

Chapter 2.5

REPORTS OF *SALMONELLA* IN POULTRY

Poultry are subject to a number of statutory and voluntary testing programmes for *Salmonella*. The Poultry Breeding Flocks and Hatcheries Order (PBFHO) 1993 requires regular monitoring of breeding flocks throughout their lifespan by bacteriological sampling of composite faeces at farms and testing of progeny at hatcheries, following standardised sampling protocols and laboratory methods. In addition to the statutory scheme, an increasing number of commercial companies operate voluntary testing schemes, particularly involving broiler production and table egg laying flocks. This is reflected in the data presented in Table 1 which show that, in contrast to other species, the largest number of reports of *Salmonella* from poultry are the result of surveillance activity rather than the investigation of clinical disease. Most incidents in poultry are therefore not associated with clinical disease but with identification of subclinical carriage of *Salmonella*.

The numbers of incidents and isolations of *Salmonella* reported from poultry species are shown at Tables 40, 41, 50, 51, 56, 57, 62 and 63. The uncertain effect of the GB epidemic of Foot and Mouth Disease on diagnostic sampling and laboratory submissions for *Salmonella* examination may limit the comparability of 2001 data with other years. Statutory monitoring of chicken breeding flocks and hatcheries for *Salmonella* continued during the FMD epidemic but with some disruption. The number of poultry diagnostic submissions to VLA/SAC laboratories fell by 34% in 2004 (1,206 submissions) compared to 2003 (1,825 submissions).

Vaccines against *Salmonella* Enteritidis and *S. Typhimurium* are now very widely used in the commercial layer sector and are also used in parent broiler breeders. Their use will have undoubtedly contributed to the control of *Salmonella* in poultry flocks.

The Zoonoses Regulation 2160/2003 came into force on the 21st December 2003 and requires that Member States put into place control plans for the monitoring and reduction of zoonoses at farm level, once the target to reduce the pathogen or infectious agent has been agreed. A mandatory survey of flocks of laying hens for *Salmonella* began on 1st October 2004. The United Kingdom is required to sample 436 premises, one flock per premises, over a twelve month period as per the agreed protocol to be implemented in all member states (2004/665/EC: Commission Decision). Faeces and dust samples are taken from the flocks at the end of lay and are timed to occur within nine weeks of depopulation. The samples taken in Great Britain are then tested at VLA

Weybridge and the results passed to Defra for submission to the Commission for further analysis to establish a baseline for the prevalence of *Salmonella* in flocks of laying hens in the Community.

Chickens

The June census reported that there were 131.7 million chickens in Great Britain reported in the June 2004 census, compared with 139.3 million in 2003 (a decrease of 5.5%). Table 40 shows the number of reported incidents of *Salmonella* in chickens in 2004 (685), which was 20% lower than in 2003 (853). The majority of incidents arose from voluntary surveillance of broiler flocks by the poultry industry. Because the amount of voluntary testing has increased by an unknown quantity in recent years it is difficult to interpret long term trends. Less than 20% of *Salmonella* reports in chickens are associated with clinical disease investigation.

Approximately 29,000 *Salmonella* tests were performed under the statutory monitoring requirements of the PBFHO 1993 and 78 (0.27%) were positive for *Salmonella*; this compares to 0.23% positive in 2003. The organism was isolated most frequently from day old chick carcasses and was only isolated from two out of 3335 composite faeces samples (0.06%) collected when the chicks were four weeks of age.

Only 16 incidents were reported as a result of this statutory monitoring of breeding flocks in 2004 (Table 1).

***Salmonella* Enteritidis**

Numbers of reports of this serovar had been declining steadily since 1997, except for a small increase in reports in 2003 (Table 40). In 2004 only 11 incidents were reported; declining from 45 in 2003. These represented 1.6% of *Salmonella* incidents in chickens. The reported phage types were: PT4 (six incidents), PT6 (two incidents), and one incident each of PTs 7, 11 and 35. There was one incident in a broiler flock (PT11) and ten incidents in laying flocks (six of PT4, two of PT6, one of PT7 and one of PT35).

***Salmonella* Typhimurium**

There were 11 reported incidents of *Salmonella* Typhimurium in 2004. Reports of *S. Typhimurium* represented 1.6% of all reports, a decrease compared with recent years (Fig 33). The most common phage type was DT104 (5 incidents: 46%). Other definitive types reported were: single

incidents of DTs 40, 41, 49, 56, 120 and 193. There were three reports of DT104 from layer flocks in 2004, and two from broiler flocks. There were no reports of *S. Typhimurium* in breeding flocks.

Other Serovars

The most common serovar isolated from chickens in 2004 was *S. Livingstone* (21.5% of all chicken incidents). In addition there were 85 reports of *S. 6,7:-:-*, which are related to *S. Livingstone* (these are not shown separately in Table 40, but are included under “structure only”). Reports of this serovar have risen in recent years.

The number of reports of *S. Virchow* more than halved compared with 2003. Of 30 incidents, the most common phage types were PT2 (63%) and PT4 (23%). The number and proportion of reports of *S. Senftenberg* rose slightly in 2004; it remains the second most commonly reported serovar. Other common serovars (4-6% of total each) were *S. Liverpool*, *S. Ohio*, *S. Kedougou* and *S. Thompson*. There were five reports of *S. 4,12:d:-* compared with 28 in 2003. These are possibly a variant of monomorphic *S. Schwarzengrund* and were largely associated with investigations in one company.

There were no reports of *S. Hadar* in 2004. There were two reports of *S. Pullorum* and eleven reports of *S. Newport* in 2004; none of the Newport isolates were associated with multiple antibiotic resistant strains (resistance to ≥ 4 antibiotics) and there was no evidence of resistance to third generation cephalosporins.

There was an increase in reports of *S. Give*, *S. Lexington*, *S. Thompson* and *S. Infantis* and a decrease in reports of *S. Montevideo*, *S. Goldcoast*, *S. Mbandaka* and *S. Bredeney*. *Salmonella* Dublin was reported for the first time since 2000, but it is believed that this was probably cross-contamination in the laboratory. *Salmonella* Saint Paul for the first time in the last five years. There were ten reports of *S. Lexington* in 2004. This serovar was also isolated from compound ruminant feed (Table 73), palm kernel and soya (Table 76).

