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

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Contents.

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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 appendix A. 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 each 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 Chris Lane for the figure on VTEC infections on page 24. Particular thanks have to go to Sally Meakins who pulled this whole report together.

Ian Fisher
On behalf of the Enter-net Project Team, Scientific Advisory Committee and all the Enter-net participants.
July 2006.

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 135,000 laboratory-confirmed cases in 2004, this remains a major public health problem within Europe and other Enter-net participating countries.
The decline in salmonellosis is predominantly within *Salmonella* Enteritidis. However this is only part of the story; phage type (PT) 4 was the most common type in 1998 comprising over 60% of all strains identified. By 2004 this had reduced to only 30%. Non-PT4 types increased in both proportion and actual numbers.
Antimicrobial resistance is a known problem within enteric bacteria; this is increasing within *Salmonella* infections. In 2000 52.3% of all non-typhoidal infections were resistant to at least one antimicrobial; by 2004 this had increased to 61.3%.
VTEC infections are increasing within the Enter-net countries. *E. coli* O157 has decreased by 6.1% between 2000 and 2004, however non-O157 serogroups have gone up over this period by 51.7%. 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 during 2004.

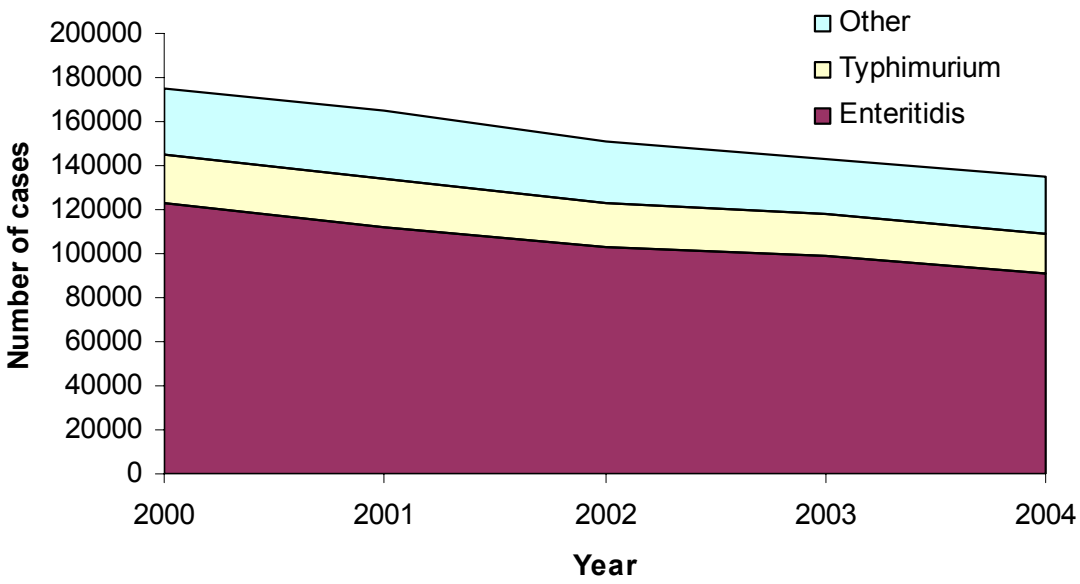
4 Summary results from the Enter-net databases.

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 2000-04 includes data from 24 countries in the Enter-net DSN. More countries provide data to the live database, but these 24 have provided retrospective data from 2000. Overall the number of cases of *Salmonella* infections has reduced from 174,595 cases in 2000 to 135,223 in 2004 (a reduction of 22.6%). The main serotype affected was *S.* Enteritidis, which fell from 123,221 to 90,852 (down 26.3%), *S.* Typhimurium fell from 21,342 to 18,576 (down 13.0%), other serotypes also went down from 30,032 to 25,795 (down 14.1%). As the number of cases of salmonellosis isolated by NRL are known to be less than the number occurring within the community, salmonellosis remains a significant public health burden.

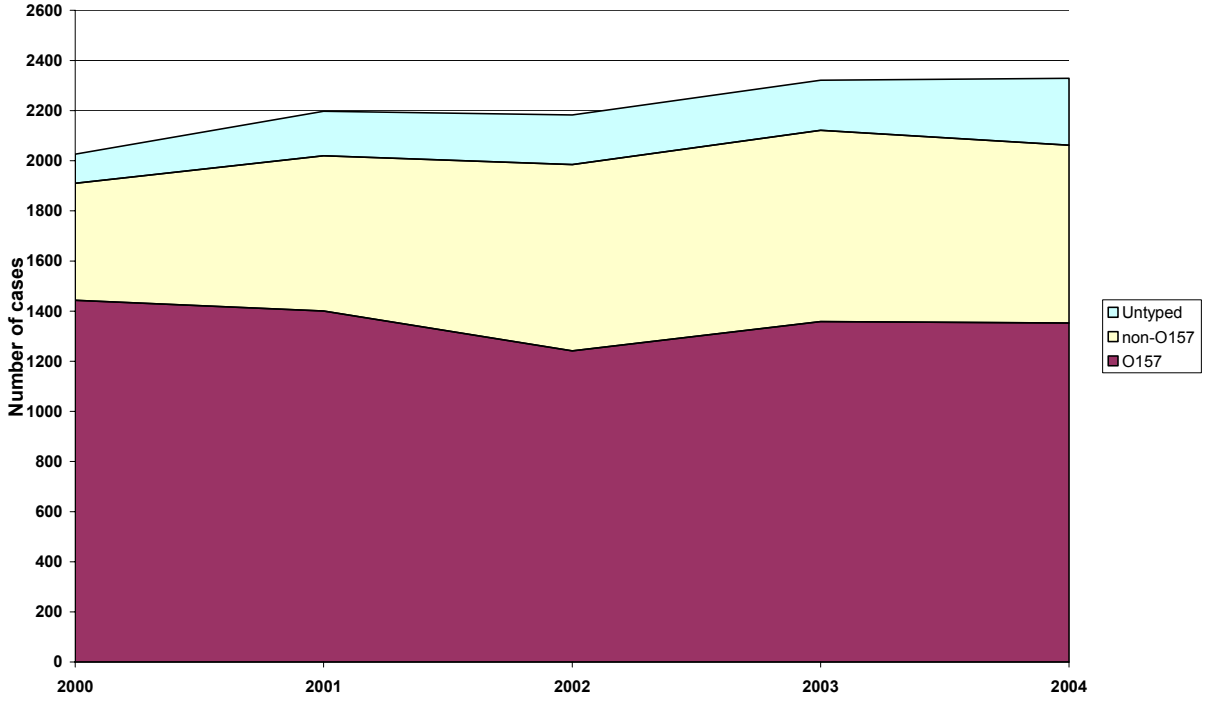
Graph Trends of salmonellosis 2000-2004



4.2 VTEC surveillance data trends.

There are data from 18 countries for the years 2000-04 in the VTEC database, and unlike *Salmonella* infections the trend is upwards. There were 2,329 cases in 2004 compared with 2,026 cases in 2000 (a rise of 15.0%). VTEC O157 is the most common single serogroup identified, and this fell slightly from 1,443 to 1,353 cases (down 6.1%) however non-O157 serogroups are also being recognised and they rose from 467 to 709 cases (up 51.8%).

Graph Trends of VTEC 2000-2004



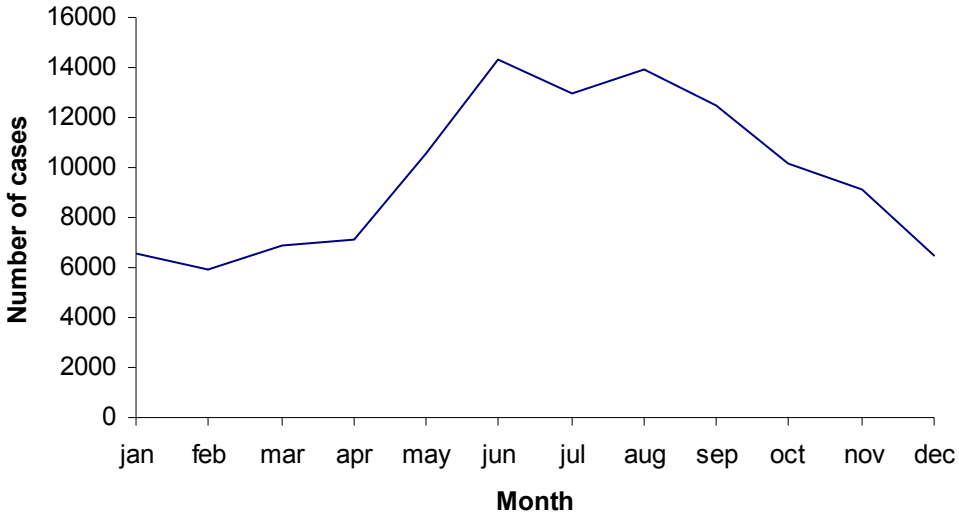
4.3 *Campylobacter* surveillance data.

Campylobacter surveillance was only introduced into Enter-net in 2004, hence retrospective data are not 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 124,109 cases of *Campylobacter* infection reported to Enter-net during 2004. 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.

The incidence of *Campylobacter* in humans has a distinct seasonal distribution, with a summer peak between June and August (Graph).

Graph Seasonality of campylobacteriosis 2004



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	Salmonella		VTEC		Campylobacter	
	Number	Rate	Number	Rate	Number	Rate
Austria	7,224	90.00	54	0.67	6,222	66.50
Australia	7,771	38.64	NS	NS	NS	NS
Belgium	9,543	92.65	44	0.43	NS	NS
Bulgaria	194	2.46	NS	NS	NS	NS
Canada	5,378	16.80	NS	NS	NS	NS
Cyprus	NS	NS	NS	NS	NS	NS
Czech Republic	29,915	293.28	NS	NS	25,492	249.92
Denmark	1,569	28.40	168	3.10	3,724	68.80
E&W	13,711	25.97	702	1.33	44,321	83.94
Estonia	135	10.38	0	0.00	124	9.10
Finland	2,266	43.58	10	0.19	3,584	68.92
France	5,923	9.86	63	0.11	2,127	3.54
Germany	2,833	3.43	795	0.96	NS	NS
Greece	1,874	17.04	0	0.0	0	0.0
Hungary	7,557	74.70	9	0.09	9,086	91.00
Iceland	108	36.00	NS	NS	NS	NS
Ireland	419	10.48	66	1.65	1,711	43.70
Italy	5,156	8.98	24	0.03	582	1.01
Japan	1,367	1.07	2,771	2.17	NS	NS
Latvia	320	13.91	NS	NS	NS	NS
Lithuania	2,245	54.00	2	0.06	957	23.10
Luxembourg	346	69.20	4	0.80	306	61.20
Malta	83	20.75	2	0.50	87	21.75
Netherlands	1,649	10.24	35	0.22	3,359	20.86
New Zealand	1,229	31.51	82	2.10	12,213	326.80
Norway	1,608	35.73	10	0.27	2,275	49.70
Poland	20,432	52.93	4	0.01	24	0.06
Portugal	691	6.84	25	0.25	NS	NS
Romania	690	3.09	0	0.00	0	0.00
Scotland	1,163	22.80	214	4.20	4,365	86.30
Slovakia	13,087	235.40	1	0.02	1,691	31.40
Slovenia	3,174	165.60	34	1.70	1,063	53.15
South Africa	1,622	3.60	0	0.00	NC	NC
Spain	6,155	14.98	18	0.04	343	0.83
Sweden	3,721	41.81	200	2.25	6,226	69.96
Switzerland	2,097	25.90	45	0.63	66	0.92

NS – No information or data submitted
NC – Data not collected

5 Selected results from the Enter-net databases

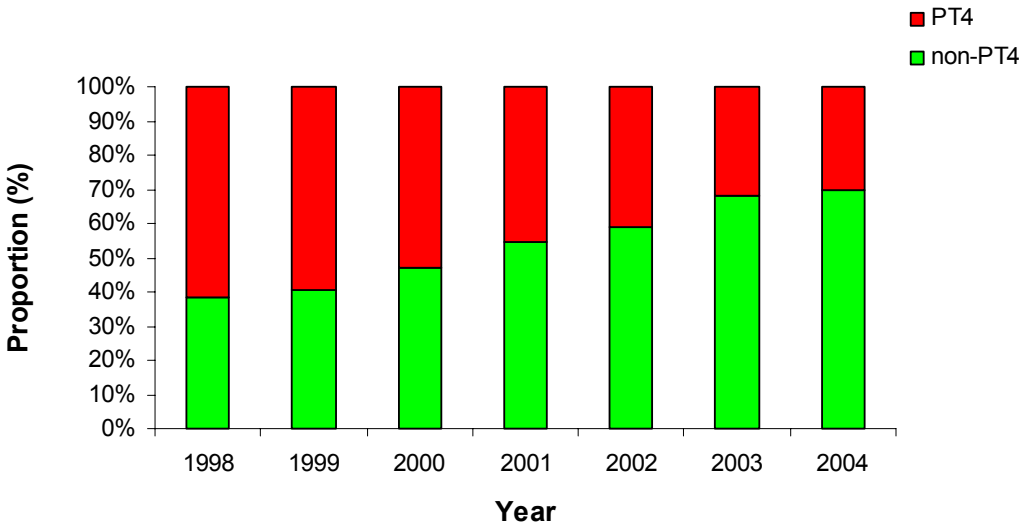
Analysis of the data received by Enter-net over the past few years has revealed important changes in the epidemiology of both *Salmonella* and VTEC infections across Europe.

5.1 *S.* Enteritidis

Historically, *Salmonella* Enteritidis infections in humans were dominated by phage type (PT) 4, however, analysis of data collected over more recent years shows a dramatic shift in the *S.* Enteritidis phage types in circulation.

In 1998, PT4 accounted for 61.8% (21,630 out of 34,998 cases) of all *S.* Enteritidis infections reported to Enter-net with phage type results, however, this proportion dropped to 30.1% (6,825 of 22,698 cases) in 2004 (Graph). This represents a continuation of the trend reported by Enter-net in 2004[1].

Graph Trends in PT4 vs non-PT4 1998-2004



The decline in incidence of PT4 is coupled with the emergence of different and newly defined phage types of *S.* Enteritidis, with the greatest upsurge occurring in *S.* Enteritidis PT1, PT8, PT14b and PT21 infections. It is important to note that the observed increase in non-PT4 infections is reflected both in the number of cases and proportion.

[1] Fisher IST on behalf of the Enter-net participants. Dramatic shift in the epidemiology of *S.* Enteritidis phage-types in Western Europe 1998-2003 – results from the Enter-net international database. *Euro Surveill* 2004; 9 (11): 43-5.

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 2004 (Table), has revealed a significant increase in the proportion of non-typhoidal *Salmonella* isolates that are resistant to at least one antimicrobial (χ^2 for trend P<0.001). In 2000, 52.3% of all non-typhoidal isolates were resistant to at least one antimicrobial, by 2004; this proportion had risen to 61.3%.

Table Non-typhoidal antimicrobial susceptibility results 2000-2004

Year	Sensitive	(%)	Resistant*	(%)	MDR#	(%)	Total
2000	6,097	47.71	4,703	36.80	1,979	15.49	12,779
2001	5,309	39.91	5,738	43.13	2,256	16.96	13,303
2002	4,577	36.72	5,693	45.68	2,193	17.60	12,463
2003	5,081	40.62	5,244	41.93	2,183	17.45	12,508
2004	4,797	38.74	5,428	43.83	2,159	17.43	12,384

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

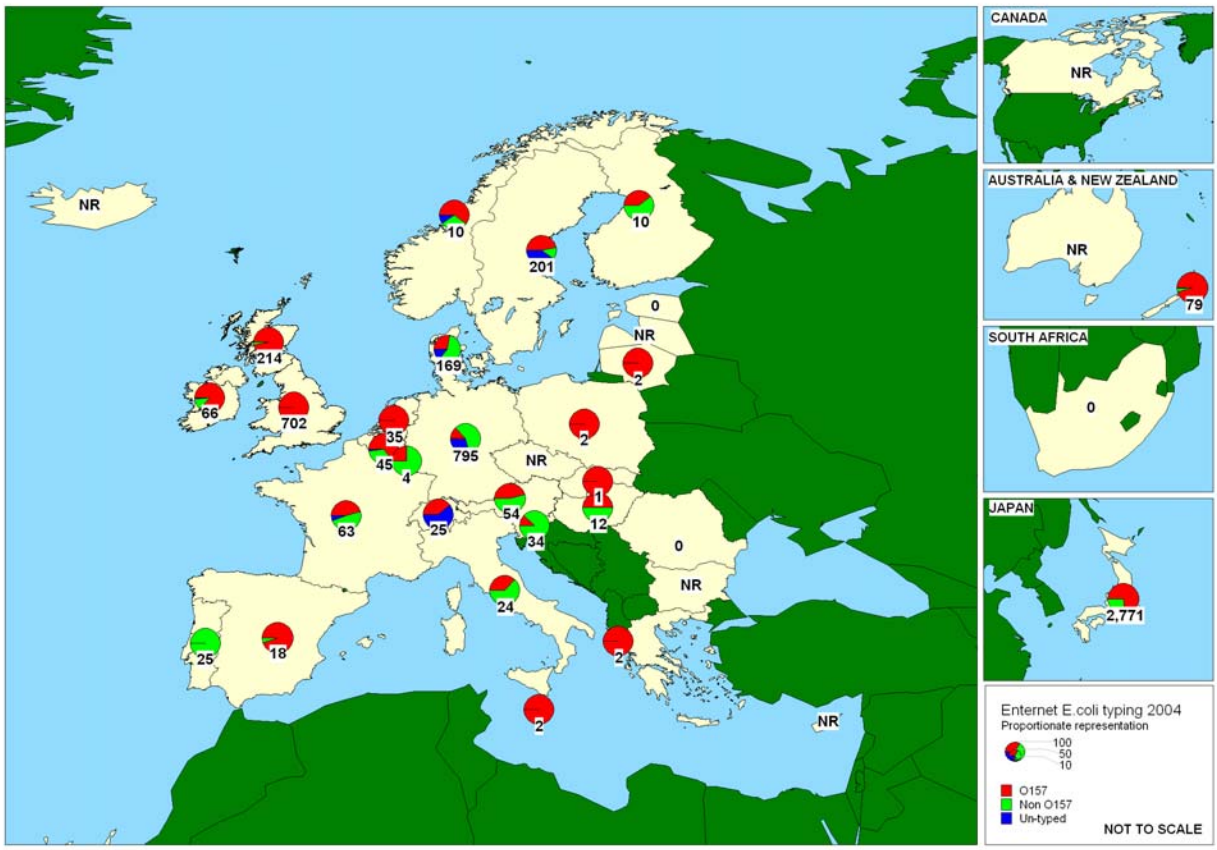
Of particular concern is the significant increase in the proportion of *S.* Virchow isolates resistant to at least one antimicrobial agent (χ^2 for trend P<0.001) or multi-drug resistant (χ^2 for trend P=0.003). In 2000, 57.3% of isolates were resistant to at least one antimicrobial and 12.7% were multi-drug resistant, by 2004; these proportions had risen to 79.4% and 27.6% respectively. *Salmonella* Virchow infection is more often characterised by bloodstream invasion compared with the majority of *Salmonella* serotypes. In 2004, invasive infection was reported more frequently in patients infected with *S.* Virchow than for those infected with other *Salmonella* serotypes (83/1,582 (5.2%) v 1,955/104,040 (1.9%); P<0.001). As antimicrobial therapy maybe essential in these cases, any changes in drug susceptibility, and multi-drug resistance in particular, has important implications for the treatment of infected patients.

5.3 VTEC

There are 5,348 VTEC cases from 27 countries in the database for 2004. Serogroup O157 is the predominant group with almost $\frac{2}{3}$ of the cases (Table).

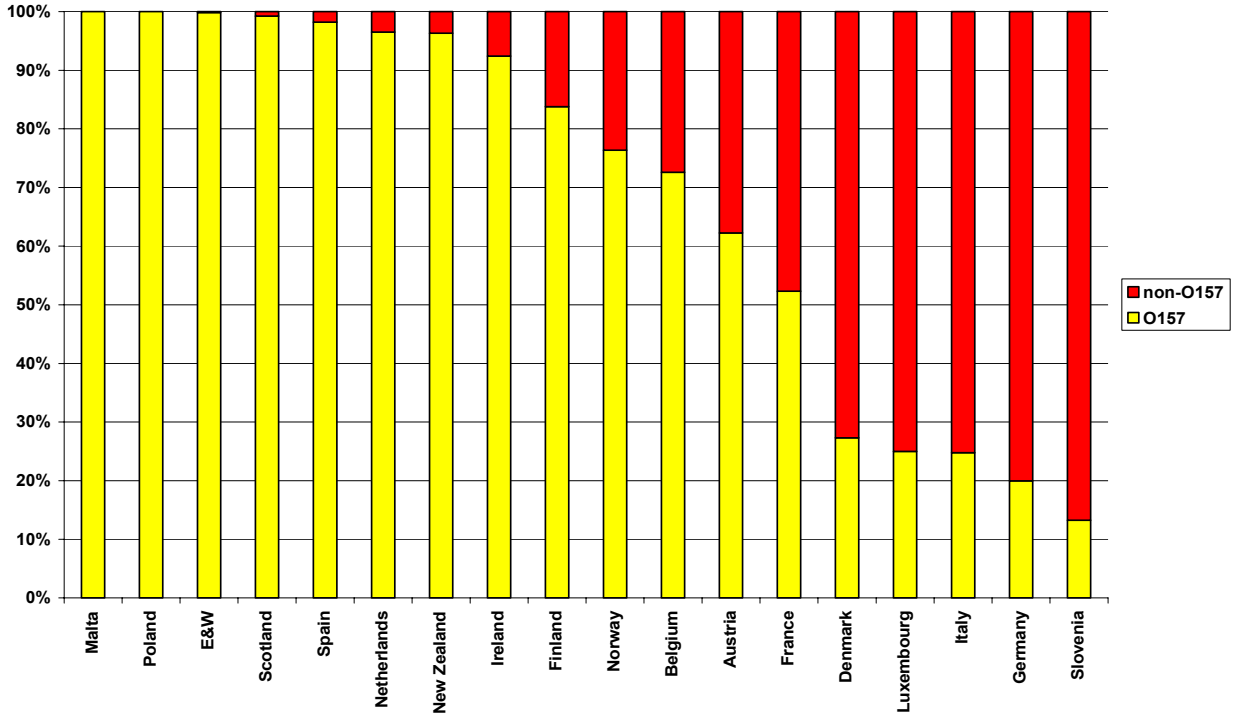
Serogroup	Frequency	%
O157	3,487	64.90
O26	664	12.35
O111	121	2.25
O145	85	1.58
O91	83	1.55
O103	78	1.45
O146	37	0.69
O128	27	0.50
O113	21	0.39
O55	19	0.35
O117	16	0.30
O2	16	0.30
Others	339	6.32
Not typable	380	7.07
Total	5,373	100.00

The distribution of O157, non-O157, and not definitively typed cases of VTEC for 2004 are shown below (figure).



Analysis of the VTEC data received from 17 European countries between 2000 and 2004 shows a clear difference in the distribution of O157 vs. non-O157 VTEC infection. Nearly all VTEC isolates reported to Enter-net from non-continental Europe (England, Ireland, Scotland and Wales) were serogroup O157 (4,962/5,001 (99.2%), in contrast the majority of isolates reported from continental Europe were non-O157 strains (3,248/4,717 (68.9%) (Graph).

Graph Proportion of O157 vs. non-O157 isolates by Enter-net country 2000-2004.



However, on closer inspection of the data, big variations in serogroup distribution also exist between the countries that form continental Europe. In Austria, Belgium, France, Finland, the Netherlands, Norway, Sweden and Spain, O157 remains the most frequently isolated serogroup. However in Denmark, Germany, Italy, Luxembourg and Slovenia non-O157 strains dominate. In comparison, New Zealand shows a similar picture to the former group of countries with 96.3% of their cases being O157, and 3.7% being non-O157, although it is believed that the number of non-O157s may be under-reported.

Where information on microbiological methods was provided it would appear that in some countries not all laboratories routinely examine stools for VTEC infection. In countries that do attempt to isolate VTEC, not all have adopted a standard testing procedure, and not all examine stools for evidence of non-O157 VTEC infection (such as Malta and Poland). This makes interpretation of the VTEC data difficult, as it is unclear whether the incidence of non-O157 infections in some countries is low or just not detected. One example of non-detection is shown by the Netherlands where the non-O157 serogroups are not detected as culture on (CT-) SMAC that is used in routine diagnostics.

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 2004 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.

Cinical manifestation	O157	Non-O157	Not typed
Diarrhoea	33.3	68.3	78.4
Bloody diarrhoea	38.6	17.1	13.6
HUS	22.8	10.4	6.8
Asymptomatic	5.3	4.2	1.2
Grand Total	100.0	100.0	100.0

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 1.15 males to each female. Of note is the fact that the ratio for those under the age of 15 is 1.34:1, and the ratio for those over 15 is only 1.08:1, 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	2,481	2.0	1,938	1.6	39	0.0	4,457	3.6
	1-5y	9,952	8.0	7,621	6.1	114	0.1	17,687	14.3
	6-14y	7,077	5.7	5,060	4.1	65	0.1	12,201	9.8
	15-64y	39,070	31.5	35,566	28.7	334	0.3	74,970	60.4
	65y+	5,854	4.7	6,092	4.9	38	0.0	11,984	9.7
	Not known	417	0.3	274	0.2	480	0.4	2,713	2.2
	Total	64,870	52.3	56,563	45.6	1,049	0.8	124,109	100.0

5.4.2 Antimicrobial susceptibility testing.

Of the countries that supplied data, high levels of reistance to Nalidixic acid (12,694 results, 44.5% were resistant), and Ciprofloxacin (10,172 results, 42.6% resistant) were seen whereas there were very low levels of resisitance to Amoxicillin/Clavulanic acid noted (4,220 results, 0.9% resistance).

5.4.3 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 and Generation.

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 is only collected by a small sentinel network.

6.4 Bulgaria

No information or data 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

No information or data provided.

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.

6.9 England and Wales

No information or data provided.

6.10 Estonia

In Estonia, salmonellosis is notifiable by law under the Communicable Diseases Prevention and Control Act (2003). The surveillance system is based on a double system of obligatory reporting.

Human cases of campylobacteriosis have been recored since 1997.

6.11 Finland

No information or data provided.

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 2004, 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* 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 $\geq$ 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 7 STEC serogroups (O157, O26, O103, O111, O145, O91, and O128) 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.

6.13 Germany

No information or data provided.

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.

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 as "Illness caused by pathogenic *E. coli*".

Salmonella infections in humans have been notifiable since 1959. The physician uses a case report form to notify salmonellosis, 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 received on an electronic system. Hungary also has a laboratory based surveillance system; NPHMOS has access to a representative dataset from most microbiological laboratories.

6.16 Iceland

No information or data 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. 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.

*Campylobacter*iosis 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 information or data provided.

6.20 Latvia

No information or data provided.

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.

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 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 *S.* Typhi, *S.* Paratyphi and extraintestinal 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 information or data 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 HP*S.* The Scottish *E. coli* O157 Reference Laboratory (SERL) also reports isolates of *E. coli* O157 and other serogroups, and seropositives 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. 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 2004, *Campylobacter* isolates were only sent by six 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, enterohaemmorragic *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 subclinical cases are included. The total number of cases are 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 *S.* Enteritidis strains undergo phage typing).

All human VTEC isolates are sent to the National Reference Laboratory for analysis.

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 were conducted to confirm identification or to differentiate between subspecies. Phage typing and antimicrobial susceptibility testing were performed on a random sample of *S.* Enteritidis, *S.* Typhimurium, *S.* Hadar and *S.* Virchow isolates. A random sample of two additional serotypes (*S.* Brandenburg and *S.* Derby) underwent antimicrobial susceptibility testing only.

7.4 Bulgaria

No information or data 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 charcterisation, 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

No information or data provided.

7.7 Czech Republic

No information or data provided.

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 2004, all VTEC isolates were real-time sub-typed using PFGE at the SSI.

7.9 England and Wales

No information or data provided.

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

No information or data provided.

7.12 France

The NRL for *Salmonella* systematically serotypes the strains they receive. Phage typing is carried out on all *S.* Typhi and Paratyphi B isolates and on a sample of *S.* Typhimurium and *S.* Enteritidis isolates. However, at present phage typing is suspended due to a lack of phages. Ribotyping is carried out on all *S.* 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 seven of the major serogroups (O26, O91, O103, O111, O128, O145, and O157) by line-blot immunoassay.

On arrival at the National Reference Laboratory for *Campylobacter* and Helicobacter (CNRCH), *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 2003]) 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

No information or data provided.

7.14 Greece

No information or data provided.

