2005

trends and sources

report on zoonotic agents in belgium in 2005

working group on foodborne infections and intoxications

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

.be

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

Executive summary

The most commonly reported zoonotic infections in humans are those caused by bacterial zoonotic agents that can be shed by asymptomatic farm animals. Campylobacteriosis became the most frequently reported zoonotic disease in humans. Broiler and other poultry meat is an important source of foodborne Campylobacter infcctions. Salmonellosis is the second most frequently reported zoonosis. The major sources of foodborne outbreaks due to Salmonella spp. are eggs, poultry meat and pig meat. VTEC infections and Yersiniosis are also commonly reported zoonotic diseases. Listeriosis also needs special attention due to high case fatality rate in humans. Findings of L. monocytogenes, over the limit that poses a risk to human health, occurred especially in ready-to-eat food categories (dairy and fishery products). Salmonella and foodborne viruses are the most reported causes of foodborne outbreaks. In Salmonella outbreaks, eggs and poultry meat were most often identified as source of infections while viruses mostly contaminated food or drinking water, fruit and vegetables.

report on zoonotic agents in belgium in 2005

2005

table of contents

2005

trends and sources

report on zoonotic agents in belgium in 2005

working group on foodborne infections and intoxications

Preface

The edition of the Belgian Trends & Sources Report 2005 is based on article 9 of Directive 2003/99/EC of the European Parliament and the Council on the monitoring of zoonoses and zoonotic agents : "Member States shall assess trends and sources of zoonoses, zoonotic agents and antimicrobial resistance in their territory. Each Member State shall transmit to the Commission every year by the end of May an official report on zoonoses, zoonotic agents and antimicrobial resistance covering the data collected during the previous year". Almost all data on zoonoses, zoonotic agents, antimicrobial resistance and foodborne outbreaks, 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. Moreover this Belgian Report 2005 shows the data over different years to better indicate trends and sources. 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 fourth edition of the Belgian report on zoonotic agents.

Hein Imberechts
CODA – CERVA

Luc Vanholme
FAVV - AFSCA

Katelijne Dierick
WIV - ISP

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

Introduction

This fourth brochure on zoonotic agents in Belgium is based on the National "Zoonoses data collection" report that was transmitted to the European Food Safety Authority (EFSA) by the 31th of May 2006. 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 this National zoonoses report is 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 European Food Safety Authority is assigned by the Commission to examine the data collected by all the reports of the Member states and to prepare the Community Summary Report. The final Community Summary Report 2005 and all National zoonoses reports 2005 will be published on EFSA website by the end of December 2006.

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 provided. For each pathogenic agent relevant information is presented, e.g. if vaccination is allowed, whether a monitoring is conducted, or which 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 (FAVV-AFSCA);
- Scientific Institute of Public Health (WIV - ISP);
- Veterinary and Agrochemical Research Centre (CODA - CERVA).

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

- N. Botteldoorn, National Reference Laboratory for foodborne outbreaks and antimicrobial resistance, Scientific Institute of Public Health;
- J.-M. Collard and S. Bertrand, 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;
- G. Daube and C. De Backer, National Reference Laboratory for Food Microbiology, Faculty of Veterinary Medicine, Université de Liège;
- 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;
- G. Ducoffre and F. Wuillaume, Epidemiology Unit, Scientific Institute of Public Health;
- J. Duculot, B. Pochet, J. Hooyberghs, K. Vermeersch, Ph. Heinen, P. Poels and J-P. Maudoux, Federal Agency for the Safety of the Food Chain, Control Policy Directorate;
- M. Fauville-Dufaux, National Reference Laboratory for Tuberculosis and Mycobacterium, Scientific Institute of Public Health, Pasteur Institute Department;
- C. Godard and C. Wildemauwe, National Phage Typing Centre, Scientific Institute of Public Health, Pasteur Institute Department;
- M. Lambert, A. Sevenants, K. Mennens, M. Delhalle and Ph. Dodion, Federal Agency for the Safety of the Food Chain, Control Directorate;
- 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, UZ Brussels, Microbiology Section;
- E. Thiry and A. Scipioni, Department of Virology and Pathology of viral animal diseases, Faculty of Veterinary Medicine, Université de Liège;
- T. van den Berg, Department of Small Stock Pathology, Veterinary and Agrochemical Research Centre;
- X. Van Huffel, Federal Agency for the Safety of the Food Chain, Control Policy Directorate, Secretariat of the Scientific Committee;
- E. Vanopdenbosch and S. Roels, Department of Biocontrol, Veterinary and Agrochemical Research Centre;
- 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.

National Reference laboratories (NRL) for zoonotic agents

Zoonotic agent	Contact	Address	E-mail	Website
Avian Influenza	T. van den Berg	CODA - CERVA, Groeselenberg 99, 1180 Brussels	thvan@var.fgov.be	http://www.var.fgov.be
Brucella, public and animal health	K. Walravens	CODA - CERVA, Groeselenberg 99, 1180 Brussels	Karl.Walravens@var.fgov.be	http://www.var.fgov.be
Biotoxins	J.-Y. Michelet	WIV-ISP, Food Section, J. Wytsmanstraat 14, 1050 Brussels	Jean-Yves.Michelet@iph.fgov.be	http://www.iph.fgov.be/
BSE / TSE	S. Roels	CODA - CERVA Groeselenberg 99, 1180 Brussels	stroe@var.fgov.be	http://www.var.fgov.be
Campylobacter	G. Zissis O. Vandenberg	CHU St.-Pierre, Microbiology Rue Haute, 322, 1000 Bruxelles	gzissis@stpierre-bru.be Olivier_Vandenberg@stpierre-bru.be	
Clostridium botulinum	A. Kimpe	WIV-ISP, Dpt Pasteur, Rue Engeland, 642, 1180 Brussels	AKimpe@pasteur.be	http://www.iph.fgov.be
Escherichia coli VTEC and EHEC, animal health	H. Imberechts	CODA - CERVA Groeselenberg 99, 1180 Brussels	Hein.Imberechts@var.fgov.be	http://www.var.fgov.be
Escherichia coli VTEC and EHEC, public health	D. Pierard	UZ Brussel, Microbiology, Laarbeeklaan 101, 1090 Brussels	labomicro@uzbrussel.be	http://www.azbrussel.be
Foodborne outbreaks	K. Dierick	WIV-ISP, Bacteriology, J. Wytmanstraat 14, 1050 Brussels	Katelijne.Dierick@iph.fgov.be	http://www.iph.fgov.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
Hantaviruses	P. Heyman	Queen Astrid Military Hospital / SMTS, Bruynstraat 2, 1120 Brussels	Paul.Heyman@mil.be	http://www.smd.be/rlvbd
Listeria monocytogenes	M.Yde	WIV-ISP, Bacteriology, J. Wytmanstraat 14, 1050 Brussels	Marc.Yde@iph.fgov.be	http://www.iph.fgov.be
Mycobacterium	M. Fauville-Dufaux (public health)	WIV-ISP Dpt Pasteur, Rue Engeland 642, 1180 Brussels	Mfauville@pasteur.be	http://www.iph.fgov.be
	F. Portaels (public health)	ITG-Mycobacteriology Nationalestraat 155, 2000 Antwerpen	Fportaels@itg.be	http://www.itg.be
	K. Walravens, M. Govaerts (animal health)	CODA - CERVA, Groeselenberg 99, 1180 Brussels	Karl.Walravens@var.fgov.be Marc.Govaerts@var.fgov.be	http://www.var.fgov.be

Zoonotic agent	Contact	Address	E-mail	Website
Phage typing centre	C. Godard C. Wildemauwe	WIV-ISP, Dpt Pasteur, Rue Engeland 642, 1180 Brussels	Cgodard@pasteur.be	http://www.iph.fgov.be
Rabies	I. Le Roux	WIV-ISP, Dpt Pasteur, Rue Engeland 642, 1180 Brussels	Ileroux@pasteur.be	http://www.iph.fgov.be
Salmonella, public health	J.M. Collard	WIV-ISP, Bacteriology, Rue J. Wytsman 14, 1050 Brussels	Jean-Marc.Collard@iph.fgov.be	http://www.iph.fgov.be/bacterio/
Salmonella, animal health	H. Imberechts	CODA-CERVA, Groeselenberg 99, 1180 Brussels	Hein.Imberechts@var.fgov.be	http://www.var.fgov.be
Trichinella and other zoonotic parasites	J. de Borchgrave P. Dorny	ITG-Diergeneeskunde Nationalestraat, 155, 2000 Antwerpen	Jdeborchgrave@itg.be Pdorny@itg.be	http://www.itg.be
Yersinia enterocolitica	J. Verhaegen M. Delmee	UZ-Leuven-Microbiology, Herestraat, 49, 3000 Leuven UCL-St. Luc 5490, Av. Hippocrate 54, 1200 Brussels	Jan.Verhaegen@uz.kuleuven.ac.be Delmee@mblg.ucl.ac.be	

2005

general information

Susceptible human population

The evolution of the total human population in Belgium categorised per age, sex and region from 2000 to 2005 is shown in the next table.

	2000	2001	2002	2003	2004	2005
Total	**10 239 085**	**10 263 414**	**10 309 725**	**10 355 844**	**10 396 421**	**10 445 852**
0-19	2 419 964	2 412 224	2 408 943	2 407 368	2 408 456	2 414 041
20-64	6 104 028	6 121 455	6 154 390	6 186 086	6 207 845	6 232 311
65+	1 715 093	1 729 735	1 746 392	1 762 390	1 780 120	1 799 500
Male	**5 006 014**	**5 018 019**	**5 042 288**	**5 066 885**	**5 087 176**	**5 111 325**
0-19	1 237 139	1 233 250	1 231 221	1 230 382	1 230 570	1 233 688
20-64	3 069 738	3 077 631	3 094 653	3 110 779	3 120 599	3 131 390
65+	699 137	707 138	716 414	725 724	736 007	746 247
Female	**5 233 071**	**5 245 395**	**5 267 437**	**5 288 959**	**5 309 245**	**5 334 527**
0-19	1 182 825	1 178 974	1 177 722	1 176 986	1 177 886	1 180 353
20-64	3 034 290	3 043 824	3 059 737	3 075 307	3 087 246	3 100 921
65+	1 015 956	1 022 597	1 029 978	1 036 666	1 044 113	1 053 253
Brussels	**959 318**	**964 405**	**978 384**	**992 041**	**999 899**	**1 006 749**
Flanders	**5 940 251**	**5 952 552**	**5 972 781**	**5 995 553**	**6 016 024**	**6 043 161**
Wallonia	**3 339 516**	**3 346 457**	**3 358 560**	**3 368 250**	**3 380 498**	**3 413 978**
Foreigners	**897 110**	**861 685**	**846 734**	**850 077**	**860 287**	**870 862**

Table 1. *Evolution in the total human population 2000-2005. Source: National Institute for Statistics http://statbel.fgov.be/*

- Susceptible human population
- Susceptible animal populations
- Animals slaughtered in 2003 2004 and 2005

Susceptible animal populations

Ruminants and pigs

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

	2003		2004		2005	
	Herds	Animals	Herds	Animals	Herds	Animals
Cattle	44 595	2 752 974	44 555	2 781 676	42 204	2 492 757
Pigs	10 986		10 614		10 792	
Breeding sows[1]		668 908		664 316		657 998
Fattening pigs[2]		5 115 683		4 998 124		4 989 016
Sheep	31 762	221 434	31 405	214 612	32 323	219 274
Goats	13 522	43 130	13 736	37 666	14 247	43 727
Deer	2 907	16 588	2 965	13 427	3 093	14 655

Table 2. *Total number of herds and animals in 2003, 2004 and 2005*

Poultry

	2004		2005	
	Herds	Animals	Herds	Animals
Gallus Gallus				
Layers	529	14 364 922	386	10 562 160
Broilers	1 097	27 873 988	1 024	26 754 817
Elite, Parent, Breeding	193	2 255 085	156	2 144 874
Total	2 284	50 947 719	1 566	39 461 851

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

	2004		2005	
	Herds	Animals	Herds	Animals
Ducks	31	33 949	17	45 140
Geese	8	4 843	5	3 800
Guinea fowl	27	87 440	16	71 400
Partridges	2	123 300	4	129 000
Pheasants	14	206 649	16	226 049
Pigeons	4	1 520	2	1 300
Quails	7	56 020	1	1 700
Turkeys	63	498 146	37	246 076

Table 3. *Total number of holdings and total number of available places for fowl in 2004 and 2005*

Animals slaughtered in 2003, 2004 and 2005

	2003	2004	*2005*
Cattle	570 000	564 266	523 795
Calves	317 000	317 269	313 115
Pigs	11 609 933	11 229 149	10 861 234
Solipeds	12 304	11 655	11 542
Sheep	83 112	87 119	112 771
Goats	2 514	3 814	2 585
Broiler	222 327 256	244 064 267	237 670 666
Layer	19 711 279	28 577 233	29 907 674

Table 4. *Number of animals slaughtered in 2003, 2004 and 2005. (Source: Data from the Federal Agency for the Safety of the Food Chain)*

The small number of layers slaughtered in 2003 is associated with the outbreak of avian influenza in March 2003 and the consequent depopulation of poultry houses.

2005

campylobacteriosis

Campylobacteriosis

Campylobacter is the most common cause of bacterial gastroenteritis worldwide. Campylobacteriosis overtakes salmonellosis as the most reported animal infection transmitted to humans. The incidence of Campylobacter peaks during infancy and early adulthood. The infection may cause Guillain-Barré syndrome.

The consumption of undercooked poultry meat represents the main mode of contamination, but other food sources are also reported like pork and beef, unpasteurised milk, or contaminated drinking water. Contacts with faeces of infected pets may also be a source of contamination. This chapter focuses on Campylobacter jejuni and Campylobacter coli which are the most frequently reported pathogens in humans

The contamination of poultry carcasses and meat with Campylobacter are monitored by the Federal Agency for the Safety of the Food Chain since 2000. The rate of positive poultry samples is high, but stable. 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 2005, 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.

Samples for Campylobacter were taken from 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 performed the sampling. Four contamination levels, 25g, 1g, 0.01g and 600cm2 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 on 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 2005 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
Broiler		
Carcasses at slaughter (n=5606)	caeca	63.2%
Carcasses at slaughter (n=270)	0.01g	19.6%
Carcasses at retail (n=77)	0.01g	3.9%
Minced meat (skinned) at retail (n=36)	25g	27.8%
Minced meat (with skin) at retail (n=41)	25g	14.6%
Meat preparation at processing plant (n=269)	0.01g	3.7%
Meat preparation at retail (n=87)	0.01g	3.4%
Fillets at processing plant (n=249)	1g	22.9%

Sample	Quantity of sample analysed	Percentage of positive samples
Layer		
Carcasses at slaughter (n=1222)	caeca	93.3%
Carcasses at slaughter (n=64)	0.01g	10.4%
Carcasses at retail (n=57)	0.01g	21.0%
Pork		
Carcasses (n=433)	600 cm2	7.2%
Minced meat at processing plant (n=288)	25g	0.7%
Minced meat at retail (n=155)	25g	0.6%
Raw milk cheese at processing plant (n=37)	25g	0%
Raw milk cheese at farm (n=141)	25g	0%
Live bivalve molluscs (n=98)	25g	11.2%

Table 5. *Zoonosis monitoring programme – Campylobacter in food*

		Sampling level	2000	2001	2002	2003	2004	2005
Broilers	Carcasses	0.01g	33.9%	27.1%	34.9%	28.0%	27.9%	19.6%
	Fillets	1g	22.5%	15.3%	18.3%	17.8%	26.0%	22.9%
	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%	10.4%

Table 6. *Evolution of the food Campylobacter prevalence 2000-2005*

The contamination rate of broiler fillets raised from 17.8% in 2003 to 22.9% in 2005. 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 2005, 267 Campylobacter strains isolated in the zoonosis monitoring programme and originating from poultry and pork were tested for their antimicrobial susceptibility. Minimum Inhibitory Concentrations (MIC) were determined by the use of E-test on blood agar plates. The antimicrobials tested and the breakpoints used are listed in the following table.

