Recent situation

Turkeys - Breeding flocks

In turkey breeding flocks, no *S.* Enteritidis or *S.* Typhimurium were detected in Finland, Sweden, Norway, The Netherlands, and Ireland. In France, 1 % of the flocks were *Salmonella* positive during the production period. Details on the serovar are not available. In Finland and Ireland, a few flocks infected with other serovars were identified.

In Germany and Italy, no positive turkey breeding flocks were reported within the voluntary investigations.

Table SA 48. *Salmonella* in turkey breeders and turkey flocks in countries which run a monitoring programme in both animals groups, 2002 (flock based data)

	Turkey breeders (all age groups)					Turkey flocks				
	Invest.	n Salm	% Salm	% *S.*Ent.	% *S.* Typ.	Invest.	n Salm	% Salm	% *S.* Ent.	% *S.* Typ.
Finland	41	1	2,4	0	0	555	3	0,5	0,2	0
Sweden	-	0	0	0	0	293	0	0	0	0
Norway [1]	5	0	0	0	0	77	0	0	0	0
Ireland	114	2	1,8	0	0	35	3	8,6	0	0
France	468	-	1,0	-	-	-	-	-	-	-
Netherlands	10	0	-	-	-	-	-	-	-	-
Denmark	-	-	-	-	-	323	27	8,4	0	1,6

[1] Data are related to farms, not flocks
- No information available

Turkeys - Production level

In turkey flocks at the production level, no *Salmonella* were detected in Sweden and Norway. In Finland, a few positive flocks were identified, one of them infected with *S.* Enteritidis. In Denmark and Ireland, *Salmonella* were detected from around 8% of the flocks. In Ireland, only other serovars than *S.* Enteritidis and *S.* Typhimurium were isolated, in Denmark also *S.* Typhimurium was detected. For Finland, Sweden and Norway, situation is comparable to previous years, with no or a few findings per year. In Denmark, *Salmonella* were more frequently detected than in 2001.

In Denmark, *Salmonella* was detected in a total of 128 (39,6 %) out of 323 flocks or batches examined after slaughter by neck-skin samples. This is considerably higher than in the previous year. In May 2002, a temporary problem with contamination of a newly installed steam-scalder in a major turkey slaughterhouse was identified. In September, a similar increase was registered, but no cause could be identified.

In Germany, about 9,7 % were *Salmonella* positive. In Austria, 5,9 % of the samples tested were positive for *Salmonella*. In a study, run in the Veneto Region of Italy, 61 % of the flocks were positive for *Salmonella*.

In Great Britain, the decreasing trend in the number of reported incidents in turkeys, seen in 2001, continued. In 2002, reported incidents (123) in turkeys decreased compared to 2001 (200). The most common serovars in turkeys have changed. In 2002, *S.* Typhimurium, *S*. Newport, *S*. Derby and *S*. Montevideo were most frequently isolated.

Turkey meat

Only very limited data are available on the Salmonella prevalence in turkey meat. Some of the samples might be included in the reports on poultry meat, described in the previous chapter.

In Germany, about 10 % of the samples tested were *Salmonella* positive.

In turkey cuts and turkey products, collected at retail in Denmark, no *Salmonella* were detected. Data available from the countries are summarised in Table AN 3.2.12.

Ducks and geese

Breeding flocks

In Sweden, Norway and France, where geese breeders are covered by the monitoring programme, no geese breeding flock were positive.

In France, 36 % of the duck breeding flocks were infected with *Salmonella,* which is an increase compared to the 14,8 % positive flocks in 2001 (Table SA 50).

Production flocks

Data on commercial geese flocks in the countries with a monitoring scheme are summarised in Table SA 49. Additional data on geese flocks at production level are available from Austria, Germany, Greece, Italy, and the United Kingdom. In Austria, 6,8 % of the geese samples tested were positive, in Germany, 8,7 % of the geese flocks tested were *Salmonella* positive. In Greece and Italy only a few flocks were tested. In Great Britain and Northern Ireland, one incident of *S.* Typhimurium infection was reported in each region.

Table SA 49. *Salmonella* in geese breeders and commercial geese flocks in countries which run a monitoring programme in both animals groups, 2002 (flock based data)

	Geese breeders (all age groups)					Geese flocks				
	Invest.	n Salm	% Salm	% *S.*Ent.	% *S.* Typ.	Invest.	n Salm	% Salm	% *S.* Ent.	% *S.* Typ.
Sweden	-	0	-	-	-	35	1	2,9	2,9	0
Norway [1]	2	0	0	-	-	6	0	0	-	-
France	19	-	0	-	-	-	-	-	-	-

[1] Data are related to farms, not flocks
- No information available

In Norway and Sweden, no *Salmonella* positive commercial duck flocks were identified.

In Denmark, again *Salmonella* was isolated in a high proportion of duck flocks tested. Compared to the previous year, where 73,6 % of the flocks were positive, in 2002 this was true for about 55 % of the flocks. In several cases more than one serovar was isolated. *S.* Anatum continued to be the most frequently isolated serovar.

In Austria, 16,7 % of the duck samples tested were *Salmonella* positive, in Germany, 10,6 % of the ducks tested were *Salmonella* positive.

In Great Britain, 235 incidents were reported from ducks. *S.* Indiana (26,4%) was the most common serovar, followed by S. Orion (13,2%), S. Binza (12,7%) and *S.* Hadar (11,5%). In Northern Ireland, *S.* Mbandaka and *S.* Budapest were isolated from ducks.

Table SA 50. *Salmonella* in duck breeders and commercial duck flocks in countries which run a monitoring programme in both animals groups, 2002 (flock based data)

	Duck breeders (all age groups)					Duck flocks				
	Invest.	n Salm	% Salm	% *S.*Ent.	% *S.* Typ.	Invest.	n Salm	% Salm	% *S.* Ent.	% *S.* Typ.
Sweden	-	0	-	-	-	47	0	-	-	-
Norway [1]	2	0	0	-	-	3	0	0	-	-
Ireland	25	7	28,0	0	0	-	-	-	-	-
France	439	-	36,0	-	-	-	-	-	-	-
Denmark	-	-	-	-	-	190	104	54,7	1,6	0

[1] Data are related to farms, not flocks
- No information available

Data available from other Member States on ducks and geese are summarised in Table AN

Other species of poultry and birds

Other poultry species, such as guinea fowl, ostriches, partridges, quails, and pheasants were tested for *Salmonella* in some countries. Results show that all types of poultry can be infected with *Salmonella* and that both *S.* Enteritidis and *S.* Typhimurium may be present.

In Italy, 4 out of 41 flocks of pheasants were *Salmonella* positive. In Great Britain, 28 incidents of *Salmonella* were reported in pheasants. Two of these incidents were caused by *S.* Enteritidis and *S.* Typhimurium, respectively.

In Spain, 11,3 % of 160 flocks of partridges were *Salmonella* positive. *S.* Enteritidis was the dominating serovar. In Great Britain and Northern Ireland, some incidents in partridges have been reported, *S.* Typhimurium was detected once in Great Britain.

As regards ostriches, in Spain 3 out of 13 flocks were *Salmonella* positive. In Italy, one positive flock out of 48 tested was identified.

In quails, *Salmonella* were detected in Spain in 54% of the 95 flocks tested, and *S.* Typhimurium was the dominating serovar. In Italy, 4 out of 18 flocks were *Salmonella* positive.

In guinea fowl, positive findings were reported from Italy and Great Britain.

Details are available in Tables AN - 3.2.13 in the Annex.

Serovar pattern in poultry and poultry meat

The overall serovar patterns in the main poultry species and the poultry meat derived of these species is compared in Figures SA 13 and SA 15 on the basis of the isolates typed and the details reported by the Member States. Patterns in the individual countries for the poultry species and the meat derived from these are given in Figures SA 14 and SA 16.

In broilers, *S.* Paratyphi B var. Java, *S.* Enteritidis, *S.* Infantis, *S.* Virchow, *S.* Livingstone, *S.* Mbandaka, *S.* Typhimurium and *S.* Senftenberg are the most frequently reported serovars (Table SA 51). In turkeys, S. Heidelberg is most frequently reported, followed by *S.* Typhimurium and S. Blockley. In ducks, *S.* Indiana is the dominating serovar. In geese, *S.* Typhimurium and *S.* Enteritidis are the dominating serovars. In each Member State, the serovar pattern is different.

Information on the serovar pattern in the meat from broilers, turkeys, geese or ducks is given by a few Member States only (Table SA 52). In fowl meat, *S.* Enteritidis was most frequently reported. In meat from geese and ducks, *S.* Typhimurium is the dominating serovar. Detailed information on the serovar for most of the isolates from turkey meat is missing. Therefor it can be just concluded that *S.* Enteritidis and *S.* Typhimurium are not the most prevalent serovars.

Table SA 51. Most frequent *Salmonella* serovars in the main poultry species in the individual countries, 2002

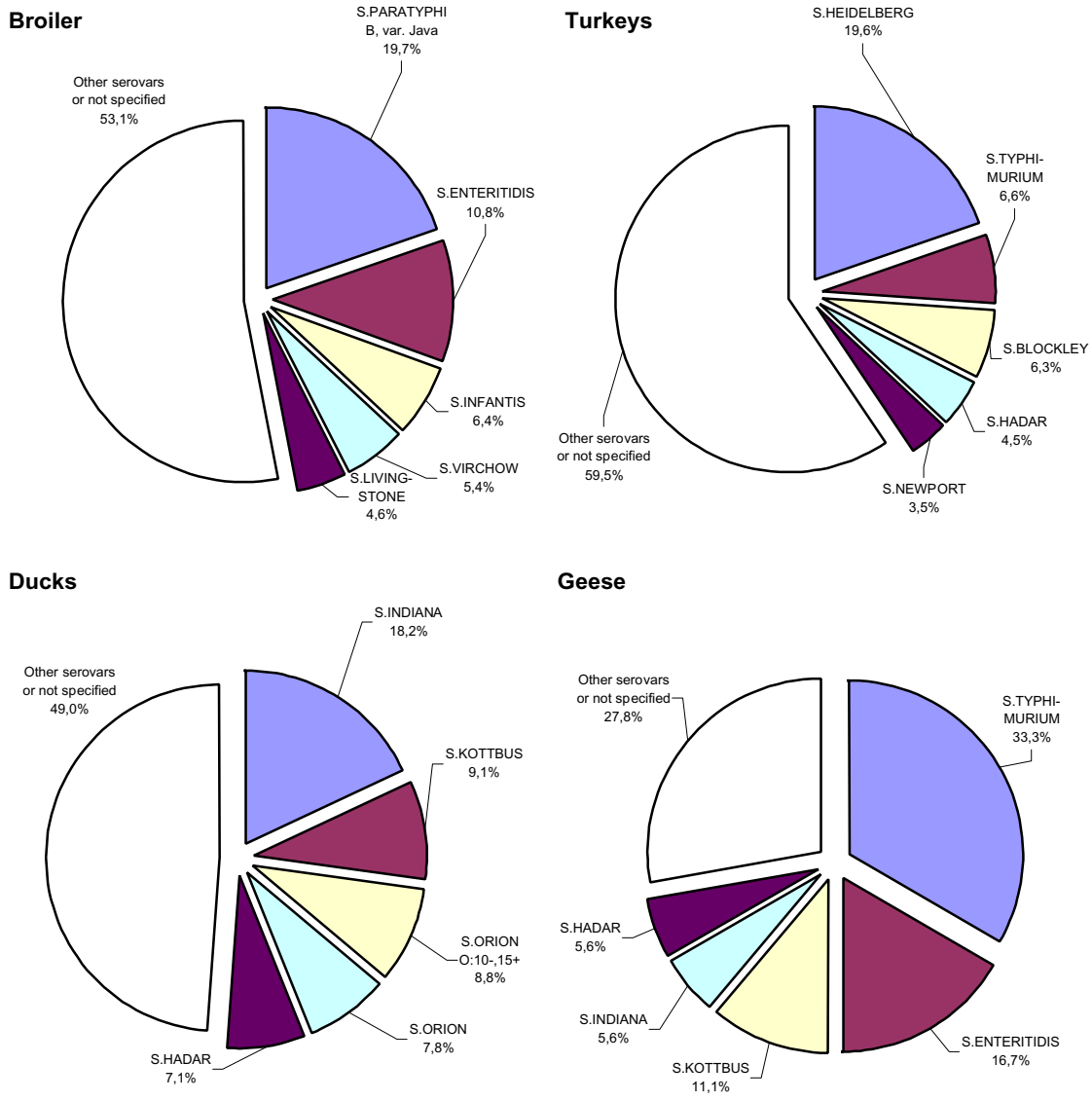
	Austria	Belgium	Denmark	Finland	Germany [2]	Greece	Ireland	Italy	Netherlands	Portugal	Spain	Sweden	United Kingdom	Total
Broilers (n=) [1]	134	319	67	11	188	-	-	79	940	13	182	-	800	2733
S.PARATYPHI B, var. Java	-	-	0	-	-	-	-	-	539	-	-	-	-	539
S.ENTERITIDIS	54	12	1	0	97	-	-	1	18	7	101	-	5	296
S.INFANTIS	18		14	3	-	-	-		139	-	-	-	2	176
S.VIRCHOW	4	50	0	-	-	-	-	24	23	-	-	-	46	147
S.LIVINGSTONE	-	-	-	4	-	-	-	1	22	-	-	-	98	125
S.MBANDAKA	3	6	-	-	-	-	-	-	60	-	-	-	50	119
S.TYPHIMURIUM	5	25	10	0	10	-	-	3	25	0	3	-	35	116
S.SENFTENBERG	7	-	-	-	-	-	-	2	7	-	-	-	92	108
S.HADAR	12	40	0	-	-	-	-	7	5	-	-	-	17	81
Turkey (n=) [1]	293	-	29	4	259	9	5	118	-	4	2	-	123	846
S.HEIDELBERG	145	-	0	-	-	-	-	21	-	-	-	-	-	166
S.TYPHIMURIUM	12	-	2	0	4	0	0	14	-	1	-	-	23	63
S.BLOCKLEY	15	-	-	-	-	-	-	36	-	2	-	-	-	53
S.HADAR	10	-	0	-	-	-	-	23	-	1	-	-	4	38
S.NEWPORT	2	-	0	-	-	6	-	-	-	-	-	-	22	30
S.SAINTPAUL	18	-	7	-	-	-	-	-	-	-	-	-	2	27
S.DERBY	9	-	-	-	--	-	-	-	-	-	-	-	18	27
S.MONTEVIDEO	11	-	-	-	-	-	-	-	-	-	-	-	14	25
S.AGONA	12	-	0	3	-	-	-	-	-	-	-	-	9	24
Ducks (n=) [1]	7	-	127	-	14	1	7	-	-	8	-	2	237	396
S.INDIANA	-	-	10	-	-	-	-	-	-	-	-	-	62	72
S.KOTTBUS	-	-	32	-	-	1	-	-	-	-	-	-	3	36
S.ORION O:10-,15+	-	-	-	-	-	-	-	-	-	-	-	-	35	35
S.ORION	-	-	-	-	-	-	-	-	-	-	-	-	31	31
S.HADAR	-	-	1	-	-	-	-	-	-	-	-	-	27	28
S.ENTERITIDIS	3	-	3	-	1	0	0	-	-	6	-	1	11	25
S.TYPHIMURIUM	3	-	0	-	3	0	0	-	-	0	-	1	10	17
S.LIVINGSTONE	-	-	-	-	-	-	-	-	-	-	-	-	15	15
S.GIVE	-	-	-	-	-	-	-	-	-	-	-	-	13	13
Geese (n=) [1]	3	-		-	11	1	-	-	-	-	-	1	2	18
S.TYPHIMURIUM	-	-	-	-	4	0	-	-	-	-	-	-	2	6
S.ENTERITIDIS	-	-	-	-	2	0	-	-	-	-	-	1	0	3
S.KOTTBUS	2	-	-	-	-	-	-	-	-	-	-	-	-	2
S.INDIANA	1	-	-	-	-	-	-	-	-	-	-	-	-	1
S.HADAR	-	-	-	-	-	1	-	-	-	-	-	-	-	1

[1] n represents the number of isolates typed / positive flocks / positive animals / positive samples. In some countries, only *S.* Enteritidis and *S.* Typhimurium are covered in the report

[2] Calculated on the basis of positive flocks or positive samples

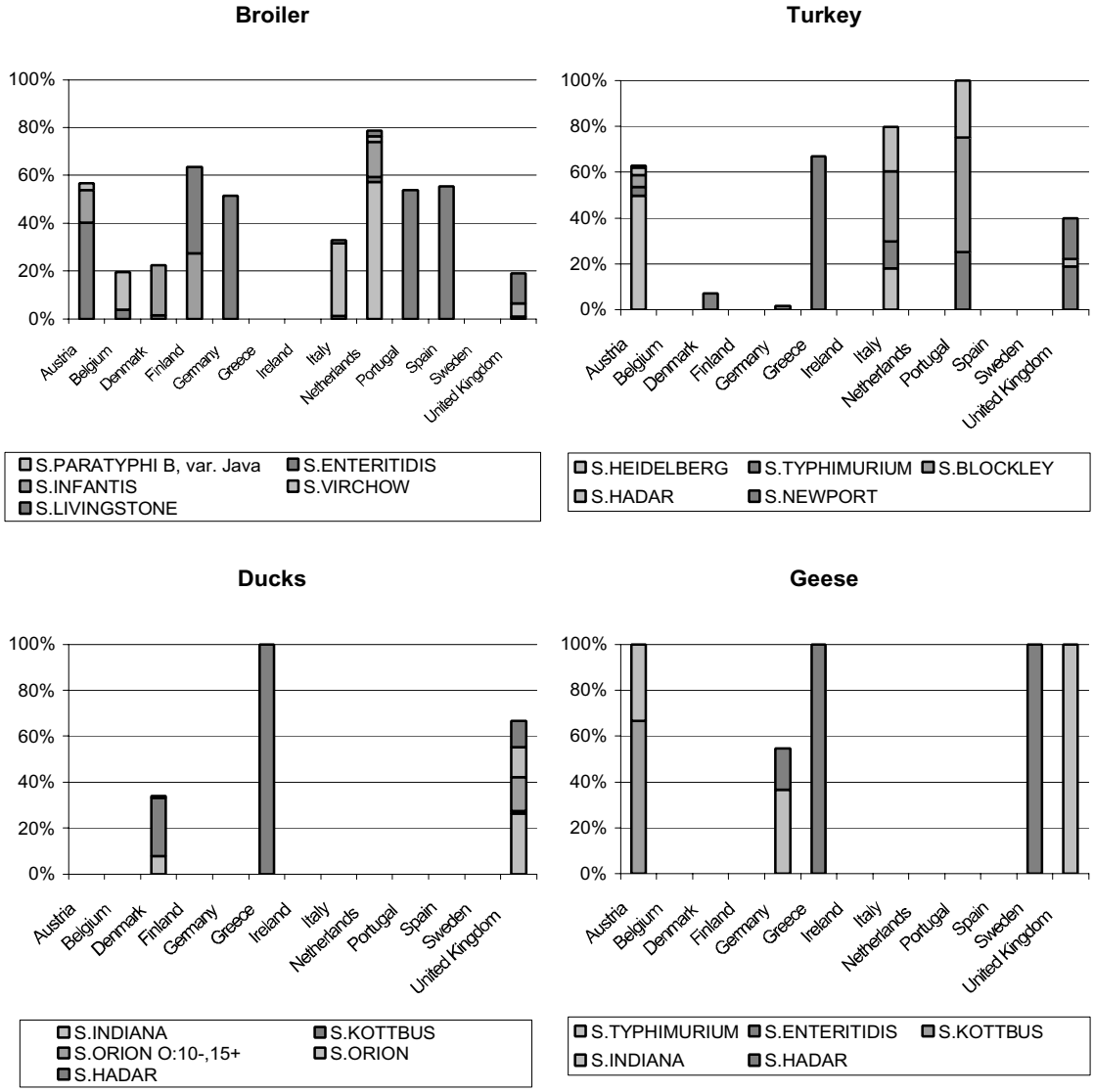
- No isolates reported among those listed; typically only the most common serovars are reported

Figure SA 13. The five most frequent *Salmonella* serovars (in %) in the main poultry species, 2002



The number of isolates used for the calculation of the percentages are listed in Table SA 51

Figure SA 14. The five most frequent *Salmonella* serovars (in %) in the European Union from the main poultry species by their occurrence in the individual countries, 2002



The number of isolates used for the calculation of the percentages are listed in Table SA 51

Table SA 52. Most frequent *Salmonella* serovars in meat of the main poultry species in the individual countries, 2002