7.15 Hungary

No information or data provided.

7.16 Iceland

No information or data 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 *S.* Enteritidis and *S.* 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 verotoxin 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 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 *S.* Enteritidis and *S.* 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 Istituto Superiore di Sanita 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 information or data provided.

7.20 Latvia

No information or data provided.

7.21 Lithuania

Serotyping of *Salmonella* isolates is conducted routinely by the laboratories of public health centres, however, in 2004, the serotype was not determined for a small proportion of isolates (2%). Phage typing is not undertaken.

In 2004, *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 *S.* Enteritidis isolates was discontinued after June 2004, 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 *S.* 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.

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 enterohemolysin 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 sero- and phage typing. 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 enterohemolysin genes. Clusters of isolates are also characterised by phage typing, PFGE and stx subtyping.

Isolates of *Campylobacter* 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 Typing.

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 verification. *S.* Enteritidis and *S.* Typhimurium are phage typed if the infection is acquired in Norway. Isolates belonging to suspected outbreaks and all *S.* 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 shigatoxin (Stx1 and Stx2) and intimin-gene (eae-gene).

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.

7.27 Poland

No information or data provided.

7.28 Portugal

No information or data 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*.

SERL characterises O157 isolates using phage and toxin typing, and molecular methods.

7.31 Slovakia

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

7.32 Slovenia

Serotyping 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 laboratories who also perform PFGE and serotyping on selected strains.

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

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. Atttempts 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 information or data provided.

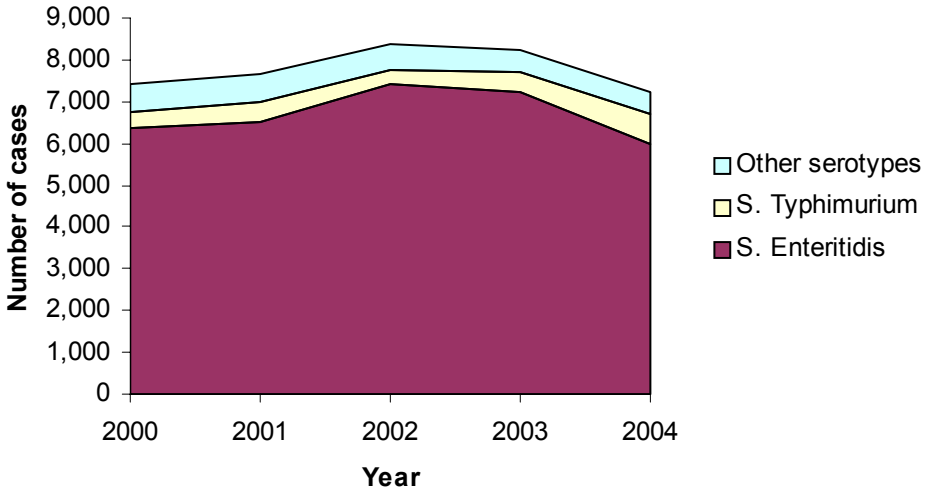
8 *Salmonella*

8.1 Austria

8.1.1 Trends and sources of infection

In 2004, the number of laboratory confirmed cases of human salmonellosis decreased by 12% compared with 2003. The incidence rate was 90 per 100,000 of the population (Graph).

Graph Trends of salmonellosis 2000-2004



S. 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	6,007	83.15
Typhimurium	678	9.39
Infantis	80	1.11
Thompson	38	0.53
Paratyphi B	31	0.43
Hadar	29	0.40
Virchow	27	0.37
Kentucky	20	0.28
Newport	16	0.22
Typhi	13	0.18
Braenderup	12	0.17
Anatum	11	0.15
Blockley	10	0.14
Agona	9	0.12
Paratyphi A	9	0.12
Others	234	3.24
Total	7,224	100.00

8.1.1.1 Salmonellosis non-typhoidal

8.1.1.1.1 *S.* Enteritidis

In 2004, *S.* Enteritidis was responsible for more than 83% of all human *Salmonella* infections. However, the number of cases declined by 17.6% compared with 2003. *S.* Enteritidis PT4, which has been predominant for many years, continued to decline, accounting for 41.7% of all *S.* Enteritidis isolates. Other phage types commonly reported were PT8 (30.8%) and PT21 (11.7%). Table eggs are the main source of human infection in Austria.

8.1.1.1.2 *S.* Typhimurium

Two large *S.* Typhimurium outbreaks, which were confined to Austria (DTU291 and DT46), have contributed to an increased proportion of *S.* Typhimurium infections in 2004 (9.4% of all human isolates in 2004 compared to 5.8% in 2003).

8.1.1.1.3 Other serotypes

Other serotypes constitute less than 10% of all cases.

8.1.1.2 Salmonellosis typhoidal

There were nine cases of *S.* Paratyphi A (two were known to be travel related), 31 cases of Paratyphi B (two were known to be travel related), and 13 cases of Typhi (four were known to be travel related).

8.1.2 Antimicrobial resistance

Antimicrobial resistance rates have remained stable during the past few years. None of the 11 antibiotics tested had a resistance rate higher than 5%. This percentage refers to all human primary isolates. The highest resistance rate observed was 4.9%, this was against Nalidixic acid. Although high level resistances against Ciprofloxacin and third generation Cephalosporins (Cefotaxime) are still extremely rare, a slight increase was noted. Just over 3% of all human isolates were multi-drug resistant.

8.1.3 Travel related infection

Travel was associated with 185 cases of non-typhoidal *Salmonellas*.

8.1.4 Outbreaks

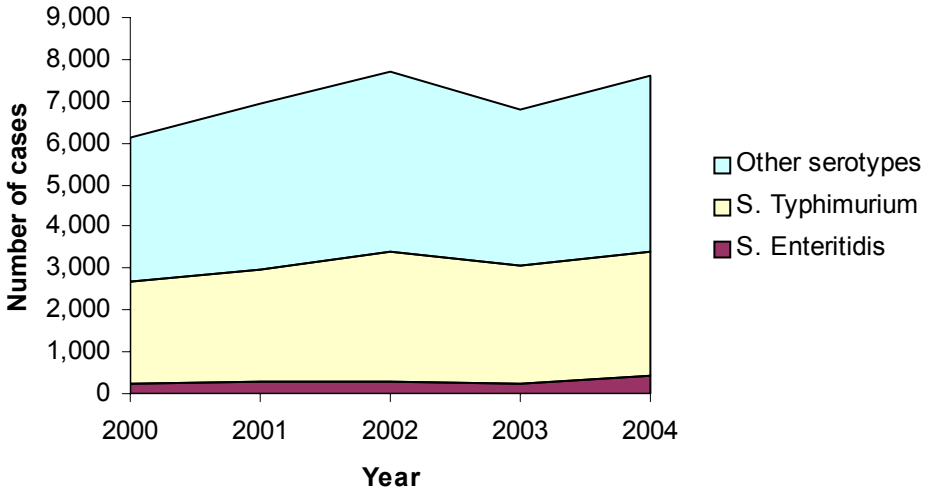
A number of outbreaks of salmonellosis were reported in 2004. In all outbreaks the source of infection was traced back to egg producers with unvaccinated flocks.

8.2 Australia

8.2.1 Trends and sources of infection

In 2004, there were 7,771 cases of salmonellosis reported in Australia (38.64 per 100,000 of the population). With the exception of Victoria and Tasmania, incidence rates increased in most States and Territories compared with 2003 (Graph).

Graph Trends of salmonellosis 2000-2004



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 2004, *S.* Typhimurium and *S.* Virchow were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	2,985	38.41
Virchow	510	6.56
Enteritidis	407	5.24
Saintpaul	394	5.07
Birkenhead	263	3.38
Chester	190	2.44
Infantis	158	2.03
Hvittingfoss	149	1.92
Aberdeen	134	1.72
Waycross	121	1.56
Muenchen	116	1.49
Java	111	1.43
Bovismorbificans	100	1.29
Anatum	100	1.29
Agona	80	1.03
Others	1,953	25.13
Total	7,771	100.00

8.2.1.1 Salmonellosis non-typhoidal

8.2.1.1.1 *S.* Enteritidis

S. Enteritidis is not a major problem in Australia, with the majority being asscociated with travel, 275 out of 407 (67.6%), although this figure is understated as one State does not send travel information.

8.2.1.1.2 *S.* Typhimurium

S. Typhimurium has been the most frequently isolated *Salmonella* serovar in Australia since the collection of national data began in 1978. In 2004, *S.* Typhimurium DT170 and DT135 were the most commonly reported *Salmonella* infections. In 2004, an increased incidence of *S.* Typhimurium DT197 was reported from the eastern seaboard states.

8.2.1.1.3 Other serotypes

Six *Salmonella* serovars new to Australia were reported in 2004. *S.* Molade and *S.* Napoli were reported as acquired overseas (the Napoli case was reported as having travelled tio Italy, see section 8.18.1.1.3) and *S.* Onireke from an Australian-born child of Sudanese parents. Several serovars reported from Queensland increased in incidence, these were *S.* Waycross, *S.* Hvittingfoss, *S.* Aberdeen, *S.* Birkenhead and *S.* Saintpaul.

8.2.1.2 Salmonellosis typhoidal

In 2004, 68 cases of *S.* Typhi and 75 cases of *S.* Paratyphi were reported. The most common Vi-phage type of *S.* Typhi was E1a, acquired mainly in India and Western Samoa. The most common phage types of *S.* Paratyphi were A13 (acquired in India and Cambodia) and A1 (acquired in India and Indonesia [including Bali]).

8.2.2 Antimicrobial resistance

Fifteen percent of the 3,992 strains that underwent antimicrobial susceptibility testing showed resistance to one or more antibiotics, as did 52% of the 385 travel associated isolates tested. There was an increased incidence of isolates exhibiting resistance to Nalidixic acid and decreased susceptibility to Ciprofloxacin, predominantly in cases reported as acquired outside Australia.

8.2.3 Travel related infection

In 2004, 575 cases of non-typhoidal salmonellosis were associated with overseas travel. *S.* 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 *S.* Stanley (Thailand), *S.* Corvallis (Malaysia) and *S.* Hadar (Bali).

8.2.4 Outbreaks

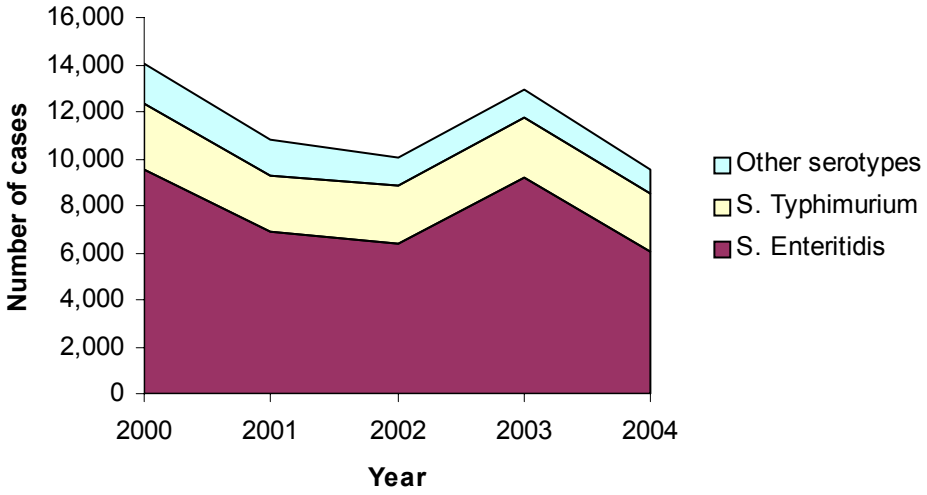
Outbreaks and clusters of salmonellosis were reported in 2004. However, most involved less than 20 confirmed cases. These clusters of infection were set against a background of general increases in several sero/phage types.

8.3 Belgium

8.3.1 Trends and sources of infection

In 2004, there were 9,543 laboratory reports of salmonellosis in Belgium, which was down from 2003 and level with 2001 and 2002 (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	6,075	63.66
Typhimurium	2,459	25.77
Infantis	107	1.12
Virchow	91	0.95
Derby	64	0.67
Brandenburg	63	0.66
Hadar	48	0.50
Ohio	46	0.48
Livingstone	34	0.36
Bovismorbificans	27	0.28
Goldcoast	26	0.27
Senftenberg	25	0.26
4:i:-	24	0.25
Newport	24	0.25
Paratyphi B	23	0.24
Others	407	4.26
Total	9,543	100.00

8.3.1.1 Salmonellosis non-typhoidal

8.3.1.1.1 *S.* Enteritidis

In 2004, there were 6,075 laboratory reports of *S.* Enteritidis, which accounted for 63.7% of all *Salmonella* infection. The predominant phage types were PT4 (43.8%) and PT21 (24.6%).

8.3.1.1.2 *S.* Typhimurium

In 2004, there were 2,459 laboratory reports of *S.* Typhimurium, which accounted for 25.8% of all *Salmonella* infections. The predominant phage types were DT104 (23.7%) and DT120 (21.1%).

8.3.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Infantis (107 cases; 1.1% of all cases) and *S.* Virchow (91 cases; 1.0% of all cases).

8.3.1.2 Salmonellosis typhoidal

There were nine reports of *S.* Paratyphi A infection, 23 reports of *S.* Paratyphi B infection and 15 reports of *S.* Typhi infection.

8.3.2 Antimicrobial resistance

Few isolates underwent antimicrobial susceptibility testing (5.4%). Resistance was most frequently seen 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
Tetracyclines	46.1
Ampicillin	45.3
Streptomycin	39.2
Sulphonamides	39.0
Chloramphenicol	22.0
Trimethoprim	15.5
Nalidixic acid	14.3
Kanamycin	1.6
Cefotaxime	0.4
Gentamicin	0.0
Ciprofloxacin	0.0

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

During 2004, there were 57 outbreaks of foodborne infection or intoxication reported in Belgium. This represents a 43.6% decrease on the number reported during 2003. However, not all outbreaks are notified and for many, data are incomplete. More than 531 people were ill, at least 74 people were hospitalised and one baby died. In 2004, 53% of outbreaks were attributed to *Salmonella*, compared with 62% in 2003. *S.* Enteritidis was the predominant

serotype (55% of all *Salmonella* outbreaks), however, the serotype was not always confirmed. In outbreaks of *S.* Typhimurium, *S.* Paratyphi B var. Java and *S.* Bovismorbificans, the causative agent was also isolated from implicated foods.

8.4 Bulgaria

8.4.1 Trends and sources of infection

In 2004, there were 194 laboratory reports of salmonellosis in Bulgaria. *S.* Enteritidis was the most prevalent serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	154	79.38
Typhimurium	8	4.12
Corvallis	7	3.61
Blockley	3	1.55
Isangi	3	1.55
Kottbus	3	1.55
Agona	2	1.03
Montevideo	2	1.03
Hadar	2	1.03
Virchow	2	1.03
Choleraesuis	1	0.52
Heidelberg	1	0.52
Istanbul	1	0.52
Mikawasima	1	0.52
Newport	1	0.52
Others	3	1.55
Total	194	100.00

8.4.1.1 Salmonellosis non-typhoidal

8.4.1.1.1 *S.* Enteritidis

In 2004, there were 154 laboratory reports of *S.* Enteritidis, which accounted for 79.4% of all *Salmonella* infections.

8.4.1.1.2 *S.* Typhimurium

In 2004, there were 8 laboratory reports of *S.* Typhimurium, which accounted for 4.1% of all *Salmonella* infections.

8.4.1.1.3 Other serotypes

The most commonly reported in 2004 was *S.* Corvallis (7 cases; 3.6% of all cases).

8.4.1.2 Salmonellosis typhoidal

There were no reports of typhoid or paratyphoid infection in 2004.

8.4.2 Antimicrobial resistance

No information or data provided.

8.4.3 Travel related infection

No information or data provided.

8.4.4 Outbreaks

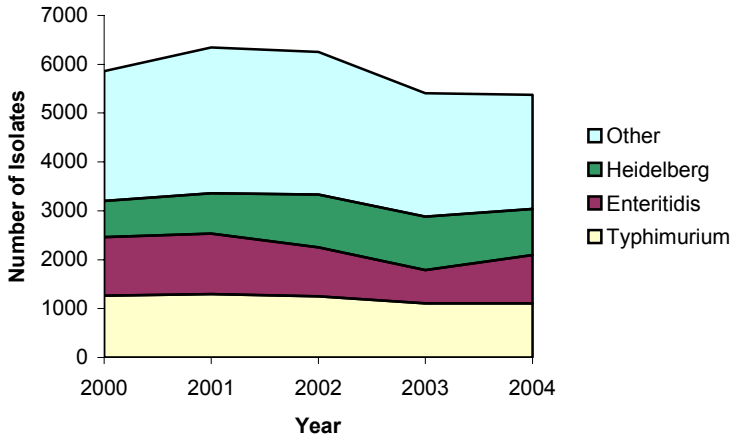
No information or data provided.

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 steadily declined each year. In 2004, NESP received 5,378 reports of *Salmonella* infection, corresponding to an incidence rate of 16.8 per 100,000 of the population (Graph).

Graph Trends of salmonellosis 2000-2004



Between 2000 and 2004, 54.1% of all *Salmonella* infections were caused by the serovars *S.* Typhimurium (20.6%), *S.* Enteritidis (17.5%) and *S.* Heidelberg (16.0%). In 2004, they continued to dominate, accounting for 56.5% of all *Salmonella* infections (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	1,107	20.58
Enteritidis	991	18.43
Heidelberg	942	17.52
Thompson	153	2.84
Hadar	149	2.77

Newport	149	2.77
Typhi	129	2.40
Agona	116	2.16
Infantis	102	1.90
Saintpaul	91	1.69
Paratyphi A	84	1.56
Subsp. I 4,5,12:i:-	82	1.52
Javiana	70	1.30
Oranienburg	55	1.02
Braenderup	53	0.99
Other	1,105	20.55
Total	5,378	100.00

8.5.1.1 Salmonellosis non-typhoidal

8.5.1.1.1 *S.* Enteritidis

The proportion of *Salmonella* infections attributed to *S.* Enteritidis has decreased slightly. PT4 remains the most prevalent phage type, accounting for approximately 30% of all *S.* Enteritidis infections in 2004, however, this proportion has fallen from the 43.6% seen five years ago. PT13 has replaced PT8 as the second most prevalent phage type, accounting for 17.4% of all *S.* Enteritidis infections in 2004.

8.5.1.1.2 S.Typhimurium

The proportion of *Salmonella* infections attributed to *S.* Typhimurium has decreased slightly. DT104 remains the most prevalent phage type, accounting for 16.2% of all *S.* Typhimurium infections in 2004, however, this proportion has fallen from the 32.2% seen five years ago. The second most prevalent phage type in 2004 was DT108 (11.9%) followed by DT10 (6.2%), DT104b (5.6%) and DT110b (4.1%).

8.5.1.1.3 Other serotypes

The number of *Salmonella* infections attributed to *S.* Heidelberg has increased from 12.6% of all salmonellosis cases in 2000 to 17.5% in 2004. Small increases in less prevalent serovars have been noted for *S.* Newport (1.7% to 2.8%) and *S.* Javiana (0.9% to 1.3%).

8.5.1.2 Salmonellosis typhoidal

There have been small increases in the prevalence of *S.* Typhi (1.5% to 2.4%) and *S.* Paratyphi A (0.6% to 1.6%) since 2000. E1 remains the most prevalent *S.* Typhi phage type, accounting for 30.4% of all infections in 2004, however, this proportion has fallen from the 64.8% seen five years ago. In contrast PTE9 has increased in prevalence from 3.8% in 2000 to 13.6% in 2004.

8.5.2 Antimicrobial resistance

Of the 1,016 *S.* Typhimurium DT104 isolates tested between 2000 and 2004, 82.1% had the ACSSuT antimicrobial resistance profile.

Of the 542 *S.* Typhi strains analysed, eighty two (15.1%) were multi-resistant to Chloramphenicol, Ampicillin and Trimethoprim/Sulphamethoxizole.

8.5.3 Travel related infection

In 2004, there were 99 travel related cases of non-typhoidal salmonellosis. Most were associated with travel to the Caribbean. *S.* Enteritidis accounted for the majority of imported infections (33 cases) followed by *S.* Typhimurium (9 cases).

8.5.4 Outbreaks

There were 47 outbreaks, case clusters or contact acquired infections reported during 2004, accounting for 325 illnesses. *S.* Typhimurium was implicated in 12 outbreaks, *S.* Enteritidis in nine and *S.* Heidelberg in eight.

8.6 Cyprus

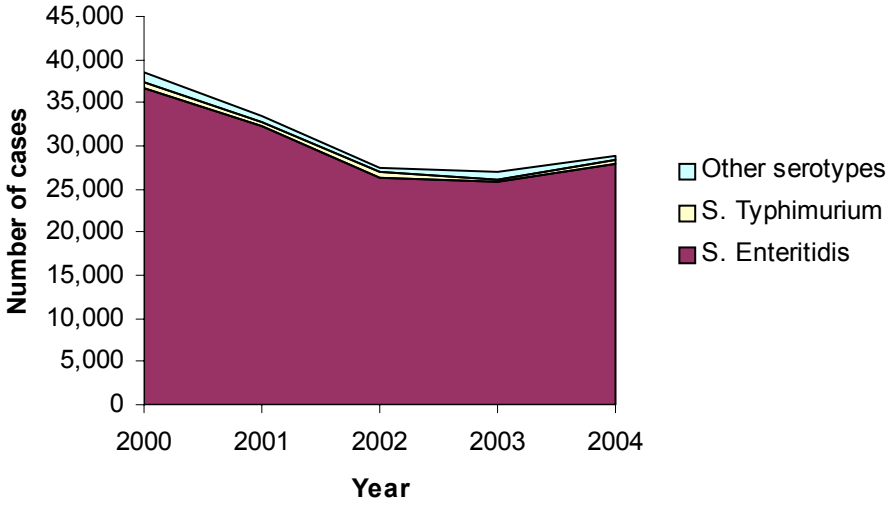
No information or data provided.

8.7 Czech Republic

8.7.1 Trends and sources of infection

In 2004, there were 29,915 laboratory reports of salmonellosis in the Czech Republic (Graph).

Graph Trends of salmonellosis 2000-2004



S. Enteritidis was the most prevalent serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	28,987	96.90
Typhimurium	440	1.47
Infantis	86	0.29
Agona	19	0.06

Unknown	19	0.06
Ohio	16	0.05
Virchow	13	0.04
Kentucky	11	0.04
Newport	10	0.03
Montevideo	9	0.03
Tennessee	9	0.03
Derby	8	0.03
Muenchen	6	0.02
Saintpaul	6	0.02
Heidelberg	6	0.02
Others	270	0.90
Total	29,915	100.00

8.7.1.1 Salmonellosis non-typhoidal

8.7.1.1.1 *S.* Enteritidis

In 2004, there were 28,987 laboratory reports of *S.* Enteritidis, which accounted for 96.9% of all *Salmonella* infections. Phage type data are not available.

8.7.1.1.2 *S.* Typhimurium

In 2004, there were 440 laboratory reports of *S.* Typhimurium, which accounted for 1.5% of all *Salmonella* infections. Phage type data are not available.

8.7.1.1.3 Other serotypes

The most commonly reported in 2004 was *S.* Infantis (86 cases; 0.3% of all cases).

8.7.1.2 Salmonellosis typhoidal

There was one report of *S.* Paratyphi A infection, two reports of *S.* Paratyphi B infection and four reports of *S.* Typhi infection.

8.7.2 Antimicrobial resistance

No information or data 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 Hungary (38 cases; 17.8%) and Egypt (33 cases; 15.4%).

Where travel history was reported, 85.7% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (3 cases; 50.0%) and Nepal (2 cases; 33.3%).

8.7.4 Outbreaks

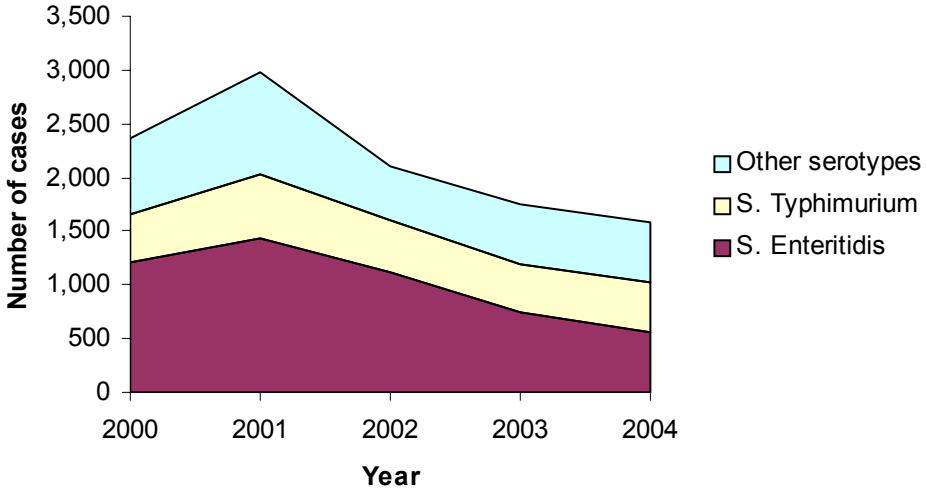
No information or data provided.

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 2004, this trend continued whereby a total of 1,569 laboratory confirmed episodes of salmonellosis were reported corresponding to 28.4 cases per 100,000 of the population (Graph). This represents a decrease of 11% compared to 2003 and 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 2000-2004



In 2004, *S.* Enteritidis and *S.* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	546	34.80
Typhimurium	467	29.76
Virchow	38	2.42
Newport	36	2.29
Stanley	35	2.23
Infantis	32	2.04
Dublin	27	1.72
Uganda	25	1.59
Kentucky	18	1.15
Saintpaul	18	1.15
Agona	16	1.02
Derby	16	1.02
Hadar	16	1.02

Typhi	15	0.96
Bovismorbificans	14	0.89
Others	250	15.93
Total	1,569	100.00

8.8.1.1 Salmonellosis non-typhoidal

8.8.1.1.1 *S.* Enteritidis

In 2004, the number of reported episodes of *S.* Enteritidis was 546 corresponding to an incidence of 10.1 per 100,000 of the population. This represents a 26% decline compared to 2003 and 85% compared to 1997. The most common phage types were PT4 (23.4%), PT8 (20.9%), PT1 (13.7%), PT21 (11.4%) and PT6 (6.2%).

8.8.1.1.2 *S.* Typhimurium

There were 467 reported episodes of *S.* Typhimurium corresponding to an incidence of 8.6 per 100,000 of the population. This is a 4% increase compared to 2003. The most common phage types were DT12 (17.8%), DT120 (16.1%) and DT104 (9.9%). Unspecified types accounted for 10% of isolates.

8.8.1.1.3 Other serotypes

Other *Salmonella* serotypes accounted for 556 episodes corresponding to an incidence of 9.7 per 100,000 of the population. This is almost the same incidence as in 2003. Of the 101 other serotypes isolated, those most commonly encountered were *S.* Virchow (38 cases), *S.* Newport (36 cases), *S.* Stanley (35 cases), *S.* Infantis (32 cases), *S.* Dublin (27 cases), *S.* Uganda (25 cases), *S.* Kentucky (18 cases) and *S.* Saintpaul (18 cases).

8.8.1.2 Salmonellosis typhoidal

There were 15 reports of *S.* Typhi infection in 2004.

8.8.2 Antimicrobial resistance

Multi-drug resistance was observed in 27% of *S.* Typhimurium isolates, whereas 43% were susceptible to all drugs tested. In 2004, 49 human cases of DT104 and DT104b were reported and 31 (63%) of these were caused by multi-drug resistant strains. Antimicrobial susceptibility testing indicates that the vast majority of infections with multi-drug resistant *S.* Typhimurium were acquired from food produced outside Denmark, whereas the majority of infections caused by resistant *S.* Typhimurium originated from Danish sources.

