transmitted data are encoded.

6.8 Denmark

Positive cases diagnosed by a clinical microbiological laboratory are reported through the laboratory surveillance system to the Unit of Gastrointestinal Infections at the Statens Serum Institut (SSI). The laboratories must report positive results to the SSI within one week. The results are recorded in the Register of Enteric Pathogens (REP) maintained by SSI. Positive cases are recorded as episodes, i.e. each person-infectious agent combination is only registered once in a six-month period.

A new database for the registration of food- and water-borne outbreaks was introduced in Denmark towards the end of 2005. This database is replacing the different parallel reporting systems for outbreaks that have been in place in previous years. The new system is accessible via the Internet to registered users. It is open to all professionals working with food-borne outbreaks such as the food control authority staff and the medical officers. Information about outbreaks and their ongoing investigation, eventually leading to a full outbreak report, can be entered by the investigators. In addition, the system is designed to capture outbreak notifications, i.e. initial reporting of verified or merely suspected outbreaks,

thus hopefully helping to alert other investigators and leading to more outbreaks being noted and solved.

6.9 England and Wales

Clinical microbiology laboratories voluntarily report data on microbiologically confirmed cases of infectious disease to the Health Protection Agency Centre for Infections (CfI). The data usually reported include:

- organism
- source laboratory (laboratory at which the specimen is initially examined)
- reference laboratory
- specimen date
- case identifier (name or laboratory identification number)
- date of birth
- sex

CfI maintains surveillance on nearly 4,000 species, subspecies and subtypes of microbial pathogens including *Salmonella*, *Campylobacter* and VTEC.

The following events must occur for data on a given case to be included in a national surveillance database for laboratory confirmed-infections:

- an infected individual must consult a clinician (GP or hospital doctor)
- the doctor must arrange for a specimen to be taken (faeces, blood etc.) and referred to a clinical microbiology laboratory,
- the laboratory must isolate or identify a pathogen,
- the laboratory must submit a report to the national surveillance centre.

The national surveillance scheme for laboratory confirmed infections is not designed to provide direct measures of the numbers of cases of infection in the population caused by those pathogens under surveillance. There are a number of factors that influence the degree of the disparity between the number of recorded laboratory reports for any given pathogen and the number of cases of infection in the population. These include:

- severity of disease
- duration of symptoms
- selectivity of screening protocols employed by diagnostic laboratories
- sensitivity of available diagnostic techniques

The severity of the disease and the duration of symptoms associated with infection dictates both the proportion of cases that consult clinicians and the proportion of presenting cases from whom specimens are collected. Both severity and duration of disease vary widely across the range of zoonoses under surveillance.

Laboratory screening protocols determine the investigations that are conducted on any given specimen. As such ascertainment of cases for any given pathogen is directly related to the laboratory screening protocols in operation.

There are marked variations in the sensitivity of the routine diagnostic techniques employed for different species and subtypes of pathogen. The sensitivity determines the proportion of cases that are identified by laboratory investigation. A range of microbiological techniques is used to identify the different types of zoonotic pathogens. These vary greatly in sensitivity and specificity. These include light microscopy, isolation, immunoassays, novel techniques based on molecular biology.

The disparity between laboratory report surveillance data and infection in the community is lessened for pathogens that cause severe disease because these infections are more often screened for, and laboratories use more sensitive methods.

CfI receives preliminary reports of general outbreaks of IID from laboratories, health protection units or boards and local authority environmental health (public protection) departments. Standardised questionnaires are then sent to the appropriate health protection unit in order to collect a minimum dataset on each outbreak. The investigating consultant is asked to complete the questionnaire when the outbreak investigation is complete. The completed questionnaires are returned to the national surveillance centre and the data entered onto a database. The following data are collected on the questionnaires:

- Health Protection Unit
- Date of outbreak
- Place of outbreak (hospital, restaurant, school, community etc.)
- Pathogen
- Mode of transmission (foodborne, person to person, mixed, other)
- For foodborne outbreaks
- Food
- Evidence (microbiological, epidemiological)
- Numbers of cases, admitted to hospital, deaths

Surveillance of general outbreaks of IID provides information on the specific risk factors associated with different pathogens and also trends in the importance of these factors. However the completeness of the surveillance data is mainly dependent on the sensitivity of detecting outbreaks at local level. The ease of identification of outbreaks is associated with the same factors that affect laboratory report surveillance (see above).

6.10 Estonia

In Estonia it is obligatory to notify all cases of salmonellosis, campylobacteriosis and *E. coli* infections. According to the Communicable Diseases Prevention and Control Act (2003) GPs and microbiological laboratories have to report to the Health Protection Inspectorate each confirmed case. *E. coli* infection has been notifiable since 1958, salmonellosis – since 1959 and campylobacteriosis – since 1997.

6.11 Finland

Human cases of salmonellosis and campylobacteriosis are notified to the National Infectious Disease Register (NIDR) by microbiological laboratories; VTEC is notified by laboratories and clinicians. The system collects data on travel within 7 days prior to the onset of symptoms, which allows distinguishing between domestic and imported cases. The National Public Health Institute (KTL) collects further information on all VTEC cases with a detailed questionnaire. HUS is not notifiable.

6.12 France

The National Reference Laboratory (NRL) for *Salmonella*, located at the Pasteur Institute in Paris, carries out the surveillance of *Salmonella* infections in France. Non-typhoidal *Salmonella* infections are not mandatorily notifiable, whereas typhoid and paratyphoid infections are.

The NRL for *Salmonella* coordinates a network of approximately 1,500 medical laboratories, representing one third of all laboratories in France. It is estimated that 50% of all *Salmonellas* are isolated in these laboratories. The NRL for *Salmonella* receives the strains or a report on the strains (including serotyping results) isolated by these laboratories.

The isolates reported to Enter-net include only those that have been received and serotyped by the NRL. This explains the difference in the number of *Salmonella* isolates reported to Enter-net compared to the NRL reports. In 2005, the number of isolates reported by the NRL to Enter-net represented 60% of all *Salmonella* isolates in the NRL database.

In France, most medical laboratories do not routinely examine stools for Shiga-toxin producing *Escherichia coli* (STEC), and STEC infections are not mandatory notifiable.

However, since 1996, a HUS surveillance system based on a national network of 31 paediatric nephrology departments has been established for children under 15 years of age. The National Reference Laboratories for Shigella and *E. coli* and Shigella at the Pasteur Institute in Paris and its associated laboratory at the Robert Debré University Hospital, test serum samples from HUS cases for antibodies to the lipopolysaccharides of STEC serogroups and collect and study STEC isolates from HUS and diarrhoeal cases.

HUS case definition: a patient <15 years of age with evidence of renal failure (serum creatinine >60 μmol/l if patients <2 years old, >70 μmol/l if patients >2 years old) and microangiopathic haemolytic anaemia (haemoglobin level <10g/100ml and schizocytes ≥ 2%)

STEC case definition: a patient with gene sequences encoding Stx production by PCR or STEC isolation from stool specimen, or antibodies to the lipopolysaccharide of eight STEC serogroups (O26, O55, O91, O103, O111, O128, O145, and O157) in serum samples.

Campylobacter surveillance is based on a network of voluntary medical laboratories that send their isolates to the National Reference Laboratory for *Campylobacter* and *Helicobacter* (CNRCH). The surveillance system, based on private and hospital laboratories, was set up in 2002 to complement the hospital laboratories based system: 325 private laboratories and 92 hospital laboratories participate in 2005.

6.13 Germany

The German national surveillance system is based on the Infectious Disease Control Act (Infektionsschutzgesetz, IfSG) which was implemented in 2001. Within the framework of this act, the Robert Koch Institute was designated to establish systems for surveillance and prevention of communicable diseases, including the development and conduct of epidemiological and laboratory analyses as well as research into the causes and diagnosis of infectious diseases. The institute collaborates with the federal state authorities, the national reference centres, other scientific facilities as well as international organisations.

Under the Infection Disease Control Act, German laboratories, hospitals and outpatient facilities report cases of notifiable infectious disease or respective positive test results to the local health departments. Local authorities then obtain additional information on the patient and electronically transfer the data through state authorities to the central database at the Robert Koch Institute. All cases are validated by case definitions, which are under regular revision.

A part of isolates of these reported cases were send to the national reference laboratories and centres for further identification, i.e. subtyping for epidemiological purposes.

The National Reference Center (NRC) for *Salmonella* and other bacterial enterics (NRC *Salmonella*) is located at the Robert Koch Institute, Branch Wernigerode. It carries out the surveillance for *Salmonella*, enteropathogenic *E. coli* (especially STEC), *Campylobacter* and other enterics in cooperation with a laboratory network consisting of routine medical laboratories.

The data reported to Enter-net include only isolates typed by the NRC. In 2005 5% of *Salmonella* cases of the national surveillance system reported to Enter-net by the NRC (STEC 65%).

6.14 Greece

In 2003, surveillance systems in Greece were modernised. The revised Mandatory Notification System included salmonellosis as well as outbreaks of food or waterborne disease.

Data from three *Salmonella* Reference Centres (the National Reference Centre for Southern Greece, Northern Greece and Crete) are sent to the Hellenic Centre for Infectious Disease Control (KEEL) on a monthly basis. *Campylobacter* is included in the Laboratory Surveillance System. Data are limited (age, pathogen) but data are sent every 3 months.

VTEC infections are included in the Mandatory Notification System and data are sent to Enter-net on a monthly basis.

6.15 Hungary

Salmonellosis, VTEC and campylobacteriosis are reported as infectious enteritis syndromes based on symptoms. Following the results of laboratory tests this syndrome-based diagnosis is modified to an aetiology-based diagnosis, although in some cases, reports are based solely on laboratory test results. HUS cases with laboratory confirmed VTEC infection are registered in the group of "Illness caused by pathogenic *E. coli*" (but not all the cases in this group are VTEC cases).

Salmonella infections in humans have been notifiable since 1959, the disease caused by VTEC has been notifiable since 1998 in Hungary. The laboratories of NPHMOS have been able to identify *Campylobacter* since 1987, human cases of campylobacteriosis have been notifiable since 1998. The physician uses a case report form to notify salmonellosis/VTEC-disease/campylobacteriosis, this is sent by mail to the municipal institute of the National Public Health and Medical Officer's Service (NPHMOS). The specialist at the institute, immediately records the information into a centralised electronic database. Hungary also has a laboratory based surveillance system; NPHMOS has access to a representative dataset from most microbiological laboratories.

6.16 Iceland

No data or information provided.

6.17 Ireland

In Ireland, human salmonellosis, campylobacteriosis and VTEC infections (under the category EHEC) are statutorily notifiable diseases – salmonellosis since 1948, and

campylobacteriosis and VTEC infection since January 1st 2004. Data on *Campylobacter* and VTEC infections had been collected through voluntary reporting systems since 1999.

Additional typing and subtyping data is collated by the National *Salmonella* Reference Laboratory (NSRL) on all human *Salmonella* isolates received. For VTEC, epidemiological information acquired through enhanced surveillance is combined with microbiological information obtained on isolates received from all regions by Public Health Laboratory, Health Service Executive, Dublin, Mid Leinster.

6.18 Italy

Salmonellosis is a notifiable disease. The Istituto Superiore di Sanita (ISS) coordinates a network of microbiological laboratories[1]. Data on approximately 5,500 human serotyped isolates are reported to the Enter-net surveillance network each year.

VTEC and HUS are not notifiable diseases and surveillance is carried out on a voluntary basis with most laboratories not routinely examining stools for signs of VTEC infection. However, a surveillance system for HUS in paediatric patients has been in place since 1988. HUS cases are notified to ISS, which examines specimens for the presence of VTEC infection. ISS also receives suspected VTEC strains from clinical microbiology laboratories. Nevertheless, due to the nature of the surveillance system, HUS cases represent most of the VTEC infections identified.

Campylobacteriosis is also not a notifiable disease with surveillance carried out on a voluntary basis. *Campylobacter* is not routinely searched for by all clinical laboratories and not all of those who culture it report to Enter-net. Therefore, the number of cases recorded does not reflect the real incidence. However, the number of clinical laboratories reporting to Enter-net has increased.

6.19 Japan

No data or information provided.

6.20 Latvia

Salmonellosis, campylobacteriosis and VTEC are obligatory notifiable diseases. The notification time is 12 hours, reporting mode - by phone and in writing by filling in the standard form. Clinicians in the public and private healthcare sectors are legally responsible for notifying the infectious diseases, as well as for case management.

Notification is required for cases of suspected infectious disease, a change or discharge of diagnosis of an infectious disease, the final diagnosis and outcome of infectious disease and laboratory confirmation of the diagnosis.

Epidemiologists of local branches of the Public Health Agency (PHA) perform investigation of the cases (outbreaks), take samples for laboratory investigation, collect, store and analyse the epidemiological data according to the standard form, organise preventive and control measures. Foodborne disease outbreaks are investigated in cooperation with the Food and Veterinary Service (http://www.pvd.gov.lv), State Sanitary Inspection and other related institutions.

There are also different regulations that describe obligatory procedures on immediate notification of serious public health events, e.g. five or more cases of salmonellosis, food intoxications and other acute intestinal infections with specified and unspecified etiology.

6.21 Lithuania

In accordance with the order made by the Ministry of Health every probable, suspected or confirmed case is registered by the local healthcare institution, who in turn informs the territorial public healthcare institution. All detected cases are reported to the national level Centre for Communicable Diseases Prevention and Control (CCDPC) and recorded in the State register for communicable diseases. The Clinician must inform the territorial public health institution about suspected, probable or confirmed cases within 12 hours by phone, and must send an urgent report within 72 hours. When diagnosis is changed the clinician must inform the territorial public healthcare institution within 12 hours. The territorial public healthcare institutions register every case using a standard form. At the end of every month data on morbidity are summarised and sent to the national level CCDPC.

6.22 Luxembourg

The microbiology unit at the Laboratoire National de Santé is the reference laboratory for *Salmonella* and *Campylobacter* in Luxembourg. Human isolates are obtained from hospital laboratories, in-house stool cultures and private laboratories. The unit works very closely with health inspectors when suspect clusters of cases are identified, in order to initiate outbreak investigations.

6.23 Malta

Salmonellosis, VTEC and campylobacteriosis are all notifiable diseases. Medical practitioners are legally obliged to report all suspected cases, whereas, medical diagnostic laboratories are legally obliged to report all positive results. Details of patients and disease are sent via the Infectious Disease Certificate by postal mail or fax to the Department of Public Health. Notifications may also be received via synapse direct, which is a secure e-mail system.

6.24 Netherlands

Salmonella is surveilled on a sentinel basis in the Netherlands. Sixteen regional public health laboratories (PHLs) participate, covering about 64% of the Dutch population. Basic information on the patient is collected, such as age, gender, residence, and country of infection.

Since April 1999, all Dutch medical microbiological laboratories contribute to the surveillance of Shiga-toxin producing *E. coli* (STEC). Epidemiological information is gathered by the municipal health services, who interview all diagnosed cases in order to obtain detailed information on risk factors and clinical aspects, using a standardised questionnaire.

Campylobacter is surveilled on a sentinel basis. Since 1995, 15 regional public health laboratories (PHLs) have reported the total number of observed cases on a weekly basis. In addition to this a patient - control study (CaSa project) was conducted between 2002 and 2003. This study collected and recorded information on age, gender, residence, travel, species and antibiotic resistance in collaboration with the PHLs. Since 2004, within the sentinel laboratories the collection and recording of individual patient and pathogen

information has become standard procedure and now runs in parallel with the weekly report compiled by the PHLs.

In the Netherlands a study[2] was performed to estimate the (selective) proportion of patients consulting their GP for an episode of gastroenteritis for whom laboratory tests were requested. In addition adherence of GPs to the guidelines for diagnostic test regime was ascertained. Data were collected from a GP network in the Netherlands. For 12% of the GP patients with gastroenteritis, a stool sample was requested and tested for enteric pathogens. In most patients, the duration, followed by severity of complaints or a visit to a specific, high-risk country was reported as reasons to request laboratory diagnostics. *Campylobacter* (requested for 87% of the tests), *Salmonella* (84%), *Shigella* (78%) and *Yersinia* (56%) were most frequently included in the stool tests.

Campylobacter was detected most often in patients. Test requests did not always comply with existing knowledge of the aetiology of gastroenteritis in GP patients and were not always consistent with the Dutch GP guidelines. Therefore, the data of this study can be used to develop educational approaches for GP's and were already used for revision of the GP guidelines.

6.25 New Zealand

Salmonellosis, VTEC and campylobacteriosis are all notifiable diseases in New Zealand. Medical practitioners are legally obliged to report all suspected cases to their local Medical Officer of Health. Case details (names, dob, address etc) and the results of investigations (risk factors, outcomes) are entered onto a national notifiable disease database and sent to the Institute for Environmental Science and Research (ESR) for national analysis and reporting. Outbreaks and the results of investigations are also reported through this database. For salmonellosis and VTEC cases, the notification and investigation information is integrated with the laboratory typing information held by the ESR to ensure cases are laboratory confirmed and to identify cases that have not been notified. Each week the notification data is examined using the CDC Early Aberration Reporting System (EARS) to identify potential outbreaks.

6.26 Norway

Human cases of salmonellosis, EHEC-infections and campylobacteriosis are reported to the Norwegian Surveillance System for Communicable Diseases (MSIS) by microbiological laboratories and clinical doctors. The system distinguishes between domestic and imported cases. The severity of the disease at the time of reporting is also recorded. However, the surveillance system does not follow individual patients over time to record further disease development and final outcome.

HUS is not a notifiable disease per se, but is reported in relation to an EHEC diagnosis.

6.27 Poland

Information on salmonellosis is obtained via aggregated laboratory reports, aggregated reports from medical providers and individual reports of *Salmonella* Typhi, *Salmonella* Paratyphi and extra intestinal infections. Ninety per cent of the aggregated reports are laboratory confirmed cases, the remainder are not laboratory confirmed but are linked to cases who are. All data are sent to the National Institute of Hygiene at regular intervals. Public Health Officers investigate foodborne outbreaks.

Notification of VTEC and *Campylobacter* infection has been mandatory since 2003.

6.28 Portugal

No data or information provided.

6.29 Romania

A surveillance system is currently being developed to monitor pathogens that cause acute diarrhoea. This system was not in place during 2004, and surveillance of non-typhoidal *Salmonella* was done on a voluntary basis. However, typhoidal infections are notifiable by law and the sending of isolates for confirmation by the National Reference Laboratory is mandatory.

6.30 Scotland

The surveillance of *Salmonella* in Scotland is based on laboratory reports to Health Protection Scotland (HPS) from the Scottish *Salmonella* Reference Laboratory (SSRL). Isolates from routine diagnostic clinical and veterinary laboratories are sent to SSRL for confirmation and typing.

Diagnostic laboratories report isolates of *E. coli* O157 and other serogroups to HPS. The Scottish *E. coli* O157 Reference Laboratory (SERL) also reports isolates of *E. coli* O157, other non-O157 serogroups, and sero-positives of *E. coli* O157. HPS liaises closely with SERL and collates laboratory data with exposure, clinical and outcome details obtained from local investigators, in a standardised enhanced surveillance dataset for each case (defined as a person-infection-episode, with microbiological confirmation), for all serogroups. Asymptomatic cases, and infections likely to be due to secondary spread, are differentiated based on detailed exposure and clinical histories obtained from local investigators HPS also contacts patients and physicians, to investigate longer-term VTEC health outcomes, and follows up all clinically reported cases of HUS irrespective of microbiological confirmation.

Isolates of *Campylobacter* are routinely reported to Health Protection Scotland by the clinical microbiology laboratories.

6.31 Slovakia

Cases of salmonellosis and campylobacteriosis are reported by doctors using standard forms which are actively checked by the Regional Public Health Authorities (RPHAs). Each individual patient report with all relevant data is sent from the RPHAs to the National Central Register of Communicable diseases in Banská Bystrica once a week.

6.32 Slovenia

Slovenia has had a communicable disease surveillance system in place for more than 50 years. Physicians are obliged by law to report individual cases, outbreaks and clusters of certain communicable diseases to regional institutes of public health, who send data on a daily basis to the National Institute of Public Health. According to the by-law on the notification of communicable diseases, *Salmonella* and *Campylobacter* should be reported within three days of diagnosis.

6.33 South Africa

The surveillance of enteric pathogens began in 2000. The Enteric Diseases Reference Unit (EDRU) monitors gastrointestinal and invasive disease caused by *Salmonella* infection.

6.34 Spain

The Spanish surveillance system for monitoring *Salmonella*, VTEC and *Campylobacter* infection is based on the number of isolates sent voluntarily by microbiology laboratories (mainly hospital laboratories) to the National Centre of Microbiology. *Salmonella* Isolates are regularly received from approximately 80% of all laboratories in Spain. Currently the volume of *Campylobacter* isolates received is not considered to be representative of the national situation. In 2005, *Campylobacter* isolates were only sent by nine of the 19 Spanish regions.

Please note data from Spain is reported by date of isolation rather than date of receipt in the reference laboratory.

6.35 Sweden

In Sweden salmonellosis, enterohaemorrhagic *E. coli* (EHEC) and campylobacteriosis are all notifiable diseases under the Communicable Disease Act (for both the laboratory and the physician).

Surveillance is mainly based on passive case findings, although samples are taken from case contacts. Both clinical and sub-clinical cases are included. The total number of cases is based on reports from both the laboratories and the physicians; however, information about country of origin is only available from physician reports. Investigations to trace the source of the infection are always performed.

HUS is not notifiable in Sweden.

6.36 Switzerland

The Swiss Federal Office of Public Health (SFOPH) coordinates the national surveillance of communicable diseases. Notifications by physicians and laboratories are addressed to cantonal (regional) health authorities and to the SFOPH under the provisions of the public health legislation, namely the Regulation on Disease Notification of January 13th 1999.

Under this scheme, the content of data provided for each notification depends on the source. Laboratories report diagnostic confirmations (subtype, method, material) whilst for selected diseases, physicians additionally cover the subsidiaries of clinical diagnosis, exposition, development and measures. Besides the case-oriented reporting, physicians also have to report observations of unexpected clusters of any communicable disease. At the SFOPH, the combined notifications of laboratories and physicians are analyzed.

The surveillance of foodborne diseases follows the mandatory system. The laboratories are required to report identifications of enteric and invasive *Salmonellae*, VTEC and *Campylobacter*.

7 Microbiological methods

7.1 Austria

The National Reference Centre for *Salmonella* (NRCS) at the Austrian Agency for Health and Food Safety receives nearly all human and non-human *Salmonella* isolates. The sending of isolates is not compulsory, but coverage is fairly complete. All *Salmonella* isolates received at the NRCS undergo serotyping and if feasible further subtyping (e.g. all *Salmonella* Enteritidis strains undergo phage typing).

The Austrian Reference Centre for EHEC at the Department of Hygiene, Microbiology and Social Medicine, Innsbruck Medical University, collects all positive human specimens throughout Austria, plus some veterinary and food samples connected to an outbreak, for phenotypic and molecular typing in order to detect outbreaks at a very early state, especially when other data do not indicate a common origin. In case of an outbreak, an immediate response to the Austrian Ministry of Health and the County’s Landessanitätsdirektion is followed by urgent calls to Enter-net & PULSENET.

The National Reference Laboratory for *Campylobacter* only receives strains of major interest.

7.2 Australia

Isolates are sent to the State Public Health Laboratories where they undergo typing. Isolates requiring phage typing are sent to the reference laboratories in Melbourne (MDU) and Adelaide (IMVS).

7.3 Belgium

All *Salmonella* isolates were serotyped using the Kauffmann-White scheme. Where necessary, additional biochemical tests are conducted to confirm identification or to differentiate between subspecies. Phage typing and antimicrobial susceptibility testing are performed on a random sample of *Salmonella* Enteritidis, *Salmonella* Typhimurium, *Salmonella* Hadar and *Salmonella* Virchow isolates. A random sample of two additional serotypes (*Salmonella* Brandenburg and *Salmonella* Derby) underwent antimicrobial susceptibility testing only.

7.4 Bulgaria

No data or information provided.

7.5 Canada

Human *Salmonella* isolates are sent by all of the provincial public health laboratories and reference centres to the National Microbiology Laboratory (NML) for characterisation, as part of surveys, enhanced surveillance activities and outbreak investigations. The NML also provides a routine reference service. The isolates received may undergo antimicrobial resistance testing, phage typing, PFGE and toxin testing.

7.6 Cyprus

During 2005, *Salmonella* culture and serotyping was done at *Salmonella* Reference Laboratory, Microbiology Department, Nicosia General Hospital. *Salmonella* Enteritidis and *Salmonella* Typhimurium isolates were sent to the Robert Koch-Institute *Salmonella* Reference Laboratory in Germany for phage typing.

7.7 Czech Republic

Salmonella isolates are routinely serotyped in district laboratories, only selected isolates have been sent to the NRL (all the non-intestinal isolates, rare and unusual serotypes, resistant serotypes, strains involved in outbreaks). On a random sample of *Salmonella* Enteritidis and *Salmonella* Typhimurium phage typing and antimicrobial susceptibility testing are performed.

7.8 Denmark

All *Salmonella* isolates are sent to the reference laboratory at the SSI for further typing.

Denmark does not have a centrally coordinated standard testing method for VTEC. Laboratories testing samples from approximately 50% of the Danish population use molecular detection methods (PCR or dot blot hybridisation), which detect verocytotoxin genes, followed by slide agglutination and further typing methods. Most of the remaining laboratories use slide agglutination of suspect colonies, with OK-antisera against the most common VTEC and EPEC serotypes. At a few laboratories verocytotoxin-specific ELISA detection is used. In 2005, all VTEC isolates were sub-typed using PFGE in real-time at the SSI.

7.9 England and Wales

All *Salmonella* isolates from cases of human infection are serotyped and subjected to biochemical identification. Isolates belonging to clinically and epidemiologically important serotypes – eg *Salmonella* Typhi, paratyphi A & B, Enteritidis, Typhimurium, Hadar and Virchow are phage typed using internationally recognised and published schemes. All isolates are tested for resistance to several antimicrobial agents. Selected isolates are sub-typed by a range of molecular methods, including plasmid-profiling, pulsed-field gel electrophoresis (PFGE), and variable number of tandem repeat (VNTR) fingerprinting.

All isolates of *E. coli* O157 are serotyped, phage typed and tested for VT genes. Selected strains are further tested by PFGE as appropriate.

7.10 Estonia

All isolates of *Salmonella* are serotyped. Since 2004, antimicrobial susceptibility testing has also been performed. Phage typing is not undertaken.

7.11 Finland

All domestic *Salmonella* isolates and almost 90% of the imported ones are sent to the Enteric Bacteria Laboratory (EBL) of KTL for further typing. All strains are serotyped, *Salmonella*

Enteritidis, *Salmonella* Typhimurium and *Salmonella* Paratyphi B strains are phage typed, and domestic strains are genotyped by *Xba*I-PFGE. The antimicrobial susceptibility of all strains is determined by the disc diffusion method to 12 antimicrobials. In addition, the nalidixic acid resistant strains are tested for MIC to ciprofloxacin by E-test.

Almost all of about 25 clinical microbiology routine laboratories use SMAC plates to screen non-SF O157 VTEC strains. A few laboratories test also the Stx toxin by commercially available methods and one routine laboratory use also in house test for the stx_1 and stx_2 genes. All VTEC isolates are sent to EBL for the verification and further tests. In addition, all primary faecal cultures of the patients hospitalized with suspected VTEC infection can be sent to EBL. At EBL, multiplex PCR is used for stx_1, stx_2, *eae*, *ehxA* and *saa*, a specific colony is fished out by colony hybridization if necessary, O:H serotyped and genotyped by *Xba*I-PFGE. All O157 strains are also phage typed.

Campylobacter strains are only occasionally sent to EBL.

7.12 France

The NRL for *Salmonella* systematically serotypes the strains they receive. Phage typing is carried out on all *Salmonella* Typhi and Paratyphi B isolates and on a sample of *Salmonella* Typhimurium and *Salmonella* Enteritidis isolates. However, at present phage typing is suspended due to a lack of phages. Ribotyping is carried out on all *Salmonella* Typhi isolates. PFGE typing is not routinely carried out, but is done during outbreak or other investigations. Antibiotic resistance testing is carried out on a random sample of isolates.

The NRL for *E. coli* and its associated laboratory exams stool samples or STEC isolates for the presence of stx1, stx2, eae and hlyA by PCR. STEC isolates are also characterized using the following molecular methods: ribotyping, molecular serotyping and PFGE. Human sera are tested for antibodies to the lipopolysaccharides of eight of the major serogroups (O26, O55, O91, O103, O111, O128, O145, and O157) by line-blot immunoassay.

On arrival at the National Reference Laboratory for *Campylobacter* and *Helicobacter*, *Campylobacter* isolates are tested for viability and then confirmed as *Campylobacter* by standard phenotypic identification. Phenotypic methods and real-time PCR are then used to differentiate between *C. jejuni*, *C. coli* and *C. fetus*. The other species are identified by comparison of their 16S rDNA sequences to those of DNA databases using the BLAST program. Identification at the species level is considered correct when isolates are at least 99% identical to only one species. *Campylobacter* isolates are evaluated for susceptibility to seven antimicrobial drugs (Nalidixic acid, Ciprofloxacin [since 2000], Erythromycin, Amoxicillin, Gentamicin, Tetracyclines and Doxycycline [since 2004]) by the agar diffusion method on Mueller Hinton agar enriched with 5% sheep blood using antibiotic disks according to the Antibiogram Committee of the French Society for Microbiology (CA-SFM) for *Campylobacter*.

7.13 Germany

All of the received samples (stool probes, isolates or mixed cultures) of enteropathogenic *E.coli* were investigated for the presence of the genes *stx1, stx2, eaeA and ehxA* by PCR. STEC isolates were further determined by serotyping and in case of *E.coli* O157 by phage typing. As well as with *Salmonella* isolates these strains were compared by PFGE or molecular serotyping (*fliC)* or ribotyping during outbreak investigations.

Sera from HUS patients were tested for antibodies to the *E.coli* lipopolysaccharides of six serogroups (O26, O91, O103, O111, O145, and O157) by microtiteragglutinationassay.

Antibiotic resistance testing was performed on all of the strains against 17 antimicrobial drugs (Amikazin, Ampicillin, Cefotaxime, Cefotiame, Cefoxitin, Ceftazidime, Chloramphenicol, Ciprofloxacin, Gentamicin, Kanamycin, Mezlocillin, Mezlocillin/Sulbactam, Nalidixic Acid, Oxytetracyclin, Streptomycin, Sulphamerazin +Trimethoprim, Sulphamerazin) by microdilution assay according to NCCLS M 100-S8 M7-A5 (2000a).

Campylobacter isolates were not reported to Enter-net. These strains were characterized only by PFGE for outbreak investigations.

7.14 Greece

Salmonella culture and serotyping was done at the three *Salmonella* Reference Laboratories in Athens, Salonica and Crete.

7.15 Hungary

Salmonella
Isolates are obtained by culturing the faeces samples of the patients on selective-differentiating media, followed by biochemical testing and serotyping. Since 2003 the Hungarian and the Colindale sets of phages have been used in parallel for phage typing of the human *S*. Enteritidis isolates received by the Phage-typing and Molecular Epidemiology Department of the 'Johan Bela' National Centre for Epidemiology. For *S*. Typhimurium isolates the schemes of Felix and Callow as well as Anderson et al. are also in use.

VTEC
The sample culturing is performed on EMB, SMAC, CT SMAC media in the county laboratories of NPHMOS. The immunomagnetic separation is applied to enrich of specimens in the National Reference Laboratory. Different feno-(i.e. sero-, phage- and colicin) typing, antimicrobial susceptibility testing, enterohemolysin production, β-D-glucuronidase activity and genotyping methods (i.e. RAPD, PFGE) had been used for complex typing of isolates. The toxin production was detected by various methods (Vero cell toxicity test, latex agglutination, ELISA, DNA probes and PCR).

Campylobacter
Isolates are obtained by culturing the faeces samples of the patients on selective-differentiating media, using reduced oxigen tension and special incubation temperature, followed by biochemical tests.

7.16 Iceland

No data or information provided.

7.17 Ireland

In 2004, antimicrobial susceptibility testing and serotyping were performed on all *Salmonella* isolates, whilst phage typing was performed on all isolates of *Salmonella* Enteritidis and *Salmonella* Typhimurium. PFGE was performed in cases of suspected outbreaks/clusters.

Suspected VTEC isolates are forwarded to the Public Health Laboratory, Health Service Executive, Dublin, Mid Leinster for serogrouping, and assessment for Vero toxin production and antimicrobial susceptibility. All VTEC O157 isolates are forwarded to the HPA

Laboratory of Enteric Pathogens at Colindale for phage typing. PFGE is performed in cases of suspected outbreaks.

There is currently no reference service in Ireland for *Campylobacter*.

7.18 Italy

The National Reference Centre for Enteric Pathogens (NRCEP) at the Istituto Superiore di Sanita (ISS) receives some of the human *Salmonella* isolates serotyped by local or regional reference centres. The sending of isolates is not compulsory and coverage is not complete. PFGE and antimicrobial susceptibility testing is carried out on a sample of all isolates received, phage typing is performed on a sample of *Salmonella* Enteritidis and *Salmonella* Typhimurium isolates.

Some clinical laboratories look for VTEC O157 using Sorbitol MAC and slide agglutination reagents. At ISS, VTEC are identified and typed by PCR-based methods that detect verocytotoxin and intimin genes. Serodiagnosis is performed at ISS looking for LPS antibodies specific for the VTEC serogroups O157, O26, O103, O111 and O145.

The NRCEP at the ISS receives human *Campylobacter* isolates and a report on the strain. Biochemical methods are used to differentiate between species. Antimicrobial susceptibility testing and genotyping are also performed. Serotyping techniques are currently being developed.

7.19 Japan

No data or information provided.

7.20 Latvia

In 2005 *Salmonella* isolates were serotyped and antimicrobial susceptibility tests were performed in the Laboratory of Microbiology of the S/A "Public Health Agency". Phage typing was not commenced. Since 2006 the S/A "Public Health Agency" does not direct involve laboratories. The institution purchases Salmonella, Campylobacter and VTEC diagnostics partly from the Food and Veterinary Service Laboratory and partly (including typing) from the Laboratory of Infectology, Center of Latvia.

7.21 Lithuania

Serotyping of *Salmonella* isolates is conducted routinely by the laboratories of public health centres, however, in 2005, the serotype was not determined for a small proportion of isolates (2%). Phage typing is not undertaken.

In 2005, *E. coli* O157 and EPEC isolates were not tested for the presence of VTX1 and VTX2.

All microbiological laboratories routinely test stool samples for the presence of *Campylobacter*. Typing of positive isolates is undertaken by the National Public Health Investigation Centre.

7.22 Luxembourg

In late 2003, the National Health Laboratory started routinely genotyping all submitted *Salmonella* isolates with PFGE. However, typing of *Salmonella* Enteritidis isolates was discontinued after June 2005, as differentiation of isolates by the method proved to be insufficient for epidemiological purposes.

An increasing number (5) of monophasic *Salmonella* isolates have been observed which in PFGE analysis tend to cluster with *Salmonella* Typhimurium isolates. This trend has also been observed in other countries.

7.23 Malta

Sorbitol and Mackonkey agar are used to culture *E. coli*. Subculture is performed on nutrient agar medium. Serological tests are carried out to detect *E. coli* O157. Positive isolates undergo further characterisation using API and the shiga-toxin test.

Medium and broth are used to culture *Campylobacter*. Four typical colonies are identified and a gram stain is performed. Subculture is done on blood agar medium. Positive isolates undergo further characterisation using API, which includes sensitivity testing for Erythromycin.

7.24 Netherlands

All first isolates of *Salmonella* are sent to the National Reference Laboratory (NRL) at the RIVM in Bilthoven (National Institute for Public Health and the Environment) for serotyping, phage typing and antimicrobial susceptibility testing. Systematic monitoring using quantitative testing of antimicrobial susceptibility in *Salmonella* started in 1998. The number of strains tested increased considerably in 2001 and 2002. Testing was done using the micro broth dilution test according to NCCLS guidelines. In 2006, MLVA was introduced on an ad hoc basis for typing of *S.* Typhimurium strains suspected to be outbreak-related.

Isolates of *E. coli* O157 are sent to the NRL for confirmation and further typing. Apart from O and H-typing, isolates undergo tests to determine the presence of shiga toxin genes (stx1 and stx2), the *E. coli* attaching and effacing gene (eae-gene), and the enterohaemolysin gene. Isolates are also characterised by pulsed field gel electrophoresis (PFGE).

7.25 New Zealand

All human isolates of *Salmonella* are sent to the Enteric Reference Laboratory (ERL), ESR, the national reference laboratory for New Zealand, for serotyping and phage typing. The antimicrobial susceptibility of all typhoidal and a representative sample (approx 20%) of non-typhoidal *Salmonella* is tested. Some strains are further analysed by PCR and PFGE.

Isolates of *E. coli* O157 are sent to the ERL for confirmation and further typing. Apart from O and H-typing, isolates undergo tests to determine the presence of shiga toxin (stx1 and stx2), *eae* and enterohaemolysin genes. Isolates are also characterised by phage typing, PFGE and stx_2 subtyping.

Isolates of *Campylobacter* species are not routinely submitted to the ERL. All isolates received are identified biochemically. Serotyping using the Penner passive haemagglutination scheme is performed (*C. jejuni* isolates), as well as PCR, PFGE and in some cases multi-locus sequence testing (MLST).

7.26 Norway

All *Salmonella* isolates from humans, animals, food and feed are sent to the Reference Laboratory for Enteropathogenic Bacteria at the National Institute of Public Health for identification, verification and further characterization by pheno- and genotyping methods. *Salmonella* Enteritidis and *Salmonella* Typhimurium are phage typed if the infection is acquired in Norway. Isolates belonging to suspected outbreaks and all *Salmonella* Typhimurium isolates are further characterised by multi-locus variable number of tandem repeat analysis typing (MLVA).

All isolates suspected to be an EHEC are also sent for confirmation and further typing, including PCR-analysis for shiga toxin (Stx1 and Stx2) and intimin-gene (eae-gene). These isolates are not tested for antibiotic susceptibility.

Isolates of *Campylobacter* are only submitted to the laboratory if belonging to a suspected outbreak. Furthermore, a representative number of isolates from each region is submitted to the laboratory for susceptibility surveillance, altogether approximately 250 strains.

7.27 Poland

No data or information provided.

7.28 Portugal

No data or information provided.

7.29 Romania

The *Salmonella* strains received by the National Reference Laboratory are confirmed by biochemical tests and serotyping. Phage typing is carried out for *Salmonella* Typhi and *Salmonella* Typhimurium. A particular set of phages are used for *Salmonella* Enteritidis phage typing. Ribotyping and PFGE typing are used to characterise the strains isolated from outbreaks.

E. coli strains are identified by biochemical tests and serotyping is carried out for EPEC pathotype. *E. coli* O157:H7 is isolated by culture on MacConkey-sorbitol agar and identified by serotyping using O157 and H7 sera. When there is a suspicion of infection with other VTEC serotype, PCR to detect stx1 and stx2 is carried out.

7.30 Scotland

Since the beginning of 2003, most non-typhoidal isolates of *Salmonella* of human origin have undergone molecular typing – plasmid profile analysis and PFGE. These molecular techniques provide results that can enhance the information from the phenotypic methods currently employed for typing *Salmonella*.

Suspected isolates of *E. coli* O157 are forwarded to SERL from hospital diagnostic laboratories for confirmation, VT-PCR (*vtx*$_1$, *vtx*$_2$, *eae* and *hly*A), phage typing and PFGE. SERL also receives faecal samples from certain high-risk groups for IMS and VT-PCR. Any non-O157 VTEC or atypical *E. coli* O157 strains detected are isolated, identified and undergo PFGE. Non-O157 VTEC strains are then sent to the HPA Laboratory of Enteric Pathogens at Colindale for serotyping.