National trends for *Salmonella* in chickens are difficult to interpret since a large proportion of reports of a specific serovar may originate from a small number of large integrated companies. Most incidents were identified by voluntary environmental sampling of broiler farms when the birds were two to five weeks of age, or monitoring of the environment at hatcheries.

Turkeys

Table 50 shows a decrease (30%) in the number of incidents of *Salmonella* reported in turkey flocks in 2004. 8% of reports were associated with clinical disease; the remainder arose through voluntary surveillance activities. The most common serovar reported in 2004 was *S. Typhimurium* (15.6% of incidents). Twenty nine of the 38 incidents (76%) involved DT104, and there were five reports of DT99, two of DT120 and single reports of DT41 and DT56.

There was a single isolation of *S. Enteritidis* from turkey flocks in 2004, which did not react with any of the phages in the typing scheme (UNTY).

The second most common serovar reported was *S. Newport* (15.2% of reports). There is little evidence for any trend over the last five years and no reported resistance to 3rd generation cephalosporins. Other common serovars reported were *S. Derby*, *S. Indiana*, *S. Kedougou* and *S. Kottbus*. Reports of *S. Kedougou* increased three-fold in 2004 to 8% of incidents. There were six reports of *S. Corvallis*, reported for the first time in 2003. There were three incidents of *S. Ajiobo* and two of *S. Rissen* which have not been reported in the last five years. *S. Dublin* was also reported for the first time since 2000. *S. Rissen* was isolated on three occasions from compound poultry feed (Table 75), and was frequently isolated from rape (Table 76). There were eight reports of *S. Hadar*, all PT10 and eleven reports of *S. Virchow* (10 of which were PT26, which was the same PT as all the incidents in 2003). There was a marked reduction in reports of *S. Montevideo* (4% of incidents) and decreases in reports of *S. Derby*, *S. Indiana* and *S. Hadar*.

Ducks and Geese

There were two reports of *Salmonella* from geese in 2003, one of which was an incident of *S. Enteritidis* PT4.

The increase in reports of *Salmonella* from ducks seen in recent years was sustained in 2004 – the number of reports increased by 21% compared with 2003. Reports from ducks represented 1.5% of all *Salmonella* reports in 2001 compared with 10.4% in 2003 and 15.0% in 2004. This is the result of enhanced voluntary surveillance activities by the duck industry (Table 1). Only a small number of incidents are associated with clinical disease investigation (2.2%).

The most common serovars reported were *S. Indiana* (26%), *S. Binza* (17%), *S. Livingstone* (19%), *S. Hadar* (9%), and *S. Orion* (8%) . The relative proportion of these serovars changed slightly from 2003, with

incidents of *S. Livingstone* increasing markedly. The number, and proportion, of isolates of *S. Hadar* increased slightly; the most common phage types were PT2, PT11 and PT22. A variety of other serovars were reported, the number of incidents of *S. Binza* and *S. Kedougou* increased compared with 2003. *S. Idikan* and *S. Newport* were both reported for the first time in the last five years.

There were seven reports of *S. Typhimurium*, a slight decrease over previous years. The most common phage type was DT8 (five reports) and there were single reports of DT30 and DT41. There were no reports of DT104 or DT104b. There were six reports of *S. Enteritidis* in ducks, three of PT9b, two of PT1 and a single report of PT35.

Game Birds

Reports of *Salmonella* in game birds decreased further in 2004 to only 13, continuing a long term trend. Most reports were associated with clinically diseased pheasants and, as in previous years, most reports were *S. Binza* or *S. Orion* (62%). There were two reports of *S. Typhimurium* (DT104 and U310) which were from pheasants. There was a single reported isolation of *S. Pullorum* (untyped) associated with clinical disease in pheasants. There were no reports of *S. Enteritidis* in game birds.

Table 40: *Salmonella* in chickens on all premises

<i>Salmonella</i> Incidents (Isolations)	2000	2001*	2002	2003	2004
ENTERICA ENTERICA					
Agama	4 (4)	2 (2)	1 (1)	6 (6)	1 (1)
Agona	18 (18)	14 (15)	3 (3)	4 (4)	2 (2)
Ajiobo	- (-)	- (-)	1 (1)	1 (1)	- (-)
Anatum	4 (4)	7 (7)	1 (1)	6 (6)	- (-)
Binza	8 (9)	24 (26)	54 (57)	6 (6)	1 (1)
Braenderup	- (-)	- (-)	1 (1)	2 (2)	1 (1)
Brandenburg	- (-)	- (-)	- (-)	16 (18)	19 (22)
Bredenev	53 (58)	6 (6)	12 (13)	11 (11)	- (-)
Carno	- (-)	- (-)	- (-)	1 (1)	- (-)
Champaign	1 (1)	- (-)	- (-)	- (-)	- (-)
Cubana	- (-)	1 (1)	- (-)	1 (1)	- (-)
Derby	- (-)	3 (4)	3 (4)	1 (2)	- (-)
Dublin	1 (1)	- (-)	- (-)	- (-)	1 (1)
Ealing	- (-)	1 (1)	- (-)	- (-)	- (-)
Eimsbuettel	- (-)	6 (7)	1 (1)	- (-)	- (-)
Enteritidis	11 (23)	7 (7)	11 (15)	45 (47)	11 (12)
Give	144 (160)	18 (18)	18 (18)	6 (6)	28 (28)
Goldcoast	- (-)	1 (1)	10 (11)	9 (9)	- (-)
Hadar	39 (53)	6 (8)	17 (17)	7 (7)	- (-)
Havana	1 (1)	2 (2)	2 (2)	10 (10)	5 (5)
Heidelberg	63 (83)	50 (57)	23 (23)	2 (2)	- (-)
Idikan	- (-)	1 (1)	1 (1)	- (-)	2 (2)
Indiana	8 (12)	7 (12)	7 (8)	4 (4)	8 (8)
Infantis	- (-)	3 (5)	3 (3)	9 (9)	18 (18)
Kedougou	81 (86)	42 (49)	60 (70)	47 (48)	33 (33)
Kentucky	12 (19)	10 (15)	2 (3)	- (-)	5 (5)
Kottbus	6 (7)	2 (2)	1 (1)	5 (5)	5 (5)
Larochelle	16 (18)	2 (2)	2 (2)	- (-)	- (-)
Lexington	- (-)	1 (1)	1 (1)	- (-)	10 (10)
Lille	- (-)	1 (1)	- (-)	- (-)	- (-)
Liverpool	31 (31)	60 (73)	31 (35)	27 (27)	41 (46)
Livingstone	47 (61)	75 (90)	122 (200)	145 (147)	147 (150)
Manhattan	2 (3)	- (-)	- (-)	- (-)	- (-)
Mbandaka	42 (50)	58 (78)	51 (58)	47 (49)	22 (22)
Meleagridis	- (-)	- (-)	- (-)	1 (1)	1 (1)
Montevideo	74 (121)	56 (94)	56 (112)	48 (48)	15 (15)
New Brunswick	- (-)	1 (1)	- (-)	- (-)	- (-)
Newport	13 (14)	5 (5)	8 (10)	7 (7)	11 (11)