8.8.3 Travel related infection

The number of travel related cases is known to be under-reported. In 2004, 76% of all patients had an unknown travel history. Futhermore, this proportion varied between *Salmonella* types. For patients infected with a resistant or multi-drug resistant *S.* Typhimurium infection, travel information was missing for around 30% of the cases, whereas this proportion was 78% for *S.* Enteritidis cases and 90% for cases infected with fully susceptible *S.* Typhimurium or with other serotypes. In 2004, 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

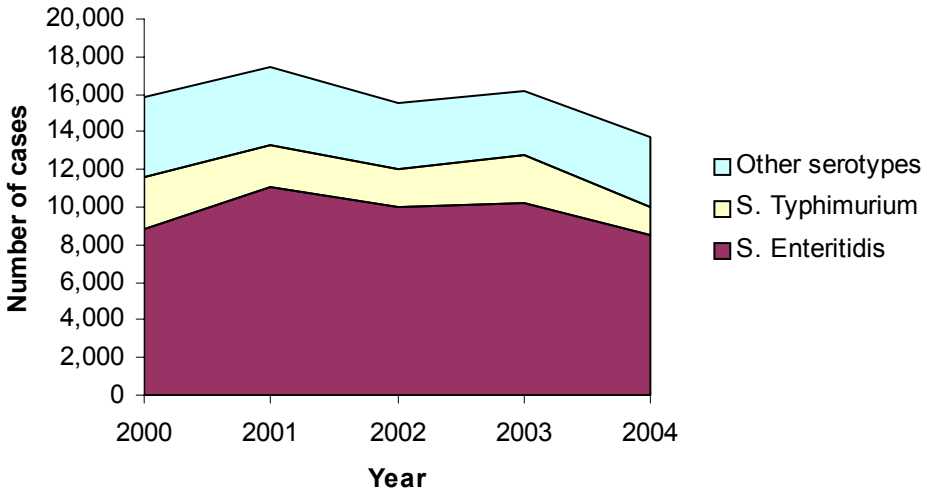
In 2004, *S.* Typhimurium phage types were the cause of all outbreak-related cases of human salmonellosis. Thirty-four cases were traced to domestic pork, whilst 10 were traced to imported pork products. The source was not identified for 51 cases.

8.9 England and Wales

8.9.1 Trends and sources of infection

In 2004, there were 13,711 laboratory reports of salmonellosis in England and Wales (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	8,536	62.26
Typhimurium	1,442	10.52
Newport	643	4.69
Virchow	290	2.12
Paratyphi A	206	1.50
Typhi	203	1.48
Stanley	128	0.93
Braenderup	108	0.79
Hadar	108	0.79
Agona	100	0.73
Infantis	92	0.67
Thompson	85	0.62
Kentucky	83	0.61
Java	76	0.55

Corvallis	72	0.53
Others	1,539	11.22
Total	13,711	100.00

8.9.1.1 Salmonellosis non-typhoidal

8.9.1.1.1 *S.* Enteritidis

In 2004, there were 8,536 laboratory reports of *S.* Enteritidis, which accounted for 62.3% of all *Salmonella* infections. The predominant phage types were PT4 (26.7%) and PT1 (22.2%)

8.9.1.1.2 *S.* Typhimurium

In 2004, there were 1,442 laboratory reports of *S.* Typhimurium, which accounted for 10.5% of all *Salmonella* infections. The predominant phage type was DT104 (42.7%).

8.9.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Newport (643 cases; 4.7% of all cases) and *S.* Virchow (290 cases; 2.1% of all cases).

8.9.1.2 Salmonellosis typhoidal

There were 206 reports of *S.* Paratyphi A infection, eight reports of *S.* Paratyphi B infection, two reports of *S.* Paratyphi C infection and 203 reports of *S.* Typhi infection.

8.9.2 Antimicrobial resistance

No information or data provided.

8.9.3 Travel related infection

Seventeen per cent of non-typhoidal cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Spain (120 cases; 5.3%), India (68 cases; 3.0%) and Pakistan (56 cases; 2.5%).

Where travel history was reported, 61.1% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (56 cases; 21.9%) and Pakistan (22 cases; 8.6%).

8.9.4 Outbreaks

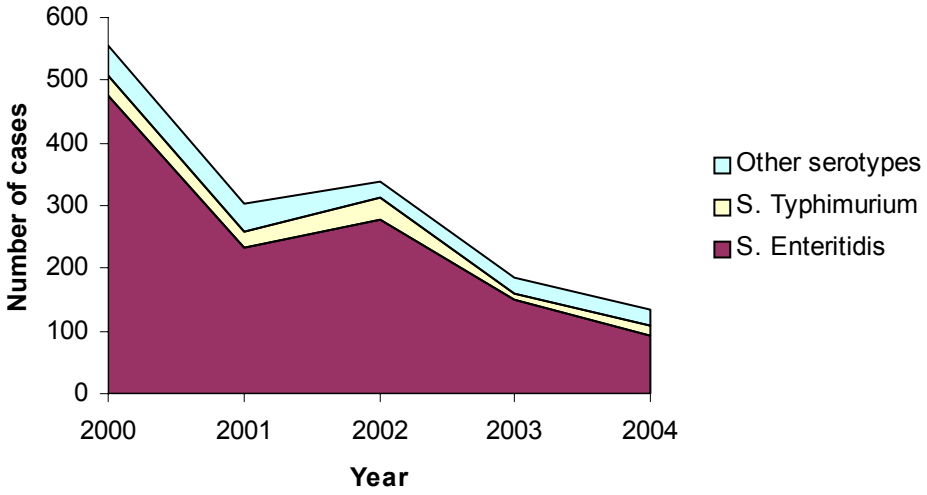
No information or data provided.

8.10 Estonia

8.10.1 Trends and sources of infection

During the last five years the number of reported cases of human salmonellosis has decreased. In 2004, 135 culture-confirmed cases of *Salmonella* infection were reported. This represents a 75% decline from the 556 cases notified in 2000 (Graph).

Graph Trends of salmonellosis 2000-2004



The age distribution shows that over a third (35.5%) of all cases were children aged between one and five years. *S.* Enteritidis and *S.* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	91	67.41
Typhimurium	18	13.33
GR-B	5	3.70
GR-C	3	2.22
GR-D	3	2.22
Agona	3	2.22
Saintpaul	2	1.48
Brandenburg	1	0.74
Chester	1	0.74
Derby	1	0.74
Java	1	0.74
Manhattan	1	0.74
Montevideo	1	0.74
Sandiego	1	0.74
Schwanzengrund	1	0.74
Others	2	1.48
Total	135	100.00

8.10.1.1 Salmonellosis non-typhoidal

8.10.1.1.1 *S.* Enteritidis

In 2004, *S.* Enteritidis accounted for 67.4% of all *Salmonella* infections. However, the proportion of salmonellosis cases where *S.* Enteritidis was identified as the causative agent has declined, in 2000 *S.* Enteritidis accounted for 85.6% of all *Salmonella* infections.

8.10.1.1.2 *S.* Typhimurium

S. Typhimurium accounted for 13.3% of all cases of salmonellosis in 2004. In contrast to *S.* Enteritidis, the proportion of salmonellosis cases where *S.* Typhimurium is identified as the causative agent has increased, in 2000 *S.* Typhimurium infections accounted for only 5.6% of all cases.

8.10.1.1.3 Other serotypes

Other serotypes accounted for less than 20.0% of all cases

8.10.1.2 Salmonellosis typhoidal

There were no reports of typhoid or paratyphoid infection in 2004.

8.10.2 Antimicrobial resistance

The proportion of isolates found to be multi-drug resistant in 2004 was 2.2%, all multi-drug resistant isolates belonged to the *S.* Typhimurium serovar.

8.10.3 Travel related infection

In 2004, 4 cases (3%) acquired their infection abroad. All imported cases of salmonellosis were infected with *S.* 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

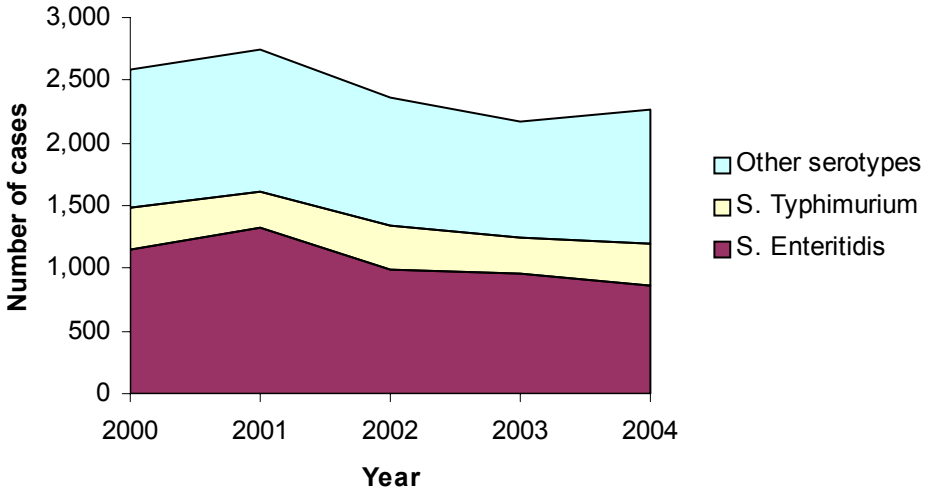
One outbreak of *S.* Enteritidis was reported in 2004. The outbreak took place in Tartu city between the 13th and 19th of August, and affected 10 people. Epidemiological investigations revealed Chinese food was the vehicle of infection.

8.11 Finland

8.11.1 Trends and sources of infection

In 2004, there were 2,266 laboratory reports of salmonellosis in Finland (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	869	38.35
Typhimurium	327	14.43
Stanley	115	5.08
Virchow	82	3.62
Newport	61	2.69
Agona	55	2.43
Corvallis	41	1.81
Kentucky	39	1.72
Infantis	37	1.63
Hadar	28	1.24
Saintpaul	27	1.19
Kottbus	25	1.10
Senftenberg	26	1.15
Braenderup	24	1.06
Rissen	24	1.06
Others	486	21.45
Total	2,266	100.00

8.11.1.1 Salmonellosis non-typhoidal

8.11.1.1.1 *S.* Enteritidis

In 2004, there were 869 laboratory reports of *S.* Enteritidis, which accounted for 38.4% of all *Salmonella* infections. Phage type data are not available.

8.11.1.1.2 *S.* Typhimurium

In 2004, there were 327 laboratory reports of *S.* Typhimurium, which accounted for 14.4% of all *Salmonella* infections. Phage type data are not available.

8.11.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Stanley (115 cases; 5.1% of all cases) and *S.* Virchow (82 cases; 3.6% of all cases).

8.11.1.2 Salmonellosis typhoidal

There were four reports of *S.* Paratyphi A infection, four reports of *S.* Paratyphi B infection, one report of *S.* Paratyphi C infection and six reports of *S.* Typhi infection.

8.11.2 Antimicrobial resistance

No information or data provided.

8.11.3 Travel related infection

Eighty-one 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; 20.1%), Spain (215 cases; 11.6%) and Bulgaria (159 cases; 8.6%).

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; 44.4%).

8.11.4 Outbreaks

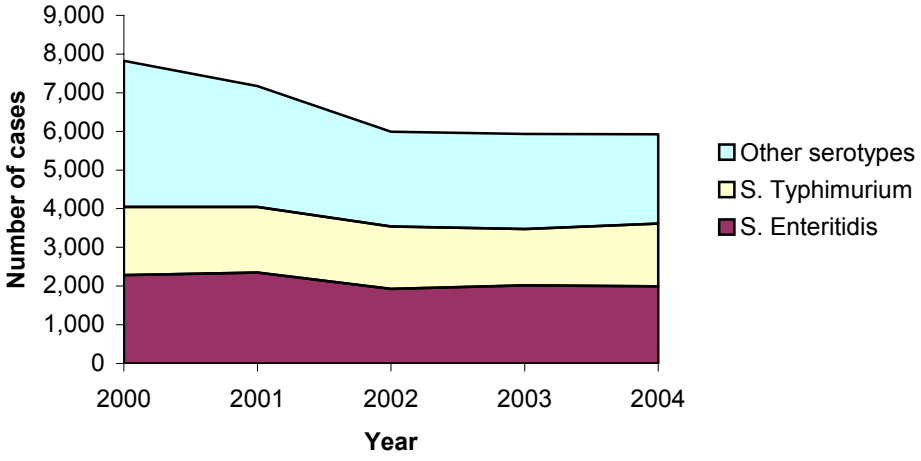
No information or data provided.

8.12 France

8.12.1 Trends and sources of infection

In 2004, the number of *Salmonella* isolates received by the NRL remained stable, at 5,923 (Graph).

Graph Trends of salmonellosis 2000-2004



S. Enteritidis and *S.* Typhimurium were still the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,996	33.70
Typhimurium	1,618	27.32
Typhi	110	1.86
Hadar	109	1.84
Derby	108	1.82
Newport	99	1.67
Agona	95	1.60
Infantis	90	1.52
Virchow	81	1.37
Napoli	79	1.33
Brandeburg	70	1.18
Indiana	62	1.05
Paratyphi A	55	0.93
Paratyphi B	53	0.89
Coeln	47	0.79
Others	1,251	21.12
Total	5,923	100.00

8.12.1.1 Salmonellosis non-typhoidal

8.12.1.1.1 *S.* Enteritidis

The number of reported isolates of *S.* Enteritidis has been declining since 1998. In 2004, there were 1,996 NRL reports of *S.* Enteritidis, which accounted for 33.7% of all isolates. The predominant phage types were PT8 (53.4%) and PT4 (22.4%). However, only a small proportion of isolates were phage-typed.

8.12.1.1.2 *S.* Typhimurium

The number of reported isolates of *S.* Typhimurium has increased over recent years. In 2004, there were 1,618 NRL reports of *S.* Typhimurium, which accounted for 27.3% of all isolates.

8.12.1.1.3 Other serotypes

On comparing 2004 NRL data with 2003, isolates of *S.* Virchow showed the largest percentage decrease, whereas isolates of *S.* Derby showed the biggest percentage increase.

During 2004, the serotype *S.* Coeln increased in rank of relative frequency and was included in the top fifteen serotypes.

8.12.1.2 Salmonellosis typhoidal

There were 55 reports of *S.* Paratyphi A infection, 53 reports of *S.* Paratyphi B infection, one report of *S.* Paratyphi C infection and 110 reports of *S.* Typhi infection.

During 2004, the serotype *S.* Paratyphi A increased in rank of relative frequency and was included in the top fifteen serotypes.

8.12.2 Antimicrobial resistance

No information or data provided.

8.12.3 Travel related infection

Travel history was not available.

8.12.4 Outbreaks

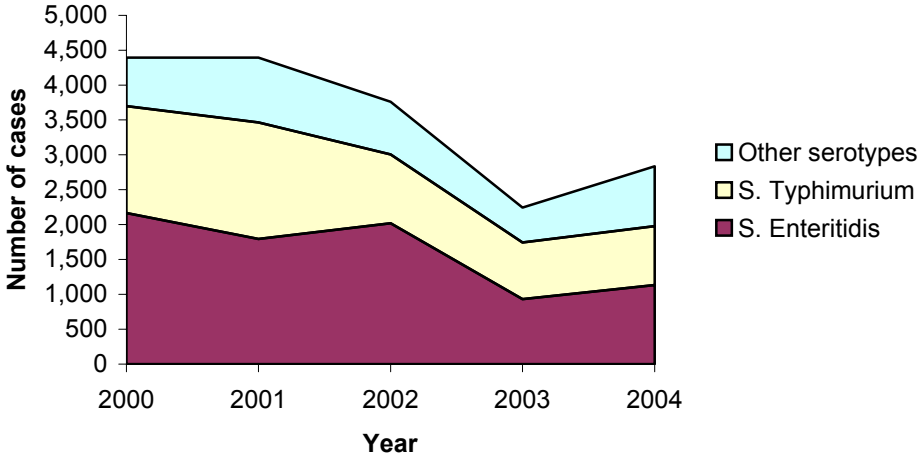
No information or data provided.

8.13 Germany

8.13.1 Trends and sources of infection

In 2004, there were 2,833 laboratory reports of salmonellosis to the NRL in Wernigerode in Germany (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,134	40.03
Typhimurium	845	29.83
Infantis	162	5.72
Give	82	2.89
Paratyphi B	60	2.12
Goldcoast	39	1.38
Typhi	36	1.27
Brandenburg	32	1.13
Derby	21	0.74
Anatum	16	0.56
Paratyphi A	14	0.49
Virchow	12	0.42
Thompson	10	0.35
Hadar	8	0.28
Livingstone	8	0.28
Others	354	12.50
Total	2,833	100.00

8.13.1.1 Salmonellosis non-typhoidal

8.13.1.1.1 *S.* Enteritidis

In 2004, there were 1,134 laboratory reports of *S.* Enteritidis, which accounted for 40.0% of all *Salmonella* infections. The predominant phage types were PT4 (59.7%) and PT21 (18.6%).

8.13.1.1.2 *S.* Typhimurium

In 2004, there were 845 laboratory reports of *S.* Typhimurium, which accounted for 29.8% of all *Salmonella* infections. The predominant phage types were DT120 (28.2%) and DT104 (27.6%).

8.13.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Infantis (162 cases; 5.7% of all cases) and *S.* Give (82 cases; 2.9% of all cases).

8.13.1.2 Salmonellosis typhoidal

There were 14 reports of *S.* Paratyphi A infection, 60 reports of *S.* Paratyphi B infection and 36 reports of *S.* Typhi infection.

8.13.2 Antimicrobial resistance

Nearly all isolates underwent antimicrobial susceptibility testing (99.1%). Almost all were resistant to Sulphonamides (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	99.4
Streptomycin	24.4
Tetracyclines	24.2
Ampicillin	21.2
Chloramphenicol	13.8
Trimethoprim	5.9
Nalidixic acid	3.6
Kanamycin	1.5
Gentamicin	0.7
Cefotaxime	0.1
Ciprofloxacin	0.1

Just over 20% 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	100.0
Blockley	100.0
Bochum	100.0
Weltevreden	75.0
Typhimurium	57.2
Kentucky	57.1
Virchow	25.0
Abony	20.0
Corvallis	20.0

Infantis	1.9
Enteritidis	0.5
Others	8.3
Total	20.5

8.13.3 Travel related infections

One per cent of non-typhoidal cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Turkey (7 cases; 24.1%) and Egypt (3 cases; 10.3%).

Where travel history was reported, 24.5% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (9 cases; 33.3%) and Turkey (5 cases; 18.5%).

8.13.4 Outbreaks

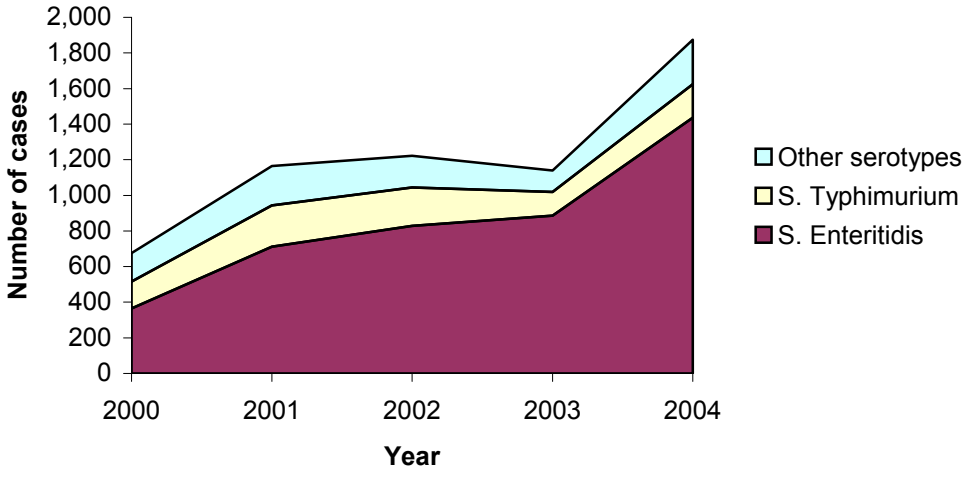
No information or data provided.

8.14 Greece

8.14.1 Trends and sources of infection

In 2004, 1,874 cases of salmonellosis were reported to KEEL by the three Reference Centres for *Salmonella* in Greece. This number was higher than that reported during 2003. This increase can probably be attributed to efforts made to encourage hospitals to send isolates to the *Salmonella* reference centers (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,435	76.57
Typhimurium	190	10.14
Blockley	33	1.76
Bovismorbificans	19	1.01
Virchow	15	0.80
Oranienburg	12	0.64
Salamae	11	0.59
Heidelberg	11	0.59
Saintpaul	8	0.43
Infantis	8	0.43
Kottbus	7	0.37
Typhi	7	0.37
Abony	6	0.32
Thompson	6	0.32
Bispebjerg	6	0.32
Others	100	5.34
Total	**1,874**	100.00

8.14.1.1 Salmonellosis non-typhoidal

8.14.1.1.1 *S.* Enteritidis

There were 1,435 reports of *S.* Enteritidis infection during 2004, which accounted for 76.6% of all salmonellosis. Phage type data are not available.

8.14.1.1.2 *S.* Typhimurium

There were 190 reports of *S.* Typhimurium infection during 2004, which accounted for 10.1% of all salmonellosis. The proportion of infections caused by *S.* 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 less than 13.0% of all cases.

8.14.1.2 Salmonellosis typhoidal

There were three reports of *S.* Paratyphi A infection, five reports of *S.* Paratyphi B infection and seven reports of *S.* Typhi infection.

8.14.2 Antimicrobial resistance

No information or data provided.

8.14.3 Travel related infection

Only four of the reported non-typhoidal cases were travel-associated. Travel history was available for one typhoidal case that had traveled to India.

8.14.3.1 Outbreaks

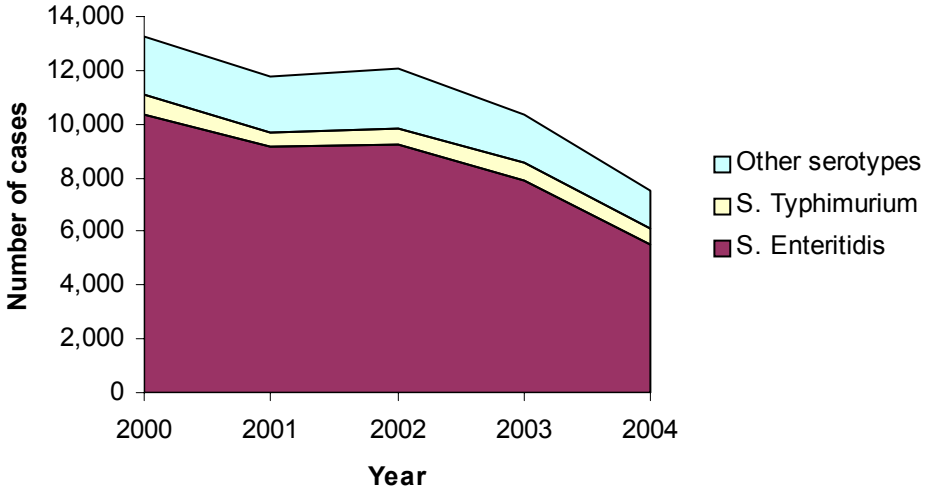
Thirty-five outbreaks of *Salmonella* were reported in 2004. *S.* Enteritidis was the causative agent in 12 and *S.* Typhimurium in one. The largest outbreak affected 651 people, however, 43% of outbreaks were relatively small (less than 5 cases). The majority of outbreaks (77%) occurred within a well-defined closed population, whilst 38% of them were confined to individual households.

8.15 Hungary

8.15.1 Trends and sources of infection

The number of cases of salmonellosis has decreased from 11,507 to 7,557 since 2000 (a decline in incidence from 114.3 to 74.7 per 100,000 of the population). Most of this decrease can be attributed to a fall in the number of *S.* Enteritidis infections (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	5,501	72.79
Typhimurium	573	7.58
Infantis	448	5.93
Blockley	59	0.78
Saintpaul	53	0.70
Bovismorbificans	44	0.58
Derby	36	0.48
Bredeney	31	0.41
Hadar	29	0.38
Virchow	28	0.37

Indiana	21	0.28
Abony	16	0.21
Bareilly	14	0.19
Goldcoast	10	0.13
Panama	9	0.12
Others	685	9.06
Total	7,557	100.00

8.15.1.1 Salmonellosis non-typhoidal

8.15.1.1.1 *S.* Enteritidis

In 2004, the most frequently reported phage type of *S.* Enteritidis isolates was PT4 (29.1%), followed by PT8 (23.9%) and PT6 (18.6%).

8.15.1.1.2 *S.* Typhimurium

In 2004, 35% of the phage typed *S.* 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

It is worth noting that the number of salmonellosis cases caused by *S.* 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 no reports of typhoid or paratyphoid infection in 2004.

8.15.2 Antimicrobial resistance

The antimicrobial resistance data for *Salmonella* hasn't shown any significant change since 2000. In 2004, 85% of the *S.* 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 *S.* Typhimurium DT104.

8.15.3 Travel related infection

No information or data provided.

8.15.4 Outbreaks

The number of reported outbreaks of salmonellosis has declined over recent years. Most of those that do take place are linked to the consumption of eggs or egg-based dishes, which have undergone inadequate heat treatment.

8.16 Iceland

8.16.1 Trends and sources of infection

In 2004, there were 108 laboratory reports of salmonellosis in Iceland. *S.* Enteritidis and *S.* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	66	61.11
Typhimurium	15	13.89
Newport	4	3.70
Infantis	3	2.78
Montevideo	2	1.85
Worthington	2	1.85
Blockley	1	0.93
Braenderup	1	0.93
Brandenburg	1	0.93
Bredeney	1	0.93
Eastbourne	1	0.93
Glostrup	1	0.93
Oranienburg	1	0.93
Thompson	1	0.93
Others	8	7.41
Total	108	100.00

8.16.1.1 Salmonellosis non-typhoidal

8.16.1.1.1 *S.* Enteritidis

In 2004, there were 66 laboratory reports of *S.* Enteritidis, which accounted for 61.1% of all *Salmonella* infections. Phage type data are not available.

8.16.1.1.2 *S.* Typhimurium

In 2004, there were 15 laboratory reports of *S.* Typhimurium, which accounted for 13.9% of all *Salmonella* infections. Phage type data are not available.

8.16.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Newport (4 cases; 3.7% of all cases) and *S.* Infantis (3 cases; 2.8% of all cases).

8.16.1.2 Salmonellosis typhoidal

There were no reports of typhoid or paratyphoid infection in 2004.

8.16.2 Antimicrobial resistance

No information or data provided.

8.16.3 Travel related infection

Sixty-nine per cent of cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Spain (26 cases; 34.7%) and Portugal (9 cases; 12.0%).

8.16.4 Outbreaks

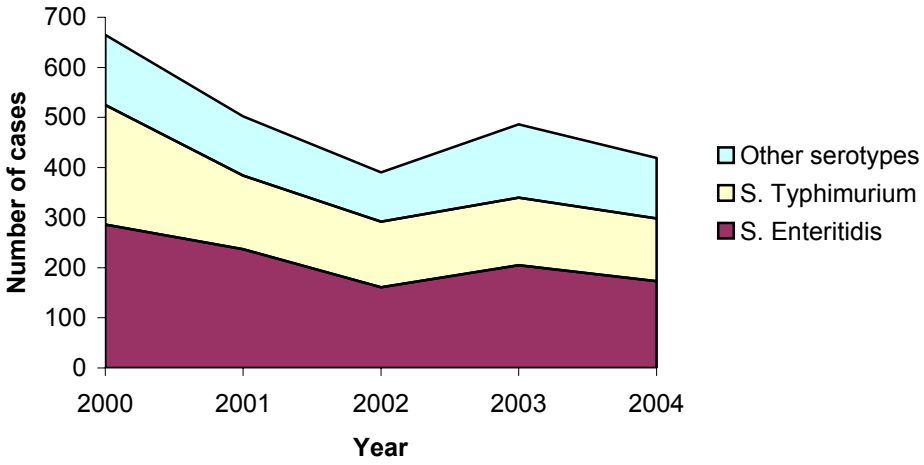
No information or data provided.

8.17 Ireland

8.17.1 Trends and sources of infection

In 2004, 419 isolates of *Salmonella* of human origin were submitted to the National *Salmonella* Reference Laboratory, Ireland (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	173	41.29
Typhimurium	125	29.83
Bredeney	11	2.63
Virchow	10	2.39
Kottbus	8	1.91
Kentucky	7	1.67
Newport	6	1.43
Havana	5	1.19
Typhi	5	1.19
Dublin	4	0.95
Hadar	4	0.95
Thompson	4	0.95
Paratyphi A	3	0.72
Saintpaul	3	0.72
Stanley	3	0.72
Others	48	11.46

Total	419	100.00

8.17.1.1 Salmonellosis non-typhoidal

8.17.1.1.1 *S.* Enteritidis

S. Enteritidis accounted for 41.3% of all cases of *Salmonella*. The predominant phage types were PT1 (28%) and PT4 (25%). This represents a decrease in the incidence of PT4 from previous years (47%). The incidence of PT21 rose from 2% to 9% while there were also smaller increases in the incidence of PT6, PT6a, PT8 and PT14b.

8.17.1.1.2 *S.* Typhimurium

S. Typhimurium accounted for 29.8% of all cases of *Salmonella*. Phage types DT104 and DT104b accounted for 38% and 18% respectively. There was a notable increase in the incidence of phage type DT49 from less than 1% in 2003 to 8% in 2004. This strain was associated with an outbreak.