7.31 Slovakia

The National Reference Laboratory (NRL) for *Salmonella* carries out serotyping and antimicrobial susceptibility testing. All strains of *Salmonella* Typhimurium and designated strains of *Salmonella* Enteritidis are phage typed. The NRL will be adopting molecular methods in the future.

7.32 Slovenia

Serotyping of *Salmonella* spp. is routinely performed by regional laboratories. All isolates undergo antimicrobial resistance testing according to the national plan. Data on serotypes and resistance profiles are collected and analysed by appointed laboratory which also performs PFGE and serotyping on selected strains.

Drigalski and McConkey (or Bromtymolblau) agar are used to culture *E. coli*. Serological tests are carried out with Mast and Croatian O antisera (some sifin and SSI as well). Premier EHEC enzyme immunoassay (Meridian), VTEC -RPLA, a reverse passive latex agglutination test for the detection of VT, Oxoid and Hain Geno Type EHEC tests (and DEC primer Mix, SSI) are used as well.

Medium and broth are used to culture *Campylobacter*. Biochemical methods are used to differentiate between species.

7.33 South Africa

Phage typing of *Salmonella* isolates is not undertaken.

7.34 Spain

Serotyping, phage typing, antimicrobial susceptibility testing (on a systematic sample of isolates) and genotyping are all routinely undertaken on *Salmonella* isolates.

Microbiological techniques currently performed on VTEC isolates include serotyping, phage typing, antimicrobial susceptibility testing and genotyping. Virulence factors are also studied.

Biochemical and molecular methods are used in the species differentiation of *Campylobacter* isolates. Antimicrobial susceptibility testing and genotyping are also performed. Serotyping techniques are currently being developed.

7.35 Sweden

Serotyping and phage typing of *Salmonella* isolates is undertaken in Sweden, whereas antimicrobial susceptibility testing is not routine. Since 2005 serotyping of isolates is undertaken by routine only for cases of Salmonella suspected infected in Sweden.

Sweden has a centrally coordinated reference method for EHEC diagnosis. All clinical laboratories (that perform EHEC testing) use PCR (conventional or real-time) to detect verocytotoxin genes in primary cultures (broth or plate) of patient samples. Attempts to isolate the appropriate strains are made on PCR-positive samples. VT-PCR positive isolates are serotyped using O157 antisera and sent to SMI for further typing including molecular serotyping (O and H), toxin gene subtyping, testing for other virulence markers, PFGE, and MLVA. Most of the Swedish EHEC isolates, except those from Gothenburg, were analysed

at SMI. Samples that were positive by vt-PCR but lacking the corresponding isolate were considered as laboratory confirmed if supported by clinical/epidemiological data. Phage typing is not performed in Sweden but was undertaken on one occasion by the Finnish reference laboratory.

7.36 Switzerland

No data or information provided.

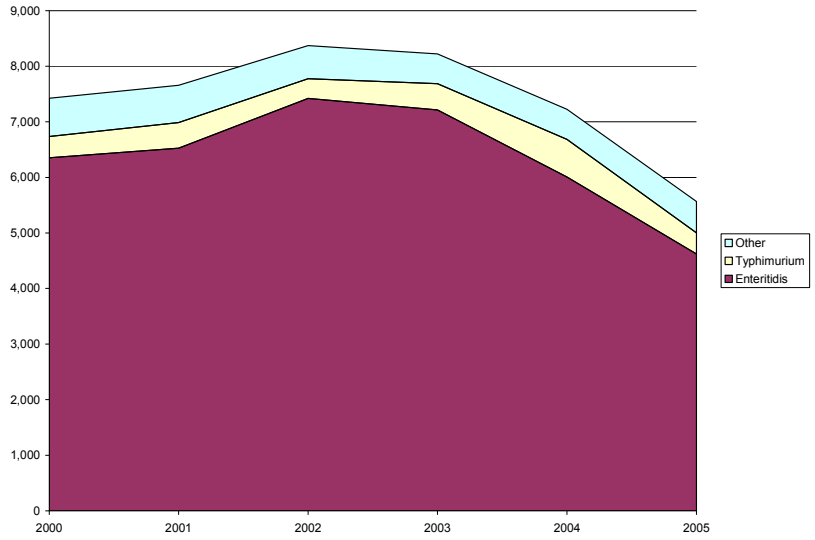
8 Salmonella

8.1 Austria

8.1.1 Trends and sources of infection

In 2005, the number of laboratory confirmed cases of human salmonellosis decreased by 23% compared with 2004. The incidence rate was 69.6 per 100,000 of the population (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis infections associated with the consumption of raw or inadequately cooked egg dishes are the main cause of human salmonellosis in Austria (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Freq	%
Enteritidis	4,621	83.04
Typhimurium	381	6.85
Agona	45	0.81
Infantis	41	0.74
Virchow	35	0.63
Saintpaul	33	0.59
Corvallis	26	0.47
Newport	26	0.47
Kentucky	21	0.38
Thompson	17	0.31
Hadar	15	0.27
Stanley	15	0.27
Montevideo	13	0.23
Blockley	12	0.22
Anatum	10	0.18
Others	254	4.56
Total	5,565	100.00

8.1.1.1 Salmonellosis non-typhoidal

8.1.1.1.1 *Salmonella* Enteritidis

In 2005, *Salmonella* Enteritidis was responsible for more than 83% of all human *Salmonella* infections. However, the number of cases declined by 23.1% compared with 2004. *Salmonella* Enteritidis PT4, which has been predominant for many years, continued to decline, accounting for 29.5% of all *Salmonella* Enteritidis isolates compared with 41.7% in 2004. Other phage types commonly reported were PT8 (28.1%) and PT21 (17.2%). Table eggs are the main source of human infection in Austria.

8.1.1.1.2 *Salmonella* Typhimurium

After two large *Salmonella* Typhimurium outbreaks in 2004 levels of *Salmonella* Typhimurium infections in 2005 almost returned to normal (6.85% in 2005 compared with 9.4% in 2004 and 5.8% in 2003).

8.1.1.1.3 Other serotypes

Other serotypes constitute just over 10% of all cases.

8.1.1.2 Salmonellosis typhoidal

There were six cases of *Salmonella* Paratyphi A (one was known to be travel related), two cases of Paratyphi B (not known to be travel related), and five cases of Typhi (two were known to be travel related).

8.1.2 Antimicrobial resistance

Almost all isolates underwent antimicrobial susceptibility testing (99.1%). Antimicrobial resistance rates have remained stable during the past few years. None of the 11 antibiotics tested had a resistance rate higher than 6%. This percentage refers to all primary human isolates. The highest resistance rate observed was 5.6%, this was against Nalidixic acid. Just over 4% of all human isolates were multi-drug resistant.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Tetracyclines	4.9
Ampicillin	5.0
Streptomycin	5.1
Sulphonamides	5.3
Chloramphenicol	1.9
Trimethoprim	1.4
Nalidixic acid	5.6
Kanamycin	0.6
Cefotaxime	0.1
Gentamicin	0.4
Ciprofloxacin	0.2

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Blockley	100.0
Concord	100.0
Kentucky	57.1
Typhimurium	36.7
Hadar	33.3
Java	28.6
Virchow	28.6
Heidelberg	25.0
Enteritidis	0.2
Others	6.4
Total	4.1

8.1.3 Travel related infection

Travel was associated with 106 cases of non-typhoidal *Salmonellas*.

8.1.4 Outbreaks

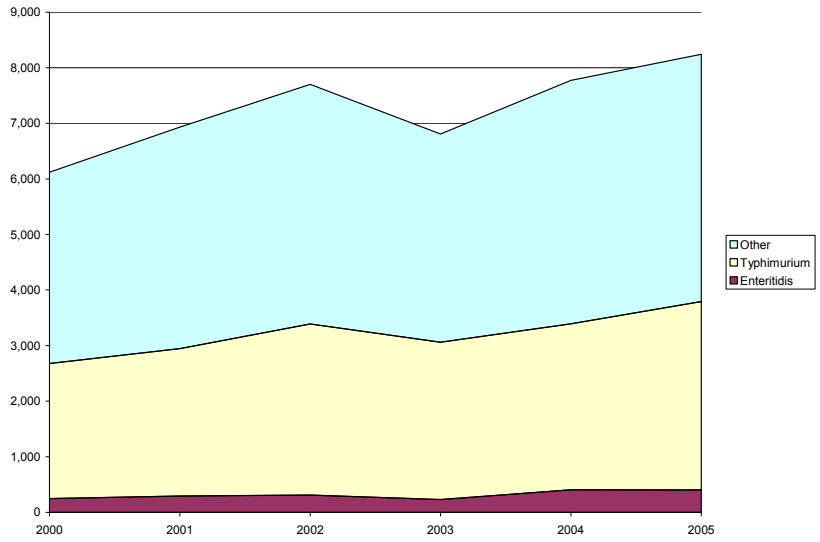
In Austria, a total of 606 food borne outbreaks, affecting 1,910 people altogether (including 368 hospitalized patients and 1 fatal outcome) were documented in 2005. *Salmonella* spp. accounted for 76% (427) of all reported outbreaks. The hospitalization rate for domestically acquired *Salmonella* spp. was 20%. Of those 606 food borne outbreaks where information as to the source was provided, eggs were implicated in 57%, meat products (especially poultry) in 30% and milk or dairy products (especially raw milk) in 4%. The ratio between family outbreaks (2 or more cases within a family) and general outbreaks was 89% to 11%. For general outbreaks the following locations of exposure were given: commercial food suppliers (incl. restaurants, cafeterias), family celebrations, nursery schools, festivities (e.g. fairs), nursing homes and a mixed outbreak involving commercial food suppliers plus homes (Austria-wide *Salmonella* Enteritidis PT19 outbreak).

8.2 Australia

8.2.1 Trends and sources of infection

In 2005, there were 8,240 cases of salmonellosis reported in Australia (40.39 per 100,000 of the population). Incidence rates increased compared with 2004 (Graph).

Graph Trends of salmonellosis 2000-05



The incidence of *Salmonella* infections fluctuates seasonally from a winter low during August and September to a late summer peak during February and March. The highest case rates are reported from the tropical northern regions. In 2005, *Salmonella* Typhimurium and *Salmonella* Virchow were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	3,392	41.17
Virchow	464	5.63
Saintpaul	436	5.29
Enteritidis	403	4.89
Birkenhead	220	2.67
Chester	185	2.25
Hvittingfoss	185	2.25
Infantis	169	2.05
Aberdeen	151	1.83
Muenchen	147	1.78
Java	138	1.67
Bovismorbificans	119	1.44
Waycross	115	1.40
Oranienburg	101	1.23
Anatum	98	1.19
Others	1,917	23.26
Total	8,240	100.00

8.2.1.1 Salmonellosis non-typhoidal

8.2.1.1.1 *Salmonella* Enteritidis

Salmonella Enteritidis is not a major problem in Australia, with the majority being associated with travel, 269 out of 403 (66.7%), although this figure is understated as one State does not send travel information.

8.2.1.1.2 *Salmonella* Typhimurium

Salmonella Typhimurium has been the most frequently isolated *Salmonella* serovar in Australia since the collection of national data began in 1978. In 2005, *Salmonella* Typhimurium DT135 (23.6%), DT197 (16.1%) and DT170 (13.9%) were the most commonly reported phage types.

8.2.1.1.3 Other serotypes

Salmonella Virchow, Saintpaul, and Birkenhead were the only other serotypes with over 200 cases in 2005.

8.2.1.2 Salmonellosis typhoidal

In 2005, 42 cases of *Salmonella* Typhi (31 travel-associated) and 40 cases of *Salmonella* Paratyphi (34 travel-associated) were reported. The most common Vi-phage type of *Salmonella* Typhi was E1a, acquired mainly in India. The most common phage types of *Salmonella* Paratyphi were A2 (acquired in India and Cambodia) and A13 (acquired in India, Bangladesh and Indonesia).

8.2.2 Antimicrobial resistance

All isolates typed at MDU underwent antimicrobial susceptibility testing. Fifteen percent of the 4,398 strains tested showed resistance to one or more antibiotics, as did 53% of the 359 travel associated isolates tested.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	5.5
Streptomycin	4.1
Tetracyclines	6.5
Ampicillin	7.4
Chloramphenicol	0.8
Trimethoprim	2.7
Nalidixic acid	4.1
Kanamycin	1.3
Gentamicin	0.6
Cefotaxime	0.06
Ciprofloxacin	4.6

Around 3% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Blockley	100
Corvallis	42
Hadar	15
Kiambu	50
Stanley	16
Enteritidis	4

Typhimurium	3
Others	6
Total	3

8.2.3 Travel related infection

In 2005, 649 cases of non-typhoidal salmonellosis were associated with overseas travel. *Salmonella* Enteritidis was the most common of these, reported most frequently from visitors to countries in South-east Asia, particularly Indonesia (Bali). The phage type most commonly isolated from such cases is PT6a. Other common overseas acquired infections were *Salmonella* Stanley (Thailand), *Salmonella* Corvallis (Bail, Malaysia) and *Salmonella* Hadar (Bali).

8.2.4 Outbreaks

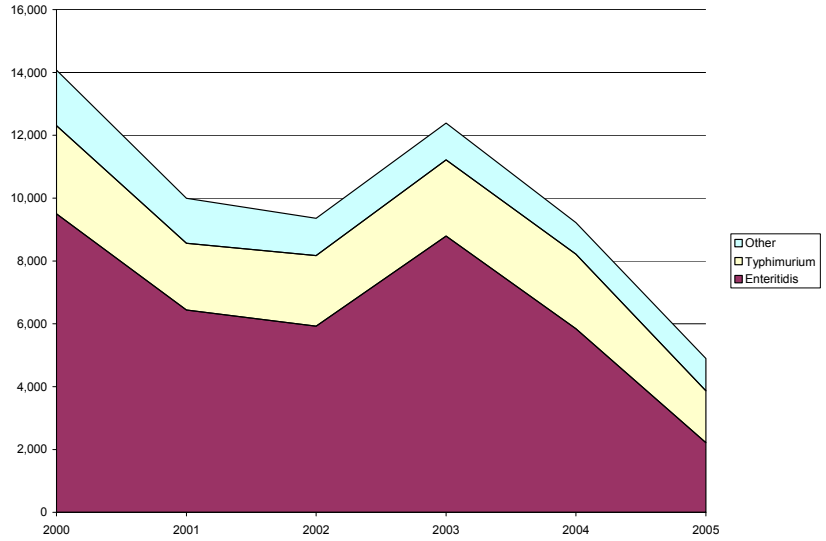
In 2005 there were 16 outbreaks involving 10 or more cases of salmonellosis, 14 of which were of phage types of *Salmonella* Typhimurium (several linked to poultry- and egg-based products in restaurant and bakery settings). The others were of *Salmonella* Oranienburg (traced to salad sprouts containing alfalfa) and *Salmonella* Saintpaul (unresolved).

8.3 Belgium

8.3.1 Trends and sources of infection

In 2005, there were 4,894 laboratory reports of salmonellosis in Belgium, which was significantly down on recent years (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	2,226	45.3
Typhimurium	1,659	33.7
Ohio	87	1.8
Brandenburg	76	1.6
Derby	67	1.4
Virchow	65	1.3
Infantis	58	1.2
Manhattan	40	0.8
Paratyphi B	34	0.7
Hadar	30	0.6
Newport	26	0.5
Kentucky	25	0.5
Montevideo	23	0.5
Bovismorbificans	18	0.4
Saintpaul	18	0.4
Others	464	9.3
Total	4,916	100.00

8.3.1.1 Salmonellosis non-typhoidal

8.3.1.1.1 *Salmonella* Enteritidis

In 2005, there were 2,226 laboratory reports of *Salmonella* Enteritidis, which accounted for 45.3% of all *Salmonella* infection. This was a reduction of 62.2% on 2004. The predominant phage types were PT21 (37.6%) and PT4 (23.6%).

8.3.1.1.2 *Salmonella* Typhimurium

In 2005, there were 1,659 laboratory reports of *Salmonella* Typhimurium, which accounted for 33.7% of all *Salmonella* infections. The predominant phage types were DT120 (21.7%) and DT104 (20.7%).

8.3.1.1.3 Other serotypes

Those most commonly reported in 2005 were *Salmonella* Ohio (87 cases; 1.8% of all cases) and *Salmonella* Brandenburg (76 cases; 1.6% of all cases).

8.3.1.2 Salmonellosis typhoidal

There were nine reports of *Salmonella* Paratyphi A infection, 34 reports of *Salmonella* Paratyphi B infection (27 *d*-tartrate +) and 17 reports of *Salmonella* Typhi infection.

8.3.2 Antimicrobial resistance

One thousand and forty four isolates underwent antimicrobial susceptibility testing (21%). Resistance was most frequently seen against Sulphonamides, Tetracyclines and Ampicillin (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	39.1
Streptomycin	22.1
Tetracyclines	24.9
Ampicillin	22.2
Chloramphenicol	7.9
Trimethoprim	10.8
Nalidixic acid	11
Kanamycin	1.4
Gentamicin	0.5
Cefotaxime	1.1
Ciprofloxacin	0

Multi-drug resistance is quite heterogeneous depending on the serotype (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Enteritidis	0.6
Typhimurium	79.7
Brandenburg	6.1
Virchow	31.8
Derby	5.7
Hadar	75
Infantis	8.5
Paratyphi B	68.8
Newport	13
Typhi	18.9
Total	

8.3.3 Travel related infection

Less than one per cent of non-typhoidal cases reported travel abroad. Information on country of travel was not reported.

Where travel history was reported, 21.3% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (4 cases; 36.4%) and Pakistan (4 cases; 36.4%).

8.3.4 Outbreaks

Twenty-one *Salmonella* outbreaks were reported during 2005, with a total of 273 patient cases from which seven were hospitalised. In nine outbreaks the serovar was not recorded.

Enteritidis was the predominant serovar. It was identified as the causative agent in eight outbreaks (38%) with a total of 61 patient cases and three people hospitalised. However, its importance decreased compared to the situation in 2004 where still 55 % of the *Salmonella*

outbreaks were due to this serovar. Four of these outbreaks (50%) could be linked to the consumption of eggs or egg-based products.

In one outbreak after a barbecue in a school 50 people were ill and *Salmonella* Paratyphi B var. Java was detected in the meat.

Three teenage girls fell seriously ill with *Salmonella* Infantis after eating a durum pita bought in a take-away pita shop. One of the girls had to be hospitalised. *Salmonella* Typhimurium was isolated in 2 patients of another food-borne outbreak. The food vehicle could not be identified.

The most important outbreak however was a dispersed national outbreak of *Salmonella* Ohio with 60 patient cases which was detected by the National *Salmonella* Reference Center. Indeed, during the summer of 2005, a significant increase in registration of *Salmonella* Ohio infections in the Belgian population ($p<0.01$) was noticed. The peak (35 isolates) was observed in the third week of July. All human strains caused self-limiting gastroenteritis. With regard to the population, both sexes (32 males and 28 females) and all age groups (three children aged < 5 years, three children 5-14, 32 adults 15-64 years and 22 adults >65 years) were infected. The isolates were detected in almost all the regions of Belgium but a cluster of patients was identified around the city of Brussels.

At the same time, an increase of this serovar was also observed in the *Salmonella* isolates detected during the monitoring program of the Agency for the Safety of the Food Chain. The samples containing *Salmonella* Ohio were of pork origin suggesting that this species was responsible for the outbreak of the disease. PFGE typing confirmed the clonal relationship between the human isolates and those isolated from pork products. Further epidemiological investigations showed that one slaughterhouse was involved. In that slaughterhouse the carcasses were contaminated during the slaughtering process by contaminated equipment and uncontrolled environmental conditions.

8.4 Bulgaria

8.4.1 Trends and sources of infection

In 2005, there were 303 laboratory reports of salmonellosis in Bulgaria. *Salmonella* Enteritidis was the most prevalent serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	181	59.74
Typhimurium	50	16.50
Infantis	17	5.61
Corvallis	13	4.29
Brandenburg	10	3.30
Agona	9	2.97
Hadar	5	1.65
Kottbus	4	1.32
Albany	3	0.99
Isangi	2	0.66
Paratyphi B	2	0.66
Virchow	2	0.66
Anatum	1	0.33

Derby	1	0.33
Gloucester	1	0.33
Others	2	0.66
Total	303	100.00

8.4.1.1 Salmonellosis non-typhoidal

8.4.1.1.1 *Salmonella* Enteritidis

In 2005, there were 181 laboratory reports of *Salmonella* Enteritidis, which accounted for 59.7% of all *Salmonella* infections.

8.4.1.1.2 *Salmonella* Typhimurium

In 2005, there were 50 laboratory reports of *Salmonella* Typhimurium, which accounted for 16.5% of all *Salmonella* infections.

8.4.1.1.3 Other serotypes

The most commonly reported in 2005 were *Salmonella* Infantis (17 cases; 6.6% of all cases) and *Salmonella* Corvallis (13; 4.3%).

8.4.1.2 Salmonellosis typhoidal

There were no reports of typhoid and one report of *Salmonella* Paratyphi B infection in 2005.

8.4.2 Antimicrobial resistance

No data or information provided.

8.4.3 Travel related infection

No data or information provided.

8.4.4 Outbreaks

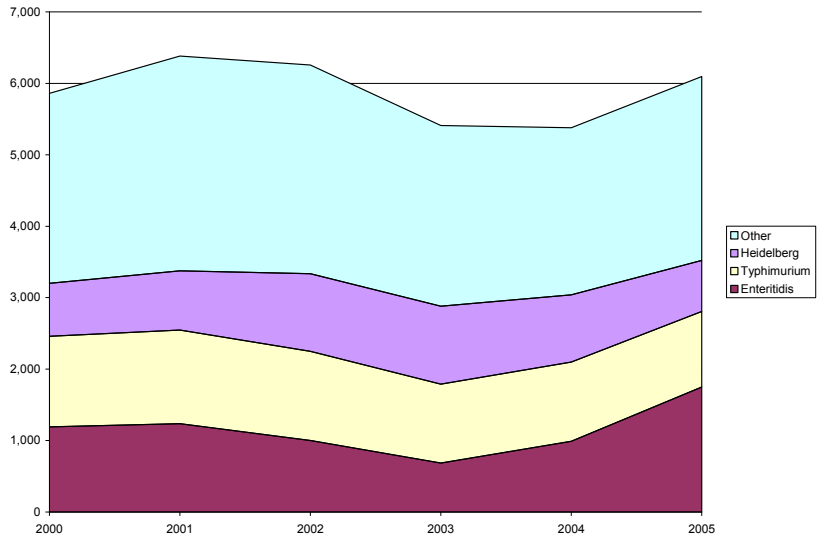
No data or information provided.

8.5 Canada

8.5.1 Trends and sources of infection

The number of laboratory confirmed cases of salmonellosis reported to NESP increased from 5,860 in 2000 (19.1 per 100,000 of the population) to 6,347 in 2001 (20.5 per 100,000 of the population). However, since 2001, the number of reports has declined each year, although this trend was reversed in 2005. In 2005, NESP received 6,096 reports of *Salmonella* infection, corresponding to an incidence rate of 18.9 per 100,000 of the population (Graph).

Graph Trends of salmonellosis 2000-05



Between 2000 and 2005, 54.7% of all *Salmonella* infections were caused by the serovars *Salmonella* Typhimurium (20.1%), *Salmonella* Enteritidis (19.3%) and *Salmonella* Heidelberg (15.3%). In 2005, they continued to dominate, accounting for 57.7% of all *Salmonella* infections (Table).

Table Top thirteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,750	28.71
Typhimurium	1,058	17.36
Heidelberg	712	11.68
Thompson	235	3.85
Hadar	168	2.76
Newport	145	2.38
Infantis	131	2.15
Typhi	123	2.02
Saintpaul	115	1.89
Paratyphi A	108	1.77
4,5,12:i:-	94	1.54
Agona	85	1.39
Oranienburg	47	0.77
Others	1,325	21.74
Total	6,096	100.00

8.5.1.1 Salmonellosis non-typhoidal

8.5.1.1.1 *Salmonella* Enteritidis

Enteritidis increased by 76.6% in 2005, from 991 cases in 2004.

8.5.1.1.2 S.Typhimurium

Typhimurium decreased by 4.4% in 2005.

8.5.1.1.3 Other serotypes

Salmonella Heidelberg is the third most dominant serotype in Canada (as it has been for many years), although the numbers reported in 2005 (712) were a reduction of 24.4% on the numbers in 2004 (942). *Salmonella* 4,5,12:i:- was the 11th most common type identified in 2005.

8.5.1.2 Salmonellosis typhoidal

In 2005, there were 108 cases of Paratyphi A and 123 of *Salmonella* Typhi.

8.5.2 Antimicrobial resistance

No data are available.

8.5.3 Travel related infection

As with most countries, travel-related infections are under-represented. There were only 70 cases of salmonellosis that were known to be travel-associated; the most commonly reported serotype was *Salmonella* Enteritidis. *Salmonella* Typhi and Paratyphi had six and five cases respectively reported as being associated with travel.

8.5.4 Outbreaks

Thirty *Salmonella*-related outbreaks and clusters, involving 15 different serovars, were identified in 2005. As was the case in 2004, *S.* Typhimurium was the most frequently confirmed serovar. It was associated with 8 outbreaks, the largest of these involving 54 confirmed cases of *Salmonella* Typhimurium PT 104 as well as one Agona, five Berta and five Derby infections. These illnesses were linked to a Mother’s Day buffet held in Ontario.
Phage typing of Typhimurium isolates in Ontario also led to the identification of a widespread outbreak, involving 45 confirmed cases of the uncommon PT U302 with onset dates from March through May 2005. Three Typhimurium outbreaks were associated with food establishments or social events where food was served.

By far the largest outbreak of 2005, involved *Salmonella* Enteritidis infections that were linked to the consumption of mung bean sprouts produced in Ontario. A total of 552 confirmed cases of *Salmonella* Enteritidis PT 13 were identified in Ontario between October 1 and December 14 and 247 of them were known to have consumed mung bean sprouts.

8.6 Cyprus

8.6.1 Trends and sources of infection

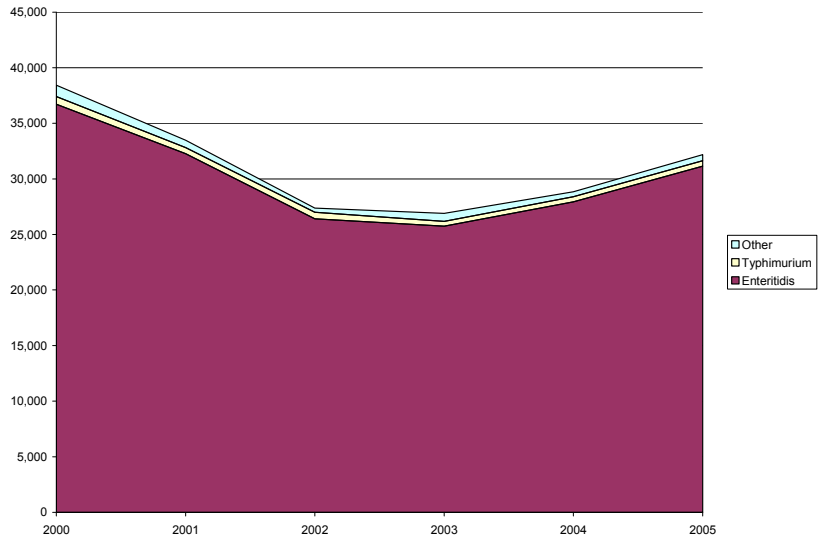
There were 64 cases of salmonellosis reported.

8.7 Czech Republic

8.7.1 Trends and sources of infection

In 2005, there were 32,171 laboratory reports of salmonellosis in the Czech Republic and increase of 11.5% on 2004 (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis was the most prevalent serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	31,140	96.80
Typhimurium	501	1.56
Infantis	100	0.31
Agona	17	0.05
Montevideo	17	0.05
Saintpaul	17	0.05
Derby	13	0.04
Hadar	11	0.03
Newport	11	0.03
Virchow	11	0.03
Blockley	10	0.03
Kentucky	10	0.03
Heidelberg	9	0.03
Bareilly	8	0.02
Mbandaka	7	0.02
Others	289	0.90
Total	32,171	100.00

8.7.1.1 Salmonellosis non-typhoidal

8.7.1.1.1 *Salmonella* Enteritidis

In 2005, there were 31,140 laboratory reports of *Salmonella* Enteritidis, which accounted for 96.8% of all *Salmonella* infections. Phage type data are not available.

8.7.1.1.2 *Salmonella* Typhimurium

In 2005, there were 501 laboratory reports of *Salmonella* Typhimurium, which accounted for 1.6% of all *Salmonella* infections. Phage type data are not available.

8.7.1.1.3 Other serotypes

The most commonly reported in 2005 was *Salmonella* Infantis (100 cases; 0.3% of all cases).

8.7.1.2 Salmonellosis typhoidal

There were no reports of Typhoidal infections.

8.7.2 Antimicrobial resistance

No data or information provided.

8.7.3 Travel related infection

Less than one per cent of non-typhoidal cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Croatia (35 cases; 15.6%) and Egypt (34 cases; 15.1%).

8.7.4 Outbreaks

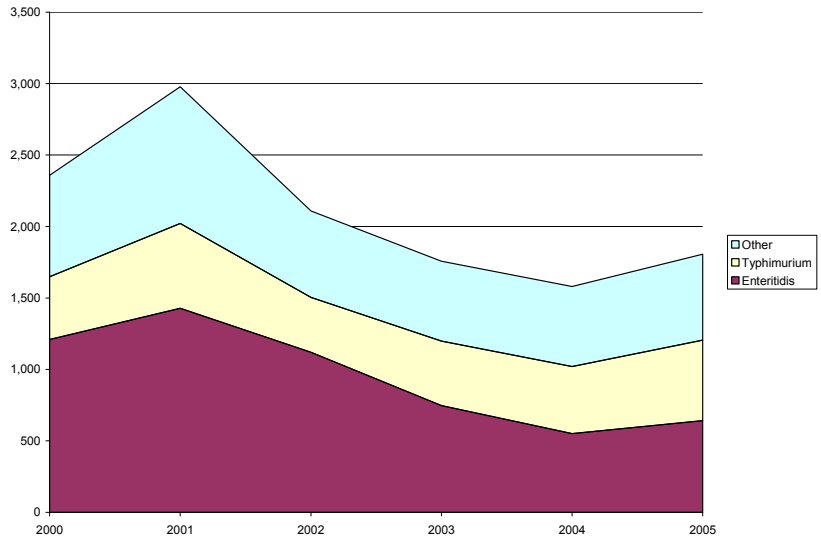
No data or information provided.

8.8 Denmark

8.8.1 Trends and sources of infection

The number of human *Salmonella* infections in Denmark began to rise in the mid-80s. During the following two decades three distinct peaks related to the consumption of broiler meat, pork and table eggs, respectively were observed. Since 1997, the incidence has steadily decreased. In 2005, this trend continued whereby a total of 1,806 laboratory-confirmed episodes of salmonellosis were reported corresponding to 34.7 cases per 100,000 of the population (Graph). This represents an increase in 2005 of 16.3% compared to 2004, but still a three-fold decrease relative to 1997. The reduction in the incidence of human cases may to a large extent be attributed to the large-scale national efforts aimed at reducing the occurrence of *Salmonella* in broilers, pigs and table-egg layers raised in Denmark.

Graph Trends of salmonellosis 2000-05



In 2005, *Salmonella* Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	641	35.49
Typhimurium	564	31.23
Newport	37	2.05
Stanley	35	1.94
Virchow	33	1.83
Infantis	30	1.66
Dublin	25	1.38
Kentucky	22	1.22
Agona	19	1.05
Typhi	19	1.05
Goldcoast	18	1.00
Corvallis	17	0.94
Montevideo	17	0.94
Braenderup	12	0.66
Anatum	11	0.61
Others	306	16.94
Total	1,806	100.00

8.8.1.1 Salmonellosis non-typhoidal

8.8.1.1.1 *Salmonella* Enteritidis

In 2005, the number of reported episodes of *Salmonella* Enteritidis was 641 corresponding to an incidence of 12.3 per 100,000 of the population. This represents a 16.3% increase compared to 2004 and 85% compared to 1997. The most common phage types were PT8 (29.3%), PT4 (14.9%), PT21 (14.0%), PT1 (11.8%), and PT14B (4.7%).

8.8.1.1.2 *Salmonella* Typhimurium

There were 564 reported episodes of *Salmonella* Typhimurium corresponding to an incidence of 10.8 per 100,000 of the population. This is a 20% increase compared to 2004. The most common phage types were DT12 (12.6%), DT120 (15.3%) and DT104 (23.2%). Unspecified types accounted for about 18% of isolates.

8.8.1.1.3 Other serotypes

Other *Salmonella* serotypes accounted for 601 episodes corresponding to an incidence of 11.6 per 100,000 of the population. This is slightly up on the incidence in 2004.

8.8.1.2 Salmonellosis typhoidal

There were 11 reports on *Salmonella* Paratyphi A, 11 reports of *Salmonella* Paratyphi B, and 10 reports of *Salmonella* Typhi infection in 2005.

8.8.2 Antimicrobial resistance

Almost half of all isolates underwent antimicrobial susceptibility testing (47.8%). Resistance to Tetracyclines was most commonly seen (Table). Multi-drug resistance was observed in 42% of *Salmonella* Typhimurium isolates, whereas 47% were susceptible to all drugs tested. In 2005, 123 human cases of DT104 and DT104b were reported and 101 (82%) of these were caused by multi-drug resistant strains. Antimicrobial susceptibility testing indicates that the vast majority of infections with multi-drug resistant *Salmonella* Typhimurium were acquired from food produced outside Denmark, whereas the majority of infections caused by resistant *Salmonella* Typhimurium originated from Danish sources.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	36.9
Streptomycin	36.8
Tetracyclines	39.5
Ampicillin	35.0
Chloramphenicol	17.8
Trimethoprim	5.6
Nalidixic acid	10.9
Kanamycin	2.0
Gentamicin	1.5
Cefotaxime	0.1
Ciprofloxacin	0.7

Just over 32% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Kentucky	66.7
Typhimurium	42.2
Hadar	35.0
Virchow	28.6
Newport	23.3
Stanley	22.6

Enteritidis	0.0
Others	12.5
Total	32.5

8.8.3 Travel related infection

The number of travel related cases is known to be under-reported. In 2005, 76% of all patients had an unknown travel history. Furthermore, this proportion varied between *Salmonella* types. For patients infected with a resistant or multi-drug resistant *Salmonella* Typhimurium infection, travel information was missing for around 30% of the cases, whereas this proportion was 78% for *Salmonella* Enteritidis cases and 90% for cases infected with fully susceptible *Salmonella* Typhimurium or with other serotypes. In 2005, it was estimated that 416 cases (27%) were travel related, however, of these, only 179 cases had reported travelling before onset of disease.

8.8.4 Outbreaks

In 2005, 12 general *Salmonella* outbreaks were recorded in the national outbreak database. Outbreaks of *Salmonella* Poona, Heidelberg and Goldcoast were seen in addition to Enteritidis and Typhimurium. More outbreaks were detected with *Salmonella* Typhimurium than Enteritidis. Part of the explanation is likely to be more extensive sub-typing of *Salmonella* Typhimurium. These isolates were routinely real-time sub-typed by MLVA, PFGE, phage typing, and antimicrobial resistance profiling, whereas *Salmonella* Enteritidis was only analysed by phage typing.

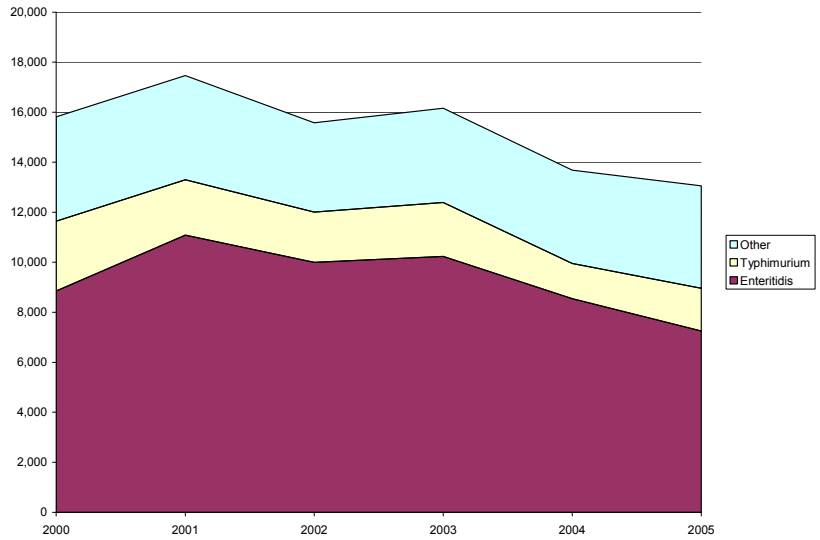
In one outbreak use of contaminated imported beef for carpaccio (which is raw marinated beef) during a period of 3 weeks in one particular restaurant resulted in a large number of cases with multi-resistant *Salmonella* Typhimurium DT104[3]. With the help of Enter-net, a Dutch outbreak with the same source was discovered a few months later. In a second outbreak with *Salmonella* Typhimurium DT12 cases occurred predominantly on the island of Funen. Comparison by typing of isolates obtained in the surveillance for *Salmonella* of food animals and at slaughterhouses identified a specific local slaughterhouse and a limited number of pig herds as the likely source of the outbreak[4]. In both these outbreaks typing by MLVA, Multiple Locus Variable number of tandem repeats Analysis, played an important role in discovering and solving the outbreaks

8.9 England and Wales

8.9.1 Trends and sources of infection

In 2005, there were 13,062 laboratory reports of salmonellosis in England and Wales (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	7,254	55.54
Typhimurium	1,710	13.09
Virchow	382	2.93
Typhi	234	1.79
Paratyphi A	211	1.62
Newport	195	1.49
Stanley	187	1.43
Hadar	174	1.33
Infantis	132	1.01
Goldcoast	127	0.97
Kentucky	103	0.79
Java	93	0.71
Agona	87	0.67
Saintpaul	86	0.66
Braenderup	77	0.59
Others	2,010	15.38
Total	13,062	100.00

8.9.1.1 Salmonellosis non-typhoidal

8.9.1.1.1 *Salmonella* Enteritidis

In 2005, there were 7,254 laboratory reports of *Salmonella* Enteritidis, which accounted for 55.4% of all *Salmonella* infections. The predominant phage types were PT4 (27.9%) and PT1 (22.2%)

8.9.1.1.2 *Salmonella* Typhimurium

In 2005, there were 1,710 laboratory reports of *Salmonella* Typhimurium, which accounted for 13.1% of all *Salmonella* infections. This was an increase of 21.1% over 2004. The predominant phage types were DT104 (31.6%) and DT193 (11.8%).

8.9.1.1.3 Other serotypes

Those third most commonly reported in 2005 was *Salmonella* Virchow (382 cases; 2.9% of all cases).

8.9.1.2 Salmonellosis typhoidal

There were 211 reports of *Salmonella* Paratyphi A infection, 20 reports of *Salmonella* Paratyphi B infection, two reports of *Salmonella* Paratyphi C infection and 234 reports of *Salmonella* Typhi infection.

8.9.2 Antimicrobial resistance

Nearly all isolates underwent antimicrobial susceptibility testing (99.3%). Resistance to Nalidixic Acid was most commonly seen (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	16.1
Streptomycin	14.9
Tetracyclines	17.5
Ampicillin	14.1
Chloramphenicol	5.9
Trimethoprim	6.6
Nalidixic acid	20.9
Kanamycin	1.6
Gentamicin	1.9
Cefotaxime	0.4
Ciprofloxacin	0.7

Just over 13% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Kentucky	70.9
Blockley	51.5
Hadar	52.9
Typhimurium	48.4
Haifa	43.5
Virchow	34.9
Stanley	31.0
Kedougou	28.0
Rissen	17.6

Enteritidis	3.4
Others	7.7
Total	13.3

8.9.3 Travel related infection

Twenty-one per cent of non-typhoidal cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Spain (474 cases; 20.5%), India (196 cases; 8.5%) and Greece (188 cases; 8.1%), representing the most common destinations for UK travellers.