Table 40: *Salmonella* in chickens on all premises

<i>Salmonella</i> Incidents (Isolations)	2000	2001*	2002	2003	2004
ENTERICA ENTERICA					
Ohio	35 (65)	23 (27)	38 (49)	32 (32)	30 (30)
Orion	- (-)	- (-)	15 (15)	3 (3)	1 (1)
Panama	1 (1)	- (-)	- (-)	- (-)	- (-)
Poona	1 (1)	1 (1)	- (-)	- (-)	- (-)
Pullorum	2 (2)	1 (1)	1 (1)	2 (2)	2 (3)
Reading	- (-)	- (-)	- (-)	1 (1)	1 (1)
Saint Paul	- (-)	- (-)	- (-)	- (-)	2 (2)
Senftenberg	256 (351)	146 (263)	107 (150)	72 (72)	78 (79)
Stanley	- (-)	- (-)	1 (1)	1 (1)	- (-)
Stourbridge	- (-)	- (-)	- (-)	1 (1)	- (-)
Taksony	- (-)	- (-)	1 (1)	- (-)	- (-)
Tennessee	- (-)	1 (1)	4 (4)	7 (7)	2 (2)
Thomasville	- (-)	1 (1)	- (-)	- (-)	- (-)
Thompson	74 (76)	57 (57)	31 (31)	12 (12)	30 (38)
Typhimurium	41 (56)	54 (64)	36 (44)	19 (21)	11 (12)
Virchow	30 (33)	23 (24)	47 (48)	72 (77)	30 (32)
Wangata	- (-)	- (-)	1 (1)	- (-)	- (-)
Worthington	3 (3)	1 (1)	- (-)	1 (1)	- (-)
UNSPECIFIED					
untypeable	1 (1)	- (-)	- (-)	- (-)	- (-)
structure only	52 (52)	90 (113)	82 (92)	152 (157)	107 (110)
rough strain	6 (6)	3 (3)	2 (2)	4 (5)	3 (3)
Untyped	5 (5)	- (-)	- (-)	- (-)	- (-)
TOTAL	1186 (1489)	873 (1147)	869 (1111)	853 (876)	684 (712)

* 2001 data may not be comparable due to impact of FMD epidemic

Fig 28: Incidents in *Salmonella* serotypes in chickens in 2004

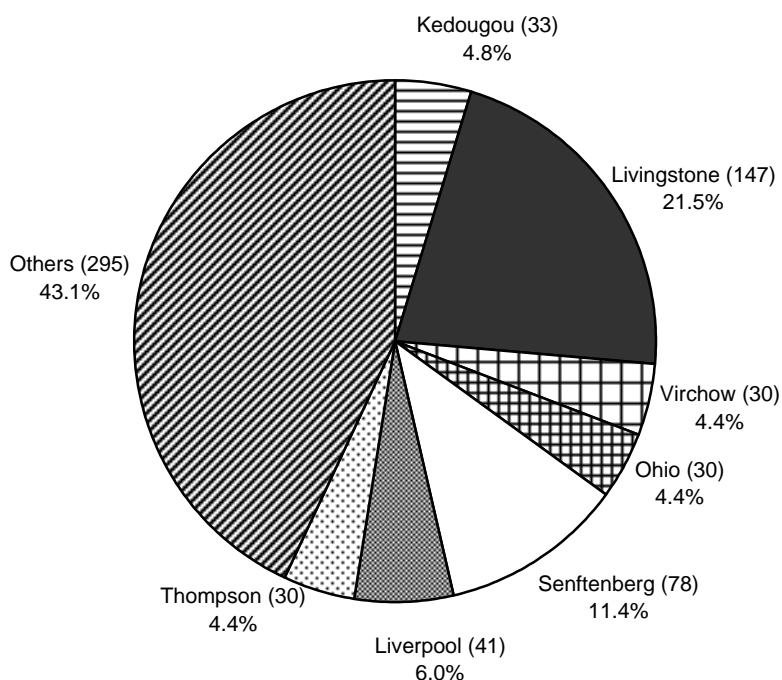
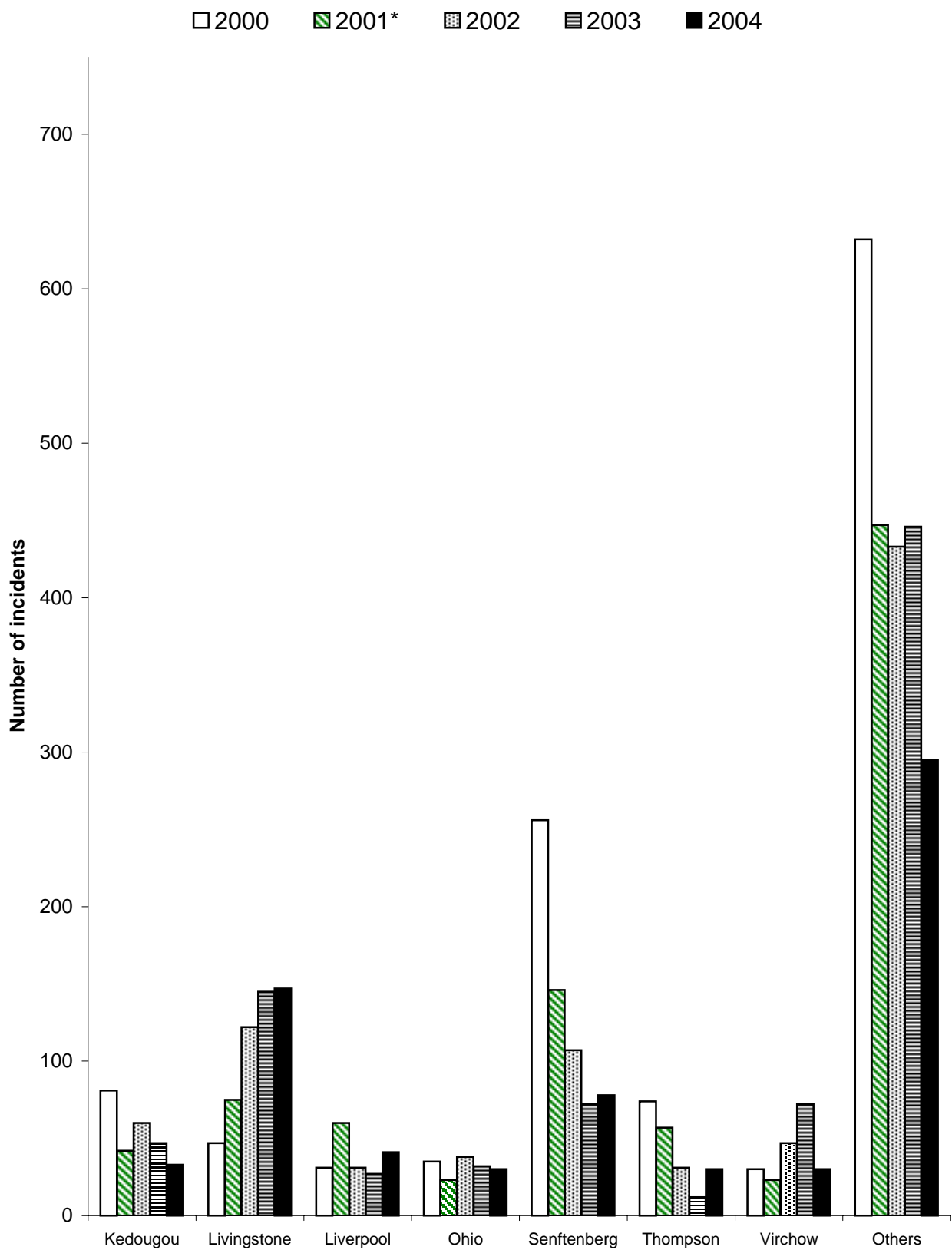