8.17.1.1.3 Other serotypes

The incidence of *S.* Bredeney increased from less than 1% in 2002 and 2003 to 3% (n=11) in 2004. *S.* Kentucky remains essentially unchanged at 2%.

8.17.1.2 Salmonellosis typhoidal

Five isolates of *S.* Typhi and three isolates of *S.* Paratyphi A were received.

8.17.2 Antimicrobial resistance

Fifty-one per cent of isolates were susceptible to all antimicrobial agents tested. Twenty-three per cent were multi-drug resistant (four or more antibiotics). Of these, 47% had the resistance profile ACSSuT and were *S.* Typhimurium DT104 or closely related clonal groups. One extended spectrum beta-lactamase (ESBL) producing *S.* Typhimurium DT8 isolate was detected. No history of recent travel was indicated. A single isolate (*S.* Kentucky) was resistant to Ciprofloxacin. A recent history of travel to Libya was noted in this case.

8.17.3 Travel related infection

A recent history of foreign travel was noted in 69 non-typhoidal cases (16%). Spain was the most common destination (26 cases).

A history of recent travel was reported in seven of the eight cases of infection with *S.* Typhi or *S.* Paratyphi. Six had recently returned from Asia (India, Pakistan, the Philippines and Nepal), whilst one *S.* Typhi case was associated with travel to Nigeria.

8.17.4 Outbreaks

There were eight outbreaks of Salmonellosis detected. Six were family outbreaks, one was a general outbreak and 1 was associated with travel to Spain. The general outbreak, involving ten persons, occurred in a restaurant and was caused by *S.* Typhimurium DT49. *Salmonella* Enteritidis PT14B and *Salmonella* Virchow were each associated with two outbreaks.

Three clusters in which we suspected an outbreak but do not have confirmation were noted by the NSRL. One cluster involved four cases of *S.* Havana, all of which were

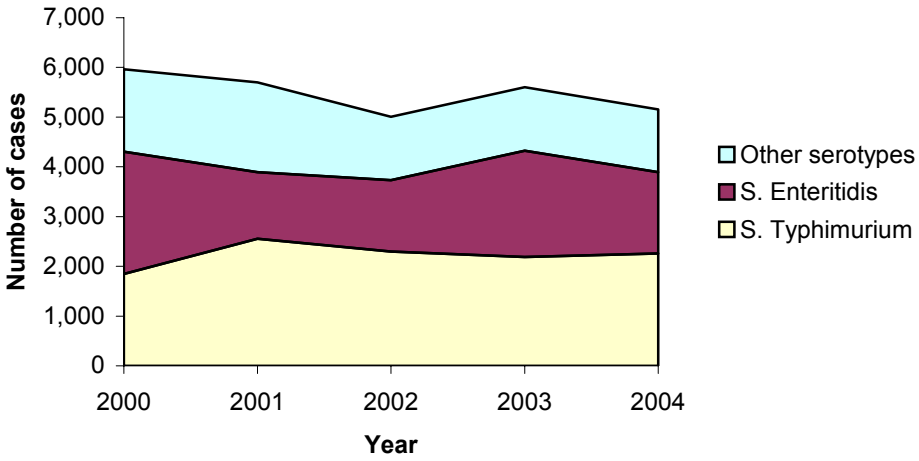
indistinguishable by PFGE. A cluster of DT104C with the unusual antibiogram ACSSuTNa was noted in four isolates. All were again indistinguishable by PFGE using XbaI and BlnI. The patterns obtained were indistinguishable from the predominant DT104 PFGE pattern.

8.18 Italy

8.18.1 Trends and sources of infection

In 2004, 5,156 cases of salmonellosis were reported (Graph), nearly one third of all infections were in children under six years of age. Most cases occurred in the summer months.

Graph Trends of salmonellosis 2000-2004



S. Enteritidis and *S.* Typhimurium were the most prevalent serovars (Table), they have accounted for approximately 80% of all cases of *Salmonella* infection during the last 10 years. Unusually in European countries *S.* Typhimrium is the most common serotype.

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	2,256	43.75
Enteritidis	1,634	31.69
Infantis	122	2.37
Napoli	112	2.17
Derby	102	1.98
Hadar	78	1.51
Muenchen	58	1.12
Thompson	58	1.12
London	53	1.03
Bredeney	48	0.93
Blockley	46	0.89
Bovismorbificans	27	0.52
Typhi	29	0.56
Goldcoast	29	0.56
Rissen	27	0.52

Others	477	9.25
Total	5,156	100.00

8.18.1.1 Salmonellosis non-typhoidal

8.18.1.1.1 *S.* Enteritidis

S. Enteritidis was the predominant serotype isolated in Italy between 1989 and 2000. In 2004, there were 1,634 cases of *S.* Enteritidis reported, which accounted for 31.7% 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 *S.* Typhimurium

S. Typhimurium replaced *S.* Enteritidis as the predominant serovar in 2001. This trend continued in 2004, with 2,256 cases of *S.* Typhimurium reported, which accounted for 43.7% of all *Salmonella* infections. DT104 remains the most frequently reported phage type (over 30%), however, a significant proportion (26%) of untypable strains (NT) were observed. *S.* Typhimurium DT104A was isolated for the first time in 2004.

8.18.1.1.3 Other serotypes

S. Infantis remained the third most common serotype (2.4%). In 2004, the increase in the number of *S.* Napoli isolates observed since 2001 continued, with 112 reports compared with 66 in 2003. Cases occurred during the summer months but were mainly confined to a limited area of northern Italy. *S.* Napoli ranks among the top ten serotypes but no specific animal reservoir has been identified, however, *S.* Napoli is frequently isolated from surface water.

8.18.1.2 Salmonellosis typhoidal

Typhoidal salmonellas were isolated from 49 cases, 29 of whom had *S.* Typhi.

8.18.2 Antimicrobial resistance

Resistance was commonly reported to Tetracyclines, Streptomycin and Sulphonamides (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	46.2
Streptomycin	44.4
Sulphonamides	44.2
Ampicillin	38.9
Chloramphenicol	11.8
Nalidixic acid	10.2
Gentamicin	9.1
Trimethoprim	7.3
Kanamycin	4.5
Cefotaxime	1.1
Ciprofloxacin	0.2

Multi-drug resistance was frequently observed in *S.* Typhimurium (60%) isolates and other serotypes rarely isolated from humans (*S.* Blockley and *S.* Bredeney) (Table). *S.* 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
Blockley	70.6
Bredeney	66.7
Typhimurium	60.2
Agona	40.0
Bovismorbificans	40.0
Hadar	37.5
Virchow	33.3
Anatum	28.6
Derby	18.2
Heidelberg	14.3
Enteritidis	5.2
Others	16.8
Total	34.2

8.18.3 Travel related infection

Two per cent of non-typhoidal infections were acquired abroad. The most common reported destination was Croatia (33 cases; 29.2%).

Travel history was available for three typhoidal cases; two reported travel to India.

8.18.4 Outbreaks

S. Typhimurium DT104A (a new subtype) was identified in June 2004, during an outbreak in Rome. The outbreak was associated with the consumption of traditional pork salami. This subtype had never previously been identified in Italy. All the DT104A isolates were susceptible to the Enter-net panel of antimicrobials, which is somewhat unusual for *S.* Typhimurium isolates. In total 63 cases were confirmed. All isolates showed a similar PFGE pattern

A cluster of isolates of *S.* Enteritidis (33 cases) were also detected. All cases had travelled to Croatia during the summer.

8.19 Japan

8.19.1 Trends and sources of infection

In 2004, there were 1,367 laboratory reports of salmonellosis in Japan. *S.* Enteritidis, *S.* Infantis and *S.* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	639	46.74
Infantis	111	8.12
Typhimurium	108	7.90
Thompson	66	4.83
Litchfield	49	3.58
Saintpaul	35	2.56
Agona	32	2.34
Virchow	24	1.76
Paratyphi B	21	1.54
Montevideo	19	1.39
Corvallis	17	1.24
Newport	13	0.95
Braenderup	11	0.80
Schwarzengrund	10	0.73
Others	212	15.51
Total	**1,367**	**100.00**

8.19.1.1 Salmonellosis non-typhoidal

8.19.1.1.1 *S.* Enteritidis

In 2004, there were 639 laboratory reports of *S.* Enteritidis, which accounted for 46.7% of all *Salmonella* infections. The most frequently reported phage types were PT1 (23.9%) and PT4 (18.7%)

8.19.1.1.2 *S.* Typhimurium

In 2004, there were 108 laboratory reports of *S.* Typhimurium, which accounted for 7.9% of all *Salmonella* infections. The predominant phage type was DT104 (47.6%)

8.19.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Infantis (111 cases; 8.1% of all cases) and *S.* Thompson (66 cases; 4.8% of all cases).

8.19.1.2 Salmonellosis typhoidal

There were 66 reports of *S.* Paratyphi A infection and 58 reports of *S.* Typhi infection.

8.19.2 Antimicrobial resistance

No information or data provided.

8.19.3 Travel related infection

Less than one per cent of non-typhoidal cases reported travel abroad. No information on country of travel was available.

All typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (39 cases; 31.5%) and Indonesia (17 cases; 13.7%).

8.19.4 Outbreaks

No information or data provided.

8.20 Latvia

8.20.1 Trends and sources of infection

In 2004, there were 320 laboratory reports of salmonellosis in Latvia. *S.* Enteritidis was the most prevalent serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	264	82.50
Derby	39	12.19
Typhimurium	9	2.81
Infantis	3	0.94
Brandenburg	2	0.63
Isangi	1	0.31
Kentucky	1	0.31
Virchow	1	0.31
Others	0	0.00
Total	320	100.00

8.20.1.1 Salmonellosis non-typhoidal

8.20.1.1.1 *S.* Enteritidis

In 2004, there were 264 laboratory reports of *S.* Enteritidis, which accounted for 82.5% of all *Salmonella* infections. Phage type data are not available.

8.20.1.1.2 *S.* Typhimurium

In 2004, there were nine laboratory reports of *S.* Typhimurium, which accounted for 2.8% of all *Salmonella* infections. Phage type data are not available.

8.20.1.1.3 Other serotypes

The most commonly reported in 2004 was *S.* Derby (39 cases; 12.2% of all cases).

8.20.1.2 Salmonellosis typhoidal

There were no reports of typhoid or paratyphoid infection in 2004.

8.20.2 Antimicrobial resistance

Thirty-seven per cent of isolates underwent some form of antimicrobial susceptibility testing. Nearly all were sensitive to the antimicrobial agents they were tested against (Table). None of the isolates tested were found to be 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	3.4
Ampicillin	2.5
Sulphonamides	1.7
Chloramphenicol	1.2
Cefotaxime	0.8
Streptomycin	0.0
Gentamicin	0.0
Kanamycin	0.0
Trimethoprim	0.0
Nalidixic acid	0.0
Ciprofloxacin	0.0

8.20.3 Travel related infection

One per cent of cases reported travel abroad. Information on country of travel was available for all four cases with imported infections, two cases reported travel to Turkey, one case to India and one to Lithuania.

8.20.4 Outbreaks

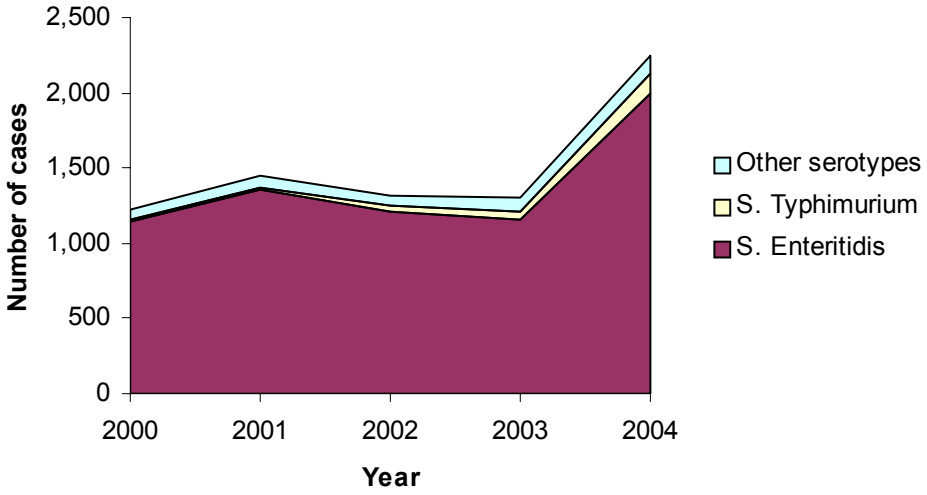
No information or data provided.

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. However, in 2004, the incidence of salmonellosis increased to 54 per 100,000 (Graph). The majority of cases in 2004 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 2000-2004



In 2004, there were 2,245 laboratory reports of salmonellosis in Lithuania. *S.* Enteritidis and *S.* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,994	88.82
Typhimurium	133	5.92
Infantis	29	1.29
Glostrup	10	0.45
Typhi	8	0.36
Braenderup	6	0.27
Tshiongwe	3	0.13
Virchow	2	0.09
Kentucky	2	0.09
Derby	3	0.13
Dublin	2	0.09
Anatum	2	0.09
Others	51	2.27
Total	2,245	100.00

8.21.1.1 Salmonellosis non-typhoidal

8.21.1.1.1 *S.* Enteritidis

In 2004, there were 1,994 laboratory reports of *S.* Enteritidis, which accounted for 88.8% of all *Salmonella* infections. Phage type data are not available.

8.21.1.1.2 *S.* Typhimurium

In 2004, there were 133 laboratory reports of *S.* Typhimurium, which accounted for 5.9% of all *Salmonella* infections. Phage type data are not available.

8.21.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Infantis (29 cases; 1.3% of all cases) and *S.* Glostrup (10 cases; 0.4% of all cases).

8.21.1.2 Salmonellosis typhoidal

There were eight reports of *S.* Typhi infection. No travel history was available.

8.21.2 Antimicrobial resistance

Most isolates underwent antimicrobial susceptibility testing (87.6%). Resistance was most commonly reported against Ampicillin (Table). Less than one per cent of 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
Ampicillin	9.0
Tetracyclines	5.7
Chloramphenicol	2.6
Gentamicin	0.6
Trimethoprim	0.5
Ciprofloxacin	0.1
Streptomycin	-
Kanamycin	-
Cefotaxime	-
Sulphonamides	-
Nalidixic acid	-

8.21.3 Travel related infection

No travel history was available.

8.21.4 Outbreaks

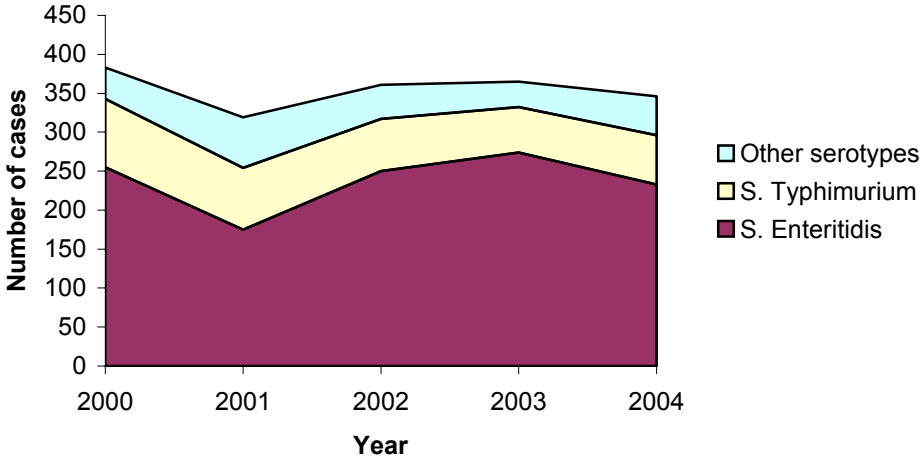
In 2004, 32 outbreaks of salmonellosis were reported, all of which were caused by *S.* Enteritidis. The majority of outbreaks were associated with homemade food.

8.22 Luxembourg

8.22.1 Trends and sources of infection

In 2004, the incidence of salmonellosis remained stable with 346 confirmed cases. Serotype distribution showed little change from previous years (Graph).

Graph Trends of salmonellosis 2000-2004



In 2004, *S.* Enteritidis and *S.* Typhimurium remained the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	233	67.34
Typhimurium	63	18.21
Livingstone	3	0.87
Java	3	0.87
Agona	2	0.58
Blockley	2	0.58
Kapemba	2	0.58
Kentucky	2	0.58
Kisii	2	0.58
Muenchen	2	0.58
Newport	2	0.58
Othmarschen	2	0.58
Blegdam	1	0.29
Braenderup	1	0.29
Brandenburg	1	0.29
Others	25	7.23
Total	346	100.00

8.22.1.1 Salmonellosis non-typhoidal

8.22.1.1.1 *S.* Enteritidis

There were 233 laboratory reports of *S.* Enteritidis in 2004, which accounted for 67.3% of all *Salmonella* infections. Phage type data are not available.

8.22.1.1.2 *S.* Typhimurium

There were 63 laboratory reports of *S.* Typhimurium in 2004, which accounted for 18.2% of all *Salmonella* infections. Phage type data are not available.

8.22.1.1.3 Other serotypes

Other serotypes accounted for 14.5% of all *Salmonella* infections. Those most commonly reported were *S.* Livingstone (3 cases; 0.9% of all *Salmonella* infections) and *S.* Java (3 cases; 0.9%).

8.22.1.2 Salmonellosis typhoidal

There were no reports of typhoid or paratyphoid infection in 2004.

8.22.2 Antimicrobial resistance

Antimicrobial resistance was common in *S.* Typhimurium isolates, 54% were multi-drug resistant (resistant to three or more antimicrobial agents). However, resistance was rare in isolates of *S.* Enteritidis, 94% were susceptible, 4% were resistant to Ciprofloxacin and Nalidixic acid.

8.22.3 Travel related infection

No information or data provided.

8.22.4 Outbreaks

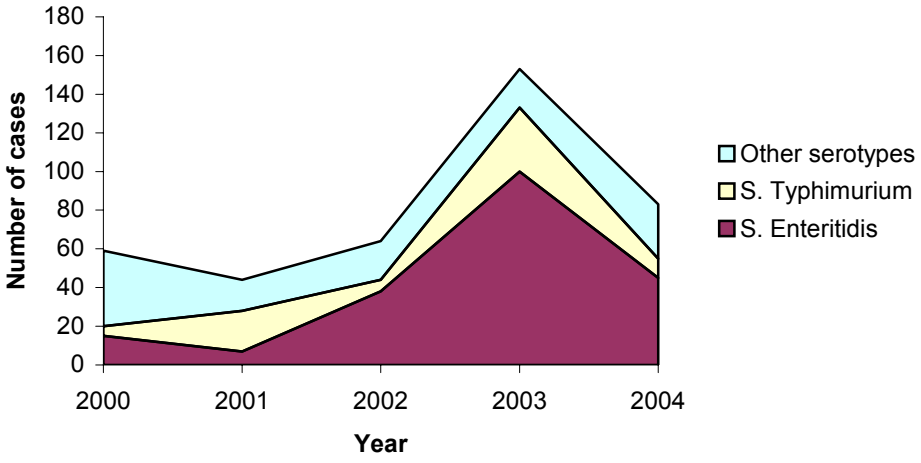
PFGE helped identify two outbreaks of *S.* Typhimurium in 2004. One of the outbreaks was identified retrospectively, and actually occurred in 2003, the other took place between March and April 2004, and was associated with a restaurant.

8.23 Malta

8.23.1 Trends and sources of infection

In 2004, there were 83 laboratory reports of salmonellosis in Malta (Graph). The majority of infections were in children less than 3 years of age. There was a sharp increase in the number of cases during November.

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	45	54.22
Typhimurium	10	12.05
Kisii	4	4.82
Virchow	3	3.61
Bardo	2	2.41
Derby	2	2.41
Lovelace	2	2.41
Hadar	2	2.41
Fyris	1	1.20
Haifa	1	1.20
Infantis	1	1.20
Kambole	1	1.20
Lindenburg	1	1.20
Manden	1	1.20
Kentucky	1	1.20
Others	6	7.23
Total	83	100.00

8.23.1.1 Salmonellosis non-typhoidal

8.23.1.1.1 *S.* Enteritidis

In 2004, there were 45 laboratory reports of *S.* Enteritidis, which accounted for 54.2% of all *Salmonella* infections. Phage type data are not available.

8.23.1.1.2 S.Typhimurium

In 2004, there were 10 laboratory reports of *S.* Typhimurium, which accounted for 12.1% of all *Salmonella* infections. Phage type data are not available.

8.23.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Kisii (4 cases; 4.8% of all cases) and *S.* Virchow (3 cases; 3.6% of all cases).

8.23.1.2 Salmonellosis typhoidal

There were no cases of typhoidal salmonellosis reported during 2004.

8.23.2 Antimicrobial resistance

Forty-two per cent of isolates underwent some form of antimicrobial susceptibility testing. Resistance was only seen against Ampicillin and Cefotaxime (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
Ampicillin	22.9
Cefotaxime	16.7
Streptomycin	0.0
Gentamicin	0.0
Nalidixic acid	0.0
Ciprofloxacin	0.0
Kanamycin	-
Sulphonamides	-
Trimethoprim	-
Chloramphenicol	-
Tetracyclines	-

8.23.3 Travel related infection

Two per cent of cases reported travel abroad. Information on country of travel was not available.

8.23.4 Outbreaks

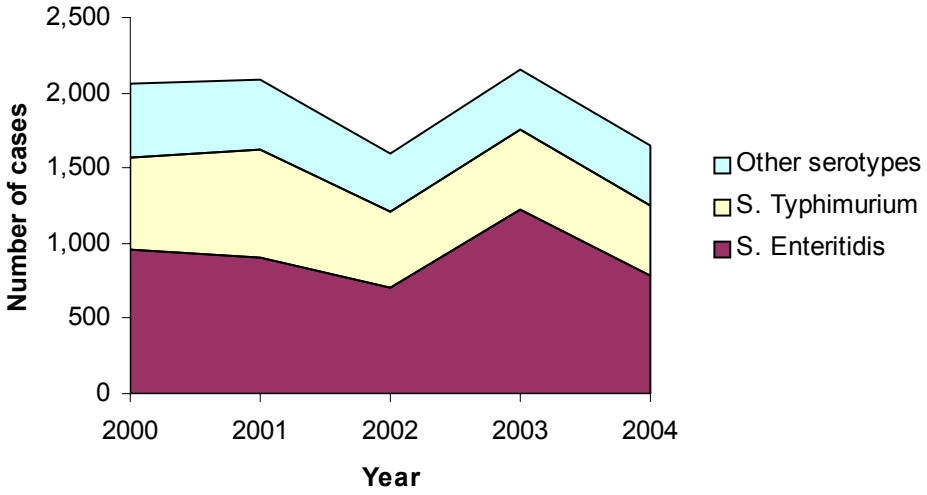
There were nine outbreaks of salmonellosis reported during 2004, affecting a total of 26 cases. Most outbreaks were associated with households (44%), hotels (11%), institutions (11%) and restaurants (11%).

8.24 Netherlands

8.24.1 Trends and sources of infection

In 2004, 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 *S.* Enteritidis epidemic (Graph). This decrease has been most noticeable in children aged between one and four years.

Graph Trends of salmonellosis 2000-2004



In 2004, there were 1,649 laboratory reports of salmonellosis in the Netherlands. *S.* Enteritidis and *S.* Typhimurium were the most prevalent serovars (Table). The age distribution shows that the incidence of salmonellosis is highest in children under four years of age, 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 the youngest and the oldest patients.

It is estimated that in 2004, 31% of human salmonellosis could be attributed to eggs, 23% to pigs, 16% to poultry, 13% to cattle and 17% to travel and unknown sources.

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	786	47.67
Typhimurium	465	28.20
Infantis	23	1.39
Kentucky	21	1.27
Brandenburg	19	1.15
Typhi	19	1.15
Give	17	1.03
Hadar	16	0.97
London	16	0.97
Goldcoast	14	0.85
Virchow	14	0.85
Heidelberg	13	0.79
Newport	13	0.79
Derby	10	0.61
Bovismorbificans	9	0.55
Others	194	11.76
Total	1,649	100.00

8.24.1.1 Salmonellosis non-typhoidal

8.24.1.1.1 *S.* Enteritidis

In 2004, there were 786 laboratory reports of *S.* Enteritidis infection, which accounted for 47.7% of all cases of salmonellosis. The most commonly reported phage types were PT4 (29.0%) and PT21 (17.9%). A number of remarkable shifts have occurred in the circulating phage types of *S.* 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 2003 in collaboration with the PHLs (the CaSa study) identified that the principle risk factor for *S.* Enteritidis infection in humans was raw egg or dishes containing raw egg.[2]

8.24.1.1.2 *S.* Typhimurium

The huge increase in *S.* Typhimurium DT104 isolates seen in 2001, which was suspected to be linked to pig manure, has now declined. In 2004, there were 465 laboratory reports of *S.* Typhimurium infection, which accounted for 28.2% of all cases of salmonellosis.

The CaSa study identified not only the consumption of raw undercooked meat but also the environment as strong risk factors for *S.* Typhimurium infection. A particularly high risk was associated with sand boxes in which children play[2].

8.24.1.1.3 Other serotypes

Other serotypes acounted for less than 25.0% of all cases.

8.24.1.2 Salmonellosis typhoidal

There were seven reports of *S.* Paratyphi A infection, six reports of *S.* Paratyphi B infection and 19 reports of *S.* Typhi infection.

8.24.2 Antimicrobial resistance

Most isolates underwent antimicrobial susceptibility testing (71.7%). Resistance was most commonly reported against tetracyclines (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	17.3
Ampicillin	16.0
Ciprofloxacin	11.0
Chloramphenicol	7.9
Trimethoprim	5.4
Kanamycin	1.3
Streptomycin	-
Gentamicin	-
Cefotaxime	-

[2] Doorduyn Y, Brandhof WE van den, Duynhoven YTHP van, Wannet WJB, Pelt W van. Risk factors for endemic *Salmonella* Typhimurium (DT104 and non-DT104) and *Salmonella* Enteritidis infection in the Netherlands: a case control study. Epidemiol Infect 2006;134:617-26).

Sulphonamides	-
Nalidixic acid	-

Three per cent 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	100.0
Stanley	33.3
Bovismorbidificans	12.5
Derby	11.1
Kentucky	10.5
Infantis	9.5
Typhimurium	6.7
Hadar	6.3
Others	0.0
Total	2.6

8.24.3 Travel related infection

In 2004, 11% of non-typhoidal cases reported recent travel abroad. As in previous years, Mediterranean countries were reported most often for travel related *S.* Typhimurium and *S.* Enteritidis infections. Between 1999 and 2004 8% of cases were travel related, however, this percentage varies between serotypes and phage types. The CaSa patient-control 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, 53.1% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were Indonesia (six cases; 35.3%), India (two cases; 11.8%) and Morocco (two cases; 11.8%).

8.24.4 Outbreaks

In 2004, 19 outbreaks of salmonellosis were notified in the category of 'foodborne disease outbreaks' which are mandatory notifiable, unlike sporadic cases of salmonellosis. These outbreaks affected 193 individuals.

8.25 New Zealand

8.25.1 Trends and sources of infection

In 2004, there were 1,229 laboratory reports of salmonellosis in New Zealand. *S.* Typhimurium and *S.* Enteritidis were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	579	47.11
Enteritidis	142	11.55
Brandenburg	86	7.00
Infantis	63	5.13
Typhi	34	2.77
Saintpaul	33	2.69
Virchow	26	2.12
Thompson	22	1.79
4,5,12 : d : -	19	1.55
Java	18	1.46
Weltevreden	13	1.06
Corvallis	11	0.90
Newport	11	0.90
Mississippi	10	0.81
3,10 : r : -	9	0.73
Others	153	12.45
Total	1,229	100.00

8.25.1.1 Salmonellosis non-typhoidal

8.25.1.1.1 *S.* Enteritidis

In 2004, there were 142 laboratory reports of *S.* Enteritidis, which accounted for 11.5% of all *Salmonella* infections. The predominant phage type was PT9A (35.2%).

8.25.1.1.2 *S.* Typhimurium

In 2004, there were 579 laboratory reports of *S.* Typhimurium, which accounted for 47.1% of all *Salmonella* infections. The predominant phage type was DT160 (38.2%).

8.25.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Brandenburg (86 cases; 7.0% of all cases) and *S.* Infantis (63 cases; 5.1% of all cases).

8.25.1.2 Salmonellosis typhoidal

There were nine reports of *S.* Paratyphi A infection, four reports of *S.* Paratyphi B infection and 34 reports of *S.* Typhi infection.