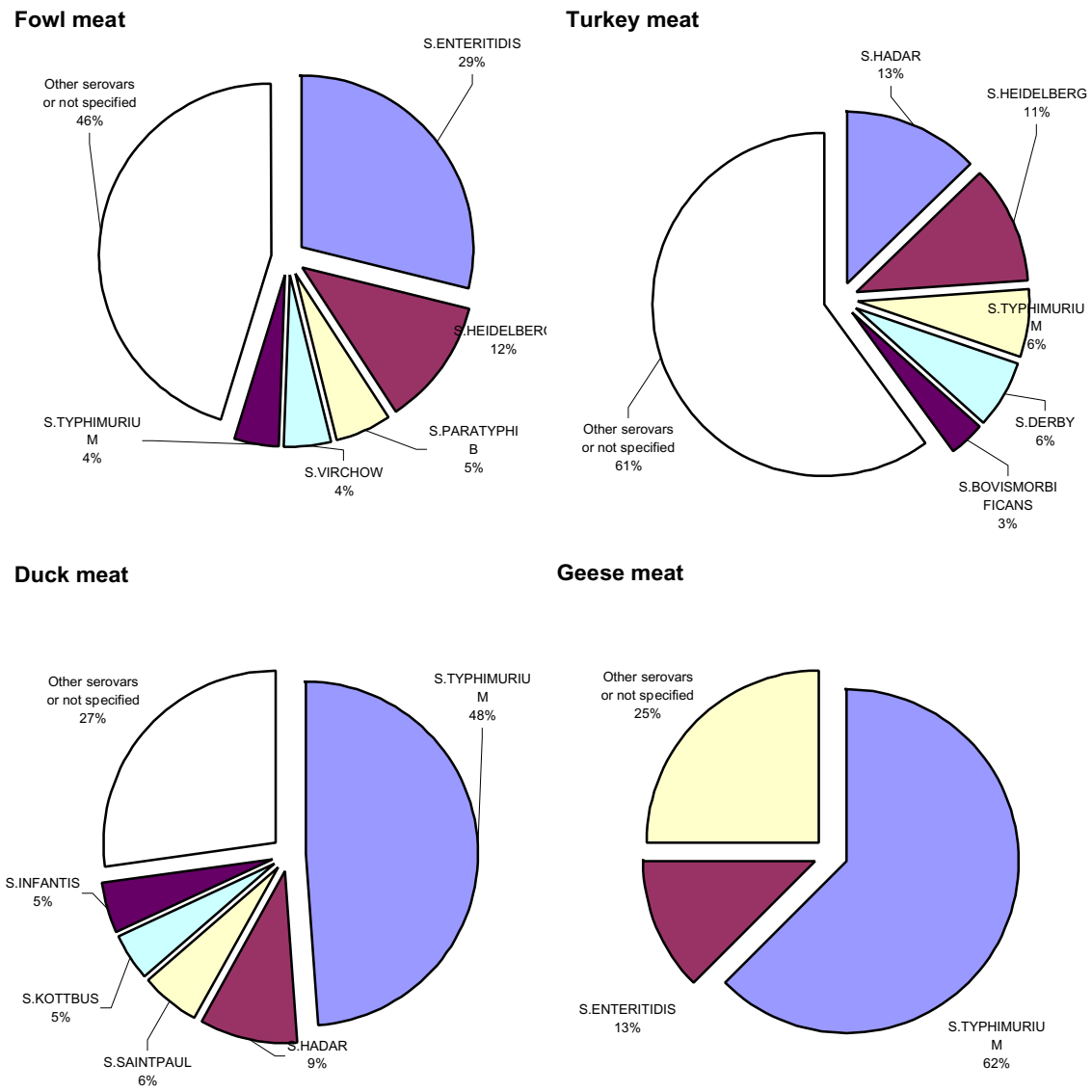
	Belgium	Denmark [2]	Germany	Total
Fowl meat (n=) [1]	71	152	225	448
S.ENTERITIDIS	22	32	76	130
S.HEIDELBERG	-	53	-	53
S.PARATYPHI B	7	-	16	23
S.VIRCHOW	8	12	-	20
S.TYPHIMURIUM	3	2	14	19
S.PARATYPHI B, var. Java	-	1	15	16
S.BREDENEY	15	-	-	15
S.INDIANA	3	4	-	7
S.HADAR	3	4	-	7
Turkey meat (n=) [1]	-	95	60	155
S.HADAR	-	20	-	20
S.HEIDELBERG	-	17	-	17
S.TYPHIMURIUM	-	3	7	10
S.DERBY	-	10	-	10
S.BOVISMORBIFICANS	-	5	-	5
S.AGONA	-	5	-	5
S.KOTTBUS	-	4	-	4
S.SAINTPAUL	-	3	-	3
S.PARATYPHI B, var. Java	-	0	2	2
Duck meat (n=) [1]	3	56	29	88
S.TYPHIMURIUM	-	32	11	43
S.HADAR	1	7	-	8
S.SAINTPAUL	-	5	-	5
S.KOTTBUS	1	3	-	4
S.INFANTIS	-	4	-	4
S.INDIANA	1	1	-	2
S.NEWPORT	-	1	-	1
S.ENTERITIDIS	-	0	1	1
S.BOVISMORBIFICANS	-	1	-	1
Geese meat (n=) [1]	-	-	8	8
S.TYPHIMURIUM	-	-	5	5
S.ENTERITIDIS	-	-	1	1

[1] n represents the number of isolates typed / positive flocks / positive animals / positive samples. In some countries, only *S.* Enteritidis and *S.* Typhimurium are covered in the report

[2] Imported meat

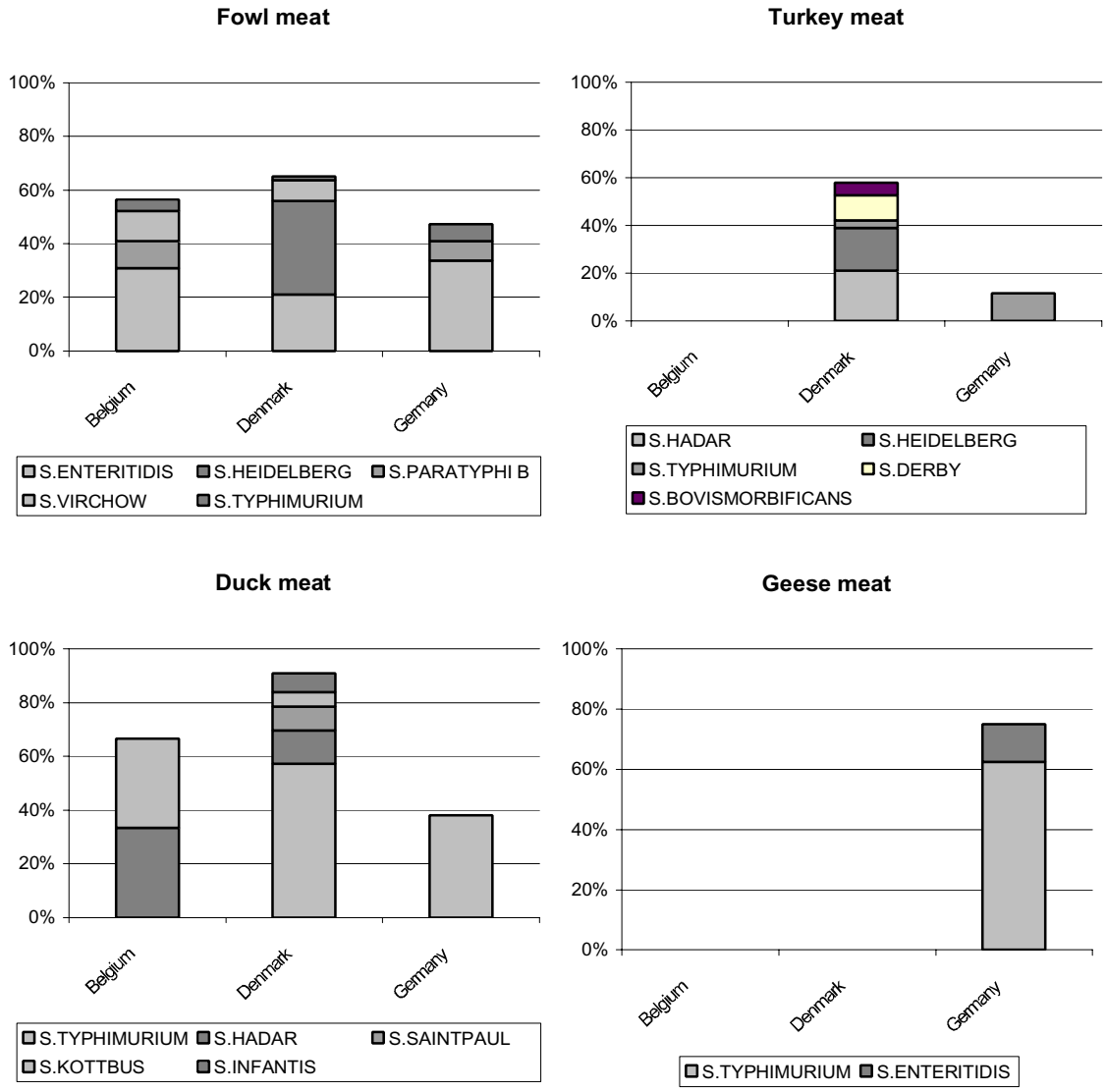
- No isolates reported among those listed; typically only the most common serovars are reported

Figure SA 15. The five most frequent Salmonella serovars (in %) in the European Union from meat of the main poultry species by their occurrence in the individual countries, 2002



The number of isolates used for the calculation of the percentages are listed in Table SA 52

Figure SA 16. The five most frequent *Salmonella* serovars (in %) in the European Union meat of the main poultry species by their occurrence in the individual countries, 2002



The number of isolates used for the calculation of the percentages are listed in Table SA 52

3.2.3. *Salmonella* in pigs and pork

Monitoring and control strategies

In four countries (Denmark, Finland, Sweden and Norway), active monitoring of breeding and multiplying herds as well as fattening pigs is established for several years now. The approaches taken in the individual country vary. A summary on the monitoring strategies applied is given in Tables SA 53 and SA 54. A few new developments in 2002 were described in the national reports.

The changes of the Danish monitoring programme, implemented during 2001, have been described in the report 2001 in detail. In May 2002, the serological surveillance programme has been taken over by the Danish Bacon and Meat Council. A penalty system has been introduced for herds with a high proportion of reactors (level 2 and 3 herds). In Denmark, the number of samples collected for control purposes at retail level was reduced in 2002

In Sweden, apart from the Salmonella control programme, within an industry run health control programme, all integrated herds or herd producing weaner pigs are sampled once a year by faecal samples. In 2002, a new voluntary Salmonella control system in pigs was introduced that will be operational in 2003.

In the Netherlands, the surveillance program of KvW/RIVM was continued. In 2003, a Plan of Approach was started by the PVE, with the aim to reduce the prevalence of Salmonella spp. in slaughter pigs.

In Italy, a monitoring plan was implemented in the Veneto region during the period May 2002 to June 2003. Faecal samples were taken from one animal per 384 herd at slaughterhouses..

In Belgium, within the monitoring programme, two sampling sites were compared for pork carcasses, the Belgian sampling method and the sampling method laid down in Commission Decision 2001/471/EC.

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Table SA 53. Sampling strategies in pigs, 2002

Breeding and multiplying herds		Fattening herds at farm		Fattening herds at slaughter		Other activities	
Type of sample							
Blood samples	DK	Faecal samples	DK[2], NL[5], S[8]	Meat juice	DK [1]	Notification of clinical out-breaks	DK, I, N, S
Pen faecal samples	DK [3]			Lymph nodes	FIN[6], S,N	Swine herds with clinical symptoms	FIN, S
Faecal samples	S, N , FIN[4]			Carcass swabs	S, FIN, N DK	Notification of *S.* Enteritidis/ *S.* Typhimurium	IRL
						Notification of all Salmonella findings	FIN , S, UK, N
						Clinical surveillance	FIN, S, N
						Autopsy	S, N
Sample size							
Up to 20 samples / herd de-pending on herd size	N	From 271 herds 60 faecal samples/herd were pooled in 5 samples/herd	NL	3000 samples from fattening pigs and 3000 samples from sows an-nually, stratified sampling proce-dure	FIN [7]		
				3000 ileo-caecal lymphnodes and 3000 swabs	N		
Frequency of sampling							
Monthly	DK	Once a year	S[8]	Random sample	N		
Once a year all herds	FIN [4], N						
Annually from elite breeding- and gilt producing herds Twice a year from sow pools	S						

[1] All herds producing more than 200 pigs for slaughter per year are monitored
[2] Level 2 (herds with a higher proportion of reactors) and level 3 (herds with an unacceptable high proportion of reactors) herds
[3] If the herd reaches a specific cut-off level. Also, those producing piglets for slaughter-pig herds placed in level 2 or 3
[4] Health scheme for top-level pig breeding farms
[5] Surveillance project KvW/RIVM
[6] An individual sample consists of 5 or more lymph nodes collected from a carcass from ileo-caecal region.
[7] Sample size sufficient to detect a 5% prevalence at the slaughterhouse level (95% confidence)
[8] All integrated herds or herds producing weaner pigs that are affiliated to a industry run health control programme

Table SA 54. *Salmonella* monitoring programmes in pigs and pork, 2002

Pigs at slaughter		**At cutting plants / at processing plants**		**Pork at retail**		**Pork products at retail**	
		Individual product lines at processing plants	IRL	Routine sampling	D, IRL	Routine sampling	D, IRL
				Pork	DK		
Surface swabs	B, FIN, S, N, DK[2]	Crushed meat samples	FIN[1], N	Regional programmes	GB		
Lymphnodes	S, FIN[5], N	Pork	S	Local municipalities	S		
		Cutting and minced meat samples	B	Minced meat	B		
				Routine sampling according to the foodsurvey KvW: pork	NL		
Sample size							
2250 / month One/day or one/month	DK[3]			100 / year	NL		
3000 samples from fattening pigs and 3000 samples from breeding pigs annually	FIN[4]		FIN[4]				
3000 samples of lymph nodes and 3000 samples of carcass-swabs/year	N	According to production capacity	N				
436/year	B	412/year	B[6]	187/year	B[6]	306/year	B[6]
Frequency							
		Twice a year	IRL				
Continuous	DK	daily, weekly, monthly or twice a year	S, FIN				
Random sample	N	Frequency dependent upon the production capacity	N[7]				

[1] Randomly during operation, at least once a week, 25g of crushed meat taken from cleaning tool of a conveyer belt, from tables or a similar point
[2] Swab samples from three designated areas of chilled half carcasses. 5 carcasses are pooled to one sample at small slaughterhouses 1 carcasses swab sample
[3] Export slaughterhouses one pooled sample (5 carcasses) per day, minor slaughterhouses one pooled sample per 200 animals slaughtered, at least one per month.
[4] To detect a 5% prevalence at slaughterhouse and meat cutting plant level (95% confidence). Sampling must be evenly distributed over the working day, week and quartal of the year. The number of samples is large enough to detect a prevalence at 0,1% at the population level in the whole country.
[5] An individual sample consists of 5 or more lymphnodes from a carcass from ileocaecal region
[6] To detect a minimal contamination rate of 1% with 95% confidence
[7] Production capacity <2 tons: twice a year, production capacity 2-20 tons: once a month, production capacity >20 tons: once a week

Results

Pigs

In Finland, Sweden and Norway, low contamination rates were detected in the carcass swabs and lymph node samples taken at the slaughterhouses and in the crushed meat samples taken at slaughterhouses or cutting plants. No or very few *Salmonella* infected herds were identified in these countries in 2002.

In Denmark, Belgium and The Netherlands, the situation as regards fattening pigs is different. In Denmark, 4,1% of pooled carcass swabs were *Salmonella* positive. After application of a conversion factor, an overall prevalence of 1,4% was calculated for the individual carcass samples. In the serological monitoring programme, by the end of 2002, 3,2 % of the herds fell in Level 2 or 3, which indicate salmonella infection. In Belgium, 15,4% of the carcass swabs were positive. In The Netherlands, in the surveillance project on farm level, *Salmonella* were isolated in 30% of the 157 herds tested by faecal samples.

In the monitoring plan, run in the Veneto region of Italy, about half of the pig herds tested were infected with *Salmonella*.

In Germany, on the basis of immunological techniques for testing like the meat juice ELISA, 5,8% of the animals showed a positive test result. In bacteriological investigations, 3,8 % of the animals were *Salmonella* positive. This is a decline compared to 2001, where 4,3 % infected animals have been reported.

In Great Britain, the number of reported incidents was comparable to the previous year.

Data available from countries running a continuous monitoring programme are summarised in Table SA 55. Data available from other Member States on pigs are given in Table AN 3.2.15

Pork and pork products

At retail level, information collected is in line with the results available from the animals.

In routine surveillance at retail level in Denmark, 1,3 % of the not-heated pork samples were *Salmonella* positive. In heat-treated products, no *Salmonella* were detected. In Belgium and The Netherlands, the contamination rate was considerably higher. In Belgium, 11,0 % positive samples of minced meat collected at processing plants and retail level and 11,2 % positive cutted pork samples at processing plants have been reported. In the Netherlands, 10,5 % *Salmonella* positive pork samples collected at retail level have been reported. For the Netherlands, this is an increase compared to the previous study run in 1999. In Germany, 2,9 % of the pork samples taken at retail level were *Salmonella* positive, which is a reduction compared to 2001.

Results from all countries where pork or pork products were sampled at retail level are summarised in Table SA 55. In pork, contamination level ranged from 0% to 10,5%. In minced meat, which could not always be restricted to porcine origin, higher contamination rates were reported. In meat products from pork, no *Salmonella* were detected in Austria, Denmark, England and Wales. In contrast, in Germany, Italy, Portugal and Spain *Salmonella* were isolated in 1,4% to 2,6% of these type of samples tested. Data available on pork, minced meat and meat products are summarised in Table SA 56.

Data available from all Member States are given in Table AN - 3.3.5.

Table SA 55. *Salmonella* in pigs and pork in countries which run a monitoring / surveillance programme

	2000				2001				2002			
	Invest.	%Salm	%S.Ent.	%S.Typ.	Invest.	%Salm	%S.Ent.	%S.Typ.	Invest.	%Salm	%S.Ent.	%S.Typ.
Pigs (herd / farm based data) - serological tests												
Denmark [1]	15494	4,1	-	-	14694	3,2	-	-	14597	3,2	-	-
Pigs (herd / farm based data) - faecal samples												
Netherlands [3]	194	35,1	0	18,6	154	29,2	0	21,4	157	29,9	0,64	17,2
Norway [7]	167	0,6	0	0,6	177	0	0	0	169	0	-	-
Pigs (sample based data) - lymph nodes												
Finland	6362	0,08	0	0,06	6404	0,09	0,03	0,02	6162	0,11	0,02	0,06
Sweden	6706	0,19	0,01	0,18	6547	0,14	0	0,12	6402	0,09	0,0	0,09
Norway	2778	0,07	0	0	2480	0	0	0	2606	0,15	0,0	0,15
Pigs (sample based data) - carcass swabs												
Belgium	436 [2]	17,7	0,5	5,4	293 [2]	20,8	0	9,2	298 [2]	15,4	-	7,1
Denmark	-	-	-	-	7427 [10]	3,9	0	2,2	7435 [10]	4,1	0,0	1,8
Finland	6387	0	0	0	6254	0,05	-	-	6260	0,08	0,03	0,02
Sweden	6733	0,03	0	0	6578	0,03	0	0,03	6420	0,02	0,0	0,0
Norway	2851	0	0	0	2452	0	0	0	2615	0	-	-
Pork meat at slaughterhouse and cutting plants												
Belgium [4, 5]	-	-	-	-	-	-	-	-	224	11,2	0,0	5,4
Belgium [11]	-	-	-	-	-	-	-	-	116	7,8	0,9	3,5
Finland [5]	3472	0	0	0	2605	0	0	0	1840	0,11	0,0	0,0
Sweden [5, 6]	4454	0,02	0	0,02	4311	0	0	0	4478	0,0	-	-
Norway [8]	2542	0	0	0	2417	0,04	-	-	2371	0,04	0,0	0,0
Pork at retail												
Belgium [11]	-	-	-	-	-	-	-	-	184	13,0	0	6,0
Denmark	1782	1,12	-	-	715	1,7	-	-	7003	1,3	-	-
Finland	167	0	-	-	-	-	-	-	-	-	-	-
Germany	1614	3,7	0,1	2,0	1547	3,8	0	1,9	2193	2,9	0	1,7
Norway [9]	4129	0,27	0	0,17	1039	0,48	0	0,19	221	0	-	-
Netherlands	-	-	-	-	-	-	-	-	105	10,5	-	-

- No information available

[1] Serological monitoring programme, level 2 and 3 herds
[2] 600 cm²
[3] Surveillance project KvW/RIVM
[4] Cuts of meat
[5] Cutting plants
[6] Both pork and beef, approximately 62% are estimated to be sampled from pork scrapings
[7] Breeding herds
[8] Data consist of samples of crushed meat from several animal species
[9] Survey regarding imported products
[10] Mainly pooled samples
[11] Minced meat

Table SA 56. *Salmonella* in pork, minced meat and meat products made from pork at retail, 2002

	Pork				Minced meat [1]				Pork meat products			
	Invest.	%Salm	%S.Ent.	%S.Typ	Invest.	%Salm	%S.Ent.	%S.Typ	Invest.	%Salm	%S.Ent.	%S.Typ
Austria	15	0	-	-	38	0	-	-	190	0	-	-
Belgium	-	-	-	-	184	13,0	0	6,0	-	-	-	-
Denmark	7003	1,3	-	-	-	-	-	-	1117	0	-	-
Germany	2193	2,9	0	1,7	2600 [1]	3,8	0	2,1	7776 [1]	1,4	0,03	0,7
Greece	7	0	-	-	1 [1]	0	-	-	1 [1]	0	-	-
Ireland	32	3,1	-	-	79 [1]	2,5	0	0	1479	0	-	-
Italy	1006	2,9	0,4	0,8	3051 [1]	1,5	0	0,2	1982	2,1	0,1	0,5
Netherlands	105	10,5	-	-	48 [3]	4,2	-	-	-	-	-	-
Portugal	-	-	-	-	29 [1]	13,8	-	-	76	2,6	0	1,3
Spain	270	1,1	0,4	0,0	1614 [1]	3,7	0,7	0,06	867	2,2	0,7	0,0
Norway [2]	221	0	-	-	-	-	-	-	-	-	-	-
England &Wales	-	-	-	-	-	-	-	-	243	0	-	-

[1] Animal species of origin not specified
[2] Imported samples
[3] Minced meat bovine / pork
- No information available

Serovar pattern in pigs and pork

Serovar patterns in pigs and pork are compared on the basis of the isolates typed and the details reported by the Member States.

In Figure SA 17, the five most frequent serovars isolated from pigs in the reporting countries together are given. As in previous years, *S.* Typhimurium is clearly dominating in the overall figure, and this is true in most of the individual countries (Figure SA 18). The next frequent serovar is *S.* Derby. Most of the other serotypes were not specified. Interestingly, again, a few *S.* Enteritidis isolates from pigs were reported from several countries.

In pork, *S.* Typhimurium is the dominating serovar, followed by *S.* Derby. Thus, this pattern is quite similar to that seen in pigs (Figure SA 19). *S.* Typhimurium is the dominating serovar in most Member States (Figure SA 20). *S.* Derby is also reported frequently.

