trends and sources

2004

report on zoonotic agents in belgium in 2004

working group on foodborne infections and intoxications

- Federal Agency for the Safety of the Food Chain (FASFC)
- Scientific Institute of Public Health (WIV-ISP)
- Veterinary and Agrochemical Research Centre (CODA-CERVA)

.be

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Preface

As was the case for the previous two editions, the basis for this brochure is the Belgian report as referred to in article 5 of Directive 92/117/EEC; i.e. "Trends and sources of zoonoses and zoonotic agents in humans, foodstuffs, animals and feeding stuffs".

Almost all data on zoonoses and zoonotic agents, as available today in Belgium, concerning primary production including feed, food and human infections can be found in this report. It comprises results from official monitoring programmes, laboratory findings and research activities. Therefore, we are convinced that the figures and the general, informative and descriptive texts are useful for the professional readers as well as for those who have a general interest in animal and human infections.

Obviously, this compilation is the combined effort of many people, laboratories and institutions. We therefore explicitly express our gratitude to those who made this publication possible, not in the least the Federal Agency for the Safety of the Food Chain and the different National Reference Laboratories.

We wish the reader a pleasant time reading this third edition of the Belgian report on zoonotic agents.

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for the members of the Working Group on Zoonosis, Foodborne Infections and Intoxications

Table of contents

Introduction

This third brochure on zoonotic agents in Belgium is based on the official "Zoonoses monitoring and data collection" report that was transmitted to the European Food Safety Authority (EFSA) in May 2005. It collects all available information on the occurrence of zoonoses, zoonotic agents, antimicrobial resistance in zoonotic agents and foodborne outbreaks in Belgium. The legal basis for the official report is Directive 92/117/EEC and Directive 2003/99/EC of the European Parliament and the Council on the monitoring of zoonoses and zoonotic agents amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC.

The collection of Belgian data on the occurrence of zoonoses and zoonotic agents in feed, animals, food and humans is essential to detect possible evolutions and to identify likely sources of zoonotic infections in humans.

In addition to the bare listing of the available data, some general information on the clinical aspects of the zoonotic infection, the route of transmission and some feasible recommendations are clarified. For each pathogenic agent relevant information is presented, e.g. if vaccination is allowed, whether a monitoring is conducted, or what laboratory methodology is used. Finally, the brochure summarises the evolution of the main zoonotic agents among animals and in foodstuffs.

Most of the data in this report are from the following sources:

- Federal Agency for the Safety of the Food Chain (FASFC);
- National Reference Laboratory for Food Microbiology (NRLFM);
- Scientific Institute of Public Health (WIV - ISP);
- Veterinary and Agrochemical Research Centre (CODA - CERVA).

This report was co-ordinated by H. Imberechts (CODA - CERVA), L. Vanholme (FASFC), K. Dierick (WIV - ISP) and G. Daube (NRLFM) and, with the collaborative help of (alphabetical order):

- J.-M. Collard, National Reference Laboratory for *Salmonella* and *Shigella*, Scientific Institute of Public Health;
- J. de Borchgrave and P. Dorny, National *Trichinella* and *Cysticercus* Reference Centre , Veterinary Department, Institute of Tropical Medicine Antwerp;

- K. De Schrijver, Ministry of the Flemisch Community, Department Hygiene and Health Inspection;
- L. De Zutter, Laboratory of Food Microbiology, Faculty of Veterinary Medicine, Ghent University;
- P. Dechamps and Ph. Dodion, Federal Agency for the Safety of the Food Chain, Control Division;
- G. Ducoffre, Scientific Institute of Public Health, Epidemiology Section;
- M. Fauville-Dufaux, National Reference Laboratory for tuberculosis and *mycobacterium*, Scientific Institute of Public Health, Pasteur Institute Department;
- Y. Ghafir and A. Van den Brande, National Reference Laboratory for Food Microbiology for the FASFC, Faculty of Veterinary Medicine, Université de Liège (actual address Y. Ghafir: Federal Agency for the Safety of the Food Chain);
- C. Godard and C. Wildemauwe, National Phage Typing Centre, Scientific Institute of Public Health, Pasteur Institute Department;
- I. Le Roux, National Reference Laboratory for Rabies, Scientific Institute of Public Health, Pasteur Institute Department;
- D. Pierard, National Reference Laboratory for Enterohemorrhagic *Escherichia coli*, Public Health, AZ-VUB, Microbiology Section;
- C. Saegerman, Federal Agency for the Safety of the Food Chain, Control Policy Division, Scientific Secretariat (actual address Departement of Infectious diseases and Parasitology, Faculty of Veterinary Medicine, Université de Liège);
- K. Vermeersch and J-P. Maudoux, Federal Agency for the Safety of the Food Chain, Control Policy Division;
- K. Walravens and M. Govaerts, National Reference Laboratory for Brucellosis, Laboratory of Bacterial Diseases and Immunology, Veterinary and Agrochemical Research Centre;
- M. Yde, National Reference Laboratory for *Listeria*, Scientific Institute of Public Health, Bacteriology Section.

Belgian reference laboratories for zoonotic agents

Zoonotic agent	Contact	Address	E-mail	Website
Brucella, public and animal health	K. Walravens	CODA - CERVA, Groeselenberg 99, 1180 Brussels	Karl.Walravens@var.fgov.be	http://www.var.fgov.be
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Escherichia coli VTEC and EHEC, public health	D. Pierard	AZ-VUB, Microbiology, Laarbeeklaan 101, 1090 Brussels	labomicro@az.vub.ac.be	
Food Microbiology	G. Daube	Université de Liège, Fac. de méd. vétérinaire, Bat. B43bis, Sart Tilman, 4000 Liège	Georges.Daube@ulg.ac.be	http://www.mdaoa.ulg.ac.be/fr/lnr
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	F. Portaels (public health)	ITG-Mycobacteriology Nationalestraat 155, 2000 Antwerpen	Fportaels@itg.be	http://www.itg.be
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Rabies	I. Le Roux	WIV-ISP, Institut Pasteur, Rue Engeland 642, 1180 Brussels	Ileroux@pasteur.be	http://www.iph.fgov.be
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Salmonella, animal health	H. Imberechts	CODA-CERVA, Groeselenberg 99, 1180 Brussels	Hein.Imberechts@var.fgov.be	http://www.var.fgov.be
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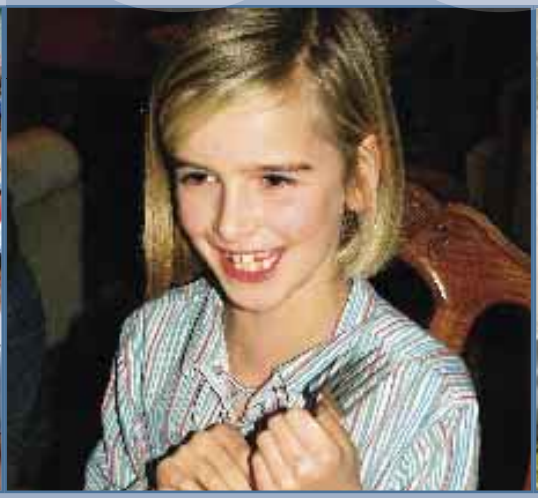
2004



general information

report on zoonotic agents in belgium in 2004 — trends and sources

Susceptible human population

The evolution of the total human population in Belgium categorised per age, sex and region from 1999 to 2004 is shown in the next table.

	1999	2000	2001	2002	2003	2004
Total	**10 213 752**	**10 239 085**	**10 263 414**	**10 309 725**	**10 355 844**	**10 396 421**
0-19	2 425 617	2 419 964	2 412 224	2 408 943	2 407 368	2 408 456
20-64	6 090 682	6 104 028	6 121 455	6 154 390	6 186 086	6 207 845
65+	1 697 453	1 715 093	1 729 735	1 746 392	1 762 390	1 780 120
Male	**4 993 718**	**5 006 014**	**5 018 019**	**5 042 288**	**5 066 885**	**5 087 176**
0-19	1 240 900	1 237 139	1 233 250	1 231 221	1 230 382	1 230 570
20-64	3 063 187	3 069 738	3 077 631	3 094 653	3 110 779	3 120 599
65+	689 631	699 137	707 138	716 414	725 724	736 007
Female	**5 220 034**	**5 233 071**	**5 245 395**	**5 267 437**	**5 288 959**	**5 309 245**
0-19	1 184 717	1 182 825	1 178 974	1 177 722	1 176 986	1 177 886
20-64	3 027 495	3 034 290	3 043 824	3 059 737	3 075 307	3 087 246
65+	1 007 822	1 015 956	1 022 597	1 029 978	1 036 666	1 044 113
Brussels	**954 460**	**959 318**	**964 405**	**978 384**	**992 041**	**999 899**
Flanders	**5 926 838**	**5 940 251**	**5 952 552**	**5 972 781**	**5 995 553**	**6 016 024**
Wallonia	**3 332 454**	**3 339 516**	**3 346 457**	**3 358 560**	**3 368 250**	**3 380 498**
Foreigners	**891 980**	**897 110**	**861 685**	**846 734**	**850 077**	**860 287**

Table A. *Evolution in the total human population 1999-2004. Source: National Institute for Statistics*

- Susceptible human population
- Susceptible animal populations
- Animals slaughtered in 2003 and 2004

Susceptible animal populations

Ruminants and pigs

The origin of the following figures is Sanitel, the computerised registration and identification database for farm animals, as managed by the Federal Agency for the Safety of the Food Chain

	2003		2004	
	Herds	Animals	Herds	Animals
Cattle	44 595	2 752 974	44 555	2 781 676
Pigs	10 986		10 614	
Breeding sows[1]		668 908		664 316
Fattening pigs[2]		5 115 683		4 998 124
Sheep	31 762	221 434	31 405	214 612
Goats	13 522	43 130	13 736	37 666
Deer	2 907	16 588	2 965	13 427

***Table B**. Total number of herds and animals in 2003 and 2004*

Poultry

	Herds	Animals
Gallus Gallus		
Layers	529	14 364 922
Broilers	1097	27 873 988
Elite, Parent, Breeding	658	8 708 809
Total	2 284	50 947 719

1 total number of available places for sows and gilts in all herds
2 total number of available places for fattening pigs in all herds

	Herds	Animals
Ducks	31	33 949
Geese	8	4 843
Guinea fowl	27	87 440
Partridges	2	123 300
Pheasants	14	206 649
Pigeons	4	1 520
Quails	7	56 020
Turkeys	63	498 146

***Table C**. Total number of holdings and total number of available places for fowl in 2004*

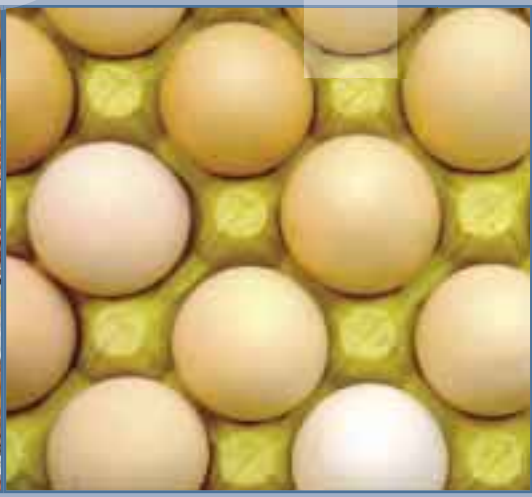
Animals slaughtered in 2003 and 2004

	Number 2003	Number 2004
Cattle	570 000	564 266
Calves	317 000	317 269
Pigs	11 609 933	11 229 149
Solipeds	12 304	11 655
Sheep	83 112	87 119
Goats	2 514	3 814
Broiler	222 327 256	244 064 267
Layer	19 711 279	28 577 233

***Table D**. Number of animals slaughtered in 2003 and 2004 (Source: Data from the Federal Agency for the Safety of the Food Chain)*

The significant rise in number of layers is associated with the outbreak of avian influenza in March 2003 and the consequent repopulation of poultry houses.

2004



salmonellosis

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Salmonellosis

In Belgium, as in many countries, Salmonella is the major cause of registered bacterial foodborne infections, both in individuals and in communities. Salmonella infections show as a gastro-intestinal illness with nausea, vomiting, abdominal cramps, diarrhoea and fever. In susceptible persons bacteraemia and septicaemia may occur. Often, food prepared with contaminated raw eggs, egg products or insufficiently heated poultry meat or pork are the source of the human Salmonella infection. Therefore, surveillance programmes that timely detect Salmonella contaminations in the whole food chain (feed, living animals, slaughterhouses, cutting plants, retail sector, restaurants) together with sanitary measures to reduce contamination are essential. In addition, good hygiene practices during food preparation in the kitchen and adequate refrigeration and heating also help to prevent Salmonella infections.

In 2004, the total number of Salmonella cases was significantly less than the year before, i.e. 9 543 records in 2004 as compared to 12 894 in 2003. This significant fall was mainly due to the remarkable decrease of serotype Enteritidis isolates in humans. The number of Salmonella Enteritidis isolates from poultry, which is known to be the main source of Salmonella contamination of eggs and poultry meat, on the other hand, did not seem to be reduced as compared to 2003. The most frequently found serotype in layers was Enteritidis, whereas in broilers Salmonella Typhimurium and Salmonella Paratyphi var. Java were mainly found. In pigs mostly serotypes Typhimurium and Derby were detected.

Salmonella contamination of meat was mainly found in poultry meat and pork and considerably less in beef. In 2004, the contamination of broiler carcasses and of minced meat was less than the year before. On the other hand, spent hens and pork were equally contaminated as in 2003. Salmonella serotypes associated with poultry meat were mainly Enteritidis (layers and broilers) and Bredeny and Agona (broilers). As for pork, Salmonella Typhimurium was the most frequently found serotype.

As for antibiotic resistance, Salmonella Enteritidis isolates were mainly susceptible to antimicrobials, whereas Salmonella Typhimurium, Salmonella Hadar and Salmonella Virchow were often found resistant to many antibiotics. The resistance of Salmonella strains isolated from a certain origin is reflected by the resistance of the serotypes most prevalent in the corresponding samples. Therefore, Salmonella from feed, food, birds and poultry are generally more susceptible than isolates from cattle and pigs.