Where travel history was reported, 52.1% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (101 cases; 44.2%) and Pakistan (71 cases; 28.5%).

8.9.4 Outbreaks

Food vehicles associated with outbreaks of *Salmonella*, England and Wales 2005

Food Vehicle Category	Vehicle associated
Poultry	2
Red Meat	0
Fish/Shellfish	1
Salad, vegetables, fruit	1
Sauces	0
Desserts	2
Milk/milk products	0
Water	0
Rice	0
Eggs	0
Miscellaneous	5
Total	11

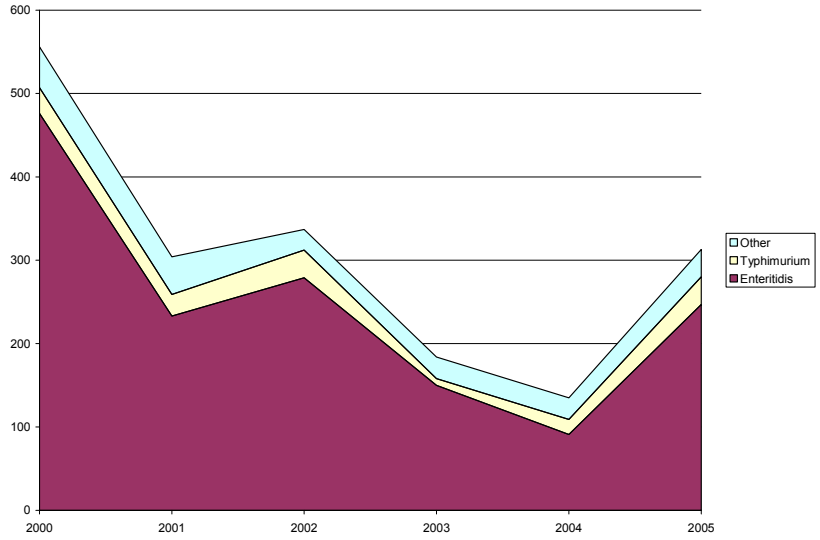
Please note that more than one food vehicle can be reported for any one outbreak.

8.10 Estonia

8.10.1 Trends and sources of infection

During the last six years the number of reported cases of human salmonellosis has decreased, although in 2005 there was an increase. There were 313 culture-confirmed cases of *Salmonella* infection reported. This represents a 44% decline from the 556 cases notified in 2000 (Graph).

Graph Trends of salmonellosis 2000-05



The age distribution shows that over a third (39.3%) of all cases were children aged between one and five years. *Salmonella* Enteritidis and *Salmonella* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	247	78.91
Typhimurium	33	10.54
Infantis	3	0.96
Montevideo	2	0.64
Agona	1	0.32
Brandenburg	1	0.32
Derby	1	0.32
Eastbourne	1	0.32
Give	1	0.32
Hadar	1	0.32
Mbandaka	1	0.32
Paratyphi A	1	0.32
Others	20	6.39
Total	313	100.00

8.10.1.1 Salmonellosis non-typhoidal

8.10.1.1.1 *Salmonella* Enteritidis

In 2005, *Salmonella* Enteritidis accounted for 78.9% of all *Salmonella* infections. However, the proportion of salmonellosis cases where *Salmonella* Enteritidis was identified as the causative agent has declined, in 2000 *Salmonella* Enteritidis accounted for 85.6% of all *Salmonella* infections.

8.10.1.1.2 *Salmonella* Typhimurium

Salmonella Typhimurium accounted for 10.5% of all cases of salmonellosis in 2005. In contrast to *Salmonella* Enteritidis, the proportion of salmonellosis cases where *Salmonella* Typhimurium is identified as the causative agent has increased, in 2000 *Salmonella* Typhimurium infections accounted for only 5.6% of all cases.

8.10.1.1.3 Other serotypes

Other serotypes accounted for just over 10% of all cases

8.10.1.2 Salmonellosis typhoidal

There was one report of *Salmonella* Paratyphi A infection in 2005.

8.10.2 Antimicrobial resistance

The proportion of isolates found to be multi-drug resistant in 2005 was 1.3%. All multi-drug resistant isolates belonged to Gr-B *Salmonellas*.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	37.7
Streptomycin	8.5
Tetracyclines	16.8
Ampicillin	15.2
Chloramphenicol	2.9
Trimethoprim	11.3
Nalidixic acid	31.9
Kanamycin	4.0
Gentamicin	0.0
Cefotaxime	0.0
Ciprofloxacin	1.0

Just over 1% of all isolates tested were multi-drug resistant (Table).

8.10.3 Travel related infection

In 2005, 22 cases (7.0%) acquired their infection abroad. The majority of imported cases were infected with *Salmonella* Enteritidis; travellers to countries with a high salmonellosis incidence are advised on how to reduce the risk of acquiring the infection.

8.10.4 Outbreaks

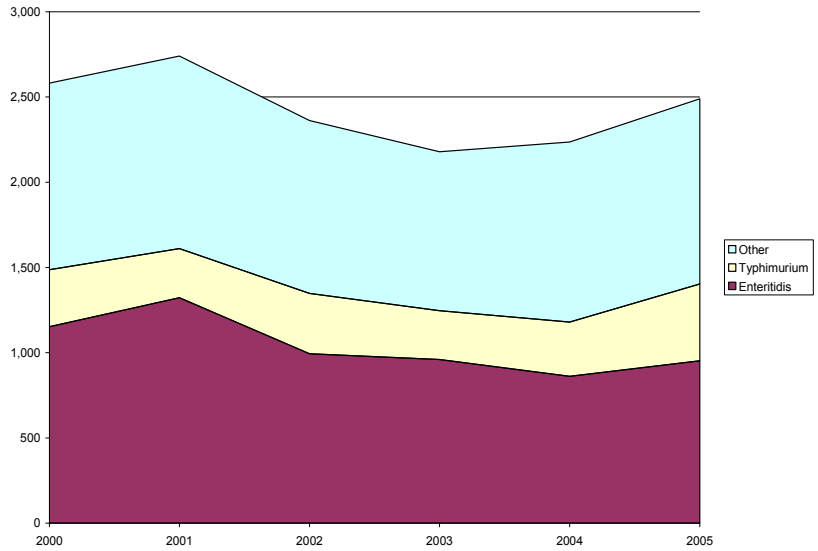
In 2005 one domestic outbreak of salmonellosis (*S* Enteritidis) was notified in Estonia – 26 laboratory confirmed cases in a Kindergarten. The source of infection and food relation has not been detected. Additionaly there were 16 family clusters in which 2-5 cases were notified. In total, in 2005 three were 69 persons involved in outbreaks/clusters, which is 22% of the total cases of salmonellosis.

8.11 Finland

8.11.1 Trends and sources of infection

In 2005, there were 2,489 laboratory reports of salmonellosis in Finland (Graph). This represented an increase of 11.3% on 2004.

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	952	38.25
Typhimurium	451	18.12
Stanley	121	4.86
Virchow	94	3.78
Corvallis	64	2.57
Agona	59	2.37
Newport	53	2.13
Infantis	50	2.01
Hadar	37	1.49
Kentucky	37	1.49
Saintpaul	31	1.25
Braenderup	19	0.76
Anatum	18	0.72
Bareilly	18	0.72
Weltevreden	15	0.60
Others	470	18.88
Total	2,489	100.00

8.11.1.1 Salmonellosis non-typhoidal

8.11.1.1.1 *Salmonella* Enteritidis

In 2005, there were 952 laboratory reports of *Salmonella* Enteritidis, which accounted for 38.3% of all *Salmonella* infections. The five most common phage types were PT4, PT1, PT21, PT14b and PT8.

8.11.1.1.2 *Salmonella* Typhimurium

In 2005, there were 451 laboratory reports of *Salmonella* Typhimurium, which accounted for 18.1% of all *Salmonella* infections. This was an increase of 41.4% on 2004. The five most common phage types were DT1, DT104B, DT40, DT104 and DT RDNC.

8.11.1.1.3 Other serotypes

Those most commonly reported in 2005 were *Salmonella* Stanley (121 cases; 4.9% of all cases) and *Salmonella* Virchow (94 cases; 3.8% of all cases).

8.11.1.2 Salmonellosis typhoidal

There were two reports of *Salmonella* Paratyphi A infection, two reports of *Salmonella* Paratyphi B infection, and seven reports of *Salmonella* Typhi infection.

8.11.2 Antimicrobial resistance

Nearly all isolates underwent antimicrobial susceptibility testing (89%). Resistance to nalidixic acid was most commonly seen (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	17.7
Streptomycin	21.0
Tetracyclines	21.1
Ampicillin	13.4
Chloramphenicol	8.2
Trimethoprim	5.4
Nalidixic acid	25.2
Kanamycin	Not tested
Gentamicin	2.3
Cefotaxime	0.5
Ciprofloxacin	0.6

Just over 14% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
S. Enteritidis	1.6
S. Typhimurium	35.2
S. Stanley	17.3
S. Virchow	29.9
S. Corvallis	25.4
Others	14.1

8.11.3 Travel related infection

Seventy-eight per cent of non-typhoidal cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Thailand (371 cases; 19.9%), Bulgaria (194 cases; 10.4%) and Spain (187 cases; 10.0%).

Where travel history was reported, 60.0% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destination was India (4 cases; 40.0%).

8.11.4 Outbreaks

In 2005, three domestic foodborne outbreaks of salmonellosis were reported in Finland. *Salmonella* Typhimurium var Copenhagen DT 104B caused a large outbreak with 70 laboratory confirmed cases in southern and western Finland. The probable source of the outbreak was iceberg lettuce imported from Spain. *Salmonella* Enteritidis PT 40 was isolated from four people who had eaten in a Chinese restaurant in northern Finland. *Salmonella* Typhimurium DT1 was isolated from six people after a birthday party in a private home. In these two outbreaks the exact source of infections remained unknown.

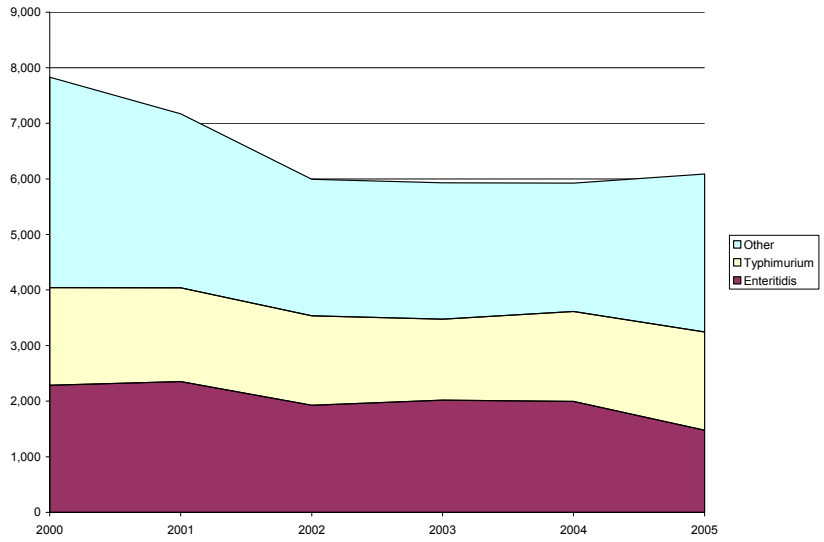
In addition, *Salmonella* Enteritidis PT 4 was isolated from 65 Finns who had eaten in one restaurant in Tallinn, Estonia. The outbreak was investigated in collaboration with the Estonian authorities. The source of the infections remained unknown, but Enteritidis which was identical to the strain isolated from Finnish patients was found in poultry in Estonia.

8.12 France

8.12.1 Trends and sources of infection

In 2005, the number of *Salmonella* isolates received by the NRL remained stable, at 6,089 (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were still the most prevalent serovars (Table), although Typhimurium has overtaken Enteritidis in frequency.

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	1,768	29.04
Enteritidis	1,478	24.27
Agona	267	4.38
Derby	156	2.56
Infantis	145	2.38
Typhi	123	2.02
Hadar	116	1.91
Virchow	113	1.86
Napoli	93	1.53
Newport	77	1.26
Brandenburg	73	1.20
Manhattan	60	0.99
Worthington	54	0.89
Indiana	51	0.84
Paratyphi B	51	0.84
Others	1,464	24.04
Total	6,089	100.00

8.12.1.1 Salmonellosis non-typhoidal

8.12.1.1.1 *Salmonella* Enteritidis

The number of reported isolates of *Salmonella* Enteritidis has been declining since 1998. In 2005, there were 1,478 NRL reports of *Salmonella* Enteritidis, which accounted for 24.3% of all isolates.

8.12.1.1.2 *Salmonella* Typhimurium

The number of reported isolates of *Salmonella* Typhimurium has increased over recent years. In 2005, there were 1,768 NRL reports of *Salmonella* Typhimurium, which accounted for 29.0% of all isolates.

8.12.1.1.3 Other serotypes

On comparing 2005 NRL data with 2004, isolates of *Salmonella* Agona showed the largest percentage increase, whereas isolates of *Salmonella* Paratyphi A showed the biggest percentage decrease.

8.12.1.2 Salmonellosis typhoidal

There were 35 reports of *Salmonella* Paratyphi A infection, 51 reports of *Salmonella* Paratyphi B infection, three report of *Salmonella* Paratyphi C infection and 123 reports of *Salmonella* Typhi infection.

During 2005, the serotype *Salmonella* Paratyphi A increased in rank of relative frequency and was included in the top fifteen serotypes.

8.12.2 Antimicrobial resistance

Antimicrobial resistance was not available at this date.

8.12.3 Travel related infection

Travel history was not available.

8.12.4 Outbreaks

In 2005, three nationwide and one international outbreaks were detected.

Between December 2004 and May 2005, 141 cases of *Salmonella* Agona infection were reported in infants. Fifty (36%) patients were hospitalised and none died. An investigation implicated infant powder formula: among the 141 cases, 44 (31%) were linked to the consumption of formula A and 92 (65%) to the consumption of formula B. The food trace back revealed that five batches of formula B had undergone their final processing steps on part of the production line of formula A. This outbreak shows that regular microbiological analysis of infant formula was insufficient to detect low grade or inhomogeneous contamination.

Between January and July 2005, 53 cases of *Salmonella* Worthington infections were identified. Forty-one cases were clustered in four hospitals, located in three administrative districts, and 12 were isolated cases. The investigation into cases’ food consumption showed that the majority of patients had consumed powdered milk from the same manufacturer, used to enrich or alter food texture to facilitate consumption for elderly and malnourished patients.

From August to November, a community wide *Salmonella* Manhattan outbreak occurred in south-eastern France. Forty cases were reported, 60% of them in October and November. The investigation incriminated pork products from a slaughterhouse, producing mainly pork (80%) but also beef (20%), as the most likely source of this outbreak.

Between April to July, 24 cases of *Salmonella* Stourbridge were identified in the western part of France. The patients were aged between 1 and 70 years. Interviews of the patients did not reveal any source or food item common to all cases, but some of them (seven cases) had

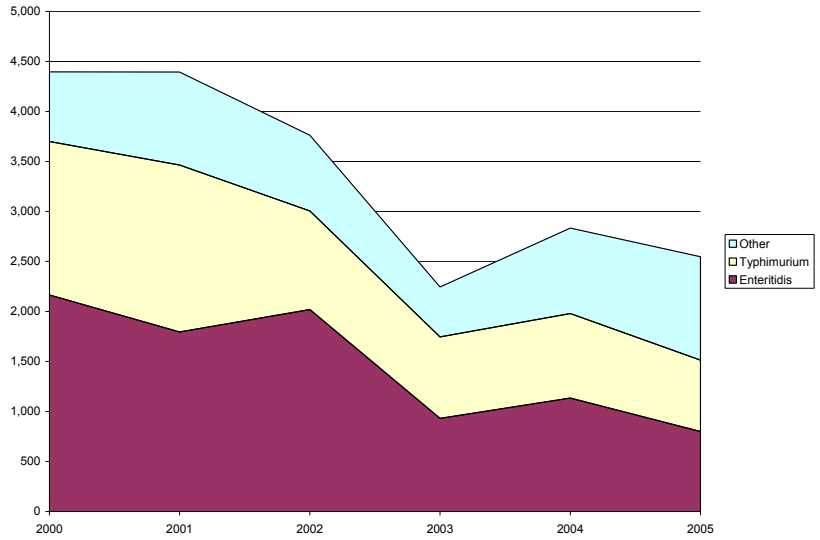
consumed raw milk goat cheeses, which was incriminated in an outbreak in Sweden. The trace back investigation showed that the suspected goat cheeses were made by the same producer in southern France. In total, more than 50 cases of *Salmonella* Stourbridge infection were reported in nine European countries (England and Wales, The Netherlands, Switzerland, Luxemburg, Austria, Germany, Norway, France, Sweden)

8.13 Germany

8.13.1 Trends and sources of infection

In 2005, there were 2,546 laboratory reports of salmonellosis to the NRL in Wernigerode in Germany (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	799	31.38
Typhimurium	715	28.08
Bovismorbificans	286	11.23
S. subspec. I 4,[5],12:i:-	82	3.20
Infantis	40	1.57
Paratyphi B	39	1.53
Hadar	38	1.49
Anatum	30	1.18
Goldcoast	29	1.14
Newport	28	1.10
Corvallis	23	0.90
Thompson	22	0.86
Typhi	20	0.79
Brandenburg	14	0.55
Derby	14	0.55

Others	357	14.45
Total	2,546	100.00

8.13.1.1 Salmonellosis non-typhoidal

8.13.1.1.1 *Salmonella* Enteritidis

In 2005, there were 799 laboratory reports of *Salmonella* Enteritidis, which accounted for 31.4% of all *Salmonella* infections. The predominant phage types were PT4 (61.7%) and PT21 (13.3%).

8.13.1.1.2 *Salmonella* Typhimurium

In 2005, there were 715 laboratory reports of *Salmonella* Typhimurium, which accounted for 28.1% of all *Salmonella* infections. The predominant phage types were DT120 (28.7%), DT104 (26.4%) and DT193 (14.3%).

8.13.1.1.3 Other serotypes

The next most commonly reported serotype in 2005 was *Salmonella* Bovismorbificans, with 286 cases; 11.2%, no other serotypes were over 10%. Of note is that the monophasic *Salmonella* 4,5,12:i:- was the fourth most common serotype identified.

8.13.1.2 Salmonellosis typhoidal

There were five reports of *Salmonella* Paratyphi A infection, 39 reports of *Salmonella* Paratyphi B infection and 20 reports of *Salmonella* Typhi infection.

8.13.2 Antimicrobial resistance

Nearly all isolates underwent antimicrobial susceptibility testing (98.4%). Resistance to Sulphonamides and Streptomycin were most common (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	36.9
Streptomycin	36.8
Tetracyclines	29.1
Ampicillin	25.4
Chloramphenicol	13.0
Trimethoprim	7.2
Nalidixic acid	5.7
Kanamycin	2.1
Gentamicin	1.2
Cefotaxime	0.5
Ciprofloxacin	0.2

Just over 25% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Hadar	86.8
Typhimurium	67.3
Stanley	20.0
Newport	14.3
Ohio	10.0
Infantis	10.0
Enteritidis	0.8
Others	12.8
Total	25.6

8.13.3 Travel related infections

Travel abroad was associated with 1.7% of non-typhoidal cases reported. Where information on country of travel was available the most frequently reported destinations were Turkey (5 cases; 11.6%) and Spain (5; 11.6%).

Where travel history was reported, 32.8% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (7 cases; 33.3%) and Turkey (5 cases; 7.8%).

8.13.4 Outbreaks

Since late 2004 till March 2005 a *Salmonella* Bovismorbificans PT24 outbreak with 525 cases were observed in Northern Germany. The peak was of onset of symptoms was in the third week of 2005. A 62 year old woman died of infection. In Saxony–Anhalt we observed 3 outbreaks caused by *Salmonella* Goldcoast, *Salmonella* Infantis and *Salmonella* Stanley. One outbreak of *Salmonella* Bareilly was in Brandenburg and two outbreaks by the monophasic variant of *Salmonella* subspecies I O 4,[5],12:i:- in Saxony and Saxony-Anhalt.

Most outbreaks (49) in 2005 were observed by *Salmonella* Enteritidis. Ten outbreaks in Saxony (PT4 4x, PT21 3x and PT8 3x), six outbreaks in Baden-Wuerttemberg (PT4 4x,14b 1x, PT8 1x), seven outbreaks in North Rhine Westfalia (PT4 3x, PT1 2x, PT25 1x and PT6 1x), five outbreaks in Bavaria (PT4 4x and PT14b 1x) five outbreaks in Lower Saxony all caused by PT4, five outbreaks in Thuringia (PT21 2x, PT1 1x, PT4 1x and PT8 1x), four outbreaks in Saxony–Anhalt (PT21 2x and PT4 2x),three outbreaks in Schleswig-Holstein (PT4 1x, PT8 1x and PT6a 1x), two outbreaks in Rhineland-Palatinae (PT6 2x) one outbreak in Brandenburg by PT4 and one outbreak in Mecklenburg-Western Pomeriania PT21.

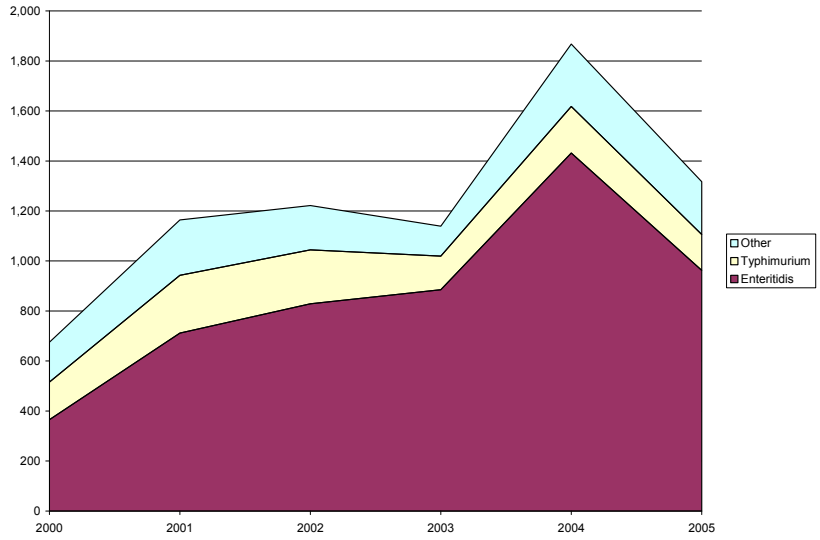
For *Salmonella* Typhimurium we documented 21 outbreaks. Seven outbreaks in Saxony (DT120 2x, DT7 2x and DT104 2x and DT193 1x), Four outbreaks in Saxony-Anhalt (DT7 1x, DT177 1x, DT193 1x and DT120 1x) Two outbreaks in Berlin (DT120 2x), two outbreaks in Thuringia (DT12 1x and DT104 1x), two outbreaks in Baden-Wuerttemberg (DT135 1x and DT120 1x), two outbreaks in Schleswig-Holstein (DT21 1x and DT193 1x) and one outbreak in Mecklenburg-Western Pomerania DT120 and one in Lower Saxony DT135.

8.14 Greece

8.14.1 Trends and sources of infection

In 2005, 1,317 cases of salmonellosis were reported to KEEL by the three Reference Centres for *Salmonella* in Greece. This was lower than that reported during 2004, and similar to 2003 (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	963	73.12
Typhimurium	143	10.86
Oranienburg	23	1.75
Blockley	21	1.59
Kottbus	13	0.99
Abony	11	0.84
Typhi	11	0.84
Bovismorbificans	9	0.68
Bredeney	7	0.53
Muenchen	6	0.46
Virchow	6	0.46
Infantis	5	0.38
Muenster	5	0.38
Thompson	5	0.38
Agona	4	0.30
Others	85	6.45
Total	1,317	100.00

8.14.1.1 Salmonellosis non-typhoidal

8.14.1.1.1 *Salmonella* Enteritidis

There were 963 reports of *Salmonella* Enteritidis infection during 2005, which accounted for 73.1% of all salmonellosis. Phage type data are not available.

8.14.1.1.2 *Salmonella* Typhimurium

There were 143 reports of *Salmonella* Typhimurium infection during 2005, which accounted for 10.9% of all salmonellosis. The proportion of infections caused by *Salmonella* Typhimurium has been decreasing, the serovar accounted for 26% of *Salmonella* infections in 1999. Phage type data are not available.

8.14.1.1.3 Other serotypes

Other serotypes accounted for just over 16% of all cases.

8.14.1.2 Salmonellosis typhoidal

There were two reports of *Salmonella* Paratyphi A infection, two reports of *Salmonella* Paratyphi B infection and five reports of *Salmonella* Typhi infection.

8.14.2 Antimicrobial resistance

A small proportion of all isolates underwent antimicrobial susceptibility testing (9.4%). Resistance to Ampicillin was most commonly seen (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	0.0
Streptomycin	
Tetracyclines	3.3
Ampicillin	5.1
Chloramphenicol	2.2
Trimethoprim	0.0
Nalidixic acid	
Kanamycin	
Gentamicin	1.7
Cefotaxime	
Ciprofloxacin	0.0

No isolates tested were multi-drug resistant (Table).

8.14.3 Travel related infection

Travel information is not available.

8.14.3.1 Outbreaks

In 2005 *Salmonella* spp. was identified as the responsible pathogen in 32 of the notified foodborne outbreaks (74%) in Greece and *Salmonella* Enteritidis was the most frequently identified serotype.

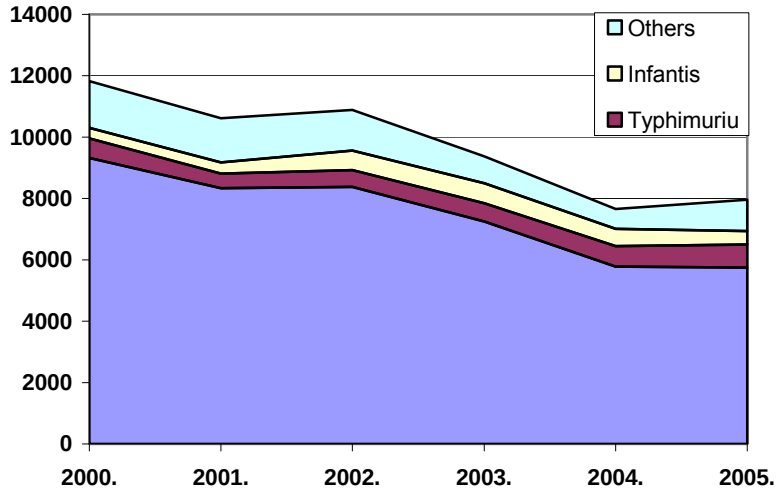
8.15 Hungary

8.15.1 Trends and sources of infection

There were 8,157 salmonellosis notified in Hungary in 2005, 7,820 of them were confirmed by laboratory (the remaining part had epidemiological link to an outbreak with salmonella aetiology). 545 cases had laboratory result with Salmonella sp. or Salmonella subgenus I., and 7,275 cases were serotyped successfully.

The number of cases of notified salmonellosis has decreased from 11,507 to 8157 since 2000 (a decline in incidence from 114.3 to 80.8 per 100,000 of the population). Most of this decrease during this period can be attributed to a fall in the number of *Salmonella* Enteritidis infections (Graph).

Graph Trends of salmonellosis 2000-05



However, despite this decline *Salmonella* Enteritidis remains the predominant serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	5,641	77.59
Typhimurium	772	10.62
Infantis	415	5.71
Virchow	58	0.80
Hadar	55	0.76
Saintpaul	52	0.72
Blockley	35	0.48
Bovismorbificans	30	0.42

Goldcoast	21	0.29
Derby	20	0.28
Bredeney	12	0.17
Newport	11	0.15
Brandenburg	10	0.14
London	10	0.14
Schwarzengrund	10	0.14
Others	118	1.63
Total	7,270	100.00

8.15.1.1 Salmonellosis non-typhoidal

8.15.1.1.1 *Salmonella* Enteritidis

The number of reported *Salmonella* Enteritidis cases slightly increased between 2004-2005 from 5,501 to 5,641 by 2.5%. In 2005, the most frequently reported phage type of *Salmonella* Enteritidis isolates was PT4 (29.1%), followed by PT8 (23.9%) and PT6 (18.6%).

8.15.1.1.2 *Salmonella* Typhimurium

Salmonella Typhimurium increased by 34.7% in 2005 up from 573 cases to 772 (based on date of reported cases). In 2005, 35% of the phage typed *Salmonella* Typhimurium isolates belonged to the pandemic DT104, 19.4% belonged to the related U302 clone. Fourteen per cent of isolates were classified as reacted but did not conform (RDNC).

8.15.1.1.3 Other serotypes

The importance of other serotypes slightly decreased from 910 isolates in 2004 to 857 isolates in 2005. It is worth noting that the number of salmonellosis cases caused by *Salmonella* Infantis PT213 or PT217 (according to the Hungarian scheme) with a Streptomycin-Tetracycline-Nalidixic acid resistance profile has increased over the past five years.

8.15.1.2 Salmonellosis typhoidal

There were three reports of typhoid infection in 2005. One of them was imported from Pakistan (PT NT), and the remaining two were indigenous (PT A) linked with asymptomatic carriers (one of them was registered carrier, the other was a newly investigated person aged around 90 years).

8.15.2 Antimicrobial resistance

The antimicrobial resistance data for *Salmonella* hasn't shown any significant change since 2000. In 2005, 85% of the *Salmonella* Enteritidis isolates were sensitive to all antimicrobial agents they were tested against. Twenty-six per cent of all *Salmonella* isolates were multi-drug resistant, most of which were *Salmonella* Typhimurium DT104. Most of multi-drug resistant isolates were *Salmonella* Typhimurium DT104.

Nearly all isolates underwent antimicrobial susceptibility testing. Resistance to Tetracyclines was most commonly seen (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% susceptible.	% intermediate	% resistant.	No. isolates tested
Sulphonamides				
Streptomycin				
Tetracyclines	74.55	1.89	23.56	4 759
Ampicillin	86.00	1.01	12.99	5 828
Chloramphenicol	93.44	0.31	6.25	640
Trimethoprim	86.69	1.25	12.06	5 830
Nalidixic acid	83.60	0.29	16.11	683
Kanamycin				
Gentamicin				
Cefotaxime	99.72	0.11	0.17	1 793
Ciprofloxacin	98.87	0.19	0.94	4 158

Just over 0.8% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

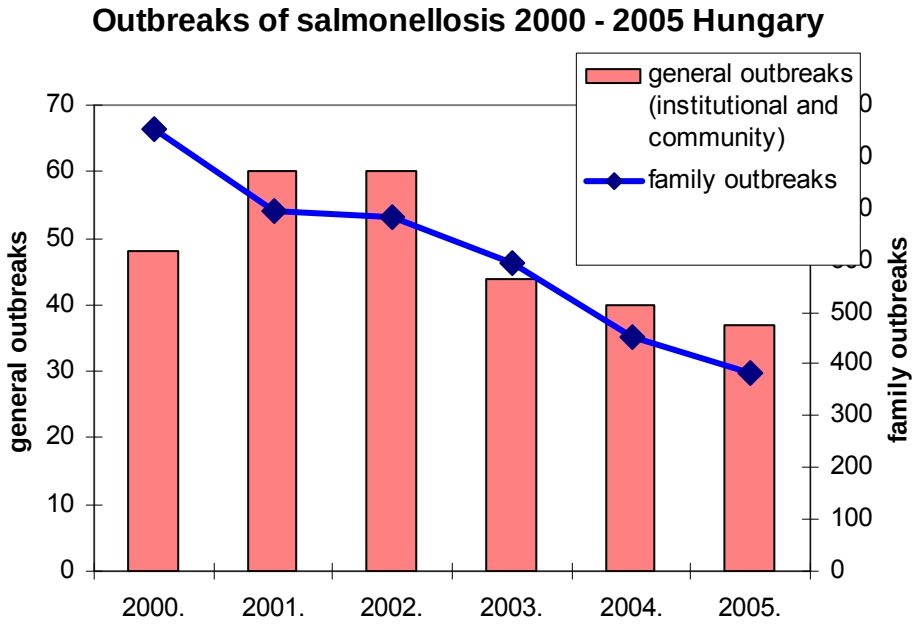
Serotype	% of isolates	No. isolates tested
Bareilly	5.3 (1)	19
Bredeney	2.9 (1)	35
Enteritidis	0.1 (9)	8,080
Hadar	1.0 (1)	103
Infantis	0.6 (5)	853
Kentucky	20.0 (1)	5
Saintpaul	8.6 (10)	116
Typhimurium	4.3 (57)	1,339
Virchow	2.0 (2)	100
Total	**0.8 (87)**	**10,650**

8.15.3 Travel related infection

Travel was known to be associated with just 14 cases (three of them were imported from Tunisia, the rest were imported from 11 different countries (eight of them are European, two African and one Asian).

8.15.4 Outbreaks

The total number of outbreaks decreased from 900 in 2000 to 419 in 2005 (Graph). In 2004 there were 492 events, 40 general and 452 family outbreaks. In 2005 the 419 outbreaks consisted of 37 general and 382 family outbreaks. Detailed data about the source of infection of general outbreaks are available: there is evidence about the 70% (28) of outbreaks were foodborne in 2004, and 78% (29 events) in 2005. Two-thirds of foodborne outbreaks in 2004, and 55% of them in 2005 were linked with eggs not fully heated before eaten.



8.16 Iceland

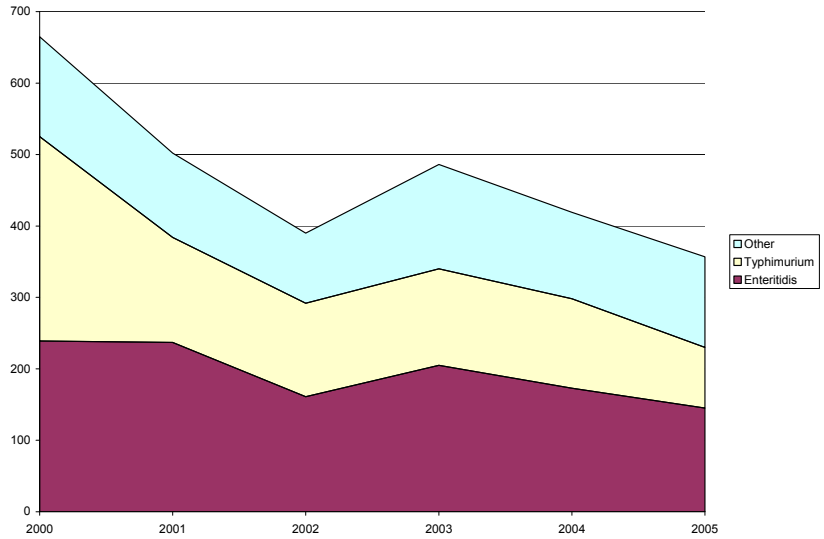
No data or information provided.

8.17 Ireland

8.17.1 Trends and sources of infection

In 2005, 357 isolates of *Salmonella* of human origin were submitted to the National *Salmonella* Reference Laboratory (Graph).

Graph Trends of salmonellosis 2000-05



As in previous years, *Salmonella* Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	145	40.62
Typhimurium	85	23.81
Agona	10	2.80
Virchow	9	2.52
Hadar	8	2.24
Goldcoast	7	1.96
Java	7	1.96
Stanley	6	1.68
Dublin	5	1.40
Newport	5	1.40
Typhi	5	1.40
Anatum	4	1.12
Blockley	4	1.12
Kentucky	4	1.12
Bredeney	3	0.84
Others	50	14.01
Total	357	100.00

8.17.1.1 Salmonellosis non-typhoidal

8.17.1.1.1 *Salmonella* Enteritidis

Salmonella Enteritidis accounted for 40.6% of all cases of *Salmonella*. The predominant phage types were PT1 (30.8%), PT14B (15.4%) and PT4 (13.3%). This represents a decrease in the incidence of PT4 from 2004 (47%), and continues the trend noted last year.

8.17.1.1.2 *Salmonella* Typhimurium

Salmonella Typhimurium accounted for 23.8% of all cases of *Salmonella*. Phage types DT104 and DT104b accounted for 44% and 15% respectively.

8.17.1.1.3 Other serotypes

The incidence of *Salmonella* Agona increased from 1% from 2000-2004 to 3% (n=10) in 2005. *Salmonella* Bredeney decreased from 3% in 2004 to 1% in 2005. *Salmonella* Kentucky remains essentially unchanged at 1-2% over the past number of years.

8.17.1.2 Salmonellosis typhoidal

Five isolates of *Salmonella* Typhi and one isolate of *Salmonella* Paratyphi A were received.

8.17.2 Antimicrobial resistance

All serotypes were tested for antimicrobial resistance. Fifty-one per cent of isolates were susceptible to all antimicrobial agents tested. Twenty-four per cent were multi-drug resistant (four or more antibiotics). Of these, 44% had the resistance profile ACSSuT and were *Salmonella* Typhimurium DT104 or closely related clonal groups. Two isolates of *Salmonella* Kentucky were resistant to Ciprofloxacin.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	25.4
Streptomycin	24.2
Tetracyclines	28.5
Ampicillin	27.4
Chloramphenicol	16.8
Trimethoprim	6.6
Nalidixic acid	21.9
Kanamycin	2.3
Gentamicin	1.4
Cefotaxime	0.3
Ciprofloxacin	0.6

Just over 23% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Typhimurium	70.6
Hadar	62.5
Blockley	50.0
Kentucky	50.0
Virchow	33.3
Stanley	33.3
Enteritidis	2.1
Others	6.7
Total	23.6

8.17.3 Travel related infection

A recent history of foreign travel was noted in 71 non-typhoidal cases (20%). Spain was the most common destination (16 cases).

A history of recent travel was reported in four of the six cases of infection with *Salmonella* Typhi or *Salmonella* Paratyphi. One case of *Salmonella* Paratyphi A had returned from Bangladesh, whilst two cases of *Salmonella* Typhi were associated with travel to Pakistan, and one to India.

8.17.4 Outbreaks

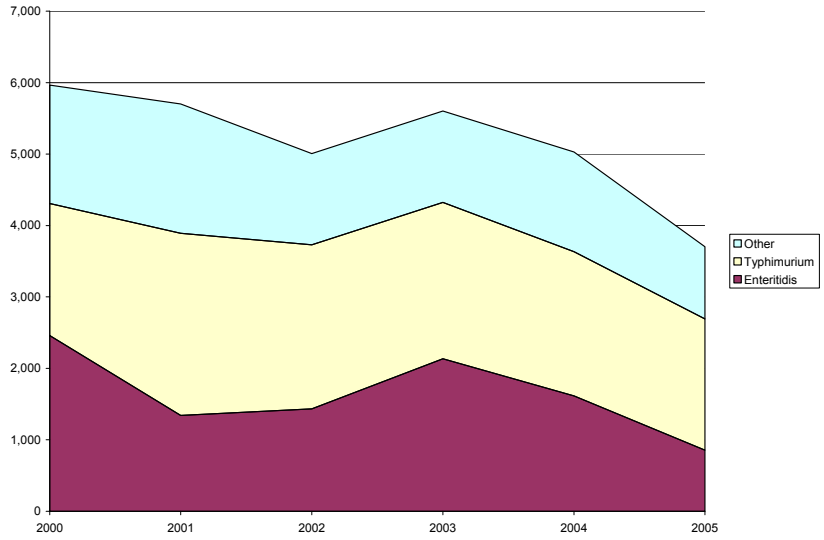
In 2005, there were 17 outbreaks of *Salmonella enterica* notified to HPSC; three small general outbreaks and 14 family clusters/ outbreaks, affecting a total of 52 people. Three of the outbreaks were travel-related with Spain, Tunisia and the Czech Republic cited as the countries of infection. The largest outbreak was a community outbreak caused by *Salmonella* Agona that affected six people and resulted in five hospitalisations.