Table SA 57. Most frequent *Salmonella* serovars in pigs in the individual countries, 2002

	Austria	Belgium	Denmark	Finland	France	Germany	Ireland	Italy	Luxembourg	Netherlands	Norway	Portugal	Sweden	United King-dom	Total
S.TYPHIMURIUM	24	167	518	4	94	49	18	28	-	259	4	12	6	156	1339
S.DERBY	3	30	88	-	40	-	1	10	1	55	-	1	-	16	245
S.BOVIS-MORBIFICANS	1	-	0	-	-	-	-	-	-	74	-	-	-	1	76
S.INFANTIS	1	6	33	-	-	-	-	-	-	26	-	-	-	2	68
S.BRANDENBURG	-	11	-	-	-	-	-	-	-	36	-	-	-	-	47
S.LONDON	-	-	-	-	-	-	-	-	-	19	-	-	-	5	24
S.MANHATTAN	-	-	-	-	-	-	-	-	-	24	-	-	-	-	24
S.LIVINGSTONE	-	7	-	-	-	-	-	-	-	16	-	-	-	-	23
S.GOLDCOAST	-	-	-	-	-	-	-	-	-	18	-	-	-	4	22
Total (n=) [1]	36	250	713	7	230	77	26	192	1	570	4	19	7	216	2348

[1] n represents the number of isolates typed / positive flocks / positive animals / positive samples. In some countries, only *S.* Enteritidis and *S.* Typhimurium are covered in the report

- No isolates reported among those listed; typically only the most common serovars are reported

Table SA 58. Most frequent *Salmonella* serovars in pork in the individual countries, 2002

	Belgium	Denmark	Finland	France	Germany	Ireland	Italy	Netherlands	Spain	Total
S.TYPHIMURIUM	24	131	1	109	38	78	49	4	0	434
S.DERBY	16	48	-	95	-	35	13	-	-	207
S.INFANTIS	-	45	2	-	-	-	-	-	-	47
S.ENTERITIDIS	-	0	2	1	-	-	6	-	1	10
S.ANATUM	-	-	-	5		-	4	-	-	9
S.BRANDENBURG	3	-	-	-	-	-	2	-	-	5
S.ORION	-	-	-	-	-	3	-	-	-	3
S.PANAMA	1	-	-	-	-	-	1	-	-	2
SALMONELLA, OTHER	-	-	1	-	19	17	-	-	-	37
SALMONELLA SP.	-	43	-	-		14		-	-	57
Total (n=) [1]	52	395	7	304	63	148	185	11	16	1181

[1] n represents the number of isolates typed / positive flocks / positive animals / positive samples. In some countries, only *S.* Enteritidis and *S.* Typhimurium are covered in the report

- No isolates reported among those listed; typically only the most common serovars are reported

Figure SA 17. The five most frequent *Salmonella* serovars (in % of all isolates) in pigs, 2002

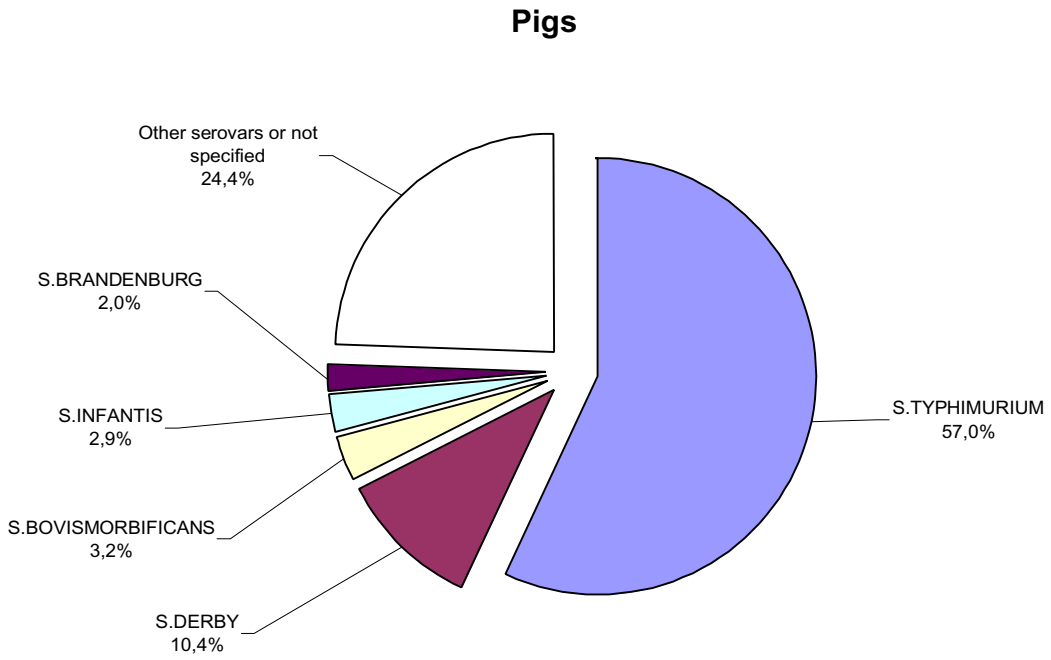
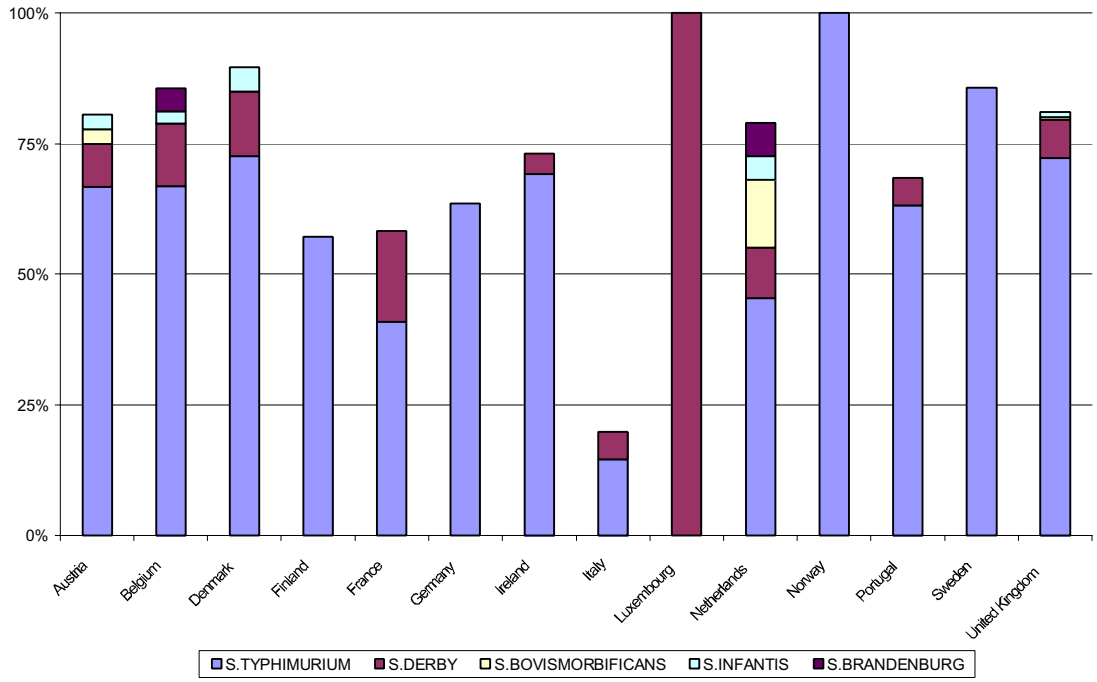


Figure SA 18 The five most frequent Salmonella serovars (in % of all isolates) in the European Union from pigs by their occurrence in the individual countries, 2002



The number of isolates used for the calculation of the percentages is listed in Table SA 57

Figure SA 19. The five most frequent *Salmonella* serovars (in % of all isolates) in pork, 2002

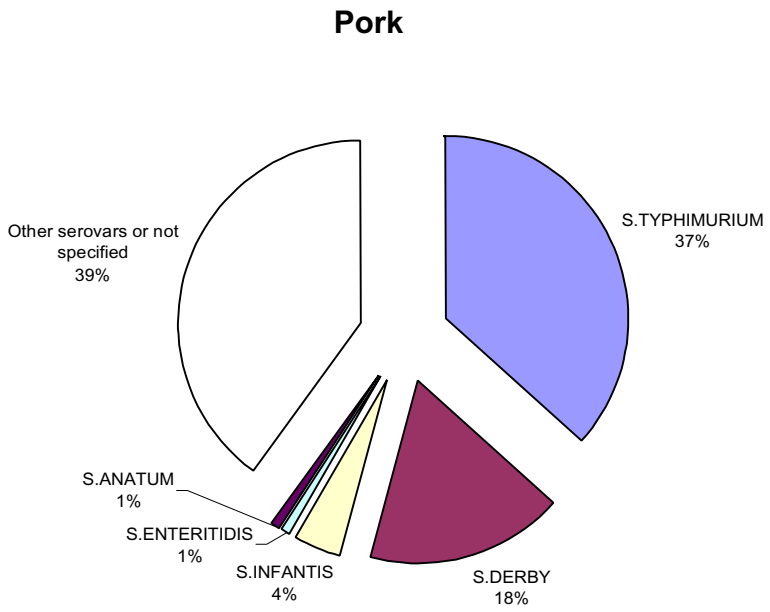
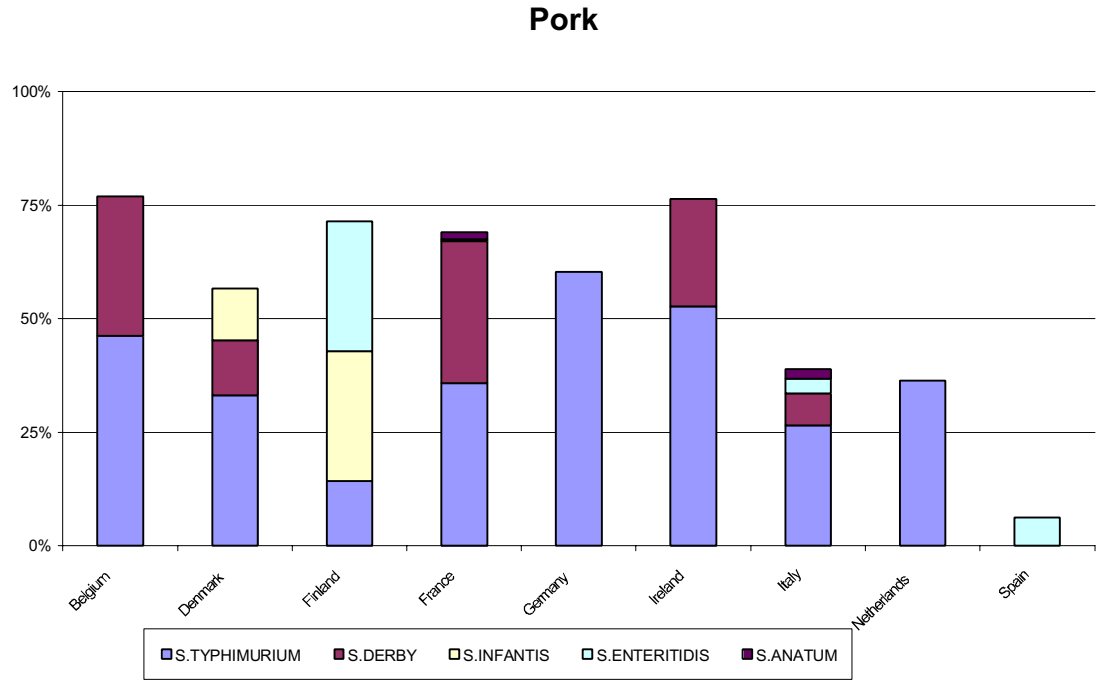


Figure SA 20. The five most frequent Salmonella serovars (in % of all isolates) in the European Union from pork by their occurrence in the individual countries, 2002



The number of isolates used for the calculation of the percentages is listed in Table SA 58

3.2.4. *Salmonella* in cattle and products thereof

Monitoring and control strategies

In four countries (Denmark, Finland, Sweden and Norway), active monitoring in cattle herds is established for years now. The approaches taken in the individual countries are different. In the Netherlands, the surveillance programme was continued. Details are given in Tables SA 59 and SA 60.

In Denmark, in October 2002, a national surveillance programme for *S.* Dublin was implemented. This programme aims at identifying herds that are free of *S*. Dublin infection. Further details have been described in the previous report.

In Italy, a monitoring plan was implemented in the Veneto region during the period May 2002 to June 2003. Faecal samples were taken from one animal per herd at slaughterhouses. For each category, calves, beef cattle and dairy cows, 600 samples were taken.

Results

Cattle

Results of the surveillance programme at slaughterhouses and cutting plants run in Finland, Sweden and Norway showed that the *Salmonella* situation continued to be favourable in cattle. In lymph node samples and carcass swabs *Salmonella* were rarely detected.

During 2001, in Finland, a slightly increased contamination level had been detected with rates between 0,2 to 0,34%. In 2002, lymph nodes samples and carcass swabs were again very rarely contaminated, with levels of 0,06% and 0,03%. In crushed meat samples, taken at processing plants, 0,4% of the samples were positive, and this is higher than the rate detected last year. In Denmark, the rate of *Salmonella* positive pooled carcass swabs increased from 0,32% to 0,6% in 2002. After application of a conversion factor, an overall prevalence of 0,2% was estimated for the individual carcass samples.

Higher contamination rates were reported in studies on farm level. In Denmark, from 3,6% of the faecal samples (one animal per farm) collected at slaughterhouse, *Salmonella* were isolated. In The Netherlands, 5,6% of the cattle farms were *Salmonella* positive. In the monitoring plan, run in the Veneto region of Italy, 2,5% of the cattle herds tested were infected with *Salmonella*. In Germany, 13,3% of the herds investigated and 3,0 % of the animals tested *Salmonella* were isolated. This is a increase in the infection rate for cattle herds. Additionally, the number of notified outbreaks of clinical salmonellosis in cattle herds had increased slightly. In Great Britain, the number of incidents reported in cattle increased again to the level seen in 2000. In Northern Ireland, a considerable lower number of outbreaks in cattle was reported.

In the Danish serological surveillance programme, 76% of the milk producing herds and 52% of the non-milk producing herds were classified to be most likely free of *S*. Dublin.

In Norway, where *S.* Typhimurium DT104 had been identified in two cattle herds in 2001, early in 2002 a few positive animals and manure samples were identified at the same two farms. Since then, all samples have been negative.

Data available from countries running a continuous monitoring programme are summarised in Table SA 61. Data available from other Member States on cattle are given in Table AN 3.2.15.

Table SA 59. Sampling strategies in cattle, 2002

Breeding herds		Cattle - at farms		Cattle - at slaughter		Other activities	
Type of sample							
		Faecal samples	NL [2]	Faecal samples	DK	Notification of clinical outbreaks	D, DK, FIN, I, N, S
Herd of origin of young A.I. bulls destined for rearing station				Lymph nodes	FIN, S, N	Notification of findings of *S.* Enteritidis and *S.* Typhimurium	IRL, N
				Carcass swabs	S, FIN, N	All *Salmonella* findings are notifiable	FIN, S, UK, N
		Bulk milk	DK[1]			Clinical surveillance	S, N,FIN
Sample size							
All animals in herd	FIN	Dairy cattle: from 135 herds 60 samples/herd, pooled in 5/herd Veal calves: same sample size	NL	One animal per herd	DK		
				3000 ileo-caecal lymph nodes and 3000 swabs	FIN, N		
		Every three month	DK[1]				
Frequency of sampling							
		Yearly survey	NL	Random sample	DK,N		

[1] Serological testing; control programme for *S.* Dublin and *S.* Typhimurium in dairy herds
[2] Surveillance programme KvW/RIVM

Table SA 60. *Salmonella* monitoring programmes in beef, 2002

Cattle at slaughter		At cutting plants / at processing plants		Beef at retail		Beef products at retail	
Type of sample							
	DK	Minced and cutting beef	B	Routine sampling	D, IRL[1]	Routine sampling	D, IRL[1]
	DK	Crushed meat samples	FIN, N	Minced beef	B		
Surface swabs	DK[2], FIN, S, N, B	Scrapings	S	Beef	DK		
Lymph nodes	S, FIN[3], N	Beef	S	Local municipalities	S		
		Minced beef	B	Routine sampling according to the food-survey KvW: beef	NL		
				Regional programmes	UK		
Sample size							
		Randomly during operation, at least once a week, 25g of crushed meat taken from cleaning tool of a conveyer belt, from tables or a similar point	FIN	About 500 /year	NL		
3000 / year	FIN	3000 / year	FIN				
3000 samples of lymphnodes and 3000 samples of carcass-swabs	N	According to production capacity	N [4]				
		318/year	B				
Frequency							
Daily, weekly, monthly or twice annually	S	Daily, weekly, monthly or twice annually	FIN				
Random sample	N	Frequency dependant upon the production capacity	N [4]				
		Continuous	B				

[1] Sampling by local authorities
[2] Swab samples from three designated areas of chilled half-carcasses. 5 carcasses are pooled to one sample; at small slaughterhouses 1 carcass swab sample
[3] An individual sample consists of 5 or more lymphnodes from a carcass from ileocaecal region
[4] Production capacity >2 tons twice a year, production capacity 2-20 tons once a month, production capacity >20 tons once a week

Table SA 61. *Salmonella* in cattle and products thereof in countries which run a monitoring / surveillance programme

	2000				2001				2002			
	Invest.	%Salm	%*S*.Ent.	%*S*.Typ	Invest.	%Salm	%*S*.Ent.	%*S*.Typ	Invest.	%Salm	%*S*.Ent.	%*S*.Typ
Cattle (herd based data) - faecal samples												
Denmark [1]	262	2,7	0	0,4	231	2,2	0	0,4	251	3,6	0,0	0,8
Netherlands	289	1,0	0	0	103	8,7	0	2,9	303	5,6	0,0	2,6
Cattle (sample based data) - lymph nodes												
Finland [2]	3025	0,03	0,03	0	3189	0,31	0	0,22	3141	0,06	0,0	0,06
Sweden [2]	3411	0,12	0	0,06	3245	0,03	0	0	3147	0	-	-
Norway [2]	2525	0,08	0	0,04	2421	0,04	0	0,04	2370	0,04	0,0	0,0
Cattle (sample based data) - carcass swabs												
Belgium [3]	-	-	-	-	294	2,7	0	1,7	191	0	-	-
Denmark [3]	-	-	-	-	2526	0,32	0,04	0,08	3353	0,6	0	0,1
Finland [3]	3154	0,10	0	0,10	3536	0,34	0	0,06	3146	0,03	0,0	0,03
Sweden [3]	3400	0,06	0	0	3243	0,03	0	0,03	3121	0	-	-
Norway [3]	2542	0	0	0	2549	0	0	0	2419	0	-	-
Beef sampled at slaughterhouse and cutting plants												
Belgium[13]	-	-	-	-	-	-	-	-	95	4,2	0,0	1,1
Belgium [4,6]	-	-	-	-	-	-	-	-	223	0,9	0,0	0,9
Finland [6]	2600	0,08	0	0,04	2050	0,20	-	-	1948	0,4	0,0	0,4
Sweden[6,7]	-	-	-	-	4311	0	-	-	4478	0		
Norway[10]	2542	0	0	0	2417	0,04	-	-	2371	0,04	0,0	0,0
Beef sampled at retail												
Belgium[13]	-	-	-	-	-	-	-	-	204	2,9	0,0	2,0
Denmark	1599	1,2	-	-	642	2,0	-	-	1400	1,0	-	-
Netherlands	-	-	-	-	-	-	-	-	532	3,0	0,0	3,0
Sweden	-	-	-	-	2490	0,5	-	-	1125	1,0	-	-
Norway	1181	0,34	0	0	14570 [11]	0,04	0	0,01	-	-	-	-
Norway	-	-	-	-	1457 [12]	0,14	0	0	2453 [12]	0,04	0,0	0,0

- No information available
[1] Monitoring programme
[2] Lymph nodes
[3] Swabs of carcasses
[4] Cuts of meat
[5] Offal, since 2000 only plucks
[6] Cutting plants
[7] Approximately 40 % is estimated to be scrapings collected from beef
[8] Survey of imported products
[9] Surveillance of consignments. Imported products
[10] Data consist of samples of crushed meat from several animal species
[11] Surveillance of imported products from third countries
[12] Survey of imported products from the EEA area
[13] Minced meat samples

Beef and beef products

At retail level, slightly higher contamination levels were reported compared to the data at slaughterhouse and processing plants. In Denmark and Sweden, 1% of the beef samples were *Salmonella* positive. This difference might be attributable to some extent to the fact that not all samples were of domestic origin. In studies, run in Norway, of products imported from the EEA area, and which may have originated from third countries, 0,04% of the samples were contaminated with *Salmonella*.

In Belgium, all carcass swabs were negative for *Salmonella*. Out of the beef meat samples taken at processing plants and retail level, 1,9 % (cuts of meat and minced meat at processing plants) and 2,9% (minced meat at retail level) were positive. In Germany, 0,85 % of the beef samples tested in routine investigations were positive for *Salmonella*.

Results from all countries where beef or beef products were sampled at retail level are summarised in Table SA 62. In beef, contamination level ranged from 0% to 3,2%, which is lower compared to the contamination level reported in pork. In beef products, no *Salmonella* were detected in Denmark, England and Wales. In contrast, in Italy and Spain *Salmonella* were isolated in 1,6% and 11,7% of the samples tested.

In summary, *Salmonella* was detected in beef at lower rates compared to poultry meat and pork in several countries. In some countries, the contamination rate reported in pork, beef and products thereof is alarming.

Data available concerning 2001, other meat, meat preparations and meat products made from beef are given in Tables AN - 3.3.6 to AN - 3.3.8.

Table SA 62. *Salmonella* in beef, minced meat and meat products at retail, 2002

	Beef				Minced meat [1]				Beef meat products			
	Invest.	%Salm	%S.Ent.	%S.Typ	Invest.	%Salm	%S.Ent.	%S.Typ	Invest.	%Salm	%S.Ent.	%S.Typ
Austria	9	0	-	-	38 [1]	0	-	-	5	0	-	-
Belgium	-	-	-	-	204	2,9	-	-	-	-	-	-
Denmark	-	-	-	-			-	-	235	0	-	-
Germany	590	0,85	0	0,2	2600 [1]	3,8	0	2,1	7776 [1]	1,4	0,03	0,7
Greece	18	0	-	-	1 [1]	0	-	-	1 [1]	0	-	-
Ireland	8	0	-	-	79 [1]	2,5	0	0	505	0	-	-
Italy	908	1,8	-	-	3051 [1]	1,5	0	0,2	613	1,6	0,2	0,3
Netherlands	532	3,0	-	-	48 [2]	4,2	-	-	-	-	-	-
Portugal	-	-	-	-	29 [1]	13,8	-	-	1	0	-	-
Spain	221	3,2	1,8	0,0	1614 [1]	3,7	0,7	0,06	299	11,7	0	0
Sweden	1125	1,0	-	-	-	-	-	-	962	1,0	-	-
England &Wales	-	-	-	-	-	-	-	-	545	0	-	-

[1] Animal species of origin not specified
[2] Minced meat bovine / pork
- No information available

Milk and milk products

As in previous years investigations of raw milk, heat treated milk and milk products usually showed low contamination levels. In most countries, all milk samples tested were negative. During 2002, a few *Salmonella* were detected in bulk milk in Germany and raw milk Italy. In France, a considerable number of isolates was collected within the Salmonella network. During 2001, a considerable contamination rate was reported in Spain, there 7 (2,95 %) out of 237 samples were positive.

In ready to eat milk products, *Salmonella* contamination rates up to 0,13% were detected. In Austria, Ireland, Norway, The Netherlands, Portugal and Sweden all samples were negative. In Germany, Spain, Greece and Italy, single samples were positive. In France, a considerable number of isolates was collected from ready to eat milk products within the Salmonella network.

In Norway, *S.* Typhimurium DT 104 was isolated from imported cheese made from raw milk.

Data are summarised in Table AN - 3.3.9 and Table AN 3.3.10 in the Annex.

Serovar pattern in cattle and beef

Serovar patterns in cattle and beef are compared on the basis of the isolates typed and the details reported by the Member States. In Figure SA 19, the five most frequent serovars isolated from cattle in the reporting countries together are given. In 2002, *S.* Dublin is dominating and is *S.* Typhimurium on the second place in the overall figure (Figure SA 22). In the individual Member States, either *S.* Typhimurium or *S.* Dublin is most frequently reported. An exception is seen in Austria, where 4 isolates of *S.* Enteritidis and 3 isolates of S. Dublin and 2 isolates of *S.* Typhimurium were reported. Again, a few *S.* Enteritidis isolates from cattle were reported from several countries. The next frequent serovar was S. Montevideo in 2002, whereas in 2001 *S.* London and *S.* Panama were among the top five serovars.

In beef, the overall pattern is more divers. For most of the isolates, the serovar was not specified. The overall distribution is shown in Figure SA 23 Altogether, *S.* Typhimurium and *S.* Dublin are the most frequently reported serovars (Figure SA 23). *S.* Enteritidis is on the third place in the ranking of the serovars reported. *S.* Enteritidis was mainly isolated from beef in two Member States (Figure SA 24). In Ireland, the dominating serovar in beef was S. Kentucky.