- Salmonella in animal feed
- Salmonella in poultry
- Salmonella in pigs
- Salmonella in cattle
- Salmonella in food (meat and meat products)
- Salmonella in humans
- Antimicrobial resistance

Salmonella in animal feed

An official monitoring for the detection of Salmonella in compound feeding stuffs and in raw materials was organised by the Federal Agency for the Security of the Food Chain. The microbiological testing on 25g of sample was done at the laboratories of Federal Agency for the Safety of the Food Chain. In case of isolation of Salmonella in official samples no certification was provided by the Federal Agency.

Forty feed materials of animal origin, 281 of vegetable origin and 428 compound feeding stuffs were analysed for Salmonella. Meat and bone meals (n=8), greaves and poultry offal meal (2 each) were all found negative. One fish meal sample (n=29) was found contaminated with Salmonella Braenderup; another fish product was Salmonella free. All 81 samples from cereal grain origin were found negative for Salmonella. Only one sample from oil seed or fruit origin (n=156) contained Salmonella (Salmonella Montevideo in line seed derived material). Among the 44 other feed materials, one sample from tubers, roots and similar contained Salmonella Livingstone. Eleven compound feeding stuff samples (n=428) were found positive. In five of 198 compound feeding stuffs for pigs the following Salmonella were detected: 1 Salmonella Enteritidis, 1 Salmonella Typhimurium and 3 other Salmonella. In addition, in 3 feeding stuffs for laying hens (n=43) and in 1 for broilers (n=60) Salmonella was found. Finally, 2 batches of complementary feeding stuffs (n=92) were found contaminated with Salmonella (Salmonella Yoruba and Salmonella Rissen).

Salmonella in poultry

Salmonella in breeders and hatcheries

Surveillance programme in breeders

The National Salmonella control programme in breeders is based on Directive 92/117/EEC. Technicians affiliated to one of the two regional animal health associations (i.e. "Association Régionale de Santé et d'Identification Animales" [ARSIA (http://www.arsia.be/)] and "Dierengezondheidszorg Vlaanderen" [DGZ Vlaanderen (http://www.dgz.be/)] take the samples.

All breeder flocks are routinely examined for Salmonella at delivery as day-old birds (imported and domestic flocks). At the farm, pieces (5 by 5 cm) of the inner linings of the delivery boxes of the day-old chickens are taken, i.e. one sample for the hen-chicks and one for the cock-chicks. Each sample consists of 20 pieces of inner linings. The two samples are analysed separately. In addition, 20 living hen-chicks and 20 living cock-chicks are brought to the laboratory for serological testing on voluntary

base. The samples have to be taken the day of the delivery and have to reach the lab within 24h of sampling. Breeders during the rearing period are sampled at the age of 16 weeks by technicians of DGZ and ARSIA. To this end, a pooled faecal sample of 60 x 1g is taken. Technicians of DGZ and ARSIA also sample all breeders in production; i.e. a pooled faeces sample of 60 x 1g every six weeks. The samples are immediately analysed in the laboratories of DGZ or ARSIA according to ISO 6579:2002.

The official programme also examines the hygiene level of hatcheries by performing 4 controls a year. These are done during visits of the technician at non-hatching days and comprise various sites of the hatchery, including hatching drawers. Rodac samples are taken and both total bacteria and moulds are counted. After appropriate incubation, an index or code is given to the number of colonies per surface of approximately 22 cm^2 in order to facilitate comparisons. In addition, a specific Salmonella control is done 4 times a year, on pooled samples from dead-in-shell chicks and on fluff and meconium. The hatchery's owner sends these samples to the laboratory and therefore the success of these controls depends of his active collaboration.

In 1999 the royal and ministerial decrees concerning the sanitary qualification (Gezondheidskwalificatie - Qualification sanitaire, Royal Decree of 10 August 1998, Ministrial Decree of 19 August 1998) came into force that prescribe minimal requirements for infrastructure and general hygienic measures and that include specific sampling for Salmonella detection on farms with more than 5 000 birds. Thus, all poultry flocks before arrival at the slaughterhouse (i.e. breeders, layers and broilers) are controlled by bacteriological examination.

Case definition, notification, sanitary measures and vaccination

A poultry breeding flock is regarded as positive if Salmonella Enteritidis or Salmonella Typhimurium is isolated. A flock is considered as positive if at least one sample is positive. Salmonella is notifiable to the Federal Agency for the Safety of the Food Chain since January 2004. Notification is done by phone, fax or via E-mail. In case of positive findings in breeder flocks, the following measures are taken:

- incubation of hatching eggs is prohibited;
- incubated hatching eggs are removed and destroyed;
- not yet incubated hatching eggs may be pasteurised;
- logistic slaughtering of positive breeding flocks;
- cleaning and disinfection of housing after removal of the breeding flock.

Vaccination is strongly recommended for grandparent and parent flocks. Both inactivated and live attenuated Salmonella Enteritidis vaccines are available.

Epidemiological investigations and results of 2004 surveillance

In 2004, 13 layer breeder flocks of one-day old chickens were tested of which none were positive for Salmonella. Of the 13 layer flocks tested during rearing, 1 was positive for Salmonella Infantis. Fifty-six flocks were tested during production and 3 were found Salmonella positive, of which 1 for Salmonella Infantis. Layer breeders were found free of Salmonella Enteritidis and Salmonella Typhimurium in 2004, as was the case in 2003.

For the meat production line, 2 grandparent flocks were tested and both of them were negative for Salmonella. One hundred twenty-nine broiler breeder flocks with day-old chicks were checked and all were found negative for Salmonella. A total of 203 rearing breeder flocks were tested and 8 were positive for Salmonella, of which 2 for Salmonella Typhimurium and 2 for Salmonella Infantis (no Salmonella Enteritidis was found). Of the 549 flocks tested during production, 27 were positive for Salmonella, of which 1 for Salmonella Enteritidis, 2 for Salmonella Typhimurium, 1 for Salmonella Hadar, 1 for Salmonella Virchow and 5 for Salmonella Infantis.

Salmonella in layers and broilers

Surveillance programme in commercial poultry flocks

For commercial layers and broilers, no national or regional control programme for Salmonella is in force. The sanitary qualification for farms with more than 5 000 birds requires an exit sample for Salmonella in general, within 3 weeks of slaughter. The owner can take the material in 3 ways: (1) pooled faeces sample (60 x 1g) taken with swabs, (2) a pooled faeces sample (60 x 1g) taken by hand, or (3) two pairs of overshoes, pooled. All samples have to reach an accreditated laboratory within 48h of sampling. In addition, layer and broiler flocks may be sampled as day-old chicks. To this end, the owner samples pieces of inner linings of the delivery boxes in the same way as is done for breeder flocks. After transport to the production unit, a 60 x 1g faecal sample may be taken of every flock with different origin of rearing.

Case definition, notification, sanitary measures and vaccination

A poultry layer flock is declared positive if Salmonella Enteritidis is isolated. As for broilers, a flock is declared positive if in one of the samples Salmonella is isolated. Salmonella is notifiable (by phone, fax or via E-mail) to the Federal Agency for the Safety of the Food Chain since January 2004. In case of positive findings in layers, eggs are pasteurised and the poultry house must be cleaned and disinfected after removal of the positive flock. If Salmonella was detected in a broiler flock at 3 weeks before slaughter, the birds were slaughtered at the end of the day (so-called logistic slaughter). Vaccination is strongly recommended for layers.

Epidemiological investigations and results of 2004 surveillance

Laboratory findings of the National Reference Laboratory show that almost 68% of commercial layer isolates were serotype Enteritidis, while only one Typhimurium strain was found. Salmonella isolates from commercial broilers mainly belonged to serotypes Salmonella Paratyphi B var. Java and to Salmonella Typhimurium (both about 20%). Also Salmonella Enteritidis (9.7%) and Salmonella Infantis (7.5%) represented a relative large number of isolates. The evolution of serotypes of poultry isolates most likely reflects the incidence of Salmonella infections in the sector due to the official monitoring programme of breeder flocks and the sanitary qualification. Remarkable is the rise of serotype Enteritidis that increased to more than 20% of the poultry strains typed, which is comparable to the period 1995 - 2001. The number of Salmonella Infantis strains in 2004 was similar to that of 1993 (about 12%) and serotype Salmonella Paratyphi B var. Java was identified as often as Salmonella Typhimurium. On the other hand, Salmonella Virchow isolates decreased surprisingly to less than 10% of the poultry isolates.

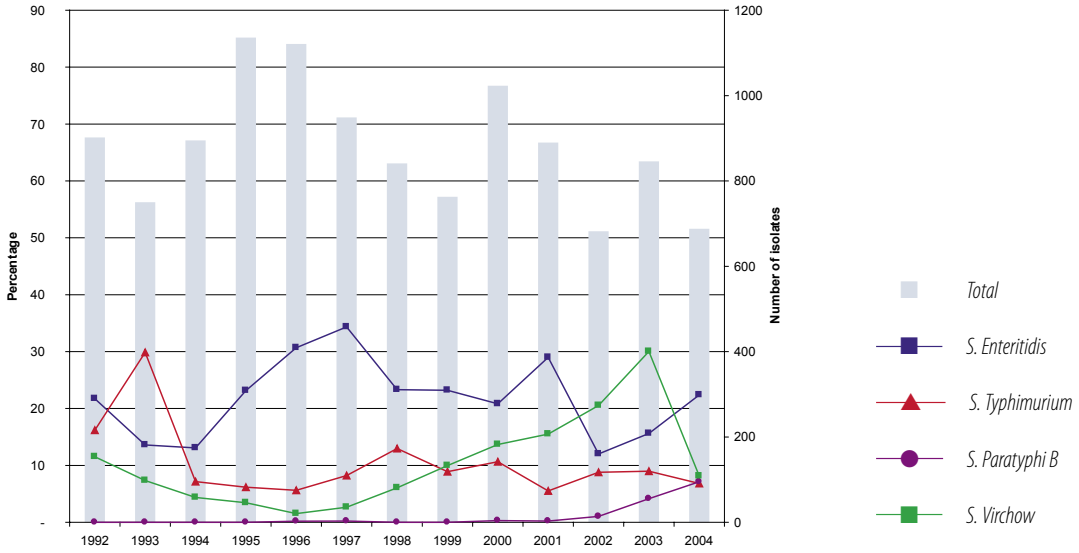

***Figure A**. Evolution of the percentages of the principal Salmonella serotypes isolated from poultry between 1992 and 2004.*

The bars represent the total number of poultry isolates per year, and refer to the right axis; the lines represent the percentage of each serotype per year and refer to the left axis.

Salmonella in turkeys, geese, ducks, pigeons and other poultry

There was no official surveillance programme for zoonotic Salmonella in turkeys, geese, ducks and pigeons in 2004 in Belgium. Nevertheless, 2 flocks of ducks were tested and one was found infected with Salmonella Enteritidis. As for geese and turkeys, 4 flocks each were sampled, but no Salmonella was found. The National Reference Laboratory received 20 isolates from pigeons. All these isolates were Salmonella Typhimurium (all variant Copenhagen O5-).

The following table gives an overview of other fowl flocks that were tested by the Federal Agency for the Safety of the Food Chain.

	Flocks tested	Positive for Salmonella	Salmonella Enteritidis	Salmonella Typhimurium
Guinea fowl	3	2	0	0
Quails	1	0	0	0
Pheasants	5	1	0	1
Partridges	2	0	0	0
Ostriches	8	0	0	0

***Table E**. Other fowl flocks that were tested by the Federal Agency for the Safety of the Food Chain*

Salmonella in pigs

There was no surveillance system for Salmonella in pigs in 2004. However, several samples were taken for research activities. In 2004, no vaccine was authorised in Belgium for the vaccination of pigs against Salmonella infections.

Laboratory findings from the National Reference Laboratory showed that, as compared to 2003, significantly less pig isolates were sent in for analysis in 2004, i.e. n=407. Among these, serotype Typhimurium (46.4%) [54.0% belong to Classic variant O5+] was the most prominent. In addition, Salmonella Derby (14.7%), Salmonella Infantis (8.6%) and Salmonella Brandenburg (6.1%) were identified.

Almost half of the Salmonella strains from pigs belonged to serotype Typhimurium, whereas the number of Salmonella Derby remains between 10 and 20% of the pig isolates since 1997. Other seroypes may become more predominant, i.e. Infantis or Brandenburg.

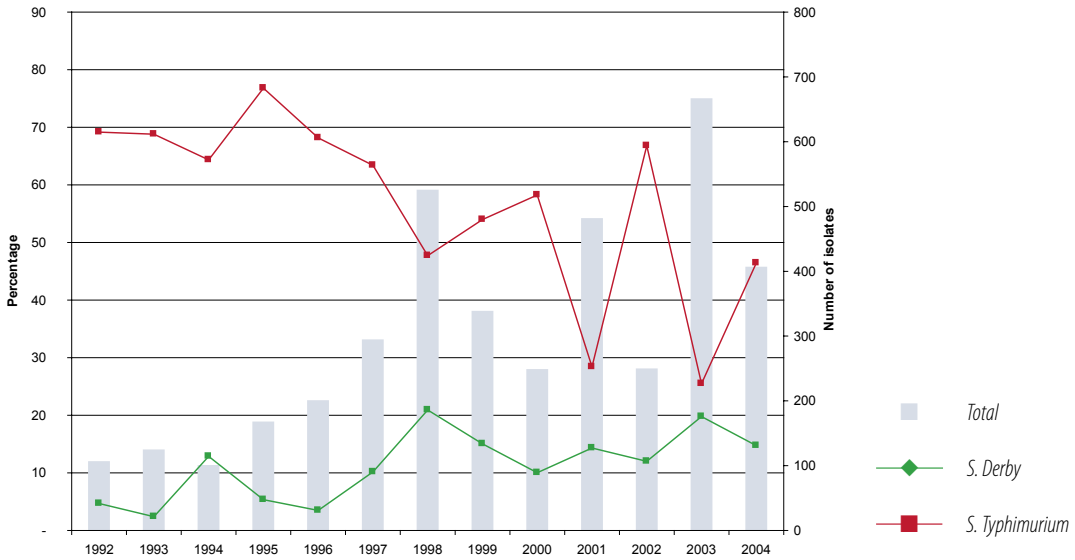

Figure B. *Evolution of the percentage of the principal Salmonella serotypes isolated from pigs between 1992 and 2004.*

The bars represent the total number of pig isolates per year, and refer to the right axis; the lines represent the percentage of each serotype per year and refer to the left axis.