8.18 Italy

8.18.1 Trends and sources of infection

In 2005, 3,702 cases of salmonellosis were reported (Graph), over 40% of all infections were in children under six years of age. Most cases occurred in the summer months.

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table), they have accounted for approximately 70% of all cases of *Salmonella* infection during the last 10 years. Typhimurium has been the most common serotype for some years.

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	1,839	49.68
Enteritidis	855	23.10
4,5,12:i:-	131	3.54
Infantis	93	2.51
Derby	89	2.40
Napoli	67	1.81
Bovismorbificans	57	1.54
Muenchen	35	0.95
Give	33	0.89
London	32	0.86
Hadar	31	0.84
Thompson	27	0.73
Virchow	24	0.65
Livingstone	21	0.57
Rissen	21	0.57
Others	347	9.37
Total	3,702	100.00

8.18.1.1 Salmonellosis non-typhoidal

8.18.1.1.1 *Salmonella* Enteritidis

Salmonella Enteritidis was the predominant serotype isolated in Italy between 1989 and 2000. In 2005, there were 855 cases of *Salmonella* Enteritidis reported, which accounted for 23.1% of all *Salmonella* infections. The most frequently reported phage types continue to be PT4 (26.6%) and PT1 (21.0%).

8.18.1.1.2 *Salmonella* Typhimurium

Salmonella Typhimurium replaced *Salmonella* Enteritidis as the predominant serovar in 2001. This trend continued in 2005, with 1,839 cases of *Salmonella* Typhimurium reported, which accounted for 49.7% of all *Salmonella* infections. DT104 remains the most frequently reported phage type[5] (over 30%), however, a significant proportion (26%) of untypable strains (NT) were observed. *Salmonella* Typhimurium DT104A was isolated for the first time in 2004.

8.18.1.1.3 Other serotypes

The third most commonly isolated type is the monophasic *Salmonella* 4,5,12:i:-, with 131 cases (3.5%). In 2005, the increase in the number of *Salmonella* Napoli isolates observed since 2001 continued, although the number of reports were down to 67 compared with 112 in 2004. Cases occurred during the summer months but were mainly confined to a limited area of northern Italy. *Salmonella* Napoli ranks among the top ten serotypes but no specific animal reservoir has been identified, however, *Salmonella* Napoli is frequently isolated from surface water.

8.18.1.2 Salmonellosis typhoidal

Typhoidal salmonellas were isolated from 21 cases, 13 of whom had *Salmonella* Typhi.

8.18.2 Antimicrobial resistance

Just over three-quarters of all isolates underwent antimicrobial susceptibility testing (76.3%). Resistance to Ampicillin and tetracyclines were most commonly seen (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials.

Antimicrobial agent	% of isolates resistant
Streptomycin	33.2
Sulphonamides	36.5
Tetracyclines	44.0
Ampicillin	45.4
Chloramphenicol	13.6
Trimethoprim	11.0
Nalidixic acid	6.8
Kanamycin	3.5
Gentamicin	8.0
Cefotaxime	1.4
Ciprofloxacin	0.4

Only 650 isolates underwent antimicrobial susceptibility testing using the Enter-net panel of 11 antibiotics. The majority of these were *Salmonella* Typhimurium (48%), *Salmonella* Enteritidis (16%) and *Salmonella* 4,5,12;i;- (7%); 45% of all isolates tested were multi-resistant. Multi-drug resistance was observed in 68% of *Salmonella* Typhimurium and in 58,7% of S.4,5,12;i;- isolates. (Table). *Salmonella* Typhimurium strains showing the ASSuT profile have steadily increased in number during the last three years. These strains often showed a not-typable phage type and a similar PFGE type. Similar strains have frequently been isolated from swine sources.

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR
4,5,12:i:-	58.7
Typhimurium	69.0
Enteritidis	0.7
Total	44.8

8.18.3 Travel related infection

Two per cent of non-typhoidal infections were acquired abroad. The most common reported destination was Croatia (6 cases; 18.2%).

Travel history was available for two typhoidal cases; one reported travel to Papua New Guinea, and one to Albania.

8.18.4 Outbreaks

Four outbreaks were detected during 2005. 27 cases of *Salmonella* Typhimurium DT121, a phage type very uncommon in Italy, showing the same PFGE profiles were associated with a school canteen, but no food item was found as vehicle. 20 cases of S. 4,5,12;i;- showing the same R-type (ASuTTmSxT) and identical PFGE profile were associated with a restaurant. 153 cases of *Salmonella* Enteritidis PT8 showing the same PFGE profile were associated to school canteen but also in this case the vehicle remains unidentified[6].

Finally, a cluster of 11 cases due to *Salmonella* Typhimurium with an atypical phage type profile (NST) was detected after an international enquiry about an outbreak occurred in Sweden and associated with consumption of Italian salami. The Swedish and Italian isolates showed the same PFGE profile.

8.19 Japan

No data or information provided.

8.20 Latvia

8.20.1 Trends and sources of infection

In 2005, there were 640 laboratory reports of salmonellosis in Latvia. *Salmonella* Enteritidis was the most prevalent serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	544	85.00
Typhimurium	57	8.91
Derby	11	1.72
Infantis	4	0.63
Papuana	3	0.47
Brandenburg	2	0.31
Isangi	2	0.31
London	2	0.31
Aba	1	0.16
Chailey	1	0.16
Choleraesuis	1	0.16
Concord	1	0.16
Escanaba	1	0.16
Glostrup	1	0.16
Hadar	1	0.16
Others	8	1.25
Total	640	100.00

8.20.1.1 Salmonellosis non-typhoidal

8.20.1.1.1 *Salmonella* Enteritidis

In 2005, there were 544 laboratory reports of *Salmonella* Enteritidis, which accounted for 85.0% of all *Salmonella* infections. Phage type data are not available.

8.20.1.1.2 *Salmonella* Typhimurium

In 2005, there were 57 laboratory reports of *Salmonella* Typhimurium, which accounted for 8.9% of all *Salmonella* infections. Phage type data are not available.

8.20.1.1.3 Other serotypes

The most commonly reported in 2005 was *Salmonella* Derby (11 cases; 1.7% of all cases).

8.20.1.2 Salmonellosis typhoidal

There was one report of *Salmonella* Typhi in 2005.

8.20.2 Antimicrobial resistance

Forty-two per cent of isolates underwent some form of antimicrobial susceptibility testing. Nearly all were sensitive to the majority of antimicrobial agents they were tested against (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	2.6
Streptomycin	14.6
Tetracyclines	15.7
Ampicillin	15.7
Chloramphenicol	12.7
Trimethoprim	2.6
Nalidixic acid	4.1
Kanamycin	0.0
Gentamicin	0.0
Cefotaxime	0.0
Ciprofloxacin	0.4

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Papuana	100.0
Typhimurium	83.3
Enteritidis	1.0
Others	0.4
Total	13.5

8.20.3 Travel related infection

One per cent of cases reported travel abroad. Information on country of travel was available for all nine cases of non-typhoidal cases with imported infections; three cases reported travel to Russia, one each to Armenia, Belarus, India, Lithuania, Turkey and Ukraine.

8.20.4 Outbreaks

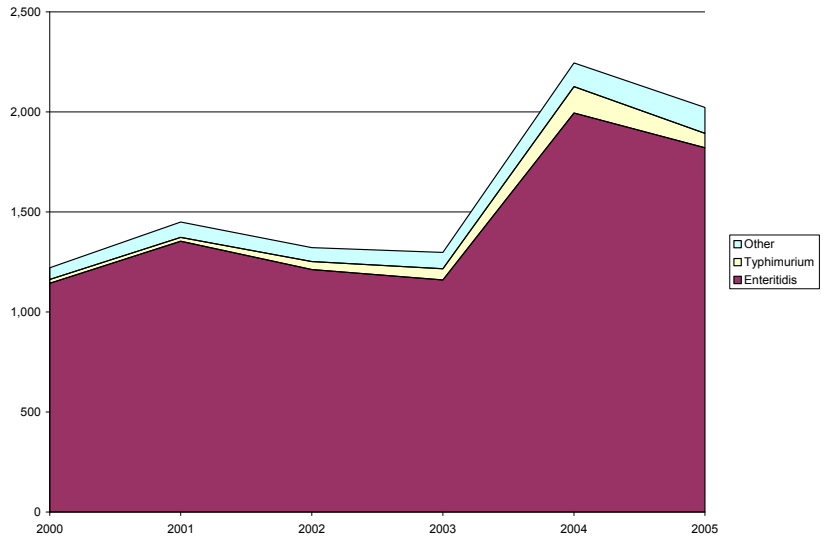
In 2005, there were 14 salmonellosis outbreaks (affecting 89 people). The cause of 11 epidemiologically confirmed food-borne salmonellosis outbreaks (affecting 80 people, incl. 21 carers) was *S. Enteritidis.* For three outbreaks the possible infection transmission factor was cakes (including home-made pie), for another three – eggs and egg containing foodstuffs, and for one – sour cream.

8.21 Lithuania

8.21.1 Trends and sources of infection

The incidence of salmonellosis has been decreasing since 1998, from a rate of 68.8 per 100,000 of the population to a rate of 33.3 per 100,000 in 2003. In 2004, the incidence of salmonellosis increased to 54 per 100,000 (Graph), although this reduced in 2005 to 48.2. The majority of cases in 2005 were sporadic (85%), and caused by the consumption of poultry or related products. Most cases (70%) acquired their infections through homemade food.

Graph Trends of salmonellosis 2000-05



In 2005, there were 2,023 laboratory reports of salmonellosis in Lithuania. *Salmonella* Enteritidis and *Salmonella* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,821	90.01
Typhimurium	72	3.56
Infantis	12	0.59
Derby	8	0.40
Brandenburg	6	0.30
Agona	5	0.25
Glostrup	4	0.20
Thompson	3	0.15
Newport	2	0.10
Agama	1	0.05
Dublin	1	0.05
Heidelberg	1	0.05
Isangi	1	0.05
Muenchen	1	0.05
Oranienburg	1	0.05
Others	84	3.84
Total	2,023	100.00

8.21.1.1 Salmonellosis non-typhoidal

8.21.1.1.1 *Salmonella* Enteritidis

In 2005, there were 1,821 laboratory reports of *Salmonella* Enteritidis, which accounted for 90.0% of all *Salmonella* infections. Phage type data are not available.

8.21.1.1.2 *Salmonella* Typhimurium

In 2005, there were 72 laboratory reports of *Salmonella* Typhimurium, which accounted for 3.6% of all *Salmonella* infections. Phage type data are not available.

8.21.1.1.3 Other serotypes

Those most commonly reported in 2005 were *Salmonella* Infantis (12 cases; 0.6% of all cases) and Derby (8 cases; 0.4% of all cases).

8.21.1.2 Salmonellosis typhoidal

There was one report of *Salmonella* Typhi infection. No travel history was available.

8.21.2 Antimicrobial resistance

Most isolates underwent antimicrobial susceptibility testing (96.6%). Resistance was most commonly reported against Tetracyclines (Table). No isolates were multi-drug resistant.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	
Streptomycin	
Tetracyclines	43.9
Ampicillin	16.4
Chloramphenicol	3.8
Trimethoprim	11.5
Nalidixic acid	
Kanamycin	9.3
Gentamicin	1.6
Cefotaxime	0.3
Ciprofloxacin	0.2

No isolates tested were multi-drug resistant.

8.21.3 Travel related infection

No travel history was available.

8.21.4 Outbreaks

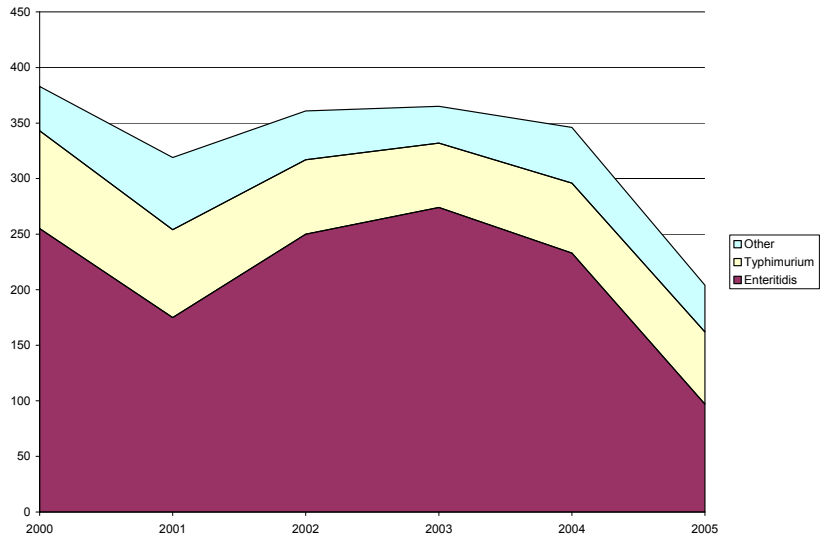
No data or information provided.

8.22 Luxembourg

8.22.1 Trends and sources of infection

In 2005, the incidence of salmonellosis fell from 346 cases in 2004 to 204 confirmed cases in2005 (down 41%). This fall was mainly due to a reduction in *Salmonella* Enteritidis cases, which fell from 233 to 97 (a reduction of 58%). The distribution of other serotypes showed little change from previous years (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium remained the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	97	47.55
Typhimurium	65	31.86
Anatum	6	2.94
Hadar	3	1.47
Thompson	3	1.47
Virchow	3	1.47
Agona	2	0.98
Brandenburg	2	0.98
Derby	2	0.98
Eboko	2	0.98
Goldcoast	2	0.98
Newport	2	0.98
Stanley	2	0.98
Abony	1	0.49
Albany	1	0.49
Others	11	5.39
Total	204	100.00

8.22.1.1 Salmonellosis non-typhoidal

8.22.1.1.1 *Salmonella* Enteritidis

There were 97 laboratory reports of *Salmonella* Enteritidis in 2005, which accounted for 47.6% of all *Salmonella* infections. This is a significant reduction on 2004 when there were 233 cases. Phage type data are not available.

8.22.1.1.2 *Salmonella* Typhimurium

There were 65 laboratory reports of *Salmonella* Typhimurium in 2005, which accounted for 31.8% of all *Salmonella* infections. This is about the same number as in 2004 (63). Phage type data are not available.

8.22.1.1.3 Other serotypes

Other serotypes accounted for 20.6% of all *Salmonella* infections.

8.22.1.2 Salmonellosis typhoidal

There were no reports of typhoid or paratyphoid infection in 2005.

8.22.2 Antimicrobial resistance

All isolates underwent antimicrobial susceptibility testing. Resistance to Sulphonamides was most commonly seen (Table). Antimicrobial resistance was common in *Salmonella* Typhimurium isolates, 49% were multi-drug resistant (resistant to three or more antimicrobial agents). However, resistance was rare in isolates of *Salmonella* Enteritidis, 80% were susceptible, and 2% were multi-drug resistant.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	27.0
Streptomycin	24.5
Tetracyclines	26.9
Ampicillin	23.0
Chloramphenicol	9.8
Trimethoprim	9.8
Nalidixic acid	11.3
Kanamycin	2.5
Gentamicin	1.5
Cefotaxime	0.5
Ciprofloxacin	10.8

Just over 22% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Hadar	66.7
Virchow	66.7
Typhimurium	49.2
Enteritidis	2.1
Others	22.2
Total	22.5

8.22.3 Travel related infection

Sixteen cases (7.8%) had travel associated information; Morocco (3, 18.8%) and Spain (2, 12.5%) were the most common countries reported.

8.22.4 Outbreaks

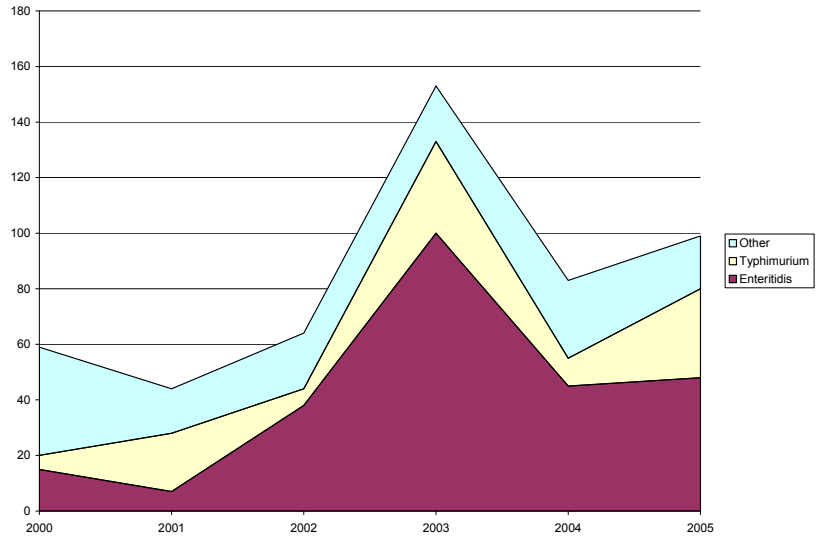
No data or information provided.

8.23 Malta

8.23.1 Trends and sources of infection

In 2005, there were 99 laboratory reports of salmonellosis in Malta (Graph). The majority of infections (63%) were in children less than 5 years of age. There was a sharp increase in the number of cases during August.

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	48	48.48
Typhimurium	32	32.32
Infantis	4	4.04
Virchow	3	3.03
Kedougou	2	2.02
Agona	1	1.01
Croft	1	1.01
Derby	1	1.01
Goldcoast	1	1.01
Panama	1	1.01
Typhi	1	1.01
Gallinarum	1	1.01
Others	3	3.03
Total	99	100.00

8.23.1.1 Salmonellosis non-typhoidal

8.23.1.1.1 *Salmonella* Enteritidis

In 2005, there were 48 laboratory reports of *Salmonella* Enteritidis, which accounted for 48.5% of all *Salmonella* infections. Phage type data are not available.

8.23.1.1.2 S.Typhimurium

In 2005, there were 32 laboratory reports of *Salmonella* Typhimurium, which accounted for 32.3% of all *Salmonella* infections. Phage type data are not available.

8.23.1.1.3 Other serotypes

Those most commonly reported in 2005 were *Salmonella* Infantis (4 cases; 4.0% of all cases) and *Salmonella* Virchow (3 cases; 3.0% of all cases).

8.23.1.2 Salmonellosis typhoidal

There was one case of *Salmonella* Typhi reported during 2005.

8.23.2 Antimicrobial resistance

Almost all isolates underwent some form of antimicrobial susceptibility testing (96.9%). Resistance was only seen against Ampicillin (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the antimicrobials used.

Antimicrobial agent	% of isolates resistant
Ampicillin	25.5
Gentamicin	0.0
Ciprofloxacin	0.0

8.23.3 Travel related infection

No cases reported travel abroad.

8.23.4 Outbreaks

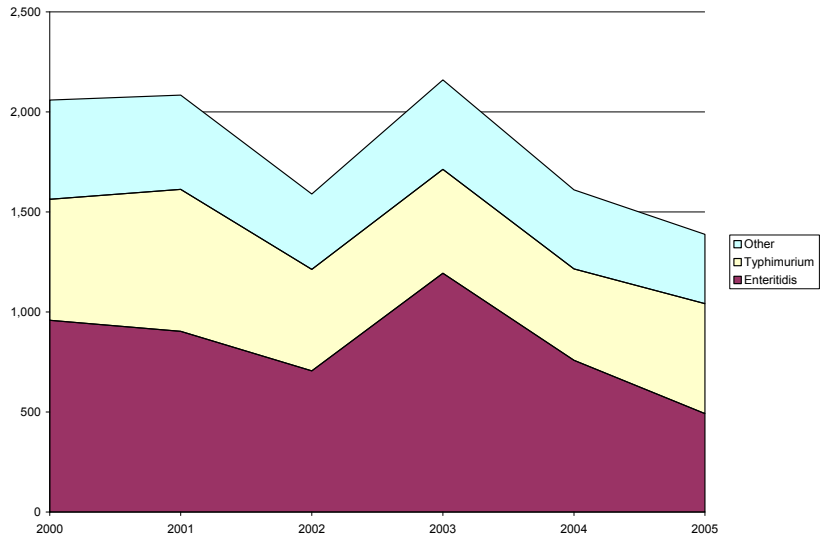
Eight outbreaks affecting a total of 124 cases were reported during 2005. The settings in four of these outbreaks were households, whilst institutions and restaurants were the settings in another four.

8.24 Netherlands

8.24.1 Trends and sources of infection

In 2005, after an explosion of cases in 2003, the number of *Salmonella* isolates that were sent in by the PHLs decreased, continuing the gradual decline seen since 1994, at the peak of the *Salmonella* Enteritidis epidemic (Graph). This decrease has been most noticeable in children aged between one and four years.

Graph Trends of salmonellosis 2000-05



In 2005, there were 1,388 laboratory reports of salmonellosis in the Netherlands. Enteritidis and Typhimurium were the most prevalent serovars (Table). The age distribution shows that the incidence of salmonellosis is highest in children under four years, followed by adults aged 64 years or older. This distribution is more pronounced in those cases that are hospitalised, indicating that the disease has a more complicated course in youngest and oldest patients.

It is estimated that in 2005, 30% of human salmonellosis could be attributed to eggs, 28% to pigs, 16% to poultry, 10% to cattle and 16% to travel and unknown sources.

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	549	39.55
Enteritidis	492	35.45
Brandenburg	25	1.80
Infantis	20	1.44
Saintpaul	19	1.37
Corvallis	17	1.22
Virchow	17	1.22
Hadar	16	1.15
Derby	14	1.01
Kentucky	11	0.79
Typhi	10	0.72
Stanley	9	0.65
Anatum	7	0.50
Newport	7	0.50
Senftenberg	7	0.50
Others	168	12.10
Total	1,388	100.00

8.24.1.1 Salmonellosis non-typhoidal

8.24.1.1.1 *Salmonella* Enteritidis

In 2005, there were 492 laboratory reports of *Salmonella* Enteritidis infection, which accounted for 35.5% of all cases of salmonellosis. This was a reduction of 35.1% from 2004, and Enteritidis became the second most common serotype. The most commonly reported phage types were PT4 (30.7%), PT21 (16.3%) and PT6 (11.4%). A number of remarkable shifts have occurred in the circulating phage types of *Salmonella* Enteritidis over recent years. Striking is the decrease of PT4, formerly the predominant phage type, and the emergence of new types, a phenomenon that is observed throughout Europe[1].

A large patient-control study conducted between April 2002 and April 2004 in collaboration with the PHLs (the CaSa study) identified that the principle risk factor for *Salmonella* Enteritidis infection in humans was raw egg or dishes containing raw egg.[7]

8.24.1.1.2 *Salmonella* Typhimurium

The huge increase in *Salmonella* Typhimurium DT104 isolates seen in 2001, which was suspected to be linked to pig manure, has now declined. In 2005, there were 549 laboratory reports of *Salmonella* Typhimurium infection, which accounted for 35.5% of all cases of salmonellosis. This was an increase of 20.1% on 2004.

The CaSa study identified not only the consumption of raw undercooked meat but also the environment as strong risk factors for *Salmonella* Typhimurium infection. A particularly high risk was associated with sand boxes in which children play.

8.24.1.1.3 Other serotypes

Other serotypes accounted for 25.0% of all cases.

8.24.1.2 Salmonellosis typhoidal

There was one report of *Salmonella* Paratyphi A infection, three reports of *Salmonella* Paratyphi B infection and 10 reports of *Salmonella* Typhi infection.

8.24.2 Antimicrobial resistance

Almost 2/3 isolates underwent antimicrobial susceptibility testing (66.1%). Resistance was most commonly reported against Tetracyclines and Ampicillin (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	-
Streptomycin	-
Tetracyclines	28.6
Ampicillin	25.9
Chloramphenicol	17.2
Trimethoprim	7.0
Nalidixic acid	-
Kanamycin	1.7
Gentamicin	-
Cefotaxime	-

Ciprofloxacin	9.3

Four percent of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR
Blockley	66.7
Stanley	33.3
Panama	20.0
Typhimurium	9.4
Kentucky	9.1
Saintpaul	7.1
Enteritidis	0.0
Others	1.6
Total	4.3

8.24.3 Travel related infection

In 2005, 20.5% of non-typhoidal cases reported recent travel. As previously, Mediterranean countries were reported most often for travel-related Typhimurium and Enteritidis infections. Between 1999 and 2005 8% of cases were travel related, however, this varies between sero- and phage types. The CaSa study shows that travel is under-reported and that approximately 25% of all laboratory confirmed *Salmonella* infections are acquired abroad.

Where travel history was reported, 35.7% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (two cases; 66.7%), and Brazil (one case; 33.3%).

8.24.4 Outbreaks

In September-November a ten-fold increase in *Salmonella* Typhimurium DT104 cases prompted an outbreak investigation[8]. Risk factors for infection were consumption of a pre-processed raw beef product and of food from mobile caterers. Molecular typing revealed a link with another DT104 outbreak in Denmark, caused by imported beef. The incriminated beef was traced in the Netherlands and sampling yielded DT104 of the outbreak strain.

In addition, through the mandatory reporting system, in 2005, 15 foodborne outbreaks of *Salmonella* were reported, involving 106 cases. *Salmonella* has been the most common reported cause of foodborne outbreaks in the Netherlands since many years.

8.25 New Zealand

8.25.1 Trends and sources of infection

In 2005, there were 1,460 laboratory reports of salmonellosis in New Zealand, a similar rate to 2004. *Salmonella* Typhimurium and Enteritidis were the most prevalent serovars (Table).

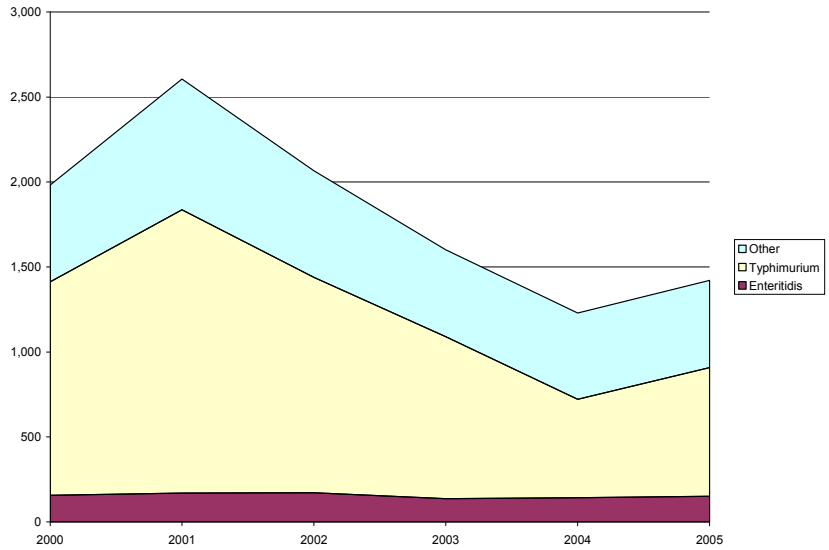


Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	757	51.85
Enteritidis	151	10.34
Brandenburg	68	4.66
Infantis	67	4.59
Saintpaul	65	4.45
Typhi	28	1.92
Mississippi	22	1.51
Thompson	16	1.10
Virchow	16	1.10
Java	15	1.03
Corvallis	14	0.96
Stanley	12	0.82
Oslo	11	0.75
Newport	10	0.68
Oranienburg	10	0.68
Others	198	13.56
Total	1,460	100.00

8.25.1.1 Salmonellosis non-typhoidal

8.25.1.1.1 *Salmonella* Enteritidis

In 2005, there were 151 laboratory reports of *Salmonella* Enteritidis, which accounted for 10.3% of all *Salmonella* infections. The predominant phage type was PT9a (48.3%).

8.25.1.1.2 *Salmonella* Typhimurium

In 2005, there were 757 laboratory reports of *Salmonella* Typhimurium, which accounted for 51.8% of all *Salmonella* infections. The predominant phage type was DT160 (32.8%).

8.25.1.1.3 Other serotypes

Those most commonly reported in 2005 were *Salmonella* Brandenburg (68 cases; 4.7% of all cases) and *Salmonella* Infantis (67 cases; 4.6% of all cases).

8.25.1.2 Salmonellosis typhoidal

There were eight reports of *Salmonella* Paratyphi A infection, three reports of *Salmonella* Paratyphi B infection and 28 reports of *Salmonella* Typhi *infection*.

8.25.2 Antimicrobial resistance

A representative sample comprising 22.4% (318) of all non-typhoidal *Salmonella* underwent antimicrobial susceptibility testing. Most isolates (89.9%) were fully susceptible to all antimicrobial agents tested. Resistance to the individual antimicrobials is shown in the table.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Tetracyclines	5.0
Sulphonamides	4.1
Nalidixic acid	5.7
Ampicillin	4.1
Streptomycin	3.1
Trimethoprim	1.9
Chloramphenicol	1.9
Gentamicin	0.6
Cefotaxime	0.0
Ciprofloxacin	0.3

Over 3% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR
Albany	100.0
Johannesburg	50.0
Kentucky	50.0
Virchow	40.0
Agona	33.3
Stanley	20.0
Java	12.5
Typhimurium	0.6
Others	1.4
Total	3.5

8.25.3 Travel related infections

Fifteen per cent of non-typhoidal cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Thailand (32 cases; 14.7%) and Fiji (30 cases; 13.8%).

Where travel history was reported, 71.8% of all typhoid and paratyphoid cases acquired their infections abroad; the most frequently reported destinations were India (12 cases; 42.9%) and Samoa (nine cases; 32.1%).

8.25.4 Outbreaks

Eight outbreaks were detected during 2005. Eight cases of *Salmonella* Thompson were associated with an open-air café adjacent to a duck pond. Seven cases of *Salmonella* Infantis were associated with a restaurant. Eight cases of *Salmonella* Enteritidis phage type 9a associated with a café with Tahini being implicated but not proven. Three cases of *Salmonella* Typhimurium RDNC were associated with a café. Twenty six cases of *Salmonella* Typhimurium phage type 1 in one area with no common source identified. Six cases of *Salmonella* Typhimurium phage type 193 associated with pork. Sixteen cases of *Salmonella* Saintpaul with a possible association with raw carrots. Six cases of *Salmonella* Typhimurium phage type 135 associated with home killed spit roast pork.

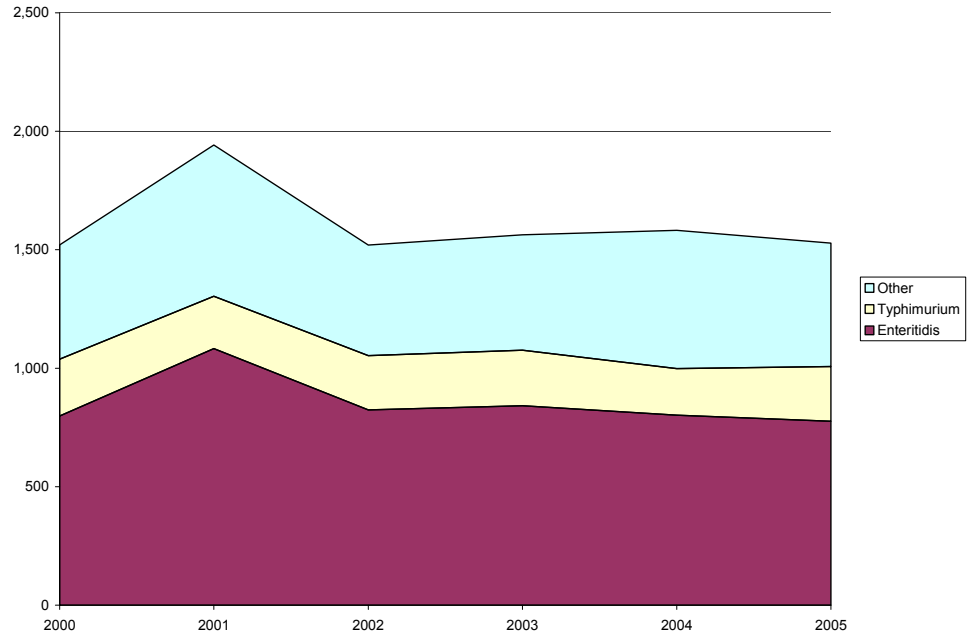
8.26 Norway

8.26.1 Trends and sources of infection

The incidence of salmonellosis has remained relatively stable during the last five years (Graph). A total of 1,528 cases of salmonellosis were reported in 2005, of which only 266 (21%) were infected in Norway. The most common serovar among domestic infection was *Salmonella* Typhimurium, accounting for approximately 47% of all *Salmonella* Typhimurium-cases and 41% of all domestic infections (see section 8.26.3 for details).

Control programmes have documented that Norwegian animals used in food production are virtually free from *Salmonella*. In fact *Salmonella* Enteritidis has never been detected in Norwegian poultry. However, data show that *Salmonella* Typhimurium occurs endemically in the environment, making transmission possible through wild birds and animals (especially hedgehogs), and untreated water.

Graph Trends of salmonellosis 2000-05



In 2005, *Salmonella* Enteritidis and *Salmonella* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%	Domestic	Imported	Unknown
Enteritidis	776	50.79	77	675	24
Typhimurium	230	15.05	109	111	11
Stanley	75	4.91	11	63	1
Virchow	45	2.95	3	42	
Hadar	24	1.57		20	4
Newport	23	1.51	6	17	
Typhi	23	1.51	5	17	1
Corvallis	18	1.18	3	13	2
Paratyphi A	16	1.05		16	
Agona	14	0.92	2	10	2
Goldcoast	11	0.72	2	9	
Java	11	0.72	1	9	1
Saintpaul	11	0.72	6	5	
Haifa	10	0.65		10	
Infantis	10	0.65	1	7	2
Others	230	15.12	40	179	10
Total	1,528	100.00	266	1,203	59

8.26.1.1 Salmonellosis non-typhoidal

8.26.1.1.1 *Salmonella* Enteritidis

Altogether 776 (51%) cases of salmonellosis were due to *Salmonella* Enteritidis, of which only 77 (10%) were infected in Norway.

8.26.1.1.2 *Salmonella* Typhimurium

Two hundred and thirty (15.1%) cases of salmonellosis were due to *Salmonella* Typhimurium, of which 109 (47.4%) were infected in Norway. A total of 50 multi-drug resistant Typhimurium DT104 infections were reported in 2005, of which 26 were acquired in Norway. MLVA typing identified three clusters among the domestic infections. One included six cases, where imported Polish meat was identified as the source. The source was not verified in the two other smaller clusters.

8.26.1.1.3 Other serotypes

Other serotypes accounted for 34.2% of all cases.

8.26.1.2 Salmonellosis typhoidal

There were 16 reports of *Salmonella* Paratyphi A infection, seven reports of *Salmonella* Paratyphi B infection and 23 reports of *Salmonella* Typhi infection. The majority of the cases were persons of foreign origin infected during visits in their home country, mainly in South-East Asia.

8.26.2 Antimicrobial resistance

In total, 229 isolates of *Salmonella* Typhimurium, 728 isolates of *Salmonella* Enteritidis, 19 isolates of *Salmonella* Typhi, 15 isolates of *Salmonella* Paratyphi A, two isolates of *Salmonella* Paratyphi B, and 457 isolates of other *Salmonella* spp. were susceptibility tested.

For *Salmonella* Typhimurium, resistance to Tetracyclines was most commonly observed followed by resistance to ampicillin, chloramphenicol, nalidixic acid and trimethoprim/ sulphamethoxazole. The proportion of *Salmonella* Typhimurium isolates susceptible to all antimicrobial agents was higher for the category "infected in Norway" (49.5%) than for the "infected abroad" category (33.3%). Multi-resistance (resistance to three or more antimicrobial agents) was slightly more common in the category "infected abroad" (40.5%) as compared to the category "infected in Norway" (33.6%). However, this high percentage of multi-resistant *Salmonella* Typhimurium among domestic cases is mainly due to a significant increase of multi-resistant DT104 from 2004 to 2005 (from 0% to 22,2%) (Table).

The vast majority of *Salmonella* Enteritidis isolates has been acquired abroad. In total, 24.6% of the isolates of *Salmonella* Enteritidis were resistant to Nalidixic acid. There was no resistance to Ciprofloxacin, whereas intermediate susceptibility was observed in 0.3% of the isolates.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	**% of isolates resistant (compared to 2004)**			
	Enteritidis	Typhimurium (domestic cases)	Typhimurium (imported)	Other *Salmonella* (excl. typhoid-group)
Sulphonamides				
Streptomycin				
Tetracyclines	4.1 (2,8)	46,7 (20,5)	63,1 (45,0)	30,5 (29,9)
Ampicillin	7,0 (5,6)	41,1 (17,9)	49,5 (37,0)	11,8 (14,0)
Chloramphenicol	0,4 (0,3)	31,8 (7,7)	36,9 (29,0)	6,3 (8,1)
Trimethoprim	1,9 (2,0)	9,3 (6,4)	9,9 (10,0)	13,1 (11,1)
Nalidixic acid	24,2 (26,4)	10,3 (2,6)	16,2 (24,0)	24,9 (22,1)
Kanamycin				
Gentamicin				
Cefotaxime				
Ciprofloxacin	0,0 (0,1)	0,9 (0,0)	0,9 (0,0)	1,0 (1,6)

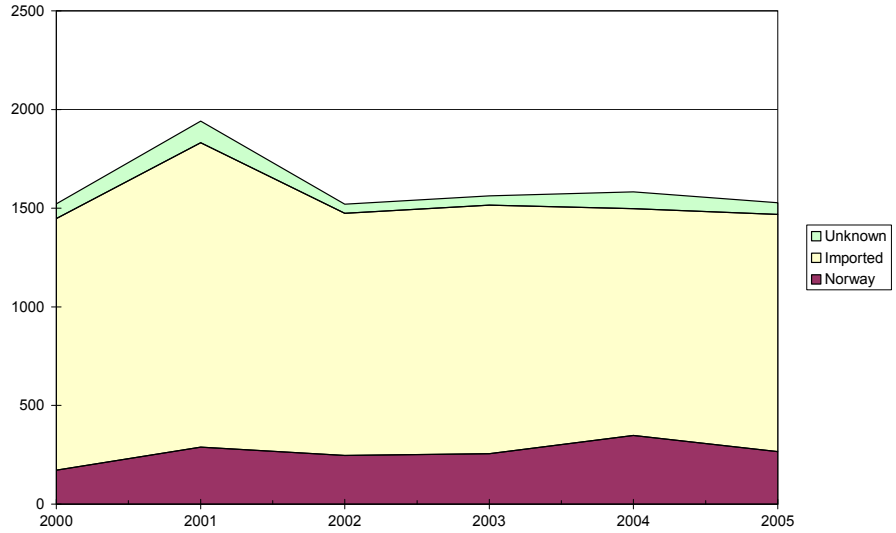
Just over 20% of all isolates tested were multi-drug resistant (Table).

Table % of isolates resistant to ≥ 3 and ≥ 4 antimicrobial agents for *Salmonella* Enteritidis and *Salmonella* Typhimurium (domestic and imported cases.

Serotype	**% of isolates MDR (%) (compared to 2004)**	
	≥ 3 agents	≥ 4 agents
Enteritidis	2,5 (2,0)	0,5 (0,0)
Typhimurium, domestic cases	33,6 (14,1)	14,0 (3,3)
Typhimurium, imported	40,5 (24,7)	15,0 (10,0)

8.26.3 Travel related infection

The majority of *Salmonella* cases in Norway are known to be travel related; 1,203 out of 1,528 of all cases (78.7%) specified travel (graph).



8.26.4 Outbreaks

In 2005, six smaller outbreaks were identified, of which two occurred among Norwegian tourists abroad. The domestic outbreaks were one with *Salmonella* Typhimurium DT104 caused by polish meat (as mentioned above), one by *Salmonella* Typhimurium caused by hedgehogs as is an annual occurrence in the western part of Norway, one by *Salmonella* Typhimurium with unknown source and one family cluster of *Salmonella* Typhimurium and *Salmonella* Infantis caused by Italian salami bought in Sweden.