Table SA 63. Most frequent *Salmonella* serovars in cattle in the individual countries, 2002

	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Luxembourg	Netherlands	Norway	Portugal	Spain	Sweden	United Kingdom	Total
S.DUBLIN	3	35	75	-	129	167	-	257	2	-	93	-	-	-	2	1036	1799
S.TYPHIMURIUM	2	24	31	8	358	156	1	31	16	11	57	2	1	-	3	146	847
S.MONTEVIDEO	-	-	-	-	107	-	-	-	-	-	0	-	-	-	-	3	110
S.ENTERITIDIS	4	1	2	0	26	20	0	0	-	2	0	0	0	1	1	6	63
S.HAVANA	-	-	-	-	-	-	-	-	-	18		-	-	-	-	-	18
S.ANATUM	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	18	18
S.AGAMA	-	-	-	-	-	-	-	-	-	-		-	-	-	-	13	13
Total (n=) [1]	11	83	117	11	875	390	1	290	75	33	175	4	1	4	6	1284	3360

[1] n represents the number of isolates typed / positive flocks / positive animals / positive samples. In some countries, only *S.* Enteritidis and *S.* Typhimurium are covered in the report
- No isolates reported among those listed; typically only the most common serovars are reported

Table SA 64. Most frequent *Salmonella* serovars in beef in the individual countries, 2002

	Denmark	Finland	France	Germany	Ireland	Italy	Nether-lands	Norway	Spain	Total
S.TYPHIMURIUM	3	8	59	1	-	3	5	0	0	79
S.DUBLIN	13	-	-	-	4	-	-	-	-	17
S.ENTERITIDIS	0	0	6	1	-	-	-	0	5	12
S.KENTUCKY	-	-	-	-	7	-	-	-	-	7
S.ANATUM	-	-	3	-		-	-	-	-	3
S.HEIDELBERG	-	-	-	-	2	-	-	-	-	2
S.CHANDANS	-	-	-	-	-	1	-	-	-	1
S.DERBY	-	-	-	-	-	1	-	-	-	1
Total (n=) [1]	35	8	191	6	16	38	16	0	16	338

[1] n represents the number of isolates typed / positive flocks / positive animals / positive samples. In some countries, only *S.* Enteritidis and *S.* Typhimurium are covered in the report
- No isolates reported among those listed; typically only the most common serovars are reported

Figure SA 21. The five most frequent *Salmonella* serovars (in % of all isolates) in cattle, 2002

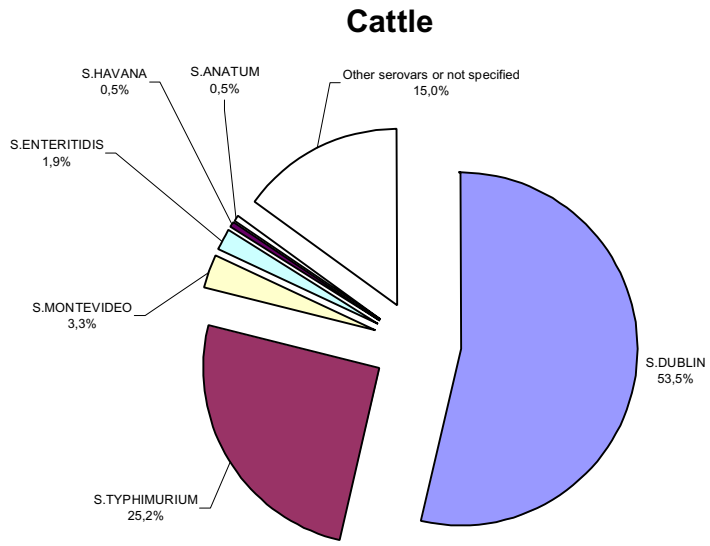
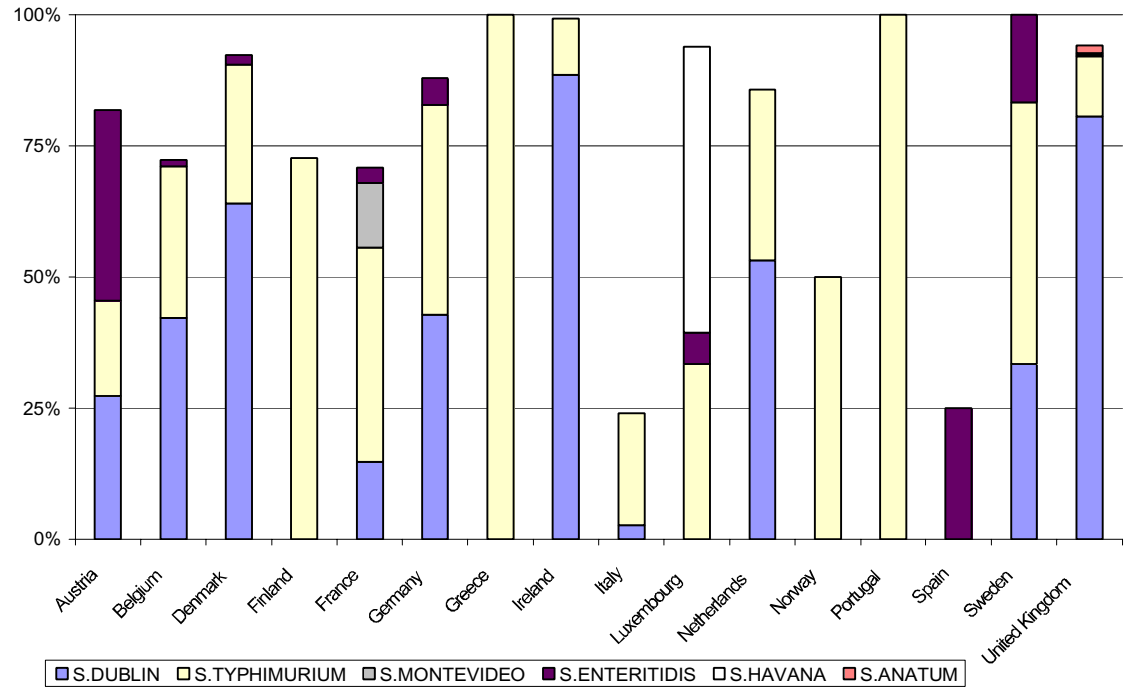


Figure SA 22. The five most frequent Salmonella serovars (in % of all isolates) in the European Union from cattle by their occurrence in the individual countries, 2002



The number of isolates used for the calculation of the percentages are listed in Table SA 63

Figure SA 23. The five most frequent *Salmonella* serovars (in % of all isolates) in beef, 2002

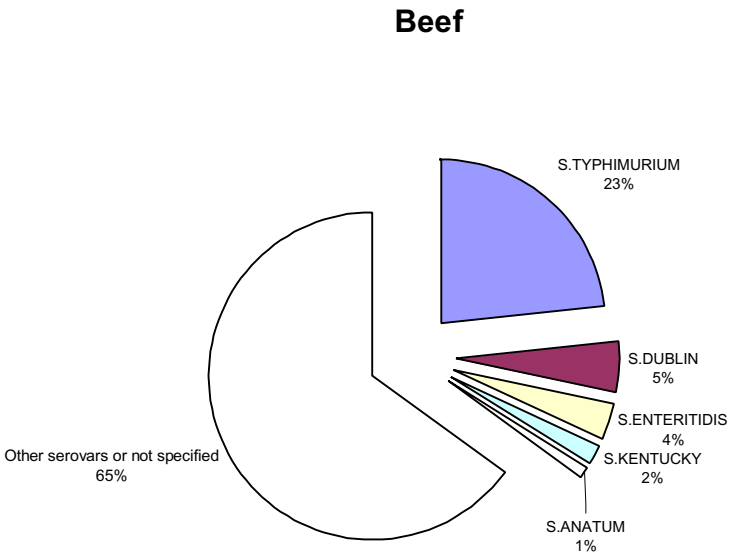
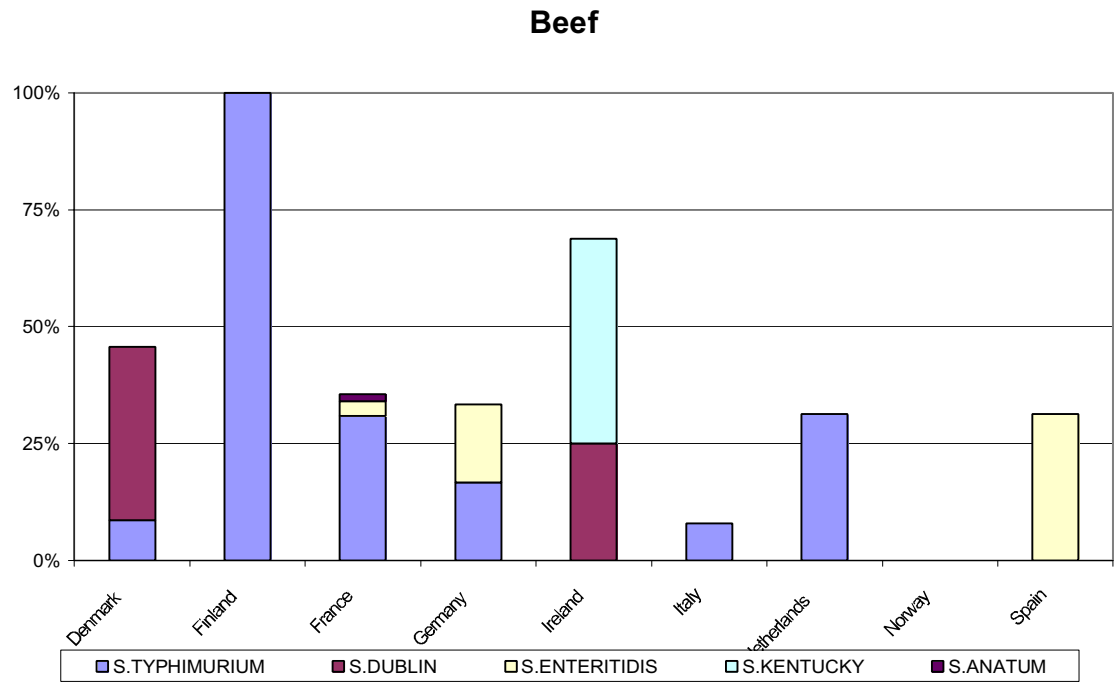


Figure SA 24. The five most frequent Salmonella serovars (in % of all isolates) in the European Union from beef by their occurrence in the individual countries, 2002



The number of isolates used for the calculation of the percentages are listed in Table SA 64

3.2.5. *Salmonella* in other animals

Sheep and goats

Salmonella were detected in sheep in several countries. The reported infection rates are quite differing, and might depend on the reason for the investigation, i.e. diagnostic submissions.

In Ireland, all 6 animals included in a clinical investigation were positive for *Salmonella*. In Norway, 15% of 299 animals were positive for *S. diarizonae*. The 45 positive animals belonged to 24 farms. In Spain, 5 (8,3%) out of 60 animals tested were *Salmonella* positive. In the other countries, up to 3,5% positive animals were identified.

In Great Britain, the number of incidents in sheep increased from 130 incidents in 2001 to 203 incidents in 2002. *S. diarizonae* was involved in over 57 % of the reports followed by *S.* Dublin (18,7 %) and *S.* Typhimurium (4,4 %). In *S.* Typhimurium incidents, DT104 continued to predominate in sheep.

Data available on other animal species are given in Tables AN - 3.2.17 to AN - 3.2.22 in the Annex.

Horses

The highest level of *Salmonella* infection in horses was reported in Italy, where 61,5% of 418 horses tested were positive for *Salmonella*. In the Netherlands, infections rates were ranging between 0 and 12,5%, depending on the diagnostic method used. In the other countries, less than 1% of the animals were infected with *Salmonella*.

Wildlife animals

Wild animals were tested for *Salmonella* in Austria, Germany, Italy, Norway and The Netherlands.

In Germany, 10,5% of the 172 hedgehogs tested were positive for *Salmonella*. 78% of the isolates were *S.* Enteritidis, and 17% were *S.* Typhimurium. In Norway, one out of 3 tested hedgehogs and four out of 25 tested wild birds, were positive for *S.* Typhimurium.

Reptiles

Reptiles were tested for *Salmonella* in Germany, Italy, Norway, The Netherlands and Sweden. In all these countries, quite high infection rates were reported, and some of the animals were infected with more than one serovar. In Germany, *S.* Enteritidis was detected in 1 reptile. *S.* Typhimurium was isolated from 4 reptiles in Germany and one reptile in Sweden.

3.2.6. *Salmonella* in other foodstuff

Meat studies

Some specific studies on the *Salmonella* prevalence in meat were run, where the animal species of origin was not reported.

In Sweden, consignments of meat-preparations from EU-countries were analysed for the presence of *Salmonella*. 13 (22%) out of 58 sampled consignments were positive. The sampling plan used was intensive, including 60 sub-samples. In six of the consignments, *S.* Enteritidis was isolated. In spot-checks of consignments of fresh meat originating from other EU countries, 33 were found contaminated with *Salmonella*. In 15 out of the 33 positive consignments, *S.* Typhimurium was isolated, including one *S.* Typhimurium DT 104.

In Denmark, an overall prevalence of 0,25% for multidrug-resistant *S.* Typhimurium DT 104 was confirmed in fresh meat imported from the other EU countries. The overall *Salmonella* prevalence decreased from 13,3% in 2001 to 9,5% in 2002.

In Great Britain, a study of ready-to eat cold sliced meats and pate from catering and retail premises was performed. In none of the 2894 cold meats and 1184 pates *Salmonella* was isolated.

In addition, meat other than beef, pork and poultry meat was tested in Austria, Germany, Greece, Ireland, Italy, Spain, Sweden and Norway. Usually, the animal species the food was derived from was not reported or data are combined for several animal species. The contamination rates reported were quite differing.

In Portugal, 8 (24%) out of 33 samples were contaminated with *Salmonella*. In Italy, 9 (9,6%) of 94 samples taken at processing plants were positive for *Salmonella*, whereas at retail level all samples were negative. In Spain, 10 (11,5%) out of 87 samples were positive, these samples were mainly from quails.

In Germany, 4,1% of the wild game meat samples were positive for *Salmonella*.

Data available concerning 2002, other meat, meat preparations and meat products are given in Tables AN - 3.3.6 to AN - 3.3.8.

Fish and fish products

Fish, fish products and other marine foodstuff were tested in most countries.

In Austria, The Netherlands, Portugal, England and Wales, no *Salmonella* were isolated from fish and fish products. In Norway, no *Salmonella* were detected in domestic fish and shellfish products, in imported fish and shellfish products, a contamination level of 0,06 % was reported. In Germany, Italy and Sweden, contamination rate was between 0,25 % and 0,44 %. Spain reported a contamination rate of 0,9% in fish products. In Greece, 4,1% of the fish products were contaminated with *Salmonella*. In Ireland, 2 (2%) out of 101 fish product samples tested were positive for *Salmonella*.

Further data on vegetables and other types of food are included in some national reports. Results confirm, that these foods might be contaminated with *Salmonella*.

Information on results of examination of other types of foods is given in Tables AN 3.3.13 to AN - 3.3.14.

3.3. Salmonellosis in humans

3.3.1. Surveillance systems

Usually reported cases include cases related to outbreaks (definition of an outbreak varies in the reporting countries), clinical cases notified by physicians, foodborne infections or laboratory-confirmed cases depending on the Member State.

3.3.2. Overall trend

Altogether, 145 231 cases of human salmonellosis have been reported by the 15 Member States of the European Union and Norway in 2002 (Table SA 65). This means an overall decrease by 10% compared to 2001, and this number is even less than the number of cases reported in the year 2000. After a continuous decreasing tendency over several years, in 2001, the total number of reported cases had increased. Now, the figure from 2002 shows a return to the decreasing trend. The trend in some selected countries in comparison to the overall development is shown in Figure SA 25.

In the individual countries, the situation is varying. Five countries reported more cases in 2002 than in the previous year. A steady increase in the number of reported cases is obvious in Austria, Greece, Italy, Luxembourg and Spain. In Greece, this appears not to reflect a real trend as the reporting is not representative and probably includes severe underreporting.

In Finland, Norway and Sweden 75-80% of all salmonellosis cases in humans are considered to be imported. In contrast, in Denmark about 74% of the cases are considered to be domestically acquired. In the Netherlands, 90% are domestic cases. Similarly, in Germany 94% of the notified cases are of autochthonous origin. In the other countries, the reporting system does not provide for that information. A comparison of the trend over the years, separately for domestic and imported cases is given in Figure SA 26.

Usually, the reporting system does not provided data on the severity of the cases. However, Norway reported that 21% of all reported cases were hospitalised, but no death were recorded.

Table SA 65. Human salmonellosis / notified cases of *Salmonella*

Country	1997	1998	1999	2000	2001	2002
Salmonellosis / findings of *Salmonella* is notifiable						
Austria	7488	7236	7058	7017	7219	8322
Denmark	5015	3880	3268	2308	2918	2075
Finland (all cases)	2964	2740	2789	2624	2731	2357
Finland (domestic cases)	825	574	684	383	431	423
Germany	105340	97529	85146	79535	77386 [2]	72377
Ireland [3]	1056	1265	956	640	430	369 [5]
Italy	15198	6789	7943	5765	8215	10744
Portugal	177	186	424	309	696	330
Sweden (all cases) [1]	4286	4300	4884	4617	4508	3892
Sweden (domestic cases) [1]	585	453	905	691	668	819
Norway (all cases)	1391	1494	1434	1489	1899	1495
Norway (domestic cases)	194	174	255	164	284	234
Reports are based on laboratory isolates						
Belgium	13724	13803	15569	14047	10784	9754
France	19174	16523	8184	7684	7456	6575
Greece [5]	326	918	221	206	284	460
Luxembourg	307	298	353	n.a.	319	528
Spain [6]	5129	6648	6918	6366	7968	8047
The Netherlands	2557	2263	2128	2059	2082	1588
Scotland	3349	2109	1879	1720	1571	1149
Northern Ireland	430	531	689	424	364	253
England and Wales	32169	23420	17251	14844	16484	14916

[1] Includes healthy carriers; about 90 % of cases were acquired abroad
[2] New act (Infektionsschutzgesetz (IfSG)) since 1.1.2001, figure on the basis of the 'reference case definition
[3] Data based on clinical notification
[4] In the National Salmonella Reference laboratory there were 411 reports
[5] Notification of confirmed cases is required but only cases from hospitals are available (accidentally diagnosed)
[6] Microbiological Information System based on hospitals notification

Table SA 66. Human salmonellosis / notified cases of *Salmonella* by origin

Number of cases by origin	Domestic			Imported		
Country	*S.* Enteritidis	*S.* Typhimurium	Other serovars	*S.* Enteritidis	*S.* Typhimurium	Other serovars
Denmark[1]	950 (3)	326 (109)	507 (5)	155	57	80
Finland	43	210	170	904	95	830
Greece	61	4	381	3	0	11
Ireland (NRL)	125	128	79	40	12	27
The Netherlands	652	502	313	54	5	62
Sweden	134	129	556	1415	175	1345
Norway	66	107	61	688	99	340

[1] Including cases of unknown origin (domestic cases in brackets)

Figure SA 25 Trend in human salmonellosis, 1995 - 2002

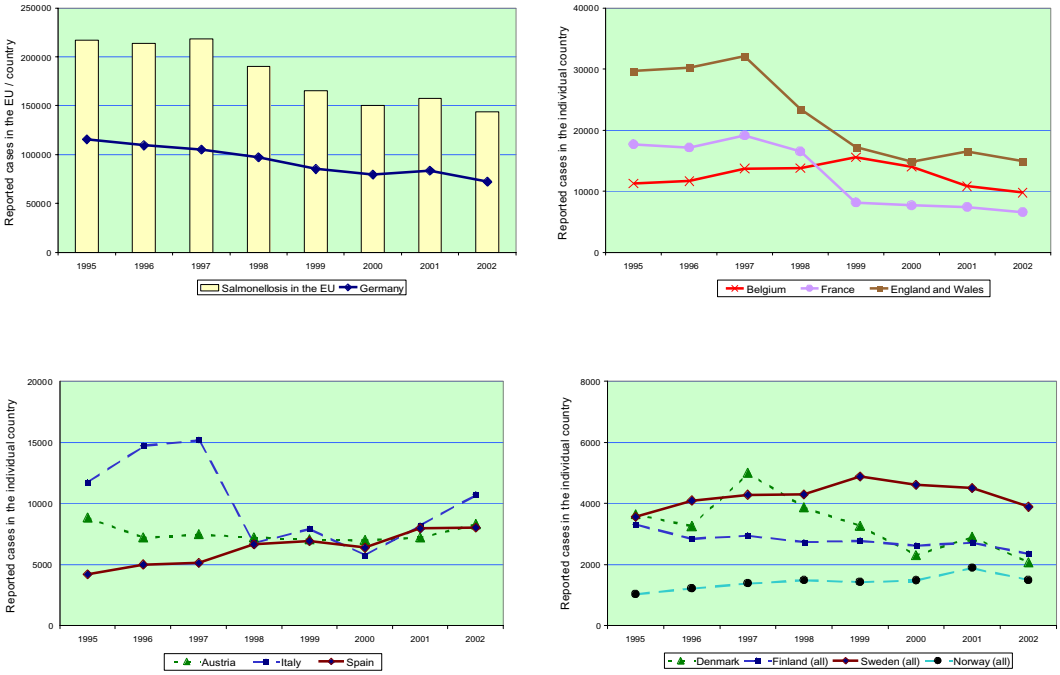
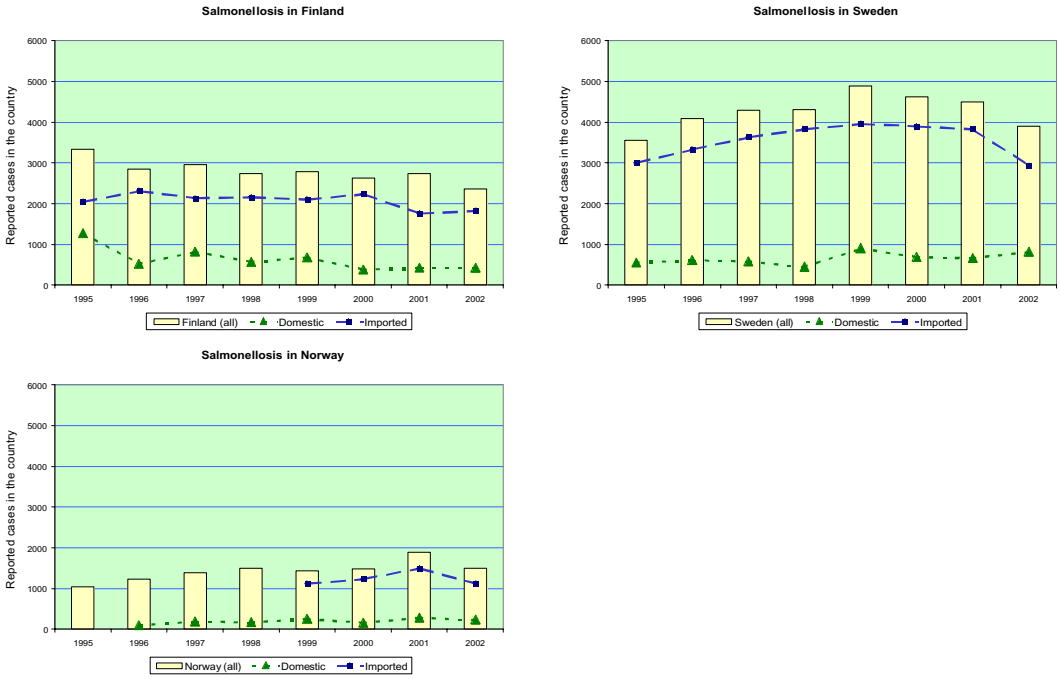


Figure SA 26. Trend in domestic and imported cases of human salmonellosis, 1995 - 2002



3.3.3. Serovars of *Salmonella*

14 countries supplied some information on the main serovars involved in human salmonellosis (Figure SA 27). No information at all on the serovars involved in human disease is available from Portugal and Italy.