Table 41: Incidents of the top 5 *Salmonella* serotypes in chickens in 2004 as a % of all incidents compared to previous years

Serotype	2000	2001	2002	2003	2004
S. Livingstone %	4.0	8.6	14.0	17.0	21.3
S. Senftenberg %	21.6	16.7	12.3	8.4	11.4
S. Liverpool %	2.6	6.9	3.6	3.2	5.8
S. Kedougou %	6.8	4.8	6.9	5.5	4.8
S. Ohio %	3.0	2.6	4.4	3.8	4.4
S. Thompson %	6.2	6.5	3.6	2.2	4.4
S. Virchow %	2.5	2.6	5.4	8.4	4.4
Total no. incidents	1186	873	869	853	684

Fig 29: Incidents of *Salmonella* serotypes in chickens (2000 - 2004)



* 2001 data may not be comparable due to uncertain impact of FMD epidemic

Table 42: S. Typhimurium in chickens on all premises

Definitive Types Incidents (Isolations)	2000	2001*	2002	2003	2004
2	- (-)	- (-)	- (-)	1 (1)	- (-)
12	- (-)	- (-)	- (-)	1 (1)	- (-)
40	1 (1)	- (-)	- (-)	- (-)	1 (1)
41	- (-)	- (-)	- (-)	1 (1)	1 (1)
49	- (-)	- (-)	- (-)	1 (1)	1 (1)
56	- (-)	- (-)	- (-)	- (-)	1 (1)
85	1 (1)	- (-)	1 (1)	- (-)	- (-)
104	24 (33)	30 (34)	24 (30)	11 (11)	5 (6)
104b	7 (10)	5 (6)	- (-)	- (-)	- (-)
120	- (-)	2 (2)	- (-)	- (-)	1 (1)
193	1 (1)	- (-)	1 (1)	2 (2)	1 (1)
193a	- (-)	- (-)	- (-)	2 (2)	- (-)
208	2 (2)	- (-)	1 (1)	- (-)	- (-)
U302	2 (5)	9 (12)	6 (8)	2 (2)	- (-)
U317	- (-)	- (-)	- (-)	1 (1)	- (-)
RDNC	- (-)	3 (3)	1 (1)	- (1)	- (-)
UNTY	3 (3)	5 (7)	2 (2)	- (1)	- (-)
TOTAL	41 (56)	54 (64)	36 (44)	22 (24)	11 (12)

* 2001 data may not be comparable due to impact of FMD epidemic

Fig 30: Incidents of *Salmonella* Typhimurium definitive types in chickens in 2004