Salmonella in cattle

There was no official monitoring for Salmonella in cattle in 2004. Diagnostic isolates were sent to the National Reference Laboratory for serotyping.

In Belgium no vaccine was authorised against Salmonella infection in cattle.

The number of cattle Salmonella isolates analysed by the National Reference Laboratory was similar as each year (n=92). Most frequently found serotypes were Dublin (39.1%) and Typhimurium (34.8%), which is similar to 2003. Classic O5+ variant Salmonella Typhimurium (65.6%) outnumbered Copenhagen $O5^{+}$ type. Four Salmonella Enteritidis were detected in cattle in 2004, which is two more than in 2003.

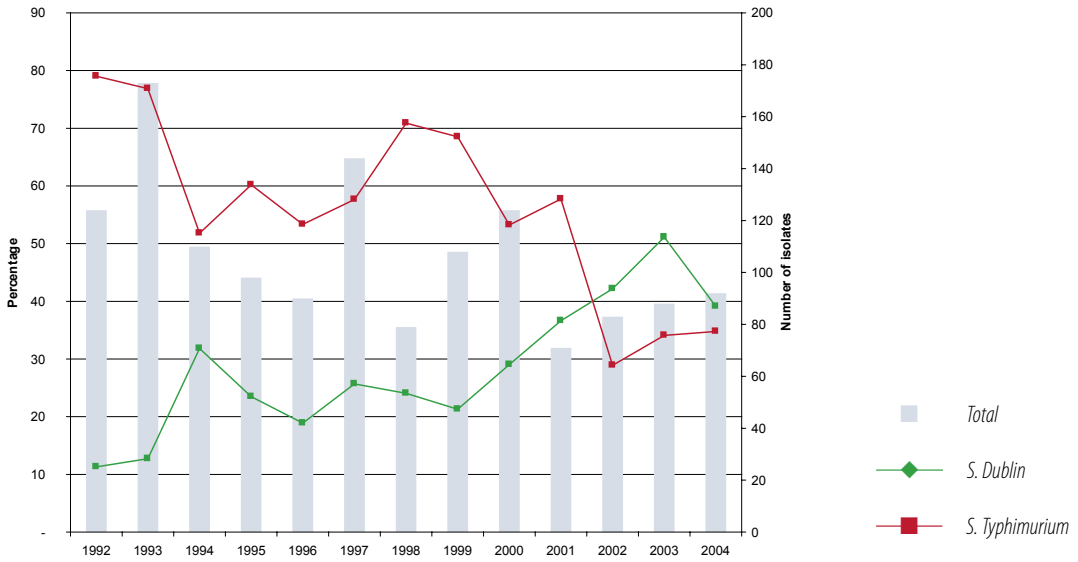

***Figure C**. Evolution of the percentage of the principal Salmonella serotypes isolated from cattle between 1992 and 2004.*
The bars represent the total number of cattle isolates per year, and refer to the right axis; the lines represent the percentage of each serotype per year and refer to the left axis.

Salmonella in food (meat and meat products)

Surveillance programme, analytical method and notification

In 2004, the Federal Agency for the Safety of the Food Chain selected for its monitoring programme more than 200 Belgian slaughterhouses, more than 100 meat cutting plants and more than 200 retail trades representative of the Belgian production of carcasses and meat.

The matrices for Salmonella sampling were carcasses, trimmings and minced meat of pork, trimmings and minced meat of beef, carcasses, meat preparation and fillets of broilers and layer carcasses. Sampling of pork carcasses was done by means of swabs. The carcass samples of broilers and layers consisted of 10g of neck skin. The following contamination levels were analysed: 25g (trimmings, minced meat of pork, chicken and beef), 600 cm^2 (pork carcasses), 1g (broiler carcasses) and 0.1g (layer

carcasses). Sampling was done by specially trained staff. For most matrices, approximately 100 - 300 independent samples were taken per matrix in order to detect a minimal contamination rate of 1% with 95% confidence.

Samples were taken every week from the first until the 52nd week, except during the 30th week of the year.

Five laboratories licensed by the Federal Agency for the Safety of the Food Chain and accredited according to ISO 17025 analysed all samples. The Belgian official method SP-VG-M002 was used for the detection of Salmonella in 25g, 1g or in swabs:

- pre-enrichment in buffered peptone water at 37°C for 16 to 20 h,
- selective enrichment on Diassalm at 42°C for 24 h,
- isolation of positive colonies on XLD at 37°C for 24h,
- confirmation of minimal 2 colonies on TSI at 37°C and miniaturised biochemical tests,
- serotyping and lysotyping at the National Reference Laboratory.

Notification is mandatory since March 2004 (Ministerial Decree on mandatory notification in the food chain). For Salmonella, absence in 25g in ready-to eat food put on the market is requested.

Epidemiological investigations and results of 2004 surveillance

The contamination of broiler carcasses (both at processing plant and at retail) is decreasing from 12.1% in 2003 to 7.9% in 2004. The contamination of broiler fillets with and without skin and of minced meat is 20.6% and 18.5%, respectively. The increase in fillets contamination from 11.7% in 2003 to 20.6% in 2004 is probably due to the inclusion of a number of samples containing skin.

The contamination of pig carcasses is slightly decreased since 2002 from 15.4% to 12.3%. The contamination of trimmings and minced meat remains unchanged for some years (between 6 and 12%).

The contamination of minced meat of beef with Salmonella is limited to some 2%.

Salmonella in other food

In the national random survey, 25g samples of raw milk cheese (n=147), ice cream (n=171), prepared dishes (n=121), cooked molluscs (n=38) and live bivalve molluscs at retail (n=139) were also tested and all were free for Salmonella.

Species	Quantity of sample analysed	Prevalence	Predominant serotype	Other serotypes (in decreasing order)
Beef				
Minced meat (n=328)	25g	2.1%	Typhimurium var. Copenhagen	Enteritidis, Typhimurium; Agona,
Carpaccio at retail (n=95)	25g	0%		
Steak tartare at retail (n=111)	25g	1.8%		
Pork				
Carcasses (n=374)	600cm^2	12.3%	Typhimurium	Typhimurium var. Copenhagen, Derby, Ohio, Infantis, Rissen
Trimmings (n=241)	25g	10.4%	Typhimurium	Derby, Typhimurium var. Copenhagen , Ohio
Minced meat (n=437)	25g	9.4%	Typhimurium	Typhimurium var. Copenhagen , Ohio, Derby, Enteritidis, Rissen, Paratyphi B
Raw ham (n=114)	25g	0%		
Broilers				
Carcasses at processing plant (n=183)	1g	8.7%	Bredeney	Virchow, Indiana, Agona,
Carcasses at retail (n=83)	1g	6.0%	Agona	Paratyphi B, Rissen
Fillets (n=282)	1g	20.6%	Enteritidis	Agona, Indiana, Infantis, Typhimurium, Paratyphi B, Bredeney, Virchow
Minced meat (n=335)	1g	18.5%	Enteritidis	Typhimurium, Typhimurium var. Copenhagen, Paratyphi B, Derby
Layers				
Carcasses (n=51)	1g	19.6%	Enteritidis	

Table F. *The results of the monitoring – Salmonella in meat and meat products*

	Samples	Sampling method	2000	2001	2002	2003	2004
Pork	Carcasses	600cm^2	24.1%	20.8%	15.4%	14.6%	12.3%
	Trimmings	25g	32.3%	17.7%	11.2%	6.1%	10.4%
	Minced meat	25g	16.6%	10.3%	11.0%	6.4%	9.4%
	Salami	25g	0.7%				
Broilers	Carcasses	1g	6.6%	11.4%	7.0%	12.1%	7.9%
	Minced meat	25g			21.0%	29.3%	18.5%
	Fillets	25g	12.7%	15.1%	12.6%	11.7%	20.6%
Layers	Carcasses	0.1g	26.7%	21.9%	20.3%	18.6%	19.6%
Beef	Carcasses	1600 cm^2		2.7%	0.0%		
	Trimmings	25g			0.9%	2.0%	
	Minced meat	25g	6.1%	2.7%	3.3%	0.3%	2.1%

***Table G**. Evolution of the food Salmonella prevalences 2000-2004*

Salmonella in humans

Surveillance programme and methods used

Data about human salmonellosis cases were obtained from 182 clinical laboratories by a weekly updated surveillance system. All isolates were serotyped by slide agglutination with commercial antisera following the Kauffmann-White scheme. When necessary, additional biochemical tests were done to confirm the identification or to differentiate between the subspecies. Phage typing and antimicrobial susceptibility testing were performed on isolates randomly sampled from the four serotypes Enteritidis, Typhimurium, Hadar and Virchow. Two additional serotypes (Brandenburg and Derby) were also randomly sampled and only tested for their antimicrobial susceptibility.

The objective of the national surveillance programme was to document the occurrence and trends of serotypes, to detect local, regional, national or even international outbreaks, to find and eliminate the source and to suggest preventive actions to the Federal Agency for the Safety of the Food Chain. This national Salmonella surveillance also intended to rapidly interact at the international level via electronic communication (with the Enter-net international surveillance network) and helped detecting outbreaks and targeting preventive strategies.

Epidemiological investigations and results of 2004 surveillance

From 1987 on, a remarkable increase in the number of registered human salmonellosis cases was registered, leading to a peak of 15 774 cases in 1999. In that year, exceptionally high numbers of Salmonella Enteritidis and Salmonella Typhimurium were recorded. Since then, the total number of laboratory-confirmed cases fell to 14 088, 11 065, 10 075, 12 894 and 9 543 reports in 2000, 2001, 2002, 2003 and 2004, respectively (Table H.). In 2003, the high number of salmonellosis cases mainly resulted from the spectacular increase of the serotype Enteritidis. These isolates exceeded for the first time 70% of the total number of Salmonella strains analysed. On the contrary, in 2004, the number of Salmonella Enteritidis and the total number of Salmonella cases diminished significantly.

In recent years, the number of Salmonella Typhimurium isolates remained at a level of about 2 500 strains per year. After decreasing over the last years, Salmonella Infantis increased in 2004 up to more than 100 cases to become the third serotype in human cases. As for Salmonella Virchow, about 140 to 150 isolates per year were analysed during 2000 to 2003, whereas in 2004 less than 100 strains were reported. This serotype represents the forth serotype in human cases. A remarkable drop of Salmonella Hadar (459 in 1998 vs 48 in 2004) and Salmonella Brandenburg (322 in 2000 vs 63 in 2004) cases was noted over the last years. Also the number of Salmonella Derby cases is shrinking since the beginning of 2000.

	1998	1999	2000	2001	2002	2003	2004
Total	14 514	15 774	14 088	11 065	10 075	12 894	9 543
Enteritidis	9 003	10 492	9 503	7 112	6 398	9 201	6 075
Typhimurium	3 221	3 348	2 799	2 370	2 438	2 486	2 459
Infantis	180	169	120	126	74	54	107
Virchow	115	86	147	143	132	152	91
Derby	162	138	169	158	92	100	64
Brandenburg	274	279	322	200	148	66	63
Hadar	459	237	178	143	74	60	48
Livingstone	107	83	109	62	47	43	34
Bovismorbificans	164	116	108	46	57	35	27
Goldcoast	83	49	77	96	54	55	26
Other Salmonella	746	777	556	609	561	642	549

***Table H**. Trends for the most prevalent Salmonella serotypes from 1998 to 2004*

Age and seasonal distribution

Most cases of salmonellosis were reported in children less than 5 years old (34.6% of cases), with no gender difference. Also people over 65 years are relatively more often infected with Salmonella.

	Salmonella				Salmonella Enteritidis				Salmonella Typhimurium			
Age	Total	M	F	SR	Total	M	F	SR	Total	M	F	SR
< 1 year	638	323	300	1.1	334	178	150	1.2	179	79	96	0.8
1 to 4 y	3305	1627	1655	1.0	1843	926	903	1.0	1229	589	635	0.9
5 to 14 y	1600	823	757	1.1	1141	588	538	1.1	375	192	179	1.1
15 to 24 y	493	224	265	0.8	357	170	185	0.9	64	27	37	0.7
25 to 44 y	982	447	525	0.9	732	323	402	0.8	115	57	56	1.0
45 to 64 y	797	375	418	0.9	541	245	295	0.8	110	52	57	0.9
≥ 65 y	1010	435	571	0.8	674	291	380	0.8	187	91	95	1.0
unknown	718	272	288	0.9	453	181	182	1.0	200	71	69	1.0
Total	9543	4526	4779	0.9	6075	2902	3035	1.0	2459	1158	1224	0.9

***Table I**. Human cases of Salmonella: Age and gender distribution. Note that the gender of all salmonellosis cases is not known. M: male; F: female; SR: sex ratio*

As for the seasonal distribution, during January to April 2004 about 500 to 600 cases were reported each month. From May until October, the monthly number of isolates increased, with a peak of about 1 200 cases in August and September 2004.

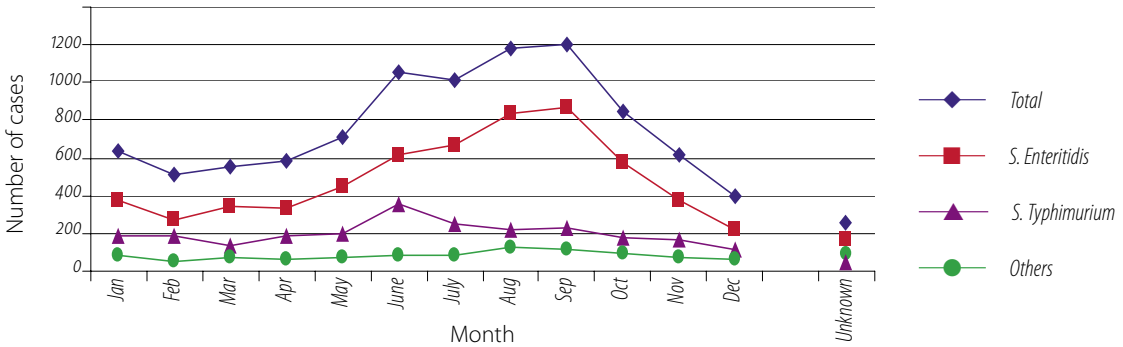

***Figure D**. Seasonal distribution of Salmonella isolates among humans in 2004*

Antimicrobial resistance

Antimicrobial resistance in isolates from living animals

Methods used

Data on antibiotic resistance of Salmonella strains from livestock came from the National Reference Laboratory. Susceptibility tests were performed by the disk diffusion test, using Neo-Sensitabs (Rosco). Tests and interpretation were done according to the manufacturers guidelines using an inoculum and breakpoints as described by NCCLS (Kirby-Bauer). Internal control was performed with quality control strain E. coli ATCC25922. Results were accepted when results with the QC strain were within the limits as proposed by Rosco.