Antimicrobial	Breakpoints (µg / ml)
Ampicillin	8 – 32
Tetracycline	4 – 16
Nalidixic acid	16 – 32
Ciprofloxacin	1 – 4
Erytromycin	1 – 8
Gentamycin	4 – 16

Table 7. *Campylobacter from meat and meat products: list of antimicrobials tested. Minimum Inhibitory Concentrations were determined following the NCCLS standards*

The percentage of resistant strains of Campylobacter in food is reported in the next table.

	Poultry meat		Pork
	C. jejuni (n=171)	C. coli (n=67)	C. coli (n=43)
Tetracycline	27	82	72
Ciprofloxacin	25	64	47
Nalidixic acid	30	67	53
Gentamicin	0	0	5
Erythromycin	3	9	23
Ampicillin	23	37	12

Table 8. *Antimicrobial susceptibility testing of Campylobacter in food: Percentage of resistant strains*

Antimicrobial resistance in Campylobacter from poultry meat

From poultry or poultry products in total 238 strains were identified as Campylobacter jejuni (171) or Campylobacter coli (67). In general the antibiotic resistance within C. coli was greater compared to C. jejuni . In particular a much higher percentage of resistance against ciprofloxacin, nalidixic acid and tetracycline was noticed for the C.coli strains compared to the C. jejuni

strains. Compared to 2004, a higher resistance was observed for erythromycin. No resistance was observed for gentamycin for Campylobacter isolates from poultry meat.

Antimicrobial resistance in Campylobacter from pork

In the C. coli isolates (43) from pork, resistance was observed for all the antibiotics tested. Compared to C. coli isolates from poultry a slightly lower percentage of resistance was observed except for erythromycin and gentamycin.

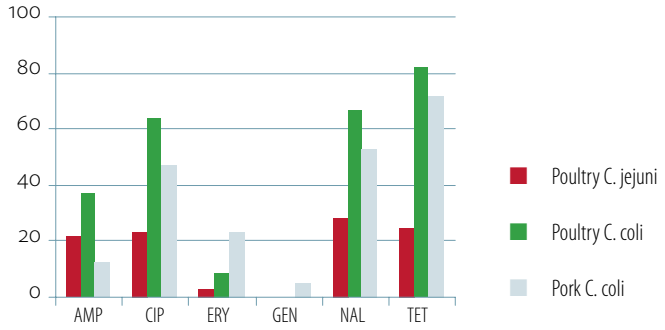


Figure A. *Percentage of resistant Campylobacter strains*

Campylobacter in humans

In 2005, the Belgian Laboratory Sentinel Network reporting Campylobacter consisted of 107 laboratories. 6,879 strains of Campylobacter were isolated which represents at country level an isolation rate of 65 per 100 000 inhabitants. For the evolution of reported Campylobacter cases, see next table.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of isolates	4 991	5 617	6 610	6 514	7 473	7 356	7 354	6 559	6 716	6 879

Table 9. *Evolution of reported Campylobacter cases*

Cases usually are reported during the entire year but with a peak in the summertime. In 2005, the seasonal variation was less pronounced, probably due to a higher number of cases in the beginning of the year.

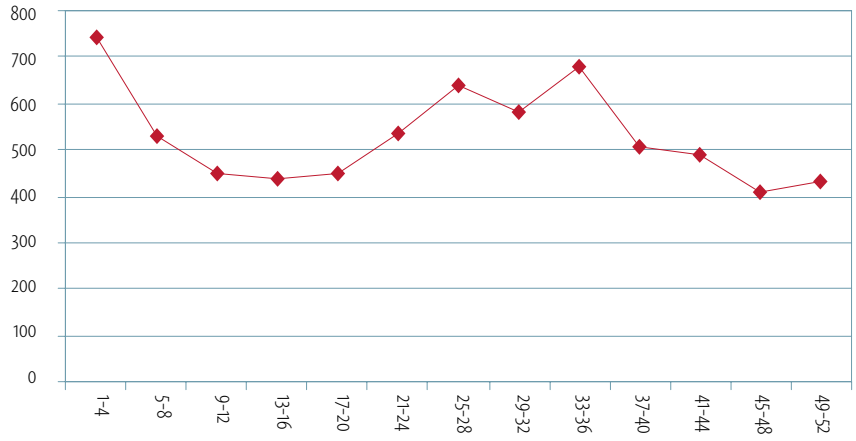


Figure B. *Weekly number of cases of Campylobacter in 2005, Belgium*

Campylobacter isolation rates are higher in the group of children below 5 years of age. Below 15 years of age, boys appear to be significantly more affected than girls. There is no explanation for this observation, but it is also described in other countries.

	Male	Female	Total
< 5 years	331	276	304
5 - 14 years	90	70	80
15 - 24 years	56	71	63
25 - 44 years	47	52	49
45 - 64 years	43	32	37
65 +	53	40	45
Belgium	69	61	65

Table 10. *Isolation rates (strains per 100,000 inhabitants) of Campylobacter by age group, 2005*

Since the beginning of the registration, the isolation rates in Flanders are twice as high as compared to Wallonia. This was confirmed in 2005 with isolation rates respectively estimated at 51/100,000 in Brussels-Capital Region, 81/100,000 in Flanders and 42/100,000 in Wallonia.

2005

salmonellosis

Salmonellosis

In Belgium, as in many countries, Salmonella is a major cause of registered bacterial foodborne infections, both in individuals and in communities. Salmonella infections provoke 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 in time 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 2005, the total number of reported Salmonella cases in humans was significantly less than the two previous years, i.e. 4.916 records in 2005, 9.543 records in 2004, and 12.894 in 2003. This significant evolution was mainly due to the remarkable decrease of Salmonella Enteritidis isolation in humans (minus 36% compared to 2004).

- 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

Each year, the Federal Agency for the Security of the Food Chain organizes an official monitoring for the detection of Salmonella in compound feeding stuffs and in raw materials. Microbiological testing on 25g samples is done in the FAVV-AFSCA laboratories. In case of isolation of Salmonella in official samples no certification is provided.

Out of sixty-four feed materials of domestic animal origin (13 dairy products, 10 meat and bone meal, 3 poultry offal meal and 38 animal fat), only one fat sample was found positive (S. Infantis). On the other hand, none of the 41 fish meal and fish oil samples were found contaminated.

A total of 131 vegetal samples were analysed in 2005. None of the three cereal samples (barley derived, maize and one other cereal grain) were found positive for Salmonella. However, 8 samples out of 119 feed materials of oil seed or fruit origin were found contaminated, i.e. one Salmonella each of serotypes Lexington, Mbandaka and Senftenberg in 15 samples derived of rape seed, S. Agona in one sample derived of sunflower seed (n=29) and 4 times S. Mbandaka in 46 samples derived from other oil seed. The 8 palm kernel samples, 19 soya and soya bean seed and 2 linseed samples were all found negative for Salmonella. Another 9 vegetal samples of miscellaneous origin were tested and found free of Salmonella.

Also 267 compound feedings stuffs were tested. All 8 feedstuffs for cattle were found negative for Salmonella, but in two feeding stuffs for pigs (n=57) Salmonella (serotypes Livingstone and Senftenberg) was detected. As for the 142 feeding stuffs for poultry, only one for broilers was contaminated (S. Jerusalem). In addition, 60 batches of complementary feeding stuffs were tested, but were free of Salmonella.

Salmonella in poultry

Salmonella in breeders and hatcheries

Surveillance programme in breeders

The samples for the Belgian Salmonella control programme in breeders are taken by technicians of the 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/)]).

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. 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 cm2 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, Ministerial 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

When Salmonella Enteritidis or Salmonella Typhimurium is isolated from a poultry breeding flock this flock is regarded as positive. If at least one sample in a flock is positive, the whole flock is considered as positive. The isolation of Salmonella should be notified to the Federal Agency for the Safety of the Food Chain by phone, fax or via E-mail.

Several measures are taken on the positive breeder flock: the hatching eggs are no longer incubated, but are removed and destroyed, and not yet incubated hatching eggs may be pasteurised. In addition, positive flocks are logistically slaughtered and after removal the houses are thoroughly cleaned and disinfected.

Vaccination against Salmonella Enteritidis and / or Salmonella Typhimurium is strongly recommended for parent flocks. Both attenuated and inactivated vaccines are available.

Epidemiological investigations and results of 2005 surveillance

In 2005, 11 layer breeding flocks were tested as one-day old birds and during rearing. None of these samples were positive for Salmonella. In addition, 46 layer breeding flocks were tested during production, and all samples were Salmonella negative. Layer breeders were found free of Salmonella Enteritidis and Salmonella Typhimurium in 2005, 2004, and 2003.

As for broiler breeders, 2 grandparent flocks were tested and both of them were negative for Salmonella. A total of 168 flocks of one day old chickens and 190 flocks during rearing were tested, and in each 1 Salmonella positive flock was found, different from Salmonella Enteritidis or Salmonella Typhimurium. Finally, 567 broiler breeder flocks were tested during production. In these, 16 flocks were positive for Salmonella, including 3 for Salmonella Enteritidis. Salmonella from broiler breeders belonged to a wide range of serotypes, including S. Infantis and S. Vichow.

Salmonella in layers and broilers

Surveillance programme in commercial poultry flocks

The national control programme for Salmonella in layers and broilers is according to the sanitary qualification, which is applicable to farms with more than 5 000 birds. The sampling consists of an exit sample for Salmonella, 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 accredited laboratory within 48h of sampling.

In addition, layer and broiler flocks may be sampled as day-old chicks at the farm (entry control). 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.

From October 2004 to September 2005, the European co-ordinated monitoring of layer flocks was undertaken according to article 5 of Directive 2003/99/EC. Details of a report of this baseline study on the prevalence of Salmonella in laying hen flocks can be found at the website of EFSA (European Food Safety Authority > Science > Zoonoses > ZDC reports). (http://www.efsa.europa.eu/en/science/monitoring_zoonoses/reports/1541.html).

Case definition, notification, sanitary measures and vaccination

A poultry layer flock is declared positive if Salmonella Enteritidis is isolated at one day of age or during rearing. In addition, the flock is positive if Salmonella belonging to any serotype is found 3 weeks before slaughter. As for broilers, a flock is declared

positive if in one of the samples Salmonella is isolated. Salmonella is notifiable to the Federal Agency for the Safety of the Food Chain since January 2004.

In case of positive findings in layers, 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 (logistic slaughter).

Vaccination is strongly recommended for layers. Both attenuated and inactivated vaccines are available.

Zoonotic Salmonella is notifiable since 1 January 2004.

Epidemiological investigations and results of 2005 surveillance

A total of 279 layer flocks were tested as day old chickens, and 8 were found positive for Salmonella. None of the 34 flocks tested during rearing were positive for Salmonella. Within 3 weeks before slaughter of laying hens, 41 out of 754 samples were positive for Salmonella, corresponding to 40 out of 666 flocks and 36 out of 346 farms.

In 2004, 27% of laying hen flocks was positive for Salmonella. In 2005, about 6% of laying hen flocks was positive. This dramatic decrease is probably in part due to the recommended vaccination.

As for the broilers, the following results were recorded for the sampling within 3 weeks of slaughter: 710 of 17 146 samples were positive for Salmonella, which corresponds to 462 out of 9 352 flocks or 248 out of 1102 farms.

Laboratory findings of the National Reference Laboratory show that almost 65% of layer isolates (n=256) were serotype Enteritidis, and 2 Salmonella Typhimurium strains were found. As for broilers (n=688), most were serotypes Enteritidis (22.5%), Paratyphi B var. Java (14.5%), Typhimurium (9.2%) and Virchow (8.0%).

During the last ten years, the number of poultry isolates sent to the NRL was between 700 and 1 100, except for 2005 when the European co-ordinated monitoring of layers caused a significant rise of isolates (almost 1 500 in total). Between 1996 and 2002, the percentage of Salmonella Enteritidis decreased annually from more than 30% to 12.0%, and subsequently raised again to a value of about 28% in 2005. Salmonella Virchow, which was the most frequent poultry serotype in 2002 and 2003, was no longer frequently found among poultry (less than 10% in 2004 and 2005). As for Salmonella Typhimurium, percentages fluctuated between 5.5% and 13.0%. About 2/3 belonged to Classic variant O5+. Noteworthy is the raise in recent years of Salmonella Paratyphi B and Salmonella Senftenberg. Whereas Salmonella Enteritidis is the single dominant serotype among layers (more than 60%), several serotypes can be found in broilers, i.e. serotypes Enteritidis, Paratyphi B, Typhimurium, Virchow, Agona, Infantis and others.

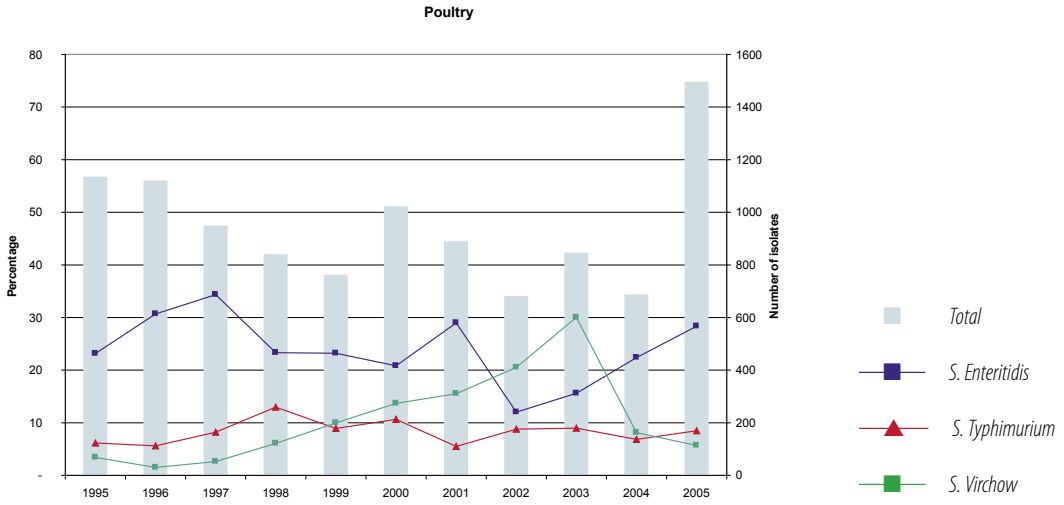


Figure C. *Evolution of the percentages of the principal Salmonella serotypes isolated from poultry between 1995 and 2005. The bars represent the total number of poultry isolates per year and refer to the right axis; the lines represent the percentage of each serotype per year and refer to the left axis. (Data from NRL)*

Salmonella in turkeys

Surveillance programme and sampling

The national control programme for Salmonella in turkeys is according to the sanitary qualification (see before). Sanitary Qualification A is mandatory for all commercial breeding flocks. They were at least sampled as day-old chick, at the age of 26 weeks when entering the production unit if this is on a different farm than the rearing unit, and within the last 3 weeks before slaughter. Meat production flocks were sampled within three weeks of slaughter if the holding has a capacity of more than 5 000 birds (Sanitary Qualification B). On a voluntary basis, one day old birds may be sampled also.