One of the outbreaks among Norwegian tourists abroad was caused by *Salmonella* Enteritidis after travel to Lithuania, and the other was part of the international outbreak among travellers to Spain caused by *Salmonella* Goldcoast.

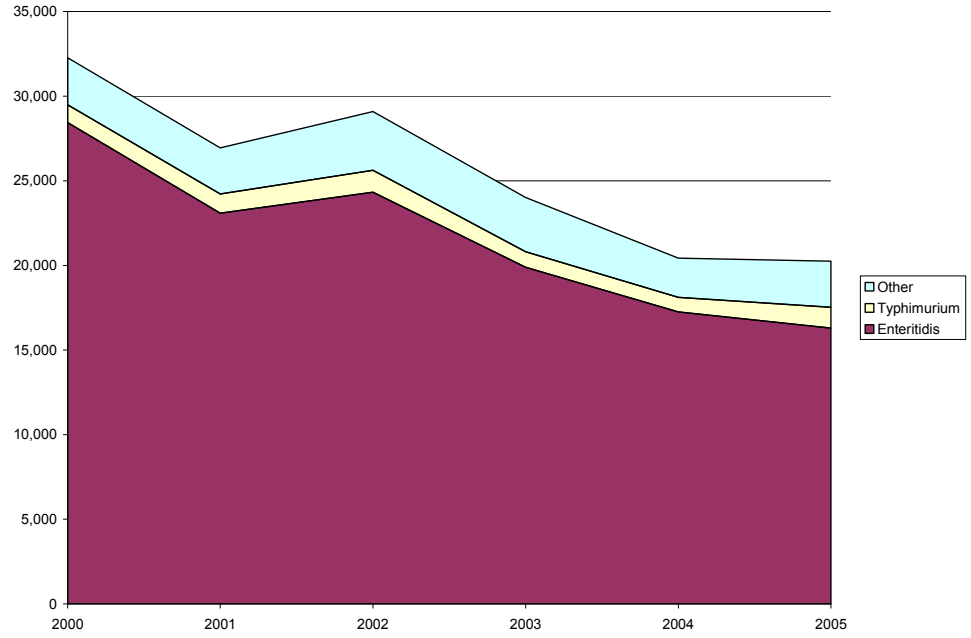
8.27 Poland

8.27.1 Trends and sources of infection

In Poland, the incidence of salmonellosis has been decreasing since the 1990’s, this decline has been seen in both the laboratory (Graph) and epidemiological surveillance systems.

In 2005, there were 20,254 laboratory confirmed cases of *Salmonella* infection reported via the laboratory system, and 16,006 cases reported via the epidemiological surveillance system. A third of all cases were children under four years of age. There was no significant difference between genders. Approximately 71% of all cases were hospitalised. Extra intestinal manifestations of salmonellosis (septicaemia, meningitis and other) were reported in 140 patients. As in previous years a seasonal peak was observed in July, August and September when over 2,000 cases were registered in each month.

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis was the predominant serovar (Table).

Table Top fifteen serotypes (inc typhoidal) Input requested

Serotype	Frequency	%
Enteritidis	16,294	80.4
Typhimurium	1,237	6.1
Infantis	740	3.7
Hadar	702	3.5
Virchow	455	2.2
Newport	83	0.4
Indiana	79	0.4
Agona	72	0.4
Andaka	65	0.3
Kottbus	60	0.3
Saintpaul	49	0.2
Thompson	46	0.2
Derby	45	0.2
Albany	32	0.2
Chester	28	0.1
Others	267	1.3
Total	20,254	

8.27.1.1 Salmonellosis non-typhoidal

8.27.1.1.1 *Salmonella* Enteritidis

There were 16,294 laboratory confirmed cases of Enteritidis in 2005, which accounted for 80.4% of all laboratory confirmed salmonellosis. Phage type data are not available.

8.27.1.1.2 *Salmonella* Typhimurium

There were 1,237 laboratory confirmed cases of *Salmonella* Typhimurium in 2005, which accounted for 6.1% of all laboratory confirmed salmonellosis. This was an increase of 44.8% on 2004. Phage type data are not available.

8.27.1.1.3 Other serotypes

The most common other serotypes are Infantis, Hadar, and Virchow.

8.27.1.2 Salmonellosis typhoidal

There were six typhoidal cases in 2005; one case of Paratyphi A, two of Paratyphi B, and three of *Salmonella* Typhi.

8.27.2 Antimicrobial resistance

No data or information provided.

8.27.3 Travel related infection

Four of the Typhoidal cases were known to be travel-related, three to India, and one to Pakistan.

8.27.4 Outbreaks

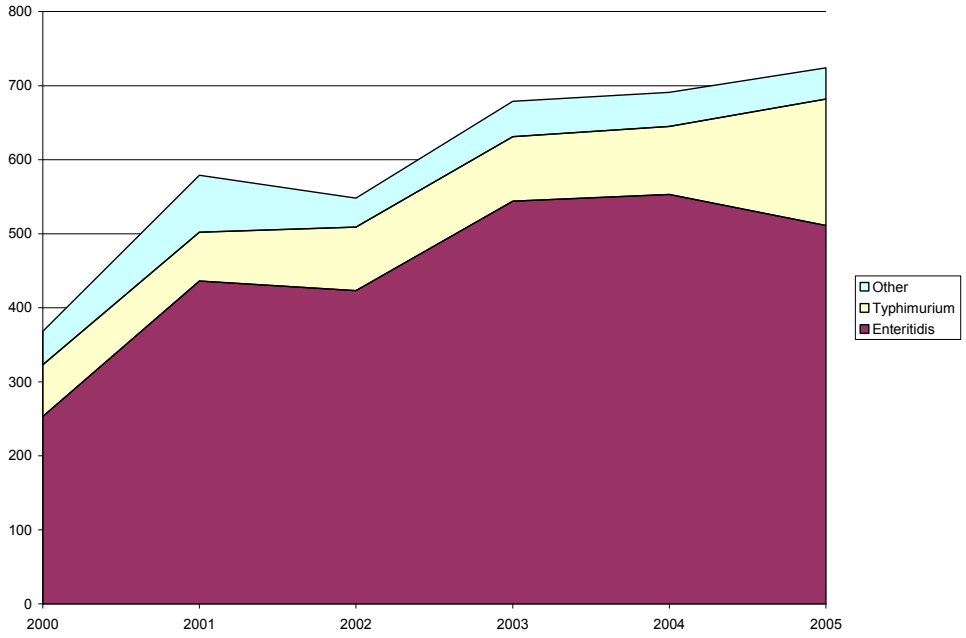
No data or information provided.

8.28 Portugal

8.28.1 Trends and sources of infection

In 2005, there were 724 laboratory reports of salmonellosis in Portugal (Graph).

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	511	70.58
Typhimurium	171	23.62
Derby	5	0.69
Essen	4	0.55
Typhi	3	0.41
Anatum	2	0.28
Friedenau	2	0.28
Norwich	2	0.28
Rissen	2	0.28
Vitkin	2	0.28
Gatow	1	0.14
Hadar	1	0.14
Heidelberg	1	0.14
Istanbul	1	0.14
Saintpaul	1	0.14
Others	15	2.07
Total	724	100.00

8.28.1.1 Salmonellosis non-typhoidal

8.28.1.1.1 *Salmonella* Enteritidis

In 2005, there were 511 laboratory reports of *Salmonella* Enteritidis, which accounted for 80.6% of all *Salmonella* infections. The predominant phage types were PT1b (62.6%) and PT4b (15.0%)

8.28.1.1.2 *Salmonella* Typhimurium

There were 171 laboratory reports of *Salmonella* Typhimurium, 23.6% of all *Salmonella* infections. The most common phage types are PTU302 (30.1%) and PT12 (20.6%).

8.28.1.1.3 Other serotypes

In Portugal, salmonellosis is dominated by the *Salmonella* Enteritidis and Typhimurium serovars, in 2005, other serotypes collectively accounted for less than 6% of all infections.

8.28.1.2 Salmonellosis typhoidal

There were three cases of *Salmonella* Typhi infection in 2005. Travel history was not reported.

8.28.2 Antimicrobial resistance

Very few isolates underwent antimicrobial susceptibility testing (5.7%). The majority of these were *Salmonella* Typhimurium (87.8%). Resistance to Sulphonamides was most commonly seen (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	100.0
Streptomycin	87.8
Tetracyclines	85.4
Ampicillin	78.0
Chloramphenicol	58.5
Trimethoprim	19.5
Nalidixic acid	41.5
Kanamycin	56.1
Gentamicin	75.6
Cefotaxime	17.1
Ciprofloxacin	19.5

Just over 85% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Typhimurium	97.2
Enteritidis	0.0
Total	85.4

8.28.3 Travel related infection

No data or information provided.

8.28.4 Outbreaks

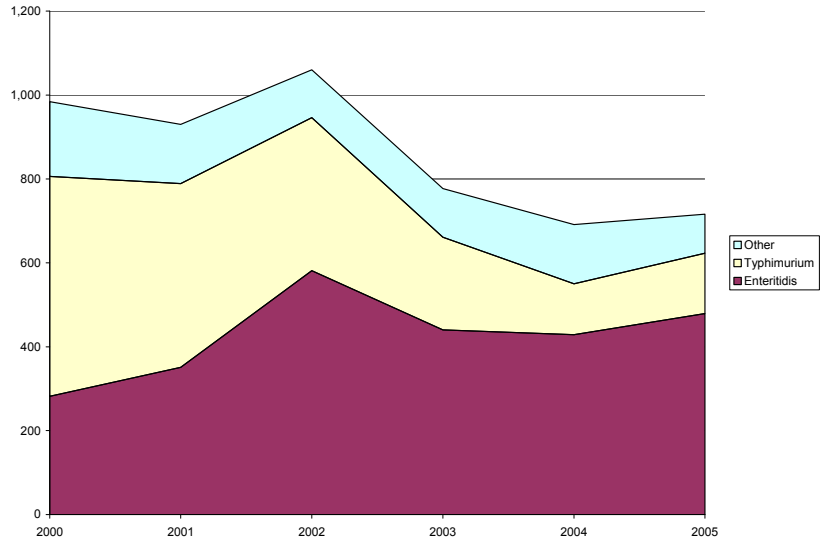
No data or information provided.

8.29 Romania

8.29.1 Trends and sources of infection

In 2005, there were 716 laboratory reports of human salmonellosis in Romania (Graph).

Graph Trends of salmonellosis 2000-05



Serovars Enteritidis and Typhimurium were the most prevalent (Table).

Table Top serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	480	67.04
Typhimurium	144	20.11
Saintpaul	32	4.47
Agona	10	1.40
Bredeney	8	1.12
Hidalgo	6	0.84
Hadar	6	0.84
Kapemba	4	0.56
Elisabethville	3	0.42
Java	3	0.42
Braenderup	2	0.28
Others	18	2.50
Total	716	100.00

8.29.1.1 Salmonellosis non-typhoidal

8.29.1.1.1 *Salmonella* Enteritidis

In 2005, there were 480 laboratory reports of *Salmonella* Enteritidis, which accounted for 67.0% of all *Salmonella* infections. This is an increase of 11.7% on 2004.

8.29.1.1.2 *Salmonella* Typhimurium

In 2005, there were 144 laboratory reports of *Salmonella* Typhimurium, which accounted for 20.0% of all *Salmonella* infections.

8.29.1.1.3 Other serotypes

The next most commonly reported serotype in 2005 was *Salmonella* Saintpaul (32 cases; 4.5% of all cases).

8.29.1.2 Salmonellosis typhoidal

There was one report of *Salmonella* Paratyphi B infection in 2005.

8.29.2 Antimicrobial resistance

All isolates underwent antimicrobial susceptibility testing in 2005.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	18.7
Streptomycin	19.0
Tetracyclines	19.6
Ampicillin	22.6
Chloramphenicol	13.7
Trimethoprim	11.5
Nalidixic acid	34.9
Kanamycin	7.4
Gentamicin	7.4
Cefotaxime	4.6
Ciprofloxacin	0.6

Just over 18% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Typhimurium	70.1
Saintpaul	27.3
Enteritidis	1.9
Others	23.5
Total	18.3

8.29.3 Travel related infection

No data or information provided.

8.29.4 Outbreaks

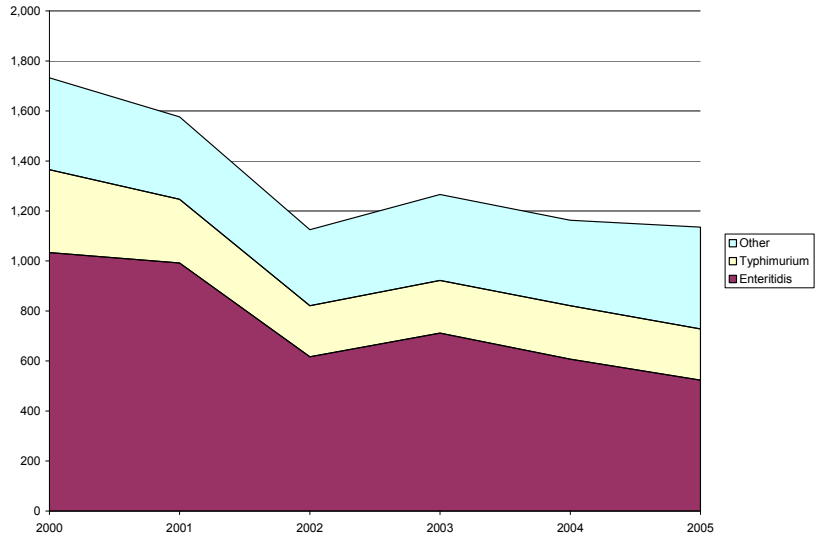
No data or information provided.

8.30 Scotland

8.30.1 Trends and sources of infection

There were 1,135 reports of *Salmonella* in 2005, which represented a decrease of 2% on the previous year’s total (Graph).

Graph Trends of salmonellosis 2000-05



As in previous years, *Salmonella* Enteritidis and Typhimurium were the most frequently reported serotypes and between them accounted for 64% of all cases (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	523	46.08
Typhimurium	205	18.06
Goldcoast	41	3.61
Virchow	39	3.44
Newport	22	1.94
Saintpaul	21	1.85
Hadar	18	1.59
Stanley	15	1.32
Corvallis	14	1.23
Agona	13	1.15
Mbandaka	12	1.06
Infantis	10	0.88
Java	10	0.88
Javiana	8	0.70
Poona	8	0.70
Others	176	15.51
Total	1,135	100.00

8.30.1.1 Salmonellosis non-typhoidal

8.30.1.1.1 *Salmonella* Enteritidis

As first reported in 2003, PT1 continues to be the most predominant phage type of *Salmonella* Enteritidis in Scotland (24.7%).

8.30.1.1.2 *Salmonella* Typhimurium

The numbers of reports of *Salmonella* Typhimurium were roughly equivalent to that seen in 2004 (205 compared to 214). DT104 remained the most frequently reported phage type with 86 reports, accounting for 42% of all *Salmonella* Typhimurium in 2005. This increase continues that reported in 2004.

8.30.1.1.3 Other serotypes

Other serotypes accounted for 38.9% of all cases.

8.30.1.2 Salmonellosis typhoidal

During 2005, there were five reports of *Salmonella* Paratyphi A, one report of *Salmonella* Paratyphi B and two reports of *Salmonella* Typhi.

8.30.2 Antimicrobial resistance

All isolates underwent antimicrobial susceptibility testing. Resistance was most commonly seen against Nalidixic acid (Table).

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	18.6
Streptomycin	18.2
Tetracyclines	19.8
Ampicillin	16.1
Chloramphenicol	10.2
Trimethoprim	6.3
Nalidixic acid	20.1
Kanamycin	1.9
Gentamicin	1.9
Cefotaxime	0.2
Ciprofloxacin	2.3

Just over 15% of isolates were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR
Typhimurium	61.5
Hadar	55.6
Stanley	53.3
Newport	22.7

Virchow	15.4
Heidelberg	14.3
Saintpaul	9.5
Enteritidis	1.9
Others	4.0
Total	15.9

8.30.3 Travel related infection

Twenty-four point six per cent of *Salmonella* Enteritidis PT1 and 21.3% of *Salmonella* Enteritidis PT4 reports indicated foreign travel as a possible source of infection.

All *Salmonella* Typhi and 66.7% of *Salmonella* Paratyphi A are believed to have been acquired outwith the UK.

8.30.4 Outbreaks

No data or information provided.

8.31 Slovakia

8.31.1 Trends and sources of infection

The incidence of salmonellosis has been decreasing since 1999 (Graph). In 2005, there were 12,248 cases of *Salmonella* infection reported in Slovakia (220.3 per 100,000 of the population). There was a slight increase on the number of cases reported in 2004 (+2.1%).

Graph Trends of salmonellosis 2000-05

Salmonella Enteritidis and Typhimurium were the most prevalent serovars in 2005 (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	10,387	84.81
Typhimurium	253	2.07
Infantis	47	0.38
Bovismorbificans	25	0.20
Kentucky	13	0.11
Virchow	11	0.09
Hadar	10	0.08
Derby	7	0.06
Gallinarum	5	0.04
Montevideo	5	0.04
Agona	4	0.03
Bareilly	4	0.03
Livingstone	4	0.03
Brandenburg	3	0.02
Corvallis	3	0.02
Others	1,467	11.98
Total	12,248	100.00

8.31.1.1 Salmonellosis non-typhoidal

8.31.1.1.1 *Salmonella* Enteritidis

Salmonella Enteritidis has been the predominant serotype since 1989, in 2005 it accounted for 84.8% of all *Salmonella* infections. The predominant phage type was PT8 (58.2%).

8.31.1.1.2 *Salmonella* Typhimurium

Salmonella Typhimurium accounted for 1.2% of all *Salmonella* infections. The most commonly reported phage type was DT104 (50.0%)

8.31.1.1.3 Other serotypes

Other serotypes accounted for 13.1% of all cases.

8.31.1.2 Salmonellosis typhoidal

There was one case of *Salmonella* Paratyphi A imported from India.

8.31.2 Antimicrobial resistance

The laboratory diagnostics of human *Salmonella* infections is routinely performed (including serotyping and ATB resistance) in medical microbiology laboratories in Slovakia. The *Salmonella* serotypes are reported to the Central Register in Banska Bystrica, but the data of ATB resistance are not available. The following strains of *Salmonella* are sent to the NRC from hospitals and laboratories:

- from patient with severe clinical course of disease
- untypable in the hospital
- *Salmonella* Typhimurium strains (currently not obligatory)
- isolated from out of intestine location
- isolated from food and environment

- from outbreaks

These strains are serotyped and tested for ATB resistance. *Salmonella* Enteritidis and Typhimurium strains are sent to the National Reference Laboratory for phage typing. There were 550 (4.5%) strains sent for ATB typing in Slovakia in 2005.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	20,4
Streptomycin	19,5
Tetracyclines	21,6
Ampicillin	19,6
Chloramphenicol	13,1
Trimethoprim	4,7
Nalidixic acid	17,6
Kanamycin	0,3
Gentamicin	0,2
Cefotaxime	Not tested
Ciprofloxacin	1,3

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates
Enteritidis	0.3 from 298
Typhimurium	72.0 from 125
Others	1.6 from 127
Total	16.9

The most resistant serotype is *Salmonella* Typhimurium, phage type DT20a (39.2%), DT104 (8.8%) and DT120 (6.4%) and 12.8% of *Salmonella* Typhimurium were NT (not typable).

8.31.3 Travel related infection

There were 36 cases of *Salmonellosis* imported into Slovakia in 2005. 10 cases were from Czech Republic, eight from South America, two from Asia, three from Ukraine, one from Africa and 12 cases from the others countries of Europe (27 *Salmonella* Enteritidis, two *Salmonella* Typhimurium, one *Salmonella* Corvallis, one *Salmonella* Manhattan, one *Salmonella* Bovismorbificans, one *Salmonella* Infantis, one *Salmonella* Heidelberg, and two strains were not laboratory confirmed).

8.31.4 Outbreaks

There were 46 outbreaks of *Salmonellosis* detected in Slovakia in 2005. The dominant serotype was *Salmonella* Enteritidis. The most frequent mode of transmission were eggs and products made from eggs. The biggest number of outbreaks (20) was reported from school canteens.

8.32 Slovenia

8.32.1 Trends and sources of infection

In 2005, the number of notifications of salmonellosis decreased by 54% (incidence rate 80.7 per 100,000 of the population) compared to 2004. *Salmonella* Enteritidis was the most prevalent serovar. There were 1,549 laboratory-confirmed cases which are included in the Enter-net *Salmonella* database (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,396	90.12
Typhimurium	57	3.68
Infantis	11	0.71
Thompson	8	0.52
Paratyphi B	5	0.32
Coeln	4	0.26
Give	4	0.26
Agona	3	0.19
Bovismorbificans	3	0.19
Heidelberg	3	0.19
Kentucky	3	0.19
Kottbus	3	0.19
Derby	2	0.13
Havana	2	0.13
Larochelle	2	0.13
Others	43	2.78
Total	1,549	100.00

8.32.1.1 Salmonellosis non-typhoidal

8.32.1.1.1 *Salmonella* Enteritidis

In 2005, the proportion of *Salmonella* Enteritidis isolates was 90.1% compared to 95.9% in 2004. Isolates that belonged to 11 different epidemics were analysed by PFGE.

8.32.1.1.2 *Salmonella* Typhimurium

In 2005 the proportion of Typhimurium isolates was 3.7% compared to 1.2% in 2004.

8.32.1.1.3 Other serotypes

In 2005 the proportion of other serotypes was 6.2% compared to 2.9% in 2004.

8.32.1.2 Salmonellosis typhoidal

There was one report of *Salmonella* Paratyphi A, and five reports of *Salmonella* Paratyphi B infection and no reports of *Salmonella* Typhi infection.

8.32.2 Antimicrobial resistance

All isolates underwent antimicrobial susceptibility testing. Resistance to Sulphonamides was most commonly seen (Table).

During the last five years there has been a decrease in the number of *Salmonella* Typhimurium isolates resistant to Ampicillin, Chloramphenicol, Nalidixic acid and Sulphonamides. However, half of all *Salmonella* Typhimurium isolates remain multi-drug resistant. The number of *Salmonella* Enteritidis isolates resistant to Ampicillin and Nalidixic acid has increased during the same time period.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	4.1
Streptomycin	1.7
Tetracyclines	2.2
Ampicillin	2.8
Chloramphenicol	0.8
Trimethoprim	0.6
Nalidixic acid	2.7
Kanamycin	0.3
Gentamicin	0.4
Cefotaxime	0.0
Ciprofloxacin	0.1

Just over 1% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR (%)
Typhimurium	36.8
Kentucky	33.3
Coeln	25.0
Infantis	9.1
Enteritidis	0.1
Others	5.3
Total	1.8

8.32.3 Travel related infection

No data are available.

8.32.4 Outbreaks

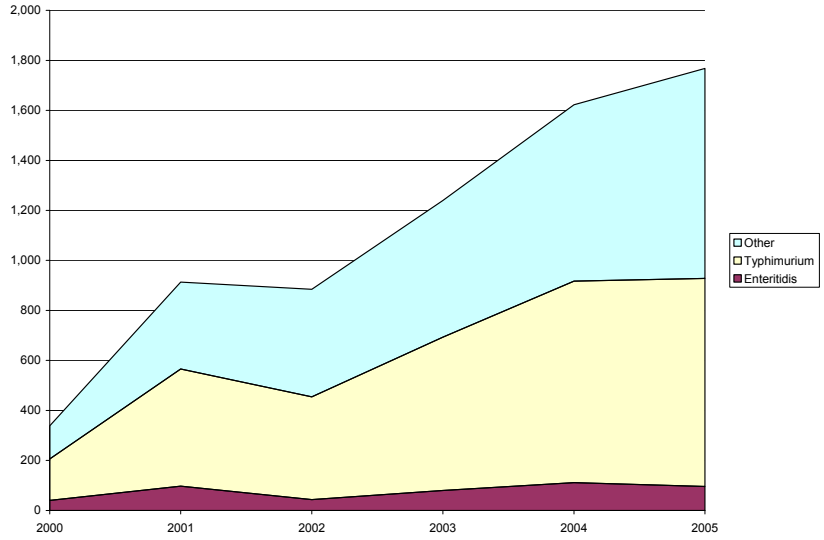
There were 11 outbreaks caused by *Salmonella* Enteritidis. In nine (seven family outbreaks, one outbreak in a hotel, and one outbreak in restaurant) out of 11 outbreaks the PFGE profile was similar, the similarity between serotypes was 99.9%.

8.33 South Africa

8.33.1 Trends and sources of infection

In 2005, there were 1,768 laboratory reports of salmonellosis (Graph). In South Africa, there is a strong association between *Salmonella* Typhimurium infection and patients presenting with HIV. The apparent rapid increase in *Salmonella* infections is a most likely to be a result of increased numbers of isolates submitted to the reference laboratory rather than an increased incidence of salmonellosis in the country.

Graph Trends of salmonellosis 2000-05



In 2005, *Salmonella* Typhimurium and Isangi were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	832	47.06
Isangi	443	25.06
Typhi	186	10.52
Enteritidis	96	5.43
Dublin	46	2.60
Schwarzengrund	20	1.13
Infantis	16	0.90
Eppendorf	13	0.74
Heidelberg	10	0.57
Hadar	9	0.51
Yovokome	8	0.45
Muenchen	7	0.40
Virchow	6	0.34
Bovismorbificans	5	0.28
Othmarschen	4	0.23
Others	67	3.79
Total	1,768	100.00

8.33.1.1 Salmonellosis non-typhoidal

8.33.1.1.1 *Salmonella* Enteritidis

In 2005, there were 96 laboratory reports of *Salmonella* Enteritidis, which accounted for 5.4% of all *Salmonella* infections.

8.33.1.1.2 *Salmonella* Typhimurium

In 2005, there were 832 laboratory reports of *Salmonella* Typhimurium, which accounted for 47.1% of all *Salmonella* infections.

8.33.1.1.3 Other serotypes

Those most commonly reported in 2005 were *Salmonella* Isangi (443 cases; 25.1% of all cases) and *Salmonella* Dublin (46 cases; 2.6% of all cases).

8.33.1.2 Salmonellosis typhoidal

There were 186 cases of *Salmonella* Typhi infection in 2005, referred to the reference laboratory. Two cases from the Eastern Cape were documented as imported from India. These were Nalidixic acid resistant and treatment failure was documented in the case treated with ciprofloxacin.

8.33.2 Antimicrobial resistance

Nearly all isolates underwent some form of antimicrobial susceptibility testing (99.9%). Resistance was most frequently seen against the majority of antimicrobials with the exception of Nalidixic acid and Gentamicin (Table). Three percent of *Salmonella* Typhimurium isolates were resistant to fluoroquinolones. Compared with previous years, resistance to quinolones is increasing.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	% of isolates resistant
Sulphonamides	61.2
Streptomycin	60.9
Tetracyclines	78.6
Ampicillin	64.9
Chloramphenicol	38.0
Trimethoprim	43.2
Nalidixic acid	22.5
Kanamycin	49.3
Gentamicin	0.4
Cefotaxime	51.9
Ciprofloxacin	41.8

Sixty-four per cent of all isolates tested were multi-drug resistant (Table). Both *Salmonella* Typhimurium and *Salmonella* Isangi tend to be multi-drug resistant, with more than 62% of *Salmonella* Typhimurium and nearly 100% of *Salmonella* Isangi showing resistance to five or more antibiotics. Resistance to extended spectrum cephalosporins is high and 29% of *Salmonella* Typhimurium and 95% of *Salmonella* Isangi express ESBL. ESBL production in *Salmonella* Typhimurium has almost doubled over the last year. This reflects both the

nosocomial transmission of these two serotypes as well as confirming previous observations that both serotypes have a predilection towards developing multi-drug resistance. *Salmonella* Enteritidis was significantly less resistant with less than 10% of isolates being multi-drug resistant, although this is high compared with other countries; no ESBL production was detected.

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	% of isolates MDR
Eppendorf	100.0
Isangi	98.0
Typhimurium	62.1
Heidelberg	20.0
Infantis	12.5
Schwarzengrund	10.0
Dublin	8.7
Enteritidis	9.4
Others	28.3
Total	64.0

8.33.3 Travel related infection

Travel histories are rarely available from patients with salmonellosis in South Africa, and many foreign patients use local addresses when being admitted for treatment in hospitals, therefore the number of imported cases in 2005 could not be ascertained.

8.33.4 Outbreaks

Nosocomial outbreaks affecting patients with suppressed immune systems are a major problem in South Africa.

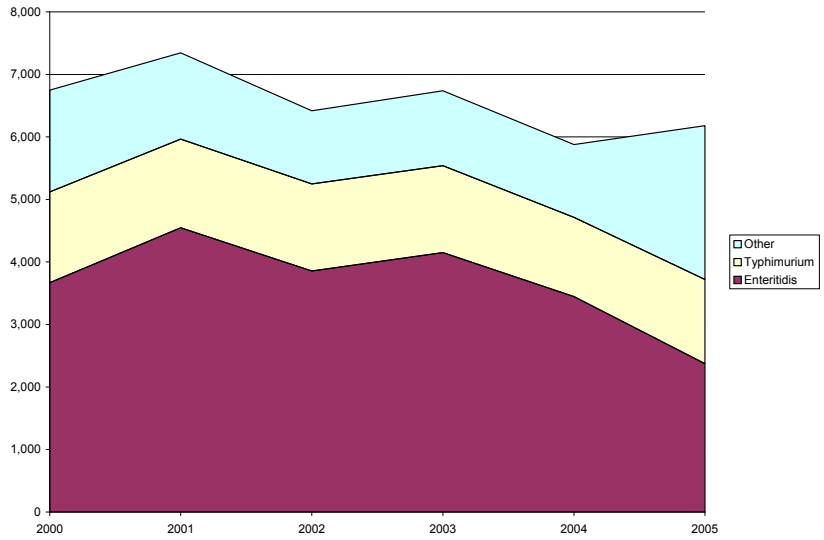
A major outbreak of typhoid fever occurred in Mpumalanga Province with spill-over into neighbouring provinces in September 2005. The epidemic was water-borne. Over 600 cases were diagnosed clinically. The organism was fully susceptible to all antimicrobials tested. Initial molecular work using PFGE and MLVA suggests that these isolates were highly clonal.

8.34 Spain

8.34.1 Trends and sources of infection

The incidence of salmonellosis has been declining since 2001, most of the reduction can be attributed to a fall in the number of reports of *Salmonella* Enteritidis (Graph). In 2005, there were 6,180 laboratory reports of salmonellosis in Spain. The rise in 2005 was due to a large outbreak of *Salmonella* Hadar associated with chicken.

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium are the most prevalent serovars, although Hadar was placed 2nd in the table due to the large outbreak (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	2373	38.40
Hadar	1488	24.08
Typhimurium	1346	21.78
Virchow	88	1.42
Rissen	75	1.21
Infantis	56	0.91
Newport	51	0.83
4,5,12:i:-	43	0.70
Saintpaul	36	0.58
Anatum	34	0.55
Ohio	34	0.55
Montevideo	30	0.49
Bredeney	29	0.47
Mikawasima	28	0.45
Brandenburg	27	0.44
Others	442	7.15
Total	6,180	100.00

8.34.1.1 Salmonellosis non-typhoidal

8.34.1.1.1 *Salmonella* Enteritidis

In 2005, there were 2,373 isolates of *Salmonella* Enteritidis, which accounted for 38.4% of all *Salmonella* infections. The predominant phage types of Enteritidis were PT1 (41.7%), PT4 (8.8%), PT21 (8.0%) and PT14B (7.5%)

8.34.1.1.2 *Salmonella* Typhimurium

In 2005, there were 1,346 isolates of *Salmonella* Typhimurium, 21.8% of all infections. The most commonly reported phage types were DTU302 (17.1%) and DT104B (12.4%).

8.34.1.1.3 Other serotypes

The most commonly reported in 2005 was *Salmonella* Hadar (1,488 cases; 24.1% of all cases). The majority of these cases were associated with the outbreak [9]

8.34.1.2 Salmonellosis typhoidal

In 2005, there was one case of *Salmonella* Paratyphi A infection, 15 cases of *Salmonella* Paratyphi B infection and 19 cases of *Salmonella* Typhi infection.

8.34.2 Antimicrobial resistance

Just over 30% of isolates underwent antimicrobial susceptibility testing. Resistance was frequently seen against Nalidixic acid, Tetracyclines and Ampicillin (Table). Ninety-eight per cent of all *Salmonella* Hadar isolates showed resistance to at least one antimicrobial agent. Over half of all *Salmonella* Enteritidis isolates were resistant to Nalidixic acid.

Table Antimicrobial susceptibility testing results showing the proportion (%) of isolates resistant to the agreed testing panel of antimicrobials

Antimicrobial agent	Frequency	%
Sulphonamides	503	26.34
Streptomycin	640	33.51
Tetracyclines	813	42.57
Ampicillin	815	42.67
Chloramphenicol	332	17.38
Trimethoprim	111	5.81
Nalidixic acid	790	41.36
Kanamycin	23	1.20
Gentamicin	26	1.36
Cefotaxime	5	0.26
Ciprofloxacin	0	0.00
Total	1,910	100.00

Almost 40% of all isolates tested were multi-drug resistant (Table).

Table Antimicrobial susceptibility testing results showing the % of isolates by serotype that were found to be resistant to four or more different classes of antimicrobials

Serotype	No. MDR	Total tested	%
Hadar	288	325	88.62
Typhimurium	389	497	78.27
4,5,12:i:-	14	19	73.68
4,12:i:-	11	12	91.67
Enteritidis	8	746	1.07
Bredeney	3	8	37.50
Brandenburg	2	9	22.22
Others	23	294	7.82
Total	738	1,910	38.64

8.34.3 Travel related infections

Travel history was not available.

8.34.4 Outbreaks

A large outbreak of Salmonellosis associated to a pre-cooked, vacuum-packed roast chicken occurred in Spain during the summer of 2005. In total 3,451 cases were identified with dates of symptom onset between 21 July and 6 August. Sixteen out of 19 autonomous regions were affected by this outbreak.

The strain identified was *Salmonella* Hadar PT 2, pulsotype Xbal-1/pulsotype Blnl-1.

The actions undertaken in response to this outbreak were the following: 1) Recall of chicken from all commercial outlets, 2) Mass awareness campaign through all media in order to avoid further consumption of chicken already purchased by the population, 3) Daily data updates sent to the Ministry of Health and all local epidemiological services, in order to evaluate the impact of all control measures undertaken.

Control measures were effective in preventing new infections from appearing, as demonstrated by the rapid decline in cases after the date of recall of the chicken.

8.35 Sweden

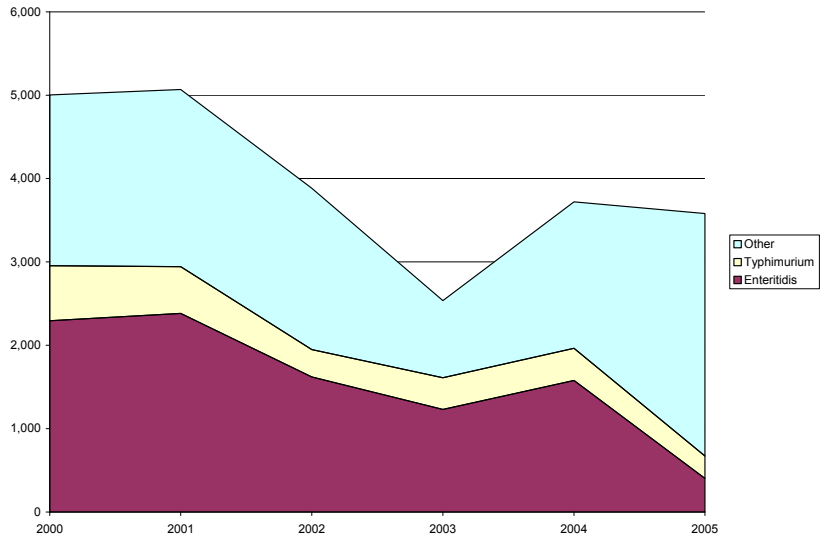
8.35.1 Trends and sources of infection

The total annual number of reported cases between 1995 and 2005 ranged from 3,562 to 5,137. During the same period, the number of domestic cases varied from 453 to 947.

Data shown in the graph include national surveillance data from 2005, including reference laboratory data. Only a slight decrease in the total number of cases was observed between 2004 and 2005. However the number of domestic cases increased. This relative increase can be attributed to the few and smaller outbreaks identified in 2004.

The majority of cases in 2005 are shown as untyped. This is due to a change in laboratory procedure at the national reference laboratory where from 2005 only suspected domestic acquired infections are routinely serotyped. Around 80% of total cases annually are travel associated.

Graph Trends of salmonellosis 2000-05



Salmonella Enteritidis and Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	402	11.22
Typhimurium	268	7.48
Stanley	25	0.70
Virchow	23	0.64
Agona	22	0.61
Newport	14	0.39
Goldcoast	12	0.34
Infantis	12	0.34
Corvallis	10	0.28
Bovismorbificans	9	0.25
Poona	8	0.22
Hadar	7	0.20
Saintpaul	7	0.20
Haifa	6	0.17
Jedburgh	6	0.17
Others	2,751	76.80
Total	3,582	100.00

8.35.1.1 Salmonellosis non-typhoidal

8.35.1.1.1 *Salmonella* Enteritidis

In 2005, there were 402 laboratory reports of *Salmonella* Enteritidis, which accounted for 11.2% of all *Salmonella* infections. Just 55 of these were infected in Sweden.

8.35.1.1.2 *Salmonella* Typhimurium

In 2005, there were 268 laboratory reports of *Salmonella* Typhimurium, which accounted for 7.5% of all *Salmonella* infections. Two hundred and sixteen of these were infected in Sweden.

8.35.1.1.3 Other serotypes

The most commonly reported in 2005 was *Salmonella* Stanley (25 cases; 0.7% of all cases), although only three of these were infected in Sweden.

8.35.1.2 Salmonellosis typhoidal

In 2005, there were 21 paratyphoid cases and nine typhoid cases.

8.35.2 Antimicrobial resistance

No information on antimicrobial resistance is available as this is not routinely undertaken in Sweden.

8.35.3 Travel related infection

According to clinical reports, 2,870 non-typhoidal cases (79%) acquired their infection abroad during 2005. Country of infection was unknown for 216 cases.

All typhoidal cases and 19 paratyphoid cases were acquired abroad.

8.35.4 Outbreaks

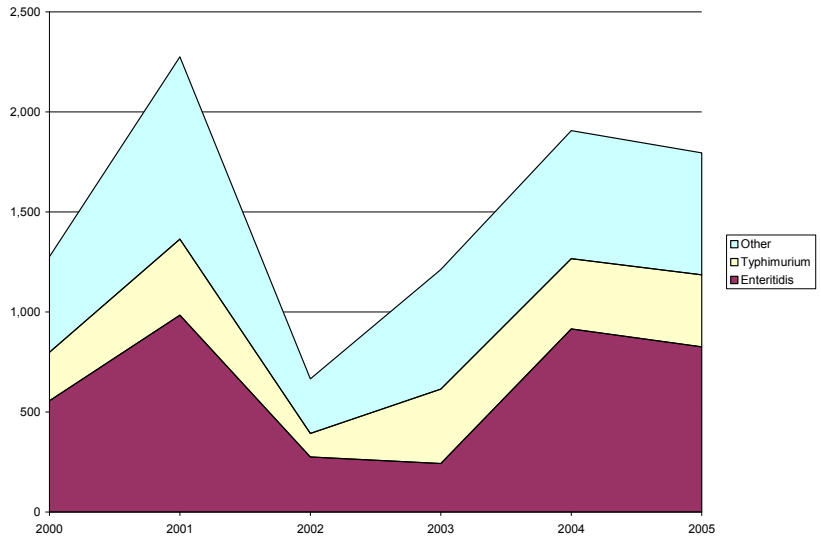
Ten domestic and one international outbreak of *Salmonella* were reported to the national centre in Sweden in 2005. Of particular note were the following two outbreaks:
- In June, 6 people were linked to a cluster of *Salmonella* Stourbridge. Through Enter-net it was identified that over 50 cases in six other European countries were reported with the same Salmonella.
- 15 cases of *Salmonella* Typhimurium NST reported in November-December were suspected to have been infected following consumption of salami originating from Italy. The same *Salmonella* serotype was identified in the salami and the product recalled in Sweden

8.36 Switzerland

8.36.1 Trends and sources of infection

The combined data of the SFOPH and the National Centre for Enteropathogenic Bacteria show a 14.5% decrease in the number of reported *Salmonella* infections (Graph). The incidence rate per 100,000 of the population dropped from 30.3 in 2004 to 25.9 in 2005. The graph below only represents data from the national laboratory, and hence does not show the trend that the combined data does.