Antimicrobial	Amount of antimicrobial	Breakpoints (mm)
Ampicillin	33µg	17 - 19
Ceftiofur	30µg	20 – 22
Streptomycin	100µg	23 – 25
Neomycin	120µg	20 – 22
Gentamicin	40µg	20 – 22
Tetracycline	80µg	20 – 22
Sulfonamides	240µg	20 – 22
Trimethoprim - sulfonamides	5.2µg + 240µg	27 – 31
Nalidixic acid	130µg	21 – 24
Enrofloxacin	10µg	20 – 22
Chloramphenicol	60µg	21 – 24
Florfenicol	30µg	15 - 18

***Table J**. Animal Salmonella: list of antimicrobials tested. For all susceptibility tests Neo-Sensitabs from Rosco were used according to the providers instructions*

Epidemiological investigations and results of 2004 surveillance

The susceptibility of 1 065 Salmonella strains was tested and a total of 606 isolates (56.9%) was fully susceptible to all antimicrobial drugs. Most resistance was found to ampicillin (30.2%), sulfonamides (28.8%) and tetracycline (26.7%). Resistance to aminoglycosides was mainly found for streptomycin (18.7%), but only 3 isolates were resistant to neomycin (2 Salmonella

Typhimurium and 1 Salmonella Enteritidis) and 1 to gentamicin (Salmonella Typhimurium). Relatively high resistance percentages were found to trimethoprim+sulfonamides (15.3%) and chloramphenicol (15.1%). Nearly 11.5% of strains were found to be resistant to florfenicol. A total of 14.7% of strains was resistant to nalidixic acid, but only 1 enrofloxacin resistant strain (Salmonella Typhimurium Copenhagen type O5- originating from a canary) was detected. Finally, 36 isolates were ceftiofur resistant (3.4%).

In 2003, the cephalosporin resistance in Salmonella Virchow (about 30% of the strains tested) and in Salmonella Enteritidis (2 strains) was remarkable.

In 2004, a total of 15 Salmonella Virchow (9.0%), 13 Salmonella Infantis (46.4%), 3 Salmonella Typhimurium (all Copenhagen variant; about 1%), 3 Salmonella Paratyphi B var. Java (7.9%) and 2 Salmonella Agona (1.7%) isolates were found resistant to ceftiofur. In contrast to 2003, ceftiofur resistance was not detected in Salmonella Enteritidis. Most of the ceftiofur resistant isolates were from poultry origin, although cephalosporin resistance was also shown in 2 Salmonella Typhimurium Copenhagen type O5- strains from pigs and in a Salmonella Typhimurium Copenhagen type O5- from a horse. In addition, ceftiofur resistant strains are frequently multi-resistant to a large number of antimicrobials.

About 83% of Salmonella Agona isolates (n=118) were fully susceptible to all antimicrobials tested. On the other hand, the multi-resistance profile ampicillin-chloramphenicol-florfenicol-streptomycin-sulfonamides-tetracycline with trimethoprim+sulf onamides was found in 8 strains. Resistance to ceftiofur was found in 2 isolates, but resistance to nalidixic acid and enrofloxacin was not detected.

As for Salmonella Dublin isolates (n=38), 44.7% were found completely susceptible. Especially resistance to sulfonamides and chloramphenicol (both 44.7%) and to streptomycin (26.3%) and nalidixic acid (23.7%) was found. All strains were susceptible to ceftiofur, enrofloxacin and florfenicol.

Among Salmonella Enteritidis isolates (n=208) 95.7% were susceptible. Ampicillin was the antimicrobial to which most resistance was found (2.9%). In addition, two highly multi-resistant strains were found (profiles: ampicillin-chloramphenicol-florfenicol-neomycin-streptomycin-sulfonamides-tetracycline and ampicillin-chloramphenicol-streptomycin-sulfonamides-tetracycline with trimethoprim+sulfonamides).

All Salmonella Hadar (n=26) strains were resistant to tetracycline and nalidixic acid. Often, isolates were also resistant to ampicillin (57.7%) or streptomycin (38.5%). Strains were at maximum resistant to 4 antibiotics. Twenty-eight (18%) of the Salmonella Infantis strains were tested for their susceptibility. Of these, 39.3% were fully susceptible. Strains were mainly resistant to ampicillin (53.6%) and ceftiofur (46.4%). Three strains were nalidixic acid resistant. Few other resistances were detected.

As for Salmonella Paratyphi B var. Java (n=38), all strains were resistant, mainly to ampicillin, sulfonamides, trimethoprim+sulfon amides and nalidixic acid (about 80%). Three strains were ceftiofur resistant.

Only 31.7% of Salmonella Typhimurium isolates (n=309) were found susceptible; Classic $O5^+$ variant strains were found more often susceptible (36.5%) than Copenhagen variant $O5^-$ isolates (26.1%). Multi-resistance profile ampicillin-streptomycin-tetracycline-sulfonamides-chloramphenicol was most frequently encountered among Classic variant $O5^+$, whereas profile ampicillin-streptomycin-tetracycline-sulfonamides was the main frequently detected profile among Copenhagen variant $O5^-$. Ceftiofur resistance was detected in two pig strains and one strain isolated from a horse.

Only one Salmonella Virchow isolate (n=62) was susceptible to all antimicrobials tested. Especially nalidixic acid resistance (96.8%) was detected, but also ampicillin resistance (46.8%). Fifteen Salmonella Virchow strains (24.2%) were resistant to ceftiofur.

Strains belonging to other serotypes were tested only occasionally. Altona, Bareilly, Bovismorbificans, Braenderup, Bredeney, Cerro, Cubana, Duisburg, Havana, Kentucky, Lagos, Lexington, Livingstone, London, Mbandaka, Newport, Ohio, Orion, Soeranga, Tennessee and Yoruba were fully sensitive for all the antimicrobials tested. Other serotypes contained few resistances except Salmonella O4, Salmonella Paratyphi B tartrate negative and Salmonella Saintpaul for which most strains were highly multi-resistant.

Obviously, the resistance of Salmonella strains isolated from a certain origin is reflected by the resistance of the serotypes most prevalent in the corresponding samples. Therefore, Salmonella from feed, food, birds and poultry are generally more susceptible (96.0%, 76.4%, 63.0% and 56.9%, respectively) than isolates from cattle and pigs (37.6% and 32.9%, respectively).

Antimicrobial resistance in strains isolated from meat and meat products

Data on antibiotic resistance of the 266 Salmonella enterica strains isolated from food (mainly meat and meat products) were tested for their antimicrobial susceptibility. Minimum Inhibitory Concentrations (MIC) were determined by the use of E-test. The antimicrobials tested are listed in the following table.

Antimicrobial	Breakpoints (µg / ml)
Ampicillin	8 – 32
Ceftriaxone	8 – 64
Streptomycin	8 – 32
Kanamycin	16 – 64
Tetracycline	4 – 16
Sulfamethoxazole	256 – 512

Antimicrobial	Breakpoints (µg / ml)
Trimethoprim	8 – 16
Trimethoprim - sulfonamides	2 – 4
Nalidixic acid	16 – 32
Ciprofloxacin	1 – 4
Chloramphenicol	8 – 32

Table K. *Salmonella from meat and meat products: list of antimicrobials tested.*
Minimum Inhibitory Concentrations were determined following the NCCLS standards.

In general, in 2004 most resistance was found to sulfamethoxazole (50%), streptomycin (41%), ampicillin (31%), tetracycline (24%), trimethoprim and trimethoprim+sulfonamides (26%) and nalidixic acid (15%). Only 9% was resistant against chloramphenicol.

The emergence of ceftriaxone resistant Salmonella Virchow strains in 2002 and 2003 was not confirmed in 2004. Ceftriaxone resistance was only found in 4 strains: once in Salmonella Anatum and Salmonella Infantis and twice in Salmonella Paratyphi B var. Java.

	Broiler meat (n=172)	Pig meat (n=128)	Bovine meat (n=7)
Fully sensitive	31	36	29
Resistant to 1 antimicrobial	19	25	14
Resistant to 2 antimicrobials	6	6	29
Resistant to 3 antimicrobials	9	9	0
Resistant to 4 antimicrobials	16	12	0
Resistant to > 4 antimicrobials	20	12	29

Table L. *Percentage of multi-resistant strains*

The level of resistance of Salmonella isolates from broilers, beef and pork is influenced by the serotype distribution in the corresponding meat. The presence of highly resistant serotypes as Hadar, Virchow, Paratyphi B and Typhimurium contributed mainly to the high resistance levels in some matrices.

	Broiler meat (n=172)	Pig meat (n=128)	Bovine meat(n=7)
Ampicillin	41	27	29
Ceftriaxon	2	0	0
Streptomycin	46	34	43
Kanamycin	0	2	0
Tetracycline	20	33	43
Sulfamethoxazole	55	50	57
Trimethoprim	31	22	29
Trimethoprim+sulfonamides	31	21	29
Nalidixic Acid	27	4	14
Ciprofloxacine	0	0	0
Chloramphenicol	12	10	0

***Table M**. Antimicrobial susceptibility testing of Salmonella spp. in food: percentage of resistant strains*

The highest resistance was found in Salmonella isolated from broilers (n=172): sulfamethoxazole (55%), ampicillin (41%), nalidixic acid (27%) and trimethoprim (31%). Twenty percent of the Salmonella isolated from broilers were resistant to 5 antibiotics or more, which is 8% less than in 2003. Pork isolates (n=128) showed a high resistance to sulfamethoxazole (50%), tetracycline (33%), streptomycin (34%) and ampicillin (27%). The few beef (n=7) where very resistant; only 2 strains were fully sensitive, whereas in 2003 no resistance was found at all in beef isolates. In total 60 Salmonella Typhimurium strains from pork were tested for their susceptibility. The overall resistance was high and at the same level of 2003 except for sulfamethoxazole where a considerable increase in resistance was noticed: 53% for tetracycline, 43% for ampicillin, 53% for sulfamethoxazole, 38% for streptomycin and 18% for chloramphenicol, trimethoprim and trimethoprim+sulfonamides. No resistance was noticed to ceftriaxone, ciprofloxacin or nalidixic acid.

Ninety-two percent of Salmonella Virchow strains (n=13) were resistant to nalidixic acid and about 62% of the strains were resistant to ampicillin, tetracycline, sulfamethoxazole and trimethoprim+sulfonamides. No strains were resistant to ceftriaxone in contrast to 2003 where 22% of the 18 isolates were resistant to this antimicrobial. The majority of the 51 Salmonella Enteritidis isolates from poultry meat tested susceptible to all antimicrobials. One strain was multi-resistant to tetracycline, chloramphenicol, nalidixic acid and ampicillin; another strain was resistant to nalidixic acid.

A total of 18 Salmonella Agona isolates from poultry meat were tested. Except for tetracycline a remarkable decrease of resistance was noticed in 2004 as compared to 2003: 17% (70% in 2003) of strains were resistant to ampicillin, 44% (60% in 2003) to sulfamethoxazole, 5% (40% in 2004) to trimethoprim and to trimethoprim+sulfonamides, 28% (30% in 2004) to tetracycline, 5% (30% in 2004) to chloramphenicol and 5% (20% in 2003) to streptomycin. No resistance was observed to ceftriaxone, kanamycin, nalidixic acid and ciprofloxacin.

Salmonella Derby (n=24) showed a major increase of resistance to sulfamethoxazole (79% instead of 17% in 2003), an increase of resistance from 8% to 17% against trimethoprim and the combination trimethoprim+sulfonamides. No significant changes were seen in the tetracycline (17%) and streptomycin (21%) resistance.

Salmonella Paratyphi B (n=9) was 100% resistant to ampicillin and trimethoprim and 89 % to nalidixic acid.

Little resistance was detected in the 10 strains of Salmonella Bredeney that were tested. Only one strain was resistant to streptomycin, sulfamethoxazole and tetracycline. Only 2 strains of Salmonella Hadar from poultry meat were isolated in 2004. They were both resistant to ampicillin, nalidixic acid and tetracycline.

Salmonella Indiana (n=8), all originating from poultry meat, were 100% resistant to sulfamethoxazole, 87 % to nalidixic acid and 75% to ampicillin and streptomycin. Only one strain was resistant to trimethoprim and trimethoprim+sulfonamides. This strain was also resistant to sulfamethoxazole and ampicillin. In Salmonella Infantis strains (n=6) resistance was only found to sulfamethoxazole (67%), ampicillin (33%) and ceftriaxone (17%)

Antimicrobial resistance and phage typing of human isolates

Methods used

A total of 520 human Salmonella isolates randomly selected from the six most important serotypes in 2004 (i.e. Enteritidis, Typhimurium, Hadar, Virchow, Brandenburg and Derby) were examined for their resistance. Thirteen antibiotics of therapeutic or epidemiological interest were tested in disk diffusion according to Kirby-Bauer, following NCCLS procedures.

Antimicrobial	Amount of antimicrobial	Breakpoints (mm)
Ampicillin	10 µg	14 - 16
Amoxicillin + clavulanic acid	20/10 µg	14 - 17
Cefotaxime	30 µg	15 - 22
Streptomycin	10 UI	12 - 14
Kanamycin	30 UI	14 - 17
Neomycin	30 UI	15 - 17
Gentamicin	10 µg	13 - 14
Tetracycline	30 UI	15 - 18
Sulfonamides	300 µg	16 - 13

Antimicrobial	Amount of antimicrobial	Breakpoints (mm)
Trimethoprim	5 µg	15 - 11
Trimethoprim + sulfamethoxazole	1,25/ 23,75 µg	11 - 15
Nalidixic acid	30 µg	14 - 18
Ciprofloxacin	5 µg	16 - 20
Chloramphenicol	30 µg	13 - 17

Table N. *List of antimicrobials used for susceptibility testing of Salmonella*

Epidemiological investigations and results of 2004 surveillance

Resistance was mostly found to tetracycline (45.2%), ampicillin (44.6%), streptomycin (38.5%), sulfonamides (38.3%) and to a lesser extent to chloramphenicol (21.5%) and trimethoprim (15.2%). The vast majority (93.1%) of human Salmonella Enteritidis isolates (n=58) was fully resistant to all antimicrobials tested. Salmonella Typhimurium (n=308) showed a high level of resistance; especially resistance to ampicillin (61.0%), sulfonamides (58.1%), tetracycline (57.1%) and streptomycin (51.9%) is striking. More than one half of the isolates (52.3%) were found resistant to four or more antimicrobial agents. In addition, almost 20% of the isolates showed multi-resistance to at least ampicillin, chloramphenicol, streptomycin, sulfonamides and tetracycline. About 80% of these multi-resistant isolates were of phage type DT104.