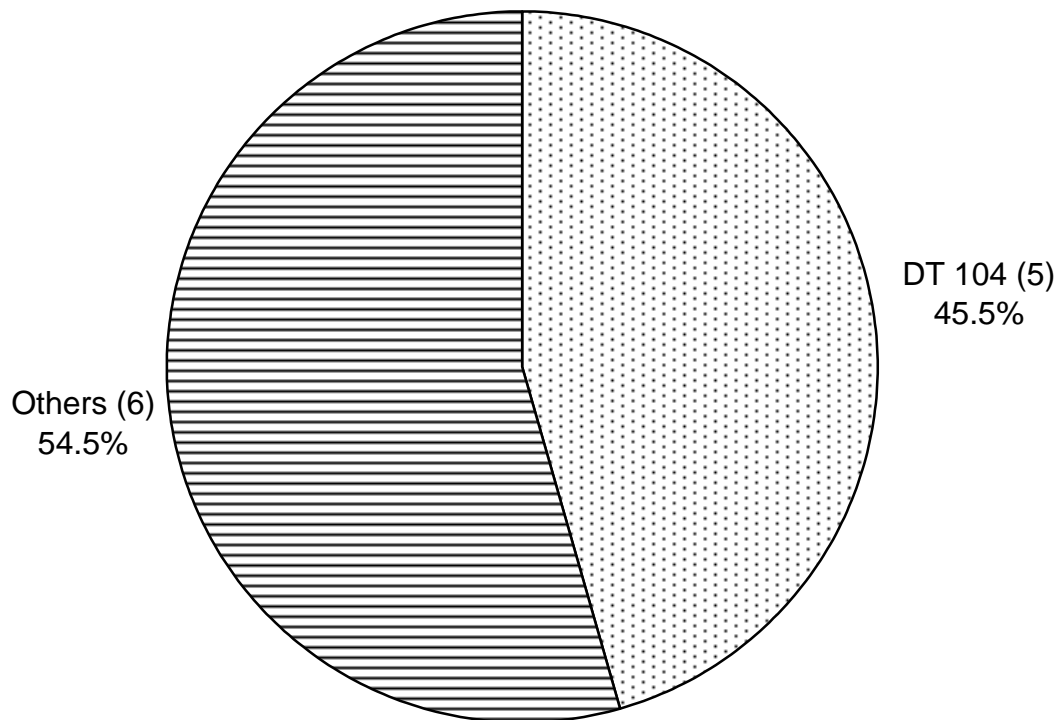
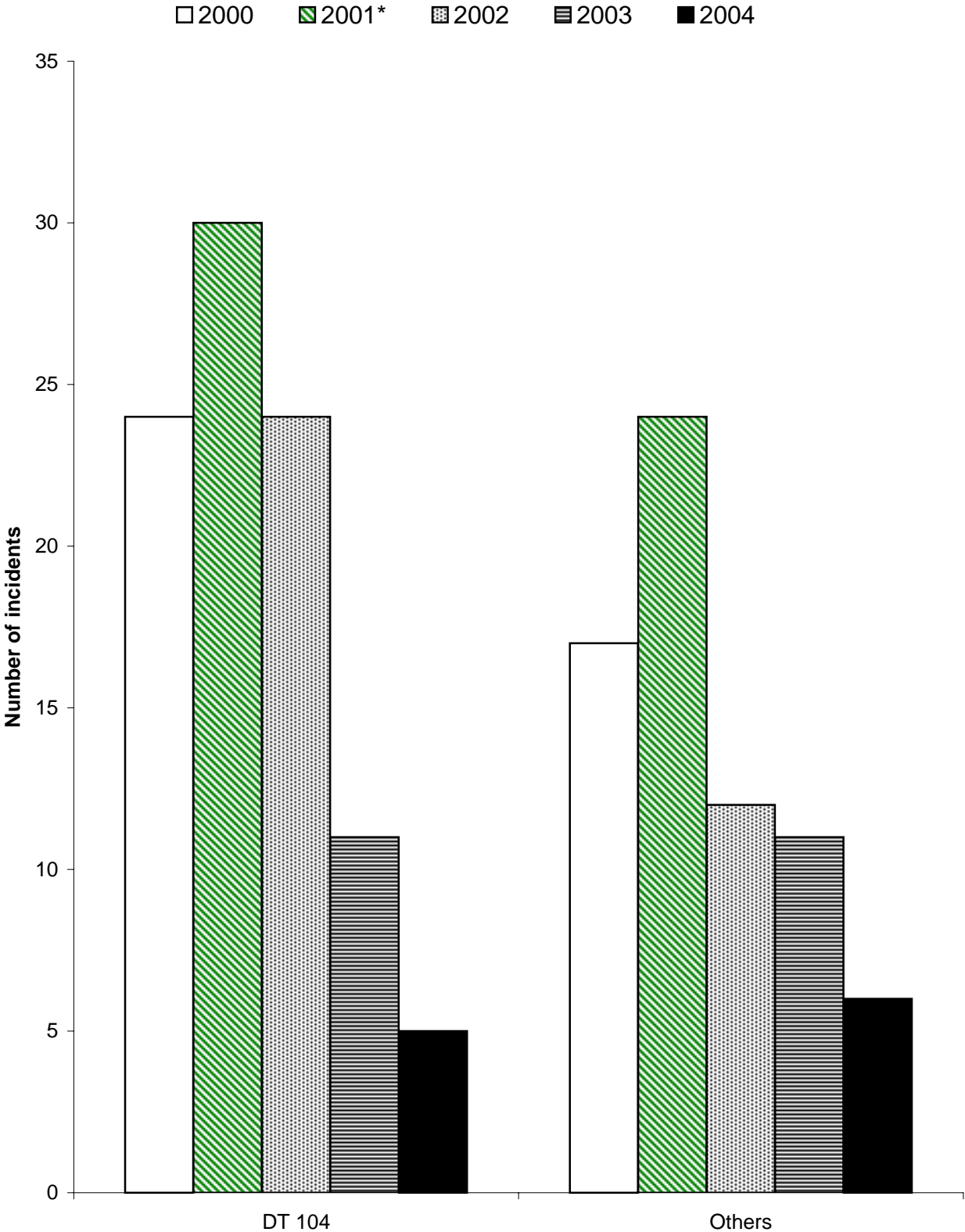


Fig 31: Incidents of *Salmonella* Typhimurium definitive types in chickens (2000 - 2004)



* 2001 data may not be comparable due to uncertain impact of FMD epidemic

Table 43: Incidents of *S. Typhimurium* definitive types in chickens in 2004 by flock type

	Number of incidents by definitive type				Total
	DT 104	DT 120	DT 193	Others	
Breeding flocks	0	0	0	0	0
Broiler production flocks	2	0	0	1	3
Egg layer flocks	3	1	1	3	8