Samples for day old birds were taken at the farm, and consisted of pieces (5 by 5 cm) of the inner linings of delivery boxes. Two samples, each composed of 20 pieces of inner linings, were taken for each flock, one for the hen chicks and one for the cock chicks. The two samples were analyzed separately according to ISO 6579.

At 26 weeks, 60 blood samples were taken of each flock. If one or more blood sample were positive, faecal samples were taken to confirm the results. The owner took faeces samples from the delivery boxes at time of delivery. A sample consisted of 60 x 5

to 10g sub-samples taken from every flock with different origin of rearing. The samples have to be examined by an accredited laboratory within 48 hours.

Within 3 weeks before slaughter, the owner takes a pooled faecal sample consisting of 60 x 1g sub-samples of each flock. Alternatively, the sampling may consist of a pooled faecal sample (60 x 1g) taken by hand, or recovered from two pair of overshoes, that were pooled for analysis.

Case definition, sanitary measures and vaccination policy

A turkey flock was considered positive if zoonotic Salmonella serotypes were isolated. Measures are taken only at time of slaughter: if the flock is Salmonella positive, it was slaughtered at the end of the day (logistic slaughter).

There was no vaccination policy for breeding flocks, nor for meat production flocks.

Results of the investigation in 2005

Two of the three breeding flocks were positive for Salmonella Typhimurium during production. Ten of the 127 meat producing flocks were positive for Salmonella within 3 weeks of slaughter. The isolates were not serotyped.

Salmonella in geese, ducks and other poultry

The surveillance programme for breeder animals of geese and ducks, and for meat producing ducks was similar to that of turkeys (sanitary qualification A for breeders and B for meat production). For geese breeders however, every flock was sampled at least once a year or before slaughter.

Three breeding flocks of geese were tested and these were found negative for Salmonella. One of the three duck breeding flocks that were tested was positive for Salmonella Typhimurium and one for Salmonella Enteritidis. A total of 28 meat production flocks of ducks were tested, and 2 were positive for Salmonella (serotypes Kottbus and Reading).

The following table gives an overview of other fowl flocks that were tested in 2005.

	Flocks tested	Positive for Salmonella	Salmonella Enteritidis	Salmonella Typhimurium
Guinea fowl	27	2	0	0
Pheasants	4	1	0	1
Partridges	2	0	0	0
Ostriches	5	0	0	0

Table 11. *Other fowl flocks tested in 2005*

Salmonella in pigs

Serology

Surveillance programme in fattening pigs

In 2005, the blood samples from fattening pigs that were taken in the framework of the monitoring of Aujeszky's disease, were also analysed for Salmonella. Blood samples from pigs were taken every 4 month. Depending on the number of pigs in the farm, 1 to 12 blood samples were taken. The analysis for Salmonella specific antibodies was done in the veterinary laboratories ARSIA and DGZ by means of a commercially available ELISA kit, following the instructions of the provider.

The aim of the current voluntary surveillance programme is to determine the 10% of pig farms with the highest Salmonella prevalence and the identification of Salmonella infection risk factors.

Pigs were not vaccinated in 2005, since no vaccine was authorised in Belgium. At this stage, since 'positive' had not been defined yet, no measures are taken.

Results of the investigation in 2005

A total of 208 013 serological analyses were performed, covering 7.798 herds with fattening pigs. Of these, 26 584 samples (12,78%) had a S/P ratio greater than 1. On the basis of these preliminary results, the Federal Agency for the Safety of the Food Chain will fix a cut-off value above which pig holdings are considered at risk.

Bacteriology

There was no surveillance system for Salmonella in pigs based on bacteriology. However, several samples were taken for research activities.

Laboratory findings from the National Reference Laboratory on the pig isolates showed that the last ten years the percentage of Salmonella Typhimurium varied between 25% and almost 70%, with a tendency to become less important. More than half of the Typhimurium strains belong to Classic variant O5+. Serotype Derby is the second most important serotype, but serotype Infantis was also frequently found.

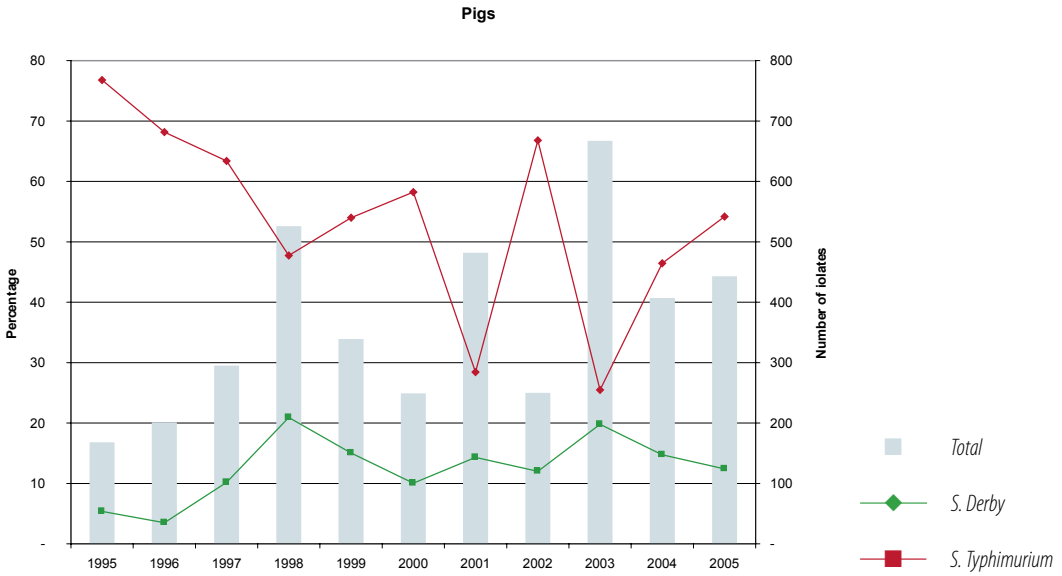


Figure D. *Evolution of the percentage of the principal Salmonella serotypes isolated from pigs between 1995 and 2005. The bars represent the total number of pig isolates per year and refer to the right axis; the lines represent the percentage of each serotype per year and refer to the left axis. (Data from NRL)*

Salmonella in cattle

There was no official monitoring for Salmonella in cattle in 2005. Isolates were sent to the National Reference Laboratory for serotyping.

In Belgium no Salmonella vaccine was authorised in cattle.

According to the National Reference Laboratory. the Salmonella serotype Typhimurium represented the most principal serotype isolated between 1996 and 2001 with more than 50% of the isolates. Since 2002, the predominant serotype found in cattle is Salmonella Dublin. In 2005, about 70% of the isolates belonged to this serotype.

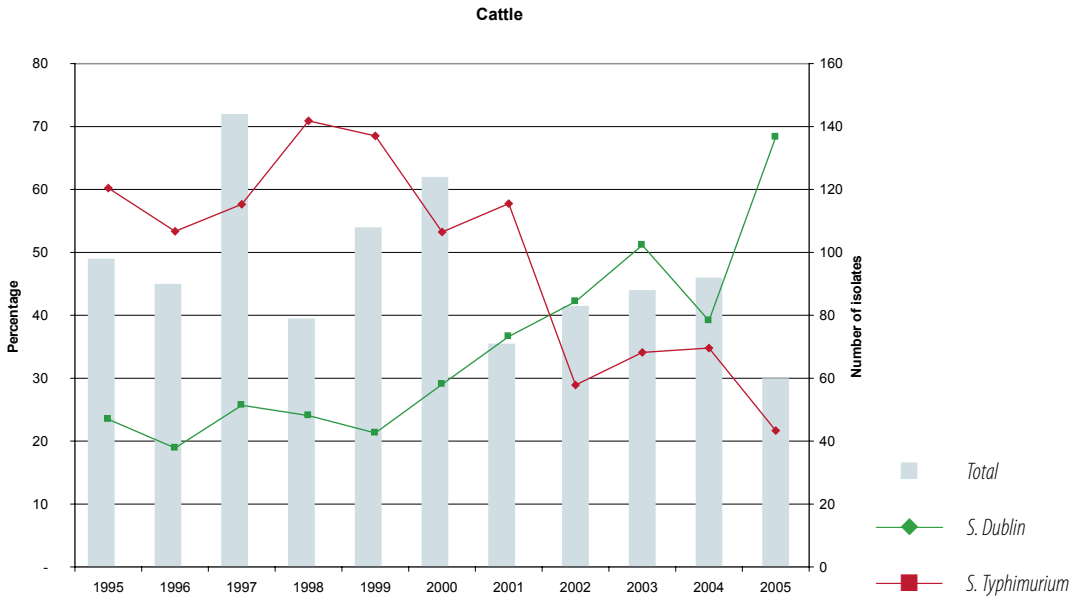


Figure E. *Evolution of the percentage of the principal Salmonella serotypes isolated from cattle between 1995 and 2005. The bars represent the total number of cattle isolates per year and refer to the right axis; the lines represent the percentage of each serotype per year and refer to the left axis. (Data from NRL)*

Salmonella in food (meat and meat products)

Surveillance programme, analytical method and notification

In 2005, 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 points representative of the Belgian production of carcasses and meat.

Sampling for Salmonella was done on the following matrices: 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 samples were analysed: 25g (trimmings, minced meat of pork, chicken and beef), 600 cm2 (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 the 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 is requested.

Epidemiological investigations and results of 2005 surveillance

The contamination of broiler carcasses (both at processing plant and at retail) decreased from 7.9% in 2004 to 5.7% in 2005. The contamination of broiler fillets with and without skin and of minced meat is 14.2% and 15.9%, respectively. The contamination of broiler fillets is decreased from 20.6% in 2004 to 14.2% in 2005.

The contamination of pig carcasses slightly decreased from 12.3% in 2004 to 9.3% in 2005. 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%.

Species	Quantity of sample analysed	Prevalence	Predominant sero-type	Other serotypes (in decreasing order)
Beef				
Minced meat at processing plant (n=280)	25g	1.4%	Typhimurium	Dublin, Derby,
Minced meat at retail (n=171)	25g	0.6%		
Steak tartare at retail (n=116)	25g	0.9%		
Pork				
Carcasses (n=442)	600cm2	9.3%	Typhimurium	Brandenburg, Derby, Mbandaka, Ohio, Infantis, Livingstone, Goldcoast, Braenderup, Saintpaul, Paratyphi B
Trimmings (n=307)	25g	7.2%	Typhimurium	Derby, Mbandaka, Livingstone, Ohio
Minced meat (n=155)	25g	6.5%	Typhimurium	, Ohio, Derby
Raw ham (n=119)	25g	0%		
Broilers				
Carcasses at processing plant (n=228)	1g	5.7%	Typhimurium	Paratyphi B, Coeln, Paratyphi B var. Java, Kentucky
Carcasses at retail (n=46)	1g	2.2%		
Fillets (n=260)	1g	14.2%	Typhimurium	Agona, Indiana, Infantis, Paratyphi B, Bredeney, Virchow, Blockley, Hadar, Minnesota, Paratyphi B var. Java
Minced meat (n=269)	1g	15.9%	Enteritidis	Paratyphi B, Derby, Virchow, Ohio, Agona
Layers				
Carcasses (n=57)	0.1g	14.0%	Enteritidis	Livingstone, Rissen

Table 12. *The results of the monitoring – Salmonella in meat and meat products*

	Samples	Sampling level	2000	2001	2002	2003	2004	2005
Pork	Carcasses	600cm2	24.1%	20.8%	15.4%	14.6%	12.3%	9.3%
	Trimmings	25g	32.3%	17.7%	11.2%	6.1%	10.4%	7.3%
	Minced meat	25g	16.6%	10.3%	11.0%	6.4%	9.4%	6.5%
	Salami	25g	0.7%					
Broilers	Carcasses	1g	6.6%	11.4%	7.0%	12.1%	7.9%	5.7%
	Minced meat	25g			21.0%	29.3%	18.5%	15.9%
	Fillets	25g	12.7%	15.1%	12.6%	11.7%	20.6%	14.2%
Layers	Carcasses	0.1g	26.7%	21.9%	20.3%	18.6%	19.6%	14.0%
Beef	Carcasses	1600 cm2		2.7%	0.0%			
	Trimmings	25g			0.9%	2.0%		1.4%
	Minced meat	25g	6.1%	2.7%	3.3%	0.3%	2.1%	0.6%

Table 13. *Evolution of the food Salmonella prevalence 2000-2005*

Salmonella in other food

In the national random survey of milk and dairy products, no Salmonella was found in 25g samples of raw milk cheese at farm (n=141) and at processing plant (38), ice cream at farm (n=40) and at processing plant (n= 51), butter at farm (n=185) and at processing plant (n=106) .

In the national random survey of other food, 25g samples of egg products (n=151), bakery desserts containing raw eggs (n=188), bakery products with egg fillings (n=118), species and herbs at retail (n=205), ready-to-eat pre cut fruits and vegetables (n=114), ready-to-eat prepared dishes (n=370), chocolate at retail (n=153), crustaceans (n=50), molluscs and shellfish (n=49), live bivalve molluscs (n=98) were analysed. Only bakery desserts containing raw eggs, ready-to-eat prepared dishes and live bivalve molluscs were found positive for Salmonella with respectively 0.5%, 0.3% and 2.0%.

Salmonella in humans

Surveillance programme and methods used

Data about human salmonellosis cases were obtained from 171 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 performed 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, all isolates of Salmonella Infantis, Newport, Typhi and Paratyphi selected and tested for their antimicrobial susceptibility.

The objective of the national surveillance programme is 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 2005 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 1). 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. From 2004 a substantial decrease of Salmonella Enteritidis infections compared with the average annual number of cases in the period 2000-2004 was recorded. This decrease was spectacular in 2005 when the total number of cases caused by Salmonella spp. and by Salmonella Enteritidis decreased to 4 872 and 2 208 cases, respectively. Compared to 2004, the decrease in 2005 could not be associated with a particular season (Fig. 1), although a higher reduction was observed from September to November (around 75% decrease vs. 45% to 65% for the others months). Paradoxically, the fall season was particularly hot (mean t = 20.5°C).

In recent years, the number of Salmonella Typhimurium isolates remained at a level of about 2 500 strains per year, but started to decrease from 2005 (-33%, Table 1). 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 in 2004, but decreased to 58 cases in 2005. As for Salmonella Virchow, about 140 to 150 isolates per year were registered from 2000 to 2003, whereas in 2004 and 2005 less than 100 strains were reported. A remarkable drop of Salmonella Hadar (459 in 1998, 237 in 1999 vs 30 in 2005) 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 but remained stable in 2004 and 2005.