All 14 countries reported the overall number of cases caused by *S.* Enteritidis and *S.* Typhimurium. No comprehensive information on the other serovars involved in all the reported cases was presented by France, Greece, Luxembourg, Sweden, Finland and Scotland. From Finland, the serovars involved in human disease is only available for the domestic cases.

As in previous years, *S.* Enteritidis was dominating, causing 67,1 % (2001: 65,7 %) of all notified cases in the European Union and Norway. Rates in the individual countries ranged between 88,6 % in Austria and 30,9 % in France (There were only 13,9% *S.* Enteritidis cases in Greece, but probably not all isolates were typed). *S.* Typhimurium was on the second place, causing 17,0 % of all cases.

In seven countries, data are reported separately for the imported and the domestic cases. There is an obvious difference in the distribution of *S.* Enteritidis and *S.* Typhimurium among the domestic and the imported cases (Figure SA 28). *S.* Enteritidis is more frequently reported in imported cases whereas *S.* Typhimurium is more frequently involved in cases acquired in the country. Figure SA 28 depicts the share of the main serovars in domestic and imported cases in the individual countries.

In Norway, the proportion of imported cases of *S.* Enteritidis infections is particularly high. In contrast, 47 % of the *S.* Typhimurium cases are indigenous ones. The main sources of these cases are to be found in the Norwegian environment, where *S.* Typhimurium is found to be particularly prevalent in wild birds and hedgehogs. The observed increase of cases caused by *S.* Typhimurium DT 104, most of these imported, is of special concern in Norway.

Figure SA 27. Serovar patterns in human salmonellosis, 2002

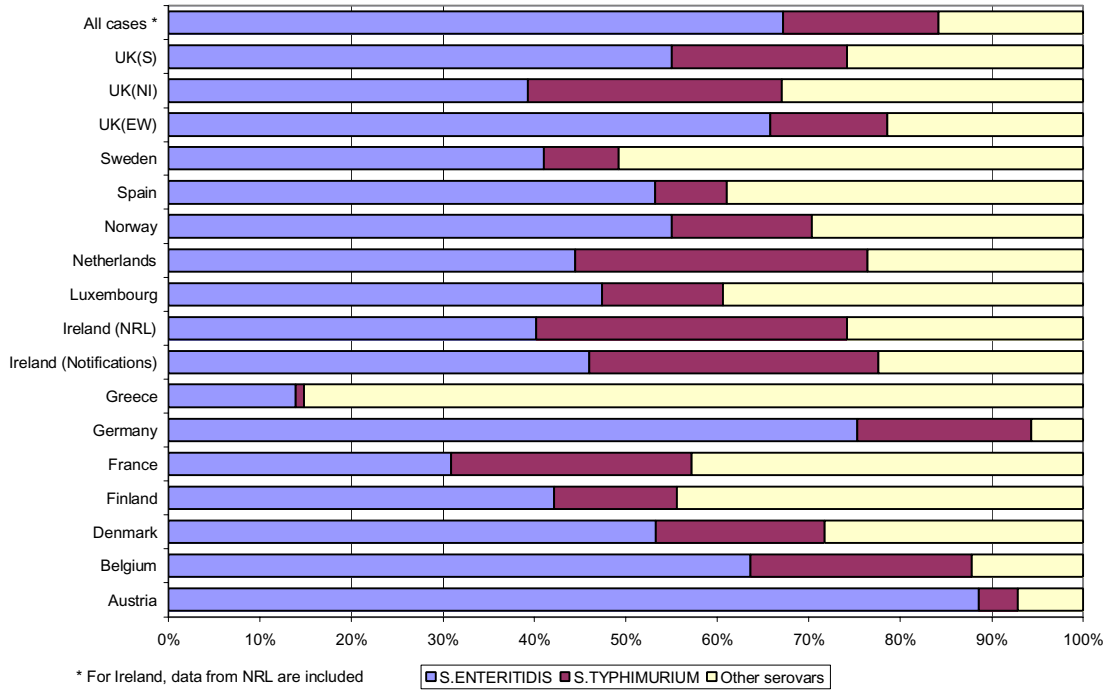
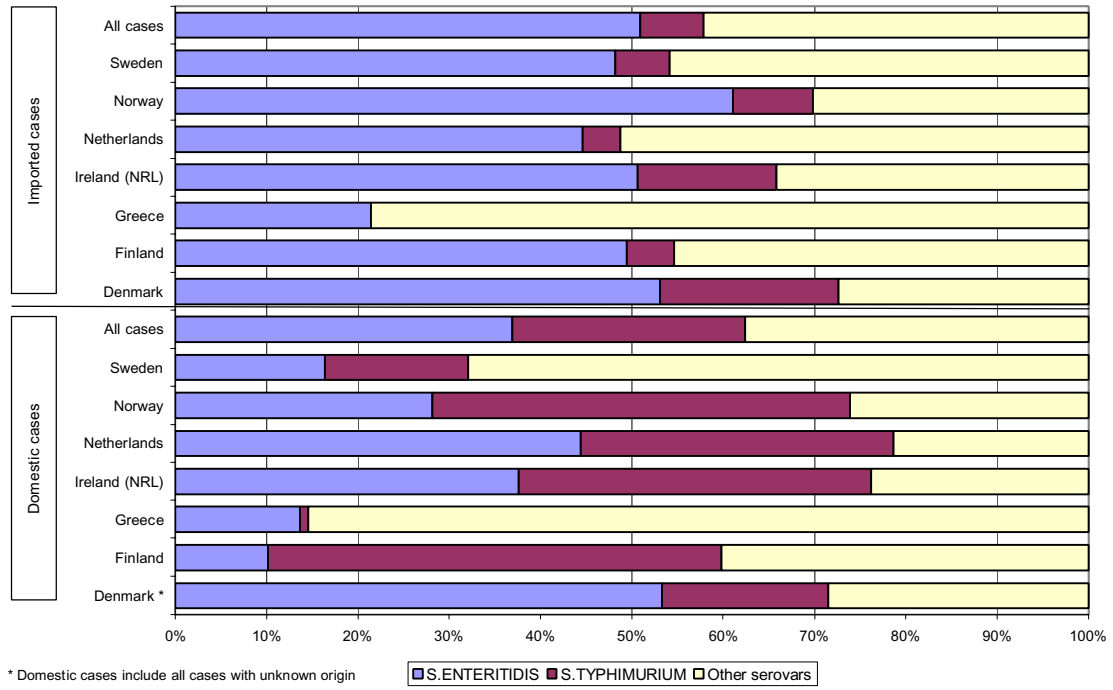
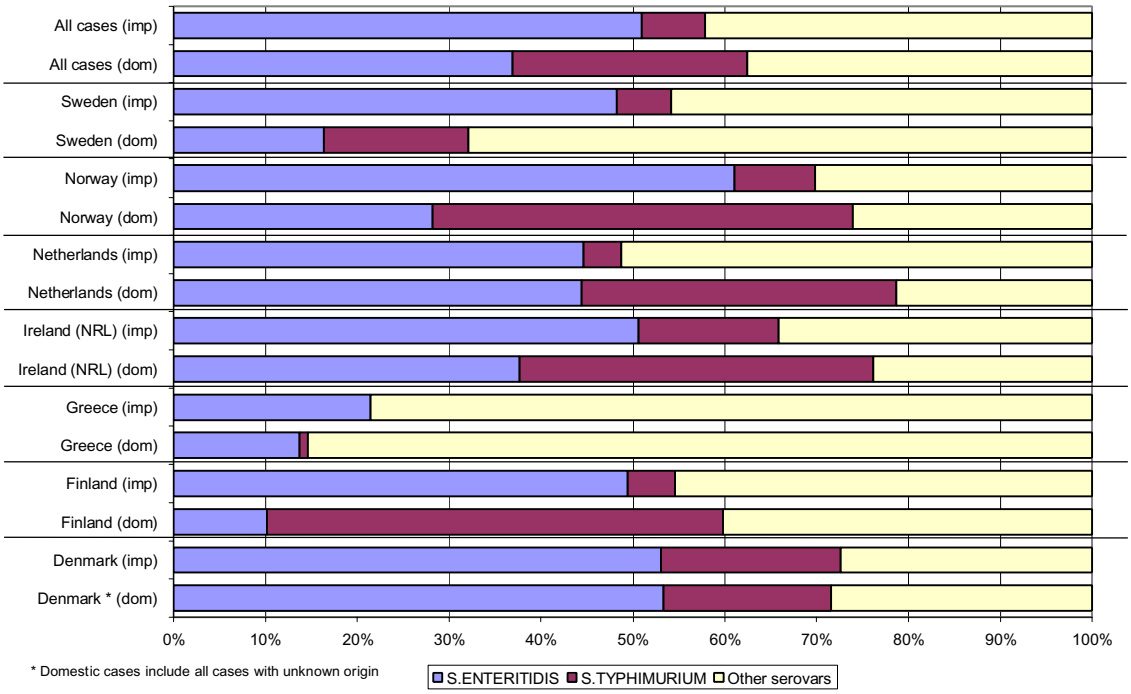


Figure SA 28. Serovar patterns in human salmonellosis differentiated to imported and domestic cases, 2002

A. Ranking by the origin of infection



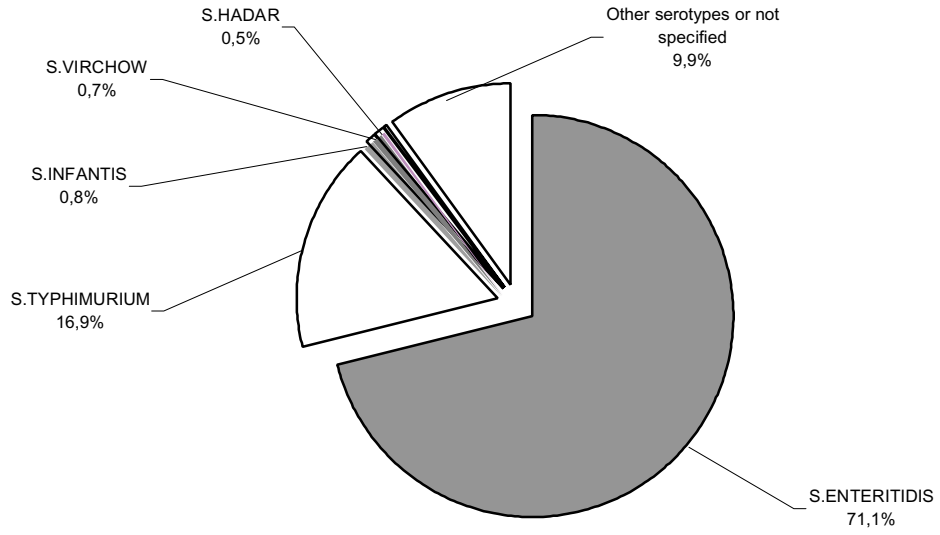
B. Ranking by the country



Detailed information on the ten most frequent serovars in 2002 was presented by 9 countries for all cases and from one country for domestic cases. As in previous years, next to *S.* Enteritidis and *S.* Typhimurium, most cases were caused by *S.* Infantis, *S.* Virchow and *S.* Hadar. This is similar to the previous year (Table SA 66).

Figure SA 29 summarises the serovars involved in human disease. For this purpose, all reported cases in the reporting countries are added and the overall share is depicted. Thus, the pie diagram reflects most strongly the top five serovars of the countries with most isolates, Germany, Great Britain, Belgium and Austria. The details on the serovar pattern in the individual countries is given in Tables SA 65 and SA 66.

Figure SA 29. Distribution of the top five serovars in human salmonellosis, 2002



A comparison of the most frequent serotypes over the years is difficult, as not each year the information is available from the same countries. Especially for 2002, the number of countries which included detailed information on the serovars involved in human salmonellosis was reduced. As described in previous reports, there is some variability in the serovars that follow the top five serovars. In 2002, each of these serovars is involved in less than 1 % of all notified cases. In Table SA 65 the first ten serovars of the regions are listed in order of their declining frequencies.

Table SA 66 shows the serovars and percentage for the individual countries. In the first and the second position are *S.* Enteritidis and *S.* Typhimurium. The next serovars in rank three to five concern about 0,2 to 0,7 % of all cases and are *S.* Hadar, *S.* Agona, *S.* Virchow, *S.* Infantis, *S.* Brandenburg, S. Derby, S. Paratyphi B, S. Dublin, S. Montevideo, and S. Braenderup. *S.* Bovismorbificans moved to the sixth position.

In Belgium, the share of cases due to *S.* Enteritidis and *S.* Typhimurium remained at the same level, although the number of cases is decreasing now. In 2002, *S.* Virchow increased and *S.* Hadar decreased.

In Denmark, an increase was observed in the number of human cases caused by *S.* Dublin, making it the fourth most common cause of human salmonellosis in 2002. Beef is considered as main source of infection, but pork could not be ruled out as a source. The risk assessment showed that the number of cases caused by eggs and pork has decreased in 2002, but there was a slight increase in the cases caused by broilers.

In Germany, the proportion of cases due to *S.* Enteritidis has again increased, in 2002 75 % of all cases are caused by this serovar. This is only exceeded by Austria, with 89 % of all cases caused by *S.* Enteritidis.

Table SA 67. The first ten serovars in order to their declining frequencies in the individual regions, 2002

	Austria	Belgium	Germany	Denmark	Spain	Ireland (NRL)
1	S.ENTERITIDIS	S.ENTERITIDIS	S.ENTERITIDIS	S.ENTERITIDIS	S.ENTERITIDIS	S.ENTERITIDIS
2	S.TYPHIMURIUM	S.TYPHIMURIUM	S.TYPHIMURIUM	S.TYPHIMURIUM	S.-GRUPPE D	S.TYPHIMURIUM
3	S.HADAR	S.BRANDENBURG	S.INFANTIS	S.PARATYPHI B, var. Java	S.TYPHIMURIUM	S.VIRCHOW
4	S.INFANTIS	S.VIRCHOW	S.VIRCHOW	S.DUBLIN	S.-GRUPPE B	S.DUBLIN
5	S.VIRCHOW	S.DERBY	S.DERBY	S.AGONA	S.-GRUPPE D1-O-FORM	S.STANLEY
6	S.BLOCKLEY	S.HADAR	S.BOVISMORBIFICANS	S.BOVISMORBIFICANS	S.-GRUPPE C1	S.HADAR
7	S.NEWPORT	S.INFANTIS	S.BRANDENBURG	S.STANLEY	S.-GRUPPE C2-O-FORM	S.KOTTBUS
8	S.BRAENDERUP	S.BOVISMORBIFICANS	S.HADAR	S.VIRCHOW	S.-GRUPPE C	S.AGONA
9	S.SAINTPAUL	S.GOLDCOAST	S.GOLDCOAST	S.HADAR	S.INFANTIS	S.NEWPORT
10	S.AGONA	S.CERRO	S.ORANIENBURG	S.INFANTIS	S.HADAR	S.INFANTIS

Table SA 67. The first ten serovars in order to their declining frequencies in the individual regions, 2002 - *continued*

	Netherlands	Norway	Finland (domestic)	UK Northern Ireland	UK England and Wales
1	S.ENTERITIDIS	S.ENTERITIDIS	S.TYPHIMURIUM	S.ENTERITIDIS	S.ENTERITIDIS
2	S.TYPHIMURIUM	S.TYPHIMURIUM	S.ENTERITIDIS	S.TYPHIMURIUM	S.TYPHIMURIUM
3	S.BRANDENBURG	S.PARATYPHI B, var. Java	S.HVITTINGFOSS	S.VIRCHOW	S.VIRCHOW
4	S.INFANTIS	S.VIRCHOW	S.ABONY	S.MONTEVIDEO	S.HADAR
5	S.HADAR	S.HADAR	S.AGONA	S.BRAENDERUP	S.INFANTIS
6	S.BOVISMORBIFICANS	S.NEWPORT		S.HADAR	S.AGONA
7	S.MANHATTAN	S.AGONA		S.INFANTIS	S.BRAENDERUP
8	S.GOLDCOAST	S.STANLEY		S.AGONA	S.PARATYPHI B, var. Java
9	S.DERBY	S.BRAENDERUP		S.NEWPORT	S.NEWPORT
10	S.KENTUCKY	S.INFANTIS		S.PANAMA	

Table SA 68. Serovars and percentage of their occurrence referred to all cases in the country, 2002

Human isolates	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland (NRL)	Luxembourg	Netherlands	Norway	Spain	Sweden	UK (England and Wales)	UK (Northern Ireland)	UK (Scotland)	Mean	Rank
Number of isolates	8421	9754	2075	2357	6575	65863	460	411	528	1588	1495	8047	3892	14916	253	1149	127783	
S.ENTERITIDIS	88,58	63,60	53,25	42,13	30,90	75,28	13,91	40,15	47,35	44,46	55,05	53,19	41,06	65,74	39,29	55,00	67,14	1
S.TYPHIMURIUM	4,30	24,20	18,46	13,41	26,31	19,01	0,87	34,06	13,26	31,93	15,32	7,83	8,14	12,82	27,78	19,15	17,04	2
S.INFANTIS	0,67	0,74	1,30	-	-	0,86	-	0,73	-	2,02	0,80	0,15	-	1,10	1,19	-	0,74	3
S.VIRCHOW	0,63	1,29	1,49	-	-	0,47	-	2,43	-	-	2,41	-	-	1,55	1,98	-	0,63	4
S.-GRUPPE D	-	-	-	-	-	-	-	-	-	-	-	8,02	-	-	-	-	0,50	5
S.HADAR	0,71	0,74	1,30	-	-	0,24	-	1,46	-	1,13	2,27	0,12	-	1,35	1,19	-	0,46	6
S.-GRUPPE B	-	-	-	-	-		-		-			5,47	-	-	-	-	0,34	7
S.AGONA	0,23	-	2,02	-	-	0,16	-	1,22	-	0,50	1,61	-	-	1,09	0,79	-	0,29	8
S.BRANDENBURG	0,08	1,50	-	-	-	0,25	-	0,73	-	2,14	-	-	-	-	-	-	0,28	9
S.DERBY	0,14	0,90	0,48	-	-	0,31	-	-	-	0,69	-	-	-	-	-	-	0,26	10
S.NEWPORT	0,36	-	1,30	-	-	0,14	-	1,22	-	0,50	1,74	-	-	0,81	0,79	-	0,24	11
S.BRAENDERUP	0,33	-	0,48	-	-	0,14	-	-	-	0,50	0,87	-	-	1,03	1,19	-	0,24	12
S.BOVISMORBIFICANS	0,07	0,55	1,93	-	-	0,28	-	-	-	0,88	-	-	-		-	-	0,23	13
S.PARATYPHI B, var. Java	0,07	-	2,31	-	-	-	-	0,73	-	0,40	2,54	-	-	1,02	-	-	0,19	14
S.-GRUPPE D1-O-FORM	0,02	-	-	-	-	-	-	-	-	-	-	2,92	-	-	-	-	0,19	15
S.GOLDCOAST	0,02	0,54	-	-	-	0,19	-	-	-	0,82	-	-	-	-	-	-	0,15	16
S.ORANIENBURG	0,18	-	0,63	-	-	0,19	-	-	-	-	-	-	-	-	-	-	0,12	17
S.SAINTPAUL	0,29	-	0,63	-	-	0,11	-	-	-	-	0,80	-	-	-	-	-	0,09	18
S.BLOCKLEY	0,38	-	0,58	-	-	0,12	-	-	-	-	-	-	-	-	-	-	0,09	19
S.-GRUPPE C1	-	-	-	-	-	-	-	-	-	-	-	1,33	-	-	-	-	0,08	20
SALMONELLA, OTHER	2,95	5,94	13,83	44,46	42,78	2,25	85,22	7,54	39,39	14,42	16,59	20,98	50,80	13,50	25,79	25,85	10,7	

- No isolates reported among those listed; typically only the most common serovars are reported

3.3.4. Age distribution

13 regions from 11 countries provided information on the age distribution of salmonellosis (Figure SA 30). The demographic data from 2001 or 2002 for the calculation of the age specific incidence were provided by the countries themselves or taken from the 'Statistisches Bundesamt' (Germany) (see chapter 14. Demographic Data).

In all regions with the exception of Finland, the age group most frequently reported to be affected by *Salmonella* is children at the age of 0 to 4 years. In 12 of these regions boys are more frequently affected, in 1 country more cases were notified in girls. In the age group from 5 to 14 years a lower incidence rate occurs than in younger children. For the adults, two major patterns are obvious. In 5 countries the age group 15 to 24 again shows a reduction in the infection rate and the other age groups remains at the low level of the young adults. In contrast, in 5 countries the incidence rate of the young adults (15 24 years) exceeded the rate of the children at the age of 5 to 14 years. In Sweden, Northern Ireland, England and Wales the age group of 25 to 44 are in the second place after the young children, in Finland this group is mainly affected. In Norway the age group of the 45 to 65 years are in the second place. In the age groups from 45 years on the incidence rate decreases again.

In the Netherlands the incidence rate decreases continuously to the age group of 25 to 44 and raises again in the group of older than 65 years.

The distribution of the cases in the age groups within the individual countries over the last 2 to 4 years is comparable. The main differences in the distribution are seen in the group of the under 4 years old children. In comparison to the previous year the infection rate in Austria doubled in the group of the 0 to 4 years old, a decrease by one third is seen in the group of 5 to 14 years old and again a doubling of the case numbers in the 15 to 24 years old. In the other age groups the case numbers are reduced or constant. In England and Wales the shift of the high incidence rate towards the adults as observed in 2001 has not continued. In 2002, mainly children were affected by the disease.

It is unclear, whether these differences are mainly attributable to differences in the reporting system (i.e. mainly children are under supervision or visit the physicians, only hospital cases are notified, samples are more frequently taken from small children), or whether the pattern can be explained by other factors like differences in the exposure, consumption habits, travelling activity or different susceptibility of the age groups.