**Fig 44: Contamination rate: imported processed animal protein
(batches tested) 1995 - 2004**

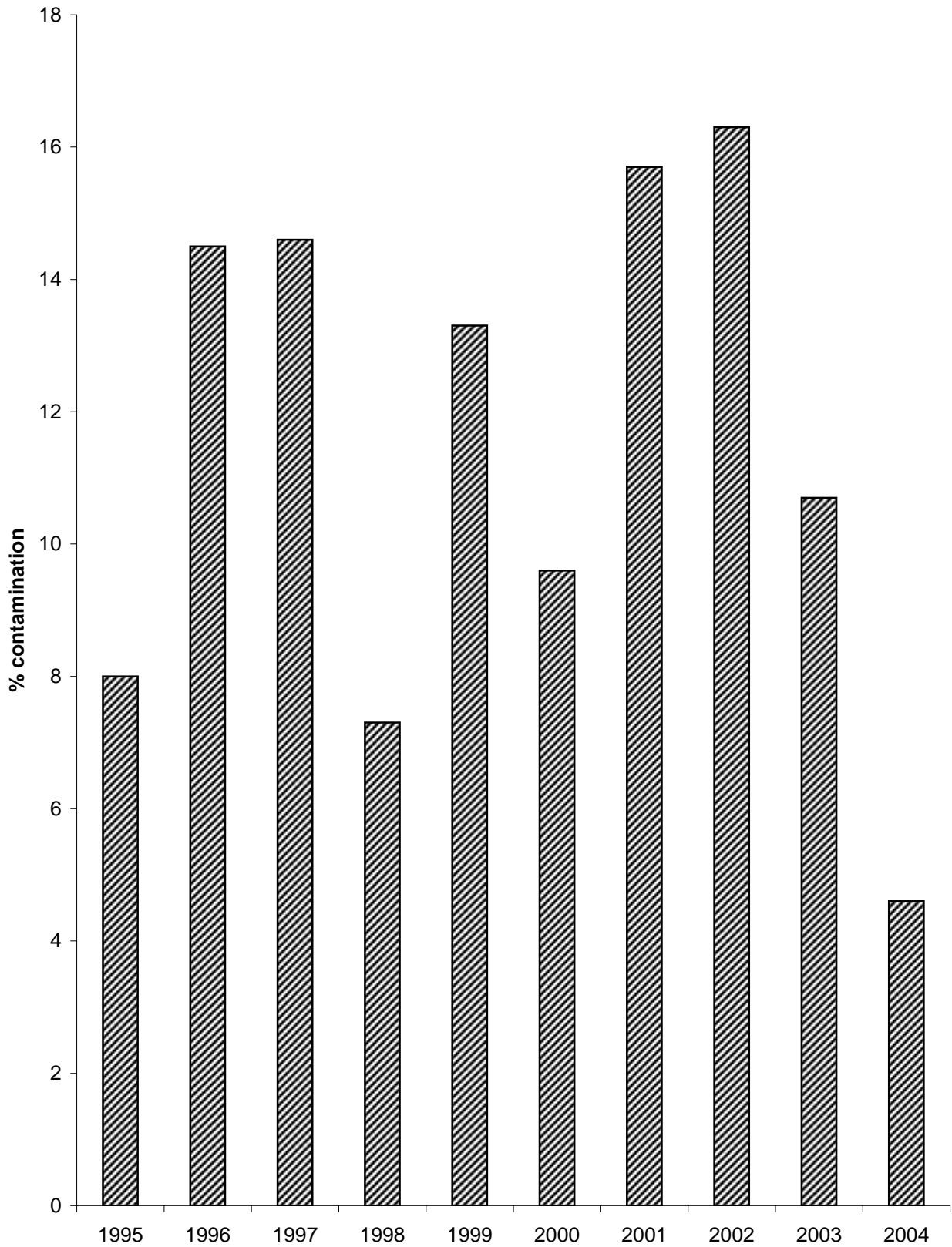
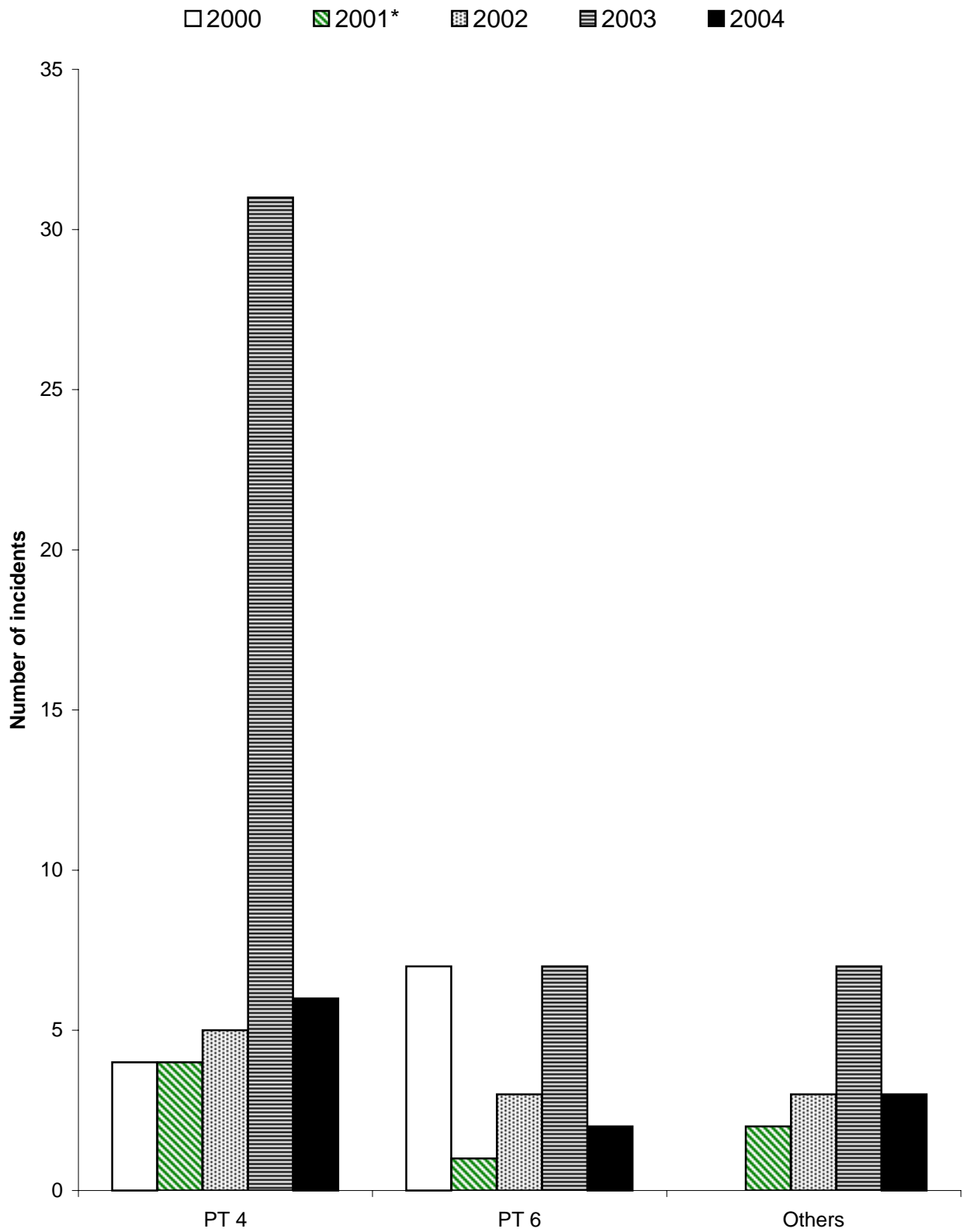