	1999	2000	2001	2002	2003	2004	2005
Total	15 774	14 088	11 065	10 075	12 894	9 543	4 916
Enteritidis	10 492	9 503	7 112	6 398	9 201	6 075	2 226
Typhimurium	3 348	2 799	2 370	2 438	2 486	2 459	1 659
Brandenburg	279	322	200	148	66	63	76
Derby	138	169	158	92	100	64	67
Virchow	86	147	143	132	152	91	65
Infantis	169	120	126	74	54	107	58
Hadar	237	178	143	74	60	48	30
Bovismorbificans	116	108	46	57	35	27	18
Livingstone	83	109	62	47	43	34	14
Goldcoast	49	77	96	54	55	26	12
Other Salmonella	777	556	609	561	642	549	691

Table 14. *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 (42% of cases), with no significant gender difference.

	Salmonella				Salmonella Enteritidis				Salmonella Typhimurium			
Age	Total	M	F	SR	Total	M	F	SR	Total	M	F	SR
< 1 year	364	189	170	1.1	127	63	61	1.0	126	66	58	1.1
1 to 4 y	1 704	841	843	1.0	667	315	345	0.9	828	426	391	1.0
5 to 14 y	735	376	352	1.0	381	200	179	1.1	270	129	138	0.9
15 to 24 y	247	111	133	0.8	118	51	67	0.8	54	26	25	1.0
25 to 44 y	445	208	235	0.9	236	103	132	0.8	54	25	28	0.9
45 to 64 y	481	218	259	0.8	241	110	130	0.8	84	41	43	0.9
≥ 65 y	573	263	305	0.9	296	136	157	0.9	115	50	63	0.8
unknown	367	128	120	1.0	160	54	56	1.0	128	43	41	1.0
Total	4 916	2 334	2 417	1.0	2 226	1 032	1 300	0.8	1 659	806	787	1.0

Table 15. *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 May 2005 about 300 to 400 cases were reported each month. From June until September, the monthly number of isolates increased, with a peak of about 643 cases in August 2005.

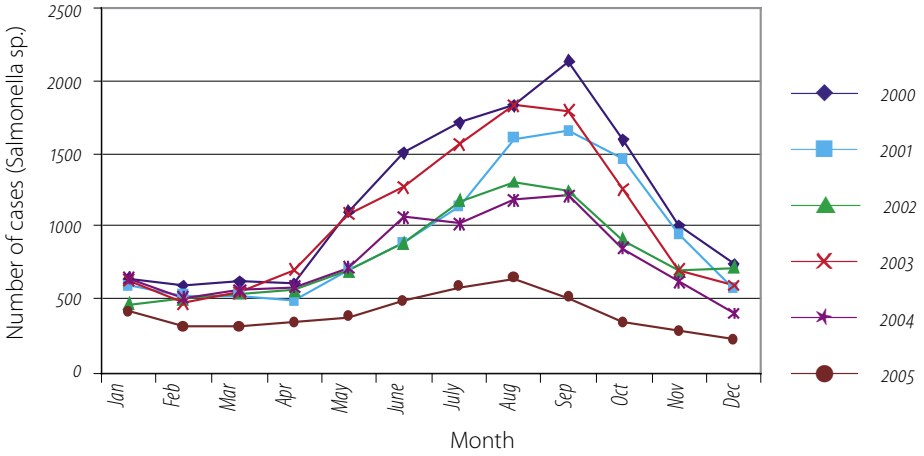


Figure F. *Seasonal distribution of Salmonella isolates among humans from 2000 to 2005*

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 CLSI (formerly NCCLS) (Kirby-Bauer).

Internal control was performed with quality control strain E. coli ATETRACYCLINC25922. 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 acidid	130µg	21 – 24
Enrofloxacin	10µg	20 – 22
Chloramphenicol	60µg	21 – 24
Florfenicol	30µg	15 - 18

Table 16. *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 2005 surveillance

The susceptibility of 1 970 Salmonella strains was tested. A total of 1 090 isolates (55,3%) was fully susceptible to all antimicrobial drugs tested. Most resistance was found against ampicillin (29.2%), sulfonamides (27.2%), tetracyclin (23.6%) and streptomycin (22.3%). Also resistance against nalidixic acid (18.8%) and against trimethoprim+sulfonamides (17.3%) are noteworthy. Only 1 enrofloxacin resistant strain (Salmonella Indiana from poultry) was detected. Relatively high resistance percentages were found against chloramphenicol (6.3%) About 60% of these isolates were also resistant against florfenicol. Finally, 82 isolates were ceftiofur resistant (4.2%). The ceftiofur resistant strains (n=82) mainly originated from poultry (n=72), but also from pigs (n=8) and one strain each from cattle and from food. Especially serotypes Paratyphi B var. Java (n=20), Virchow (n=16) and Infantis (n=14) were associated with ceftiofur resistance. Frequently, ceftiofur resistant strains are multi-resistant to a large number of antimicrobials.

Eighty-six percent of Salmonella Agona isolates (n=114) were fully susceptible for all antimicrobials tested. On the other hand, the multiresistance profile ampicillin, streptomycin, tetracycline, sulfonamides, trimethoprim+sulfonamides, chloramphenicol, florfenicol was found in 2 strains. Resistance against ceftiofur was found in 5 isolates.

Only 12.8% of Salmonella Blockley isolates (n=39) were completely resistant, and 28 isolates had profile ampicillin, nalidixic acid, sulfonamides, tetracycline, trimethoprim+sulfonamides.

Most of Salmonella Derby strains (n=46) were sensitive (58.7%), but resistance profile streptomycin, tetracycline, sulfonamides was detected in 13 isolates. Ceftiofur resistance was found in one multi-resistant strain.

As for Salmonella Dublin isolates (n=39), 35.9% were found completely susceptible. Resistance against sulfonamides (41.0%), chloramphenicol (38.5%), nalidixic acid (33?3%) and streptomycin (28.2%) was remarkable. Nine strains showed the profile streptomycin, sulfonamides, chloramphenicol.

Salmonella Enteritidis isolates (n=381) were susceptible for 81.9% of the isolates. As opposed to former years, nalidixic acid was the antimicrobial against which most resistance was found (15.0%). Also ampicillin resistance (3.1%) and one ceftiofur resistant isolate (profile ampicillin, ceftiofur, nalidixic acid) was noteworthy.

Nearly all Salmonella Hadar (n=46) strains were resistant against nalidixic acid (97.8%), tetracyclin (93.5%) and streptomycin (84.8%). Most strains (84.8%) were resistant to all three antimicrobials. One sensitive isolate was identified. Strains were at maximum resistant against 4 antibiotics.

Most Salmonella Indiana strains had the profile ampicillin, streptomycin, tetracycline, sulfonamides, trimethoprim+sulfonamides (62.2%). In addition, 32.1% had the profile ampicillin, sulfonamides, trimethoprim+sulfonamides. One of the multi-resistant isolates was resistant against enrofloxacin.

Two-third of the Salmonella Infantis strains (n=115) were fully susceptible. Strains were mainly resistant against ampicillin (27.0%), ceftiofur and sulfonamides (both 13.9%) and nalidixic acid (12.2%).

Although many of Salmonella London (n=25) isolates were fully sensitive (44.0%), multi-resistance profile streptomycin, tetracycline, sulfonamides, trimethoprim+sulfonamides, chloramphenicol was detected in 28.0% of the isolates. In addition, ceftiofur resistance was found in one strain.

As for Salmonella Paratyphi B var. Java (n=113), few strains were found sensitive (2.7%), and most resistance was found against the profile ampicillin, sulfonamides, trimethoprim+sulfonamides, nalidixic acid (about 38%). In addition, ceftiofur resistance is common (17.7%).

Only 29.9% of Salmonella Typhimurium isolates (n=368) were found susceptible; classic variant strains were found more often susceptible (31.7%) than Copenhagen variant isolates (26.5%). The multiresistance profile ampicillin, streptomycin, tetracycline, sulfonamides was encountered in 38.2% of O5+, whereas this profile could be detected in 60.8% of O5- isolates. Ceftiofur resistance was detected in two Classic O5+ strains.

Seven Salmonella Virchow isolate (n=84) were susceptible to all antimicrobials tested. More than half of the strains (51.2%) had

resistance profile ampicillin, tetracycline, sulfonamides, trimethoprim+sulfonamides, nalidixic acid. Sixteen Virchow isolates (19.0%) were resistant against ceftiofur.

A small number of strains belonging to other serotypes were also tested. Most of these isolates were fully sensitive for all the antimicrobials tested.

Antimicrobial resistance in strains isolated from meat and meat products

During 2005, 126 strains of Salmonella enterica isolated from poultry meat and 84 from pork were tested for their antimicrobial susceptibility. Meat samples included carcasses, meat cuts and minced meat. Minimum Inhibitory Concentrations (MIC) were determined by the use of E-test. The antimicrobials tested were ampicillin, ceftriaxon, chloramphenicol, ciprofloxacin, kanamycin, nalidixic acid, streptomycin, sulfamethoxazole, tetracycline, trimethoprim and trimethoprim – sulfonamides. Interpretation of the results was according to NCCLS. Quality control was performed by using an Escherichia coli ATCC 25922 strain. Breakpoints used 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
Trimethoprim	8 – 16
Trimethoprim - sulfonamides	2 – 4
Nalidixic acid	16 – 32
Ciprofloxacin	1 – 4
Chloramphenicol	8 – 32

Table 17. *Salmonella from meat and meat products: list of antimicrobials tested with their breakpoints*

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. The results for poultry meat and pork are summarized in the next table.

Antimicrobial tested	Broiler meat (n=126)	Pig meat (n=84)
Ampicillin	21	40
Ceftriaxon	0	0
Streptomycin	26	33
Kanamycin	1	2
Tetracycline	29	29
Sulfamethoxazole	34	54
Trimethoprim	25	30
Trimethoprim+sulfonamides	24	29
Nalidixic Acid	15	1
Ciprofloxacine	0	1
Chloramphenicol	4	17

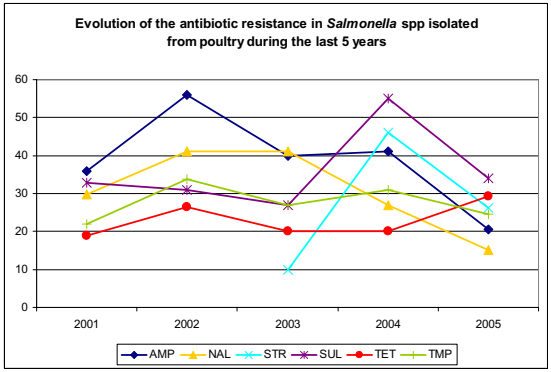
Table 18. *Antimicrobial susceptibility testing of Salmonella spp. isolated from meat: percentage of resistant strains*

Antimicrobial resistance in strains isolated from poultry meat and meat products

In 2005, 126 Salmonella enterica isolates from poultry meat were tested for their antimicrobial susceptibility. Of all tested strains 40% were sensitive for all tested antibiotics. Most resistance was found to sulfamethoxazole (34%), tetracycline (29%), streptomycin (26%) trimethoprim and trimethoprim+sulfonamides (24%), ampicillin (21%) and nalidixic acid (15%). Chloramphenicol resistance was observed in 4% of the Salmonella strains isolated from poultry meat. No resistance was found for the fluoroquinolone ciprofloxacin and the cephalosporin ceftriaxon. From the Salmonella isolates from broiler the percentage of resistance decreased for almost all the antibiotics tested except for tetracycline where and increase in the percentage resistance was noticed in comparison with 2004.

If serovars are considered separately, 54 Salmonella Enteritidis isolates from poultry meat were tested for their susceptibility to all antimicrobials. It was clear that a much higher resistance against tetracycline (30%), trimethoprim (26%), sulfamethaxozole (30%) and trimethoprim+sulfonamides (26%) was found in comparison with previous years.

Salmonella Derby (n=10) isolates from poultry showed resistance to sulfamethoxazole(20%), tetracyclines (20%) and trimetho prim+sulfonamides (10%) and a decline in resistance against streptomycin (10%) in comparison with 2004 (21%). Salmonella Ohio (n=10) isolated from poultry showed resistance against tetracycline (20%), trimethoprim (10%), sulfamethoxazole and trimethoprim+sulfonamides (40%) and streptomycin (10%). Salmonella Paratyphi B (n=19) was 100% resistant to streptomycin and showed in 74% of the strains resistance against ampicillin. Resistance was noticed for tetracycline 32%, nalidixic acid (53%), sulfamethoxazole and trimethoprim (48%) and 16 % to ceftriaxone.



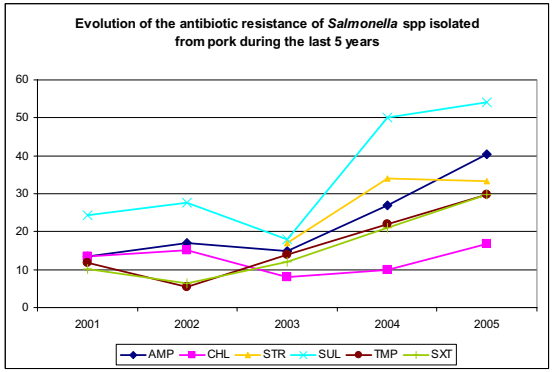


Figure G. *Evolution of the antibiotic resistance in Salmonella spp. insulated from poultry and pork*

Antimicrobial resistance in strains isolated from pork and pork products

In total 84 Salmonella strains from pork were tested for their susceptibility. The overall resistance was high, 77% of the strains were at least resistant against one antibiotic tested. The level of resistance was the same or higher than in 2004, with a high degree of resistance for sulfamethoxazole 54%, streptomycin 33% and tetracycline, 29%. In comparison with 2004 the resistance against ampicillin, 40%, trimethroprim 30% and chloramphenicol 17% increased. No resistance was noticed to ceftriaxone and only 1% of the isolates were resistant against ciprofloxacin or nalidixic acid.

Salmonella Typhimurium was the most frequently isolated serotype from pork, in total 62 strains were tested for their susceptibility. The overall resistance was high but in comparison with 2004 a decrease was noticed for tetracycline (from 53% to 27%) and sulfamethoxazole (from 53% to 37%). The resistance against chloramphenicol (23%) increased slightly and the resistance against trimethoprim and trimethoprim+sulfonamides increased from 18% to 31%. Only one strain (2%) was resistant to nalidixic acid, in combination with a resistance to ampicillin. No resistance was noticed to ceftriaxone and ciprofloxacin.

Antimicrobial resistance in strains isolated from beef

Only 3 Salmonella isolates from beef were analysed for antibiotic resistance. One strain was susceptible for all antibiotics tested, and the two others ones were resistant against ampicillin and streptomycin and one strain was resistant against nalidixic acid.

Antimicrobial resistance and phage typing of human isolates

Methods used

A total of 620 human Salmonella isolates randomly selected from the six most important serotypes in 2004 (Enteritidis, Typhimurium, Hadar, Virchow, Brandenburg and Derby), comprising as well all isolates of Salmonella Infantis, Newport, Typhi and Paratyphi 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
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 19. *List of antimicrobials used for susceptibility testing of Salmonella*

Epidemiological investigations and results of 2005 surveillance

Resistance was mostly found to sulfonamides (35.5%), tetracycline (26.7%), ampicillin (21.1%), streptomycin (20.1%), and to a lesser extent to trimethoprim (10%).

The vast majority (94.3%) of human Salmonella Enteritidis isolates (n=454) was fully sensitive to all antimicrobials tested.

Salmonella Typhimurium (n=304) showed a high level of resistance; especially resistances to ampicillin (51.6%), sulfonamides (69.7%), tetracycline (63.8%) and streptomycin (51.3%) are striking. About half of the isolates (48.7%) were found resistant to four

or more antimicrobial agents. In addition, almost 15% of the isolates showed multi-resistance to at least ampicillin, chloramphenicol, streptomycin, sulfonamides and tetracycline. About 89% of these multi-resistant isolates (ACSSuT) were of phage type DT104.