Graph Trends of salmonellosis 2000-05



The most prevalent serovars were *Salmonella* Enteritidis and Typhimurium (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	825	45.96
Typhimurium	360	20.06
Infantis	39	2.17
Virchow	32	1.78
Napoli	28	1.56
Hadar	26	1.45
Stanley	23	1.28
Newport	19	1.06
Corvallis	17	0.95
Derby	17	0.95
Thompson	16	0.89
Kentucky	14	0.78
Typhi	14	0.78
Anatum	12	0.67
Paratyphi A	9	0.50
Others	344	19.16
Total	1,795	100

8.36.1.1 Salmonellosis non-typhoidal

8.36.1.1.1 *Salmonella* Enteritidis

There were 825 cases of *Salmonella* Enteritidis. Phage typing is not routinely undertaken.

8.36.1.1.2 *Salmonella* Typhimurium

There were 360 cases reported, an increase of 3.2% on 2004. Phage typing is not routinely undertaken.

8.36.1.1.3 Other serotypes

The only other serotypes with more than 30 cases reported were Infantis and Virchow.

8.36.1.2 Salmonellosis typhoidal

There were 14 reports of *Salmonella* Typhi infection, six reports of *Salmonella* Paratyphi A infection and nine reports of *Salmonella* Paratyphi B infection to the SFOPH.

8.36.2 Antimicrobial resistance

No data or information provided.

8.36.3 Travel related infection

No data or information provided.

8.36.4 Outbreaks

No data or information provided.

9 VTEC

9.1 Austria

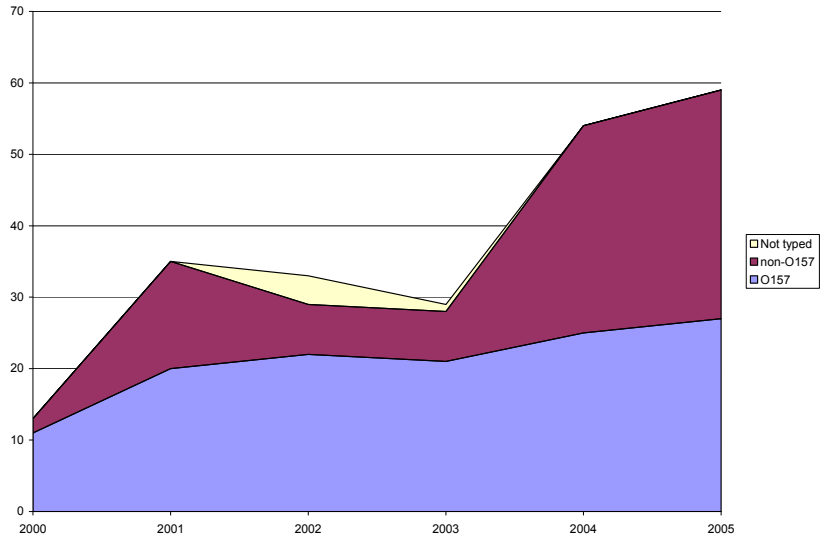
9.1.1 Trends and sources of infection

In 2005, 59 VTEC infections were reported in Austria (Graph), O157 remains the most frequently isolated serogroup (45.8%), followed by O103 (6.8%) and O26 (8.5%), all the other cases were non-O157 serogroups.

Serotype	Frequency	%
O157	27	45.76
O26	5	8.47
O103	4	6.78
O5	2	3.39
O111	2	3.39
O113	2	3.39
O177	2	3.39
O16	1	1.69
O22	1	1.69
O55	1	1.69
non-O157	4	6.78
Others	8	13.56
Untyped/untypable	0	0.00
Total	59	100.00

In 2005, most cases of O157 infection were male (55.6%), 63.0% of cases were under 14 years of age. The majority of non-O157 cases were female (65.5%), however, a much larger proportion of cases (81.3%) were aged 14 or under.

Graph Trends of VTEC infection 2000-05



9.1.1.1 HUS

Eight cases of HUS were reported; *E. coli* O157 was detected in 87.5% of these cases.

9.1.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	27	4.8%	0.0%	23.8%	76.2.%	100.0%
non-O157	32	87.5%	50.0%	28.1%	21.9%	56.3%
Not typed						

(* not all strains may be tested for each characteristic)

9.1.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157	21	0.0%	0.0%	100.0%
non-O157	30	3.33%	23.33%	73.33%
Not typed				
(* not all strains may be tested for antimicrobial resistance)				

9.1.4 Travel related infection

Travel was reported in one case – to Egypt.

9.1.5 Outbreaks

In 2005 there were no major outbreaks in Austria, only four small family outbreaks, two with two and two with three subjects involved. In three outbreaks the isolates belonged to serogroup O157:H- and in one case to serogroup O5:H-.

9.2 Australia

Not all the data on VTEC isolates are referred to NEPSS, so are not included in this report.

9.3 Belgium

9.3.1 Trends and sources of infection

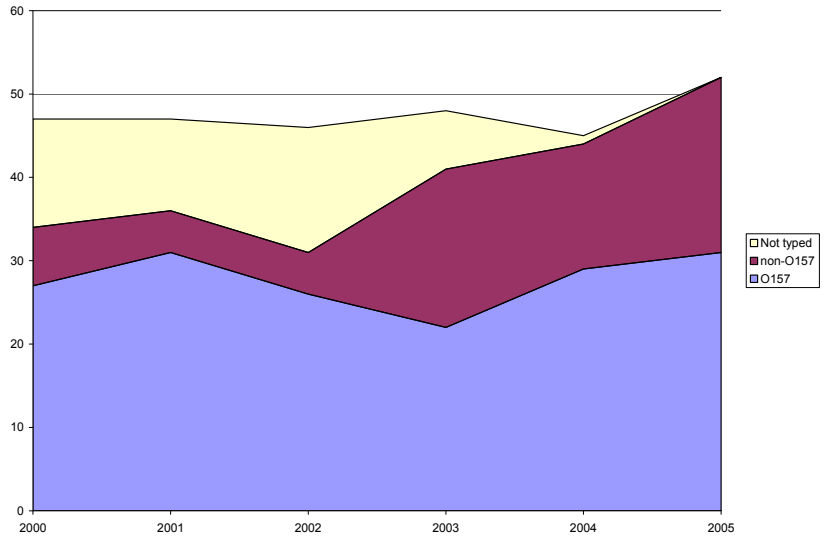
The number of VTEC infections detected remains low. In 2005, there were 52 reports of VTEC infection, 59.6% were caused by the serogroup O157 (Graph).

Serotype	Frequency	%
O157	31	59.62
O103	4	7.69
O145	3	5.77
O26	2	3.85

O146	2	3.85
O38	1	1.92
O91	1	1.92
O111	1	1.92
O113	1	1.92
O153	1	1.92
non-O157	1	1.92
Others	4	7.69
Untyped/untypable	0	0.00
Total	52	100.00

In 2005, most cases of O157 infection were female (54.8%), 83.9% of cases were under 14 years of age. The majority of non-O157 cases were also female (71.3%), however, a smaller proportion of cases (61.9%) were aged 14 or under.

Graph Trends of VTEC infection 2000-05



9.3.1.1 HUS

Twenty cases of HUS were reported during 2005; *E. coli* O157 infection was detected in 85.0% of these cases.

9.3.2 Microbiological characteristics

Phage typing data were reported for 27 (87%) of O157s; the predominant types were PT12 (38.7%), PT4 (12.9%), and PT8 (12.9), PT14, 32, 49, and 51 constituted the remainder.

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	31	0.0%	0.0%	85.2%	14.8%	100.0%
non-O157	21	95.0%	50.0%	15.0%	35.0%	55.0%
Not typed						

(* not all strains may be tested for each characteristic)

9.3.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157	27	0.0%	3.7%	96.3%
non-O157	20	15.00%	20.00%	65.00%
Not typed				
(* not all strains may be tested for antimicrobial resistance)				

9.3.4 Travel related infection

Travel was reported in one case – to Italy.

9.3.5 Outbreaks

There were no outbreaks in 2005.

9.4 Bulgaria

9.4.1 Trends and sources of infection

No data or information provided.

9.5 Canada

9.5.1 Trends and sources of infection

There were 796 cases of verotoxigenic *E. coli* recorded in 2005, the lowest number of VTEC ever reported through the NESP.

9.5.1.1 HUS

These data are not available.

9.5.2 Microbiological characteristics

These data are not available.

9.5.3 Travel related infection

These data are not available.

9.5.4 Outbreaks

Twenty-three outbreaks and clusters associated with *E. coli* O157:H7 and one cluster involving *E. coli* O26:NM were reported to the NESP in 2005. Twelve of these, including the *E. coli* O26:NM were household related clusters of between 2 and 4 cases.

9.6 Cyprus

9.6.1 Trends and sources of infection

There were no cases reported in 2005.

9.7 Czech Republic

9.7.1 Trends and sources of infection

No data or information provided.

9.8 Denmark

9.8.1 Trends and sources of infection

In 2005, there were 155 reported episodes of Verocytotoxin-producing *Escherichia coli* (VTEC) infections with an incidence of 2.8 per 100,000. Cultures were obtained from 147 episodes (the remaining being found by PCR only), 17% of which were caused by O157 (Graph). The annual number of episodes has been steadily increasing since 1997. The overall increase is in part due to improved diagnostic methodologies and increased awareness. The number of registered infections in 2005 was 9% lower compared to 2004. However, no general outbreaks were recorded in 2005 whereas two outbreaks involving 30 registered patients occurred in 2004 and thus more sporadic episodes were recorded in 2005.

Denmark does not have a centrally coordinated standard testing method for VTEC. It should be noted that the incidence through the past nine years (1997-2005) has been 3 to 10 times higher in counties using a diagnostic approach involving molecular detection methods. These counties covered approximately 43% of the Danish population in 2005 and have been circled in the Figure presenting the geographical distribution of human VTEC infections in Denmark. In 2005, the age group specific incidence in counties using molecular methods was 20.5 in children less than 5 years and 4.4 in cases aged 5 years or more compared to 9.8 and 0.3 respectively in counties using other methods.

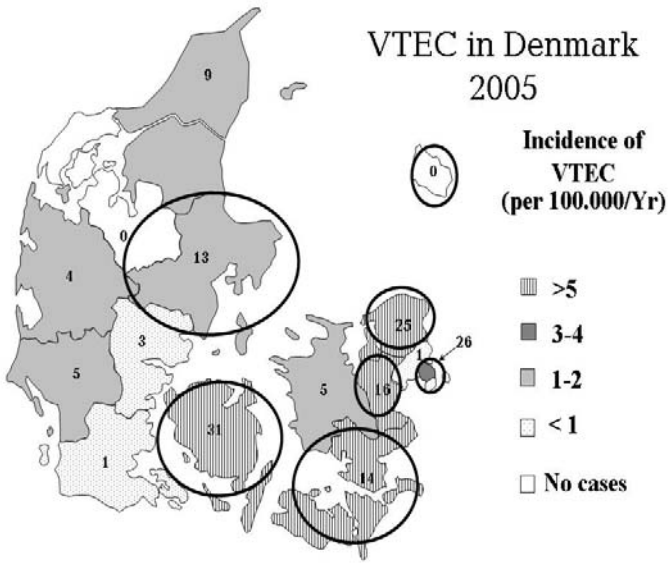


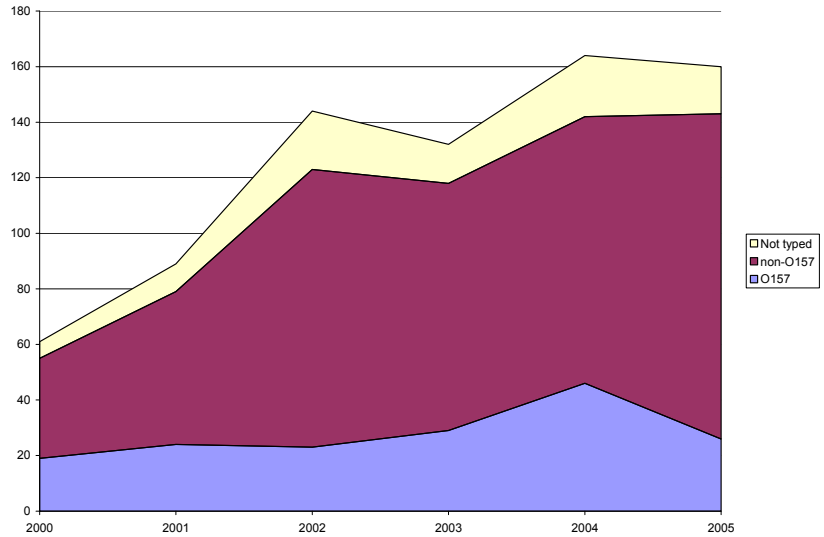
Figure. *Regional differences in Danish VTEC infections. Number of diagnosed VTEC infections and annual incidence of VTEC infections by county in 2005. Counties using molecular detection methods are marked with a circle. Data from Statens Serum Institut, Copenhagen, Denmark.*

In 2005, all VTEC isolates were real-time sub-typed using PFGE at the SSI. The total distribution of VTEC O-groups, resulting in five or more episodes is presented in the Table below.

Serotype	Frequency	%
O157	25	16.1
O103	23	14.8
O26	16	10.3
O128ab/c	11	7.1
O117	11	7.1
OR	9	5.8
O145	7	4.5
O146	7	4.5
O111	6	3.9
O76	4	2.6
O174	3	1.9
O175	3	1.9
Others	25	15.0
Untyped	8	5.2
Total	155	100

In 2005, most cases of O157 infection were female (53.9%), 42.3% of cases were under 6 years of age. The majority of non-O157 cases were male (53.9%), however, a smaller proportion of cases (33.3%) were aged 6 or under.

Graph Trends of VTEC infection 2000-05



9.8.1.1 HUS

Six cases of HUS were reported in 2005. VTEC strains were isolated from three cases, one of which had two different VTEC strains (O157:H- and O145:H-). The other two cases had one each of serotype O111:H- and O157:H7. In two HUS cases, *eae* positive *E. coli* was isolated but not further characterised. One HUS case was complicated by ornitose.

9.8.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	26		0.0%	73.1%	26.9%	96.2%
non-O157	117		63.7%	25.7%	10.6%	53.9%
Not typed	8		12.5%	50.0%	37.5%	7.7%

(* not all strains may be tested for each characteristic)

9.8.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157				
non-O157				
Not typed				
(* not all strains may be tested for antimicrobial resistance)				

9.8.4 Travel related infection

Travel was reported in 28 cases – no countries of infection were reported.

9.8.5 Outbreaks

No general outbreaks were recorded in 2005 – see 9.8.1 above.

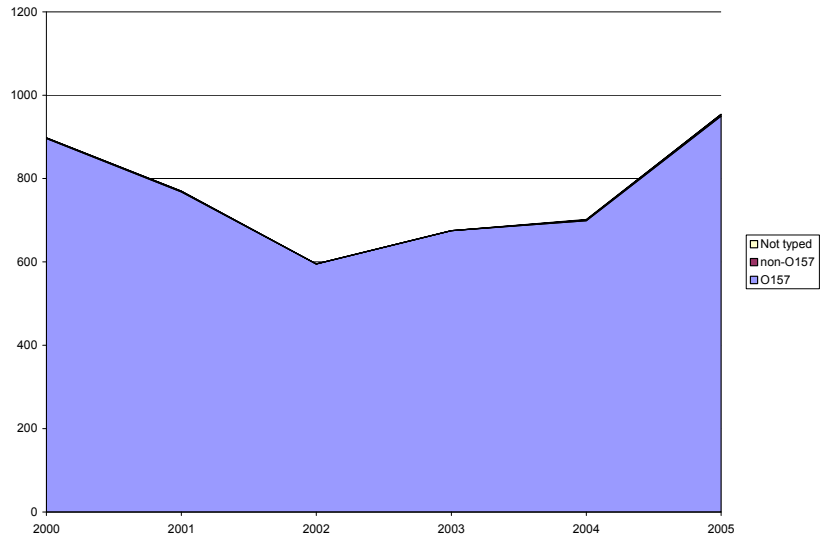
9.9 England and Wales

9.9.1 Trends and sources of infection

In 2005, there were 954 laboratory reports of VTEC infection in England and Wales, 950 (99.6%) of which were caused by the serogroup O157 (Graph).

Serotype	Frequency	%
O157	950	99.58
non-O157	0	0.00
Others	4	0.42
Untyped/untypable	0	0.00
Total	954	100.00

Graph Trends of VTEC infection 2000-05



9.9.1.1 HUS

No data or information provided.

9.9.2 Microbiological characteristics

No data or information provided.

9.9.3 Antimicrobial resistance

No data or information provided.

9.9.4 Travel related infection

No data or information provided.

9.9.5 Outbreaks

In England & Wales there were 10 general outbreaks of VTEC O157 infection reported to CfI in 2005. Two were associated with animal contact, four with person to person transmission and four foodborne outbreaks were reported. A number of settings were reported (Table).

Outbreaks of VTEC O157 in England and Wales 2005

Main mode of transmission	Location
Foodborne	Hall
Foodborne	Schools
Foodborne	School
Foodborne	National
Person to person	Nursing home
Person to person	Community
Person to person	School
Person to person	School
Animal contact	Petting farm
Animal contact	Open farm

9.10 Estonia

9.10.1 Trends and sources of infection

Nineteen human cases were notified in 2005.

Serotype	Frequency	%
O157	15	78.95
O26	2	10.53
O128	2	10.53
non-O157	0	0.00
Others	0	0.00
Untyped/untypable	0	0.00
Total	19	100.00

In 2005, most cases of O157 infection were female (60.0%), 26.7% of cases were under 14 years of age. All non-O157 cases were male, however, a much larger proportion of cases (75.0%) were aged 14 or under.

9.10.1.1 HUS

HUS is not notifiable in Estonia.

9.10.2 Microbiological characteristics

Data are not available.

9.10.3 Travel related infection

In 2005 no travel related cases of VTEC infection were reported.

9.10.4 Outbreaks

There were no outbreaks of VTEC infection reported in 2005.

9.11 Finland

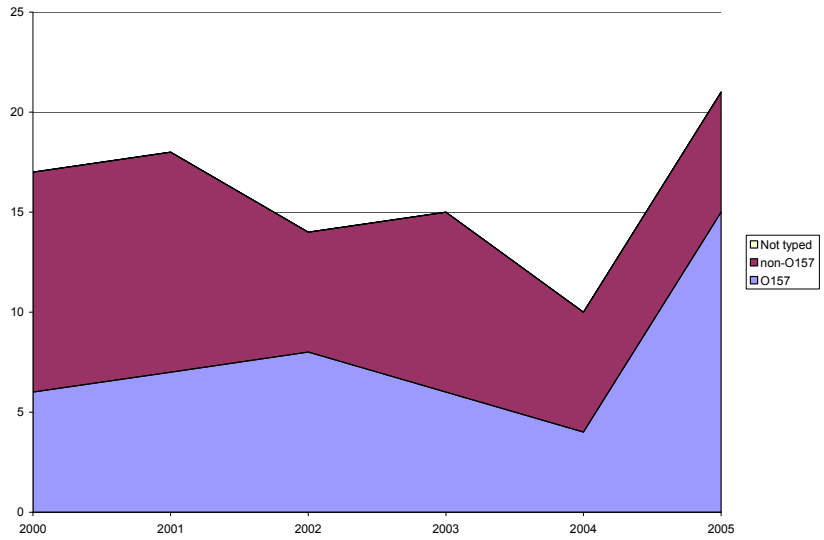
9.11.1 Trends and sources of infection

In 2005, there were 21 cases of *E. coli* infection reported in Finland, 71% of which were caused by the serogroup O157 (Graph). The most common O157 phage type was PT 88.

Serotype	Frequency	%
O157	15	71.43
non-O157	6	28.57
Others	0	0.00
Untyped/untypable	0	0.00
Total	21	100.00

In 2005, most cases of O157 infection were female (60.0%), 73.3% of cases were under 14 years of age. Non-O157 cases were equally split between male and female (65.5%), and half the cases were aged 14 or under.

Graph Trends of VTEC infection 2000-05



9.11.1.1 HUS

No data or information provided.

9.11.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	15	67%				100%
non-O157	6	83%				83%
Not typed	0					

(* not all strains may be tested for each characteristic)

9.11.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157	15	0%	7%	93%
non-O157	6	0%	0%	100%
Not typed	0			
(* not all strains may be tested for antimicrobial resistance)				

9.11.4 Travel related infection

Two of the 21 cases acquired their infections abroad: one reported travel to Malta and one to Turkey.

9.11.5 Outbreaks

In 2005 no outbreaks of VTEC infection were reported.

9.12 France

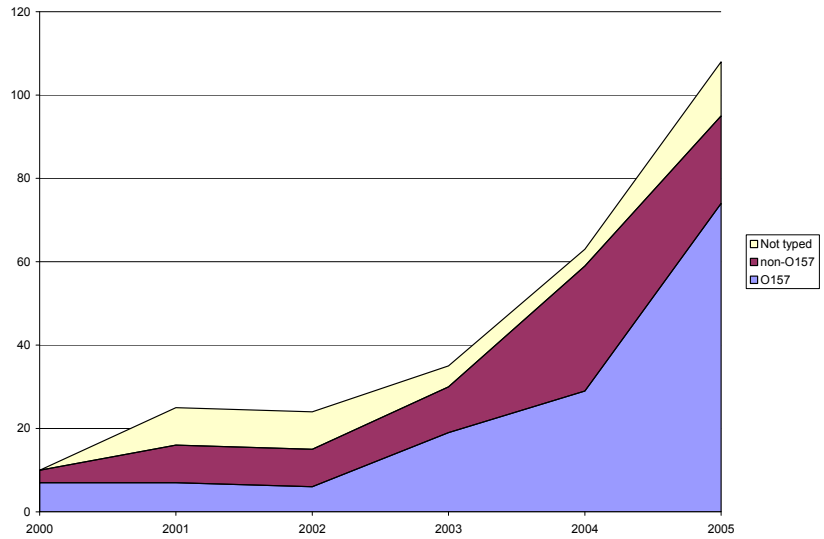
9.12.1 Trends and sources of infection

There are 108 cases of VTEC infections in the Enter-net database in 2005 (table).

Serotype	Frequency	%
O157	74	68.52
O26	19	17.59
O128	2	1.85
non-O157	0	0.00
Others	0	0.00
Untyped/untypable	13	12.04
Total	108	100.00

In 2005, where the gender was known most cases of O157 infection were female (52.9%), 79.1% of cases were under 14 years of age. Non-O157 cases were split equally between male and female, a larger proportion of cases (85.7%) were aged 14 or under.

Graph Trends of VTEC infection 2000-05



9.12.1.1 HUS

In 2005, 122 cases of HUS were reported compared to 86 cases in 2004. Evidence of STEC infection was present in 79% of cases, 61% of which were positive for the O157 serogroup, 10% by serogroup O26, the remaining were untyped. Since 1996, the annual incidence rate of HUS has remained stable at less than 1 per 100,000 of the population under 15 years.

9.12.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	74		2.7%	31.1%	66.2%	100.0%
non-O157	21		61.9%	33.3%	4.8%	100.0%
Not typed	13		23.0%	46.2%	30.8%	100.0%

(* not all strains may be tested for each characteristic)

9.12.3 Antimicrobial resistance

Antimicrobial resistance was not tested.

9.12.4 Travel related infection

Travel history was not available.

9.12.5 Outbreaks

In 2005, two outbreaks of STEC infections were detected.

In October-November 2005, 69 cases of *E. coli* O157 infections were identified (12 adults and 57 children) in southwest France. Seventeen cases developed HUS; none died. All cases reported having eaten ground beef, produced by a same manufacturer. All *E. coli* O157:H7 isolates obtained from patients, from ground beef taken from the freezers of cases and from ground beef sampled at the manufacturing plant, carried *stx*1, *stx*2, and *eae* genes and were genetically related by PFGE.

This community-wide outbreak is the first documented outbreak linked to the consumption of ground beef in France. The investigation illustrates the necessity of preventive measures to reduce meat contamination all along the food chain and to inform customers to cook ground beef thoroughly.

Between October and December 2005, 16 cases of HUS, aged from 10 months to 6 years, were identified in the west part of France. Nine cases reported having eaten unpasteurised cows cheeses, produced by a same producer. *E. coli* O26 was isolated in stools from seven patients (four carried the *stx2*+ gene), and *E. coli* (*stx2*+) with undetermined serogroup was isolated in stools from nine patients. At the manufacturing plant, inspections didn't reveal mistakes in the hygienic practices. *E. coli* O26 (*stx-)* strains were isolated from cheese taken from the refrigerator of a patient, from cheeses sampled at the plant and from raw milk. No further cases were identified after the recall of the entire cheese production. The investigation shows that STEC O26 contamination of cows' cheeses was responsible for this outbreak and suggests environmental contamination as the origin of contamination.

9.13 Germany

9.13.1 Trends and sources of infection

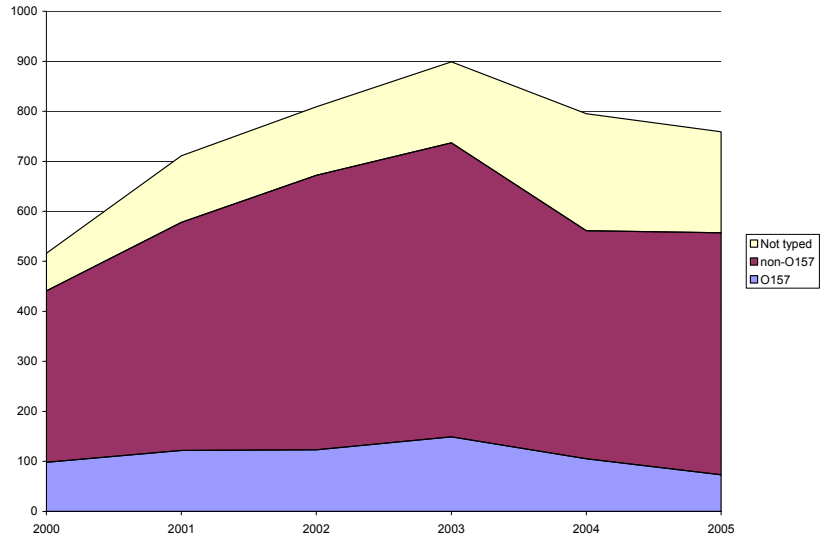
In 2005, there were 759 reports of *E. coli* infection in Germany (Graph). The serogroup was not determined for all isolates. However, where further characterisation did take place the most commonly reported serogroups were O26 (10.8%), O91 (10.5%), O103 (10.41%), and O157 (9.6%).

Serotype	Frequency	%
O26	82	10.80
O91	80	10.54
O103	79	10.41
O157	73	9.62
O145	38	5.01
O111	28	3.69
O146	19	2.50
O55	15	1.98

O76	13	1.71
O128	11	1.45
non-O157	0	0.00
Others	121	15.94
Untyped/untypable	200	26.35
Total	759	100.00

In 2005, cases of O157 infection were split equally between male and female, 79.2% of cases were under 14 years of age. Of the non-O157 cases there were slightly more females (50.6%), however, a larger proportion of cases (66.6%) were aged 14 or under.

Graph Trends of VTEC infection 2000-05



9.13.1.1 HUS

Nine cases of HUS were reported during 2005; *E. coli* O157 infection was detected in two of the cases, also O26 in two, O rough, O6, 55, and 98 in one case each, and one untyped.

9.13.2 Microbiological characteristics

Phage type was determined for all O157 isolates. Where further typing was undertaken the most commonly reported phage types were PT8 (34.8%), and PT88 (24.7%).

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	73	26.0%	0.0%	70.6%	29.4.%	100.0%
non-O157	484	97.4%	61.6%	21.7%	16.7.%	53.9%
Not typed	202	75.9%	50.0%	30.3%	19.7%	33.8%

(* not all strains may be tested for each characteristic)

9.13.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157	71	1.41%	90.14%	8.45%
non-O157	473	11.42%	73.78%	14.80%
Not typed	159	7.55%	69.18%	23.27%
(* not all strains may be tested for antimicrobial resistance)				

9.13.4 Travel related infection

Travel was reported in seven cases: Algeria (O76), Tunisia (not typed), Russia (O157), Ecuador (O91), Ukraine (O rough), Turkey (O111) and Egypt (O nt)

9.13.5 Outbreaks

In 2005 were three outbreaks reported to the NRC: one with *E. coli* O26:H- in March associated with consumption of raw milk in a kindergarten in Schleswig-Holstein, one *E .coli* O91:H14 in June in Lower Saxony (no source was found) and one with *E. coli* O26:H11 in July also in a kindergarten in Mecklenburg-Pomerenia. In the outbreaks more than three cases were reported by symptoms and positive ELISA screening for Shigatoxin, but not all of them were confirmed by an isolate.

Furthermore 24 family outbreaks with two or more cases were observed (6x O157, 5x O26, 2x O91, 2x O103, 2x O76, 2x O nt, 1x O111, 1x O8, 1x O146, 1x O rough).

9.14 Greece

There is no reference laboratory for VTEC in Greece. Data on VTEC infections are not systematically collected. There were no cases reported during 2005.

9.15 Hungary

9.15.1 Trends and sources of infection

In 2005, five cases of VTEC infection were reported in Hungary, O157 was the most frequently isolated serogroup (3 cases, 60.0%).

Serotype	Frequency	%
O157	3	60.00
O75	2	40.00
non-O157		
Others		
Untyped/untypable		
Total	5	100.00

9.15.1.1 HUS

There were no reports of HUS during 2005.

9.15.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	3		0.0%	0.0%	100.0%	100.0%
non-O157	2		0.0%	0.0%	100.0%	100.0%
Not typed						

(* not all strains may be tested for each characteristic)

9.15.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4 AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157	3	0	0	100%
non-O157	2	0	0	100%
Not typed				
(* not all strains may be tested for antimicrobial resistance)				

9.15.4 Travel related infection

There were no imported cases registered in 2005.

9.15.5 Outbreaks

There were no general or family outbreaks in 2005 in Hungary.

9.16 Iceland

9.16.1 Trends and sources of infection

No data or information provided.

9.17 Ireland

9.17.1 Trends and sources of infection

In 2005, 125 cases of VTEC were reported in Ireland. This was an increase of 89% on the number reported in 2004 (Graph). Serogroup O157 was the cause for 108 cases (86%).

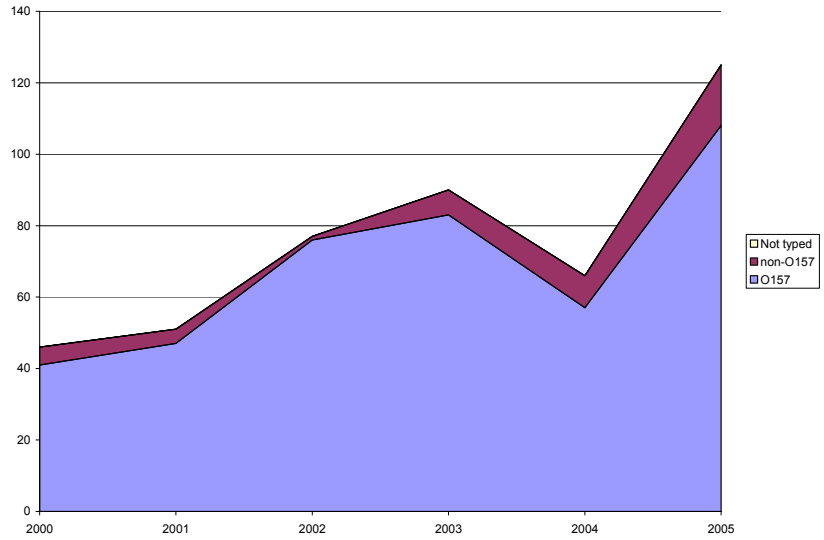
Serotype	Frequency	%
O157[a]	108	86.40
O26	12	9.60
O21	1	0.80
O123	1	0.80
O145	1	0.80
non-O157	2	1.60
Others	0	0.00
Untyped/untypable	0	0.00

Total	125	100.00

[a] includes two cases diagnosed by serodiagnosis.

In 2005, there were similar proportions of male and female cases of O157 infection (females comprised 51.4%), and 53.3% were under 14 years of age. The majority of non-O157 cases were female (62.5%), and a larger proportion of cases (70.5%) were aged 14 or under. The largest number of cases was reported in the third quarter of the year (45%).

Graph Trends of VTEC infection 2000-05



9.17.1.1 HUS

Almost one third of cases (40/125, 32%) had bloody diarrhoea and 17 had HUS. Thirteen of the HUS cases were due to *E. coli* O157 (two of which were SF O157), one due to *E. coli* O21 and three due to *E. coli* O26.

9.17.2 Microbiological characteristics

As in previous years, PT32 was the predominant phage type accounting for over half of the 106 O157 isolates. The next most common types were PT21/28 (12.3%) and PT8 (11.1%).

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	106[#]	2.8%	0%	88.7%	11.3%	99.1%
non-O157	17	100.0%	41.2%	11.8%	47.1%	82.4%
Not typed						

(* not all strains may be tested for each characteristic, [#] Only 106 O157 isolates; two reported O157 cases were diagnosed by serodiagnosis)

9.17.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157	103	0.00%	9.71%	90.29%
non-O157	17	11.76%	23.53%	64.71%
Not typed				
(* not all strains may be tested for antimicrobial resistance)				

9.17.4 Travel related infection

Nine VTEC cases were travel-associated. The countries visited within 14 days of onset of illness were Greece (2), Spain (2), Croatia (1), UK (1), Hungary (1), Belgium (1) and Turkey (1), reflecting to some extent the frequency of travel by Irish people to these destinations.

9.17.5 Outbreaks

In Ireland, active case finding among family and other close contacts is an important aspect of public health investigation of apparently sporadic cases. In consequence, many small family outbreaks are identified. In 2005, 19 VTEC outbreaks were reported, comprising 65 of the 125 confirmed cases reported. Four outbreaks were described as general outbreaks and 15 as family outbreaks. Seventeen were due to VTEC O157 and two to VTEC O26. The suspected modes of transmission reported are listed below.

Table. VTEC outbreaks in Ireland 2005 by suspected mode of transmission

Suspected modes of transmission*	Number of outbreaks	Number confirmed cases	Number ill
P-P	4	12	7
P-P and animal contact	2	4	6
P-P and foodborne	2	4	4
Foodborne	2	6	3
P-P and waterborne	1	3	2
P-P, waterborne and animal contact	1	18	9
Foodborne and animal contact	1	2	2
Unknown/Not specified	6	16	17
Total	19	65	50

*P-P denotes person-to-person transmission

The most significant VTEC O157 outbreak in Ireland in 2005 occurred in the Mid West area in October/November 2005[10]. Nine people were reported ill, including two children who developed HUS. A further nine asymptomatic contacts were confirmed as being infected with the outbreak strain and two persons with non-O157 VTEC strains. All cases recovered. This was the largest VTEC outbreak reported in Ireland to date. No food or water samples tested positive for VTEC, but results from a case-control study indicated that potential exposure to drinking water from a vulnerable local private group water scheme (GWS) was a risk. The implicated GWS drew water from areas of agricultural land with close proximity to cattle and slurry spreading. VTEC O157 indistinguishable from the outbreak strain was isolated from an animal/farm sample.

9.18 Italy

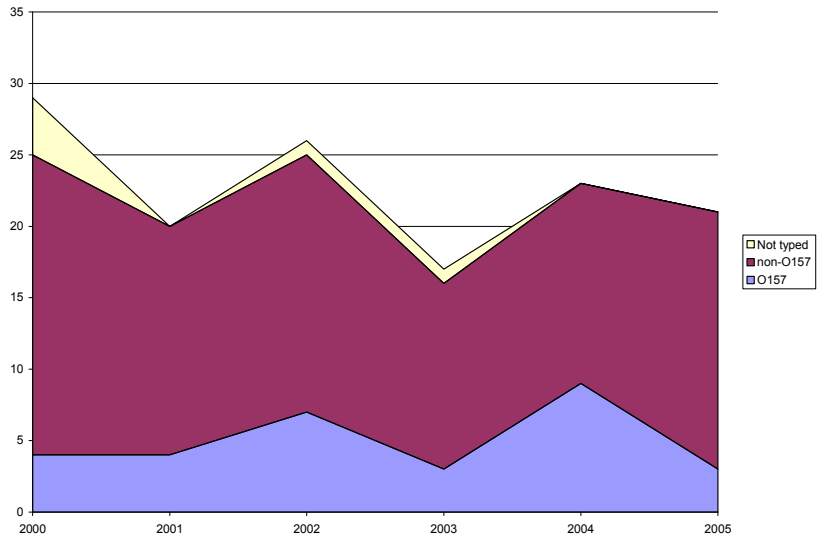
9.18.1 Trends and sources of infection

The most common serogroup in 2005 was O26 (38.1%); VTEC O157 represented only 14% of reported cases. This is slightly down on the 2004 total (Graph).

Serotype	Frequency	%
O26	8	38.10
O111	6	28.57
O103	1	4.76
O145	3	14.29
O157	3	14.29
non-O157	0	0.00
Others	0	0.00
Untyped/untypable	0	0.00
Total	21	100.00

In 2005, cases of O157 infection were split evenly between males and females, all the cases were under 6 years of age. The majority of non-O157 cases were male (60.0%), a slightly smaller proportion of cases (93.3%) were aged 6 or under.

Graph Trends of VTEC infection 2000-05



9.18.1.1 HUS

The incidence of HUS remains stable, with approximately 30 cases reported each year (0.3 cases per 100,000 of the population aged between 0 and 14 years). No cases in the Enter-net VTEC database had HUS.

9.18.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	1		0.0%	100.0%	0.0%	100.0%
non-O157	2		0.0%	0.0%	100.0%	100.0%
Not typed						

(* not all strains may be tested for each characteristic)

9.18.3 Antimicrobial resistance

Antimicrobial susceptibility testing is not routinely performed.

9.18.4 Travel related infection

No infections related to travellers were reported in Italy in 2005

9.18.5 Outbreaks

Two clusters of HUS cases epidemiologically related and associated with VTEC O26 infection have been identified in summer 2005, in Southern Italy. All the patients were children aged less than 3 years and one case was fatal. No VTEC strain was isolated from the patients while antibodies against the lipopolysaccaride of *E. coli* O26 serogroup were found in all the cases (N=3) of the former cluster and in one case of the latter (N=3). Despite epidemiological investigations pointed out the presence of several risk factors (related either to food or environment) the source of VTEC infection was not identified.

9.19 Japan

9.19.1 Trends and sources of infection

In 2005, there were 1,576 reports of *E. coli* infection in Japan, 1,078 (68.4%) were identified as serogroup O157.

Serotype	Frequency	%
O157	1,078	68.40
non-O157	498	31.60
Others		
Untyped/untypable		
Total	1,576	100.00

9.19.1.1 HUS

No data or information provided.

9.19.2 Microbiological characteristics

No data or information provided.