Fig 32: Incidents of *Salmonella* Enteritidis phage types in chickens (2000 - 2004)



* 2001 data may not be comparable due to uncertain impact of FMD epidemic

Fig 33: S. Enteritidis and S. Typhimurium as a proportion of all incident reports in chickens (1985 - 2004)

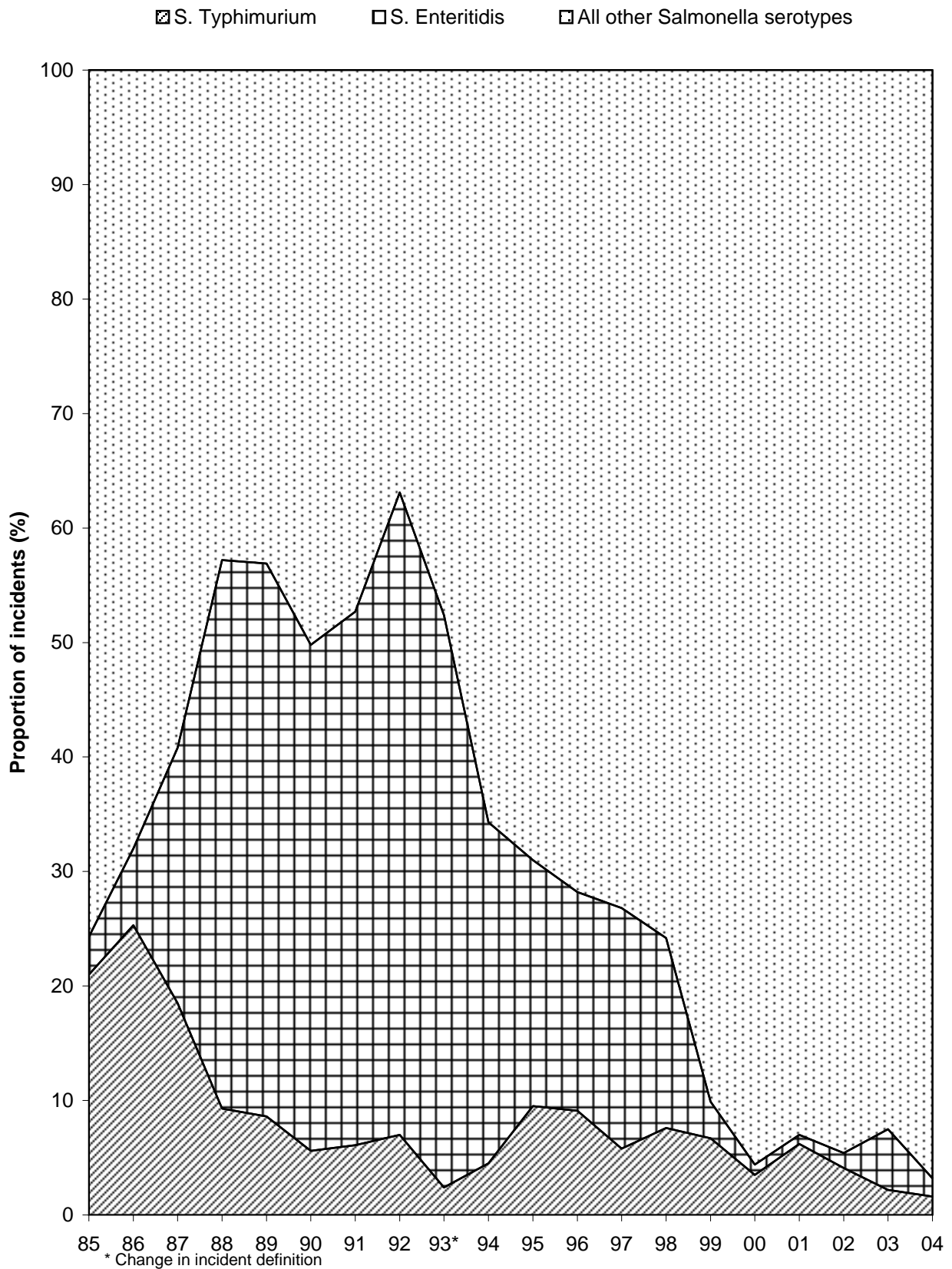


Table 45: Incidents of *S. Enteritidis* phage types in chickens in 2004 by flock type

	Number of incidents by phage type			Total
	PT 4	PT 6	Others	
Breeding flocks	0	0	0	0
Broiler production flocks	0	0	1	1
Egg layer flocks	6	2	2	10

Table 46: S. Hadar in chickens on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
2	1 (1)	1 (1)	1 (1)	- (-)	- (-)
5	13 (15)	- (-)	- (-)	- (-)	- (-)
9	- (-)	- (-)	- (-)	2 (2)	- (-)
10	1 (1)	1 (1)	1 (1)	2 (2)	- (-)
11	1 (1)	- (-)	- (-)	- (-)	- (-)
14	1 (1)	- (-)	1 (1)	- (-)	- (-)
17	1 (1)	- (-)	- (-)	- (-)	- (-)
22	7 (7)	1 (1)	3 (3)	- (-)	- (-)
41	10 (22)	3 (5)	- (-)	- (-)	- (-)
50	1 (1)	- (-)	- (-)	- (-)	- (-)
58a	- (-)	- (-)	- (-)	3 (3)	- (-)
RDNC	- (-)	- (-)	6 (6)	- (-)	- (-)
NOPT	3 (3)	- (-)	5 (5)	- (-)	- (-)
TOTAL	39 (53)	6 (8)	17 (17)	7 (7)	- (-)