Except two strains, all Salmonella Hadar isolates (n=22) were resistant to at least one antibiotic. Resistance to tetracycline, nalidixic acid, ampicillin and streptomycin reached values from 64% up to 88 %. Simultaneous resistance to these four antibiotics was observed in 75% of these isolates. Resistance to sulfonamides significantly increased (up to 56%). However, isolates from this serotype remained fully sensitive to cefotaxime, ciprofloxacin, chloramphenicol, trimethoprim, trimethoprim+sulfonamides and gentamicin.

In Salmonella Virchow (n=61), multi-resistance was less common as compared to 2003 (31.8% of the strains in 2005 instead of 60% of the 2003 isolates). The highest incidence of resistance was observed for nalidixic acid (65.6%). Resistances to ampicillin, tetracycline, sulfonamides, trimethoprim and trimethoprim+sulfonamides were common (> 30%). Four strains of Salmonella Virchow showed resistance to cefotaxime due to the presence of CTX-M2 (2 isolates) and TEM-52 (2 isolates) β-lactamases.

In contrast, the vast majority of Salmonella Brandenburg (n=32) and Salmonella Derby (n=35) isolates remained sensitive to the vast majority of tested antibiotics: 78.3% and 88.6% sensitive or resistant to one antibiotic, respectively. It is noteworthy that these two serovars displayed within one year a high level of resistance to sulfonamides (59.4% and 74.3%, respectively).

For Salmonella Infantis (N= 47), 4 isolates produced a TEM-52 β-lactamase but displayed in general a low level of multi-resistance.

The vast majority of Salmonella Paratyphi B (N=32) were multi-resistant (69%). Resistance to nalidixic acid, trimethoprim, ampicillin and streptomycin reached values from 53% up to 69 %. In contrast, the vast majority of Salmonella Newport (n=23) isolates remained sensitive to the vast majority of tested antibiotics: 78.2% sensitive or resistant to only one antibiotic (in general sulfonamides). However, two isolates displayed resistance to 11 antibiotics but remained sensitive to amoxicillin + clavulanic acid, cefotaxime and ciprofloxacin.

No tendency could be highlighted from the results on Salmonella Typhi. That could be due to the fact that most of isolates are travel-associated and that the origins (country/region) of the isolates were different.

In general, resistance patterns and levels of Salmonella isolated in 2005 were comparable to those from 2002-2004, except for sulfonamides for which an increase was noted.

A total of 474 human Salmonella Enteritidis isolates were phage typed. Of these, 37.6% were PT 21 and 23.6% were PT 4. In addition, 304 Salmonella Typhimurium isolates were phage typed and most prevalent types were DT120 (21.7%), DT104 (20.7%), DT12 (14.5%), DT193 (8.5%) and U302 (5.6%).

Serotype		Percentage of resistant strains												
	Nb	AMP	AMX	CTX	NAL	CIP	TET	CHL	GEN	KAN	STR	TMP	SUL	SXT
Enteritidis														
2005	454	0.7	0	0	2.2	0	0.7	0.2	0	0	0.2	0.4	4.8	0.4
2004	58	3.4	0	0	3.4	0	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														
2005	304	51.6	3.3	0.7	2.0	0	63.8	24.7	0.3	2.3	51.3	19.7	69.7	21.7
2004	308	61.0	2.9	0	3.6	0	57.1	36.0	0	1.6	51.9	21.8	58.1	21.4
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														
2005	32	0	0	0	0	0	18.7	0	0	0	9.4	6.2	59.4	6.25
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														
2005	61	37.7	1.6	6.6	65.6	0	29.5	1.6	1.6	1.6	3.3	31.1	54.1	31.1
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

Serotype		Percentage of resistant strains												
	Nb	AMP	AMX	CTX	NAL	CIP	TET	CHL	GEN	KAN	STR	TMP	SUL	SXT
Derby														
2005	35	2.9	0	0	0	0	5.7	0	0	0	5.7	2.9	74.3	5.7
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														
2005	24	64	12	0	80	0	84	0	0	8	88	0	56	0
2004	38	78.9	10.5	0	94.7	0	97.4	0	0	5.3	81.6	0	2.6	0
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 20. *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;

2005

listeriosis

Listeriosis

Listeria monocytogenes is of major concern to 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 case fatality 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. Listeriosis can also be transmitted to humans via contact with animals and cross-infection of foetus or newborn babies. 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. Vulnerable populations (e.g. the very young, pregnant women, the elderly, immuno-compromised people), 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. Findings of Listeria monocytogenes in numbers above the critical contamination level (100 cfu/g) were most commonly detected in previous mentioned RTE products.

The Belgian monitoring programme indicates that the contamination level of food with Listeria monocytogenes remains stable over the last few years.

- Listeria monocytogenes in food
- Listeria monocytogenes in humans

Listeria monocytogenes in food

Surveilla nce programme and method used

In 2005, 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 2005 surveillance

Sample		Quantity analysed	Percentage of positive samples
Beef	Minced meat at processing plant (n=284)	1g	6,7%
	Minced meat at retail (n=171)	0.01g	1,2%
	Meat preparation at retail intended to be eaten raw (n=116)	0.01g	0,9%
Pork	Minced meat at processing plant (n=283)	1g	10,2%
	Minced meat at retail (n=155)	0.01g	1,3%
	Cooked ham at processing plant (n=291)	25g	4,5%%
	Cooked ham at retail (n=159)	0.01g	0%
	Pâté at processing plant (n= 286)	25g	1.4%
	Pâté at retail (n=90)	0.01g	0%
	Fermented sausages at processing plant (n= 254)	1g	3,9%
	Fermented sausages at retail (n=92)	0.01g	0%
	Meat preparation at retail intended to be eaten raw (n=119)	0.01g	0%

Sample		Quantity analysed	Percentage of positive samples
Poultry	Meat preparation at retail intended to be eaten cooked (n=87)	0.01g	6,9%
	Meat preparation at processing plant intended to be eaten cooked (n=280)	0.01g	7,5%
Other food products and prepared dishes	Unspecified RTE foods (n=370)	0.01g	0%
Cheeses	Cheeses made from raw cow milk (n=164)	1g	3,7%
	Cheeses made from raw or low heated cow milk at farm (n=141)	0.01g	5,0%
	Cheeses made from raw or low heated cow milk at processing plant (n=39)	25g	2,6%
	Cheeses made from pasteurised cow milk at processing plant (n=144)	25g	0%
	Cheeses made from pasteurised cow milk at retail (n=185)	0.01g	0%
Dairy products	Butter made from raw or low heat-treated milk at farm (n=184)	1g	14,3%
	Butter made from pasteurised cow milk at processing plant (n=106)	25g	0%
	Ice cream at farm (n=40)	1g	2,5%
Fish	Smoked salmon at processing plant (n=145)	25g	15,7%

Table 21. *Zoonosis monitoring programme - Listeria monocytogenes in food (2004)*

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

The Listeria prevalence in minced pork and beef dropped from 25.0% and 16.0% in 2000 to 10,2% and 6,7% in 2005, respectively

		Sampling level	2000	2001	2002	2003	2004	2005
Pork	Minced meat	1g	25.0%	18.3%	20.7%	21.5%	17.6%	10,2%
	Cooked ham	25g	6.0%	4.6%	3.0%	2.5%	3.8%	4,5%
	Pâté	25g	4.3%	4.9%	5.4%	4.0%	1.2%	1,4%
		0.01g					0.9%	0%
	Salami	25g	16.0%					
	Salami	1g		8.6%		9.8%	8%	3,9%
		0.01g					1.3%	0%

		Sampling level	2000	2001	2002	2003	2004	2005
Beef	Minced meat	1g	16.0%	14.8%	13.7%	10.7%	13.6%	6,7%
		0.01g					2%	1,7%
Chicken	Meat preparation	1g			33.8%	60.0%		
		0.01g					7.9%	7,5%
Fish	Smoked salmon	25g			23.1%	22.1%	8%	15,7%
		0.01g					3.4%	

Table 22. *Evolution of the food Listeria monocytogenes prevalence 2000-2005*

Listeria monocytogenes in humans

In 2005, the Sentinel Laboratory Network and the National Reference Laboratory reported 62 cases of listeriosis.This number is less than in 2003 and 2004, when with particularly high numbers of listeriosis cases were recorded. Four cases were reported in Brussels, 32 in Flanders and 23 in Wallonia (3 from unknown geographic origin).

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of isolates	45	60	64	48	57	44	76	89	62

Table 23. *Listeria monocytogenes in humans*

The National Reference Laboratory serotyped 40 Listeria strains. The serovar 1/2a and 4b were the most prevalent (40.0% and 42,5% respectively). Two strains were related to perinatal cases (one isolated in the child and the other in the mother), 8 strains were isolated from cerebro-spinal fluid (conclusive for a meningo-encephalitis form), 29 strains were isolated from blood and one from joint fluid.

2005

yersiniosis

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 may occur.

Only a few strains of Y. enterocolitica cause illness in humans. The major animal reservoir for Y. enterocolitica infection in humans 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 unpasteurised 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 2005, the surveillance programme concentrated on one matrix, i.e. pork minced meat intended to be eaten cooked and one contamination level (1g).

Sample		Quantity analysed	Percentage of positive samples
Pig meat	Minced meat at processing plant (n=293)	1g	0,7%
	Minced meat at retail (n=155)	1g	1,3%

Table 24. *Yersinia enterocolitica in pork*

Yersiniosis in humans

In 2005, the Sentinel Laboratory Network registered 303 cases, corresponding to a national incidence estimated at 2.9 per 100.000 inhabitants. Cases were observed all over the year. Forty three percent of cases were 0 to 4 year old children.

As already reported in former years, the incidence in Flanders is higher than in Wallonia. In 2005, the incidence was 3.5 per 100.000 inhabitants in Flanders, 2.3 per 100.000 inhabitants in Wallonia and 1.6 per 100.000 inhabitants in Brussels Capital Region.

Since 1986, when 1.514 cases were reported, the number of human infections in Belgium significantly decreased.

	2000	2001	2002	2003	2004	2005
Number of cases	507	375	330	338	326	303

Table 25. *Yersiniosis cases in humans*

2005

verotoxin producing escherichia coli (vtec)

Verotoxin producing Escherichia coli

Zoonotic verotoxin producing E. coli may cause life-threatening diseases in young children or in immunocompromised or elderly people, The disease spectrum associated with E. coli O157 infection ranges from mild diarrhoea through haemorraghic colitis (HC) to haemolytic uremic syndrome (HUS), thrombotic thrombocytopaenic purpura (TTP) and death. TTP is a syndrome that incorporates the main clinical features of HUS but with additional neurological involvement. HUS tends to be more common in children and TTP in adults, particularly the elderly. Disease is most severe in infants and the elderly.

Cattle are often indicated as the principal reservoir of VTEC, but are not clinically affected by zoonotic VTEC infection. The organism is excreted in the faeces, which represents a potential risk to those working closely with farm animals and their environment. Research has suggested that in cattle herds only a few animals, at anyone a particular time, excrete high numbers of the organism, which may be sufficient in maintaining infection in the herd over long periods.

Human infections occur after consumption of contaminated food, after contact with contaminated water, or by direct transmission of VTEC from infected humans or animals. Therefore, prevention mainly relies on bio-security measures at farm-level and hygienic measures at the level of the slaughterhouses. At slaughterhouses, measures have to be taken to minimise the faecal contamination of carcasses. An assessment of the fleece/hide cleanliness of animals arriving at abattoirs can be recommended highly. The veterinary officer can decide if the animals, which have high faecal contamination, are to be rejected, cleaned before re-submission to ante mortem inspection, or to be processed paying particular attention to hygienic dressing procedures.

In 2005, 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 1.1%, 1.0% and 0.6% of the cases, respectively. Cattle were not sampled at the farm in this official monitoring programme.

- 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 used

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 2005 surveillance

In 2005, 4 herds were monitored after E. coli O157 was isolated at the surface of a carcass that was delivered to the slaughterhouse. Two herds were sampled twice.

In the first herd, 10 faecal samples, 1 dust sample and 2 feed samples were taken, and all were negative. The results of a second sampling on that herd about six weeks later, with a comparable number of samples, were also negative. In the second herd 18 faecal samples, one dust and 4 feed samples were taken. Although E. coli O157 was detected in 2 faecal samples, the isolates did not bear any toxin nor intimin sequences. On the second sampling six weeks later, E. coli O157 was not detected. In a third herd a limited sampling was done (1 faeces, 1 dust and 2 feed samples). Two E. coli O157 were found, but these were not virulent (negative for toxin and intimin). The last herd was also found negative for E. coli O157.

Escherichia coli O157 in food

Surveillance programme and method used

In 2005, 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 (1600cm2), 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.

A sample was considered positive when E. coli O157 was isolated and after PCR confirmation of the virulence sequences.

Notification is mandatory since March 2004 (Ministerial Decree on mandatory notification in the food chain). For enterohemorrhagic E. coli, absence in 25g in ready-to-eat food products put on the market was compulsory.

Results of the 2005 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=2 554)	1.1%
	Fresh meat at cutting plant (n=307)	1.0%
	Minced meat at processing plant (n=281)	0,0%
	Minced meat at retail (n=171)	0.6%
	Meat preparations at retail, intended to be eaten raw (n=116)	0.0%
Milk	Raw milk (n=175)	0.0%

	Sample	Prevalence
Vegetables	Ready to eat, at processing (n=20)	0.0%
	At retail, not precut (n=56)	0.0%
Cheese	From raw milk, at farm (n=141)	0.0%
	From raw milk, at processing (n=39)	0.0%
Butter	From raw milk, at farm (n=183)	0.0%
Fruit, vegetables	Ready to eat (n=114)	0.0%

Table 26. *Zoonosis monitoring programme - E. coli O157 (2005)*

Verotoxinogenic Escherichia coli in humans

Data were obtained from the National Reference Laboratory, Public Health. Since only few clinical laboratories examine human stools for the presence of E. coli O157, a correct incidence of VTEC in human populations cannot be estimated.

In 2005, the National Reference Laboratory for VTEC confirmed 47 verotoxigenic E coli. Among these:

- 36 were typical VTEC isolates, meaning they were positive for two factors of additional virulence: a) the presence of the gene eae (intimin) and b) the gene encoding enterohemolysin (EHEC virulence plasmid)
- 9 were atypical VTEC isolates, or negative for the two factors of virulence.

The number of isolates analysed annually by the Reference Laboratory has been rather constant, corresponding to a large rate of underdiagnosis.

	1998	1999	2000	2001	2002	2003	2004	2005
Number of O serogroups	48	53	47	46	46	47	45	47
Number of typical isolates	38	46	33	36	37	40	36	36

Table 27. *E. coli in humans*

In 2005, 15 strains (13 from serotype O157:H7 and 2 from serotype O145:H-) were associated with haemolitic uremic syndrome (HUS). Eight patients were children less then 5 years old, 6 were children between 5 and 13 years old and one was a female adult. According the information available at the laboratory level, these cases were not related, except two sisters who presented HUS.

Beside those confirmed cases by culture, VTEC was also serologically confirmed in five children aged 1 to 8 years old and presenting HUS (4 serogroup O157 and 1 serogroup O103).