9.19.3 Antimicrobial resistance

No data or information provided.

9.19.4 Travel related infection

No data or information provided.

9.19.5 Outbreaks

No data or information provided.

9.20 Latvia

9.20.1 Trends and sources of infection

There were no cases registered in 2005.

9.21 Lithuania

9.21.1 Trends and sources of infection

Due to the microbiological methods used in Lithuania it is not possible to determine the prevalence of VTEC infection.

9.21.1.1 HUS

It is not compulsory to register cases of HUS in Lithuania.

9.21.2 Microbiological characteristics

No data or information provided.

9.21.3 Antimicrobial resistance

No data or information provided.

9.21.4 Travel related infection

No travel history was available.

9.21.5 Outbreaks

No data or information provided.

9.22 Luxembourg

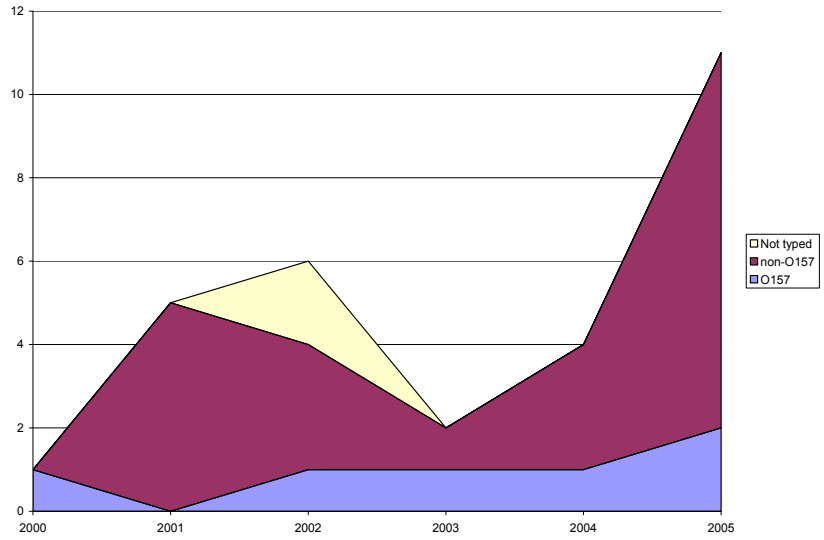
9.22.1 Trends and sources of infection

In 2005, 11 cases of *E. coli* infection were reported in Luxembourg, the majority of these were caused by non-O157 serogroups (Graph).

Serotype	Frequency	%
O128	7	63.64
O157	2	18.18
O26	1	9.09
O127	1	9.09
non-O157	0	0.00
Others	0	0.00
Untyped/untypable	0	0.00
Total	11	100.00

In 2005, both cases of O157 infection were female (55.6%), aged between 15-64 years of age. The majority of non-O157 cases were male (88.9%), all were aged between 5-16y.

Graph Trends of VTEC infection 2000-05



9.22.1.1 HUS

No cases of HUS were reported.

9.22.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	2		0.0%	50.0%	50.0%	100.0%
non-O157	9		100.0%	0.0%	0.0%	100.0%
Not typed						

(* not all strains may be tested for each characteristic)

9.22.3 Antimicrobial resistance

No data or information provided.

9.22.4 Travel related infection

No data or information provided.

9.22.5 Outbreaks

No data or information provided.

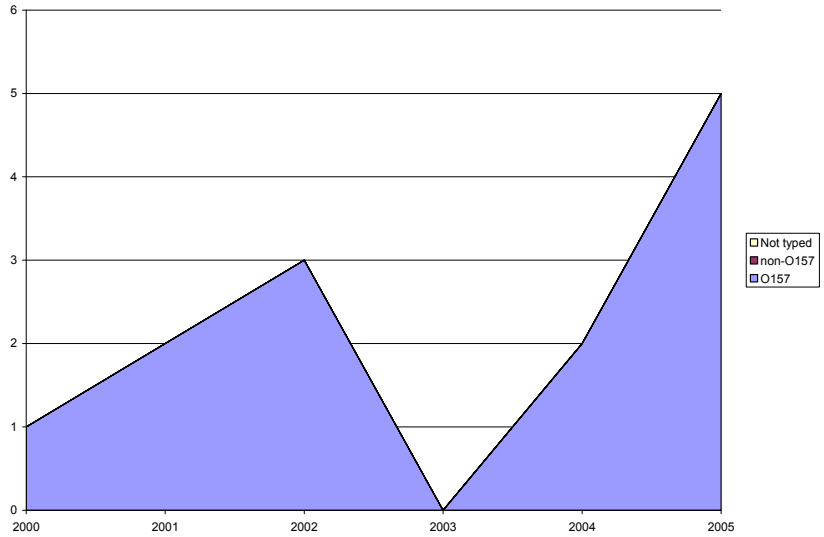
9.23 Malta

9.23.1 Trends and sources of infection

In 2005, five sporadic cases of *E. coli* 0157 infection were reported in Malta. There were two males and three females, all cases were under five years of age.

Serotype	Frequency	%
O157	5	100.00
non-O157		
Others		
Untyped/untypable		
Total	5	100.00

Graph Trends of VTEC infection 2000-05



9.23.1.1 HUS

There were no reported cases of HUS in 2005.

9.23.2 Microbiological characteristics

No genotyping was performed.

9.23.3 Antimicrobial resistance

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157	4	0.0%	0.0%	100.0%
non-O157				
Not typed				

(* not all strains may be tested for antimicrobial resistance)		

9.23.4 Travel related infection

The cases were not travel related.

9.23.5 Outbreaks

No outbreaks were reported in 2005.

9.24 Netherlands

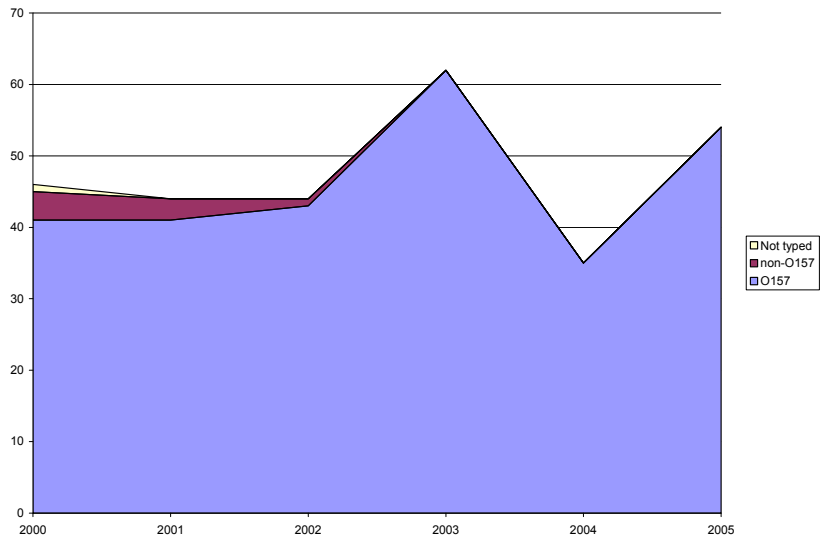
9.24.1 Trends and sources of infection

In 2005, 54 patients were diagnosed with STEC O157. This was an increase of 10 to 50% compared to diagnosed cases in the previous years (Graph). The relatively high incidence was caused by the first nation-wide outbreak of STEC O157[11]. The descriptive analysis suggests a decline in the number of cases where animal contact could have played a role in disease transmission, and an increase in the number of cases where contaminated beef was suspected as the vehicle of infection. However, in 2005, no microbiological evidence was obtained through testing of animal or food samples collected, to support the descriptive evidence.

Serotype	Frequency	%
O157	54	100.00
non-O157		
Others		
Untyped/untypable		
Total	54	100.00

In 2005, most cases of O157 infection were female (61.1%), and only 38.9% of cases were under 14 years of age.

Graph Trends of VTEC infection 2000-05



9.24.1.1 HUS

Four cases developed HUS, of which one died. The number of HUS cases was relatively low compared to previous years. As the incriminated food in the national outbreak is only rarely consumed by small children, this had no impact on the HUS number.

9.24.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	54	0.0%	2.0%	74.5%	23.5%	94.4%
non-O157						
Not typed						

(* not all strains may be tested for each characteristic)

9.24.3 Antimicrobial resistance

No data or information provided.

9.24.4 Travel related infection

Travel was reported in four cases – to Turkey (3), and Brazil (1).

9.24.5 Outbreaks

In September 2005, the first national outbreak of Shiga toxin (Stx)-producing Escherichia coli (STEC) O157 was investigated in the Netherlands[11]. A total of 21 laboratory-confirmed cases, and another 11 probable cases (two primary and nine secondary cases) became ill between September 11 and October 10, 2005. This corresponds with about 1,800 to 19,000 estimated cases in the community. A case-control study supported the hypothesis that filet américain was the likely source of the outbreak (matched odds ratio (OR) 272, 95% confidence interval (CI) 3 – 23,211). Even so, consumption of ready-to-eat vegetables was also associated with STEC O157 infection (matched OR 24, 95% CI 1.1 – 528). Samples of filet américain taken at one chain of supermarkets where most cases (67%) reported to have likely obtained the filet américain, all tested negative for STEC O157. However, sampling was done only three days after the date of symptom onset of the last reported case. Since 88% of the cases were ill within a two week period, point source contamination probably explains these negative results. It is concluded that filet américain was the most likely cause of the first national outbreak in the Netherlands.

Through the mandatory reporting system, in 2005, no outbreaks of STEC were reported.

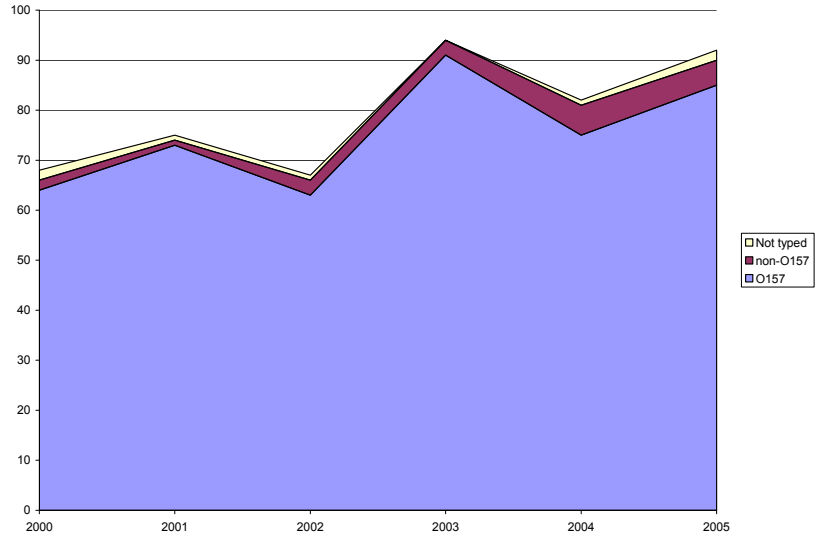
9.25 New Zealand

9.25.1 Trends and sources of infection

In 2005, there were 92 cases of VTEC infection reported in New Zealand, 92.4% of which were caused by serogroup O157. The majority of O157 cases were female (61.2%), and over half (53.6%) were less than five years of age.

Serotype	Frequency	%
O157	85	92.39
non-O157	5	5.43
Others	0	0.00
Untyped/untypable	2	2.17
Total	92	100.00

Graph Trends of VTEC infection 2000-05



9.25.1.1 HUS

In 2005, there were seven cases of HUS reported. VTEC O157 was detected in six cases; the seventh was detected by PCR but was unable to be serotyped, as a positive colony was not able to be isolated.

9.25.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	85		0.0%	84.4%	15.6%	75.3%
non-O157	5		0.0%	100.0%	0.0%	0.0%
Not typed						

(* not all strains may be tested for each characteristic)

9.25.3 Antimicrobial resistance

No data or information provided.

9.25.4 Travel related infection

No cases were travel related.

9.25.5 Outbreaks

No data or information provided.

9.26 Norway

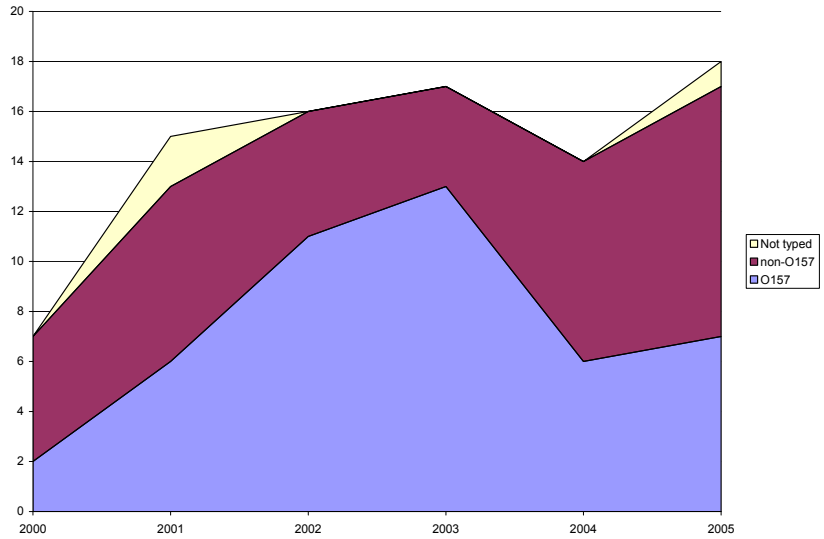
9.26.1 Trends and sources of infection

The reported incidence of VTEC in Norway has so far been low (0-18 cases per year, incidence rate 0-0.4 per 100,000 of the population) (Graph). However, data show that VTEC O157 is present in the cattle and sheep populations. Thus, it is possible that the incidence may increase in the future, and that outbreaks may occur.

Serotype	Frequency	%
O157	7	38.89
O103	3	16.67
O26	1	5.56
O111	1	5.56
O119	1	5.56
O145	1	5.56
non-O157	2	11.11
Others	0	0.00
Untyped/untypable	2	11.11
Total	18	100.00

In 2005, most cases of O157 infection were female (57.1%), the majority (71.4%) of cases were aged between 15-64 years of age. The majority of non-O157 cases were female (55.6%), however, only (44.4%) were aged between 15-64 years.

Graph Trends of VTEC infection 2000-05



9.26.1.1 HUS

There was one case of HUS in 2005, associated with serogroup O26.

9.26.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	7		0.0%	57.1%	42.9%	100.0%
non-O157	9		62.5%	25.0%	12.5%	83.3%
Not typed	2		100.0%	0.0%	0.0%	

(* not all strains may be tested for each characteristic)

9.26.3 Antimicrobial resistance

No data available.

9.26.4 Travel related infection

Approximately half of all cases acquire their infection abroad.

9.26.5 Outbreaks

Only two small outbreaks of VTEC-infections have been registered in Norway. The first was a small outbreak with four laboratory-confirmed cases of VTEC O157 in 1998. The source of infection was believed to be contaminated kebab made from Norwegian beef. In the second outbreak in 1999, also with four cases, salad was implicated as the probable source of infection. This was based on epidemiological investigation followed by inspection of the production plant, but no definite source was found.

In 2005, no outbreaks were reported.

9.27 Poland

9.27.1 Trends and sources of infection

In 2005 in Poland four cases of VTEC were reported to epidemiological surveillance system; all strains were O157 but only one of them were tested for verotoxin; it was done in Department of Bacteriology PZH and this strain was verotoxin (+) and sorbitol (-); moreover 10 more O157 strains isolated in Poland in 2005 were tested in this laboratory and all of them were verotoxin (-) and sorbitol (+).

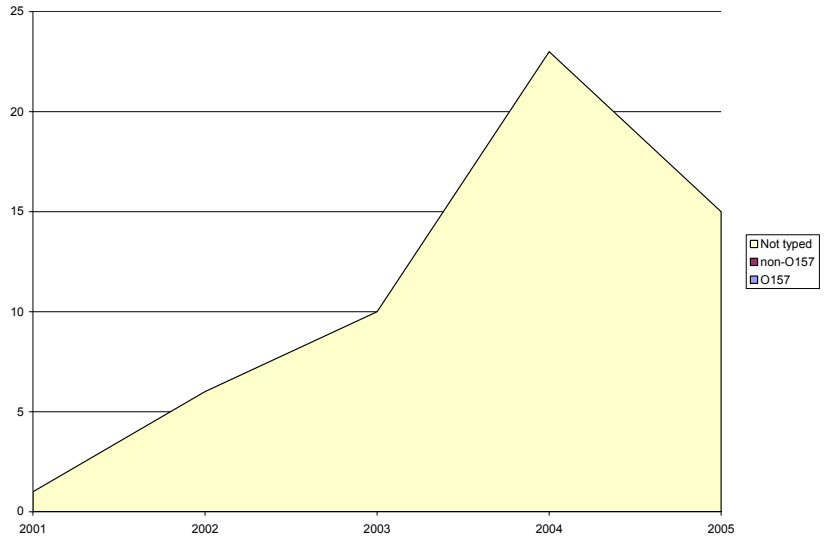
9.28 Portugal

9.28.1 Trends and sources of infection

In 2005, there were 15 cases of *E. coli* infection reported in Portugal, all of which were caused by untyped serogroups. This was a decrease of 35% on 2004. The majority of cases were female (64.2%).

Serotype	Frequency	%
non-O157		
Others		
Untyped/untypable	15	100.00
Total	15	100.00

Graph Trends of VTEC infection 2000-05



9.28.1.1 HUS

No data or information provided.

9.28.2 Microbiological characteristics

No data or information provided.

9.28.3 Antimicrobial resistance

No data or information provided.

9.28.4 Travel related infection

No data or information provided.

9.28.5 Outbreaks

No data or information provided.

9.29 Romania

9.29.1 Trends and sources of infection

During 2005, no isolates of VTEC were received by the reference laboratory.

9.30 Scotland

9.30.1 Trends and sources of infection

Scotland generally reports higher rates of infection with *E. coli* O157 than elsewhere in the United Kingdom. Background incidence has been between 200 to 250 cases per annum since the mid-1990s. On average 5.3 cases per 100,000 of the population were reported

annually during the ten years 1995 to 2005, peaking at 9.9 cases in 1996. This peak was associated with a major outbreak involving 279 symptomatic, laboratory confirmed cases. Whilst two large foodborne outbreaks occurred in the mid-1990s, most cases are sporadic, with different aetiology related to grazing animals and their environment. In 2005, 176 culture-positive cases of VTEC infection were reported to HPS by SERL and diagnostic laboratories throughout Scotland, a decrease of 18% on 2004.

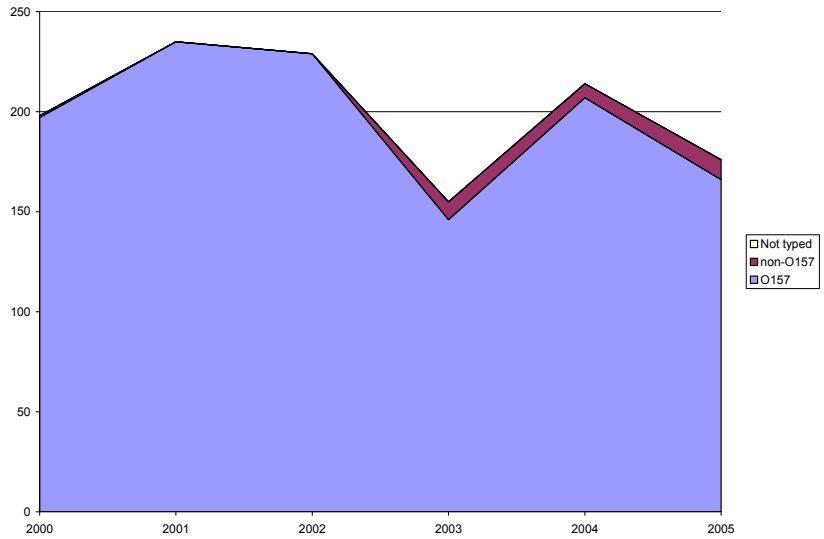
Serotype	Frequency	%
O157	166	94.32
O26	2	1.14
O103	1	0.57
O145	1	0.57
non-O157	6	3.41
Others	0	0.00
Untyped/untypable	0	0.00
Total	176	100.00

VTEC O157 accounted for 166 cases (Graph), with an incidence rate of 3.3 cases per 100,000 population. Non-O157 VTEC reports comprised two VTEC O26 cases, single reports of O103 and O145, and six other non-O157 serogroups. No *vtx* genes were identified in 6 isolates of *E.coli* O157 which are not included in the 176 cases above, amounting to 4% of all *E.coli* O157 isolates in 2005; this was the highest proportion of VT-negative O157 isolates identified since enhanced surveillance began in 1999.

Within VTEC O157 cases, historical patterns in geographical variation showed some variation in 2005. Although rates remained high in the North East, the highest rate of infection in mainland Scotland was reported in the South West, where high rates are reported periodically. Children under 10 accounted for 29% of all cases. Person-to-person spread was the most likely source of infection for 5% of cases.

In 2005, most cases of O157 infection were male (53%), and 36% of cases were under 14 years of age. Non-O157 cases were split evenly between males and females, and only 30% were aged 14 or under.

Graph Trends of VTEC infection 2000-05



9.30.1.1 HUS

Bloody diarrhoea is reported by approximately 60% of VTEC O157 patients in Scotland each year. In 2005, although 7% of all VTEC O157 cases were asymptomatic, 45% required hospital admission. HUS was reported in 16 (10%) of the 166 patients who were culture positive for VTEC O157, and in one patient with non-O157 *E.coli* (serogroup designated O-unidentifiable). One further patient with culture negative but serum antibody positive *E.coli* O157 infection also developed HUS in 2005.

9.30.2 Microbiological characteristics

Although PT21/28 continued to predominate, as observed in Scotland since the late 1990s, and accounted for 46% of VTEC O157 isolates in 2005, this was a marked decrease from 59% with PT21/28 in 2004. PT8 increased to account for 24% of isolates in 2005, compared to 11% in 2004; but 35% of PT8 cases were imported infections, the majority in patients who visited Turkey.

Almost 98% of *E. coli* O157 isolates characterised at SERL from 1999 to 2005 were verotoxigenic. In recent years, small but increasing numbers of non-O157 *E. coli* isolates have also been reported. Possession of verotoxin genes was more varied amongst these organisms. Although no sorbitol-fermenting VTEC O157 isolates were reported in 2005, SERL did identify two non-verotoxigenic, sorbitol-fermenting O157 isolates.

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	166**	0.0%	0.0%	73.9%	26.1%	165
non-O157	10		40.0%	40.0%	20.0%	10
Not typed						

(* not all strains may be tested for each characteristic)

(** VT and *eae* results not available for one isolate)

9.30.3 Antimicrobial resistance

Not routinely undertaken in Scotland.

9.30.4 Travel related infection

Thirty (17%) of the 176 VTEC cases in 2005 were reported by local investigators to have acquired infection outside the UK, based on travel, clinical and exposure histories. Destinations most frequently reported were the Middle East (16 cases) and central Europe (five cases).

9.30.5 Outbreaks

Enhanced surveillance identified that sporadic infection accounted for 81% of VTEC O157 cases in 2005, the same proportion as in 2004, with 12 general outbreaks (defined as involving members of more than one household or institution) accounting for the remainder. In eight outbreaks, the most likely source of infection was exposure to farm animals or their environments, including two outbreaks where VTEC O157 was isolated from private water supplies on farmland. Although two small outbreaks involved cases linked to food outlets, no specific food items were identifiable as the vehicle of transmission. Outbreak epidemiology in Scotland has become more varied: although the largest outbreak in Scotland (in 1996, 279 positive cases) was foodborne, in recent years substantial numbers have been affected in

outbreaks involving campsites or water supplies contaminated by faeces from grazing animals.

9.31 Slovakia

9.31.1 Trends and sources of infection

In 2005, 61 cases of VTEC infections were reported in Slovakia in one outbreak. Nine cases were laboratory confirmed, the others were reported on the based of epidemiological link.

Serotype	Frequency	%
O157	9	100.00
non-O157		
Others		
Untyped/untypable		
Total	9	100.00

9.31.1.1 HUS

No cases of HUS were reported in 2005.

9.31.2 Microbiological characteristics

These data are not available as only one human clinical laboratory tests for these for serotype O157.

9.31.3 Antimicrobial resistance

There were no reported data about antimicrobial resistance.

9.31.4 Travel related infection

There were no imported case of O157 in 2005.

9.31.5 Outbreaks

There were 61 cases of VTEC in one outbreak among spa guests in Slovakia. The mode of transmission was not determined.

9.32 Slovenia

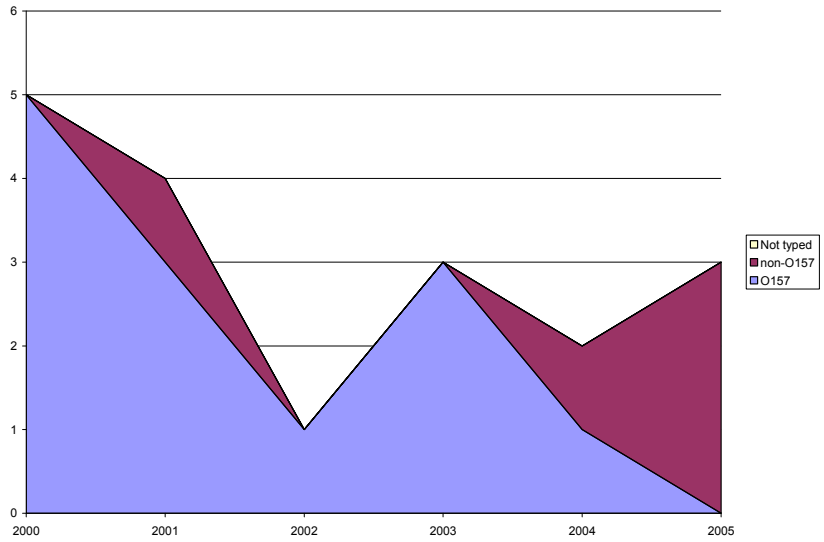
9.32.1 Trends and sources of infection

There were three cases of VTEC infection reported in 2005, all were non-O157 serogroups. All the cases were female and were aged under 5years of age.

Serotype	Frequency	%
O26	2	66.67
O145	1	33.33
non-O157	0	0.00
Others	0	0.00
Untyped/untypable	0	0.00

Total	3 100.00

Graph Trends of VT positive VTEC infection 2000-05



9.32.1.1 HUS

Two cases of HUS were reported in 2005, associated with serogroups O26 and O145.

9.32.2 Microbiological characteristics

VT production was present in three cases (2 O26, 1 O145), although the type of toxin was not confirmed.

9.32.3 Antimicrobial resistance

In 2005 just three *E.coli* strains were VTEC positive. All were resistant against amp. One strain was MDR (resistant against Ampicillin, Chloramphenicol, Streptomycin, Sulphonamides, Tetracyclines, Trimethoprim).

Percentage of strains sensitive, resistant (1-3 AMRs), and MDR (≥4AMRs) by O157, non-O157 and not typed serogroups.

	Total*	MDR	Resistant	Sensitive
O157				
non-O157	3[#]	33.3	66.7	0.0
Not typed				
(* not all strains may be tested for antimicrobial resistance)				

one O26 MDR, one O26 and one O145 resistant.

9.32.4 Travel related infection

No travel information was available.

9.32.5 Outbreaks

There were no outbreaks caused by VTEC in 2005.

9.33 South Africa

9.33.1 Trends and sources of infection

The EDRU received no human VTEC isolates during 2005.

9.34 Spain

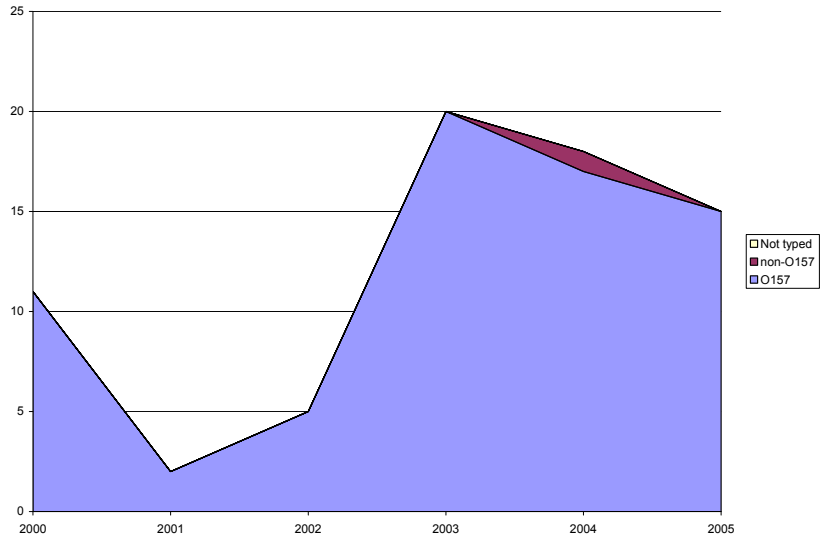
9.34.1 Trends and sources of infection

In 2005, there were 15 cases of VTEC infection reported in Spain. All were serogroup O157. The number of reported cases has increased over recent years (Graph). This can be attributed to including of isolates from the reference laboratory for *E. coli* at the University of Santiago de Compostela (Galicia), which has increased the coverage of VTEC surveillance.

Serotype	Frequency	%
O157	15	100.00
non-O157		
Others		
Untyped/untypable		
Total	15	100.00

In 2005, most cases of O157 infection were female (55.6%), 88.9% of cases were under 14 years of age.

Graph Trends of VTEC infection 2000-05



9.34.1.1 HUS

One case of HUS was reported in 2005, associate with serogroup O157.

9.34.2 Microbiological characteristics

Phage typing data were reported for 14 (93.3%) of O157s; the predominant types were PT8 (26.7%), PT34 (20.0%), PT54 (13.3%), PT2, 4, 21, 42 and 54 variant constituted the remainder.

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	15	0.0%	6.6%	46.7%	46.7%	100.0%
non-O157						
Not typed						

(* not all strains may be tested for each characteristic)

9.34.3 Antimicrobial resistance

No data or information provided.

9.34.4 Travel related infection

Travel history was not available.

9.34.5 Outbreaks

In 2005 no international outbreaks were detected.

9.35 Sweden

9.35.1 Trends and sources of infection

During 1995 and 1996, there was a large outbreak of EHEC O157 infection affecting at least 120 people. The outbreak increased the awareness of EHEC O157 and since then most people with haemorrhagic diarrhoea are investigated for the presence of EHEC.

Between 1998 and 2001, the annual number of human cases of EHEC varied between 69 and 96. In 2002, physicians reported 129 (mostly domestic) cases. This sudden increase was attributed to two outbreaks, one caused by water and the other by contaminated cold-smoked sausage. In 2003 the number of cases declined to 72.

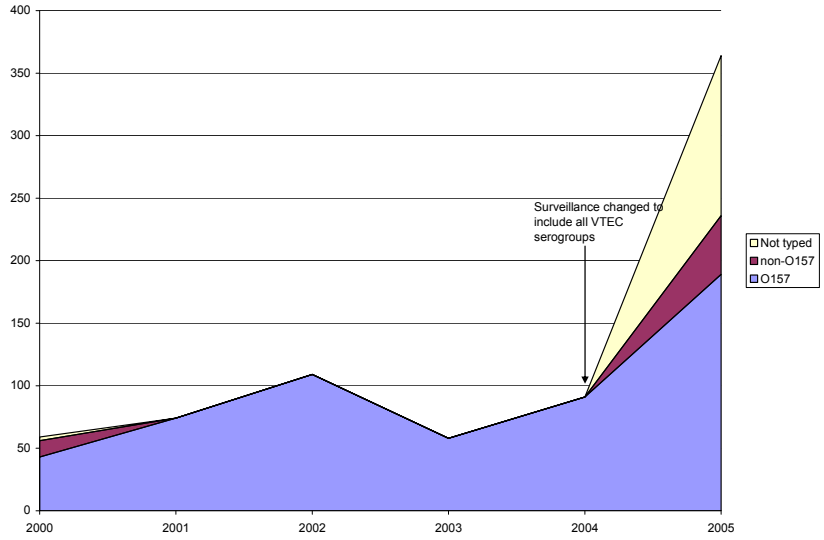
During 2004 the Communicable Disease Act was changed to include all serogroups of EHEC instead of just O157. This change in the legislation, led to a large increase in reported cases of EHEC in 2004 (202 cases). This increase was observed in both sexes and among all age groups. In 2005 there was an even larger increase in EHEC cases with 364 cases of VTEC infections being reported. This increase was mainly due to a large outbreak (see below). The majority of which were serogroup O157 (52%).

Serotype	Frequency	%
O157	189	51.92
O26	17	4.67
O121	10	2.75
O103	5	1.37
O177	4	1.10
O8	2	0.55
O117	2	0.55
O5	1	0.27
O11	1	0.27
O87	1	0.27
non-O157	0	0.00

Others	4	1.10
Untyped/untypable	128	35.16
Total	364	100.00

In 2005, most cases of O157 infection were female (58.2%), only 20.6% of cases were under 14 years of age. The majority of non-O157 cases were male (55.3%), however, a much larger proportion of cases (61.7%) were aged 14 or under.

Graph Trends of VTEC infection 2000-05



9.35.1.1 HUS

Eleven people developed HUS in 2005, seven with VTEC O157, one with O26, one with O121, and two further people with EHEC of unknown serotype.

9.35.2 Microbiological characteristics

Of the 189 isolates of EHEC O157 87% carried only the VT2 gene, 1,6% carried only the VT1 gene, and 11% both the VT1 and VT2 genes.

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	189		1.6%	87.8%	10.6%	91.2%
non-O157	47		55.6%	40.0%	4.4%	78.3%
Not typed	128		42.3%	49.5%	8.2%	85.7%

(* not all strains may be tested for each characteristic)

9.35.3 Antimicrobial resistance

Antimicrobial susceptibility testing is not routinely performed

9.35.4 Travel related infection

Seventy-one cases (19.5%) acquired their infections abroad. The most commonly reported destinations were Turkey (19, 26.0%), and Egypt (9, 12.3%).

9.35.5 Outbreaks

In total, five outbreaks were reported during the year. In August-September the largest EHEC outbreak in Sweden ever occurred with 135 cases. Most of the ill people lived at the Swedish west coast and unusually many of them were women. A case-control study was performed, which showed a greater risk of falling ill after having consumed iceberg lettuce. All cases had eaten lettuce from the same producer at the Swedish west coast. No bacteria were found in food samples, but in brook water, which was used to water the lettuce. The four further EHEC outbreaks were all small and comprised in total 14 persons.

9.36 Switzerland

9.36.1 Trends and sources of infection

In 2005, there were 18 VTEC infections were notified to the SFOPH by primary diagnostic laboratories. The majority of these (11, 61.1%) were identified as non-O157 serogroups, the specific serogroups were not identified.

Serotype	Frequency	%
O157	7	38.89
non-O157	11	61.11
Others	0	0.00
Untyped/untypable		0.00
Total	18	100.00

In 2005, most cases of O157 infection were male (71.4%), 71.4% of cases were under 14 years of age. The majority of non-O157 cases were also male (63.6%), however, a larger proportion of cases (81.8%) were aged 14 or under.

9.36.1.1 HUS

No data or information provided.

9.36.2 Microbiological characteristics

Percent of isolates tested by microbiological characteristic.

	Total*	Sorbitol +ve	VT1 only	VT2 only	VT1&2	eae gene
O157	7		0.0%	28.6%	71.4%	100.0%
non-O157	11		55.6%	45.4%	.%	81.8%
Not typed						

(* not all strains may be tested for each characteristic)

9.36.3 Antimicrobial resistance

No data or information provided.

9.36.4 Travel related infection

No data or information provided.

9.36.5 Outbreaks

No data or information provided.

10 Campylobacter

10.1 Austria

10.1.1 Trends and sources of infection

In 2005, there were 5,093 reported and 6,287 laboratory confirmed cases of campylobacteriosis in Austria, a slight increase of laboratory confirmed cases on 2004[12]. Based on reported cases overall incidence comes up to 63.4 cases per 100,000 of the population. Campylobacteriosis is the second most frequent food-associated infection notified to public health authorities in Austria, being on top of the reports in five federal states.

10.1.1.1 Species differentiation

Species differentiation of more than one third of all isolates revealed 93.2% were *C. jejuni*, 6.5% were *C. coli*, in 0.2% of isolates other species were identified.

10.1.2 Antimicrobial resistance

Resistance rates of *Campylobacter* isolates for 2005 were similar to those in previous years. Rates of resistance were more than 40% for quinolones, more than 20% for Tetracyclines, and 2.6% for macrolides, respectively.

10.1.3 Travel related infection

See paragraph on outbreaks below.

10.1.4 Outbreaks

In Austria, a total of 606 food borne outbreaks affecting 1,910 people were documented in 2005[13]. *Salmonella* ssp. and *Campylobacte*r spp. accounted for 99% of all reported outbreaks. One hundred and twenty-eight (23%) of a total of 560 domestically acquired food borne outbreaks were due to *Campylobacter* spp., 59 of those were caused by *C. jejuni* and one by *C. coli*, respectively. Five outbreaks of human campylobacteriosis and one outbreak due to *Salmonella* spp. and *Campylobacter* spp. were travel-associated.

10.2 Australia

10.2.1 Trends and sources of infection

Not all the data on *Campylobacter* isolates are referred to NEPSS, so are not included in this report.

10.3 Belgium

10.3.1 Trends and sources of infection

There were 6,879 cases of *Campylobacter* reported in Belgium in 2005, a slight increase on 2004. The majority (47.3%) were in the 15-64y age band although 27.6% were aged less than 5 year.

10.3.1.1 Species differentiation

Species differentiation is not routinely carried out.

10.3.2 Antimicrobial resistance

Antimicrobial resistance is not reported.

10.3.3 Travel related infection

Travel related infections are not reported.

10.3.4 Outbreaks

Four outbreaks attributed to *Campylobacter* were reported, involving 37 persons. Two outbreaks occurred in youth camps, one caused by a spaghetti sauce and the other by chicken food. The third outbreak occurred in a Chinese restaurant and no source was found for the fourth.

10.4 Bulgaria

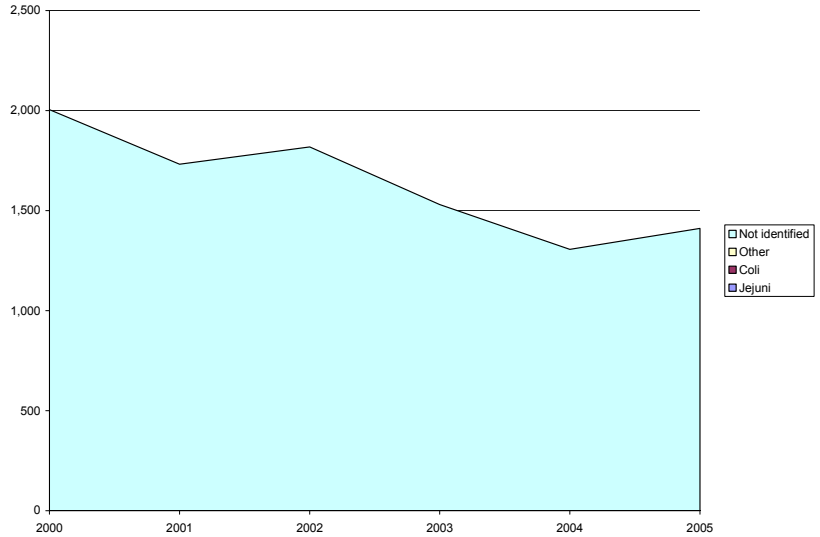
10.4.1 Trends and sources of infection

No data or information provided.

10.5 Canada

10.5.1 Trends and sources of infection

The number of reported cases of *Campylobacter* increased in 2005 (from 1,306 to 1,411 +8.0%), although this goes against the recent trend.



10.5.1.1 Species differentiation

No data or information provided.

10.5.2 Antimicrobial resistance

No data of information provided.