All Salmonella Hadar isolates (n=38) were resistant to at least two antibiotics. Resistance to tetracycline, nalidixic acid, ampicillin and streptomycin reached values from 78.9% up to 97.4 %. Simultaneous resistance to these four antibiotics was observed in 47.3% of these isolates. However, isolates from this serotype remained fully sensitive to cefotaxime, ciprofloxacin, chloramphenicol, trimethoprim, trimethoprim+sulfonamides and gentamicin.

In Salmonella Virchow (n=44), multi-resistance was less common as compared to 2003 (20.9% of the strains in 2004 instead of 60% of the 2003 isolates). The highest incidence of resistance was observed for nalidixic acid (53.5%). Resistances to ampicillin, tetracycline, sulfonamides, trimethoprim and trimethoprim+sulfonamides were common (> 20%). Two strains of Salmonella Virchow showed resistance to cefotaxime. In contrast, the vast majority of Salmonella Brandenburg (n=32) and Salmonella Derby (n=41) isolates remained sensitive to all tested antibiotics: 87.5% and 73.1%, respectively. In general, resistance patterns and levels of Salmonella isolated in 2004 were comparable to those from 2003 and 2002.

A total of 479 human Salmonella Enteritidis isolates were phage typed. Of these, 210 were PT 4 (43.8%) and 118 were PT 21 (24.6%). In addition, 308 Salmonella Typhimurium isolates were phage typed and most prevalent types were DT104 (23.7%), DT120 (21.1%) and DT193 (10.7%).

		Percentage of resistant strains												
	Nb	AMP	AMX	CTX	NAL	CIP	TET	CHL	GEN	KAN	STR	TMP	SUL	SXT
Enteritidis														
2004	58	3.4	0	0	3.4	0	0	0	0	0	0	0	0	
2003	49	4.1	0	0	0	0	0	0	0	0	0	0	0	0
2002	203	1.5	1.0	0	1.0	0	0.5	0.5	0	0	0.5	0	0	0
2001	197	2.5	-	0	1.0	0	1.0	0	0.5	0	0.5	1.5	2.5	1.5
Typhimurium														
2004	308	61.0	2.9	0	3.6	0	57.1	36.0	0	1.6	51.9	21.8	58.1	
2003	314	43.6	6.1	0	2.5	1.0	41.7	20.5	1.6	2.2	34.1	9.6	40.4	9.9
2002	319	39.0	14.0	0	1.6	0.3	52.0	26	0.9	0.6	39.0	9.1	41.0	8.8
2001	308	50.0	-	0	3.2	0.6	59.1	39	0.6	1.3	46.8	12.0	52.3	12.3
Brandenburg														
2004	32	3.1	0	0	0	0	9.4	0	0	0	0	6.3	6.3	
2003	31	3.2	0	0	0	0	3.2	3.2	0	0	6.5	0	3.2	0
2002	34	0	0	0	0	0	8.8	0	0	0	2.9	0	0	0
2001	38	5.3	-	0	0	0	18.4	2.6	2.6	0	5.3	5.3	7.9	2.6
Virchow														
2004	43	25.6	0	4.7	53.5	0	20.9	2.3	0	2.3	0.3	20.9	23.3	-
2003	44	52.3	15.9	13.6	86.4	0	50	0	2.3	4.5	9.1	52.3	52.3	52.3
2002	47	40.0	19.1	6.4	80.9	0	25.5	2.1	0	0	10.6	31.9	34.0	29.8
2001	51	19.6	-	3.9	47.1	0	15.7	3.9	0	0	11.8	15.7	15.7	8.0
Derby														
2004	41	0	0	0	2.4	0	24.4	0	0	0	12.2	2.4	17.1	
2003	43	0	0	0	0	0	2.3	0	2.3	0	2.3	2.3	2.3	2.3
2002	34	0	0	0	0	0	2.9	2.9	0	0	17.6	2.9	2.9	2.9
2001	37	2.7	-	0	0	0	5.4	0	0	0	2.7	5.4	8.1	5.4
Hadar														
2004	38	78.9	10.5	0	94.7	0	97.4	0	0	5.3	81.6	0	2.6	
2003	42	76.2	28.6	0	88.1	0	90.5	0	0	7.1	71.4	4.8	4.8	4.8
2002	44	80.4	56.5	0	93.5	0	97.8	0	0	2.2	95.7	2.2	2.2	0
2001	51	66.0	-	0	92.0	0	94.0	0	0	2	94.0	0	0	0

Table 0. *Antimicrobial resistance in human Salmonella of serotypes Enteritidis, Typhimurium, Brandenburg, Derby, Hadar and Virchow isolated in 2001 to 2004*

Abbreviations antimicrobial; AMP, ampicillin; AMX, amoxicillin + clavulanic acid; CTX, cefotaxime; NAL, nalidixic acid; CIP, ciprofloxacin; TET, tetracycline; CHL, chloramphenicol; GEN, gentamicin; KAN, kanamycin; STR, streptomycin; TMP, trimethoprim; SUL, sulfonamides; SXT, trimethoprim + sulfonamides;

2004

campylobacteriosis

report on zoonotic agents in belgium in 2004 — trends and sources

Campylobacteriosis

Campylobacter is a leading source of bacterial foodborne gastrointestinal diseases in humans in all parts of the world. It can also cause postinfectious complications as Guillain-Barré syndrome.

In 80% of the cases, the infection route of campylobacteriosis is food, but domestic animals including pets are also involved. The transmission of this pathogen to humans is mostly due to consumption of undercooked poultry, pork and beef, unpasteurized milk, contaminated drinking water, or contacts with the faeces of infected pets. This chapter will focus on Campylobacter jejuni and Campylobacter coli that are the main causes of enteritis in humans[1].

The contamination of poultry carcasses and meat with Campylobacter are monitored since 2000 by the Federal Agency for the Safety of the Food Chain. The rate of positive poultry samples is stable, but high. Broiler and layer meat have to be well cooked and cross-contamination should be avoided during preparation.

- Campylobacter in food
- Campylobacter in humans

Campylobacter in food

Surveillance programme and method used

In 2004, the Federal Agency for the Safety of the Food Chain selected for its monitoring programme more than 200 Belgian slaughterhouses, more than 100 meat cutting plants and more than 100 retail trades representative of the Belgian production of carcasses and meat.

Samples for Campylobacter consisted of carcasses, meat preparation and fillets of broilers, carcasses of layers, carcasses and minced meat from pork, dairy products and live bivalve molluscs. Specially trained staff of the Federal Agency for the Safety of the Food Chain did the sampling. Four contamination levels, 25g, 1g, 0.01g and 600cm^2 were analysed. For broiler carcasses and fillets, approximately 300 independent samples were taken per matrix in order to detect a minimal contamination rate of 1% with 95% confidence.

The detection consisted of a selective enrichment in Preston at 42°C for 48h, followed by the isolation on mCCDA at 42°C for 24h-120h. Confirmation of minimum 1 colony was done by miniaturised biochemical tests (API Campy, BioMérieux, France) and by PCR typing.

Results of the 2004 surveillance

The results of the monitoring of Federal Agency for the Safety of the Food Chain are shown in the next table.

Sample	Quantity of sample analysed	Percentage of positive samples	Predominant Campylobacter species	Other species
Broiler				
Carcasses at slaughter (n=197)	0.01g	27.9%	jejuni	coli
Carcasses at retail (n=77)	0.01g	35%	jejuni	coli
Minced meat at retail (n=336)	0.01g	3.3%	jejuni	coli, lari
Fillets at processing plant (n=131)	1g	26%	jejuni	coli
Fillets at retail (n=106)	25g	60.4%	jejuni	coli
Layer				
Carcasses at slaughter (n=35)	0.01g	34.3%	jejuni	
Carcasses at retail (n=16)	0.01g	0%		

Sample	Quantity of sample analysed	Percentage of positive samples	Predominant Campylobacter species	Other species
Pork				
Carcasses (n=344)	600 cm^2	5%	coli	jejuni
Minced meat at processing plant (n=266)	25g	1.5%	jejuni	coli
Minced meat at retail (n=161)	25g	5.0%	coli	jejuni
Raw milk cheese (n=147)	25g	1.4%		
Live bivalve molluscs (n=90)	25g	16.7%		

***Table P**. Zoonosis monitoring programme – Campylobacter in food*

		Sampling level	2000	2001	2002	2003	2004
Broilers	Carcasses	0.01g	33.9%	27.1%	34.9%	28.0%	27.9%
	Fillets	1g	22.5%	15.3%	18.3%	17.8%	26.0%
	Minced meat	25g			49.4%		
		1g				44.9%	
		0.01g					3.3%
Layers	Carcasses	0.01g	23.0%	19.3%	20.5%	12.8%	23.5%

***Table Q**. Evolution of the food Campylobacter prevalences 2000-2004*

The contamination of broiler fillets raised from 17.8% in 2003 to 26.0% in 2004. This increase is probably due to the inclusion of a number of samples with skin.

Antimicrobial resistance in strains isolated from meat and meat products

Surveillance programme and method used

In 2004, 228 Campylobacter were tested for their antimicrobial susceptibility. Strains were isolated in the monitoring programme and originated from poultry and pork.

Minimum Inhibitory Concentrations (MIC) were determined by the use of E-test. The following antibiotics were tested: ampicillin, ciprofloxacin, nalidixic acid, tetracycline, gentamicin and erythromycin.

Epidemiological investigations and results of 2004 surveillance

The results are shown in the table below. C. coli shows a higher overall resistance than C. jejuni. In C. coli the highest resistance was found for tetracycline (88%) and in C. jejuni for tetracycline (71%), ciprofloxacin (62%) and nalidixic acid (58%). No resistance was found to gentamicin and only one C. jejuni strain was resistant to erythromycin.

	Poultry meat		Pork	
	C. jejuni (n=163)	C. coli n=34)	C. jejuni n=7)	C. coli (n=22)
Tetracycline	34	71	43	88
Ciprofloxacin	33	62	29	41
Nalidixic acid	34	58	29	41
Gentamicin	0	0	0	0
Erythromycin	1	12	0	27
Ampicillin	26	27	29	14

***Table R**. Antimicrobial susceptibility testing of Campylobacter in food: Percentage of resistant strains*

Campylobacter in humans

Data are provided by the sentinel laboratory network, created in 1984. All cases are updated on a weekly base.

In 2004, 6 716 cases are registered by 107 laboratories and the national incidence is estimated to 64.6 per 100 000 inhabitants. A significant increase ($p<0.05$) with a linear trend, of the number of cases was observed between 1996 (n=4 991) and 2000 (n=7 473). Later on, this number has slightly decreased between 2001 (n=7 356) and 2003 (n=6 559) to increase again with 20% in 2004 (Table S.).

Since the beginning of the registration, the incidence in Flanders is twice as high as in Wallonia. For example, in 2004, the incidence was 77.8 per 100 000 inhabitants in Flanders and 40.4 per 100 000 inhabitants in Wallonia.

More specifically, the incidence is highest in the districts of Turnhout (191 per 100 000 inhabitants), Leuven (162 per 100 000 inhabitants) and Mechelen (161 per 100 000 inhabitants). No information is available to explain the evolution in the number of registered cases, nor the geographical distribution.

Cases are of all ages but children between 1 and 4 years old represent one fourth of the cases every year. Cases are observed all the year round with a peak during the summer.

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of isolates	4991	5465	6610	6514	7473	7357	7354	6556	6716

***Table 5**: Reported cases of campylobacteriosis in humans*

2004

zoonotic tuberculosis

Belgium is officially free from bovine tuberculosis since 25 June 2003 (Commission Decision 2003/467/EC establishing the official tuberculosis, brucellosis and enzootic bovine leucosis free status of certain Member States and regions of Member States as regards to bovine herds).

Zoonotic tuberculosis (Mycobacterium bovis)

Tuberculosis in humans caused by M. bovis is rare.

- In regions where M. bovis infections in cattle are largely eliminated, only few residual cases occur among elderly persons as a result of the reactivation of dormant M. bovis within old lesions and among migrants from high-prevalence countries. Agricultural workers may acquire infection by M. bovis by inhaling cough aerosols from infected cattle and may subsequently develop typical pulmonary or genito-urinary tuberculosis. Such patients may infect cattle through cough or urine, but evidence for human-to-human transmission is only seldom reported.
- In developing countries where M. bovis is largely prevalent among cattle, some studies reported that 3-6% of all diagnosed tuberculosis cases are due to M. bovis and that mostly young people get infected by the ingestion of contaminated raw milk.

In humans, the disease caused by M. bovis is clinically indistinguishable from that caused by M. tuberculosis. Pulmonary tuberculosis is frequently observed but cervical lymphadenopathy, intestinal lesions, chronic skin tuberculosis and other nonpulmonary forms are particularly common. In 2004, 5 human cases of bovine tuberculosis were identified.
This number is probably underestimated because the specific identification of M. bovis of the Mycobacterium spp. group is only done on special request of the medical practitioner. Molecular typing of strains isolated from cattle and human cases is on-going in order to evaluate the presence of similar strains in both species.

Human tuberculosis (Mycobacterium tuberculosis)

The incidence of human tuberculosis shows little variation over the last years. In 2001, 2002, 2003 and 2004 respectively 1321, 1309, 1128 and 1244 new notified cases of active human tuberculosis were detected. Over the 60% were male patients. More than 50% of the tuberculosis cases were foreigners. The autochthonous tuberculosis cases are detected mostly in elderly persons. Groups at risk are persons with a marginal existence, asylum seekers and refugees. Alcoholism and a co-infection with HIV are known as specific risk factors. Human tuberculosis cases are mainly concentrated in urban populations.

- Mycobacterium bovis in cattle
- Mycobacterium in other animals
- Mycobacterium in humans

Mycobacterium bovis in cattle

Surveillance programme

The control of tuberculosis is based on Council Directive 64/432/EEC, which is implemented and adapted in the national legislation since 1963 and last adapted by Royal Decree of 17 October 2002.