Figure SA 30. The age distribution of salmonellosis (incidence rate per 100 000 persons of the age group) in the European countries and Norway

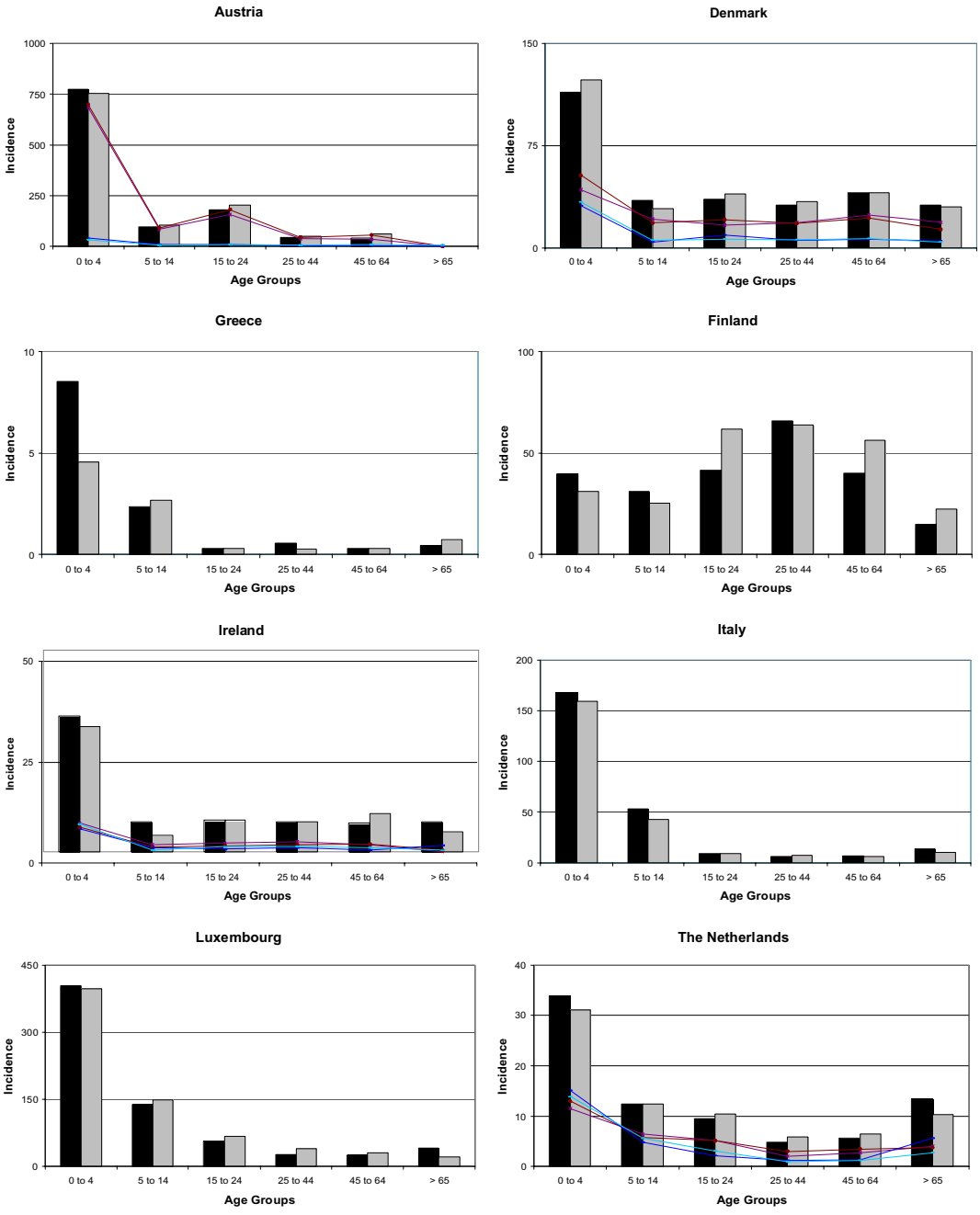
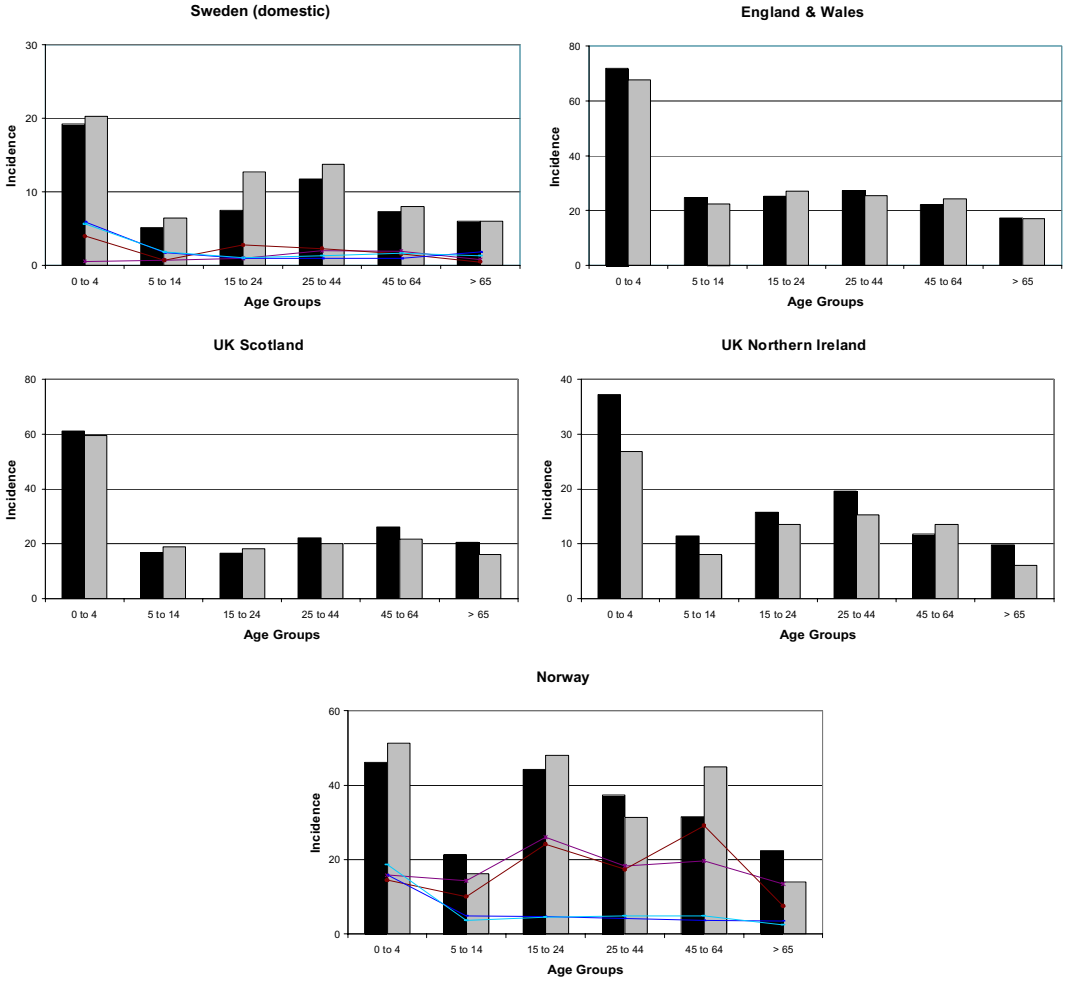
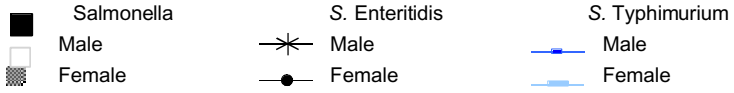


Figure SA 30. The age distribution of salmonellosis (incidence rate per 100 000 persons of the age group) in the European countries and Norway continued



For Ireland, the information from the clinical notifications is shown



3.3.5. Seasonal distribution

14 regions from 12 countries notified the case numbers by month (Figure SA 29). In these regions the distribution of the case numbers follows 3 patterns. All countries show a clear seasonality. In general, the increase of salmonellosis cases follows the rise of the temperature with a 2-month delay.

The number of salmonellosis cases raise in May, has its maximum in July, August or September and decreases in November. In 9 countries a slight second raise in the number of cases occurred in January. The lowest value could be seen in February or March. 5 of the reporting countries have an increase of salmonellosis from February to March with a decrease or stagnation of the infection rate in April. In the countries, in principle, cases are distributed at similar ways over the different reporting years.

In all countries except Spain and Greece a sharp increase occurs in summer with a maximum from July to September. The duration of high case numbers is short and the decrease is as steep as the increase. However, in Spain the high case numbers remain from August to October and keep high until the end of the year.

Greece has two peaks in summer, one in August and another smaller one in November.

An outbreak on a ferryboat is the reason for the unusual number of cases in April in Sweden. Besides that outbreak the increase of the infection rate between February and March is higher than in the last years.

Figure SA 31. Distribution of the salmonellosis cases over the year

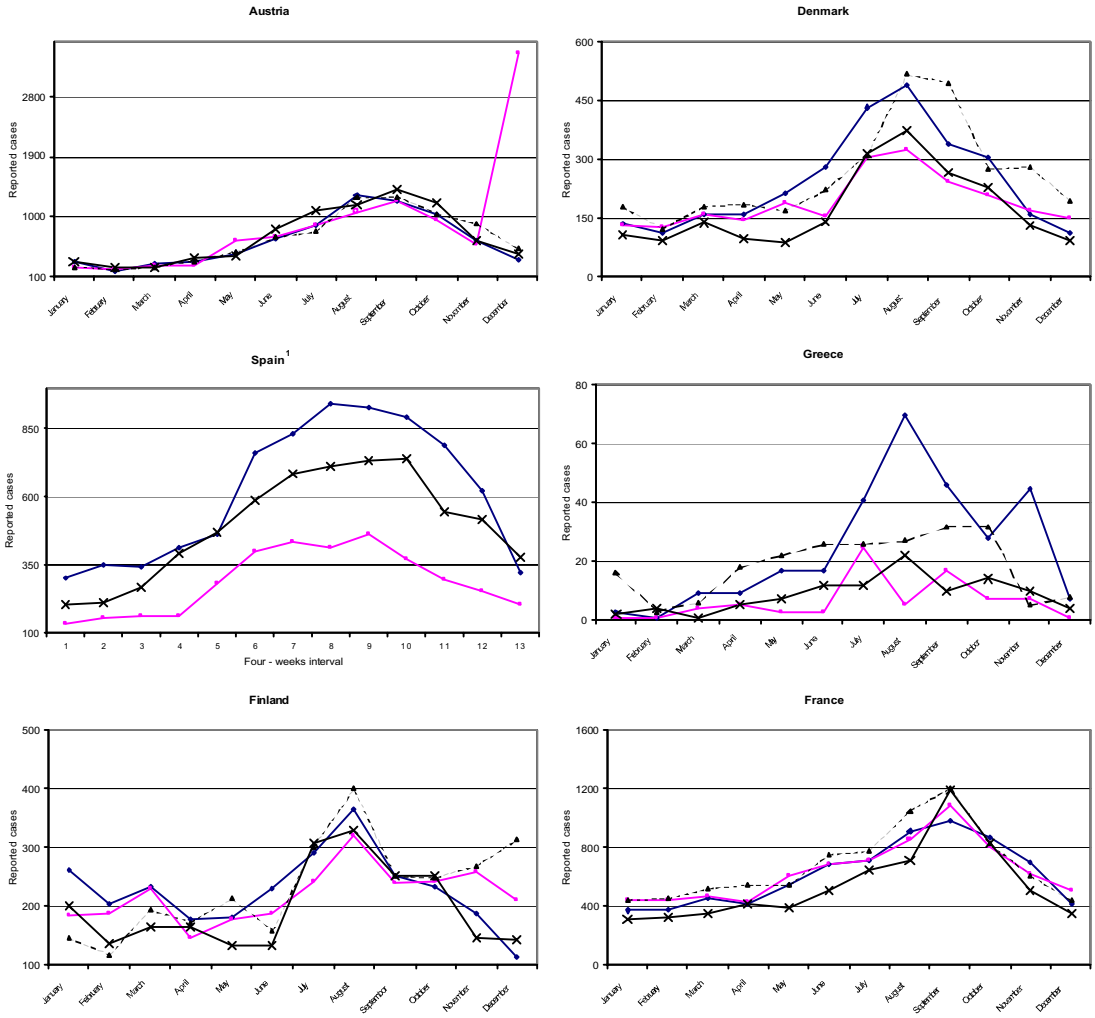
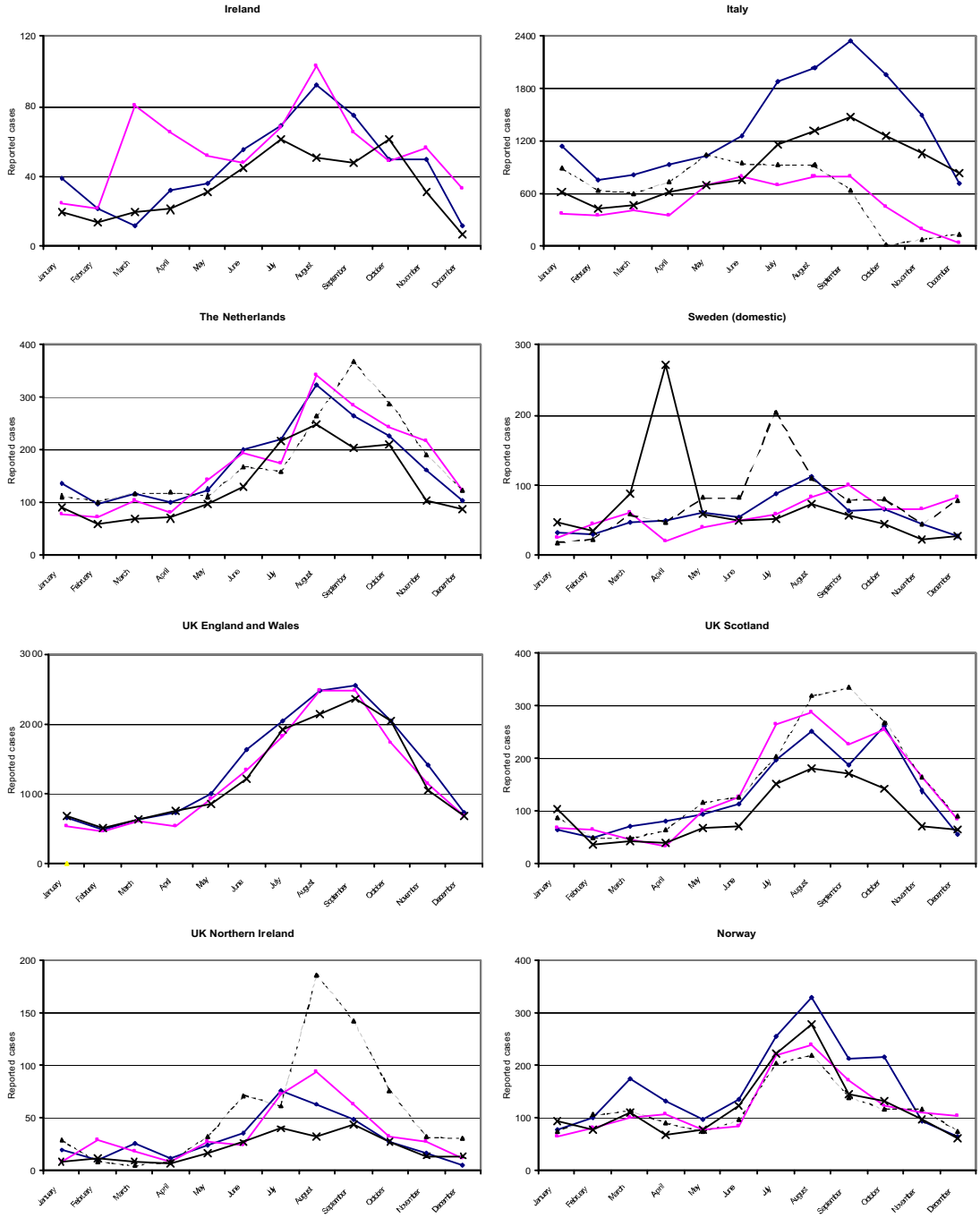


Figure SA 31. Distribution of the salmonellosis cases over the year *continued*



For Ireland, the information from the National Reference Laboratory is shown

2002	2001	2000	1999

[1] Cases are reported in a four-week interval in previous years

3.4. Sero- and phagetypes of Salmonella an overview

3.4.1. Serovars

Typing of Salmonella isolates is done in all Member States on the basis of the Kaufmann White Scheme. The level of details available on serovars along the food chain is different in the individual countries. Table SA 69 summarises the countries, species and food sources, where data are available for 2002. The sources of these isolates and the patterns within the animal species and food types have been already described in the previous chapters. There, the number of isolates typed and the degree of typing of all isolates available has been specified.

An overview of the notified serovars in the food chain from the individual countries is given in the Tables SA 77 to SA 93, where the serovars are ranked according to their frequency.

Table SA 69. Countries, which provided data on serovars

	Humans	Cattle	Pigs	Poultry	Beef	Pork	Poultry meat
Austria	X	X	X	X			X
Belgium	X	X	X	X		X	X
Denmark	X	X	X	X	X	X	X
Finland	O	X	X	X	X	X	X
France	O	X	X	O	X	X	X
Germany	X	X	X	X	X	X	X
Greece	O	X		X			X
Ireland	X	X	X		X	X	X
Italy		X	X	X	X	X	X
Luxembourg	X	X	X				
Portugal		X	X	X			X
Spain	X	X		X	X	X	X
Sweden	O	X	X	X			
The Netherlands	X	X	X	X	X	X	X
Great Britain	X	X	X	X			
Northern Ireland	X	X	X	X			
Norway	X	X	X		X		X

X complete serotype distribution
O specified to *S.* Enteritidis, *S.* Typhimurium, *Salmonella* other

In all countries, *S.* Enteritidis and *S.* Typhimurium are the dominating serovars in human salmonellosis. In this chapter, a comparison is made for the next frequent serovars in humans in the individual country and their occurrence in non-human sources.

In Austria, *S.* Enteritidis is the main causative agent in humans and is also most frequently detected in poultry and poultry meat. In addition, *S.* Enteritidis is the serovar most frequently reported in cattle. The next serotype, *S.* Typhimurium, is the most frequent serovar in pigs and on the third position in cattle. It is less frequent in poultry and poultry products. The other more common human serovars, *S.* Hadar, *S.* Infantis and *S.* Virchow, are reported to some degree in poultry and poultry meat, *S.* Infantis was also reported in pigs.

In Belgium, besides *S.* Enteritidis and *S.* Typhimurium, the next important serovars in humans are *S.* Brandenburg, *S.* Virchow, and *S.* Derby. *S.* Brandenburg and *S.* Derby were among the frequent serovars isolated in pigs and pork. *S.* Virchow was the most frequent serovar in poultry and also frequently detected in poultry meat. *S.* Brandenburg, *S.* Derby and *S.* Infantis showed fluctuations in their frequency over the years. *S.* Virchow showed an increase over the last years. The *S.* Hadar isolates steadily decreased over the years in humans.

In Denmark, *S*. Paratyphi B var. Java, *S*. Dublin and S. Agona were the next frequent serovars in humans. *S*. Paratyphi B var. Java is not among the frequent serovars in domestic livestock or foodstuff, but an outbreak involving *S*. Java was registered in 2002. *S*. Dublin was the fourth most common serovar isolated from humans and the most commonly encountered serovar in cattle and beef. It was also isolated from finishing pigs and pork. On the basis of the pulsed-field gel electrophoresis (PFGE) profile analysis which was made to trace the sources of human salmonellosis, it is assumed that beef was the major source of human salmonellosis caused by *S*. Dublin but pork could not be ruled out as a source. *S*. Agona, which was the fifth most prevalent serotype in humans, was isolated from several non-human sources. Analysis of PFGE patterns indicated that Danish pork and turkey meat were important sources of human infections caused by *S*. Agona.

In Finland, *S.* Enteritidis and *S.* Typhimurium are rarely detected in poultry and poultry meat, but a few isolates were reported in pork. *S.* Typhimurium is the most frequently reported serovar in cattle, pigs and beef. Within domestic cases, the next frequent serovars in humans were *S*. Hvittingfoss, *S*. Agona and *S*. Abony. *S*. Agona was the most frequent serovar in poultry meat, the other serovars were not among those reported in livestock or foodstuffs.

In France, about 57% of all human cases were caused by *S.* Enteritidis or *S.* Typhimurium. No details were given on the other serotypes involved in human disease. *S.* Enteritidis was reported in poultry, poultry meat and beef. *S.* Typhimurium is the most frequent serovar in cattle, pigs, beef, pork and poultry meat.

In Germany *S.* Infantis, *S*. Virchow and *S*. Derby were the next most common serovars in humans. These serovars were not among the most frequent ones reported in the overall categories animals or foods. Detailed information for the individual animal species or category of foodstuff was not included in the report.

In Greece, *S.* Enteritidis is the most frequent serovar in poultry and poultry meat.

In Ireland, *S.* Virchow, *S*. Dublin and *S*. Hadar are under the first five serovars in humans. *S.* Virchow and *S*. Hadar were not among those serovars frequently reported in livestock and foodstuff. *S*. Dublin is the most frequent serovar in cattle and also common in beef.

Due to a lack of information on the main serovars in human salmonellosis, no comparison between serovar patterns observed in humans, animals and foods can be made for Italy and Portugal. For Luxembourg, very limited data on the Salmonella serovars present in animals and foods are available, thus no comparison can be made.

In Spain, *S.* Enteritidis, which is the major cause of human salmonellosis, was also the major serovar in poultry. For the other serovars and categories, too little information is available on their presence in the food chain to make any comparisons.

No detailed information on the main serovars involved in human salmonellosis in available from Sweden. *S.* Enteritidis, the causative agent for 41% of all cases was isolated from cattle (1 isolate) and poultry (2 isolates). *S.* Typhimurium, which was involved in 8% of all human cases, was the most frequent serovar in cattle, pigs and poultry.

In The Netherlands, *S*. Brandenburg, *S*. Infantis and *S*. Hadar were the next most frequent serovars in human salmonellosis. *S*. Paratyphi B var. Java, which continued to increase in broilers and layers and which is the most frequent serovar in poultry meat, was not among the frequent serovars in humans. *S*. Brandenburg was among the more common serovars in pigs, but was also detected in cattle and in poultry. *S*. Infantis is common in poultry, both in broilers and in layers. *S*. Hadar was only rarely detected in livestock and poultry meat.

In Great Britain, *S*. Virchow, *S*. Hadar and *S*. Infantis are among the most frequent serovars in humans. *S*. Virchow and *S*. Hadar were detected in poultry to some extent, whereas *S*. Infantis was isolated from cattle and pigs.

In Norway, *S*. Paratyphi B var. Java, *S*. Virchow and *S*. Hadar were the next most frequent serovars in humans. These pathogens were not reported in domestic sources. Approximately 80% of reported cases of salmonellosis in humans have acquired the infection abroad.

3.4.2. Phagetypes of *S.* Enteritidis and *S.* Typhimurium

The method of the differentiation of S. Enteritidis and S. Typhimurium into phagetypes was established and standardised by L. Wards[1,2]. The method is usually called the Colindale scheme. The Netherlands classifies S. Typhimurium with another set of phages, therefor with the exception of DT 104 the patterns are not comparable.