10.5.3 Travel related infections

No data of information provided.

10.5.4 Outbreaks

Only one *Campylobacter*-related outbreak was identified in 2005. Thirty-five confirmed cases of *C. jejuni* infection reported by Alberta in June were associated with a youth camp. The presence of *C. jejuni* as well as *E. coli* was confirmed in well water used at the camp, following heavy rains in the area.

10.6 Cyprus

10.6.1 Trends and sources of infection

No data or information provided.

10.7 Czech Republic

10.7.1 Trends and sources of infection

In 2005, there were 30,268 laboratory reports of campylobacteriosis in the Czech Republic, an increase of 18.7%. Nearly half of all cases were in the 15 to 64 year age group (49.2%), 52% of cases were male.

10.7.1.1 Species differentiation

Nearly all isolates were identified as *C. jejuni* (95%).

10.7.2 Antimicrobial resistance

No data or information provided.

10.7.3 Travel related infection

One per cent of cases reported travel abroad, the most commonly reported destinations were Slovakia (43 cases; 15.9%), Tunisia (31, 11.5%), and Bulgaria (30, 11.1%).

10.7.4 Outbreaks

No data or information provided.

10.8 Denmark

10.8.1 Trends and sources of infection

Since 1999, campylobacteriosis has been the single leading cause of bacterial gastrointestinal disease in Denmark. Consumption and handling of poultry and poultry products are believed to be the primary sources of infection, though other sources also exist.

In 2005, there were 3,677 reported cases, with an incidence of 68.8 cases per 100,000 of the population, a slight decrease on 2004. The incidence of *Campylobacter* in humans has a distinct seasonal distribution, with a summer peak between June and September.

10.8.1.1 Species differentiation

Species differentiation is not routinely undertaken in Denmark.

10.8.2 Antimicrobial resistance

No data or information provided.

10.8.3 Travel related infection

Information on travel history is not reliably recorded, therefore the incidence of people infected outside Denmark is unknown. It is estimated that approximately one third of cases are travel related.

10.8.4 Outbreaks

Outbreaks of human campylobacteriosis are rare, none were identified by laboratory-based surveillance during 2005.

10.9 England and Wales

10.9.1 Trends and sources of infection

In 2005, there were 46,298 laboratory reports of campylobacteriosis in England and Wales, a slight increase on 2004.

10.9.1.1 Species differentiation

Most isolates are not speciated. Of the small proportion of isolates that underwent further characterisation the majority were identified as *C. jejuni*.

10.9.2 Antimicrobial resistance

No data or information provided.

10.9.3 Travel related infection

A recent sentinel surveillance scheme for *Campylobacter* infection indicates that 19% of infections in England and Wales are associated with foreign travel.

10.9.4 Outbreaks

No data or information provided.

10.10 Estonia

10.10.1 Trends and sources of infection

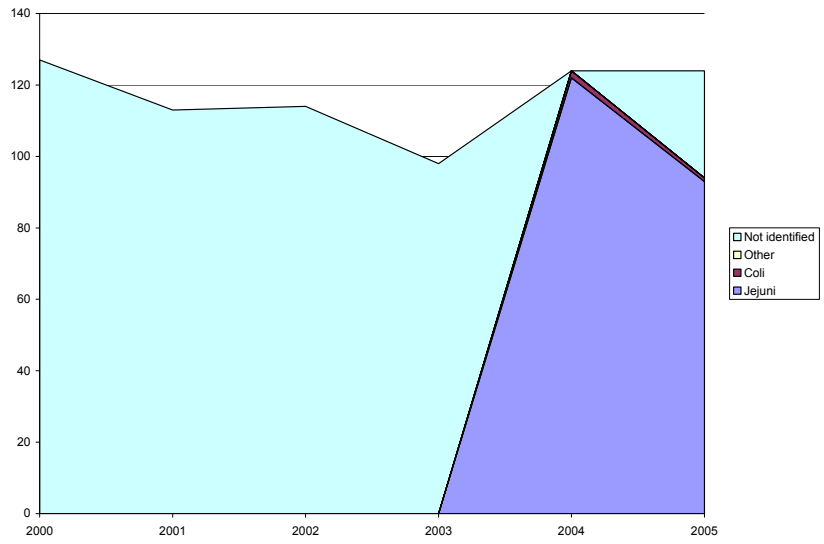
Since surveillance began the number of notified cases has varied considerably, the average yearly incidence is 7.9 per 100,000 of the population.

In 2005, 124 cases of campylobacteriosis (9.1 per 100,000 of the population) were reported. Cases were registered from March to November with a peak in September. The age distribution shows a large proportion of cases (45%) were children aged between one and five years.

10.10.1.1 Species differentiation

The majority of isolates underwent speciation. *C. jejuni* was isolated from 99% of isolates, the remaining 1% were identified as *C. coli*.

Graph Trends of *Campylobacter* isolates 2000-05



10.10.2 Antimicrobial resistance

Data are not available.

10.10.3 Travel related infection

In 2005, nine cases of campylobacteriosis (7.3% of the total) acquired their infection abroad. Four cases reported travel to Egypt, three to Finland, one to Russia and the other to Hungary/Poland.

10.10.4 Outbreaks

In 2005 no outbreaks of *Campylobacter* were reported.

10.11 Finland

10.11.1 Trends and sources of infection

In 2005, there were 4,002 reports of campylobacteriosis in Finland, an increase of 11.7% on 2004. A large proportion of cases were in the 15 to 64 year age group (86%), 54% were male. A seasonal peak was observed during July and August.

10.11.1.1 Species differentiation

Of those that were speciated, most of the isolates were identified as *C. jejuni* (95.6%).

10.11.2 Antimicrobial resistance

Strains not collected; data not available.

10.11.3 Travel related infection

Over half of all cases acquired their infections abroad (52%). The most commonly reported destinations were Turkey (219 cases; 10.5%), Spain (178 cases; 8.5%), Thailand (154 cases; 7.4%), Bulgaria (149, 7.3%), and India (149 cases; 7.3%).

10.11.4 Outbreaks

In 2005, two waterborne outbreaks of *Campylobacter jejuni* were reported in Finland. One outbreak occurred in southern Finland at an institution which has its own water supply system. In this outbreak more than 100 people fell ill; *C. jejuni* was isolated from seven cases. The other outbreak was associated with a municipal water supply. In this outbreak, an estimated 600 people fell ill; *C. jejuni* was isolated from 32 cases. Campylobacter was not detected in the water samples, but several dead squirrels were found from the water tower, and *C. jejuni* with an indistinguishable PFGE pattern was isolated from them. The squirrels had apparently found their way into the water tower through a broken air conditioning pipe.

10.12 France

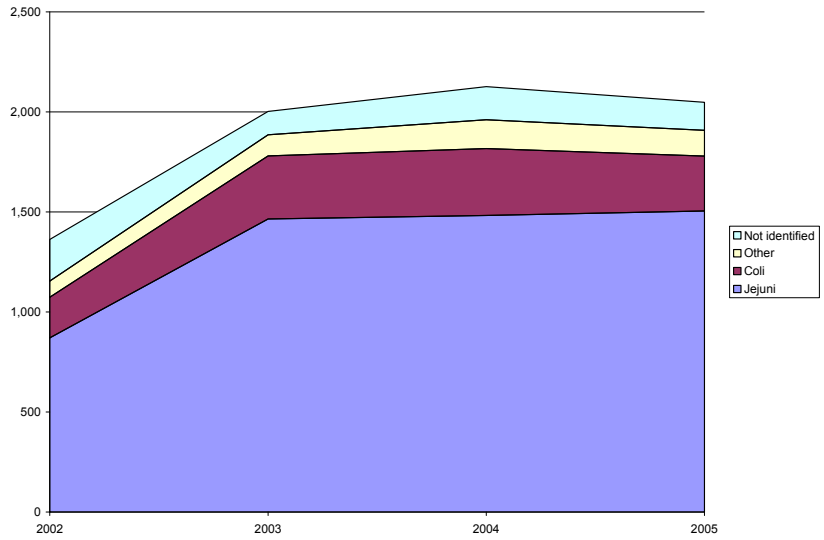
10.12.1 Trends and sources of infection

In 2005, the NRL for *Campylobacter* received 2,048 strains, a slight decrease on 2004. Fifty-seven percent of cases were male, 23.7% were under 5 years old. A seasonal peak was observed between June and October.

10.12.1.1 Species differentiation

Of the 1,908 (93%) isolates which have been speciated so far, 1,505 (78.9%) were *C. jejuni* followed by 274 (14.4%) *C. coli* and 93 (5%) *C. fetus*. Data are marked by a relatively high proportion of *C. coli* isolates compared to other European countries.

Graph Trends of *Campylobacter* isolates 2002-05



10.12.2 Antimicrobial resistance

Resistance to Ampicillin was 21% and resistance to Nalidixic acid was 35.6%. Resistance to Ciprofloxacin is higher for *C. coli* (51.3%) than for *C. jejuni* (31.6%). Resistance to Erythromycin is low (3.6%) and only one strain was resistant to Gentamicin (0.1%). Data are marked by the frequency of resistance to Ampicillin (21.3%) compared to other European countries.

10.12.3 Travel related infection

Ninety-six cases reported an association with travel; the majority to Morocco (19, 19.8%), most of these were *C. jejuni* (14, 73.6%).

10.12.4 Outbreaks

There were no outbreaks reported.

10.13 Germany

10.13.1 Trends and sources of infection

There is no report on Campylobacter by the NRC. The characterization of isolates started in 2005. The first report will be given in 2006. The only available data on campylobacteriosis can be found in the national surveillance and notification system on the website of the Robert Koch Institute.

10.14 Greece

10.14.1 Trends and sources of infection

There is no reference laboratory for *Campylobacter* in Greece. The only available data on campylobacteriosis comes from the Laboratory Notification System. There were no outbreaks of *Campylobacter* infection reported in 2005.

10.15 Hungary

10.15.1 Trends and sources of infection

During the last five years the incidence of campylobacteriosis has remained stable. However, since 2005 *Campylobacter* has become the leading cause of acute gastroenteritis in Hungary, surpassing salmonellosis for the first time. Between 2000 and 2005 the number of cases of campylobacteriosis ranged between 8,300 and 9,200 a year (incidence between 81.6 and 91.0 per 100 000 of the population). There were 8,293 cases registered in 2005 (and 9086 cases in 2004), down (-9.1%) on 2004.

10.15.1.1 Species differentiation

C. jejuni was the most important species (5,685 isolates, 85% of typed isolates), the number of *C. jejuni* cases decreased by 12% from 2004 (6,455 isolates). The second important species was *C. coli* (690 isolates, 10.3% of typed isolates), and the number of *C. coli* isolates was also decreased in 2005 (923 isolate in 2004, - 25.3%). The third important was *C. lari* with 313 isolates (4.7%), the number of isolates were similar to the number in 2004.

10.15.2 Antimicrobial resistance

The antimicrobial resistance data for 2005 are marked by the frequency of resistance to quinolones (56.2%), 3rd generation cephalosporins. Resistance to fluoroquinolones is an emerging problem in Hungary with over 50% of human isolates resistant to Norfloxacin, Ciprofloxacin and Pefloxacin.

10.15.3 Travel related infection

Travel was known to be associated with just 13 cases

10.15.4 Outbreaks

General outbreaks are rare. Between 2000 and 2005 most reported outbreaks were confined to families. There were 119 family outbreaks (183 family outbreaks in 2004.) in 2005. There were no general outbreaks registered in 2005 (4 events in 2004.). Between the years 2000 and 2005 95% of *Campylobacter* cases were sporadic.

10.16 Iceland

10.16.1 Trends and sources of infection

No data or information provided.

10.17 Ireland

10.17.1 Trends and sources of infection

*Campylobacter*iosis is the commonest bacterial cause of human gastrointestinal illness in Ireland. In 2005, there were 1,803 cases of confirmed campylobacteriosis reported, which corresponds to a crude incidence rate of 46.0 cases per 100,000 of the population. This represented an increase on the previous two years (1,711 cases in 2004 and 1,568 cases in 2003). The highest burden of illness was in those aged 0-5y. A peak in cases occurred in week 26.

10.17.1.1 Species differentiation

Speciation of *Campylobacter* isolates is not routinely carried out in Ireland.

10.17.2 Antimicrobial resistance

Antimicrobial susceptibility testing is not routinely carried out on *Campylobacter* isolates in Ireland.

10.17.3 Travel related infection

Country of infection was provided for 75 cases (4.1%). Of these, just three cases reported travel outside of Ireland during the exposure period of their illness. The countries listed were Portugal, India, and the UK.

10.17.4 Outbreaks

There were no general outbreaks of campylobacteriosis notified in Ireland in 2005 but there were eight small family outbreaks/clusters, affecting a total of 17 people. The suspected modes of transmission recorded were foodborne (5), person-to-person (2) and unknown (1).

10.18 Italy

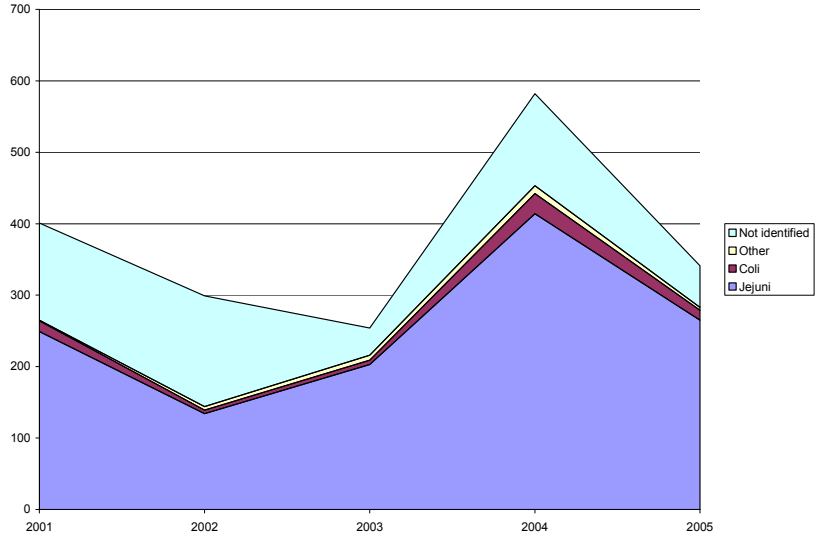
10.18.1 Trends and sources of infection

In 2005, 342 human isolates were reported, a decrease of 41.4%, and back to the levels in the early 2000s. Forty-two per cent of cases occurred between July and September.

10.18.1.1 Species differentiation

C. jejuni represents 77.7% of all isolates.

Graph Trends of *Campylobacter* isolates 2001-05



10.18.2 Antimicrobial resistance

Resistance to fluoroquinolones is an emerging problem in Italy with about 50% of human and animal isolates resistant to Ciprofloxacin. High levels of resistance to Tetracyclines (48.3%) Nalidixic Acid (45.4%) were also of note.

10.18.3 Travel related infection

Only two cases reported travel – Brazil and Tanzania.

10.18.4 Outbreaks

No outbreaks of *Campylobacter* infection have been detected in Italy.

10.19 Japan

10.19.1 Trends and sources of infection

There were 211 cases of *Campylobacter* reported in 2005. The majority were seen in those aged 15-64y (68.7%).

10.19.1.1 Species differentiation

Two hundred and two (95.7%) of the cases were speciated as *C. coli*.

10.19.2 Antimicrobial resistance

Almost one third of cases were resistant to Tetracyclines, and over a quarter were resistant to Nalidixic Acid and Ciprofloxacin.

10.19.3 Travel related infections

No data or information provided.

10.19.4 Outbreaks

No data or information provided.

10.20 Latvia

10.20.1 Trends and sources of infection

There were no cases registered in 2005.

10.21 Lithuania

10.21.1 Trends and sources of infection

No data or information provided.

10.22 Luxembourg

10.22.1 Trends and sources of infection

In 2005, 320 human cases of *Campylobacter* infection were reported, which is the highest reported incidence of campylobacteriosis during the last 5 years. Seasonality is less pronounced than for *Salmonella*, and a greater proportion of cases are adults.

10.22.1.1 Species differentiation

All isolates underwent speciation, 319 were confirmed as *C. jejuni* and the remaining one was identified as *C. coli*.

10.22.2 Antimicrobial resistance

No data or information provided.

10.22.3 Travel related infection

No data or information provided.

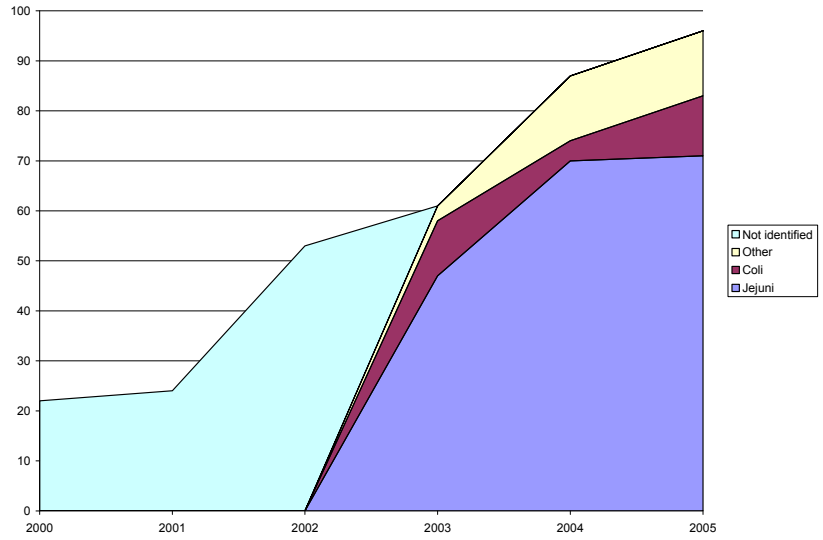
10.22.4 Outbreaks

No data or information provided.

10.23 Malta

10.23.1 Trends and sources of infection

During 2005, there were 96 *Campylobacter* isolates reported from local medical diagnostic laboratories, an increase of 12.9%. A higher number of isolates were seen in the months of April and November compared with the other months of the year, 59.4% of cases were male.



10.23.1.1 Species differentiation

The species most frequently isolated was *C. jejuni* (74.0%).

10.23.2 Antimicrobial resistance

Isolates are routinely tested for sensitivity to Erythromycin. All were sensitive.

10.23.3 Travel related infection

None of the reported cases were associated with foreign travel.

10.23.4 Outbreaks

There were ten outbreaks of campylobacter in 2005 affecting a total of 26 cases. Eight of these outbreaks were related to households whilst the other two were related to institutions and restaurants.

10.24 The Netherlands

10.24.1 Trends and sources of infection

With 3,765 cases in 2005, the incidence of campylobacteriosis appears to be gradually declining in the Netherlands. The increase in the number of cases seen in 2005 compared to the exceptionally low levels seen in 2004 can be attributed to the temporary reduction in sales of poultry meat during and after the explosion of avian influenza.

10.24.1.1 Species differentiation

Between 2002 and 2005 the vast majority of the isolates speciated were shown to be *C. jejuni*. In 2005 these constituted 92.5%.

10.24.2 Antimicrobial resistance

The gradual increase in resistance to fluoroquinolones (Norfloxacin, Ofloxacin and Ciprofloxacin) witnessed over the past decade has remained stable over more recent years at just above 30%. This is also the case for resistance to Tetracyclines but on a lower level. Resistance to macrolides (Erythromycin) also remains stable at a very low level.

10.24.3 Travel related infection

Based on information derived from the CaSa study approximately 23% of *Campylobacter* cases are travel related. Surveillance data also show that resistance to fluoroquinolones is considerably higher in travel related infections. As fluoroquinolones are the antibiotics of first choice for serious campylobacteriosis, this is a matter of concern especially in the treatment of travellers' diarrhoea.

10.24.4 Outbreaks

Through the mandatory reporting system, in 2005, 10 foodborne outbreaks of Campylobacter were reported, involving 63 cases.

10.25 New Zealand

10.25.1 Trends and sources of infection

The case rate of campylobacteriosis in New Zealand in 2005 was 370.3 per 100,000.

10.25.1.1 Species differentiation

No data or information provided.

10.25.2 Antimicrobial resistance

No data or information provided.

10.25.3 Travel related infections

No data or information provided.

10.25.4 Outbreaks

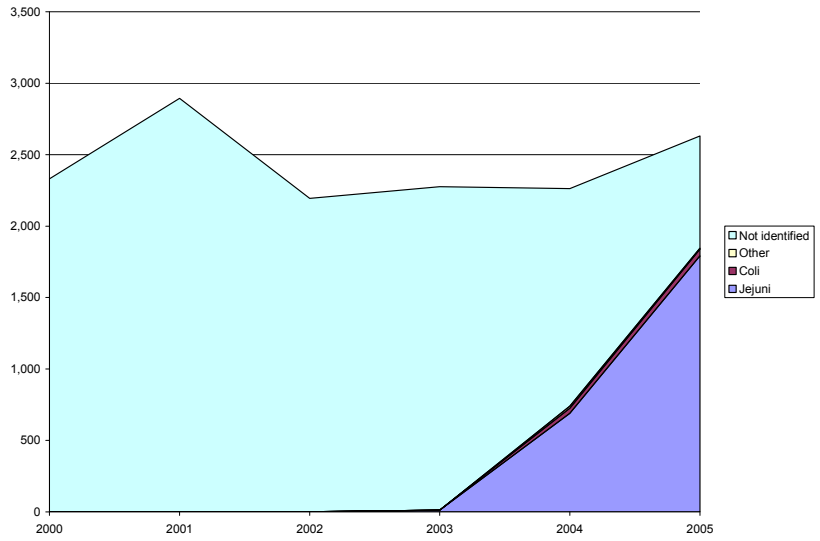
No data or information provided.

10.26 Norway

10.26.1 Trends and sources of infection

During the 1990s there was a significant increase in the incidence of campylobacteriosis in Norway and in 1998 *Campylobacter* surpassed *Salmonella* as the most frequently reported bacterial cause of acute gastroenteritis. A case-control study conducted during 1999 and 2000 identified intake of untreated drinking water, consumption of poultry meat purchased fresh, consumption of barbecued meat, and professional contact with animals as significant risk factors for infection.

In 2005, a total of 2,632 cases of campylobacteriosis were reported in Norway (incidence rate 49.7 per 100,000). Of these, 1,241 (47%) were known to be imported, 1,224 (46.5%) were domestically acquired, and for 166 (6.5%) information on place of infection was not available. The incidence of campylobacteriosis has remained relatively stable since the significant increases seen in the 1990s.



10.26.1.1 Species differentiation

Not all laboratories speciate isolates of *Campylobacter*. However, the National Reference Laboratory for Enteropathogenic Bacteria at the NIPH receives and speciates a systematic

sample of isolates. Approximately 97% are identified as *C. jejuni*, 2.5% as *C. coli*, and the remaining 0.5% as other species.

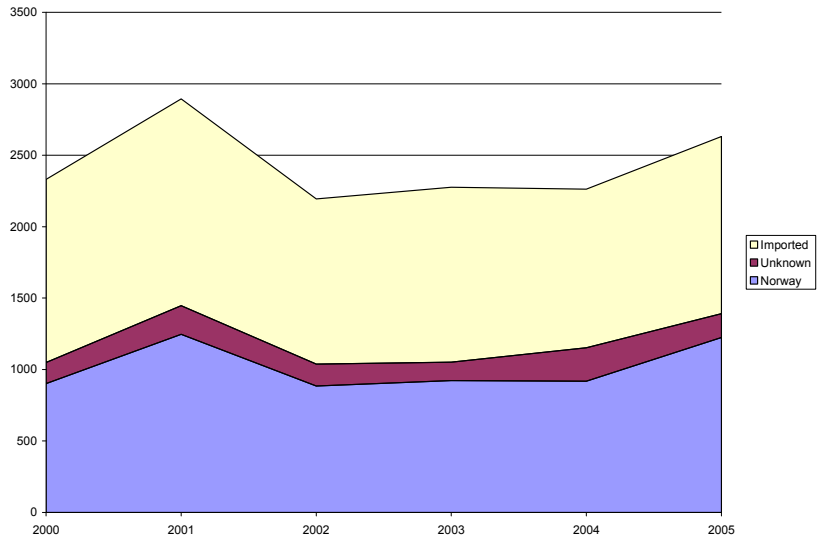
10.26.2 Antimicrobial resistance

The data show that resistance was significantly more widespread among C. jejuni isolates derived from patients infected abroad as opposed to patients infected in Norway. Only 29.8% of the isolates in the first category were susceptible to all antimicrobial agents included as opposed to 89% of the isolates from patients infected in Norway. These discrepancies are explained by the widespread occurrence of resistance to ciprofloxacin/nalidixic acid (61.6%/63.6% versus 6.0%/11.0%) and to tetracyclines (47.7% versus 3.0%) among isolates acquired abroad as opposed to patients infected in Norway (Table).

Antimicrobial agent	**% of isolates resistant (compared with 2004)**	
	Campylobacter jejuni, domestic n=100	*Campylobacter jejuni*, imported n=151
Tetracyclines	3.0 (5.9)	47.7 (59.2)
Erythromycin	1.0 (3.9)	5.4 (4.0)
Gentamicin	2.0 (2.9)	6.0 (3.2)
Ciprofloxacin	6.0 (8.7)	61.6 (68.8)
Nalidixic acid	11.0 (9.7)	63.6 (68.8)

10.26.3 Travel related infection

At least half of all cases of campylobacteriosis are travel related, this can be seen from the graph below. The most commonly reported destinations in 2005 were Spain (247 cases; 19.9%), Turkey (116 cases; 9.4%), Thailand (64 cases; 5.2%), France (62 cases; 5.0%).



10.26.4 Outbreaks

In 2005, only a few small outbreaks (from 2-5 persons ill) were reported.

10.27 Poland

10.27.1 Trends and sources of infection

In 2005, 47 cases of campylobacteriosis were reported in Poland.

10.27.1.1 Species differentiation

Species differentiation is not done.

10.27.2 Antimicrobial resistance

No data or information provided.

10.27.3 Travel related infection

No data or information provided.

10.27.4 Outbreaks

No data or information provided.

10.28 Portugal

10.28.1 Trends and sources of infection

No data or information provided.

10.29 Romania

10.29.1 Trends and sources of infection

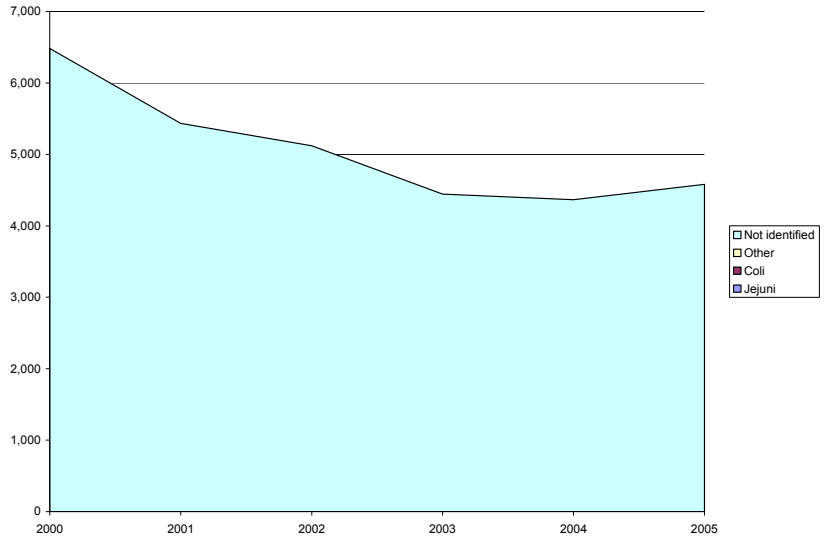
No isolates of *Campylobacter* were received by the reference laboratory in Romania.

10.30 Scotland

10.30.1 Trends and sources of infection

The incidence of *Campylobacter* infection increased during the 1980’s and 90’s and peaked in 2000, with 6,482 isolates reported. However, the incidence has declined since. Graph

In 2005, 4,581 isolates were reported, a reduction of 1,901 (28%) on the peak, and slightly higher than in 2004 (graph). In 2005, the rate of infection across Scotland was 86.3 per 100,000 of the population, but with a large variation across the 15 NHS board areas, with rates ranging from 0 to 118.2 per 100,000 of the population. Overall the lowest rate was observed in one of the Island Health Boards. The lowest rate in a mainland Health Board area was 43.6 per 100,000 of the population.



10.30.1.1 Species differentiation

Most laboratories do not speciate isolates of *Campylobacter* and at present no further characterisation is undertaken.

10.30.2 Antimicrobial resistance

No data or information provided.

10.30.3 Travel related infection

No data or information provided.

10.30.4 Outbreaks

Despite the fact that *Campylobacter* is the most frequently reported bacterial cause of infectious intestinal disease in Scotland, outbreaks of *Campylobacter* infection are relatively rare. In 2004, a total of 205 general outbreaks of infectious intestinal disease were reported in Scotland, but none of these were of *Campylobacter* infection, indeed only 22 outbreaks of *Campylobacter* infection have been reported in Scotland between 1996 and 2004.

10.31 Slovakia

10.31.1 Trends and sources of infection

There were 2,203 sporadic cases of *Campylobacter* reported in the Slovak Republic (40.9 per 100,000 of the population). The highest incidence rate is in children up to one year. The seasonality of campylobacteriosis is typical with most cases occurring during the summer months of June, July and August.

10.31.1.1 Species differentiation

Although there is routine testing in diagnostic laboratories for *Campylobacter* species, most laboratories do not speciate isolates of *Campylobacter* and at present no further characterisation is undertaken. To improve laboratory surveillance of *Campylobacteriosis* it is intended that the public health authorities will cooperate with the national veterinary institute.

10.31.2 Antimicrobial resistance

There was no reporting of the data about antimicrobial resistance.

10.31.3 Travel related infection

Travel was reported in 11 (0.5%) of cases, the most common destination was the Czech Republic (5 cases, 45.5%).

10.31.4 Outbreaks

There were no reported outbreaks of Campylobacteriosis in Slovakia in 2005.

10.32 Slovenia

10.32.1 Trends and sources of infection

Campylobacteriosis is the second most frequent cause of bacterial gastroenteritis in Slovenia. Up until 2004, the number of notifications of *Campylobacter* appeared to be decreasing, however in 2004, the number of reports rose by 19.4% to 1,063, this figure increased slightly in 2005 to 1,088. The majority of cases occurred during July, August and September, and nearly half of all infections were in children under 10 years of age.

10.32.1.1 Species differentiation

Notified cases in 2005: *Campylobacter jejuni*: 926 (85%), *C.* spp. 93, (8.5%), *C. laridis* 35 (3.2%), *C. fetus* 1 (< 1%), and *C. sputorium* 1 (< 1%).

10.32.2 Antimicrobial resistance

Almost half of all isolates tested were resistant to Nalidixic Acid (46.1%) and to Ciprofloxacin (44.1%). (Test were done just for samples from two laboratories; the Institute of Public Health of Slovenia and laboratory of Medical Faculty).

10.32.3 Travel related infection

No data are available.

10.32.4 Outbreaks

No outbreaks of *Campylobacter* have been detected in last decade or in 2005 in Slovenia.

10.33 South Africa

10.33.1 Trends and sources of infection

No surveillance system for *Campylobacter* infection currently operates in South Africa. This is due to the inconsistencies that exist in the quality of isolation and identification between laboratories.

10.34 Spain

10.34.1 Trends and sources of infection

In 2005, the National Reference Laboratory received 338 isolates of *Campylobacter*.

10.34.1.1 Species differentiation

C. jejuni was the predominant species identified (85.5%).

10.34.2 Antimicrobial resistance

Most isolates of *C. jejuni* and *C. coli* were resistant to Ciprofloxacin (85.8%) and Tetracyclines (80.8%). Compared to other countries relatively high levels of resistance to Erythromycin (15.1%) were noted.

10.34.3 Travel related infection

Travel history was not available.

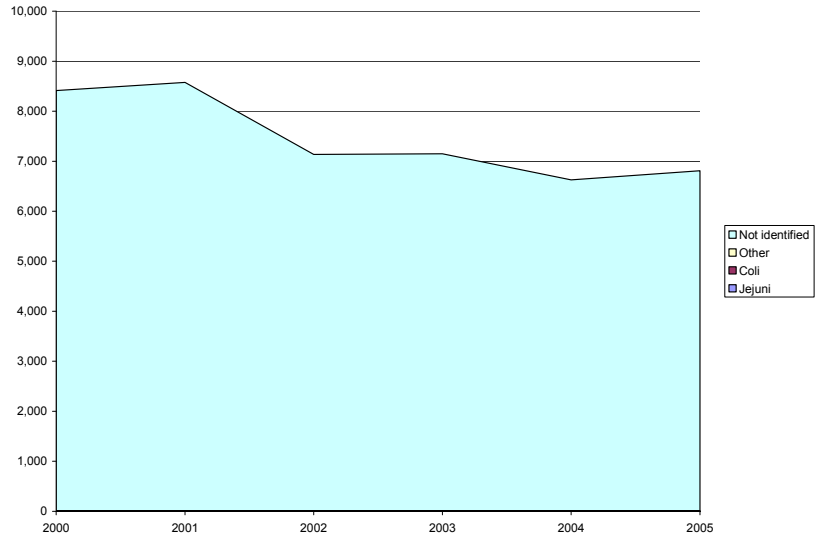
10.34.4 Outbreaks

In 2005 no international outbreaks were detected.

10.35 Sweden

10.35.1 Trends and sources of infection

Between 1995 and 2005, the total number of cases reported has varied considerably (between 5,081 and 8,578), with the highest figure in 2001. However, in 2002 the number of reported cases decreased slightly compared with the preceding years a decrease that lasted the two following years. In 2005, with a total of 6,811 reported cases of campylobacteriosis a small increase (2.8%) was seen. This increase was evenly distributed between the sexes and the different age groups throughout the country.



10.35.1.1 Species differentiation

Species differentiation is not routinely performed.

10.35.2 Antimicrobial resistance

Antimicrobial susceptibility testing is not routinely performed.

10.35.3 Travel related infections

Approximately 70% of infections are acquired abroad. The most common destinations were Turkey (543 cases, 11.9%), Spain (418, 9.2%), and Thailand (386, 8.5%).

10.35.4 Outbreaks

Seven small outbreaks of campylobacteriosis were reported in 2005.

10.36 Switzerland

10.36.1 Trends and sources of infection

No data or information provided.

11 Urgent enquiries sent during 2005.

One of the functions of Enter-net is to receive and disseminate requests for information on potential threats to health. During 2005, Enter-net received 36 urgent enquiries (Table), nearly all involved *Salmonella* infection.

Table Summary of urgent enquiries sent during 2005.

Index country	Month	Pathogen	Association	International dimension
Germany	January	*Salmonella* Bovismorbificans	Not known	No
Scotland	February	*Salmonella* Typhimurium DT104 (MDR)	Not known	No
Ireland	February	*Salmonella* Arechavaleta	Foreign travel	Yes
England & Wales	February	*Salmonella* Virchow PT8	Imported cooked chicken	Yes
USA	February	*Salmonella* Enteritidis	Travel to Jamaica	Yes
France	March	*Salmonella* Agona	Infant formula[14]	Yes
Bulgaria	March	*Salmonella* Brandenburg	Not known	No
England & Wales	April	*Salmonella* Saintpaul	Not known	No
Sweden	May	*Salmonella* Typhimurium NT (U302)	Imported salami	Yes
Enter-net	June	*Salmonella* Aberdeen	Ground Ginger imported into the EU	Yes
Sweden	June	*Salmonella* Stourbridge	Unpasteurised cheese[15,16,17]	Yes

Finland	June	*Salmonella* Typhimurium DT104B (MDR)	Lettuce	Yes
Ireland	June	*Shigella sonnei*	Travel to Egypt	Yes
Italy	June	*Salmonella* Napoli	Environment/fresh water	Yes
France	July	*Salmonella* Worthington	Powdered milk	No
USA	July	*Salmonella* Enteritidis	Travel to Russia	Yes
Australia	July	*Salmonella* Hvittingfoss	N/K	N/K
Spain	August	*Salmonella* Hadar PT2	Cooked chicken	Yes
Scotland	August	*E. coli* O157	Travel to Turkey	Yes
Sweden	September	*E. coli* O157	Lettuce	No
Sweden	September	*Salmonella* Enteritidis	Travel to Poland	Yes
Denmark	September	*Salmonella* Typhimurium DT104 (MDR)	Carpaccio[3]	Yes
Ireland	September	*Salmonella* Agona	None found	No
Netherlands	October	VTEC O157	Beef[18]	No
Scotland	October	*Salmonella* Goldcoast	Travel to Majorca	Yes
France	November	VTEC O157	Beef burgers	No

Netherlands	November	*Salmonella* Typhimurium DT 104 (MDR)	Filet Américain (Italy)[8]	Yes
Norway	November	*Salmonella* Typhimurium DT 104	Meat from Poland	Yes
Latvia	November	*Salmonella* Papuana	None found	No
Italy	November	*Salmonella* Typhimurium DT 121	None found	No
Austria	November	*Salmonella* Typhimurium DT 120 (variant)	None found	No
England & Wales	November	VTEC O157 PT8	Consumption/handling raw beef at home	No
Ireland	November	VTEC O157 PT32	Epi link to private water supply	No
France	December	*Salmonella* Manhattan	Pork meat[19]	No
France	December	VTEC O26	Camembert cheese – International recall of the product, no cases identified outside France	Yes
Sweden	December	*Salmonella* Typhimurium NST	Salami (Italy)[20]	Yes

12 External Quality Assurance of National Reference Laboratories.

EQAs for VTEC serogrouping and *Salmonella* sero- and phage typing, and *Salmonella* AST results had been run during the year.

VTEC EQA.

The VTEC serogrouping EQA was distributed to the new Member States for the first time, and showed excellent results in both the O group and H typing. PFGE typing of the ten EQA strains was also undertaken with 20 out of 23 tiff images being of acceptable quality to allow international comparison.

The Enter-net part of the ring trial had a new record of 30 countries participating. A number of these laboratories were non-Enter-net participants but participated at their own expense. We thus came very close to establishing a worldwide international network of Quality Evaluation and Assurance for typing of *E. coli*. The results showed that 57% of the laboratories got 80% or more of the O groups correct, which compared with 50% in the previous ring-trial. In the H-typing part the same number (57%) also achieved 80% or more correct, which was slightly higher than the previous ring-trial (55.5%). In the O:H typing part 53.3% got 70% or more correct, compared to 50% previously.

The third Enter-net ring trial EQA scheme for serotyping, virulence typing and typing by Pulse Field Gel Electrophoresis (PFGE) of *E. coli* was launched. The PFGE part of the ring trial was co-ordinated with Pulse Net Europe as part of the “Pulse Net Europe Feasibility Study" of VTEC. This part of the ring trial had the voluntary participation of 29 veterinary, food and human diagnostic laboratories. The study has been presented at the numerous meeting and coordination of PulseNet Europe has received EU funding for 2004-5 through the Med-Vet Net programme. The results were published in 2006[21].

Salmonella sero- and phage typing EQA.

The *Salmonella* serotyping, phage typing and AST EQAs also showed excellent results[22].

All Enter-net laboratories correctly identified the O-antigens, however there were some problems with the H-antigens, due to a non-motile variant of the correct strain having been (unintentionally) received. Once this strain was adjusted for, the H-antigens were correctly identified by 99% of all Enter-net laboratories. The serovar name was also correctly identified by 99% of the labs.

For the phage typing EQA, all labs achieved 80% or more correct for the Enteritidis phage types, and 93.3% achieved 80% for the Typhimurium EQA. Combining the two schemes all laboratories accurately identified 80% or more of the strains.

Salmonella AST EQA.

The AST typing EQA showed that for those laboratories using MIC testing only 0.1% showed a minor error, and 0.6% a major error. These were slightly higher for those using disc diffusion methods, with 1.8% showing a minor error, and 1.4% showing a major error.

13 List of Enter-net participants 2005

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