The control implies:

- Skin testing of animals at the occasion of trade (mandatory by purchase),
- In case of a positive reactor, intensive skin testing of all the animals of the holding and intensive testing of all contact animals (tracing on and tracing back),
- Systematic post mortem examinations at the slaughterhouse; in case a suspected lesion is identified, a sample is sent to the National Reference Laboratory for analysis.

The Federal Agency for the Safety of the Food Chain is informed about any doubtful or positive result of the skin test and may decide to re-examine (additional tests) the animals or to kill them (test slaughter). As a consequence of post mortem examinations or of mandatory test-slaughter, if M. bovis is isolated, all animals in the herd of origin are skin tested and a complete epidemiological investigation is done.

An animal is defined as infected with bovine tuberculosis if the skin testing is positive or if M. bovis is isolated by culture or confirmed by laboratory testing (PCR). A holding is defined as infected if M. bovis was isolated or detected by PCR from an animal of the holding.

Isolation of M. bovis and biochemical testing is exclusively performed in the National Reference Laboratory where also IFN-gamma and molecular typing by means of IS6110 RFLP, spoligotyping and MIRU-VNTR[1] are done.

In Belgium, vaccination against tuberculosis is not allowed.

1 Mycobacterium Interspersed Repetitive Units-Variable Number of Tandem Repeats [Ref: Roring S., Scott A., Brittain D., Walker I., Hewinson G., Neill S. and Skuce R. 2002. Development of Variable-Number Tandem Repeat Typing of Mycobacterium bovis: comparison of results with those obtained by using existing exact tandem repeats and spoligotyping. J. Clin. Microbiol., 40: 2126-2133

Epidemiological investigations and results of 2004 surveillance

At the slaughterhouse, 142 tissue samples from 44 cattle herds were taken. The samples originated from animals suspected of being infected with M. bovis, i.e. skin test reactors, animals that had been in contact with M. bovis infected animals or animals that showed suspect lesions at meat inspection. The samples were submitted to the National Reference Laboratory where culture, PCR and confirmatory tests were done. M. bovis was detected and confirmed in submissions from 8 herds.

The National Reference Laboratory performs routine IS6110 RFLP typing and spoligotyping of M. bovis field isolates. Since 1995, 96% of the outbreak herds had their isolates typed by both methods. More recently, all strains typed by RFLP and spoligotyping were additionally analysed by MIRU-VNTR, which is done in collaboration with Pasteur Institute Brussels. As a consequence, a comprehensive database of the vast majority of M. bovis types circulating in Belgium since 1995 is available.

For 2004, the M. bovis isolates originating from 5 out of the 8 outbreak herds belonged to lineages already known to circulate in Belgium since 1995, i.e. spoligotype SB0911 in a first group of 3 epidemiological related herds and spoligotypes SB0162 and SB10 86 in two other herds. In the three remaining herds, 2 new types of isolates have been identified, i.e. spogilotypes SB0134 and SB1085, both with exotic MIRU-VNTR and IS6110 RFLP profiles.

Mycobacterium in other animals

In Belgian wildlife no case of bovine tuberculosis was found in 2004.

Mycobacterium bovis in humans

In 2004, 5 human cases of bovine tuberculosis were identified.

2004

brucellosis

report on zoonotic agents in belgium in 2004 — trends and sources

Zoonotic brucellosis

(Brucella melitensis, Brucella abortus, Brucella suis)

Bacteria of the genus Brucella may infect sheep, goats, cattle, deer, elk, pigs, dogs and several other animals, where they cause disease. Humans become infected by coming in contact with infected animals or with contaminated animal products. Brucella infections in humans may cause a range of symptoms that are similar to that of flu and may include fever, sweats, headaches, back pains and physical weakness. Several infections of the central nervous systems or lining of the heart may occur.

- In the non-"officially brucellosis free" Mediterranean countries, the consumption of raw milk or raw cheese from sheep and goats is thought to be the major source of contamination (B. melitensis).
- In Northern European countries, besides some occupational human cases of B. abortus infections, the majority of brucellosis cases are imported and are mainly caused by B. melitensis.
- In Belgium, less than 10 cases/year of imported B. melitensis infections have been reported over the past few years. In 2004, 8 cases were reported.

- Brucellosis in cattle
- Brucellosis in sheep and goats
- Brucellosis in pigs
- Brucellosis in humans

Brucellosis in cattle

Belgium is officially free from bovine brucellosis since the 25 June 2003 (Commission Decision 2003/467/EC establishing the official tuberculosis, brucellosis and enzootic-bovine-leucosis-free status of certain Member states and regions of Member states as regards bovine herds).

Surveillance programme and methods used

Since the official brucellosis free status, the eradication programme has been changed in a surveillance programme. Beef cattle older than 2 years are monitored once every three years by means of serological tests. The herds for serological examination are selected by geographical localisation. Dairy cattle are checked at least 4 times a year via tank milk. Furthermore, all animals are serologically tested at trade. Each abortion or premature birth in animals at risk is subject to compulsory notification to the Federal Agency for the Safety of the Food Chain and testing for brucellosis is obligatory. Aborting females should be kept in isolation until the results of the investigation exclude Brucella infections.

Tank milk is examined by means of the milk ring test. For animals older than 2 years, serology (i.e. micro-agglutination as screening test; in case of a positive result, an indirect ELISA test is performed in parallel as confirmatory test) is used if no sufficient milk ring tests are done (at least 4 ring tests a year). Bacteriological examination is done when serological and/or epidemiological suspicion is present.

Allergic (brucellin) test may be carried out if serological cross-reactions are suspected. These tests are performed by the Federal Agency for the Safety of the Food Chain in collaboration with the National Reference Laboratory.

An animal is legally suspected of brucellosis in case of a positive ELISA. If, according to the epidemiology and the results of the skin test, an animal or herd is found to be at risk, a bacteriological investigation always takes place. Hence, a brucellosis animal is defined as an animal in which Brucella has been isolated and a cattle herd is considered as infected if one of its animals is positive by culture for brucellosis.

	Individual serological tests	Bulk milk tests
Routine testing	225.669	102.267 pools
Testing at trade	262.879	

By individual serological testing, 4.617 animals reacted positive in the micro-agglutination test. All these animals were false positive serological reactors (FPSR). To reduce the number of FPSR to be slaughtered, the micro-agglutination test has been used for routine testing whereas the indirect ELISA is accepted for confirmation. All these FPSR were finally negative by repeated serological individual analysis with micro-agglutination and ELISA.

Vaccination has been prohibited in Belgium since 1992.

Epidemiological investigations and results of 2004 surveillance

The intensified bovine brucellosis eradication programme started in Belgium in 1988. In case of active brucellosis, i.e. excretion of Brucella, the plan consisted in the culling of all animals of the infected herd (total depopulation) and was compensated for based on the replacement value of the animals.

The annual herd prevalence notified at the year end was 1.13% in 1988 and has fallen below 0.01% since 1998. In March 2000, the last case of bovine brucellosis was identified. No infected herd was recognised in Belgium since then.

In 2004, the Federal Agency for the Safety of the Food Chain instructed, for additional analysis, the mandatory test slaughter of 8 positive serological reacting animals by repeated testing. The official brucellosis free status of the corresponding holdings was temporary suspended. The results of the additional analysis after test-slaughter of the positive serological reactors was finally negative.

Brucellosis in sheep and goats

Belgium is official brucellosis free for sheep and goat brucellosis (B. melitensis) since 29 March 2001 (Commission Decision 2001/292/EC amending Decision 93/52/EEC recording the compliance by certain Member States or regions with the requirements relating to brucellosis (Brucella melitensis) and according them the status of a Member State or region officially free of the disease).

Surveillance programme

Serum samples taken in the framework of national monitoring for Visna-Maedi and at export were examined for Brucella melitensis specific antibodies by means of ELISA (5% of the total population). Positive samples were subsequently tested in Rose Bengal and in complement fixation test. A sample is classified as positive for brucellosis only if positive in all three tests. If

this is the case, a skin test should be performed on the seropositive animals and the congeners. A positive skin test leads to the bacteriological investigation of the animal.

In 2001, 2002 2003 and 2004 about 7 000 serum samples from sheep and goats were tested at the National Reference Laboratory. In addition, 388 serum samples from sheep for export were analysed. The results confirmed those of previous years, i.e. the absence of any epidemiological or bacteriological evidence of ovine brucellosis in Belgium.

Brucellosis in pigs

Surveillance programme in pigs and epidemiological investigations

Serological screening for Brucella is done for breeding pigs that are gathered (e.g. at a fair), at artificial insemination centres and in animals intended for trade. The methods used are Rose Bengal test (RBT), Slow Agglutination test (SAT) according to Wright, complement fixation test (CFT) and ELISA. Bacteriological examination for Brucella and Yersinia is done in case of positive serology.

Regularly, false positive serological reactions are reported. These are due to a Yersinia enterocolitica O9 infection and are confirmed by Yersinia spp. isolation in the absence of Brucella spp. isolation.

B. suis biovar 2 may be isolated from wild boars (Sus scrofa). The infection seems to be enzootic in wild boar in Europe.

The domestic pig population is free of brucellosis (last Brucella isolation in pigs in Belgium was in 1969). It is interesting to note that the Office International des Epizooties (http://www.oie.int) considers that the value of any brucellosis serological test in pigs is questionable.

Regional control programme

Since 2002, an annual surveillance programme is organised by the veterinary faculty of the University of Liège (Walloon Region funds) in collaboration with the National Reference Laboratory with the aim to analyse brucellosis in wild boars (Sus scrofa) and lagomorphs in the South of Belgium. Blood samples and organs of hunted and/or dead animals were analysed in order to follow the seroprevalence and identify isolates of Brucella in these species. The tonsils of 51 hunted wild boars were bacteriologically tested, only one test was positive. PCR assays of the spleens of 15 hares were all negative.

Brucellosis in humans

Probably due to the absence of a domestic animal reservoir of Brucella in Belgium, no single autochthon human brucellosis case was reported in 2004. However, nine cases of imported B. melitensis infection were registered at the National Reference Laboratory. It is helpful to note that B. suis biovar 2, circulating among wild boars, shows only limited pathogenicity for human, if pathogenic at all.

2004

listeriosis

report on zoonotic agents in belgium in 2004 — trends and sources

Listeriosis

Listeria monocytogenes is a major concern for the food industry and public health authorities. Ingestion of food contaminated with Listeria monocytogenes may cause either a serious invasive illness affecting people with altered or deficient immune responses, or a non-invasive febrile gastro-enteritis. Although the incidence of listeriosis is low, the high mortality rate, which often reaches as high as 30-40%, requires early diagnosis and appropriate antimicrobial therapy.

Listeria monocytogenes is also pathogenic for cattle and sheep where it may cause abortion and encephalitis.

Listeria is ubiquitous and widely distributed in the environment (soil, vegetables, meat, milk, fish) and is mostly transmitted to humans via consumption of contaminated food. Listeria monocytogenes may grow at refrigeration temperatures of 4°C or lower. As a consequence, special attention should be paid to preserve foods that may be contaminated with Listeria monocytogenes. As some persons are at elevated risk (pregnant women, immunocompromised people), they are advised not to eat soft cheeses, smoked fish and all raw food and should be aware of the risk inherent to all raw ready-to-eat food.

The Belgian monitoring programme indicates that the contamination level of food with Listeria monocytogenes is stable over the last few years. Even though the number of human cases in 2004 has almost doubled in comparison to 2002, no large-scale listeriosis outbreaks were reported.

- Listeria monocytogenes in food
- Listeria monocytogenes in humans

Listeria monocytogenes in food

Surveillance programme and method used

In 2004, the Federal Agency for the Safety of the Food Chain selected for its monitoring programme more than 100 meat cutting plants and more than 200 retail trades representative of the Belgian production of carcasses and meat.

The matrices for Listeria isolation were minced meat from pork and beef, chicken meat preparations, cooked ham, pâté, fermented sausages, raw milk cheese, smoked salmon and various meat salads (tuna, surimi, shrimps). Three contamination levels, 25g, 1g and 0.01g were assessed. Approximately 300 independent samples were taken for pork and beef products in order to detect a minimal contamination rate of 1% with 95% confidence.

For detection of Listeria monocytogenes in meat samples, the validated method AFNOR BIO-12/9-07/02 VIDAS LMO2 followed by a validated chromogenic confirmation (AFNOR SDP-07/4-09/98 Rapid'L.mono or AFNOR AES-10/3-09/00 ALOA ONE DAY) was used. Briefly, the method consisted in a pre-enrichment on half-Fraser broth at 30°C for 24 h, followed by an enrichment on Fraser broth at 37°C for 24 h, the immunoassay (VIDAS LMO2) and isolation of minimum 1 colony on Rapid'L.mono or ALOA (24-48h at 37°C).

Results of the 2004 surveillance

The results of the monitoring and the trends of Listeria monocytogenes prevalence since 2000 are shown.

Sample		Quantity analysed	Percentage of positive samples
Beef	Minced meat (n=236)	1g	13.6%
	Minced meat (n=98)	0.01g	2%
	Carpaccio at retail (n= 95)	0.01g	0%
	Steak tartare at retail (n=110)	0.01g	0%
Pork	Minced meat at processing plant (n=262)	1g	17.6%
	Minced meat at retail (n=152)	0.01g	5.3%
	Raw ham (n=114)	0.01g	0%
	Cooked ham at processing plant (n=266)	25g	3.8%
	Cooked ham at retail (n=350)	0.01g	0.3%

Sample		Quantity analysed	Percentage of positive samples
	Pâté at processing plant (n= 243)	25g	1.2%
	Pâté at retail (n=326)	0.01g	0.9%
	Fermented sausages at processing plant (n= 224)	1g	8%
	Fermented sausages at retail (n=78)	0.01g	1.3%
Poultry	Broiler minced meat (n=330)	0.01g	7.9%
Other meat products	Various meat salads at retail (tuna, surimi, shrimps) (n=149)	0.01g	0%
Cheeses	Raw milk cheese (n=147)	0.01g	0%
Fish	Smoked salmon at processing plant (n=63)	25g	8%
	Smoked salmon at end of shelflife (n=59)	0.01g	3.4%
	Prepared dishes at retail (n=121)	0.01g	1.65%

***Table T**. Zoonosis monitoring programme - Listeria monocytogenes in food (2004)*

The Listeria prevalence in minced pork and beef dropped from 25.0% and 16.0% in 2000 to 17.6% and 13.6% in 2004, respectively.