8.25.2 Antimicrobial resistance

A representative sample, comprising 21% of all non-typhoidal *Salmonella*, underwent antimicrobial susceptibility testing. Most (88.8%) isolates were fully susceptible to all antimicrobial agents tested against. 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	6.8
Sulphonamides	6.4
Nalidixic acid	6.0
Ampicillin	4.8
Streptomycin	4.4
Trimethoprim	3.6
Chloramphenicol	2.0
Gentamicin	0.8
Cefotaxime	0.0
Ciprofloxacin	0.0

Six per cent of all isolates tested were multi-drug resistant (Table).

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

Serotype	% of isolates MDR
Corvallis	100.0
Haifa	100.0
Kentucky	100.0
Rissen	100.0
Schwarzengrund	50.0
Newport	33.3
Mbandaka	25.0
Virchow	14.3
Enteritidis	3.4
Typhimurium	3.1
Others	1.3
Total	6.0

8.25.3 Travel related infections

Eleven per cent of non-typhoidal cases reported travel abroad. Where information on country of travel was available the most frequently reported destinations were Thailand (22 cases; 16.3%) and Fiji (15 cases; 11.1%).

Where travel history was reported, 57.4% of all typhoid and paratyphoid cases acquired their infections abroad, the most frequently reported destinations were India (12 cases; 44.4%) and Samoa (nine cases; 33.3%).

8.25.4 Outbreaks

No information or data provided.

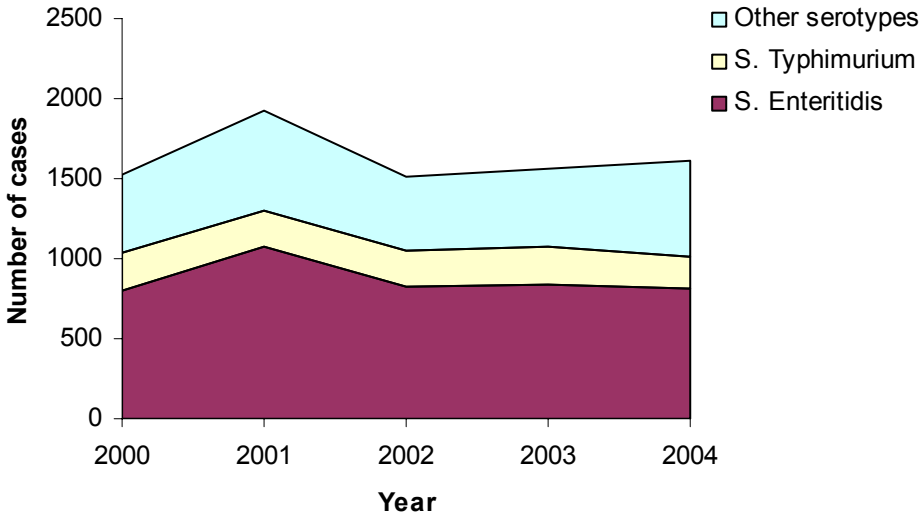
8.26 Norway

8.26.1 Trends and sources of infection

The incidence of salmonellosis has remained relatively stable during the last three years. However, in 2004, the number of reported domestic cases increased to levels not seen since 1987. This rise was attributed to two outbreaks; a nosocomial outbreak of *S.* Infantis and an outbreak of *S.* Thompson linked to imported rocket lettuce. A total of 1,608 cases of salmonellosis were reported in 2004, of which 345 (22%) were infected in Norway (Graph).

Control programmes have documented that Norwegian animals used in food production are virtually free from *Salmonella*. In fact *S.* Enteritidis has never been detected in Norwegian poultry. However, data show that *S.* Typhimurium occurs endemically in the environment, making transmission possible through wild animals and untreated water. The regular occurrence of hedgehog-associated outbreaks of *S.* Typhimurium in the Bergen area are a cause for concern.

Graph Trends of salmonellosis 2000-2004



In 2004, *S.* Enteritidis and *S.* Typhimurium were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	807	50.19
Typhimurium	201	12.50
Infantis	88	5.47
Stanley	62	3.86
Virchow	41	2.55
Java	36	2.24
Thompson	25	1.55
Paratyphi A	18	1.12
Hadar	17	1.06
Saintpaul	17	1.06
Agona	16	1.00

Newport	14	0.87
Typhi	14	0.87
Heidelberg	12	0.75
Kentucky	10	0.62
Others	230	14.30
Total	1,608	100.00

8.26.1.1 Salmonellosis non-typhoidal

8.26.1.1.1 *S.* Enteritidis

Altogether 807 (51%) cases of salmonellosis were due to *S.* Enteritidis, of which only 80 (10%) were infected in Norway.

8.26.1.1.2 *S.* Typhimurium

Two hundred and one (13%) cases of salmonellosis were due to *S.* Typhimurium, of which 83 (42%) were infected in Norway. The increase in the incidence of multi-drug resistant *S.* Typhimurium DT104 infections acquired in Norway, seen during the last few years, seems to have ceased. In 2004 there were no reported cases infected in Norway, and only 11 reported cases infected abroad.

8.26.1.1.3 Other serotypes

Other serotypes accounted for 35.9% of all cases.

8.26.1.2 Salmonellosis typhoidal

There were 18 reports of *S.* Paratyphi A infection, seven reports of *S.* Paratyphi B infection and 14 reports of *S.* Typhi infection.

8.26.2 Antimicrobial resistance

No information or data provided.

8.26.3 Travel related infection

The majority of *Salmonella* cases in Norway are known to be travel related; 1,172 out of 1,608 of all cases (72.9%) specified travel.

8.26.4 Outbreaks

The largest outbreak in 2004 was a nosocomial outbreak of *S.* Infantis that took place in a hospital in southern Norway, involving approximately 70 patients and staff. The outbreak was probably related to an infected food handler. Nosocomial salmonellosis outbreaks are extremely rare in Norway, there have only been two reported during the last 60 years.

During 2004, an international outbreak of *S.* Thompson was linked with the consumption of imported rocket lettuce, eighteen of the confirmed cases were from Norway. Messages sent via the Rapid Alert System for Food and Feed (RASSF) revealed that different *Salmonella* serovars as well as *Campylobacter* were isolated from the product.

Other outbreaks reported in 2004 include, a small outbreak of *S.* Enteritidis affecting factory workers where homemade chocolate cake was identified as the vehicle of infection. There

were also two outbreaks of *S.* Typhimurium. One outbreak was associated with contact with hedgehogs on the western coast of Norway, and the other was a small family outbreak, probably involving secondary transmission. There was also an outbreak of *S.* Uganda reported in 2004. Eight people who attended a cultural gathering were affected. Traditional foods originating from the Middle East were the suspected sources of infection.

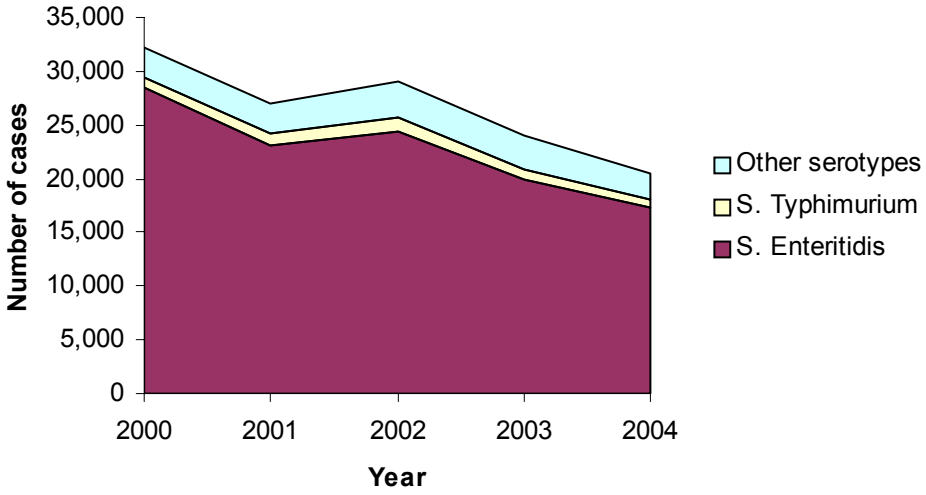
8.27 Poland

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 2004, there were 20,432 laboratory confirmed cases of *Salmonella* infection reported via the laboratory system, and 15,958 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. Extraintestinal manifestations of salmonellosis (septicemia, menigitis and other) were reported in 140 patients. As in previous years a seasonal peak was observed in July and August.

Graph Trends of salmonellosis 2000-2004



S. Enteritidis was the predominant serovar (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	17,254	84.45
Typhimurium	854	4.18
Hadar	568	2.78
Infantis	520	2.55
Virchow	420	2.06
Agona	97	0.47
Newport	71	0.35

Mbandaka	68	0.33
Indiana	59	0.29
Derby	40	0.20
Bredeney	38	0.19
Oranienburg	19	0.09
Orion	15	0.07
Saintpaul	15	0.07
Isangi	14	0.07
Others	380	1.86
Total	20,432	100.00

8.27.1.1 Salmonellosis non-typhoidal

8.27.1.1.1 *S.* Enteritidis

There were 17,254 laboratory confirmed cases of *S.* Enteritidis in 2004, which accounted for 84.4% of all laboratory confirmed salmonellosis. Phage type data are not available.

8.27.1.1.2 *S.* Typhimurium

There were 854, laboratory confirmed cases of *S.* Typhimurium in 2004, which accounted for 4.2% of all laboratory confirmed salmonellosis. Phage type data are not available.

8.27.1.1.3 Other serotypes

Those most frequently reported in 2004 were *S.* Hadar (568 cases; 2.8% of all laboratory confirmed cases) and *S.* Infantis (520 cases; 2.5% of all laboratory confirmed cases).

8.27.1.2 Salmonellosis typhoidal

There was one report of *S.* Paratyphi A infection, five reports of *S.* Paratyphi B infection (including three asymptomatic cases) and seven reports of *S.* Typhi infection (five asymptomatic cases).

8.27.2 Antimicrobial resistance

No information or data provided.

8.27.3 Travel related infection

Two typhoidal cases reported recent travel abroad, one visited Nepal and the other Pakistan.

8.27.4 Outbreaks

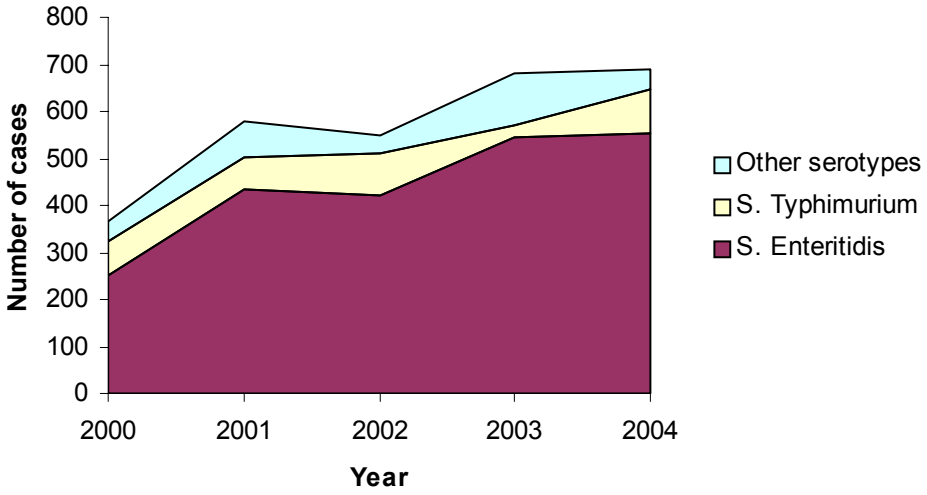
There were 205 foodborne outbreaks of salmonellosis reported during 2004, of these, 95% were caused by *S.* Enteritidis.

8.28 Portugal

8.28.1 Trends and sources of infection

In 2004, there were 691 laboratory reports of salmonellosis in Portugal (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	553	80.03
Typhimurium	92	13.31
Typhi	4	0.58
Bardo	3	0.43
Hadar	3	0.43
Haifa	3	0.43
Saintpaul	3	0.43
Derby	2	0.29
Istanbul	2	0.29
Rissen	2	0.29
Virchow	2	0.29
Agona	1	0.14
Anatum	1	0.14
Bareilly	1	0.14
Brandenburg	1	0.14
Others	18	2.60
Total	691	100.00

8.28.1.1 Salmonellosis non-typhoidal

8.28.1.1.1 *S.* Enteritidis

In 2004, there were 553 laboratory reports of *S.* Enteritidis, which accounted for 80.0% of all *Salmonella* infections. The predominant phage types were PT1B (55.6%) and PT4B (13.8%)

8.28.1.1.2 *S.* Typhimurium

In 2004, there were 92 laboratory reports of *S.* Typhimurium, accounting for 13.3% of all *Salmonella* infections. Phage type data are not available.

8.28.1.1.3 Other serotypes

In Portugal, salmonellosis is dominated by the *S.* Enteritidis and *S.* Typhimurium serovars, in 2004, other serotypes collectively accounted for only 6% of all infections.

8.28.1.2 Salmonellosis typhoidal

There were four cases of *S.* Typhi infection in 2004. Travel history was not reported.

8.28.2 Antimicrobial resistance

No information or data provided.

8.28.3 Travel related infection

No information or data provided.

8.28.4 Outbreaks

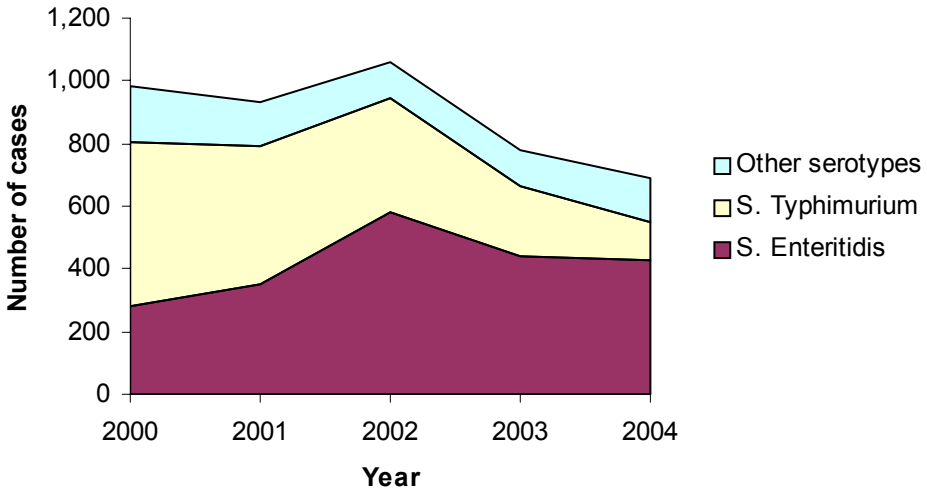
No information or data provided.

8.29 Romania

8.29.1 Trends and sources of infection

In 2004, there were 690 laboratory reports of human salmonellosis in Romania (Graph).

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	429	62.17
Typhimurium	121	17.54
Naestved	24	3.48
Derby	23	3.33
Saintpaul	19	2.75
Agona	12	1.74
Bredeney	12	1.74
Litchfield	12	1.74
Hadar	9	1.30
Concord	8	1.16
Virchow	6	0.87
Paratyphi B	4	0.58
London	3	0.43
Tennessee	2	0.29
Blockley	1	0.14
Others	5	0.72
Total	**690**	**100.00**

8.29.1.1 Salmonellosis non-typhoidal

8.29.1.1.1 *S.* Enteritidis

In 2004, there were 429 laboratory reports of *S.* Enteritidis, which accounted for 62.2% of all *Salmonella* infections.

8.29.1.1.2 *S.* Typhimurium

In 2004, there were 121 laboratory reports of *S.* Typhimurium, which accounted for 17.5% of all *Salmonella* infections.

8.29.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Naestved (24 cases; 3.5% of all cases) and *S.* Derby (23 cases; 3.3% of all cases).

8.29.1.2 Salmonellosis typhoidal

There were four reports of *S.* Paratyphi B infection in 2004.

8.29.2 Antimicrobial resistance

No isolates underwent antimicrobial susceptibility testing in 2004.

8.29.3 Travel related infection

No information or data provided.

8.29.4 Outbreaks

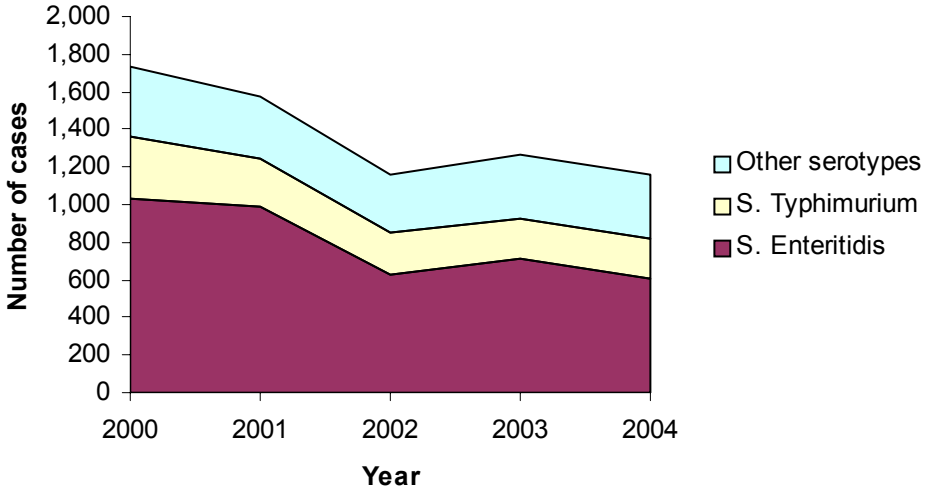
No information or data provided.

8.30 Scotland

8.30.1 Trends and sources of infection

There were 1,163 reports of *Salmonella* in 2004, which represented a decrease of 9% on the previous year's total (Graph).

Graph Trends of salmonellosis 2000-2004



As in previous years, *S.* Enteritidis and *S.* Typhimurium, were the most frequently reported serotypes and accounted for 71% of all cases (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	607	52.19
Typhimurium	214	18.40
Newport	35	3.01
Virchow	23	1.98
Stanley	17	1.46
Hadar	17	1.46
Montevideo	15	1.29
Saintpaul	15	1.29
Braenderup	13	1.12
Agona	12	1.03
Paratyphi A	12	1.03
Java	11	0.95
Corvallis	8	0.69
Dublin	8	0.69
Infantis	8	0.69
Others	148	12.73
Total	1,163	100.00

8.30.1.1 Salmonellosis non-typhoidal

8.30.1.1.1 *S.* Enteritidis

As first reported in 2003, PT1 continues to be the most predominant phage type of *S.* Enteritidis in Scotland.

8.30.1.1.2 *S.* Typhimurium

The numbers of reports of *S.* Typhimurium were roughly equivalent to that seen in 2003 (214 compared to 211). DT104 remained the most frequently reported phage type with 79 reports, accounting for 37% of all *S.* Typhimurium in 2004. This represented an increase of 55% on the 51 reports received in 2003.

8.30.1.1.3 Other serotypes

Other serotypes accounted for 28.2% of all cases.

8.30.1.2 Salmonellosis typhoidal

During 2004, there were 12 reports of *S.* Paratyphi A and eight reports of *S.* Typhi.

8.30.2 Antimicrobial resistance

Resistance was most commonly seen against Nalidixic acid and Sulphonamides (Table).

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

Antimicrobial agent	% of isolates resistant
Nalidixic acid	22.0
Sulphonamides	17.6
Tetracyclines	16.6
Streptomycin	15.1
Ampicillin	15.1
Chloramphenicol	7.9
Trimethoprim	6.4
Kanamycin	1.7
Ciprofloxacin	1.7
Gentamicin	0.9
Cefotaxime	0.3

Thirteen per cent 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
Albany	100.0
Bredeney	100.0
Typhimurium	47.7
Derby	33.3

Hadar	29.4
Stanley	29.4
Saintpaul	26.7
Corvallis	25.0
Virchow	13.0
Agona	9.1
Enteritidis	2.3
Others	3.6
Total	12.9

8.30.3 Travel related infection

Twenty-nine per cent of *S.* Enteritidis PT1 and 25% of *S.* Enteritidis PT4 reports indicated foreign travel as a possible source of infection.

All *S.* Typhi and 75% of *S.* Paratyphi A are believed to have been acquired outwith the UK.

8.30.4 Outbreaks

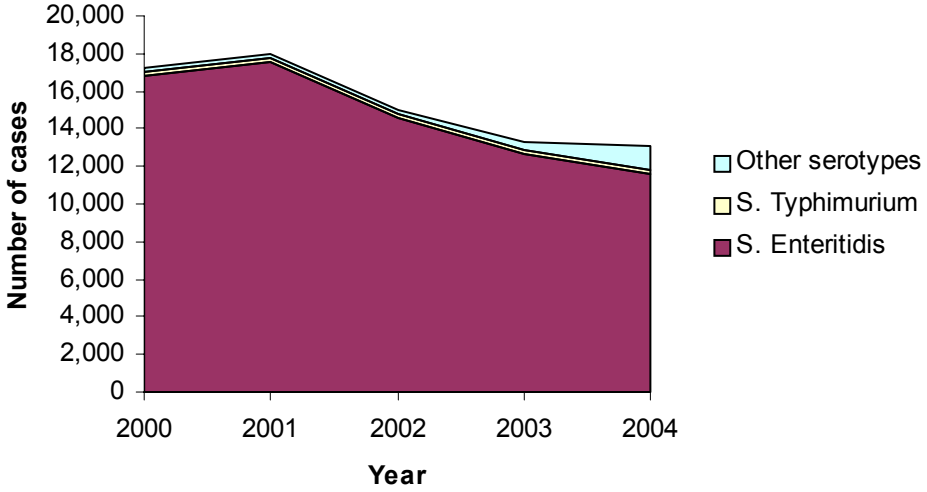
Five outbreaks of *Salmonella* infection were reported during 2004, a decrease compared to the seven reported in 2003. The largest of these outbreaks was of *S.* Enteritidis PT4, and was associated with a cruise ship in which 115 people were ill and 25 were microbiologically confirmed. An outbreak of *S.* Newport was part of a larger UK wide outbreak; the three other outbreaks were of *S.* Saintpaul, *S.* Enteritidis PT14b and *S.* Typhimurium.

8.31 Slovakia

8.31.1 Trends and sources of infection

The incidence of salmonellosis has been decreasing since 1999 (Graph). In 2004, there were 13,087 cases of *Salmonella* infection reported in Slovakia (235.4 per 100,000 of the population), this represents an 11% decrease on the number of cases reported in 2003.

Graph Trends of salmonellosis 2000-2004



S. Enteritidis and *S.* Typhimurium were the most prevalent serovars in 2004 (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	11,614	88.74
Typhimurium	154	1.18
Kentucky	85	0.65
Infantis	28	0.21
Bovismorbificans	18	0.14
Agona	11	0.08
Derby	7	0.05
Bredeney	5	0.04
Blockley	4	0.03
Cholerasuis	4	0.03
Others	1,157	8.84
Total	13,087	100.00

8.31.1.1 Salmonellosis non-typhoidal

8.31.1.1.1 *S.* Enteritidis

S. Enteritidis has been the predominant serotype since 1989, in 2004 it accounted for 88.7% of all *Salmonella* infections. The predominant phage type was PT8 (53.6%).

8.31.1.1.2 *S.* Typhimurium

S. Typhimurium accounted for 1.2% of all *Salmonella* infections. The most commonly reported phage type was DT104 (25.0%)

8.31.1.1.3 Other serotypes

Other serotypes accounted for 10.1% of all cases.

8.31.1.2 Salmonellosis typhoidal

Typhus abdominalis – in the year 2004 there was one disease registered in the Slovak Republic. The case was a professional, work-related infection in a woman who worked in a microbiological laboratory and was processing a positive sample from a stool from a refugee.

8.31.2 Antimicrobial resistance

No information or data provided.

8.31.3 Travel related infection

Thirty-four cases were imported; over half had travelled within Europe.

8.31.4 Outbreaks

Most cases of salmonellosis are sporadic. However, outbreaks were reported in 2004. The most frequently implicated vehicles of infection were undercooked eggs and egg products. Most outbreaks were confined to households, although outbreaks associated with schools

and canteens were also reported. Common contributory faults included inappropriate storage and inadequate food preparation.

8.32 Slovenia

8.32.1 Trends and sources of infection

In 2004, the number of notifications of salmonellosis decreased by 17.4% (incidence rate 165.6 per 100,000 of the population) compared to 2003. *S.* Enteritidis was the most prevalent serovar. There were 3,307 cases notified in the Slovenian national notification data, but only 3,174 of these were laboratory-confirmed, the latter are included in the Enter-net *Salmonella* database (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	3,043	95.87
Typhimurium	39	1.23
Coeln	15	0.47
Stanleyville	9	0.28
Infantis	6	0.19
Derby	4	0.13
Typhi	4	0.13
Braenderup	3	0.09
Paratyphi B	3	0.09
Tennessee	3	0.09
Thompson	3	0.09
Bredeney	2	0.06
Teddington	2	0.06
Virchow	2	0.06
Agama	1	0.03
Others	35	1.10
Total	3,174	100.00

8.32.1.1 Salmonellosis non-typhoidal

8.32.1.1.1 *S.* Enteritidis

In 2004, the proportion of *S.* Enteritidis isolates was 95.9% compared to 93.7% in 2003. Isolates that belonged to 14 different epidemics were analysed by PFGE.

8.32.1.1.2 *S.* Typhimurium

In 2004 the proportion of *S.* Typhimurium isolates was 1.2% compared to 2.3% in 2003.

8.32.1.1.3 Other serotypes

In 2004 the proportion of other serotypes was 2.9% compared to 4.1% in 2003.

8.32.1.2 Salmonellosis typhoidal

There were three reports of *S.* Paratyphi B infection and four reports of *S.* Typhi infection.

8.32.2 Antimicrobial resistance

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

8.32.3 Travel related infection

In 2004, three cases of *S.* Typhi infection were acquired abroad; all reported travel to India.

8.32.4 Outbreaks

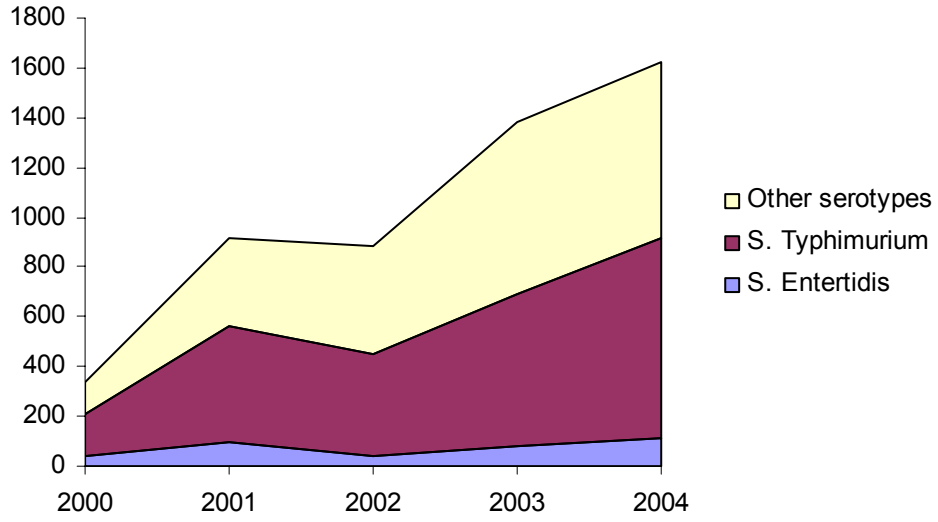
In 2004, *Salmonella* was the causative agent in 10 family outbreaks, and eight general outbreaks associated with schools, summer camps and a farm.

8.33 South Africa

8.33.1 Trends and sources of infection

In 2004, there were 1,622 laboratory reports of salmonellosis (Graph). In South Africa, there is a strong association between *S.* 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 2000-2004



In 2004, *S.* Typhimurium and *S.* Isangi were the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Typhimurium	806	49.69
Isangi	310	19.11
Enteritidis	111	6.84
Typhi	63	3.88
Dublin	46	2.84
Schwartzengrund	33	2.03
Muenchen	19	1.17
Hadar	13	0.80
Infantis	13	0.80
Virchow	12	0.74
Anatum	8	0.49
Heidelberg	8	0.49
Bovismorbificans	5	0.31
Arizonae	4	0.25
Manhattan	4	0.25
Others	167	10.30
Total	1,622	100.00

8.33.1.1 Salmonellosis non-typhoidal

8.33.1.1.1 *S.* Enteritidis

In 2004, there were 111 laboratory reports of *S.* Enteritidis, which accounted for 6.8% of all *Salmonella* infections.

8.33.1.1.2 *S.* Typhimurium

In 2004, there were 806 laboratory reports of *S.* Typhimurium, which accounted for 49.7% of all *Salmonella* infections.