In 2002 information from Austria, Belgium, Denmark, Finland, Germany, Italy, Sweden, The Netherlands and the United Kingdom was available. The provided data covered at least poultry and humans. The data from Denmark covered the whole food chain. Belgium restricted the information to human isolates. Germany provided the data as text report without specifying the animal species or food categories involved.

The sources of the isolates are different in the individual countries. In Denmark, the information on the phagetypes is closely linked to the individual monitoring programme where isolates are derived from. In other countries, all *S.* Enteritidis and *S.* Typhimurium strains sent to the reference laboratory for different purposes are typed.

S. Enteritidis

Austria, Belgium, Denmark, Finland and The Netherlands provided data on phagetypes from *S.* Enteritidis (Table SA 70). The main phagetype from *S.* Enteritidis in animals and humans in Austria, Belgium, Finland and The Netherlands is PT 4. In Austria, Belgium and The Netherlands PT 21 is under the top three, in Denmark and Austria PT 8 is common. The frequency of the occurrence of the phagetypes besides PT4 is specific to the individual countries. In Italy a frequent phagetype in poultry is PT14b, only found in Austria in imported meat and in humans in Austria and Belgium with a far lower magnitude. In the United Kingdom PT4 and PT6 have the same frequency.

In humans, the main phagetypes remained phagetypes (PT) 4, PT 8, PT 21, PT 1 and PT 6. These phagetypes are also among the most frequent ones in poultry. As can be taken from Table SA 70, the patterns in the individual countries are different. In Austria, Italy and The Netherlands, PT 4 is by far the most frequent phagetype in man and poultry. In contrast, in Denmark the main causative agent in humans and frequently isolated in layers is *S.* Enteritidis PT 8.

In The Netherlands, the predominant PT 4 continued to decrease in humans and in poultry and is replaced by PT 1, 6, 8 and 21. PT 21 is the strongest emerging phagetype in 2002 in humans. Clear differences exist in types circulating among broilers and layers and between the years. From these detailed typing data it is estimated that more than 35 % of all human salmonella infections is still related to the consumption of contaminated eggs in 2001 and 2002.

In Belgium, 8 % (n=495) of the *S*. Enteritidis isolates from humans were phage typed. PT4 (41,6%) was the predominant phagetype found in 2002. PT 21 was the second most prevalent phagetype with 35,8 %. The next frequent phagetypes were PT 14b (5,9%), PT 1 (3,4%) and PT 6 (2,2%).

[1] Ward, L.R., J.D. de Sa, and B. Rowe. 1987. A phage-typing scheme for *Salmonella* Enteritidis. Epidemiol. Infect. 99: 291-294

[2] Anderson, E.*S.* , L.R.Ward, M.J.Saxe and J.D.de Sade. 1977. Bacteriophage-typing designation of *Salmonella* Typhimurium. J. Hyg. (Lond) 78:297 -300

In Finland, 51 *S.* Enteritidis isolates from humans were typed and PT4 was the most frequent type. The next frequent phage type was PT 1.

In Germany phage typing was applied for onward differentiation and 615 isolates of *S.* Enteritidis from animals were typed. Among *S.* Enteritidis the dominating phage type in 2002 is PT 4 (69%). PT 8 (12%), PT 21 (11%) and PT 1 (7%) are the other most frequent isolated phagetypes. Half of the isolates of PT 4 originated from animals, mainly from poultry (64%), especially from *Gallus gallus* (51%). This phagetype was not found in pigs, but in cattle with 35%. PT 4 is also dominating in food with 43% of all isolates, the isolates were mainly from eggs and poultry meat.

_S._ Typhimurium

Overall, including all countries and all species tested, the most commonly isolated phagetype of *S.* Typhimurium in 2002 was definite type (DT) 104 and this phagetype also remained one of the three most commonly isolated phagetypes from humans in all reporting countries. DT 120 was commonly encountered in human isolates in 3 countries (Table SA 72). The information available for food and animal derived isolates is summarised in Table SA 71. This information, grouped by the main animal species cattle, pigs and poultry is given in Tables SA 73 to SA 75. The Netherlands developed their own phagetyping system. Except for DT 104 phagetypes are not comparable with the 'Colindale System. Results are presented as the separate Table SA 76.

In Belgium, S. Typhimurium (n=319) DT 104 was predominant (22,6%) in humans. Other common phagetypes were DT 193 (11 %), DT 120 (9,7 %) and DT 12 (5,6 %). The provisional phagetype U302, which is related to DT 104, was found in 3,8% of the tested isolates.

Finland differs from the other reporting countries with a high amount of DT 1 in human isolates.

A clear association between the source and the occurrence in humans is seen for phagetype DT 46 in Austria. It was one of the top ten isolated in poultry and in humans only in Austria. The infection of Danish people with DT 12 is also associated with the domestic animal production. The occurrence of DT 120 might be associated with products from cattle and pigs. DT 104, U302 and DT 193 are ubiquitous.

The occurrence of phagetypes in cattle is not uniform. In Italy, The Netherlands and the United Kingdom DT 104 is dominant (Table SA 73), in Denmark the main isolated phagetype is DT 12 and in Finland DT 68. The phagetype DT 68 is restricted to cattle in Finland, referred to the top ten isolates.

In pigs (Table SA 74) no dominating phagetype could be seen, the exception is Denmark where DT 12 is dominating. In Italy and the United Kingdom, DT 104 occurs with less than 15% of the isolates. The phagetypes DT 170 and 66 are restricted to pigs in Denmark and U 308a to pigs in the United Kingdom, referred to the top ten isolates in pigs. Due to the favourable *Salmonella* situation in Sweden, only few isolates were available for typing and the typeable one is DT 1.

In poultry, DT 104 is the dominating phagetype (Table SA 75). The main occurrences of certain phagetypes in the countries differ in Austria, Italy and the United Kingdom. DT 2 is the only phagetype isolated from ducks in Austria and from turkeys in Italy. The phagetypes DT 7 in Italy, DT 46 in Austria and DT 8 in the United Kingdom occur only in poultry in the countries.

In Germany phage typing was applied for onward differentiation of 1508 isolates of *S.* Typhimurium. As in previous years, the phage types dominating in 2002 among *S.* Typhimurium were DT 104 (39 %), DT 2 (17 %), DT 120 and DT 9 (3%). DT 104 is the main phagetype of *S.* Typhimurium with a total of 592 isolates. 64 % of these isolates originate from animals and 32% from food. DT 104 has a share of 52 % in cattle from 222

isolates, 55 % in pigs from 231 isolates and 23 % in poultry. DT 2 was not detected in isolates from food or feed, but a few isolates were found in poultry, cattle and pigs. 92% of all DT 2 isolates were from pigeons. Out of the 52 isolates of DT 120 46 % originated from animals and 37 % from food. In pigs 6 % of the 231 isolates, in cattle 2 % from 432 isolates and in meat products 5 % of the isolates were DT 120.

In the United Kingdom, *S*. Typhimurium DT 104 continued to predominate in cattle and sheep but less so in pigs where DT 193 was as common. U 302 and DT 208 were the next most common phagetypes in pigs, and U302 in sheep.

In The Netherlands, *S.* Typhimurium in pigs as a whole was less important in 2002. Multiresistant phagetype DT 104 decreased even more than the other phagetypes. However, FT 507 increased and might be related to an increasing number of small outbreaks in humans in 2002. In cattle, DT 104 became relatively more important. In poultry the fraction of *S*. Typhimurium isolates are too low to discuss. FT 150, causing problems in humans and poultry in the late 90 s and 2001, was not found in 2002. Data are summarised in Table SA 76.

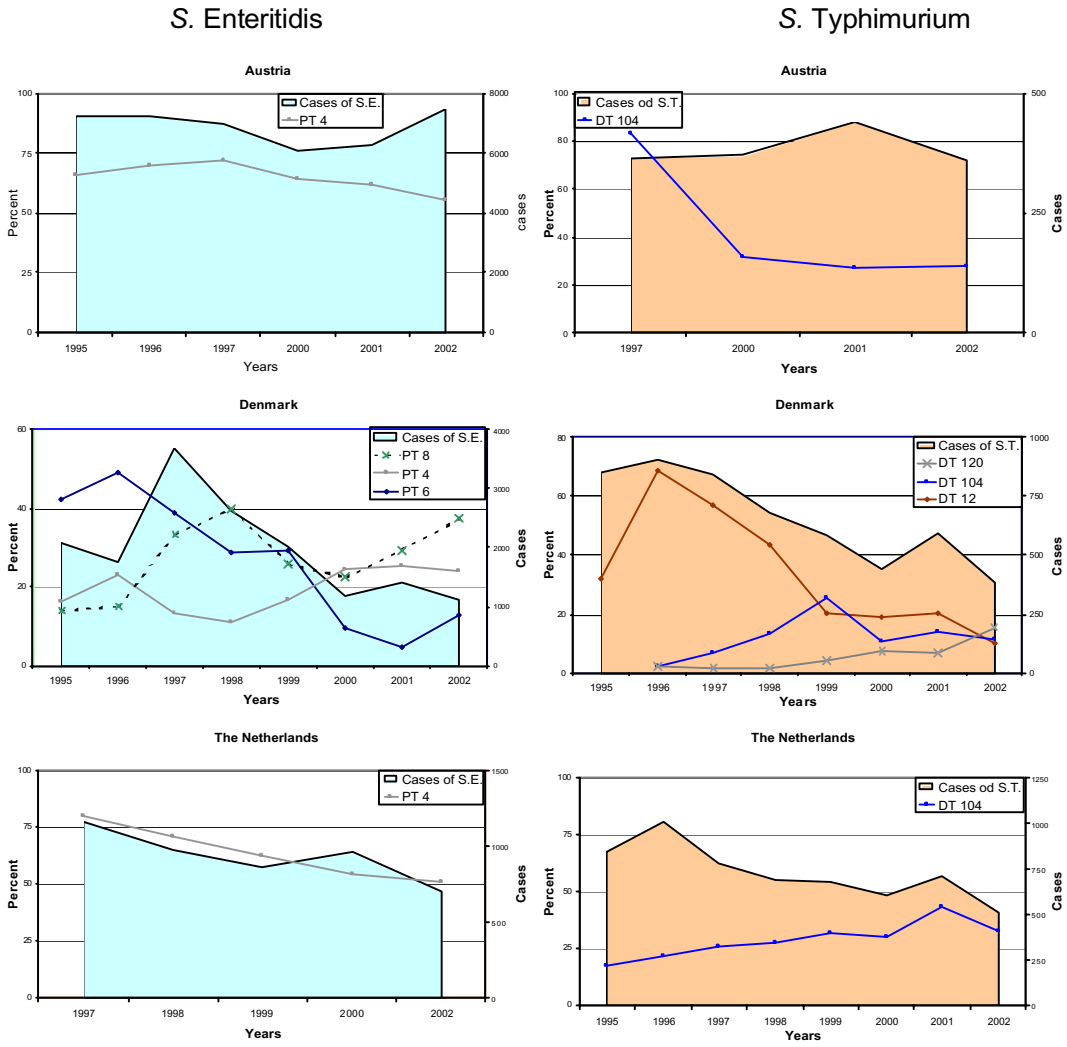
Comparison of the trends of all *S.* Enteritidis and *S.* Typhimurium to the main phagetypes in humans

Austria, Denmark and The Netherlands provided data from human isolates for the last 5 to 7 years. During this period the number of salmonellosis cases decreased in Denmark and the Netherlands, little changes in the case numbers could be seen in Austria.

Among human *S.* Enteritidis cases, the proportion of PT 4 decreased in Austria and The Netherlands. In Denmark, the total number of *S.* Enteritidis cases has decreased almost continuously since 1997. In 2002, PT 8 was the dominating phagetype and an increase was observed in the proportion of both PT 8 and PT 6. In contrast, the share of PT 4 has remained almost constant since 2000 (Figure SA 32).

The share of DT 104 among *S.* Typhimurium cases declined rapidly in Austria from 1997 to 2000, but has remained at the same level since then. In Denmark, the share of DT 120 has increased since 1998 and in 2002 it was the dominant phagetype. In The Netherlands, a continuous increase in the share of DT 104 was observed until 2001. However, in 2002, the number of *S.* Typhimurium decreased, as did the share of DT 104.

Figure SA 32. Trend of all *S.* Enteritidis and *S.* Typhimurium cases in humans in comparison to cases caused by single phagetypes



Right scale for total number of cases of the serovar; left scale ratio of the phagetype depicted to *S.* Enteritidis or *S.* Typhimurium

Table SA 70. Phagetype distribution (%) of S. Enteritidis in 2002

	Austria								Belgium	Denmark			Finland	Italy			The Netherlands				United Kingdom					
	imported																									
Phagetype	Poultry	Turkey	Humans	Duck	Poultry Parents meat production line	Layers rearing	Layers production	Broilers rearing	Humans	Humans	Layers[1]	Poultry meat imported[2].	Humans	Cattle	Pigs	Poultry (gallus gallus)	Poultry	Humans	Broilers	Layers	Cattle	Broilers	Layers	Duck	Horse	Total
	N=287	N=73	N=7459	N=7	N=3	N=10	N=122	N=134	N=495	N=633	N=15	N=30	N=51	N=3	N=5	N=71	N=139	N=706	N=18	N=77	N=6	N=5	N=6	N=11	N=4	N=10357
4	32,4	2,7	55,7			20,0	30,3	0,7	41,6	23,9	13,3	30,0	33,3		40,0	31,0	49,6	51,3	50,0	51,9	33,3	20,0	66,7		50,0	50,1
8	16,0	2,7	21,8			10,0	14,8	5,2	1,8								2,2		5,6							16,5
21			6,0				3,3	6,7	35,8	5,1	6,7	13,3				1,4										6,5
6	2,4		4,1				7,4		2,2	13,0	13,3	6,7					6,5	6,0	16,7	7,8	33,3	20,0			25,0	5,1
8										37,4	53,3					4,2		4,1		1,3		20,0				2,7
1	3,8		3,2				0,8						25,5	66,7		4,2			5,6							2,6
14B	1,0		1,4						5,9	4,3						23,9		2,3								1,9
21	8,7																12,9	17,0	11,1	6,5						1,6
5			2,1																							1,5
not typable	1,4		1,0	42,9			0,8		2,8	3,5	6,7				20,0	9,9		2,5					16,7			1,4
Total	65,9	5,5	95,2	42,9	0,0	30,0	57,4	12,7	90,1	87,2	93,3	50,0	58,8	66,7	60,0	74,6	71,2	83,2	89,0	67,5	66,7	60,0	83,3	0,0	75,0	89,9

Only countries where more than 1 isolate were typed are listed

[1] Representative samples from surveillance programme in production flocks

[2] Monitoring of imported meat and meat products

Table SA 71. Phagetype distribution (%) of S. Typhimurium in 2002

	Austria				Denmark						Fin	Italy				Sweden		United Kingdom							
Phagetype	Poultry, imported	Duck, imported	Layers production	Broilers rearing	Cattle[2]	Pigs[1]	Broilers[4]	Pork[3]	Pork imported[5]	Duck meat imported[5]	Cattle	Cattle	Pigs	Turkey	Poultry (gallus gallus)	Pigs	Birds	Cattle	Pigs	Turkey	Broilers	Pigeons	Sheep	Duck	Total
N=	59	7	122	134	31	535	10	131	18	32	6	68	320	70	43	6	11	140	147	23	35	19	9	10	3258
104			1,6	1,5	6,5	3,7	10,0	2,3	33,3	3,1		32,4	14,7	28,6	25,6			42,9	12,9	73,9	65,7		55,6		12,3
12					61,3	37,9	30,0	28,2	5,6			13,2	6,3	14,3	2,3			4,3	1,4						10,7
120	5,1				3,2	9,2		8,4	11,1			2,9	3,4					2,9		4,3					6,1
1	5,1		2,5											1,4		16,7									5,0
193	10,2		2,5	0,7	3,2	4,9		1,5	5,6				0,6					2,1	13,6		2,9				4,2
U302						0,9		1,5	5,6	9,4		10,3	12,5	2,9	4,7			10,7	8,8	4,3	11,4		22,2		4,0
104l	6,8																								2,6
170						8,8	20,0	6,9										4,3							2,5
208												5,9	10,6		2,3			3,6	6,1						2,0
not typable[6]	8,5			1,5	9,7	7,7		16,8	16,7	3,1		23,5	39,7	28,6	39,5	50,0	27,3	7,1	3,4		2,9	5,3			16,4
Total	27,1	0,0	6,6	2,2	74,2	65,4	60,0	48,8	61,2	12,5	0,0	64,7	48,1	47,1	34,9	16,7	0,0	70,7	42,9	82,6	80,0	0,0	77,8	0,0	49,3

Only more than 1 isolate listed. The ranking was made by summarising all isolates from all countries

[1] Isolates obtained from sampling in slaughter-pig herds placed in level 2 or 3

[2] Data not representative for the Danish cattle population

[3] Representative swab samples of pork and beef carcass from surveillance programme at slaughterhouses

[4] Representative faecal or sock samples from mandatory ante-mortem inspection

[5] Monitoring of imported meat and meat products

[6] includes RDNC isolates in Austria

Table SA 72. Phagetype distribution (% of all isolates) of S. Typhimurium in humans in 2002

Phagetype	Austria	Belgium	Denmark	Finland	Total
N=	363	319	370	235	1287
not typable	26,7	21,0	21,1	4,3	19,6
1	5,5			57,4	12,0
104		22,6	11,6	10,2	10,8
120	7,4	9,7	15,4		8,9
104l	22,0				6,2
193	4,7	11,0	4,6		5,4
12			10,3		3,0
46	9,4				2,6
U302	0,8	3,8	4,9		2,6
9				10,6	1,9
Total	76,6	68,1	67,9	82,6	73,1

Table SA 73. Phagetype distribution (% of all isolates) of S. Typhimurium in cattle in 2002

Phagetype	Denmark	Finland	Italy	United Kingdom	Total
N=	31	6	68	140	245
104	6,5		32,4	42,9	34,3
12	61,3		13,2	4,3	13,9
U302			10,3	10,7	9,0
208			5,9	3,6	3,7
120	3,2		2,9	2,9	2,9
170				4,3	2,4
104b			1,5	3,6	2,4
68		66,7			1,6
193	3,2			2,1	1,6
not typable	9,7		23,5	7,1	11,8
Total	74,2	66,7	66,2	74,3	71,8

Table SA 74. Phagetype distribution (% of all isolates) of S. Typhimurium in pigs in 2002

Phagetype	Denmark	Italy	Sweden	United Kingdom	Total
N=	535	320	6	147	1008
12	37,9	6,3		1,4	22,3
104	3,7	14,7		12,9	8,5
120	9,2	3,4			6,0
U302	0,9	12,5		8,8	5,7
193	4,9	0,6		13,6	4,8
170	8,8				4,7
208		10,6		6,1	4,3
66	4,1				2,2
U308a				10,9	1,6
not typable	7,7	39,7	50,0	3,4	17,5
Total	69,5	48,1	0,0	53,7	60,0

Table SA 75. Phagetype distribution (% of all isolates) of S. Typhimurium in poultry in 2002

Phagetype	Austria		Denmark	Italy	United Kingdom			Total
	Poultry	Duck	Broilers	Turkey	Turkey	Broilers	Duck	
N=	59	7	10	70	23	35	10	205
104			10,0	28,6	73,9	65,7		29,8
104h	40,7							11,7
12			30,0	14,3				6,3
46	15,3							4,4
2		14,3		10,0				3,9
8							80,0	3,9
U302				2,9	4,3	11,4		3,4
193	10,2					2,9		3,4
120	5,1				4,3			2,0
not typable	8,5			28,6		2,9		12,7
Total	71,2	14,3	40,0	55,7	82,6	80,0	80,0	68,8

Table SA 76. Phagetype distribution (% of all isolates) of *S.* Typhimurium in The Netherlands in 2002

Phagetype	Cattle	Pigs	Poultry	Humans	Broilers	Layers	Total	Correspondence with the Colindale scheme
N =	57	259	53	507	25	7	908	
506	66,7	22,0	30,2	30,8	28,0	57,1	30,6	DT 104
507	1,8	13,5	7,5	12,6	8,0		11,7	DT 208 and various DT
510		3,9		7,7			5,4	DT 208, DT 193, DT 195 and various DT
296		8,5		3,2			4,2	DT 12 and various DT
655	5,3	6,6	3,8	2,2		14,3	3,8	
401	3,5	6,6	13,2	1,4	4,0		3,8	DT 104
353	3,5	3,9		2,4			2,7	
508		0,4	1,9	3,2	4,0		2,1	
350		3,5	3,8	1,2	8,0		2,1	DT 193 and various DT
90				2,6			1,5	
Total	80,8	68,9	60,4	67,3	52,0	71,4	67,8	

Table SA 77. Main *Salmonella* serovars in Austria, 2002

	Cattle		Pigs		Poultry		Beef	Pork	Poultry Meat		Humans	
	Total	**11**	**Total**	**36**	**Total**	**1246**	**Total**	**Total**	**Total**	**34**	**Total**	**8250**
1	S.ENTERITIDIS	4	S.TYPHIMURIUM	24	S.ENTERITIDIS	438			S.ENTERITIDIS	15	S.ENTERITIDIS	7459
2	S.DUBLIN	3	S.DERBY	3	S.HEIDELBERG	169			S.HEIDELBERG	4	S.TYPHIMURIUM	362
3	S.TYPHIMURIUM	2	S.BREDENEY	2	S.INFANTIS	144			S.SAINTPAUL	3	S.HADAR	60
4	S.-GRUPPE E1 MONOPHASISCH	1	S.ENTERITIDIS	2	S.TYPHIMURIUM	97			S.INDIANA	2	S.INFANTIS	56
5	S.I-FORM	1	S.ANATUM	1	S.HADAR	64			S.INFANTIS	2	S.VIRCHOW	53
6			S.BOVISMORBIFICANS	1	S.BLOCKLEY	46			S.SENFTENBERG	2	S.BLOCKLEY	32
7			S.INFANTIS	1	S.SENFTENBERG	42			S.TYPHIMURIUM	2	S.NEWPORT	30
8			S.MBANDAKA	1	S.AGONA	27			S.VIRCHOW	2	S.BRAENDERUP	28
9			S.THOMPSON	1	S.VIRCHOW	25			S.AGONA	1	S.SAINTPAUL	24
10					S.SAINTPAUL	24			S.NEWPORT	1	S.AGONA	19
11					S.MONTEVIDEO	23					S.ORANIENBURG	15
12					S.BRAENDERUP	22					S.MUENCHEN	13
13					S.ANATUM	21					S.BREDENEY	12
14					S.BREDENEY	20					S.DERBY	12
15					S.INDIANA	14					S.KENTUCKY	12
16					S.MBANDAKA	13					S.HEIDELBERG	11
17					S.KENTUCKY	11					S.INDIANA	11
18					S.KOTTBUS	11					S.COELN	10
19					S.SCHWARZEN-GRUND	10					S.TYPHI	9
20					S.WORTHINGTON	9					S.ORION	8
21					S.DERBY	9					S.THOMPSON	7
22											S.BRANDENBURG	7