		Sampling level	2000	2001	2002	2003	2004
Pork	Minced meat	1g	25.0%	18.3%	20.7%	21.5%	17.6%
	Cooked ham	25g	6.0%	4.6%	3.0%	2.5%	3.8%
	Pâté	25g	4.3%	4.9%	5.4%	4.0%	1.2%
		0.01g					0.94%
	Salami	25g	16.0%				
	Salami	1g		8.6%		9.8%	8%
		0.01g					1.3%
Beef	Minced meat	1g	16.0%	14.8%	13.7%	10.7%	13.6%
		0.01g					2%
Chicken	Meat preparation	1g			33.8%	60.0%	
		0.01g					7.9%
Fish	Smoked salmon	25g			23.1%	22.1%	8%
		0.01g					3.4%

***Table U**. Evolution of the food Listeria monocytogenes prevalences 2000-2004*

Listeria monocytogenes in humans

Data were obtained from passive surveillance through sentinel laboratory results and from the National Reference Laboratory. All cases were updated weekly.

In 2004, 89 cases of listeriosis were notified, which confirms the increase that was noticed in 2003. This increase has been observed in Flanders as well as in Brussels and Wallonia. Sixty-eight strains were serotyped. The serovar 1/2a was the most prevalent (47%) and followed by serovar 4b (32%). Nine isolates were from perinatal listeriosis cases and 59 from non-perinatal listerioses cases among which 8 with meningo-encephalitis and 50 with septicemia.

	1997	1998	1999	2000	2001	2002	2003	2004
Number of isolates	45	60	64	48	57	44	76	89

Table V. *Listeria monocytogenes in humans*

2004

report on zoonotic agents in belgium in 2004

2004

yersiniosis

report on zoonotic agents in belgium in 2004 — trends and sources

Yersinia enterocolitica

Y. enterocolitica is a relatively infrequent cause of diarrhea and abdominal pain. Infection with Y. enterocolitica occurs most often in young children. Common symptoms in children are fever, abdominal pain and diarrhea, which is often bloody. Symptoms typically develop 4 to 7 days after exposure and may last 1 to 3 weeks or longer. In older children and adults, right-sided abdominal pain and fever may be the predominant symptoms and may be confused with appendicitis. In a small proportion of cases, complications such as skin rash, joint pains, or spread of bacteria to the bloodstream can occur.

Only a few strains of Y. enterocolitica cause illness in humans. The major animal reservoir for Y. enterocolitica strains that cause human illness is pigs, but other strains are also found in many other animals including rodents, rabbits, sheep, cattle, horses, dogs and cats. In pigs, the bacteria are most likely to be found on the tonsils. Infection is most often acquired by eating contaminated food, especially raw or undercooked pork products. Drinking contaminated unpasteurized milk or untreated water can also transmit the infection.

- Yersinia enterocolitica in food
- Yersiniosis in humans

Yersinia enterocolitica in food

Surveillance programme

The Federal Agency for the Safety of the Food Chain organised a food surveillance of meat and meat products in 1997, which showed a very low prevalence of meat and meat products from pork, beef and poultry. In 2004, the surveillance programme concentrated on one matrix, i.e. pork minced meat and one contamination level (1g). None of the analysed samples (n=301) was contaminated.

Yersiniosis in humans

Data were provided on a weekly basis by the sentinel laboratory network.

With 326 cases registered by 76 laboratories in 2004, the national incidence is estimated at 3.1 per 100.000 inhabitants. Cases were observed all over the year, with a peak in September/October. Thirty percent of cases were 1 to 2 year old children.

Since 1986 a steadily decreasing trend is noticed in the number of infections reported in humans in Belgium. Comparing the data of 1986 (n=1 514) to those of 2004 (n=326), the observed decrease is convincing. Since 2001, there is a clear stabilization in the number of infections reported in humans.

Since the beginning of the registration, the incidence in Flanders is higher than in Wallonia. For example, in 2004, the incidence was 3.7 per 100.000 inhabitants in Flanders and 2.3 per 100.000 inhabitants in Wallonia. Since 2000, the incidence is stable in Wallonia and decreases in Flanders.

	2000	2001	2002	2003	2004
Number of cases	507	375	330	338	326

***Table W**. Yersiniosis cases in humans*

2004

report on zoonotic agents in belgium in 2004

2004

verotoxin producing escherichia coli (vtec)

report on zoonotic agents in belgium in 2004 — trends and sources

Verotoxin producing Escherichia coli

Zoonotic verotoxin producing E. coli may cause life-threatening diseases in young children or in immunocompromised or elderly people, i.e. hemorrhagic colitis, hemorrhagic uremic syndrome (HUS) and even death. E. coli O157 is the best known and most studied VTEC. Cattle are often indicated as the principal reservoir of VTEC, but are not clinically affected by zoonotic VTEC infection. Infection of humans takes place via consumption of contaminated food, through contact with contaminated water, or by direct transmission of VTEC from infected humans or animals. Therefore, prevention mainly relies on hygienic measures.

In 2004, typical E. coli O157 (i.e. verotoxigenic, intimin-positive E. coli O157 isolates) were found on cattle carcasses, in trimmings and in minced meat in 1.4%, 0.8% and 0.3% of the cases, respectively. Living cattle were not analysed in this official monitoring programme.

As for VTEC infections in humans, approximately 40 verotoxin producing E. coli strains are annually analysed at the National Reference Laboratory. A large of these belong to serogroup O157. In 2004, 8 typical EHEC isolates were from children between 10 months and 11 years old suffering from HUS: 5 belonged to serotype O157:H7, 2 to O157:H- and one to O145:H-. Since only few clinical laboratories examine human stools for the presence of E. coli O157, the incidence of VTEC among humans cannot be correctly estimated.

- Verotoxin producing Escherichia coli in cattle
- Escherichia coli O157 in food
- Verotoxinogenic Escherichia coli in humans

Verotoxin producing Escherichia coli in cattle

Surveillance programme, measures and methods use

In case E. coli O157 was isolated from a carcass at the slaughterhouse (official zoonosis programme), the farm of origin was traced back via Sanitel, the computerised registration and identification database for farm animals, managed by the Federal Agency for the Safety of the Food Chain. Faecal samples were taken from twenty percent of the animals aged between 6 months and 2 years, with a maximum of 20 animals. In addition, samples of the available feed and of dust were collected. Hygienic and management measures were imposed on these farms during the period that the samples were analysed in the laboratory. The sale of not heat-treated milk or milk products was forbidden and animals could not be sold.

If results were positive, the animals with positive faeces samples were isolated from the rest of the group. In addition, animals could only leave the farm, with permission of the competent authority, if it was to be slaughtered. The sale of not heat-treated milk was prohibited. A re-sampling took place after 6 weeks.

The method used for isolation of E. coli O157 was that described in ISO 16654:2001. Briefly, the faecal, feed and dust samples were enriched in mTSB with novobiocin and treated by immunomagnetic separation. Subsequently, the suspected colonies on CT-SMAC were latex agglutinated for the detection of E. coli O157. Confirmation of serotype (O group) was done by means of slow tube agglutination after heating of the bacterial cultures. Virulence factors were determined by PCR for toxin genes vt1 and vt2 and for eae (intimin). A typical E. coli O157 isolate is defined as a strain isolated by immunomagnetic separation and O157 specific agglutination and confirmed by PCR as vt2 and eae positive. An atypical E. coli O157 had either no eae or vt gene.

Epidemiological investigations and results of 2004 surveillance

Laboratory findings are available on clinical E. coli strains sent to the National Reference Laboratory for VTEC, animal health for analysis. In 2004, 11 herds were monitored after E. coli O157 was isolated at the surface of a carcass that was delivered to the slaughterhouse. A total of 102 samples were taken from faeces, dust and feed (occasionally from water). From these, two herds were found positive (E. coli O157, vt2 eae) and samples were taken a second time approximately six weeks later. Finally, only on one herd E. coli O157 vt2 eae was detected.

Escherichia coli O157 in food

Surveillance programme and method used

In 2004, the Federal Agency for the Safety of the Food Chain selected for its monitoring programme more than 200 Belgian slaughterhouses, more than 100 meat cutting plants and more than 100 retail trades representative of the Belgian production of carcasses and meat.

The samples for isolation of E. coli O157 were carcasses (1600cm^2), trimmings (25g) and minced meat of beef (25g). Staff of the Federal Agency for the Safety of the Food Chain was specifically trained to obtain uniform results.

The detection method (SP-VG-MOO1) consisted of a pre-enrichment in mTSB with novobiocin at 42°C for 6 hours. After that, enrichment was done in CT-Mac Conkey at 37°C for 16-18 hours and subsequent testing in the immunoassay O157 (VIDAS ECO, bioMérieux). Subsequent selective immunomagnetic enrichment was done (Dynabeads, Dynal or VIDAS ICE, bioMérieux) and the isolation on sorbitol-Mac Conkey, incubated at 42°C for 18 h. Isolation and confirmation were by means of agglutination of latex particles (Oxoid). Suspected isolates were sent to the National Reference Laboratory for detection of genes encoding virulence factors.

Results of the 2004 surveillance

The results of the monitoring of Federal Agency for the Safety of the Food Chain are shown in the following table.

Sample	Prevalence
Beef	
Carcasses (n=1 319)	1.4%
Trimmings (n=244)	0.8%
Minced meat (n=332)	0.3%

Table X *: Zoonosis monitoring programme - E. coli O157 (2004).*

Verotoxinogenic Escherichia coli in humans

Data were obtained from the National Reference Laboratory, public health.

In 2004, 36 typical EHEC isolates were identified, that is VTEC with virulence gene eae (intimin) and with the gene encoding enterohemolysin (EHEC virulence plasmid). The majority of these isolates (n=29) belonged to serogroup O157, comprising 28 O157:H7 and one O157:H- isolates. Nine of these O157:H7 typical EHEC isolates were from patients suffering from HUS, comprising 8 children aged from 1 to 8 years and one woman aged 64. No other serotype was isolated from HUS cases.

The 64 years old woman with HUS was resident of a psychiatric hospital near Ghent, where also three other patients developed this syndrome after an outbreak of bloody diarrhea (number of cases not recorded). EHEC were not searched for until 10 days after the first case of HUS occurred, when 190 stools and 5 urine samples were sent to the reference laboratory. Only one sample, taken from a member of the kitchen was found to be positive. Isolates from both persons were undistinguishable by PFGE typing. It is not clear of this personnel member was involved in the origin of the outbreak or only one of the victims. His stool cultures remained positive for several weeks and became only negative after antibiotic treatment.

The occurrence of this badly documented outbreak underlines once again the need for introduction of the detection of EHEC in the Belgian nomenclature for reimbursement of laboratory analyses, in order to detect outbreaks earlier, when intervention is still possible.

During the last eight years, the number of isolates analyzed annually by the reference laboratory has been rather constant, corresponding to a large rate of underdiagnosis.

2004

report on zoonotic agents in belgium in 2004

2004

rabies

report on zoonotic agents in belgium in 2004 — trends and sources

Rabies

Rabies is an acute viral encephalomyelitis of warm blooded animals (e.g. foxes, dogs, cats, bats) including human beings. The disease is caused by a Lyssavirus (8 genotypes), which is spread through the saliva of infected animals. In humans, the inability to swallow liquids has given the disease the name of hydrophobia.

Infected animals pass on the infection especially through bites or scratches, or less frequently via the injured skin or mucous membranes. The incubation period is usually from 4 to 8 weeks, but may range from 10 days to as long as one year or more. If not treated, human rabies is almost always fatal. Administration of rabies post exposure prophylaxis combining wound treatment, passive immunization and vaccination are effective when appropriately applied. Pre-exposure vaccination should be offered to persons at risk, such as laboratory workers, veterinarians, animal handlers, international travellers.

In July 2001, Belgium has obtained the official status of rabies-free country according to the OIE recommendations. No indigenous cases of human rabies have been reported since 1923 although cases imported from Africa are diagnosed from time to time.

- Rabies in animals

Rabies in animals

Surveillance programme and methods used

Food animals with nervous symptoms are suspect for rabies and therefore these cases have to be notified to the veterinary officer. Affected animals are killed and their brain is examined by immunofluorescence and virus cultivation in neuroblasts at the National Reference Laboratory.

Wildlife found dead or shot is transferred to the clinical veterinary laboratories (ARSIA – DGZ) for autopsy. In case of suspected lesions brain samples are examined in the National Reference Laboratory.

Vaccination policy

Vaccine baits (Raboral, Rhône-Mérieux) were dispersed for the vaccination of foxes. In April and October 2003, a zone of approximately 1 800 km^2 along the German border was covered by spreading 32 000 baits by means of a helicopter (17.78 baits per km^2). Since there were no more cases of rabies for the last years, vaccination of foxes by baits was stopped by the end of 2003.

In the south of the country, below the rivers Sambre and Meuse, vaccination of dogs and cats is compulsory. In addition, all pets staying on any Belgian public camping must be vaccinated.

Epidemiological investigations and results of 2004 surveillance

A total of 617 analyses were done at the National Reference Laboratory. The majority of samples originated from foxes (211) and cattle (274). The high number for cattle is the consequence of the surveillance system for transmissible spongiform encephalopathy (TSE) in cattle: all suspected cases were first examined for rabies. Rabies must be considered in the differential diagnosis of TSE, although the course of the disease is usually shorter.

None of the samples was found positive. Since the last indigenously acquired case of rabies occurred in Belgium in a bovine in July 1999, the country is officially free of rabies.

2004

report on zoonotic agents in belgium in 2004

2004

trichinellosis

report on zoonotic agents in belgium in 2004 — trends and sources

Trichinella

Trichinella is an intestinal parasite whose larvae can be present in the muscles of different animal species and is transferred to humans by the consumption of contaminated raw or undercooked meat. Therefore, pork, wild boar and horse meat are examined before marketing. Carcasses found positive for the presence of Trichinella are declared unfit for consumption.

After a 1 to 4 weeks incubation, trichinellosis in humans consists of myalgia, fever, eosinophilia, facial oedema and myocarditis.

Trichinella has not been detected in carcasses of pigs and horses destined for human consumption in Belgium for years.