8.33.1.1.3 Other serotypes

Those most commonly reported in 2004 were *S.* Isangi (310 cases; 19.1% of all cases) and *S.* Dublin (46 cases; 2.8% of all cases).

8.33.1.2 Salmonellosis typhoidal

There were 63 cases of *S.* Typhi infection in 2004.

8.33.2 Antimicrobial resistance

Nearly all isolates underwent some form of antimicrobial susceptibility testing (99.6%). Resistance was most frequently seen against Sulphonamides, Tetracyclines and Ampicillin (Table). Although Nalidixic acid resistance was observed in a significant proportion of all isolates, fluoroquinolone resistance was rare. Three percent of *S.* 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	65.1
Tetracyclines	65.1
Ampicillin	63.6
Streptomycin	55.6
Kanamycin	53.2
Trimethoprim	47.5
Chloramphenicol	37.7
Nalidixic acid	36.4
Cefotaxime	30.6
Ciprofloxacin	27.7
Gentamicin	1.9

Sixty-one per cent of all isolates tested were multi-drug resistant (Table). Both *S.* Typhimurium and *S.* Isangi tend to be multi-drug resistant, with more than 65% of *S.* Typhimurium and nearly 100% of *S.* Isangi showing resistance to five or more antibiotics. Resistance to extended spectrum cephalosporins is high and 29% of *S.* Typhimurium, and 95% of *S.* Isangi express ESBL. ESBL production in *S.* 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. *S.* Enteritidis was significantly less resistant with less than 10% of isolates being multidrug 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
Isangi	98.3
Typhimurium	66.2
Agona	33.3
Schwarzengrund	8.7
Infantis	7.7
Enteritidis	7.6
Others	3.3
Total	61.4

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 2004 could not be ascertained.

8.33.4 Outbreaks

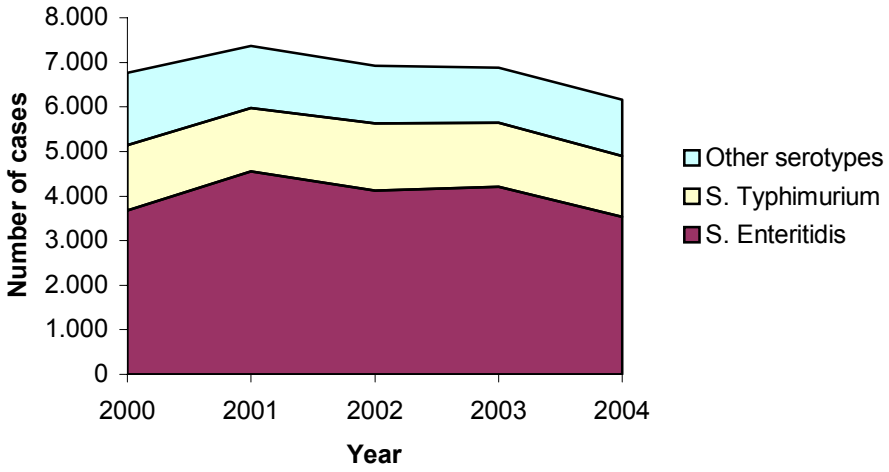
Nosocomial outbreaks affecting patients with suppressed immune systems are a major problem in South Africa.

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 *S.* Enteritidis (Graph). In 2004, there were 6,155 laboratory reports of salmonellosis in Spain.

Graph Trends of salmonellosis 2000-2004



S. Enteritidis and *S.* Typhimurium are still the most prevalent serovars (Table).

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	3,540	57.51
Typhimurium	1,354	22.00
Hadar	130	2.11
Virchow	82	1.33
Rissen	81	1.32
Infantis	77	1.25
Newport	77	1.25
4,5,12:i:-	64	1.04
Muenchen	52	0.84
Bredeney	44	0.71
4,12:i:-	42	0.68
Derby	36	0.58
Montevideo	31	0.50
Ohio	26	0.42
Anatum	23	0.37
Others	496	8.06
Total	**6,155**	100.00

8.34.1.1 Salmonellosis non-typhoidal

8.34.1.1.1 *S.* Enteritidis

In 2004, there were 3,540 isolates of *S.* Enteritidis, which accounted for 57.5% of all *Salmonella* infections. The predominant phage types were PT1 (36.2%) and PT4 (13.6%)

8.34.1.1.2 *S.* Typhimurium

In 2004, there were 1,354 isolates of *S.* Typhimurium, which accounted for 22.0% of all *Salmonella* infections. The most commonly reported phage types were DTU302 (17.1%) and DT104B (12.3%).

8.34.1.1.3 Other serotypes

The most commonly reported in 2004 was *S.* Hadar (130 cases; 2.1% of all cases).

8.34.1.2 Salmonellosis typhoidal

In 2004, there were four cases of *S.* Paratyphi A infection, five cases of *S.* Paratyphi B infection and 21 cases of *S.* Typhi infection.

8.34.2 Antimicrobial resistance

Thirty-three per cent of isolates underwent antimicrobial susceptibility testing. Resistance was most frequently seen against Nalidixic acid and Tetracyclines (Table). Ninety-four per cent of all *S.* Hadar isolates showed resistance to at least one antimicrobial agent. Nearly half of all *S.* 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	% of isolates resistant
Nalidixic acid	33.1
Tetracyclines	30.0
Ampicillin	29.3
Sulphonamides	24.9
Streptomycin	20.7
Chloramphenicol	16.4
Trimethoprim	5.6
Kanamycin	1.8
Gentamicin	1.7
Cefotaxime	0.4
Ciprofloxacin	0.0

Twenty-five per cent 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	76.2
Kapemba	75.0
Hadar	67.6
Anatum	42.9
Brandenburg	37.5
Bredeney	36.4
Virchow	34.5
Goldcoast	33.3
Others	22.9
Rissen	21.9
Newport	6.5
Enteritidis	1.4
Total	24.6

8.34.3 Travel related infections

One non-typhoidal case reported travel to Morocco.

8.34.4 Outbreaks

No information or data provided.

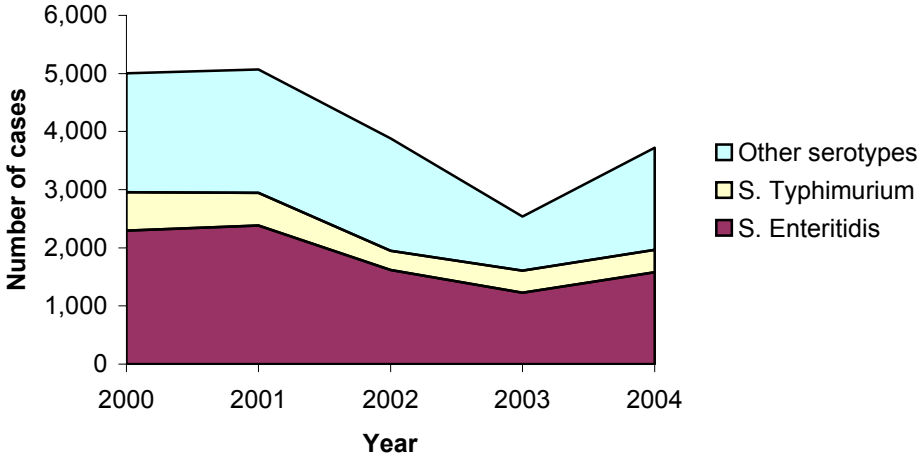
8.35 Sweden

8.35.1 Trends and sources of infection

The total number of reported cases between 1995 and 2004 ranged from 3,562 to 5,137. During the same 10-year period, the number of domestic cases varied from 453 to 947.

In 2004, the total number of cases decreased for the fifth year in a row, down to 3,721 (Graph). The number of domestic cases was the lowest recorded since 1998. The number of cases decreased by 35% in comparison to 2003. This can be attributed to the small number of cases affected in the five outbreaks reported in 2004. The decrease was evenly distributed throughout the country, during the whole year, between the sexes and between the different age groups. The graph only shows the data from the Reference laboratory, and not those reported to the national surveillance system, and hence shows an increase on 2003.

Graph Trends of salmonellosis 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	1,578	42.41
Typhimurium	386	10.37
Stanley	215	5.78
Virchow	198	5.32
Newport	88	2.36
Hadar	62	1.67
Agona	60	1.61
Corvallis	59	1.59
Saintpaul	59	1.59
Hadar	25	0.67
Kottbus	39	1.05
Infantis	39	1.05
Braenderup	35	0.94
Kentucky	34	0.91
Thompson	33	0.89
Others	811	21.80
Total	3,721	100.00

8.35.1.1 Salmonellosis non-typhoidal

8.35.1.1.1 *S.* Enteritidis

In 2004, there were 1,578 laboratory reports of *S.* Enteritidis, which accounted for 42.4% of all *Salmonella* infections. Just 75 of these were infected in Sweden.

8.35.1.1.2 *S.* Typhimurium

In 2004, there were 386 laboratory reports of *S.* Typhimurium, which accounted for 10.4% of all *Salmonella* infections. One hundred and ninety-three of these were infected in Sweden.

8.35.1.1.3 Other serotypes

The mosy commonly reported in 2004 was *S.* Stanley (215 cases; 5.8% of all cases). Twelve of these were infected in Sweden.

8.35.1.2 Salmonellosis typhoidal

In 2004, 29 cases of *S.* Paratyphi were notified. There was one outbreak reported during the year; two babies and one of their mothers fell ill after having been to the same children's hospital.

In 2004, eight cases of *S.* Typhi were reported.

8.35.2 Antimicrobial resistance

No information or data provided.

8.35.3 Travel related infection

According to clinical reports, 2,870 non-typhoidal cases (79%) acquired their infection abroad during 2004. Country of infection was unknown for 216 cases.

Twenty-four (82.7%) *S.* Paratyphi cases and all of the *S.* Typhi cases were imported.

8.35.4 Outbreaks

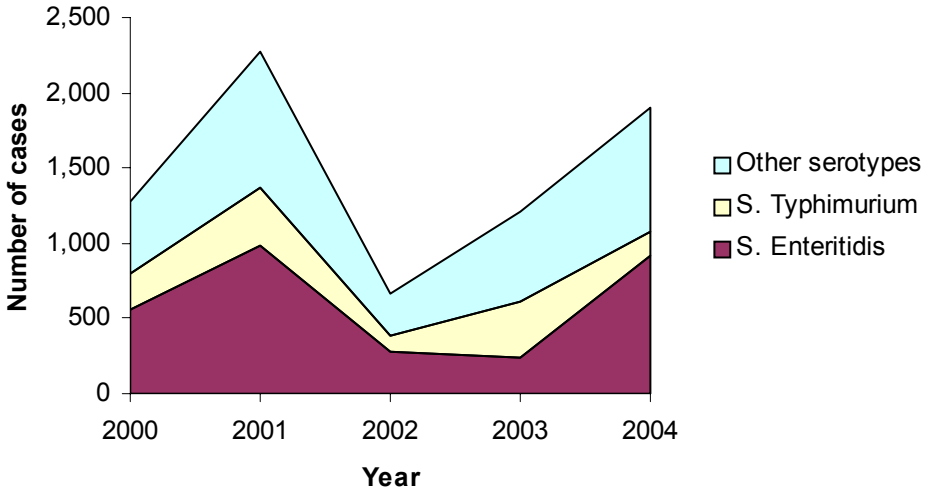
Five domestic foodborne outbreaks of salmonellosis were reported in 2004. Reported vehicles of infection included roast beef (*S.* Typhimurium DT104), sausage (*S.* Typhimurium DT120), chicken (*S.* Bardo), and rocket salad (*S.* Thompson). The source of infection in an outbreak of *S.* Mikawasima was never identified.

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 2003 to 25.9 in 2004. 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 2000-2004



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

Table Top fifteen serotypes (inc typhoidal)

Serotype	Frequency	%
Enteritidis	915	43.63
Typhimurium	356	16.98
Infantis	33	1.57
Virchow	33	1.57
Napoli	25	1.19
Newport	25	1.19
Stanley	25	1.19
Derby	20	0.95
Typhi	17	0.81
Paratyphi A	16	0.76
Kentucky	15	0.72
Braenderup	14	0.67
Oranienburg	14	0.67
Thompson	14	0.67
Hadar	13	0.62
Others	562	26.80
Total	2,097	100.00

8.36.1.1 Salmonellosis non-typhoidal

8.36.1.1.1 *S.* Enteritidis

The number of *S.* Enteritidis isolates decreased by 16.8% compared to the previous year. Phage type data are not available.

8.36.1.1.2 *S.* Typhimurium

The number of *S.* Typhimurium isolates decreased by 16.7% compared to the previous year. Phage type data are not available.

8.36.1.1.3 Other serotypes

The following serovars increased in frequency compared to 2003: Newport (up from 39 cases to 50), Stanley (up from 14 cases to 26), Veneziana (up from 11 cases to 22), Tennessee (up from one case to 12). The following serovars decreased in frequency compared to 2003; Virchow (down from 54 cases to 38; [there was an outbreak in 2003 affecting both Switzerland and France), Mbandaka (down from 24 cases to 12), Saintpaul (down from 22 cases to seven).

8.36.1.2 Salmonellosis typhoidal

There were 21 reports of *S.* Typhi infection, 15 reports of *S.* Paratyphi A infection and five reports of *S.* Paratyphi B infection to the SFOPH.

8.36.2 Antimicrobial resistance

No information or data provided.

8.36.3 Travel related infection

Travel history was reported for 26 typhoidal cases, of which 25 had a history of travel abroad. The most frequently reported destinations were India (9 cases; 36%), other Asian countries (9 cases; 36%) and Latin America (4 cases; 16%).

8.36.4 Outbreaks

Five notable *S.* Enteritidis outbreaks were reported to the SFOPH. They were all investigated by cantonal authorities, and were traced to raw eggs, used for preparation of either dessert dishes (4 outbreaks) or dough consumed before baking (1 outbreak).

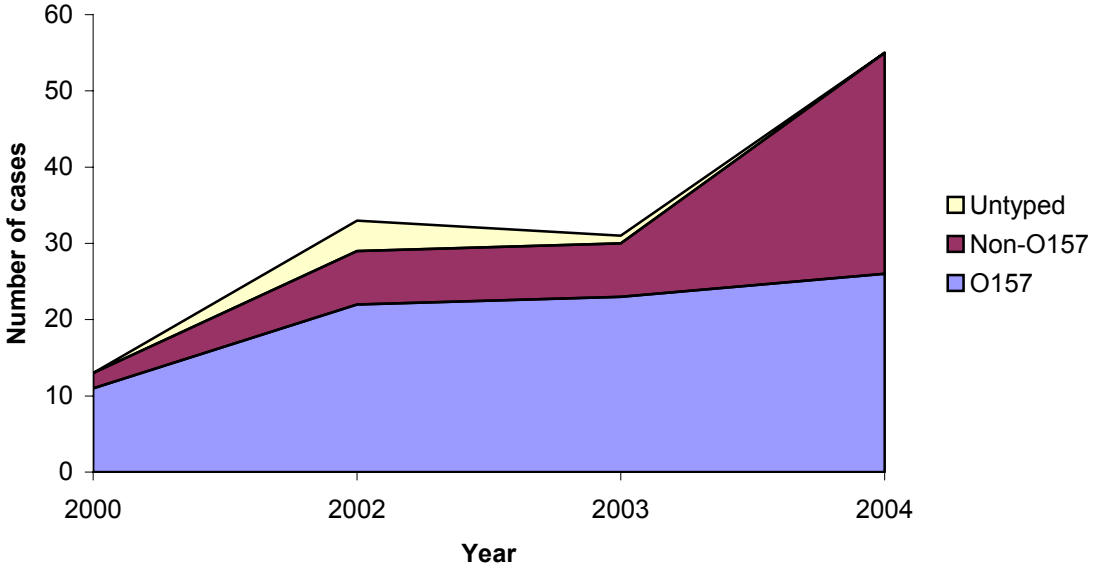
9 VTEC

9.1 Austria

9.1.1 Trends and sources of infection

In 2004, 54 *E. coli* infections were reported in Austria (Graph), O157 remains the most frequently isolated serogroup (44%), followed by O145 (11%) and O26 (9%). In 2004, most cases of O157 infection were male (62.5%), 58.3% of cases were under 14 years of age. The majority of non-O157 cases were also male (62.1%), however, a much larger proportion of cases (82.8%) were aged 14 or under.

Graph Trends of VTEC infection 2000-2004



9.1.1.1 HUS

Nine cases of HUS were reported during 2004; *E. coli* O157 infection was detected in 89% of cases.

9.1.2 Microbiological characteristics

Eighteen of the O157 isolates tested (75.0%) carried VT genes, of which 11.1% carried only the VT1 gene, 38.9% carried only the VT2 gene, and the remaining 50.0% carried both. Seventeen (94.4%) of the O157 isolates tested carried the eae gene.

The distribution of toxin genes in non-O157 isolates differed considerably. All of the non-O157 isolates tested carried VT genes, of which 51.7% carried only the VT1 gene, 31.0% carried only the VT2 gene, and the remaining 17.2% carried both. Twenty (69.0%) of the non-O157 isolates tested carried the eae gene.

9.1.3 Travel related infection

No information or data provided.

9.1.4 Outbreaks

No information or data provided.

9.2 Australia

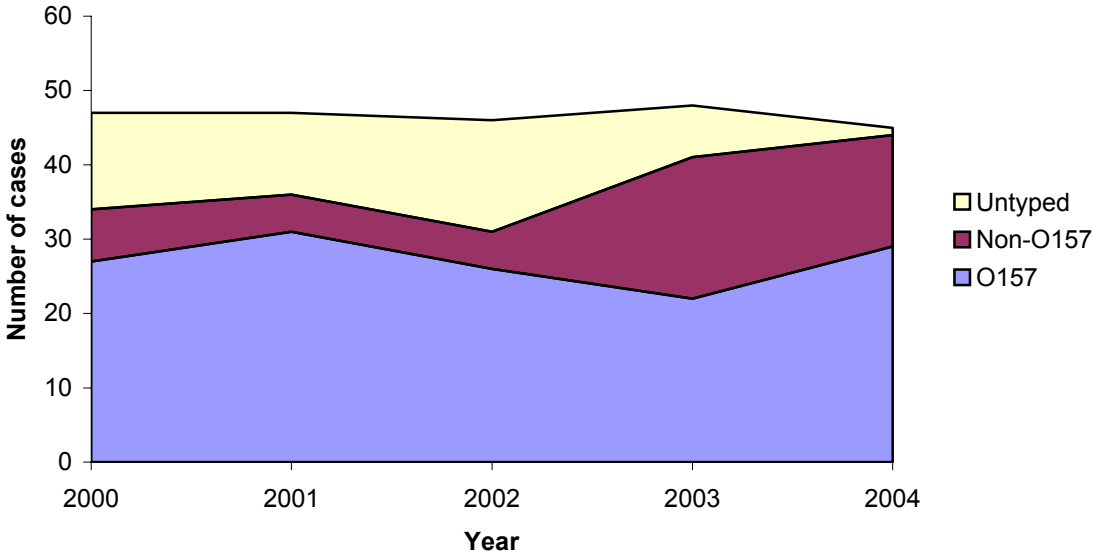
No information or data provided.

9.3 Belgium

9.3.1 Trends and sources of infection

The number of VTEC infections detected remains low. In 2004, there were 45 reports of VTEC infection, 64.4% were caused by the serogroup O157 (Graph).

Graph Trends of VTEC infection 2000-2004



9.3.1.1 HUS

In 2004, three cases of HUS were reported in patients staying in a psychiatric institute after an outbreak of diarrhoea; VTEC O157 was isolated from one case.

9.3.2 Microbiological characteristics

Of the 29 O157 cases, four were VT1 and VT2 positive, one was VT1 positive and VT2 negative, and 24 were VT1 negative, VT2 positive. Of the 15 non-O157 cases, three were VT1 and VT2 positive, nine were VT1 positive and VT2 negative, and three were VT1 negative, VT2 positive.

9.3.3 Travel related infection

No information or data provided.

9.3.4 Outbreaks

An outbreak associated with a psychiatric institution was reported in 2004. One member of staff tested positive for VTEC O157, however, it was not possible to determine if they were the source of infection or a victim of the outbreak.

9.4 Bulgaria

No information or data provided.

9.5 Canada

No information or data provided.

9.6 Cyprus

No information or data provided.

9.7 Czech Republic

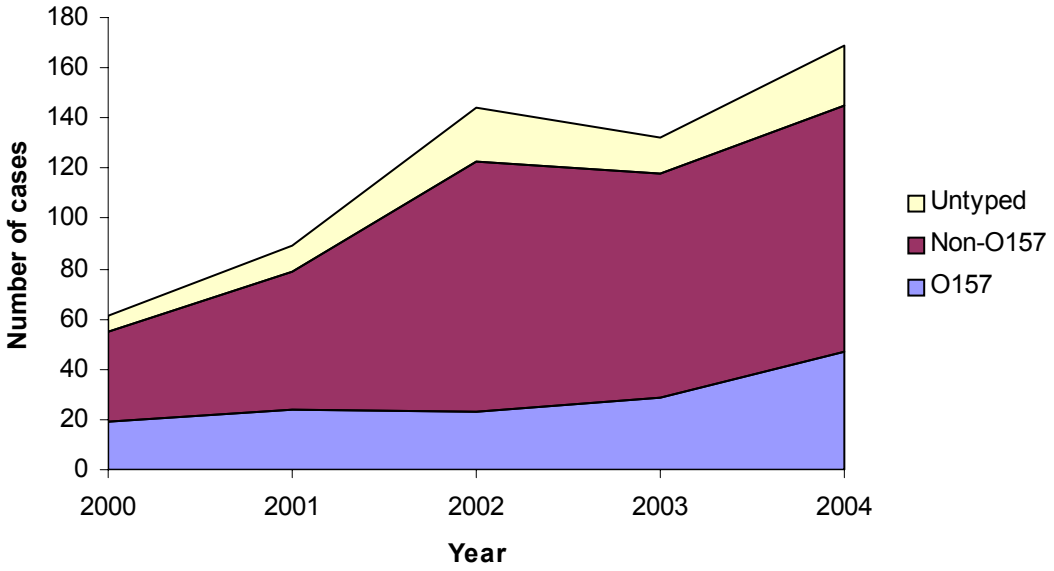
No information or data provided.

9.8 Denmark

9.8.1 Trends and sources of infection

In 2004, there were 168 reported episodes of infection, an incidence of 3.1 per 100,000 of the population, 28% 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. 2004 represented a 30% increase compared to 2003. Two outbreaks that occurred in 2004, involving 30 cases explain part of the increase.

Graph Trends of VTEC infection 2000-2004



9.8.1.1 HUS

Five cases of HUS were reported in 2004; none were fatal. VTEC strains were isolated from all cases, three of serogroup O157 and one each of serogroup O104 and O26.

9.8.2 Microbiological characteristics

No information or data provided.

9.8.3 Travel related infection

No information or data provided.

9.8.4 Outbreaks

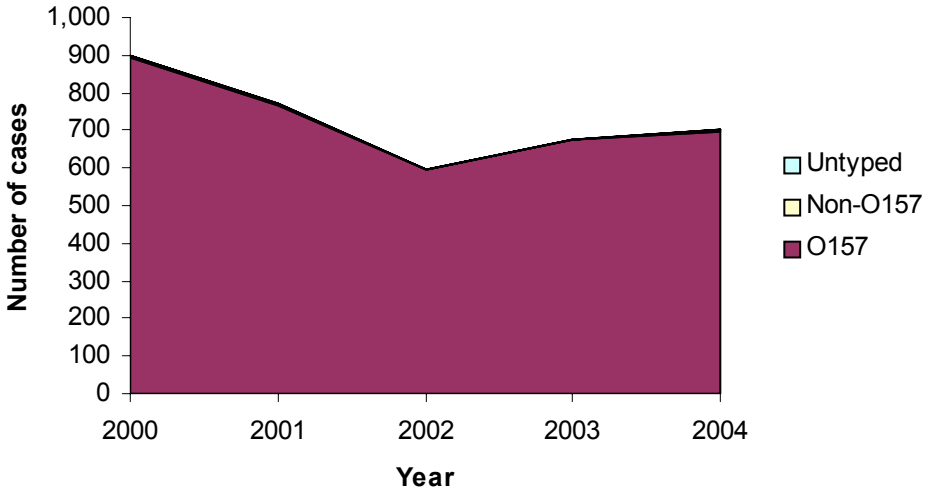
In 2004, Denmark experienced its first VTEC outbreaks. The largest of these was caused by VTEC O157 and involved 25 laboratory confirmed cases from or near the Copenhagen area. The outbreak investigation included a case-control study and implicated milk produced at a relatively small organic dairy. The second outbreak occurred amongst visitors, primarily children, to a petting farm. At least five people were infected with various VTEC serotypes.

9.9 England and Wales

9.9.1 Trends and sources of infection

In 2004, there were 702 laboratory reports of VTEC infection in England and Wales, 699 (99.6%) of which were caused by the serogroup O157 (Graph).

Graph Trends of VTEC infection 2000-2004



9.9.1.1 HUS

No information or data provided.

9.9.2 Microbiological characteristics

PT21/28 was the most commonly reported O157 phage type accounting for 29.2% of isolates, followed by PT8 (22.6%) and PT2 (21.7%).

Less than one per cent of O157 isolates carried only the VT1 gene, 68.5% carried only the VT2 gene, and the remaining 30.6% carried both. All of the O157 isolates tested carried the eae gene.

9.9.3 Travel related infection

Less than 10% of cases reported travel abroad (64/702). The most frequently reported countries of travel were Turkey (12 cases; 18.8%), Spain (nine cases; 14.1%) and Greece (nine cases; 14.1%).

9.9.4 Outbreaks

No information or data provided.

9.10 Estonia

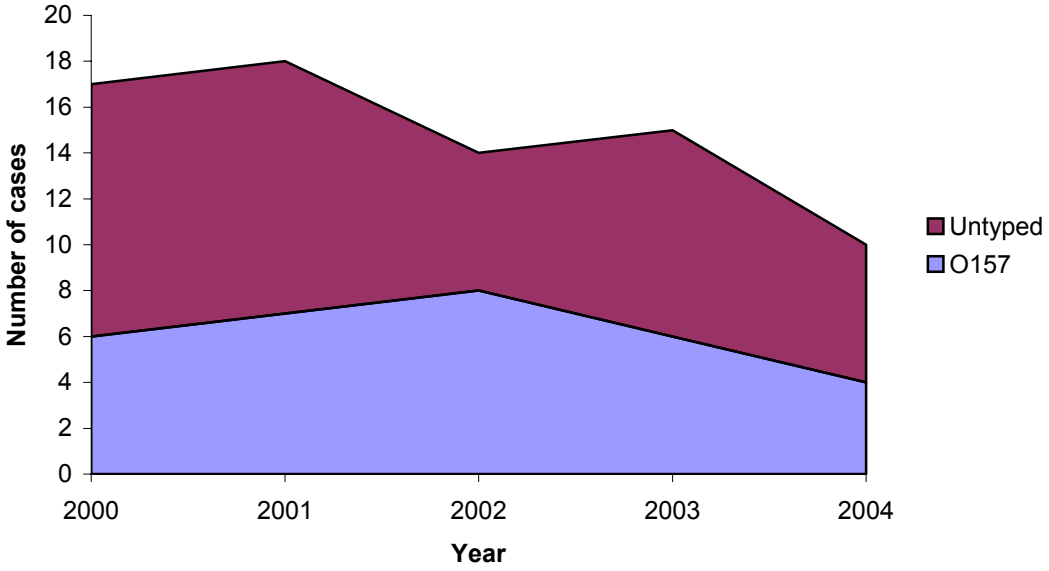
No human cases were notified in 2004.

9.11 Finland

9.11.1 Trends and sources of infection

In 2004, there were 10 cases of *E. coli* infection reported in Finland, 40% of which were caused by the serogroup O157 (Graph).

Graph Trends of VTEC infection 2000-2004



9.11.1.1 HUS

No information or data provided.

9.11.2 Microbiological characteristics

No information or data provided.

9.11.3 Travel related infection

Four of the 10 cases acquired their infections abroad. Two reported travel to Greece, one each to Turkey and Bulgaria.