Table SA 78. Main *Salmonella* serovars in Belgium, 2002

	Cattle		Pigs		Poultry		Beef	Pork		Poultry Meat		Humans	
	Total	**83**	**Total**	**250**	**Total**	**928**	**Total**	**Total**	**47**	**Total**	**71**	**Total**	**9754**
1	S.DUBLIN	35	S.TYPHIMURIUM	167	SALMONELLA, OTHER	228		S.TYPHIMURIUM	24	S.ENTERITIDIS	22	S.ENTERITIDIS	6204
2	S.TYPHIMURIUM	24	S.DERBY	30	S.VIRCHOW	191		S.DERBY	16	S.BREDENEY	15	S.TYPHIMURIUM	2360
3	SALMONELLA, OTHER	23	SALMONELLA, OTHER	28	S.ENTERITIDIS	148		S.BRANDENBURG	3	S.VIRCHOW	8	SALMONELLA, OTHER	536
4	S.ENTERITIDIS	1	S.BRANDENBURG	11	S.TYPHIMURIUM	104		S.BOVISMORBIFICANS	1	S.PARATYPHI B	7	S.BRANDENBURG	146
5			S.LIVINGSTONE	7	S.HADAR	89		S.GOLDCOAST	1	S.BLOCKLEY	5	S.VIRCHOW	126
6			S.INFANTIS	6	S.AGONA	77		S.PANAMA	1	S.HADAR	4	S.DERBY	88
7			S.ENTERITIDIS	1	S.MBANDAKA	53		S.WIEN	1	S.INDIANA	4	S.HADAR	72
8			S.DUBLIN	0	S.INFANTIS	38				S.TYPHIMURIUM	3	S.INFANTIS	72
9										S.AGONA	1	S.BOVISMORBIFICANS	54
10										S.GOLDCOAST	1	S.GOLDCOAST	53
11										S.KOTTBUS	1	S.CERRO	43

Table SA 79. Main *Salmonella* serovars in Denmark, 2002

	Cattle		Pigs		Poultry		Beef		Pork		Poultry Meat		Humans	
	Total	**117**	**Total**	**713**	**Total**	**239**	**Total**	**21**	**Total**	**345**	**Total**	**304**	**Total**	**2068**
1	S.DUBLIN	75	S.TYPHIMURIUM	518	SALMONELLA, OTHER	114	S.DUBLIN	13	S.TYPHIMURIUM	149	S.HEIDELBERG	70	S.ENTERITIDIS	1104
2	S.TYPHIMURIUM	31	S.DERBY	88	S.KOTTBUS	34	SALMONELLA, OTHER	4	SALMONELLA, OTHER	85	SALMONELLA, OTHER	52	S.TYPHIMURIUM	383
3	SALMONELLA, OTHER	7	SALMONELLA, OTHER	63	S.INDIANA	25	S.TYPHIMURIUM	3	S.DERBY	49	S.TYPHIMURIUM	37	SALMONELLA, OTHER	209
4	S.ENTERITIDIS	2	S.INFANTIS	33	S.ENTERITIDIS	19	S.INFANTIS	1	S.INFANTIS	47	S.ENTERITIDIS	33	S.PARATYPHI B, var. Java	48
5	S.INFANTIS	1	S.AGONA	6	S.INFANTIS	14			S.RISSEN	7	S.HADAR	31	S.DUBLIN	44
6	S.BOVISMORBIFICANS	1	S.ENTERITIDIS	2	S.TYPHIMURIUM	13			S.AGONA	3	S.SAINTPAUL	14	S.AGONA	41
7			S.DUBLIN	1	S.SAINTPAUL	9			S.DUBLIN	2	S.VIRCHOW	12	S.BOVISMORBIFICANS	39
8			S.PANAMA	1	S.AGONA	4			S.PANAMA	2	S.INFANTIS	11	S.VIRCHOW	31
9			S.HEIDELBERG	1	S.DERBY	3			S.HEIDELBERG	1	S.DERBY	11	S.INFANTIS	27
10					S.BOVISMORBIFICANS	1					S.KOTTBUS	8	S.NEWPORT	
11					S.KENTUCKY	1					S.AGONA	7	S.HADAR	27
12					S.HADAR	1					S.INDIANA	7	S.NEWPORT	27
13					S.THOMPSON	1					S.BOVISMORBIFICANS	6	S.BLOCKLEY	12
14											S.NEWPORT	3	S.SAINTPAUL	12
15											S.PARATYPHI B, var. JAVA	1	S.DERBY	10
16											S.BLOCKLEY	1	S.THOMPSON	10
17													S.HEIDELBERG	10

Table SA 80. Main *Salmonella* serovars in France, 2002

	Cattle		Pigs		Poultry		Beef		Pork		Poultry Meat		Humans	
	Total	**630**	**Total**	**136**	**Total**	**114**	**Total**	**69**	**Total**	**212**	**Total**	**298**	**Total**	**6575**
1	**S.TYPHIMURIUM**	**358**	**S.TYPHIMURIUM**	**94**	**S.ENTERITIDIS**	**88**	**S.TYPHIMURIUM**	**59**	**S.TYPHIMURIUM**	**109**	**S.TYPHIMURIUM**	**162**	**SALMONELLA, OTHER**	**2813**
2	S.DUBLIN	129	S.DERBY	40	S.TYPHIMURIUM	26	S.ENTERITIDIS	6	S.DERBY	95	S.NEWPORT	44	S.ENTERITIDIS	2032
3	S.MONTEVIDEO	107	S.MONTEVIDEO	1			S.ANATUM	3	S.ANATUM	5	S.ENTERITIDIS	35	S.TYPHIMURIUM	1730
4	S.ENTERITIDIS	26	S.ENTERITIDIS	1			S.NEWPORT	1	S.NEWPORT	2	S.ANATUM	34		
5	S.DERBY	10							S.ENTERITIDIS	1	S.DERBY	23		
6														

Table SA 81. Main *Salmonella* serovars in Finland, 2002

	Cattle		Pigs		Poultry		Beef		Pork		Poultry Meat		Humans	
	Total	**12**	**Total**	**7**	**Total**	**17**	**Total**	**8**	**Total**	**7**	**Total**	**2**	**Total**	**2357**
1	S.TYPHIMURIUM	8	S.TYPHIMURIUM	4	S.INFANTIS	5	S.TYPHIMURIUM	8	S.INFANTIS	2	S.INFANTIS	1	SALMONELLA, OTHER	1048
2	S.TENNESSEE	1	S.TENNESSEE	1	S.LIVINGSTONE	4			S.ENTERITIDIS	2	S.AGONA	1	S.ENTERITIDIS	993
3	S.KONSTANZ	1	S.KONSTANZ	1	S.AGONA	3			SALMONELLA, OTHER	1			S.TYPHIMURIUM	316
4	S.KENTUCKY	1	S.ENTERITIDIS	1	S.MONTEVIDEO	2			S.TYPHIMURIUM	1				
5	S.INFANTIS	1			S.TENNESSEE	1			S.KENTUCKY	1				
6					S.STOCKHOLM	1								
7					S.ENTERITIDIS	1								
8														

Table SA 82. Main *Salmonella* serovars in Germany, 2002

	Cattle		Pigs		Poultry	Beef		Pork		Poultry Meat	Humans	
	Total	**6290**	**Total**	**1152**	**Total**	**Total**	**5**	**Total**	**57**	**Total**	**Total**	**64836**
1	S.TYPHIMURIUM	3397	S.TYPHIMURIUM	825		SALMONELLA, OTHER	3	S.TYPHIMURIUM	38		S.ENTERITIDIS	49582
2	SALMONELLA, OTHER	1370	SALMONELLA, OTHER	304		S.TYPHIMURIUM	1	SALMONELLA, OTHER	19		S.TYPHIMURIUM	12520
3	S.DUBLIN	1020	SALMONELLA SP.	12		S.ENTERITIDIS	1				S.INFANTIS	566
4	S.ENTERITIDIS	359	S.ENTERITIDIS	9							S.VIRCHOW	310
5	SALMONELLA SP.	126	S.DUBLIN	2							S.DERBY	207
6	S.ABONY	18									S.BOVISMORBIFICANS	185
7											S.BRANDENBURG	166
8											S.HADAR	156
9											S.ORANIENBURG	128
10											S.GOLDCOAST	128
11											S.AGONA	103
12											S.BRAENDERUP	91
13											S.NEWPORT	90
14											S.KENTUCKY	78
15											S.PANAMA	77
16											S.BLOCKLEY	76
17											S.LIVINGSTONE	72
18											S.SAINTPAUL	72
19											S.ANATUM	68
20											S.HEIDELBERG	58
21											S.LONDON	52
22											S.GIVE	51

Table SA 83. Main *Salmonella* serovars in Greece, 2002

	Cattle		Pigs		Poultry	Beef	Pork	Poultry Meat		Humans	
	Total	**1**	**Total**	**72**	**Total**	**Total**	**Total**	**Total**	**74**	**Total**	**460**
1	S.TYPHIMURIUM	1	S.ENTERITIDIS	33				S.ENTERITIDIS	25	SALMONELLA, OTHER	392
2			S.BRAENDERUP	8				S.BLOCKLEY	12	S.ENTERITIDIS	64
3			S.NEWPORT	6				S.INFANTIS	11	S.TYPHIMURIUM	4
4			S.BLOCKLEY	5				SALMONELLA SP.	6		
5			S.LIVINGSTONE	4				S.THOMPSON	5		
6			S.HADAR	3				S.LIVINGSTONE	4		
7			S.ANATUM	3				S.INDIANA	3		
8			S.TYPHIMURIUM	2				S.MELEAGRIDIS	2		
9			S.CERRO	2				S.MBANDAKA	2		
10			SALMONELLA SP.	1				S.HADAR	2		
11			S.UGANDA	1				S.TYPHIMURIUM	1		
12			S.MUENSTER	1				S.KOTTBUS	1		
13			S.KOTTBUS	1							
14			S.INFANTIS	1							
15			S.GALLINARUM-PULLORUM	1							

Table SA 84. Main *Salmonella* serovars in Ireland, 2002

	Cattle		Pigs		Poultry	Beef		Pork		Poultry Meat		Humans	
	Total	**288**	**Total**	**22**	**Total**	**Total**	**16**	**Total**	**148**	**Total**	**541**	**Total**	**411**
1	S.DUBLIN	257	S.TYPHIMURIUM	18		S.KENTUCKY	7	S.TYPHIMURIUM	78	S.KENTUCKY	153	S.ENTERITIDIS	165
2	S.TYPHIMURIUM	31	S.DUBLIN	1		S.DUBLIN	4	S.DERBY	35	S.LIVINGSTONE	57	S.TYPHIMURIUM	140
3			S.DERBY	1		SALMONELLA, OTHER	2	SALMONELLA, OTHER	17	SALMONELLA, OTHER	57	SALMONELLA, OTHER	40
4			S.CHOLERAESUIS	1		S.HEIDELBERG	2	SALMONELLA SP.	14	S.ENTERITIDIS	47	S.VIRCHOW	10
5			S.ALTONA	1		SALMONELLA SP.	1	S.ORION	3	S.MBANDAKA	44	S.DUBLIN	9
6								S.GIVE	1	S.BREDENEY	43	S.STANLEY	7
7										S.TYPHIMURIUM	39	S. HADAR	6
8										S.-GRUPPE B	39	S.KOTTBUS	6
9										S.INFANTIS	14	S.AGONA	5
10										S.-GRUPPE C	14	S.NEWPORT	5
11										S.AGONA	10	S.INFANTIS	3
12										SALMONELLA SP.	7	S.OHIO	3
13										S.HEIDELBERG	6	S.PARATYPHI B var. java	3
14										S.GOLDCOAST	4	S.BRANDEN-BURG	3
15										S.DERBY	3	S.PUTTEN	3
16										S.COELN	2	S.MBANDAKA	
17										S.BLOCKLEY	2		

Table SA 85. Main *Salmonella* serovars in Italy, 2002

	Cattle		Pigs		Poultry		Beef		Pork		Poultry Meat		Humans
	Total	**34**	**Total**	**65**	**Total**	**217**	**Total**	**9**	**Total**	**82**	**Total**	**22**	**Total**
1	S.TYPHIMURIUM	16	S.TYPHIMURIUM	28	S.BLOCKLEY	45	S.TYPHIMURIUM	3	S.TYPHIMURIUM	49	S.TYPHIMURIUM	5	
2	SALMONELLA, OTHER	9	SALMONELLA, OTHER	18	S.HADAR	33	S.CHANDANS	1	S.DERBY	13	S.ENTERITIDIS	4	
3	S.ABORTUSOVIS	5	S.DERBY	10	S.HEIDELBERG	28	S.DERBY	1	S.ENTERITIDIS	6	S.HADAR	4	
4	S.DUBLIN	2	S.ANATUM	7	S.VIRCHOW	25	S.HADAR	1	S.ANATUM	4	S.VIRCHOW	4	
5	S.III-FORM	1	S.WILHELMSBURG	1	S.ENTERITIDIS	23	S.MONTEVIDEO	1	S.BRANDENBURG	2	S.HEIDELBERG	2	
6	S.HEIDELBERG	1	S.BREDENEY	1	S.TYPHIMURIUM	19	S.READING	1	S.NEWLANDS	2	S.BLOCKLEY	1	
7					S.BRAENDERUP	8	S.SAINTPAUL	1	S-GRUPPE B	1	S.KOTTBUS	1	
8					S.MBANDAKA	8			S.GOLDCOAST	1	S.MUENCHEN	1	
9					S.LIVERPOOL	7			S.LONDON	1			
10					S.GALLINARUM-PULLORUM	6			S.PANAMA	1			
11					S.ANATUM	2			S.RISSEN	1			
12					S.INFANTIS	2			S.SAINTPAUL	1			
13					S.SENFTENBERG	2							
14					S.ANGONA	1							
15					S.ALBANY	1							
16					S.BREDENEY	1							
17					S.CAMBERWELL	1							
18					S.COELN	1							
19					S.HILLINGDON	1							
20					S.III-Form	1							

Table SA 86. Main *Salmonella* serovars in Luxembourg, 2002

	Cattle		Pigs		Poultry	Beef	Pork	Poultry Meat	Humans	
	Total	**33**	**Total**	**1**	**Total**	**Total**	**Total**	**Total**	**Total**	**528**
1	S.HAVANA	18	S.DERBY	1					S.ENTERITIDIS	250
2	S.TYPHIMURIUM	11							SALMONELLA, OTHER	208
3	S.ENTERITIDIS	2							S.TYPHIMURIUM	70
4	S.BOVISMORBIFICANS	1								
5	S.III-FORM	1								

Table SA 87. Main *Salmonella* serovars in Norway, 2002

	Cattle		Pigs		Poultry		Beef[1]		Pork		Poultry Meat[1]		Humans	
	Total	**4**	**Total**	**4**	**Total**	**0**	**Total**	**1**	**Total**	**0**	**Total**	**13**	**Total**	**1495**
1	S.JAVIANA	2	S.TYPHIMURIUM	4			S.JAVIANA	1			S.KOTTBUS	5	S.ENTERITIDIS	823
2	S.TYPHIMURIUM	2									S.ANATUM	2	S.TYPHIMURIUM	229
3											S.INDIANA	2	S.PARATYPHI B, var. JAVA	38
4											S.THOMPSON	2	S.VIRCHOW	36
5											S.SAINTPAUL	1	S.HADAR	34
6											S.TYPHIMURIUM	1	S.NEWPORT	26
7													S.AGONA	24
8													S.STANLEY	24
9													S.BRAENDERUP	13
10													S.INFANTIS	12
11													S.SAINTPAUL	12
12													S.MONTEVIDEO	10
13													SALMONELLA, OTHER	214

[1] All isolates from imported food

Table SA 88. Main *Salmonella* serovars in Portugal, 2002

	Cattle		Pigs		Poultry		Beef	Pork	Poultry Meat		Humans
	Total	**1**	**Total**	**19**	**Total**	**71**	**Total**	**Total**	**Total**	**1**	**Total**
1	S.TYPHIMURIUM	1	S.TYPHIMURIUM	12	S.ENTERITIDIS	32			S.-GRUPPE D1-O-FORM	1	
2			SALMONELLA, OTHER	4	S.TYPHIMURIUM	15					
3			S.BREDENEY	1	S.HAVANA	8					
4			S.DERBY	1	S.HEIDELBERG	8					
5			S.RISSEN	1	S.BLOCKLEY	2					
6					S.SAINTPAUL	2					
7					S.ANATUM	1					
8					S.BREDENEY	1					
9					S.HADAR	1					
10					S.LAGOS	1					

Table SA 89. Main *Salmonella* serovars in Spain, 2002

	Cattle		Pigs	Poultry		Beef		Pork		Poultry Meat		Humans	
	Total	**4**	**Total**	**Total**	**506**	**Total**	**5**	**Total**	**1**	**Total**	**15**	**Total**	**8047**
1	SALMONELLA SP.	2		S.ENTERITIDIS	246	S.ENTERITIDIS	5	S.ENTERITIDIS	1	S.ENTERITIDIS	12	S.ENTERITIDIS	4280
2	S.ENTERITIDIS	1		SALMONELLA SP.	206					SALMONELLA, OTHER	3	SALMONELLA SP.	1549
3	S.WESTHAMPTON	1		S.TYPHIMURIUM	52	Most not typed		Most not typed				S.-GRUPPE D	645
4				S.ALTONA	1							S.TYPHIMURIUM	630
5	Most not typed			S.NEWPORT	1							S.-GRUPPE B	440
6												S.-GRUPPE D1-O-FORM	235
7												S.-GRUPPE C1	107
8												S.-GRUPPE C2-O-FORM	83
9												S.-GRUPPE C	56
10												S.INFANTIS	12
11												S.HADAR	10

Table SA 90. Main *Salmonella* serovars in Sweden, 2002

	Cattle		Pigs		Poultry		Beef	Pork	Poultry Meat	Humans	
	Total	**6**	**Total**	**7**	**Total**	**11**	**Total**	**Total**	**Total**	**Total**	**3892**
1	S.TYPHIMURIUM	3	S.TYPHIMURIUM	6	S.TYPHIMURIUM	3				SALMONELLA, OTHER	1977
2	S.DUBLIN	2	SALMONELLA, OTHER	1	S.ENTERITIDIS	2				S.ENTERITIDIS	1598
3	S.ENTERITIDIS	1			S.LIVINGSTONE	2				S.TYPHIMURIUM	317
4					S.SAINTPAUL	2					
5					S.RISSEN	1					
6					SALMONELLA, OTHER	1					

Table SA 91. Main *Salmonella* serovars in The Netherlands, 2002

	Cattle		Pigs		Poultry		Beef		Pork		Poultry Meat		Humans	
	Total	169	**Total**	234	**Total**	454	**Total**	5	**Total**	4	**Total**	136	**Total**	1588
1	S.DUBLIN	95	S.TYPHIMURIUM	188	S.ENTERITIDIS	398	S.TYPHIMURIUM	5	S.TYPHIMURIUM	4	S.PARATYPHI B, var. Java	115	S.ENTERITIDIS	706
2	S.TYPHIMURIUM	41	SALMONELLA, OTHER	45	S.TYPHIMURIUM	26					S.TYPHIMURIUM	16	S.TYPHIMURIUM	507
3	SALMONELLA, OTHER	33	S.ENTERITIDIS	1	S.INFANTIS	18					S.ENTERITIDIS	5	SALMONELLA, OTHER	135
4					S.PARATYPHI B, var. JAVA	12							S.BRANDENBURG	34
5													S.INFANTIS	32
6													S.HADAR	18
7													S.BOVISMORBIFICANS	14
8													S.MANHATTAN	14
9													S.GOLDCOAST	13
10													S.DERBY	11
11													S.KENTUCKY	11
12													S.PARATYPHI A	11
13													S.TYPHI	9
14													S.ANGONA	8
15													S.BRAENDERUP	8
16													S.NEWPORT	8

Table SA 92. Main *Salmonella* serovars in UK (Great Britain), 2002

	Cattle		Pigs		Poultry		Beef	Pork	Poultry Meat	Humans	
	Total	998	**Total**	207	**Total**	1189	**Total**	**Total**	**Total**	**Total**	14916
1	S.DUBLIN	768	S.TYPHIMURIUM	147	S.LIVINGSTONE	137				S.ENTERITIDIS	9806
2	S.TYPHIMURIUM	140	S.DERBY	16	S.SENFTENBERG	117				SALMONELLA, OTHER	2013
3	S.ANATUM	15	S.KEDOUGOU	10	S.ORION O:10-,15+	103				S.TYPHIMURIUM	1912
4	S.AGAMA	13	S.LONDON	5	SALMONELLA, OTHER	88				S.VIRCHOW	231
5	S.NEWPORT	11	S.READING	5	S.INDIANA	79				S.HADAR	201
6	SALMONELLA, OTHER	10	SALMONELLA, OTHER	5	S.TYPHIMURIUM	73				S.INFANTIS	164
7	S.ENTERITIDIS	6	S.GOLDCOAST	4	S.MONTEVIDEO	70				S.AGONA	163
8	S.AGONA	4	S.-RAUHFORM	2	S.KEDOUGOU	64				S.BRAENDERUP	153
9	S.THOMPSON	4	S.DUBLIN	2	S.ORION	53				S.PARATYPHI B, var. JAVA	152
10	S.VEJLE	4	S.INFANTS	2	S.MBANDAKA	52				S.NEWPORT	121
11	S.GOLDCAST	3	S.PANAMA	2	S.HADAR	48					
12	S.MONTEVIDEO	3	S.AGONA	1	S.VIRCHOW	47					
13	SALMONELLA SP.	3	S.AJIOBO	1	S.OHIO	38					
14	S.-RAUHFORM	2	S.ANATUM	1	S.GIVE	31					
15	S.AJIOBO	2	S.BOVISMORBIFICANS	1	S.LIVERPOOL	31					
16	S.INFANTIS	2	S.ENTERITIDIS	1	S.NEWPORT	31					
17	S.MBANDAKA	2	S.KIMUENZA	1	S.THOMPSON	31					
18	S.NAGOYA	2	S.MBANDAKA	1	S.DERBY	23					
19	S.ANK	1			S.ENTERITIDIS	23					
20	S.BREDENEY	1			S.HEIDELBERG	23					

Table SA 93. Main *Salmonella* serovars in UK (Northern Ireland), 2002

	Cattle		Pigs		Poultry		Beef	Pork	Poultry Meat	Humans	
	Total		Total		Total		Total	Total	Total	Total	253
1	S.DUBLIN	268	S.TYPHIMURIUM	9	S.MBANDAKA	26				S.ENTERITIDIS	99
2	S.TYPHIMURIUM	6			S.MONTEVIDEO	7				S.TYPHIMURIUM	71
3	S.ANATUM	3			S.ORION O:10-,15+	7				S.VIRCHOW	5
4	S.III-Form				S.ANATUM.	3				S.MONTEVIDEO	4
5	S.MBANDAKA	1			S.BUDAPEST	1				S.BRAENDERUP	3
6	S.SENFTENBERG				S.LEXINGTON	1				S.HADAR	3
7					S.TENNESSEE	1				S.INFANTIS	3
8					S.TYPHIMURIUM	1				S.AGONA	2
9					SALMONELLA, OTHER	1				S.NEWPORT	2
10										S.PANAMA	2
11										S.SENFTENBERG	2
12										SALMONELLA, OTHER	57