It is recommended to travellers not to import raw meats of susceptible animals, e.g. sausages, bear meat and not to consume meats of unknown quality abroad.

Ministerial Decree of 18 November 1991 imposes systematic Trichinella examination of all pig carcasses intended for export and all horses, wild boar and other susceptible wildlife animals.

- Trichinella in food animals
- Trichinella in wildlife

Trichinella in food animals

Surveillance programme and methods used

Pig carcasses intended for intracommunity trade or export, except when frozen, all locally slaughtered horses and wild boars placed on the market were checked for Trichinella.

The analysis is done by artificial digestion: the magnetic stirrer method of pooled 100 gram sample as described in Council Directive 77/96/EEC, 1 gram per pig and 5 gram per horse or wild boar. Serology may be done in live pigs and for epidemiological studies on wildlife.

Notification to the Federal Agency for the Safety of the Food Chain is compulsory.

Results of the 2004 surveillance

A total of 10 284 186 pigs, 11.416 solipeds (mainly horses) and 8.167 wild boars were examined. Only one sample of wild boar was positive for Trichinella britovi.

Trichinella in wildlife

In 2004 91 foxes, 30 badgers, 42 martens, 52 polecats, 92 rats were analysed for Trichinella, only one fox tested positive.

2004

report on zoonotic agents in belgium in 2004

2004

echinococcosis

report on zoonotic agents in belgium in 2004 — trends and sources

Echinococcosis

Echinococcosis is caused either by Echinococcus granulosus or Echinococcus multilocularis.

- Echinococcus granulosus produces unilocular human hydatidosis. It is a small tapeworm (6 mm) that lives in the small intestine of domestic and wild canids. Sheep and cattle serve as intermediate hosts for the infection. Humans acquire infection by ingestion of typical taeniid eggs, which are excreted in the faeces of infected dogs. When eggs are ingested by the intermediate hosts or by humans, the oncospheres liberated from the eggs migrate via the bloodstream to the liver, lungs and other tissues to develop in hydatid cysts. Within the cyst brood capsules and protoscoleces develop. Each protoscolex is a potentially infective organism for canids. Indigenous unilocular hydatidosis in man has been reported in Belgium.
- Echinococcus multilocularis causes alveolar (multilocular) echinococcosis in humans. Foxes and dogs are the definitive hosts of this parasite and small rodents the intermediate hosts. In the liver of rodents the invasive larval stage has a multi-compartimented appearance containing many protoscoleces. Ingestion of the eggs by humans can result in the development of invasive cysts in the liver. In Belgium, the percentage of infected foxes varies with the region, with a decreasing rate from the South-East to the North-West: e.g 33% in the Ardennes, 13% in the Condroz region and 2% in Flanders. The endemic region is situated under the river Meuse, on the heights of the Ardennes. Thanks to an efficient information campaign in wooded areas only nine human cases of alveolar echinococcosis have been detected in Belgium since 1999.

Echinococcus in food animals

Post mortem macroscopic examination is done at the slaughterhouse in the Echinococcus domestic intermediate hosts: cattle, sheep, horses and pigs. The following partial rejections were noted by the Federal Agency for the Safety of the Food Chain in 2003: 200 cases of adult cattle and 3 of sheep. Echinococcus granulosus was not detected in calves, pigs, goats and wild boars. As for 2004, 48 cases of adult cattle and 2 cases of sheep were notified. Goats, pigs and solipeds were found free.

2004

cysticercosis

report on zoonotic agents in belgium in 2004 — trends and sources

Cysticercosis

- Cysticercus bovis in muscular tissue of cattle is the larval stage of the tapeworm, Taenia saginata, a parasitic cestode of the human gut (taeniasis). Humans contaminate themselves by the ingestion of raw or undercooked beef containing the larval form (cysticerci). Usually the pathogenicity for humans is low. The tapeworm eggs contaminate the environment directly or through surface waters. Macroscopic examination is routinely done in adult cattle as well as in calves and sheep in the slaughterhouse. Serological examination is possible and confirmation of the lesions by PCR can be done.
- Although Cysticercus ovis in sheep is not transmissible to humans, its presence causes total rejection of the carcass.
- The Belgian pig population is virtually free from Cysticercus cellulosae. Taenia solium (and Cysticercus cellulosae) is not autochthonous in Belgium.

Cysticercosis in cattle

Post-mortem, macroscopic examination of carcasses is routinely done in the slaughterhouse. Figures from the Federal Agency for the Safety of the Food Chain show that in 2004, 21 carcasses of adult cattle were rejected for generalised cysticercosis. In addition, the meat of 2 981 cattle was treated by a 10 days freezing before human consumption. No calves nor sheep were found to be infected.

2004

sarcosporidiosis and toxoplasmosis

report on zoonotic agents in belgium in 2004 — trends and sources

Sarcosporidiosis and Toxoplasmosis

The following species are of zoonotic importance: Sarcocystis bovihominis (man final host, bovine intermediate host), Sarcocystis suihominis (man final host, pig intermediate host) and Toxoplasma gondii (cat final host, man and most warm-blooded animals intermediate hosts).

Man is infected with Sarcocystis spp by ingesting undercooked infected meat; infection with T. gondii occurs through ingestion of undercooked infected meat or upon accidental ingestion of sporulated oocysts from the environment.

Sarcocystis spp. infections are mostly asymptomatic but may cause mild aspecific gastrointestinal symptoms like nausea and diarrhoea. Most infections with T. gondii are asymptomatic, however mild (flu-like symptoms), moderate (lymphadenopathy, chronic fatigue) to severe disease (disseminated toxoplasmosis, encephalitis) may occur, the latter mainly in immunocompromised hosts. Moreover, when infection occurs in pregnant women, toxoplasmosis may cause abortion and congenital disorders.

In the case of toxoplasmosis, the majority of adult persons have acquired immunity to re-infection but can remain carrier, while for human sarcosporidiosis there is no immunity development.

The majority of grazing animals are inapparent carriers of tissue cysts. There is a need for suitable microscopic, serological and molecular biological methods for the detection.

- Surveillance programme in food animals
- Toxoplasmosis in humans

Surveillance programme in food animals

Carcasses are partially or entirely condemned when lesions of sarcosporidiosis or toxoplasmosis are apparent.

Number of partial rejections of cattle in 2004 because of sarcosporidiosis lesions: 19.

Toxoplasmosis in humans

Toxoplasmosis during pregnancy can cause foetal infection. Manifestations of congenital toxoplasmosis in the foetus and newborn are unpredictable; they range from intra-uterine death, hydrocephalus and severe mental retardations to less severe lesions as ocular disorders.

As the disease is generally a-symptomatic, diagnosis relies on serological tests. Primary prevention intends to avoid the infection of the foetus, while secondary prevention aims at reducing the severity of sequelae. Although cats play a role in the epidemiology of the disease, there is no statistical correlation between toxoplasmosis infection and cat ownership.

The life cycle of this protozoon is fully known and theoretically prevention of the infection is possible. Humans are mostly infected by the oral route: by either ingestion of oocysts excreted by cats or by ingestion of cysts present in inadequately cooked meat. If sero-negative pregnant women adopt measures aimed at avoiding the ingestion of potentially infectious items, the risk of infection can be reduced.

Prevention of congenital toxoplasmosis is most often based on the results of a serological screening programme in pregnant women followed by prenatal and postnatal treatment of women and their newborns when infection is already established during pregnancy (secondary prevention).

Efforts are made for primary prevention of toxoplasmosis during pregnancy. Primary prevention is based on education by physicians about preventive measures and distribution of leaflets containing written recommendations on the nature of the disease and its avoidance.

The mode of acquiring toxoplasmosis from meat, cat faeces and contaminated soil is so circumscribed that simple measures are mostly preventive. It is realistic to ask pregnant women to apply simple hygienic measures over a short period. It is not difficult to persuade pregnant women to wash their hands after contact with cats, meat, soil and water. Freezing meat before consumption or adequate heating when preparing are other effective measures.

Prevention is better than cure. A primary prevention campaign can help to reduce the costs for screening and treatment of established toxoplasmosis during pregnancy.

2004

foodborne outbreaks in humans

report on zoonotic agents in belgium in 2004 — trends and sources

Foodborne outbreaks in humans

According to the World Health Organization a foodborne disease is a disease of an infectious or toxic nature caused by or thought to be caused by the consumption of food or water. An outbreak, also according to WHO, is an incident in which 2 or more persons experience a similar illness after ingestion of the same food, or after ingestion of water from the same source and where epidemiological evidence implicates the food or water as the source of the illness.

In case of an outbreak the source of contamination, the cause and the etiological agent need to be determined to prevent more victims and to take adequate measures. In the Belgian situation the source is frequently fresh eggs or food prepared with fresh eggs that are not or insufficiently heated during preparation (chocolate mousse, home-made mayonnaise and bavarois). Meat, meat preparations and especially poultry meat are also a frequent source of contamination.

The most frequent causes of foodborne outbreaks are disruption of cold chain, insufficient heating of the food, lack of personal hygiene, bad hygiene in the kitchen, long delay between preparation and consumption and raw materials of poor microbiological quality.

The etiological agent can be a bacterium, a toxin or a virus. Salmonella, Campylobacter, Verotoxinogenic E. coli and Yersinia enterocolitica are often responsible for foodborne infections. Bacillus cereus, coagulase positive Staphylococci, Clostridium perfringens and Clostridium botulinum produce toxins and will cause acute food intoxications. The symptoms and the time of onset after the meal can give an indication of the responsible etiological agent.

Foodborne outbreaks can be prevented by the application of simple hygienic rules like adequate refrigeration of the food, hand washing before and during preparation, separation of raw and cooked food and sufficient heating during preparation. Foodborne outbreaks due to viruses are frequently traced back to an infected food handler who neglected basic hygiene measures. Hepatitis A virus and Norovirus are the only viruses registered in association with foodborne outbreaks in Belgium since 1999.

- Causative agents
- Source of the foodborne outbreaks

Data came from the Federal Agency for the Safety of the Food Chain, the Flemish Community, the sentinel laboratories network for human microbiology and the Federal Reference Centres for Foodborne outbreaks, for Clostridium botulinum, for Salmonella and Shigella and for Listeria.

During 2004, a total of 57 outbreaks of foodborne infections and intoxications were recorded in Belgium. This is about half the number of outbreaks recorded in 2003 (n=101). More than 531 people were ill, at least 74 persons were hospitalised and 1 baby died. However not all outbreaks were notified and for many outbreaks data are incomplete.

Causative agents

Fifty-three percent of the outbreaks were due to Salmonella (n=30), with Enteritidis as the predominant serotype (55%). For comparison, in 2003 Salmonella was responsible for 62% of the recorded outbreaks. Serotypes Typhimurium, Paratyphi B var. Java and Bovismorbificans were also isolated from implicated foods. Not in every outbreak caused by Salmonella the serotype was recorded.

Thermotolerant Campylobacter was responsible for three outbreaks with a 90% hospitalisation rate.

B. cereus was the causative agent in 2% of the cases and Staphylococcus aureus was identified in 4% of the cases. Other agents were C. botulinum (n=1), Hepatitis A (n=2), Norovirus (n=2) and histamine (n=2). Listeria monocytogenes (n=1) was responsible for the stillbirth of one baby.

In 21% of the outbreaks no causative agent could be identified.

Causative agent	Outbreaks	Ill	Died	Hospitalised	Sources
Salmonella	30	197	-	25	Preparations with raw eggs, beef, poultry and minced meat
Campylobacter	3	42		38	Chicken stew
B. cereus	1	50			Pasta
S. aureus	2	15			Sea food
E. coli O157	1	3		3	Meat
Hepatitis A	2	19		3	
Histamine	2		-	2	Tuna steak, tuna salad
Norovirus	2	33			
C. Botulinum type B	1	1		1	Home-cured ham
Listeria monocytogenes	1	1	1		Cheese
Unknown	12	165	-	2	
Total	57	531	1	74	

Table Y. *Foodborne outbreaks in humans in Belgium in 2004*

Source of the foodborne outbreaks

In 36 % of the outbreaks, preparations with raw eggs (eggs, chocolate mousse, mashed potatoes prepared with raw eggs, mayonnaise, pastry) were identified as the source of the infection, where in 2003 this was 43%. Meat or meat-based products (beef, poultry, minced meat) were responsible for 16% of the cases (20% in 2003). Home cured ham contaminated with C. botulinum type B toxins caused an intoxication of 2 persons of the same family. The 2 outbreaks of histamine poisoning were associated with the consumption of tuna (fresh tuna and tuna salad).

Working Group on Foodborne Infections

Presentation of the working group

The working group was created in 1995 by the Institute of Public Health (WIV – ISP) and brings together, on a voluntary basis, the main actors in the field of foodborne infections and intoxications in Belgium. Since its final reform in 1993, Belgium consists of Communities and Regions, each with their specific responsibilities and competences. Since food and food hygiene is a federal matter and matters related to persons such as illness are the competence of the Flemish, French or German community, data on foodborne outbreaks are dispersed. As a consequence, there was a need for a working group that assures the coordination, the streamlining of policy and the harmonization of the approach between the different partners implicated in outbreaks.

The group is composed of delegates representing

- the Federal Public Service Public Health, Food Chain Safety and Environment,
- the Federal Agency for the Safety of the Food Chain,
- the Health Inspection Services of the Communities,
- the Brussels Community Coordination Commission,
- the Anti-poison centre,
- the Food microbiology laboratory of the University of Ghent,
- the National Reference Laboratory for food microbiology at the University of Liège and
- the Veterinary and Agricultural Research centre (CODA-CERVA).

The Institute of Public Health houses the working group and is represented by the Epidemiology section, the Reference centres for Salmonella and Shigella, for Listeria and for Foodborne Infections and Intoxications.

The main goals of the working group are to exchange field information on detection, epidemiological investigation, controlling and reporting of outbreaks and eventually of sporadic cases of foodborne infections in the country. Significant effort has been put on the improvement of outbreak data collections and case-control studies. The working group also provides scientific support to the mandatory annual Belgian Trends and Sources Report to the European Food Safety Agency (EFSA). In 2004, the Belgian authorities recognized the working group as 'Platform for foodborne infections and intoxications and food related zoonoses' reporting to the Conference of Ministers of Public Health.

Addendum

Legislation

http://www.ejustice.just.fgov.be/cgi/welcome.pl

http://europa.eu.int/eur-lex/en/index.html

Publications

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Tables and Figures

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