9.11.4 Outbreaks

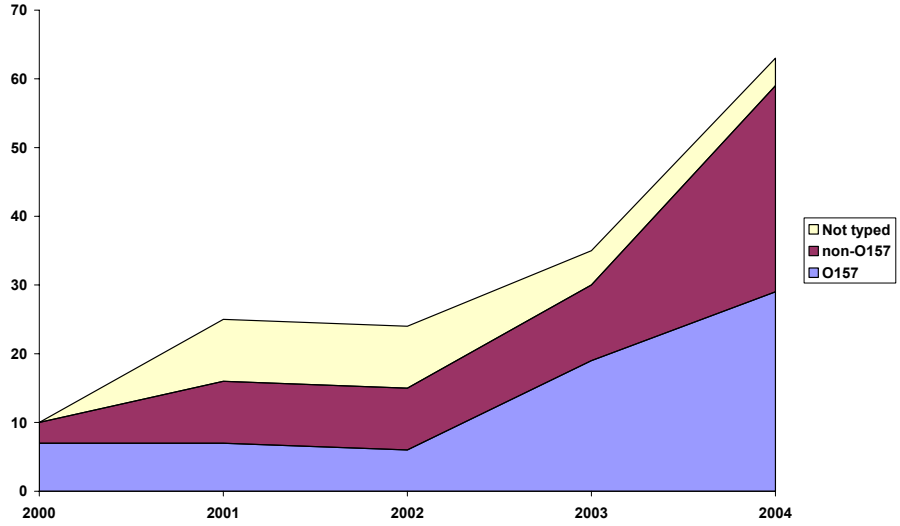
No information or data provided.

9.12 France

9.12.1 Trends and sources of infection

There are 63 cases of VTEC infections in the Enter-net database in 2004, 29 (46.0%) were O157, 30 were non-O157s (47.6%) and four (6.4%) were untyped (graph).

Graph Trends of VTEC infection 2000-2004



9.12.1.1 HUS

In 2004, 86 cases of HUS were reported compared to 90 cases in 2003. Evidence of STEC infection was present in 70% of cases, 81% of which were positive for the O157 serogroup. Since 1996, the annual incidence rate of HUS has remained stable at less than 1 per 100,000 of the population under 15 years of age.

9.12.2 Microbiological characteristics

Information on all the cases within the NRL database show that there were 31 O157:H7 isolates carried stx genes: stx1 (12.9%), stx2 (80.6%), stx1 and stx2 (6.5%). Thirty-six non-O157 isolates carried stx genes: stx1 (69.4%), stx2 (27.8%), stx1 and stx2 (2.8%). Twenty-two of these isolates (61%) were *E. coli* O26.

9.12.3 Travel related infection

No information or data provided.

9.12.4 Outbreaks

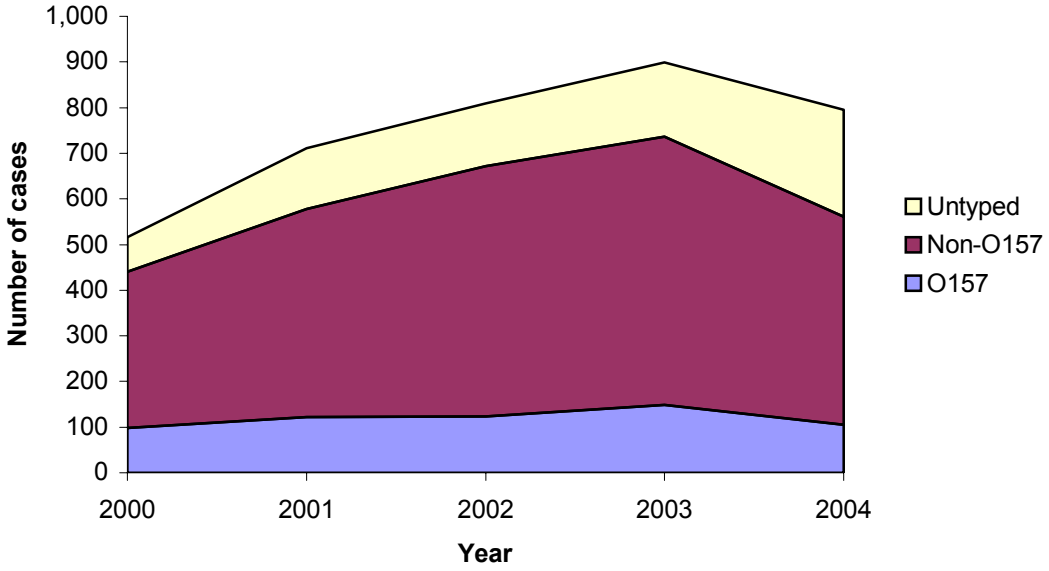
In 2004, one family outbreak of STEC O157 infection was detected. An investigation implicated unpasteurised goat's cheese as the vehicle of infection.

9.13 Germany

9.13.1 Trends and sources of infection

In 2004, there were 795 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 O157 (13.2%), O26 (9.6%) and O91 (8.3%).

Graph Trends of VTEC infection 2000-2004



9.13.1.1 HUS

Four cases of HUS were reported during 2004; *E. coli* O157 infection was detected in three of the cases.

9.13.2 Microbiological characteristics

Phage type was not determined for all O157 isolates. However, where further typing was undertaken the most commonly reported phage types were PT8 (22.9%), PT14 (12.4%) and PT2 (10.5%).

9.13.3 Travel related infection

No information or data provided.

9.13.4 Outbreaks

No information or data provided.

9.14 Greece

There is no reference laboratory for VTEC in Greece. Data on VTEC infections are not systematically collected. There were no outbreaks reported during 2004.

9.15 Hungary

9.15.1 Trends and sources of infection

In 2004, nine cases of VTEC infection were reported in Hungary, O157 was the most frequently isolated serogroup (5 cases, 55.6%).

9.15.1.1 HUS

There were two reports of HUS during 2004, both cases had a laboratory confirmed non-O157 VTEC infection.

9.15.2 Microbiological characteristics

Twenty-one per cent of isolates carried only the VT1 gene, 5.3% carried only the VT2 gene, and the remaining 73.7% carried both.

9.15.3 Travel related infection

No information or data provided.

9.15.4 Outbreaks

No general outbreaks have ever been detected in Hungary, however, small family outbreaks have been identified.

9.16 Iceland

No information or data provided.

9.17 Ireland

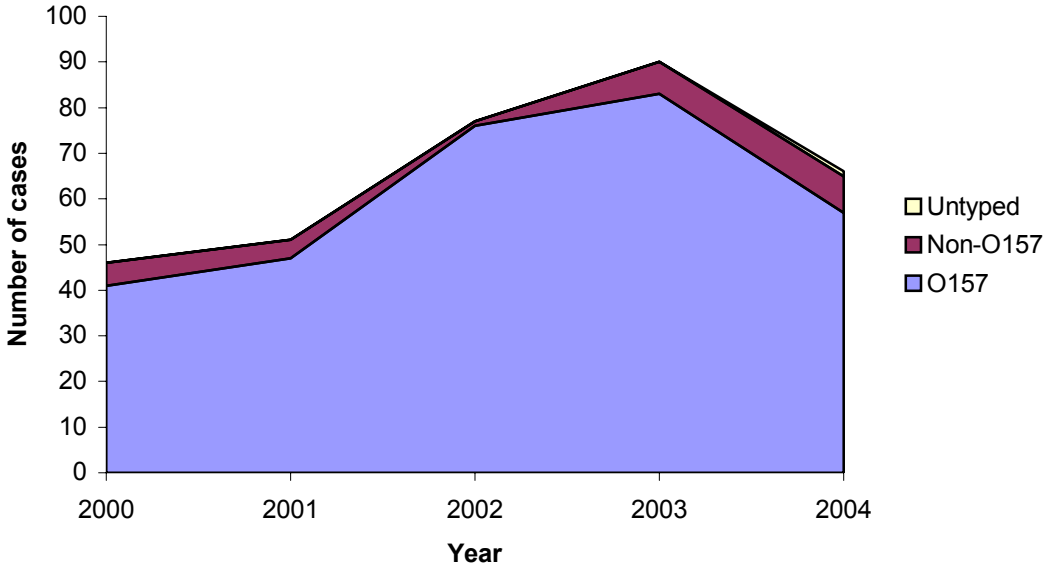
9.17.1 Trends and sources of infection

In 2004, 66 cases[3] of VTEC were reported in Ireland. This was a reduction of 27% on the number reported in 2003 (Graph). Fifty seven cases (86%) were caused by the serogroup O157.

As in previous years, the highest incidence was recorded in children under 5 years of age, and the largest number of cases were reported in the third quarter of the year (45%).

[3] Please note that the number of cases reported here for 2004 differs from that reported in the HPSC Annual Report on VTEC 2004. The date for inclusion used here is date of report whereas the date for inclusion used in the HPSC annual report is date of onset. As a result, five cases of VTEC O157 that had dates of onset in 2003 but were reported in 2004 are included here.

Graph Trends of VTEC infection 2000-2004



9.17.1.1 HUS

Almost half (47%) of symptomatic cases had bloody diarrhoea and four developed HUS, all of which were under 10 years of age. Two of the HUS cases were due to *E. coli* O157, one due to *E. coli* O111 and one due to *E. coli* O145.

9.17.2 Microbiological characteristics

As in previous years, PT32 was the predominant O157 phage type accounting for over 60% of isolates. Seventy-six per cent of O157 isolates carried only the VT2 gene with the remaining 24% having both VT1 and VT2 genes. No O157 isolates carried only the VT1 gene. The distribution of toxin genes in non-O157 VTEC differed considerably, with 55% of isolates carrying only the VT1 gene, 22% carrying both the VT1 and VT2 genes and 23% carrying only the VT2 gene. All O157 isolates had the eae gene.

9.17.3 Travel related infection

Seven VTEC cases in 2004 were travel-associated. The countries visited within 14 days of onset of illness were Spain (2), UK (2), Italy (1), Malaysia (1) and Turkey (1), reflecting to some extent the frequency of travel by Irish people to these destinations.

9.17.4 Outbreaks

There was one general outbreak of VTEC O157 reported in 2004, resulting in four confirmed cases, three of whom were admitted to hospital. Epidemiological and microbiological investigations implicated the drinking water used at a sports club visited by all four cases. This water was drawn from a private well that was contaminated with the outbreak strain. An extensive investigation was conducted involving several health regions as several hundred people were potentially exposed to the drinking water.
Two additional family clusters were also reported as waterborne. Microbiological evidence was obtained linking water from a private well to two confirmed cases in one of these outbreaks. For the second, water from a private well was found positive for *E. coli* and coliforms but no VTEC were isolated. A third family cluster was reported as being transmitted

either by water or by animal contact. In this instance, both water from a group water scheme used by the family, and samples taken subsequently from sheep on the family farm, tested positive for VTEC O157 that were indistinguishable from those isolated from the human cases.

For the four remaining family/household clusters, two were suspected to be due to contact with livestock on family farms, one to person-to-person transmission and for the remaining cluster the mode of transmission was reported as unknown.

9.17.5 Research

9.17.5.1 VT2 subtyping study

One hundred and thirty human clinical VTEC (vt2 positive) strains collected by the Public Health Laboratory, Health Service Executive, Dublin, Mid Leinster in 2003 and 2004 were tested by PCR for the vt2 subtypes – vt2, vt2c, vt2d, vt2e and vt2f. These isolates were previously typed for verotoxin genotypes (vt1 and vt2) and for phage type, and included 124 O157 and 6 non-O157 isolates.

Overall, 79 isolates were positive for the subtypes vt2 and vt2c (60.8%), making this combination the most prevalent genotype in both O157 and non-O157 VTEC isolates. Furthermore, a predominance of subtypes vt2 and vt2c in combination was also evident in isolates carrying the vt1 and vt2 genes, and in those carrying the vt2 gene only. A total of 30 isolates (23.0%) were positive for vt2c only, whilst 21 isolates (16.2%) were positive for vt2 only. The subtypes vt2d, vt2e and vt2f were not detected in any of the isolates examined. Despite the high prevalence of vt2 and vt2c in combination, application of vt2 subtyping to predominant phage types did facilitate further differentiation of isolates, particularly when analysed in the context of associated epidemiological data. See table below.

Table Comparison of vt2 subtypes within phage type for VTEC O157

Phage type	Total number of isolates (%)	Toxin genotype		vt2 subtyping		
		vt2	vt1 & vt2	vt2 only	vt2c only	vt2 & vt2c
PT1	2 (1.6)	1	1	0	1	1
PT2	3 (2.4)	3		0	0	3
PT8	24 (19.4)	7	17	2	13	9
PT14	12 (9.7)	11	1	0	9	3
PT31	2 (1.6)	2		1	0	1
PT32	57 (46.0)	52	5	15	6	36
PT21/28	18 (14.5)	18		2	0	16
PT34	1 (0.8)	1		0	1	0
PT51	1 (0.8)	1		0	0	1
RDNC[a]	2 (1.6)	2		0	0	2
U[b]	2 (1.6)	1	1	0	0	2

RDNC[a] – abbreviation for Reacts but Does Not Conform – indicating that the strain reacts with the typing phages but does not conform to a currently defined pattern.

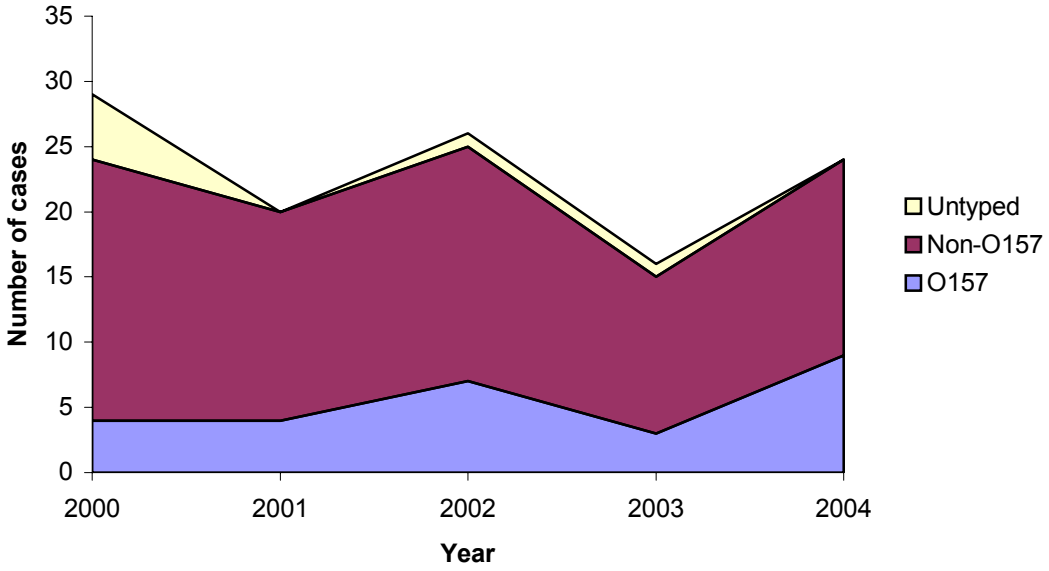
U[b] – Untypable by phage typing

9.18 Italy

9.18.1 Trends and sources of infection

The most common serogroup in 2004 was O26 (40%); VTEC O157 represented only 35% of reported cases (Graph).

Graph Trends of VTEC infection 2000-2004



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).

9.18.2 Microbiological characteristics

No information or data provided.

9.18.3 Travel related infection

No information or data provided.

9.18.4 Outbreaks

Two family outbreaks of VTEC O157 were reported in 2004. In one outbreak microbiological evidence implicated dry fermented salami made with pork meat as the vehicle of infection.

9.19 Japan

9.19.1 Trends and sources of infection

In 2004, there were 2,771 reports of *E. coli* infection in Japan, 2,018 (72.8%) were identified as serogroup O157.

9.19.1.1 HUS

No information or data provided.

9.19.2 Microbiological characteristics

Phage type was only determined for a very small proportion (5.6%) of O157 isolates. The most commonly reported was PT14 (17.6%).

9.19.3 Travel related infection

No information or data provided.

9.19.4 Outbreaks

No information or data provided.

9.20 Latvia

No information or data provided.

9.21 Lithuania

9.21.1 Trends and sources of infection

In 2004, two cases of *E. coli* O157 infection were reported in Lithuania, both cases were male and under five years of age.

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 information or data provided.

9.21.3 Travel related infection

No travel history was available.

9.21.4 Outbreaks

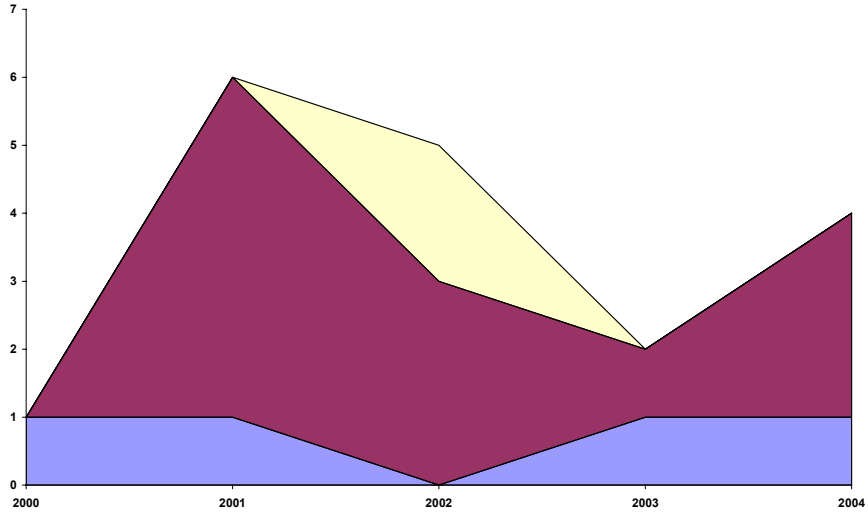
No outbreaks of E.coli have been reported recently in Lithuania.

9.22 Luxembourg

9.22.1 Trends and sources of infection

In 2004, four cases of *E. coli* infection were reported in Luxembourg, three were caused by non-O157 serogroups (Graph).

Graph Trends of VTEC infection 2000-2004



9.22.1.1 HUS

No information or data provided.

9.22.2 Microbiological characteristics

No information or data provided.

9.22.3 Travel related infection

No information or data provided.

9.22.4 Outbreaks

No information or data provided.

9.23 Malta

9.23.1 Trends and sources of infection

In 2004, two sporadic cases of *E. coli* 0157 infection were reported in Malta. Both cases were under five years of age. There have only been eight cases of O157 reported between 2000-04; one in 2000, two in 2001, three in 2002, none in 2003 and two in 2004.

9.23.1.1 HUS

There were no reported cases of HUS in 2004.

9.23.2 Microbiological characteristics

No genotyping was performed.

9.23.3 Travel related infection

The cases were not travel related.

9.23.4 Outbreaks

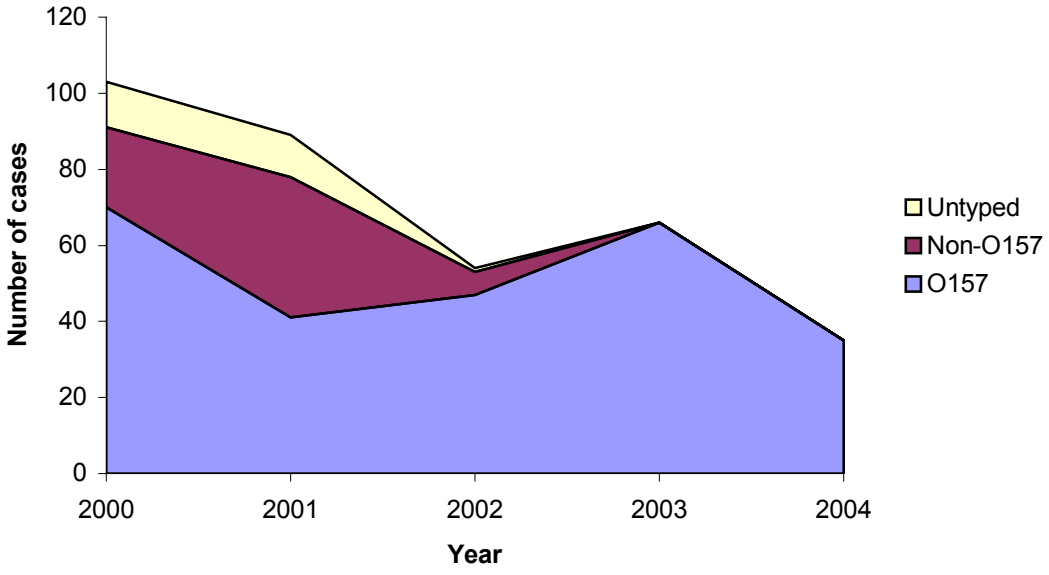
Both cases reported in 2004 were sporadic.

9.24 Netherlands

9.24.1 Trends and sources of infection

In 2004, 35 patients were diagnosed with STEC O157. This was a relatively low number compared to previous years (Graph). 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 2004, no microbiological evidence was obtained through testing of animal or food samples collected, to support the descriptive evidence.

Graph Trends of VTEC infection 2000-2004



9.24.1.1 HUS

Fourteen per cent of cases developed HUS.

9.24.2 Microbiological characteristics

Eighty per cent of O157 isolates carried only the VT2 gene; the remaining 20% carried both the VT1 and VT2 genes. The eae gene was present in all O157 isolates.

9.24.3 Travel related infection

No information or data provided.

9.24.4 Outbreaks

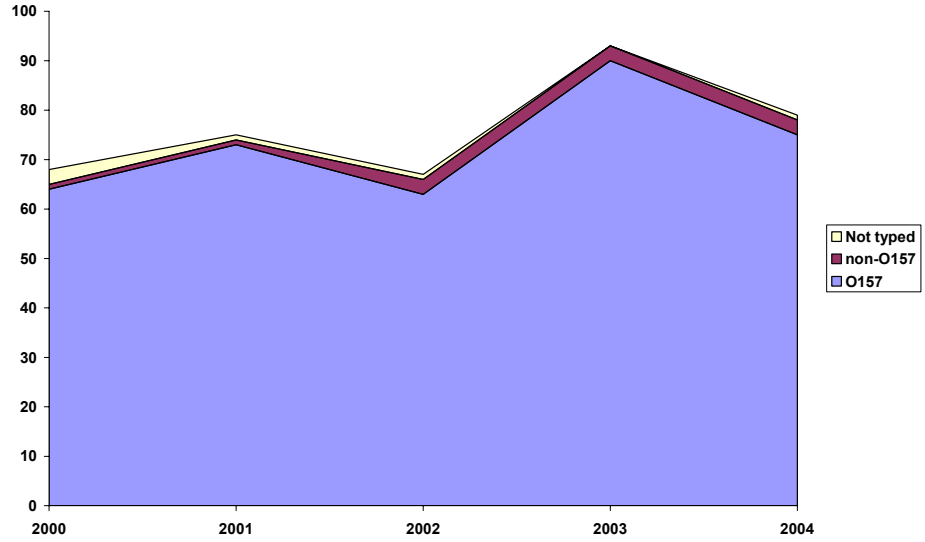
In 2004, cluster analysis of the DNA-fingerprints (PFGE) of the STEC O157 isolates suggested a relationship between some of the cases, this was also occasionally supported by descriptive evidence. In two clusters raw or undercooked beef proved to be the common source.

9.25 New Zealand

9.25.1 Trends and sources of infection

In 2004, there were 82 cases of VTEC infection reported in New Zealand, 91.5% of which were caused by serogroup O157 (graph). The majority of O157 cases were female (58.7%), and over half (54.7%) were under five years of age.

Graph Trends of VTEC infection 2000-2004



9.25.1.1 HUS

In 2004, there were three cases of HUS reported; VTEC O157 was detected in all three cases.

9.25.2 Microbiological characteristics

Eighty five per cent of O157 isolates carried only the VT2 gene; the remaining 15% carried both the VT1 and VT2 genes. The eae gene was present in all O157 isolates.

9.25.3 Travel related infection

No cases were travel related.

9.25.4 Outbreaks

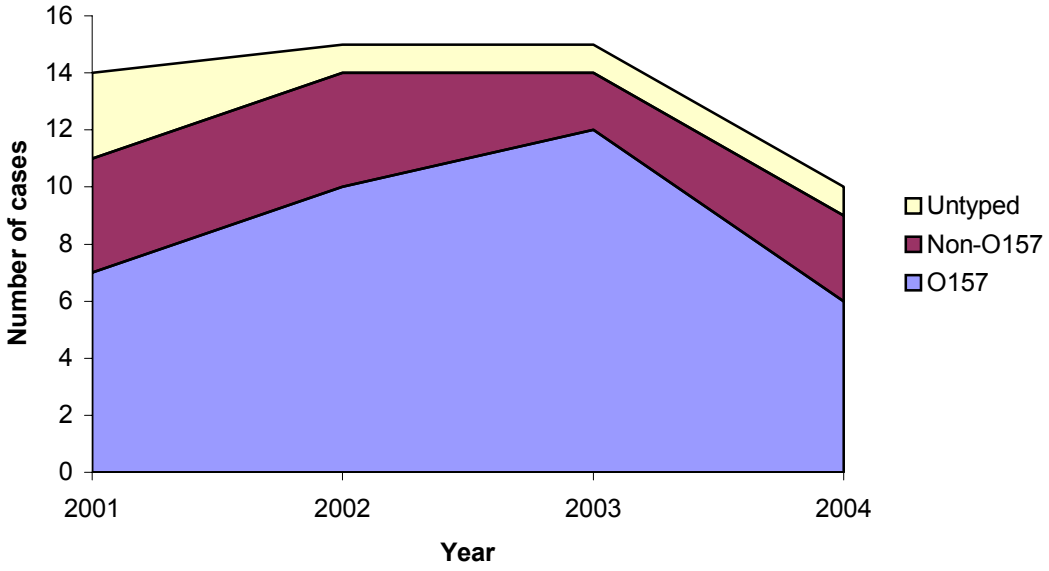
No information or data provided.

9.26 Norway

9.26.1 Trends and sources of infection

The reported incidence of VTEC in Norway has so far been low (0-17 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.

Graph Trends of VTEC infection 2000-2004



9.26.1.1 HUS

During the time period 1992 to 2004, there were eight cases of HUS.

9.26.2 Microbiological characteristics

No information or data provided.

9.26.3 Travel related infection

Approximately half of all cases acquire their infection abroad.

9.26.4 Outbreaks

The only registered foodborne VTEC O157 outbreak occurred in 1999. Epidemiological investigations implicated domestically produced lettuce as the most likely source of infection.

9.27 Poland

9.27.1 Trends and sources of infection

In 2004, there were four cases of VTEC reported in Poland.

9.27.1.1 HUS

No information or data provided.

9.27.2 Microbiological characteristics

No information or data provided.

9.27.3 Travel related infection

No information or data provided.

9.27.4 Outbreaks

No information or data provided.

9.28 Portugal

9.28.1 Trends and sources of infection

In 2004, there were 25 cases of *E. coli* infection reported in Portugal, all of which were caused by non-O157 serogroups. The majority of cases were male (60.0%).

9.28.1.1 HUS

No information or data provided.

9.28.2 Microbiological characteristics

All isolates carried VT genes. The eae gene was present in 32.0% of isolates.

9.28.3 Travel related infection

No information or data provided.

9.28.4 Outbreaks

No information or data provided.

9.29 Romania

During 2004, no isolates of VTEC were received by the reference laboratory in INCDMI, Cantacuzino.

9.30 Scotland

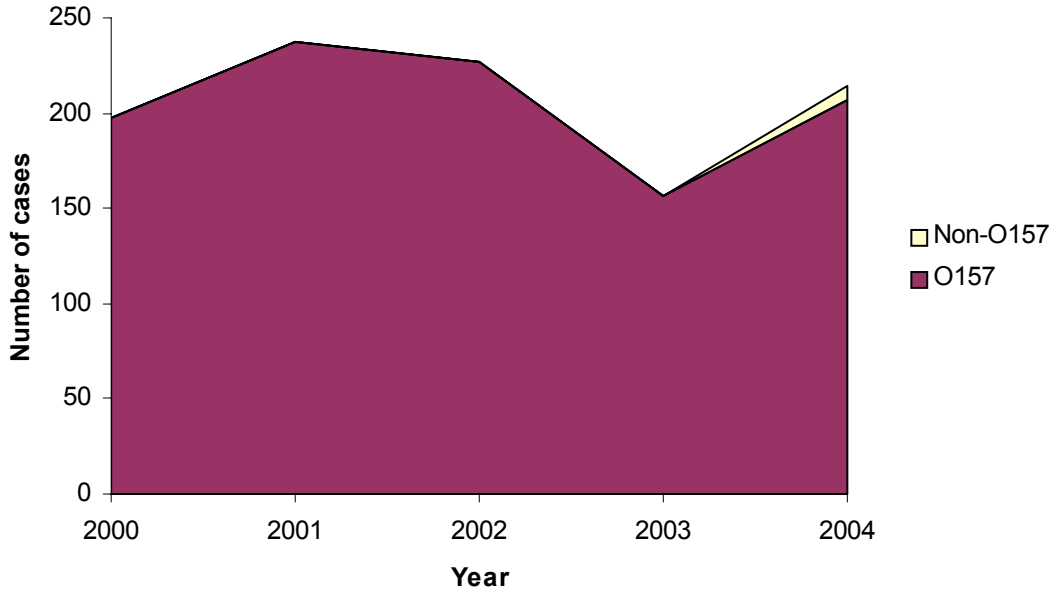
9.30.1 Trends and sources of infection

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 2004, 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 2004, SERL and diagnostic laboratories reported 214 culture-positive cases of VTEC infection to HPS (Graph). VTEC O157 accounted for 207 cases, with an incidence rate of 4.1 cases per 100,000 population. No vtx genes were identified in a further two isolates of E.coli O157. Non-O157 VTEC reports comprised two VTEC O145 cases, and single reports of five other non-O157 serogroups.