2005

zoonotic tuberculosis

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 aerosols from coughing 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 rarely 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. Also occupational contacts should be regarded as a risk factor for transmission to humans, although companion animals can provide a less common indirect route of infection.

In human, 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 non pulmonary forms are particularly common. In 2005, the National Reference Laboratory identified 3 human cases of bovine tuberculosis. However, the molecular identification of Mycobacterium performed in 25 laboratories of the country only identifies the complex M. tuberculosis, without distinction between bovis and tuberculosis. The number of M. bovis reported by laboratories is thus underestimated.

Human tuberculosis (Mycobacterium tuberculosis)

The incidence of human tuberculosis shows little variation over the last years. In 2001, 2002, 2003, 2004 and 2005 respectively 1321, 1309, 1128, 1244 and 1202 new notified cases of active human tuberculosis were detected. Over the 60% were male patients. In 2005, 54 % of the tuberculosis cases were foreigners. 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

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).

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 purchase (mandatory),
- In case of a positive reactor, skin testing of all the animals of the holding and skin 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, additional tests). 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 performed.

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 are done.

In Belgium, vaccination against tuberculosis is prohibited.

Epidemiological investigations and results of 2005 surveillance

At the slaughterhouse, 182 tissue samples from individual animals 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 suspicious 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 5 herds.

The National Reference Laboratory performs routine IS6110 RFLP typing and spoligotyping of M. bovis field isolates. Since 1995, the dates of 96% of the outbreak herds are 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 isolated in Belgium since 1995 is available.

For 2005, all M. bovis isolates originating from 5 outbreak herds belonged to lineages already known to circulate in Belgium since 1995. Twice, 2 herds epidemiologically related by trade (purchase of bovines) presented the same common serotype (spoligotype SB0162 and spoligotype SB0134). In the remaining herd, a very uncommon spogilotype SB0946 has been detected. This rare serotype was only observed in one previous herd in 1996. An epidemiological link between both herds couldn't yet be proved.

Mycobacterium in other animals

In Belgian wildlife no bovine tuberculosis was detected in 2005.

Mycobacterium bovis in humans

In 2005, 3 human cases of bovine tuberculosis were identified.

2005

brucellosis

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 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 2005, 2 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 25th of 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 serologically monitored once every three years. The herds are selected on the basis of geographical localisation. Dairy cattle are checked at least 4 times a year via tank milk. Furthermore, all female animals older than 1 year and breeding bulls are serologically tested at purchase. 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 as confirmatory test) is used if no sufficient milk ring tests are done (at least 4 ring tests a year). Bacteriological examination is done in case of serological and/or epidemiological suspicion.

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 for brucellosis by culture.

	Individual serological tests	Bulk milk tests
2004	488 548	102 267 pools
2005	579 390	80 025 pools

By individual serological testing, 6.918 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 2005 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), the slaughtered animals were compensated for based on the replacement value.

The annual herd prevalence notified at the end of the year 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 detected in Belgium since then.

In 2005, the Federal Agency for the Safety of the Food Chain instructed, for additional analysis, the mandatory test slaughter of 11 animals positive by repeated serological testing. The official brucellosis free status of the corresponding holdings was temporary suspended. The results of the bacteriological examination after test-slaughter of these serological reactors were 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.

Since 2001, yearly serum samples from about 5% of the sheep and goats populations were tested at the National Reference Laboratory. In addition, serum samples from sheep for export were analysed. In 2005, 7.910 samples were tested. Serological positive reacting animals after serial and repeated testing were finally negative. The National Reference laboratory has confirmed infections of Yersinia enterocolitica 0:9 in sheep. Those infections are associated with false positive serology in the tests ELISA, Rose Bengal and possibly CFT of brucellosis. The phenomenon of FPSR (false positive serological reactors) as documented for bovines is also observed in sheep. In absence of clinical, bacteriological and epidemiological evidence, an infection with Y. enterocolitica 0:9 can be retained to explain FPSR met in small ruminants in our country.

Brucellosis in pigs

Surveillance programme in pigs and epidemiological investigations

Serological screening for Brucella is done for breeding pigs that are assembled (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 and wild hares in Europe.

The domestic pig population is free of brucellosis (last Brucella isolation in pigs in Belgium was in 1969).

Regional control programme

Since 2002, an annual surveillance programme is organised by the Faculty of Veterinary Medicine 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. PCR assays of the spleen of 21 lagomorphs were all negative. Brucella suis biovar 2 was isolated from the uterus of a female wild boar.

Recommendation.

Further attention should be given to brucellosis in wild species, as the potential for contact with B. suis can be high, particularly for people handling and/or slaughtering game animals. The species to be considered should include at least wild boar, deer and other wild ruminants as well as hares.

Brucellosis in humans

The last indigenous case of Brucella was reported in 1997. It is helpful to note that B. suis biovar 2, the only biovar circulating in Belgium among wild boars, shows only limited pathogenicity for human, if pathogenic at all.

In 2005, the National Reference laboratory confirmed two cases of Brucella melitensis 3.

2005

q-fever

Coxiella burnetii

Q fever is a zoonotic disease caused by Coxiella burnetii, a stable bacteria that resists to heat, drying and many common disinfectants. This resistance enables the bacteria to survive for long period in the environment. Cattle, sheep, and goats are the main reservoirs but a wide variety of other animals can be contaminated, including domesticated pets. Coxiella burnetii does not usually cause clinical disease in these animals, although an increased abortion rate and fertility problems in cattle, sheep and goats are observed. The emergence of these common symptoms over a longer period of time leads finally to the diagnosis of Q fever.

Organisms are excreted in milk, urine, and faeces by infected animals. Animals shed the organisms especially during parturition within the amniotic fluids and the placenta. Airborne transmission can occur in premises contaminated by placental material, birth fluids or excreta from infected animals. Airborne inhalation is the most important transmission route of infection.

- Coxiella in humans

Coxiella in humans

Only about one-half of all people infected with C. burnetii develop signs of clinical illness. Pneumonia is the most frequent complication of acute Q fever. Also hepatitis may occur. Chronic forms of the disease are rare but very severe, especially when an endocarditis develops. Q fever infection results mainly from occupational exposure. Livestock farmers, dairy workers, veterinarians, slaughterhouse and meat processing plant workers, and researchers at laboratories or facilities housing susceptible animals are especially concerned and have to be informed about this disease, the possible transmission of infection and preventive measures to be respected.

The following measures could be used in the prevention and control of Q fever:

- public education and information on sources of infection
- giving advice to high risk persons, especially with pre-existing cardiac valvular disease or individuals with vascular grafts and pregnant women
- restrict access to barns and laboratories used in housing potentially infected animals
- quarantine aborted animals
- appropriately disposal of placenta, birth products, foetal membranes, and aborted foetuses
- use only pasteurised milk and milk products
- infected holding facilities should be located away from populated areas. Measures should be implemented to prevent airflow to other occupied areas.

Data

The Institute of Tropical Medicine of Antwerp diagnosed 19 cases of Q fever in 2005. Most cases were young male adults. The ages of patients ranged from 17 to 69 years, with a median age at 23 years. The patients included 4 women and 15 men.

Nine cases were reported among a group of students from Antwerp who participated to a 3-months summer camp in Tel Aviv, Israël. In total, 117 cases were registered among the 270 international participants. No chronic complication was noted from the 9 Belgian participants who were contaminated (Vlaams Infectieziektebulletin, Nr. 57/2006/3).

The countries of probable contamination were:

- Israël: 9
- Tanzania: 1
- Angola: 1
- Unknown: 8

2005

foodborne outbreaks

Foodborne outbreaks in humans

A 'Foodborne outbreak' means an incidence, observed under given circumstances, of two or more human cases of the same disease and/or infection, or a situation in which the observed number of human cases exceeds the expected number and where the cases are linked, or are probably linked, to the same food source (Directive 2003/99/EC, Article 2(d)). This includes outbreaks caused by any virus, bacteria, algae, fungus, parasite, other biological entity or their toxins which is likely to cause foodborne illness. Outbreaks caused by ingestion of drinking water are also considered foodborne (Regulation 178/2002/EC, Art. 2).

In case of an outbreak the source of contamination, the cause and the etiological agent need to be determined to take adequate measures to prevent more human cases.

The etiological agent can be a bacterium, a toxin or a virus. The symptoms and the time of onset after the meal can give an indication of the responsible etiological agent.

Major etiological agents

Foodborne bacteria

Salmonella enterica—Although the number of human salmonellosis drastically decreased in 2005 in Belgium, it remains the most frequently reported pathogen in foodborne outbreaks. The onset time varies between 6 and 48 hours after ingestion of the contaminated food. Nausea, vomiting, abdominal cramps, diarrhea, fever and headache are the symptoms in an acute outbreak and last for 1-2 days or longer. In case of an outbreak human samples (stool) and suspected food samples are tested for Salmonella. If Salmonella is detected, PFGE typing can confirm the clonal relationship between the human isolates and those isolated from food products. Raw or undercooked meat, poultry, eggs, shrimps, cream-filled desserts and chocolate are frequently associated with foodborne Salmonella outbreaks. The food can be the origin of contamination or transmit the infection from a contaminated food handler.

- Reported outbreaks in 2005
- Causative agents
- Source of the foodborne outbreaks

Campylobacter jejuni and coli—Since 2005 campylobacter is the most frequently reported foodborne pathogen in humans in Belgium. Campylobacter jejuni and coli infections cause diarrhea, which may be watery or sticky and can contain blood. Other symptoms often observed are fever, abdominal pain, constipation, nausea, headache and muscle pain. The illness usually occurs 2-5 days after ingestion of the contaminated food or water and generally lasts 7-10 days, but relapses are not uncommon (about 25% of cases). Campylobacter frequently contaminates raw chicken and raw pork. Raw milk and cheeses made from raw milk are also sources of infections.

Yersinia enterocolitica—Yersiniosis is frequently characterized by symptoms as gastroenteritis with diarrhea and/or vomiting; however, fever and abdominal pain are typical symptoms. Yersinia infections can also cause pseudo- appendicitis and arthritis. Illness onset is usually between 24 and 48 hours after ingestion of food or water, which are the usual vehicle of infection. Contaminated and undercooked pork is a common source of infection, but also ice-cream has been reported as the source of infection.

Clostridium perfringens—The common form of Clostridium perfringens poisoning is characterized by intense abdominal cramps and diarrhea which begin 8-22 hours after consumption of foods containing large numbers vegetative cells of strains capable of producing the food poisoning toxin. . Toxin production in the digestive tract is associated with sporulation. The illness is usually over within 24 hours but less severe symptoms may persist in some individuals for 1 or 2 weeks. In most instances, the actual cause of poisoning by C. perfringens is temperature abuse of prepared foods. Small numbers of the organisms are often present after cooking and multiply to food poisoning levels during cooling and storage of prepared foods under anaerobic conditions (e.g. fat layer on stock). Meat, meat products, and gravy are the foods most frequently implicated.

Staphylococcus aureus—Some Staphylococcus strains are capable of producing a highly heat-stable enterotoxin that causes illness in humans. The toxin is preformed in the food. The onset of symptoms in staphylococcal food poisoning is usually rapid and in many cases acute, depending on individual susceptibility to the toxin, the amount of contaminated food eaten, the amount of toxin in the ingested food, and the general health of the victim. The most common symptoms are nausea, vomiting and abdominal cramping. Recovery generally takes two days. Food at risk for staphylococcal food poisoning are those that require considerable handling during preparation and that are kept at slightly elevated temperatures after preparation. Contamination occurs by infected food handler or by the food itself (e.g. milk)

Bacillus cereus—Although Bacillus cereus is a well-known cause of foodborne illness it is not commonly reported because of its usually mild symptoms. It can cause two types of food poisoning known as the emetic and the diarrhoeal types. For the emetic type, a heat-stable emetic toxin named cereulide, preformed in the food, is responsible for the symptoms similar to those of Staphylococcus aureus intoxication, and is characterized by a short incubation period. This type is probably the most dangerous since it has been associated with life-threatening acute conditions like acute liver failure. Heat-unstable enterotoxins, produced in the gut by vegetative cells cause the diarrhoeal type, with symptoms parallel to those of the Clostridium perfringens food poisoning, with a 6 to 24h incubation period. The emetic type is frequently associated with the consumption of food rich in carbohydrates such as rice and pasta whereas the diarrhoeal type is often associated with cooked meat and meat products .

Foodborne viruses

Foodborne and water-borne viral infections are increasingly recognized as causes of illness in humans. This increase is partly explained by changes in food processing, consumption patterns, and globalisation of the food trade. Bivalve molluscan shellfish, especially oysters because they are consumed raw, are notorious as a source of foodborne viral infections (filter-feeding shellfish can concentrate viruses up to 100-fold from large volumes faecally contaminated water). Several other foods, however, have also been implicated as vehicles of transmission (fruits, berries, vegetables, salads, sandwiches). Raw and minimally processed fruits and vegetables are high risk food products.

Viruses cannot grow in or on food but may be present on fresh products by contact with polluted water in the growing area or during processing. Unhygienic handling during distribution or final preparation is also reported as a cause of contamination. People can be infected without showing symptoms. Person to person transmission is common and the high frequency of secondary cases following a foodborne outbreak results in amplification of the problem. It is often difficult to identify whether the food is contaminated at the source, as is common with oysters, or whether the food is contaminated by a sick food handler, or whether person to person transmission occurred.

Although there are numerous faecal-orally transmitted viruses, the risk of foodborne transmission is highest for hepatitis A virus and norovirus. European data show that oysters are frequently reported as a main source of contamination, but water, fruits and food handler contamination are also reported. Increased awareness towards viral infections and improved detection methods due to advances in molecular techniques, especially real-time RT-PCR which allow quantification, has made diagnosis and outbreak management easier.

Focus on Noroviruses—Noroviruses are among the most important causes of gastroenteritis in adults and often occur as outbreaks which may be foodborne. They are the most common cause of non-bacterial foodborne outbreaks recognised in Europe and United States and have been diagnosed worldwide. Noroviruses can be transmitted from person to person, or indirectly via food or water contaminated with faeces or vomit. They are responsible of mild, self-limited gastro-enteritis but attack rates are high. Noroviruses infections are underreported in Belgium. First, individual cases are under diagnosed because illness is mild, self-limiting and physicians are not aware of norovirus. Also, there are only few laboratories able to detect noroviruses in food. Furthermore, until the end of the nineties, noroviruses were thought to be restricted to human. However, they were found recently in healthy pig and calf stool specimens from the UK, Germany and United States. Animal strains are genetically so close to human noroviruses that it has raised important questions about the host range, zoonotic transmission and potential animal reservoir, but those are still not elucidated.

Data about norovirus strains circulating in Belgium are available thanks to research activity. Strains were identified in humans and also bovines. Study of genetic proximity showed that the human strains are in majority belonging to genotype II, which circulate the most in Europe. Belgian bovine noroviruses were characterised, showing that they are close to each other, clustering with genotype III. Currently, animal noroviruses appear to form genetically distinct stable lineages, but are sufficiently close to human noroviruses, that under right conditions interspecies transmission can occur.

Well standardised surveillance networks are needed which combine epidemiological and virological information for an integrated laboratory based rapid detection system for foodborne viral outbreaks. With better surveillance, documented outbreaks of foodborne infections could be reported faster, in time to take preventive measures to stop further spread. Also virological data on human and animal norovirus strains circulating are needed to solve the question about zoonotic transmission.