Within VTEC O157 cases, historical patterns in geographical variation recurred in 2004, with the North East reporting the highest rate of infection in mainland Scotland. Children under 10 accounted for 38% of all cases. Person-to-person spread accounted for 6% of cases.

Graph Trends of VTEC infection 2000-2004



9.30.1.1 HUS

Whilst 10% of all VTEC O157 cases were asymptomatic, 62% reported bloody diarrhoea, and 43% required hospitalisation; HUS was reported in 10% (21 cases). HUS was reported in two further cases in 2004: one patient with culture negative but serum antibody positive serogroup O157, and one with VTEC O145.

9.30.2 Microbiological characteristics

Of the 206 isolates of VTEC O157 in 2004 available for further investigation, 86% possessed the VT2 gene alone; the remaining 14% possessed both VT1 and VT2 genes. PT21/28 continued to predominate, as observed in Scotland since the late 1990s, accounting for 59% of VTEC O157 isolates in 2004. PT2, identified in the two large foodborne outbreaks,

declined markedly from the late 1990s but increased to account for 17% of isolates in 2004. In 2003, PT2 accounted for 9% of isolates.

Over 98% of *E. coli* O157 isolates submitted to SERL from 1999 to 2004 were verotoxigenic. In recent years, small but increasing numbers of non-O157 *E. coli* isolates were also reported. Possession of verotoxin genes was more varied amongst these organisms.

9.30.3 Travel related infection

Twenty-four of the 214 VTEC cases in 2004 were reported by local investigators to have acquired infection outside the UK, based on travel, clinical and exposure histories. Destinations most frequently reported were Africa and Spain (six cases each) and the Middle East (four cases).

9.30.4 Outbreaks

Enhanced surveillance identified that sporadic infections accounted for 81% of VTEC O157 cases in 2004, with 11 general outbreaks (defined as involving members of more than one household or institution) accounting for the remainder. In seven outbreaks, exposures to farm animals or their environments were reported as the most likely source of infection, including two outbreaks where VTEC O157 was isolated from private water supplies on farmland. In one further outbreak, occupational contact with raw meat was the suspected source. Outbreak epidemiology has become more varied in recent years, with substantial numbers affected during incidents involving campsites or water supplies contaminated by faeces from grazing animals.

9.31 Slovakia

9.31.1 Trends and sources of infection

In 2004, one case of *E. coli* O157 infection was reported in Slovakia. The case was female and under one year of age.

9.31.1.1 HUS

No information or data provided.

9.31.2 Microbiological characteristics

No information or data provided.

9.31.3 Travel related infection

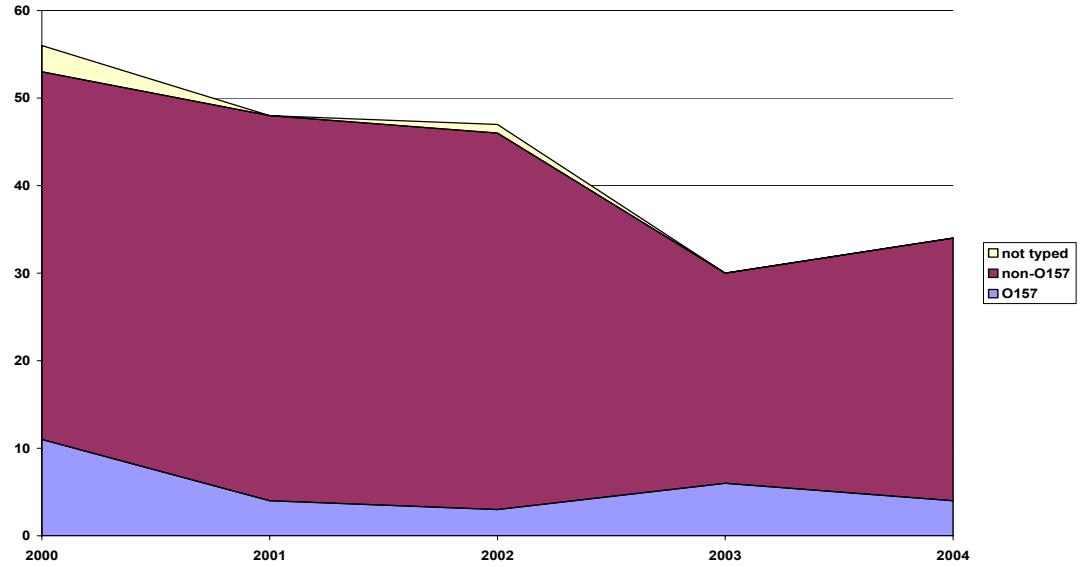
No information or data provided.

9.31.4 Outbreaks

No information or data provided.

9.32 Slovenia

There were 34 cases of VTEC infection reported in 2004. The majority (30, 88.2%) were non-O157 serogroups, the most frequent being O2 (8, 26.7% of non-O157 cases), O1 (7, 23.3%), O6 (4, 13.3%), and O26 (4, 13.3%), five other serogroups were reported.



9.33 South Africa

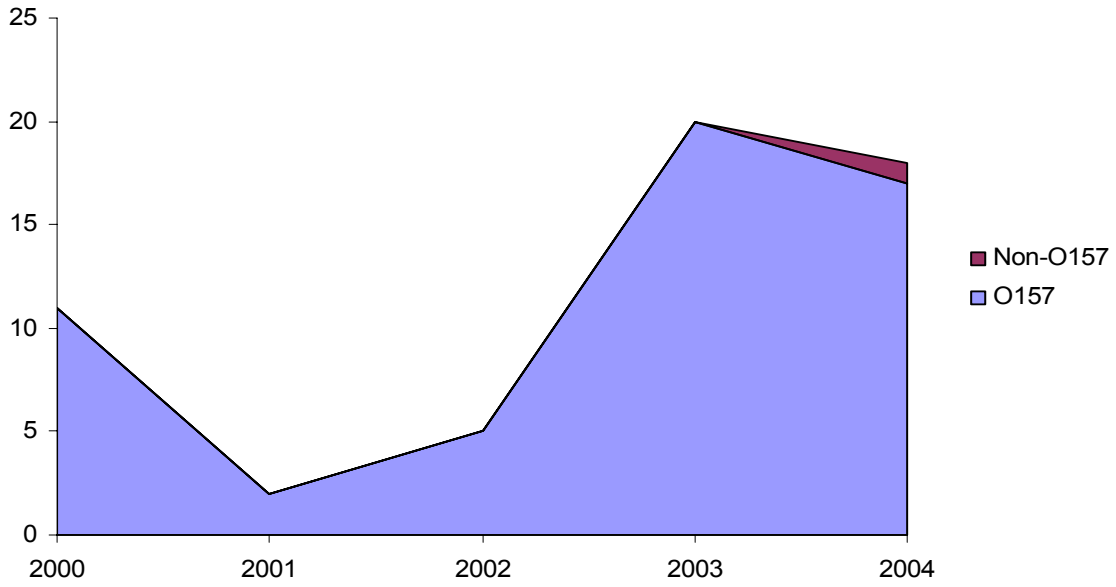
The EDRU received no human VTEC isolates during 2004.

9.34 Spain

9.34.1 Trends and sources of infection

In 2004, there were 18 cases of VTEC infection reported in Spain. The number of reported cases has increased over recent years (Graph). The rise can be attributed to the inclusion 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.

Graph Trends of VTEC infection 2000-2004



9.34.1.1 HUS

One case of HUS was reported in 2004.

9.34.2 Microbiological characteristics

All of the VTEC isolates carried VT genes, of which 50.0% carried only the VT2 gene and the other 50.0% carried both. All of the O157 isolates and none of Non-O157 isolates carried the eae gene.

9.34.3 Travel related infection

No information or data provided.

9.34.4 Outbreaks

No information or data provided.

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. The distribution of cases throughout the country differed from previous years, with more cases in the counties of Stockholm and Jönköping (in Jönköping an ongoing study made the number of samples analysed for EHEC higher than normal).

9.35.1.1 HUS

Six people with EHEC O157 and one further person with EHEC of unknown serotype developed HUS in 2004.

9.35.2 Microbiological characteristics

No information or data provided.

9.35.3 Travel related infection

Fifty-nine cases (29.5%) acquired their infections abroad.

9.35.4 Outbreaks

There was one outbreak of EHEC reported in 2004. Fourteen young Swedes and one German fell ill after attending a football tournament in July. All the cases were infected with the same strain of EHEC O157. The source of infection was probably food they had consumed at a school they had stayed at during the tournament.

9.36 Switzerland

9.36.1 Trends and sources of infection

In 2004, 45 VTEC infections were notified to the SFOPH by primary diagnostic laboratories, 25 of these were confirmed by the National Centre for Enteropathogenic bacteria.

9.36.1.1 HUS

In a study with the Swiss Paediatric Surveillance Unit (SPSU) that commenced on 1st April 2004, 17 cases of HUS in children below the age of 16 years were registered. Evidence of VTEC infection was present in 11 cases. A VTEC strain was isolated by the NENT in six cases, three of which belonged to the O157 serogroup.

9.36.2 Microbiological characteristics

No information or data provided.

9.36.3 Travel related infection

Information on travel history was available for 34 reported cases of VTEC infection, of which 16 (47%) had a history of travel abroad. The reported destinations were countries in Latin America (5; 31%), Africa (5; 31%), Asia (4; 25%) and Southern Europe (2; 13%).

9.36.4 Outbreaks

No outbreaks were detected in 2004.

10 Campylobacter

10.1 Austria

10.1.1 Trends and sources of infection

In 2004, there were 6,222 cases of campylobacteriosis, which was a significant increase (36.8%) in reported cases of campylobacteriosis throughout Austria in 2003. All federal counties reported increasing numbers, especially Tyrol who saw an increase of 77.7% and Styria who saw an increase of 70.5%. In Vienna and Salzburg campylobacteriosis is the most frequently reported infectious disease. Incidence throughout Austria now lies at 66.5 per 100,000 of the population, however this varies considerably between the different counties.

10.1.1.1 Species differentiation

Species differentiation of approximately one third of all reported faecal isolates revealed 91.8% were *C. jejuni*, 6.3% were *C. coli*, and 1.9% were other species.

10.1.2 Antimicrobial resistance

No substantial change in antimicrobial resistance has been observed in Austria compared to 2003. Forty per cent of isolates show resistance to quinolones, 20% show resistance to Tetracyclines and 2% show resistance to macrolides.

10.1.3 Travel related infection

No information or data provided.

10.1.4 Outbreaks

No information or data provided.

10.2 Australia

No information or data provided.

10.3 Belgium

There were 6,716 cases of *Campylobacter* reported in Belgium in 2004. The majority (45.6%) were in the 15-64y age band although 23.7% were aged 1-5y. No speciation is done.

10.4 Bulgaria

No information or data provided.

10.5 Canada

No information or data provided.

10.6 Cyprus

No information or data provided.

10.7 Czech Republic

10.7.1 Trends and sources of infection

In 2004, there were 25,492 laboratory reports of campylobacteriosis in the Czech Republic. Nearly half of all cases were in the 15 to 64 year age group (47%), 52% of cases were male.

10.7.1.1 Species differentiation

Nearly all isolates were identified as *C. jejuni* (92%).

10.7.2 Antimicrobial resistance

No information or data provided.

10.7.3 Travel related infection

One per cent of cases reported travel abroad, the most commonly reported destination was Slovakia (45 cases; 17.9%).

10.7.4 Outbreaks

No information or data 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 2004, there were 3,724 reported cases, with an incidence of 68.8 cases per 100,000 of the population. Following two years of decline, this was a 5.1% increase in confirmed laboratory cases compared to 2003. However, the number of cases was still lower than in 2002 (4,378 cases). 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

No information or data provided.

10.8.2 Antimicrobial resistance

No information or data 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 2004.

10.9 England and Wales

10.9.1 Trends and sources of infection

In 2004, there were 44,321 laboratory reports of campylobacteriosis in England and Wales. A large proportion of cases were in the 15 to 64 year age group (73%), 53% of cases were male. A seasonal peak was observed between May and September.

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 information or data provided.

10.9.3 Travel related infection

No information or data provided.

10.9.4 Outbreaks

No information or data 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 2004, 124 cases of campylobacteriosis (9.1 per 100,000 of the population) were reported. Cases were registrated from March to November with a peak in September. The age distribution shows a large proportion of cases (33%) were children aged between one and four years.

10.10.1.1 Species differentiation

All isolates underwent speciation. *C. jejuni* was isolated from 98% of isolates, the remaining 2% were identified as *C. coli*.

10.10.2 Antimicrobial resistance

No information or data provided.

10.10.3 Travel related infection

In 2004, four cases of campylobacteriosis (3.2%) acquired their infection abroad. Two cases reported travel to Turkey, one to Austria and the other to the United Kingdom.

10.10.4 Outbreaks

All cases were sporadic.

10.11 Finland

10.11.1 Trends and sources of infection

In 2004, there were 3,584 reports of campylobacteriosis in Finland. 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

Most of the isolates were identified as *C. jejuni* (81%).

10.11.2 Antimicrobial resistance

No information or data provided.

10.11.3 Travel related infection

Over half of all cases acquired their infections abroad (55%). The most commonly reported destinations were Spain (250 cases; 12.6%), Thailand (194 cases; 9.8%), Turkey (134 cases; 6.8%) and India (110 cases; 5.5%).

10.11.4 Outbreaks

No information or data provided.

10.12 France

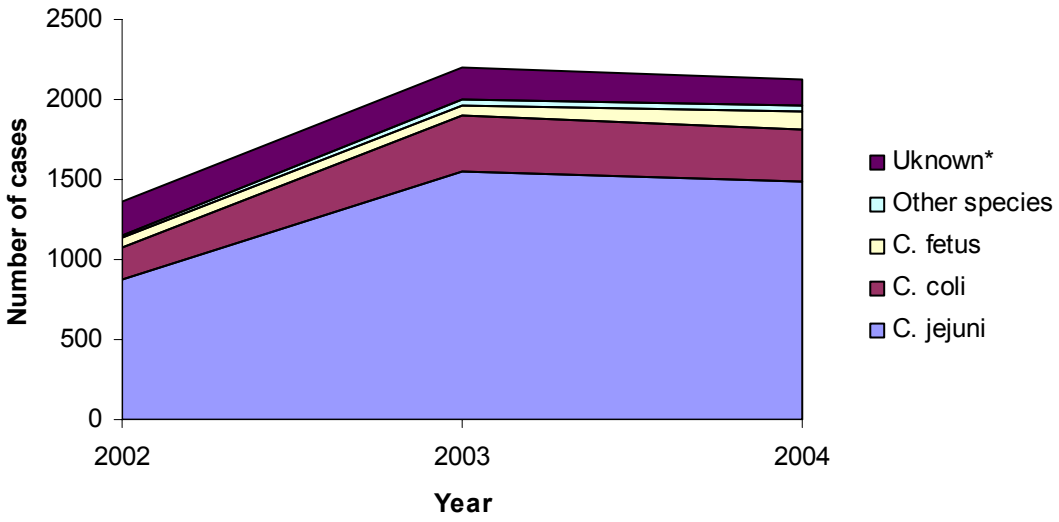
10.12.1 Trends and sources of infection

In 2004, the NRL for *Campylobacter* received 2,127 strains. Fifty six percent of cases were male, 26% were under 5 years old. A seasonal peak was observed between June and October.

10.12.1.1 Species differentiation

Of the 1,961 (92%) isolates which have been speciated so far, 1,482 (75.6%) were *C. jejuni* followed by 335 (17.0%) *C. coli* and 114 (5.8%) *C. fetus*. Data are marked by a relatively high proportion of *C. coli* isolates compared to other European countries.

Graph Trends of *Campylobacter* isolates 2002-2004



10.12.2 Antimicrobial resistance

Resistance to Ampicillin was 37% and resistance to Nalidixic acid was 36%. Resistance to Ciprofloxacin is higher for *C. coli* (42.0%) than for *C. jejuni* (25.3%). Resistance of *C. jejuni* to fluoroquinolones has decreased from 31.7% in 2002 to 25.3% in 2004. Resistance to Erythromycin is low (3.2%) and no strain is resistant to Gentamycin. Data are marked by the frequency of resistance to Ampicillin compared to other European countries.

10.12.3 Travel related infection

No information or data provided.

10.12.4 Outbreaks

No information or data provided.

10.13 Germany

No information or data provided.

10.14 Greece

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 2004.

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 2004 *Campylobacter* has become the leading cause of acute gastroenteritis in Hungary, surpassing salmonellosis for the first time. Between 2000 and 2004 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 9,086 cases in 2004.

10.15.1.1 Species differentiation

No information or data provided.

10.15.2 Antimicrobial resistance

The antimicrobial resistance data for 2004 are marked by the frequency of resistance to quinolones, Ampicillin and 3rd generation cephalosporins. Resistance to fluoroquinolones is an emerging problem in Hungary with about 50% of human isolates resistant to Norfloxacin, Ciprofloxacin and Pefloxacin.

10.15.3 Travel related infection

No information or data provided.

10.15.4 Outbreaks

General outbreaks are rare. Between 2000 and 2004 most reported outbreaks were confined to families. Many of the outbreaks implicated inadequate heated poultry or other contaminated food as the vehicle of infection. However, sewage contaminated tap water was found to be responsible for a community outbreak affecting 203 people in 2004. This outbreak had dual aetiology, with the majority of cases infected with norovirus, however, *Campylobacter* was isolated from the stools of eight cases. Between the years 2000 and 2004 95% of *Campylobacter* cases were sporadic.

10.16 Iceland

No information or data 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 2004, there were 1,711 cases of confirmed campylobacteriosis reported, which corresponds to a crude incidence rate of 43.7 cases per 100,000 of the population. This represented an increase on the previous two years (1,568 cases in 2003 and 1,336 cases in 2002). The highest burden of illness was in children under five years of age. A peak in cases occurred in week 24 and week 38.

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

Travel history was provided for 34 cases (2%). Of these, four reported travel outside of Ireland during the exposure period of their illness. The countries listed were Mexico, Peru, Tunisia and Thailand.

10.17.4 Outbreaks

One small family outbreak of campylobacteriosis (involving two cases) was notified in 2004. The mode of transmission was suspected to be foodborne.

10.18 Italy

10.18.1 Trends and sources of infection

In 2004, 582 human isolates were reported. Forty-three per cent of cases occurred between July and September.

10.18.1.1 Species differentiation

C. jejuni represents about 90% of all isolates.

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.

10.18.3 Travel related infection

No information or data provided.

10.18.4 Outbreaks

No outbreaks of *Campylobacter* infection have been detected in Italy.

10.19 Japan

No information or data provided.

10.20 Latvia

No information or data provided.

10.21 Lithuania

10.21.1 Trends and sources of infection

The incidence of infection has increased from 0.2 per 100,000 of the population in 1995 to 23.1 per 100,000 of the population in 2004, when there were 957 cases. Epidemiological investigations of clusters of disease have shown that campylobacteriosis in Lithuania is caused by poultry and its products.

10.21.1.1 Species differentiation

In 2004, less than 50% of the obtained *Campylobacter* isolates were speciated. Thirty eight per cent were identified as *C. jejuni*, less than five per cent were *C. coli* (3.6%).

10.21.2 Antimicrobial resistance

In 2004, just over 67% of isolates underwent antimicrobial susceptibility testing. Resistance was most commonly reported against Ampicillin (13.3%) and Ciprofloxacin (10.8%).

10.21.3 Travel related infection

No travel history was available.

10.21.4 Outbreaks

No outbreaks of *Campylobacter* have been reported recently in Lithuania.

10.22 Luxembourg

10.22.1 Trends and sources of infection

In 2004, 306 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, 304 were confirmed as *C. jejuni* and the remaining two were identified as *C. coli*.

10.22.2 Antimicrobial resistance

Ninety-nine (32%) isolates tested were found to be resistant to both Ciprofloxacin and Nalidixic acid. A further 27 (9%) were resistant to Nalidixic acid only. One hundred and seventy-nine isolates (59%) were susceptible to all of the three antibiotics tested (Erythromycin, Nalidixic acid, Ciprofloxacin).

10.22.3 Travel related infection

No information or data provided.

10.22.4 Outbreaks

No information or data provided.

10.23 Malta

10.23.1 Trends and sources of infection

During 2004, there were 87 isolates of *Campylobacter* reported from local medical diagnostic laboratories. A higher number of isolates were seen in the months of April and November on comparison with the other months of the year, 56.3% of cases were male.

10.23.1.1 Species differentiation

The species most frequently isolated was *C. jejuni* (80.5%).

10.23.2 Antimicrobial resistance

Isolates are 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

Fourteen outbreaks affecting 30 people were reported in 2004, the majority of which were confined to households. Other venues implicated included hotels, restaurants and institutions.

10.24 The Netherlands

10.24.1 Trends and sources of infection

With 3,359 cases in 2004, the incidence of campylobacteriosis appears to be gradually declining in the Netherlands. The increase in the number of cases seen in 2004 compared to the exceptionally low levels seen in 2003 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 2004 the vast majority of the isolates speciated were shown to be *C. jejuni*.

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 macrolids (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

In 2004, eight outbreaks of campylobacteriosis were reported as 'foodborne disease outbreaks', which are mandatory notifiable in the Netherlands, unlike the sporadic cases of campylobacteriosis. The reported outbreaks were small and affected in total 32 patients.

10.25 New Zealand

With 12,213 cases reported the rate of campylobacteriosis in New Zealand in 2004 was 326.8 per 100,000 of the population.

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 2004, a total of 2,275 cases of campylobacteriosis were reported in Norway (incidence rate 49.7 per 100,000 of the population). Of these, 1,111 (49%) were known to be imported, 907 (40%) were domestically acquired, and for 257 (11%) 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 Norwegian Institute of Public Health (NIPH) receives and speciates a systematic sample of isolates. Approximately 85% are identified as *C. jejuni*, 10% are identified as *C. coli*, and the remaining five percent are identified as other species.

10.26.2 Antimicrobial resistance

No information or data provided.

10.26.3 Travel related infection

At least half of all cases of campylobacteriosis are travel related. The most commonly reported destinations in 2004 were Spain (270 cases; 24.3%), Turkey (74 cases; 6.7%), France (65 cases; 5.9%), Thailand (57 cases; 5.1%) and Egypt (52 cases; 4.7%).

10.26.4 Outbreaks

Most domestic cases are sporadic. However, in 2004 eight small outbreaks of campylobacteriosis were reported to NIPH. This is a similar number to previous years. The most common supected vehicles of infection in domestic campylobacteriosis outbreaks are chicken and drinking water.

10.27 Poland

10.27.1 Trends and sources of infection

In 2004, 24 cases of campylobacteriosis were reported in Poland. Most of the cases (91.7%) were reported from one region.

10.27.1.1 Species differentiation

No information or data provided.

10.27.2 Antimicrobial resistance

No information or data provided.

10.27.3 Travel related infection

No information or data provided.

10.27.4 Outbreaks

No information or data provided.

10.28 Portugal

No information or data provided.

10.29 Romania

During 2004, no isolates of *Campylobacter* were received by the reference laboratory in INCDMI, Cantacuzino.

10.30 Scotland

10.30.1 Trends and sources of infection

The incidence of *Campylobacter* infection increased during the 1980's and 1990's and peaked in 2000, with 6,482 isolates reported. However, the incidence has declined every year since.

In 2004, 4,365 isolates were reported, a reduction of 2,117 (33%) on the peak. In 2004, 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 information or data provided.

10.30.3 Travel related infection

No information or data 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

In the year 2004, there were 1,691 cases of *Campylobacter* reported in the Slovak Republic (31.4 per 100,000 of the population). The age specific incidence rate is highest in children under four years of age. The seasonality of campylobacteriosis is fairly typical with most cases occurring during the summer months of June, July and August.

10.31.1.1 Species differentiation

No information or data provided.

10.31.2 Antimicrobial resistance

No information or data provided.

10.31.3 Travel related infection

No information or data provided.

10.31.4 Outbreaks

No information or data provided.

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. The majority of cases occurred during August and September, and nearly half of all infections were in children under 10 years of age.

10.32.1.1 Species differentiation

No information or data provided.

10.32.2 Antimicrobial resistance

No information or data provided.

10.32.3 Travel related infection

No information or data provided.

10.32.4 Outbreaks

No outbreaks of *Campylobacter* have ever been detected in Slovenia.

10.33 South Africa

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 within different laboratories.

10.34 Spain

10.34.1 Trends and sources of infection

In 2004, the National Reference Laboratory received 343 isolates of *Campylobacter*.

10.34.1.1 Species differentiation

C. jejuni was the predominant species identified (82%).

10.34.2 Antimicrobial resistance

Most isolates of *C. jejuni* and *C. coli* were resistant to Ciprofloxacin and Tetracyclines.

10.34.3 Travel related infection

No information or data provided.

10.34.4 Outbreaks

No information or data provided.

10.35 Sweden

10.35.1 Trends and sources of infection

Between 1995 and 2004, 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 and during the last two years this decline has continued. During 2004, a total of 6,226 cases of campylobacteriosis were reported, a big decrease from the year before. This decrease was evenly distributed throughout the country, during the whole year, between the sexes and the different age groups.

10.35.1.1 Species differentiation

No information or data provided.

10.35.2 Antimicrobial resistance

No information or data provided.

10.35.3 Travel related infections

Approximately 55 to 70% of infections are acquired abroad.

10.35.4 Outbreaks

Four small outbreaks of campylobacteriosis were reported in 2004.

10.36 Switzerland

10.36.1 Trends and sources of infection

According to laboratory reports to the SFOPH, the decreasing trend of campylobacteriosis continued in 2004, the number of reported cases (66) declined by 9.5%.

10.36.1.1 Species differentiation

No information or data provided.

10.36.2 Antimicrobial resistance

No information or data provided.

10.36.3 Travel related infection

No information or data provided.

10.36.4 Outbreaks

No outbreaks were detected.

11 Urgent enquiries sent during 2004.

One of the functions of Enter-net is to receive and disseminate requests for information on potential threats to health. During 2004, Enter-net received 18 urgent enquiries (Table), nearly all involved *Salmonella* infection.

Table Summary of urgent enquiries sent during 2004

Index country	Month	Pathogen	Cases	Association	International dimension
Austria	Feb	*S.* Typhimurium U291	100+	Eggs	Yes
Ireland	Mar	*S.* Havana	4	Unknown	Yes
Denmark	Mar	*E. coli* O157	25	Milk	No
Germany	Mar	*S.* Goldcoast	250+	Raw pork	Unknown
Ireland	Apr	*S.* Typhimurium DT49	8	Unknown	Unknown
USA	May	*S.* Enteritidis PT39	Unknown	Almonds	Yes
Portugal	Jul	Unknown	Unknown	European Football Cup 2004	Unknown
Sweden	Aug	*E. coli* O157	17	Gothia cup football tournament	Yes
Czech Republic	Aug	*S.* Enteritidis PT13	Unknown	Unknown	Unknown
Austria	Aug	*S.* Typhimurium DT46	Unknown	Eggs/poultry	Unknown
England and Wales	Sep	*S.* Newport	500	Lettuce	Yes

Latvia	Sep	*S.* Enteritidis	10	International seminar	Yes
Denmark	Oct	*S.* Typhimurium NT	34	Pork	No
Denmark	Oct	*S.* Typhimurium PT12	25	Unknown	Yes
Canada	Oct	Hepatitis A	Unknown	International wine festival	Unknown
Norway	Nov	*S.* Thompson	Unknown	Lettuce	Yes
Sweden	Nov	*S.* Mikawasima	Unknown	Unknown	Unknown
Latvia	Dec	*S.* Derby	36	Pork	No

12 External Quality Assurance of National Reference Laboratories.

External quality assurance schemes for *Salmonella* serotyping, and the phage typing of *S.* Enteritidis and *S.* Typhimurium were run in 2004.

There were 10 *Salmonella* strains for serotyping, 10 Enteritidis and 10 Typhimurium strains for phage typing sent out during March and April 2004.

The results can be summarised as the following; 8 of 12 laboratories participating in the Enteritidis phage typing QA scheme identified the correct phage type in 80% or more of the strains, and 11 of the 12 labs in the Typhimurium phage typing QA achieved 80% or more correct types. Overall 10 of the 12 laboratories achieved 80% or more in total.

There was no VTEC EQA scheme in 2004.

13 List of Enter-net participants 2004

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