The different authorities that are dealing with foodborne outbreaks in Belgium:

The Federal Agency for the Safety of the Food chain FAVV-AFSCA deals with safety of foodstuffs, epidemiological investigation on foodstuffs and animal health issues in case of a foodborne outbreak.

The Communities (Flemisch, French and German speaking Community) that deal with person related matters as human health, can start an epidemiological investigation by its Public health medical inspectors in case of a foodborne outbreak.

The Scientific Institute of Public Health IPH is National reference laboratory on Foodborne Outbreaks and analyses all suspected food samples, collects all data on foodborne outbreaks and gives scientific support to the FAVV-AFSCA officers and the Public Health Inspectors.

A national "Platform Foodborne outbreaks", approved by the National Conference of Ministers of Public Health, was created to advance data exchange between different competent authorities on food safety, animal health and public health.

Prevention

Since 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, outbreaks can be prevented by the application of simple hygienic rules like adequate refrigeration of the food, hand washing before and during preparation, clean surfaces and materials in the kitchen, separation of raw and cooked food and sufficient heating during preparation.

Reported outbreaks in 2005

During 2005, a total of 105 outbreaks of foodborne infections and intoxications were recorded in Belgium. More than 673 people were ill, at least 53 persons were hospitalised. However not all outbreaks were notified and for many outbreaks data are incomplete. The geographic distribution is shown in the next figure.

Figure H. *Geographical distribution of foodborne outbreaks in Belgium - 2005*

Causative agents

About 20 % of the outbreaks were due to Salmonella (n=21), with Enteritidis as predominant serovar (40%), a marked decrease compared to the situation in 2004 when still 53 % of the outbreaks were due to Salmonella (serovar Enteritidis 55%). The serovars Infantis, Paratyphi B var Java and Tyhimurium were also isolated. Not in every outbreak of Salmonella the serovar was recorded.

Thermotolerant Campylobacters were responsible for 4% of the outbreaks. B. cereus was the causative agent in only one outbreak (1% of the cases) and Staphylococcus aureus was the cause in 4% of the cases. Other agents were C. giardia (n=1), C. perfringens in combination with S. aureus, and Yersinia enterocolitica O:3 in combination with Salmonella.

In 70% of the outbreaks no causative agent could be identified, which is mainly due to the absence of left-overs. In 90% of the unknown cases, a more consistent reporting is needed and analytical methods must be further developed to detect norovirus in most kinds of foodstuffs

Causative agent	Outbreaks	Ill	Died	Hospitalised	Sources
Salmonella	21	273	0	7	Preparations with raw eggs, ice cream, minced meat
Campylobacter	4	37	0	5	Chicken, Chinese meal, spaghetti sauce
B. cereus	1	6	0	0	Chinese meal
S. aureus	4	39	0	23	Shrimps, durum pita
Giardia	1	2	0	0	
Microbial toxins	1	32	0	0	
Unknown	73	284	0	18	
Total	105	673	0	53	

Table 28. *Foodborne outbreaks in humans in Belgium in 2005*

Source of the foodborne outbreaks

In 8 % of the outbreaks, preparations with raw eggs were identified as the source of the illness, which means a considerable decrease because in 2004, 36% of outbreaks were associated with egg consumption.

Meat or meat based products became more important and were responsible for 25% of the cases, an increase of 6% in comparison with 2004.

Striking was the appearance of pita as incriminated food in 10% of the cases, and also Chinese meals in 8% of the cases. Both fish (including shell fish) and sandwiches each are responsible for 7% of the outbreaks. Surprisingly potatoes (mostly French fries) provoked 7 % of outbreaks.

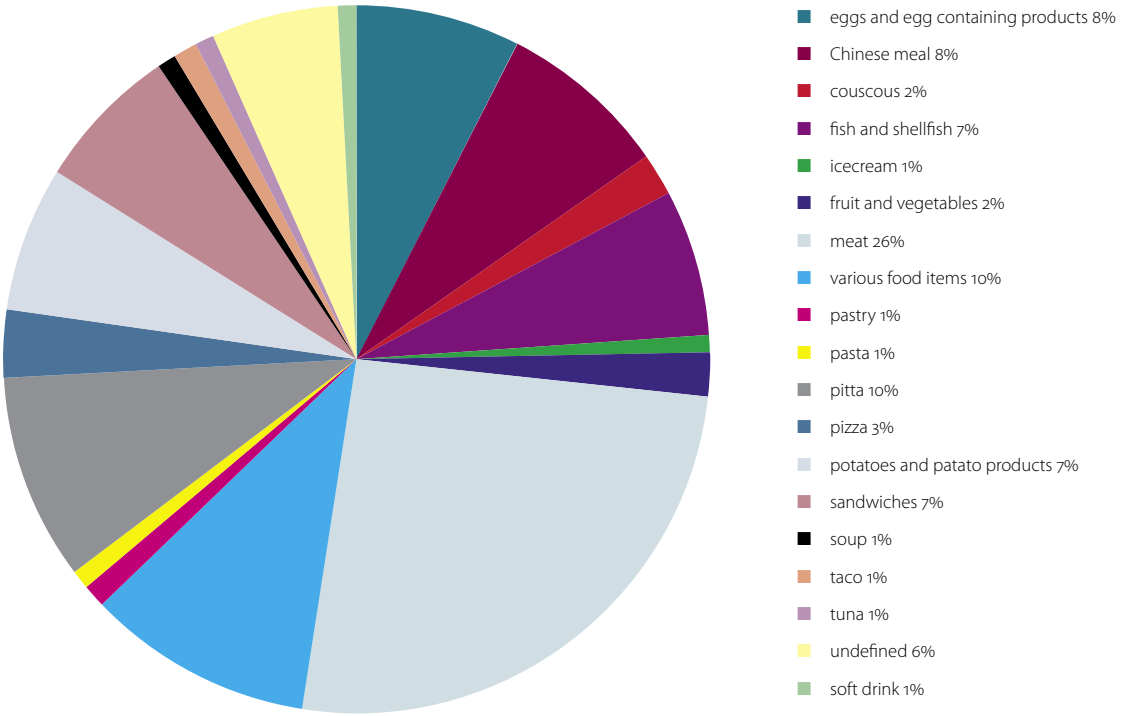


Figure I. *Food vehicles in foodborne outbreaks 2005*

Working Group on Foodborne Infections

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).

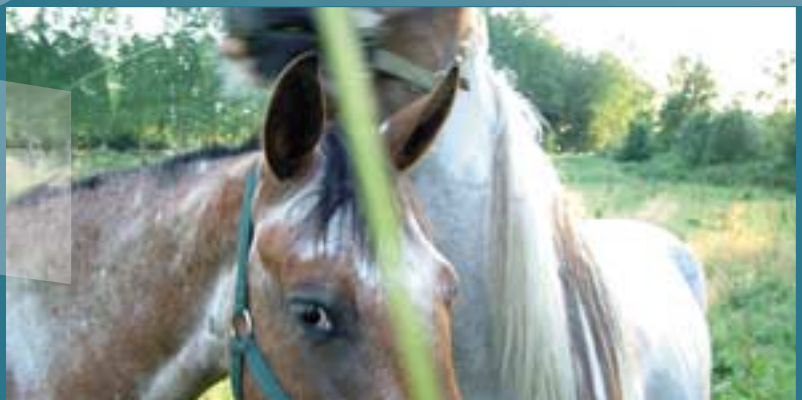
The Institute of Public Health houses the working group and is represented by the Epidemiology unit, the Reference centres for Salmonella and Shigella, for Listeria and for Foodborne Infections and Intoxications.

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.

2005

trichinellosis



Trichinella

Trichinella is an intestinal parasite whose larvae can be present in the muscles of different animal species. It is transferred to humans by the consumption of contaminated raw or undercooked meat or meat products from an infested animal. The animals at risk of being infected are in particular:

- game, in particular wild boar and carnivorous hosts such as the bear and fox;
- backyard pigs and pigs with extensive outdoor access including pigs from organic farms;
- horses.

Therefore, pork, wild boar and horse meat are always examined before marketing. Carcasses found positive for the presence of Trichinella are declared unfit for consumption.

After 1 to 4 weeks incubation, trichinellosis in humans causes myalgia, fever, eosinophilia, facial oedema and possibly fatal 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 meat of susceptible animals, e.g. sausages, bear meat and not to consume meat 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. Improvements in the monitoring and the reporting of Trichinella in wildlife should be considered.

- Trichinella in food animals
- Trichinella in other wildlife

Trichinella in food animals

Surveillance programme and methods used

Pig carcasses intended for intra community 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 2005 surveillance

A total of 10.549.454 pigs, 11.267 solipeds (mainly horses) and 11.128 wild boars were examined. All samples were negative.

Trichinella in other wildlife

In 2005, 52 foxes, 24 badgers, 44 marten, 52 polecats and 3 falcons were analysed for Trichinella, all tested negative.

An important measure to avoid spreading of trichinellosis among wildlife is not to leave offal of animal carcasses in the field after skinning of hunted animals.

2005

echinococcosis

Echinococcosis

Echinococcosis is caused either by Echinococcus granulosus or Echinococcus multilocularis.

- Echinococcus granulosus, the agent of cystic echinococcosis, produces unilocular human hydatidosis. It is a small tapeworm (6 mm) that lives in the small intestine of domestic and wild canids. Sheep, goats, pigs, cattle and wild boar serve as intermediate hosts for the infection. Humans also can acquire infection by accidental ingestion of typical taeniid eggs, which are excreted in the faeces of infected dogs and foxes. 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 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 sporadically reported in Belgium. Recommendations for basic risk-mitigation actions are destruction of contaminated viscera found at the slaughterhouse in order to avoid the infection of dogs.

- Echinococcus multilocularis is the agent of alveolar (multilocular) echinococcosis in humans. Alveolar echinococcosis in particular is of public health relevance as it is considered to be the most severe of all parasitic zoonoses since up to almost all untreated cases in humans may be fatal. Foxes and dogs are the definitive hosts of this parasite and small rodents and voles 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 infested 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. As the population of foxes increases in the last few years, the opportunity for contact between humans and this wild carnivore, even in urban areas, has conse-

- Echinococcosis in food animals
- Echinococcosis in humans

quently increased. With regards to domestic animals, cats have been ruled out as hosts of E. multilocularis, since the parasite does not fully develop in their intestine. Possible risk factors include contact with dogs hunting for game, and rodents which may be infected with the larval stage of the parasite, and ingestion of contaminated water or contaminated unwashed fresh products (in particular, raspberries and strawberries) and vegetables. Chewing grass is another practice to be associated with alveolar echinococcosis. Contamination of the hands during gardening, through contact with contaminated soil, may also carry some risk.

- Recommendations to improve the protection of public health are the use of good general hygiene practices such as washing fruit and vegetables before consumption, cooking berries or mushrooms, hand-washing after gardening and before the consumption of meals, and after contact with dogs, especially if they have direct contact with wildlife or live in areas where wildlife, in particular, foxes, rodents or voles, is abundant. Planned treatment of dogs with taenicides and subsequent hygienic disposal of their faeces in endemic areas is recommended. Thanks to an efficient information campaign in wooded areas in Belgium, only nine human cases of alveolar echinococcosis have been detected since 1999.

Echinococcus in food animals

Surveillance programme and results

Post mortem macroscopic examination is done at the slaughterhouse in the Echinococcus domestic intermediate hosts: cattle, sheep, horses and pigs.

The following total rejections were noted by the Federal Agency for the Safety of the Food Chain in 2005: 34 cases of sheep. Echinococcus granulosus was not detected in adult cattle, calves, pigs, goats and wild boars (possible intermediate hosts).

Echinococcus in humans

In 2005, the National Reference Laboratory confirmed eight cases of hydatic echinococcosis. No case of alveolar echinococcosis was diagnosed.

In 2004, a serological study among 115 forest guards did not identify any suspect case of echinococcosis in this specific group.

2005

cysticercosis

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). The risk factor for bovine cysticercosis infection in cattle is the ingestion of vegetation contaminated with T. saginata eggs shed in human faeces. Cattle can become infected when grazing contaminated vegetation in or around the farm or close to railway or camping sites where human carriers of T. saginata have defecated, or grazing pastures where contaminated urban sewage sludge have been applied for fertilization. Accidental overflow of sewage polluted rivers onto pastures has also been identified as a risk factor for bovine cysticercosis.

  Humans contaminate themselves by the ingestion of raw or undercooked beef containing the larval form (cysticerci). Usually the pathogenicity for humans is low. However, it should be noted that T. saginata may cause reactive arthritis (enteropathic arthropathy) as a secondary disease state. The tapeworm eggs contaminate the environment directly or through surface waters. Human carriers should be treated promptly. Strict rules for the hygienic disposal or sanitation of human faeces with a method that inactivates T. saginata eggs should be developed. The spreading of excrement on land should only be allowed after proper sanitation.

  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 or DNA-test can be done. The introduction of serological techniques for the detection of cysticerci antigens in the serum of animals (cattle, pigs) should be developed. This would allow the detection of more cases than visual inspection of carcasses at the slaughterhouse.

- 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 2005, 15 carcasses of adult cattle and 1 of a calf were rejected for generalised cysticercosis. In addition, the meat of 2.374 cattle and of 2 calves was treated by a 10 days freezing before human consumption. No sheep were found to be infected.

2005

sarcosporidiosis and toxoplasmosis

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 a-specific 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. A percentage of young children (1 to 14-year-old age group) may get post-natal infections with T. gondii and develop symptomatic toxoplasmosis (e.g. ocular disease). A number of cases of the disease in a 15 to 24-year-old age group may be referred to as acquired toxoplasmosis in immunocompetent patients, which may present with a range of signs, from lymphadenopathy to retinitis and uveitis. Immunocompetent individuals may often develop clinical toxoplasmosis.

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 indiscernible carriers of tissue cysts. There is a need for suitable microscopic, serological and molecular biological methods for both indirect and direct tests used in animals and food for the laboratory diagnosis of toxoplasmosis.

- 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.

The number of partial rejections due to sarcosporidiosis lesions found at post-mortem examination are: 13 carcasses of adult cattle and 1 carcass of a calf.

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.

Humans are mostly infected by the oral route: by either ingestion of oocysts excreted by cats (e.g. in litter trays) or by ingestion of cysts present in inadequately cooked meat and some meat products containing the tissue cysts of T. gondii, or food (e.g. vegetables) contaminated with cat faeces containing infectious oocysts of the parasite or the consumption of contaminated water. 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 but effective measures can be recommended during pregnancy: regular hand-washing, especially after contact with cats, meat, soil and water. Freezing meat (at < -20°C) before consumption or adequate heating of meat during preparation are other effective measures.

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

Toxoplasmosis in animals

Toxoplasmosis in animals is mostly considered in the differential diagnosis of reproductive disorders of sheep and goats.

2005

avian influenza

Avian influenza

Since 2002, for the first time in the history of avian influenza, different wild bird species became infected in Asia and Europe with a highly pathogenic H5N1 strain that was able to induce clinical symptoms in wild birds. With the first outbreaks suddenly notified from Siberian lowlands during August 2005 and the likely correlation with an outbreak of H5N1 infection occurring among wild birds at Qinghai Lake in China, the risk of the virus being rapidly transported to Europe via either poultry commercial routes or migrating wild birds, or the combination of both, was suddenly considered high.

In Belgium, like in other EU Member-States, a large monitoring plan has been implemented since autumn 2005 including passive (dead birds) and active wild birds surveillance (1600 swabs planned in 2005); exclusion diagnosis in the professional sector (upon abnormal mortality rate or treatment set-up) and increased serological surveillance (20.000 HI tests planned in 2006).

The active wild bird surveillance was developed in close cooperation with the Royal Belgian Institute of Natural Science, the Veterinary Faculty of Liège and CODA-CERVA

- Monitoring of avian influenza

Monitoring of Avian influenza

Passive monitoring of dead birds.

An expert group has determined the criteria for passive monitoring and further analysis of dead birds. The criteria were related to the number of dead birds, the finding place and the conditions in which the dead birds were found, in order to avoid an overload of samples to be sent to the laboratories. During the last three months of 2005, samples of 10 cases complying with these criteria were analysed, all with negative results.

Active monitoring of wild birds.

Cloacal swabs were taken from wild birds during the hunting season and during ringing identification. In total, 1669 wild birds were analysed during hunt of which 603 wild ducks. In case of ringing, 1066 birds of 21 different species were analysed. All results were negative.

Surveillance of housed poultry flocks.

In case of any abnormal symptom in a domesticated poultry flock, the owner has to inform his veterinarian who is obliged to examine clinical symptoms and evaluate a possible suspicion. In case of suspicion, samples are taken for further analysis. Since the summer of 2005, 550 cases were recorded and examined. All results were negative.

Serological screening of housed poultry flocks.

Serological screening for antibodies against H5 and H7 viral antigens of the avian influenza virus was performed on poultry of 376 poultry holdings selected on a '"risk based" approach. In total, 4770 birds were analysed. None of these routine and complementary sampling analyses did detect any infection of avian influenza virus.

2005

rabies

Rabies

Rabies is a zoonotic viral disease present in domestic and wild carnivores and bats all over the world. Rabies is caused by Lyssaviruses. The animal reservoir are carnivores and bats. Other animals do not play a role in the maintenance of the disease, but are victims of the disease.

The Lyssavirus genus, within the Rhabdoviridae family, is subdivided into several genotypes based on RNA sequencing:

genotype 1 – 'Classic' rabies virus, worldwide spread

genotype 2 – Lagos bat virus, Africa

genotype 3 – Mokola virus, Africa

genotype 4 – Duvenhage virus, Africa

genotype 5 – European bat lyssavirus 1 (EBLV-1), Europe

genotype 6 – European bat lyssavirus 2 (EBLV-2), Europe

genotype 7 – Australian bat lyssavirus, Australia.

'Classic' rabies virus (RABV), genotype 1, causes an acute viral encephalomyelitis of warm blooded animals (e.g. foxes, dogs, cats, wildlife) and humans.

Rabies is transmitted to other animals and humans through close contacts with saliva from infected animals, especially via bites or scratches, or less frequently via licks on broken 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. Once symptoms of the disease develop, rabies is fatal to both animals and humans. In humans, initial symptoms can include anxiety, headaches and fever. Later the effects of the encephalitis intensify.

- Rabies in animals

The inability to swallow liquids has given the disease the name of hydrophobia. Respiratory failure finally leads to death. Therefore it's very important for any person who has been bitten by a 'suspected' animal (abnormal behaviour) to seek medical attention and start the necessary treatment consisting of wound treatment, passive immunization and vaccination. Some people still die, although post-exposure treatment using modern vaccines and whenever required rabies immunoglobulin. Pre-exposure vaccination should be offered to persons at risk, such as laboratory workers, veterinarians, animal handlers, international travellers. Currently available vaccines are safe and effective against both the classic rabies virus and the bat lyssaviruses.

Lyssaviruses and rabies in European bat species.

Over one thousand species of bats are known worldwide. Bats are listed as endangered and protected animals across Europe. Rabies is at times detected in bats in some European countries and is caused by two independent Lyssa virus genotypes 5 and 6 (European bat lyssavirus-1 en European bat lyssavirus-2) . Both genotypes are related to the Classical rabies virus. Some but not all the bat species carry the viruses. Bat rabies is a public health concern. After infection the disease is fatal in humans and has been described several times following a bat bite. Post-exposure vaccination and treatment after a bat bite or after exposure to bats is highly recommended. Any person exposed to bats should be vaccinated preventively against rabies. No one should handle diseased or dead bats without protection such as gloves. Any one finding a bat behaving abnormally, found in an unusual place, or under unusual circumstances, should not attempt to handle or move the animal but should contact official authority. Education and recommendations should be given to travellers in order to reduce their risk of infection. Although dogs represent a more serious threat in many countries, yet the risk of rabies infection by bat bites also exists.

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

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 Federal Agency for the Safety of the Food chain. Affected animals are killed and their brain is examined by immunofluorescence and virus cultivation in neuroblasts at the National Reference Laboratory. The remaining nervous tissue of rabies-negative animals is afterwards transmitted to the National Reference Laboratory for TSE diagnosis.

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 at 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 km2 along the German border was covered by spreading 32 000 baits by means of a helicopter (17.78 baits per km2). 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 2005 surveillance

A total of 537 analyses were done at the National Reference Laboratory. The majority of samples originated from foxes (117) , cattle (231)and sheep and goats (106). The high number for cattle and small ruminants is the consequence of the surveillance system for transmissible spongiform encephalopathy (TSE) in these species: 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.

2005

hantaviruses

Photos: JL Wertz/ © ULG-P Drion

Hantaviruses

Wild rodents (or laboratory rodents) are the reservoir for Hantaviruses worldwide; humans are accidental hosts. The infection is chronic and apparently asymptomatic in host animals. A hantavirus serotype is hosted by a specific rodent species. According to the infectious agent and its region, hanta-viral diseases present with different level of severity, from mild infections to severe hemorrhagic fever with renal syndrome (HFRS). HFRS presents as an acute onset of fever, lower back pain, hemorrhagic manifestations and renal involvement. Hantavirus pulmonary syndrome (HPS) was also described as an infection predominantly involving the respiratory system. Outbreaks of HFRS and HPS are generally observed during years with dense rodent populations resulting from favourable climatic and environmental conditions and when this population is heavily infected by the virus. Human activities, such as rodent trapping, farming, cleaning rodent-infested areas, construction word, camping and hunting, are also implicated in the occurrence of hantavirus disease.

Hantavirus is excreted through urine, faeces or saliva of rodents. The transmission of hantaviruses to humans mainly occurs via inhalation of infected excretions. Person-to-person transmission is rare. The virus can survive hours or days in the environment.

Strategies to prevent hanta-viral infections consist in controlling rodents in and around the houses, and cleaning houses with bleach. Preventive measures in endemic areas rely essentially on information campaigns and rodent control.

- Cases of Hantavirus — data

Cases of Hantavirus — data

In 2005, the Belgian Sentinel Laboratory Network reported 372 cases of Hantavirus. This report indicates a significant increase of cases compared to the previous years.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of infections	224	55	49	124	68	110	51	122	47	372

Table 29. *Yearly number of Hantavirus infections, 1996 –2005 Source : Belgian Laboratory Sentinel Network*

Classically, hantavirus infections in Belgium display a seasonal peak in spring and summer and a periodic resurgence every 2 to 3 years. High seasonal peaks were reported in Belgium during the springs-summers of 1996, 1999, 2001, 2003 and specially 2005. Part of this increase is due to a greater awareness among health professionals and to a higher hantavirus testing. However, under-diagnosing of hantavirus infections remains a problem in Belgium.

Among the cases reported in 2005, 90% (N=329) resided in Wallonia, 7% (N=26) in Flanders and 3% (N=9) in Brussels. The highest incidence rates are reported in the districts of Liège (N=64), Neufchâteau (N=52), Thuin (N=38) and Dinant (N=30). Most of these areas are known to be endemic for the disease but cases in the district of Liège are only reported from 2003 on.

In 2005, the majority of cases are adults over 19 years (90%) and 71% are males

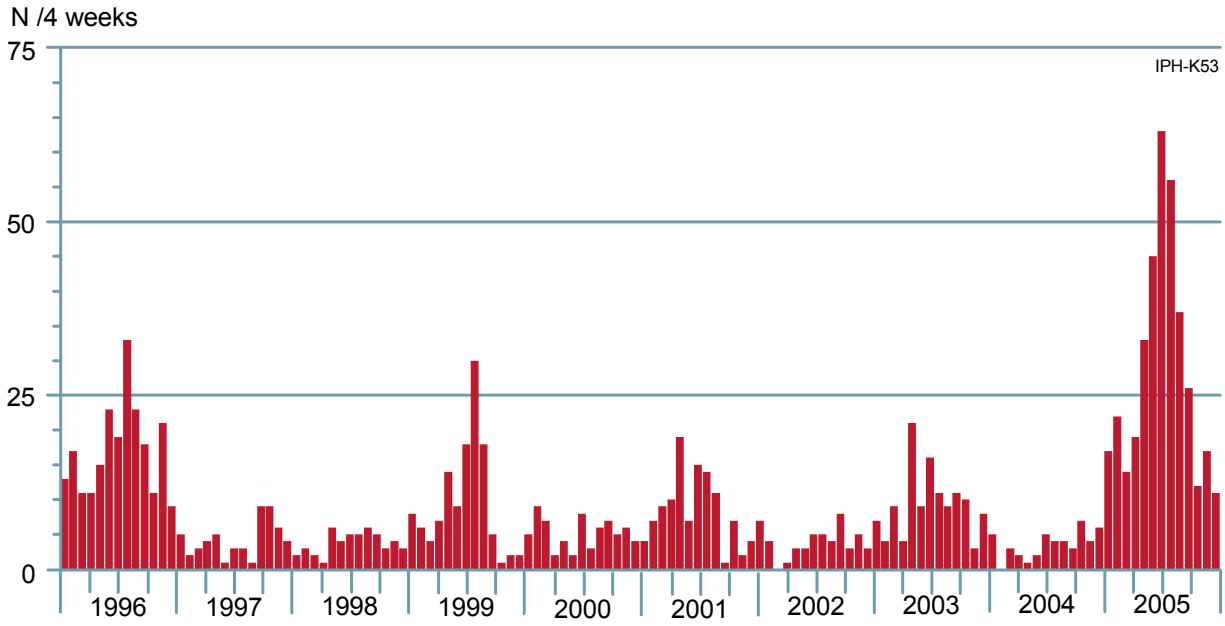


Figure J. *Distribution of Hantavirus infections (N/4 weeks), 1996 –2005 Source : Belgian Sentinel Laboratory Network*

2005

transmissible spongioform encephalopathy

Transmissible Spongioform Encephalopathy

Transmissible spongiform encephalopathies (TSEs) known as prion diseases, are caused by an infectious agent, whose molecular properties have not been fully determined. The animal TSEs include the archetype – scrapie in domestic sheep and goats – and animal diseases much more recently recognized, including transmissible mink encephalopathy (TME) and feline spongiform encephalopathy (FSE); chronic wasting disease (CWD) of deer and elk; and bovine spongiform encephalopathy (BSE).

The theory of BSE being defined as a disease solely in cattle is questioned more and more, especially since the first case of BSE was found in a French goat in 2006. In the past, the link between BSE and the new variant Creutzfeldt-Jakob disease in humans was already established. Therefore, the possible spread of this agent to sheep is of considerable concern, as exposure to BSE-contaminated meat and bone meal in some sheep flocks is very likely. Furthermore, the tissue distribution of the prions in an affected sheep and the transmission (vertical and horizontal) is more pronounced than in cattle.

Transmissible Spongioform Encephalopathy

After the start of the epidemic in the UK in 1986, BSE became a notifiable disease in Belgium in 1990. In 1997, a Royal Decree described the regulations for the epidemiological surveillance for ruminant TSE in Belgium, including the herd slaughter and compensation policy. In the beginning of 2001, this 'passive' surveillance was supplemented with an 'active' surveillance (based on EU Regulation (EC) N° 999/2001) controlling slaughtered animals and the fallen stock. For the moment the national reference laboratory uses 5 tests for diagnosis, i.e. the 'rapid' ELISA test , histopathology, immunohistochemistry, electronmicroscopic detection of scrapie associated fibrils (SAFs) and western blotting.

In Belgium, all 19 private laboratories (primary 'active' screening) and the NRL are accredited (ISO 17025:2005) and the whole epidemiological surveillance is coordinated by the Federal Agency for the Safety of the Food Chain.

Year		Slaughterhouse	Suspected Animals: Herd screening / farm, slaughter, autopsies	Fallen stock
2001	Cattle	360 948	3 522 / 379	13 060
	Small ruminants	0	11 / 45	0
2002	Cattle	410 379	3 277 / 377	36 386
	Small ruminants	2 195	428 / 85	780
2003	Cattle	357 389	1 126 / 250	33 691
	Small ruminants	2 447	205 / 52	499
2004	Cattle	358 120	172 / 254	35 322
	Small ruminants	39	333 / 170	1 650
2005	Cattle	325 302	15 / 234	41 729
	Small ruminants	703	8 / 86	1 588
Total	Cattle	1 824 147	8 112 / 1 494	160 188
	Small ruminants	5 384	985 / 438	4 517

Table 30. *Number of animals controlled in Belgium (2001-2005)*

Year	Cattle	Sheep primary outbreaks)
1992	0	1 (First case) / 5C
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	1 (First case) / C	2 / C
1998	6 / C	8 / 3C – 5Sc
1999	3 / C	11 / 2C – 9Sc
2000	9 / C	0
2001	46 / 28S – 10C – 7F – 1Sc	0
2002	38 / 17S – 5C – 16F	25 (1 atypical case) / 1S - 2C - 2F – 20Sc
2003	15 / 10S – 5F	2 / F
2004	11 / 6S – 3C – 2F	11 (1 atypical case) / 1S – 3F – 7Sc
2005	2 / 1S – 1C	2 (2 atypical cases) / F
Total	131 (62 slaughterhouse / 38 clinical cases / 30 fallen stock / 1 second case in a farm)	66 (2 slaughterhouse / 14 clinical cases / 9 fallen stock / 41 Sc)

S = slaughterhouse control / C = suspected clinical / F = fallen stock / Sc = additional case in a herd

Table 31. Positive TSE cases in cattle and sheep in Belgium (First case – 2005)

2005

addendum

Websites

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

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

http://www.efsa.europa.eu/

Legislation

COMMISSION REGULATION (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs JO L 338.

COMMISSION REGULATION (EC) No 2075/2005 of 5 December 2005 laying down specific rules on official controls for Trichinella in meat.

Royal Decree of 22 December 2005 laying down additional measures on official controls of animal products for human consumption. Official Journal of Belgium 2005-12-30

Publications

Ghafir Y, China B, Korsak N, Dierick K, Collard JM, Godard C, De Zutter L, Daube G. 2005. Belgian surveillance plans to assess changes in Salmonella prevalence in meat at different production stages. J Food Prot. 2005 Nov;68(11):2269-77

Chahed A, Ghafir Y, China B, Dierick K, De Zutter L, Pierard D, Daube G. 2005. Survey of the contamination of foodstuffs of animal origin by Shiga toxin producing Escherichia coli serotype O157:H7 in Belgium from 1999 to 2003. Euro Surveill. 2005 Mar;10(3):33-6

Tables and figures

Editor in charge:
Gil Houins
FAVV-AFSCA
Simon Bolivarlaan 30
1000 Brussel

Graphic design: FAVV Communication service (EDV&JG)

D/2007/10.413/1

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