Table 47: S. Pullorum in chickens on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
1	2 (2)	- (-)	- (-)	1 (1)	2 (2)
7	- (-)	1 (1)	- (-)	- (-)	- (-)
15	- (-)	- (-)	- (-)	1 (1)	- (-)
NOPT	- (-)	- (-)	1 (1)	- (-)	- (-)
untyped	- (-)	- (-)	- (-)	- (-)	- (1)
TOTAL	2 (2)	1 (1)	1 (1)	2 (2)	2 (3)

* 2001 data may not be comparable due to impact of FMD epidemic

Table 48: S. Thompson in chickens on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
1	1 (1)	1 (1)	2 (2)	1 (1)	- (-)
1a	14 (14)	24 (24)	6 (6)	4 (4)	12 (12)
3	1 (1)	1 (1)	1 (1)	- (-)	- (-)
6	1 (1)	4 (4)	9 (9)	7 (8)	19 (19)
11	- (-)	- (-)	- (-)	- (-)	1 (1)
14	- (-)	1 (1)	- (-)	1 (1)	- (-)
23	- (-)	1 (1)	- (-)	- (-)	- (-)
49	- (-)	- (-)	- (-)	- (-)	1 (1)
RDNC	1 (1)	2 (2)	1 (1)	- (-)	- (1)
NOPT	55 (57)	23 (23)	12 (12)	- (-)	- (-)
Untyped	1 (1)	- (-)	- (-)	- (-)	- (8)
TOTAL	74 (76)	57 (57)	31 (31)	13 (14)	33 (42)

Table 49: S. Virchow in chickens on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
2	6 (6)	8 (8)	22 (22)	51 (53)	19 (19)
4	1 (2)	3 (3)	9 (9)	17 (17)	7 (7)
26	4 (5)	5 (6)	- (-)	4 (4)	2 (2)
31	- (-)	1 (1)	- (-)	- (-)	- (-)
35	6 (7)	2 (2)	- (-)	1 (1)	2 (2)
37	- (-)	1 (1)	- (-)	- (-)	- (-)
57	- (-)	- (-)	- (-)	1 (1)	- (-)
RDNC	- (-)	1 (1)	- (-)	- (1)	- (-)
NOPT	13 (13)	2 (2)	16 (17)	- (2)	- (1)
untyped	- (-)	- (-)	- (-)	- (-)	- (1)
TOTAL	30 (33)	23 (24)	47 (48)	74 (79)	30 (32)

* 2001 data may not be comparable due to impact of FMD epidemic

Table 50: *Salmonella* in turkeys on all premises

<i>Salmonella</i> Incidents (Isolations)	2000		2001*		2002		2003		2004	
ENTERICA ENTERICA										
Agama	2	(3)	1	(3)	-	(-)	-	(-)	2	(3)
Agona	30	(38)	46	(58)	9	(10)	22	(22)	15	(17)
Ajiobo	-	(-)	-	(-)	-	(-)	-	(-)	3	(3)
Anatum	-	(-)	-	(-)	2	(2)	-	(-)	-	(-)
Binza	15	(24)	11	(13)	2	(2)	-	(-)	1	(1)
Braenderup	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
Bredeney	1	(1)	-	(-)	1	(2)	6	(6)	3	(3)
Champaign	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
Corvallis	-	(-)	-	(-)	-	(-)	3	(3)	6	(6)
Derby	39	(69)	36	(50)	18	(22)	39	(41)	20	(21)
Dublin	1	(1)	-	(-)	-	(-)	-	(-)	2	(2)
Enteritidis	-	(-)	1	(1)	-	(-)	-	(-)	-	(1)
Fischerkietz	17	(21)	2	(3)	1	(1)	-	(-)	2	(2)
Goldcoast	2	(8)	2	(4)	-	(-)	1	(1)	-	(-)
Hadar	7	(7)	1	(1)	4	(4)	14	(14)	8	(9)
Hato	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Heidelberg	8	(11)	-	(-)	-	(-)	-	(-)	-	(-)
Indiana	9	(12)	20	(22)	9	(11)	35	(39)	23	(23)
Infantis	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Kedougou	4	(4)	4	(5)	-	(-)	6	(6)	19	(19)
Kentucky	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Kottbus	10	(10)	15	(16)	5	(5)	29	(31)	27	(28)
Larochelle	5	(6)	-	(-)	-	(-)	1	(1)	-	(-)
Manhattan	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Mbandaka	2	(2)	-	(-)	1	(1)	-	(-)	1	(1)
Meleagridis	-	(-)	-	(-)	1	(1)	1	(1)	-	(-)
Menston	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Montevideo	14	(20)	32	(36)	14	(16)	64	(65)	9	(9)
Newport	21	(28)	15	(16)	22	(22)	33	(33)	37	(37)
Orion	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Poona	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Rissen	-	(-)	-	(-)	-	(-)	-	(-)	2	(2)

Table 50: *Salmonella* in turkeys on all premises

<i>Salmonella</i> Incidents (Isolations)	2000		2001*		2002		2003		2004	
ENTERICA ENTERICA										
Saint Paul	2	(2)	-	(-)	2	(2)	-	(-)	-	(-)
Schwarzengrund	5	(6)	3	(4)	1	(2)	2	(2)	-	(-)
Senftenberg	12	(15)	7	(10)	2	(2)	-	(-)	-	(-)
Stanley	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Taksony	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Teddington	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Typhimurium	30	(47)	35	(40)	23	(34)	37	(39)	38	(46)
Virchow	-	(-)	-	(-)	-	(-)	13	(13)	11	(11)
UNSPECIFIED										
structure only	8	(13)	1	(3)	1	(1)	28	(28)	10	(14)
rough strain	3	(4)	2	(2)	1	(1)	8	(9)	1	(1)
Untyped	-	(-)	1	(1)	1	(1)	-	(-)	-	(-)
TOTAL	253	(358)	237	(290)	122	(144)	345	(357)	243	(262)

* 2001 data may not be comparable due to impact of FMD epidemic

Fig 34: Incidents of *Salmonella* serotypes in turkeys in 2004

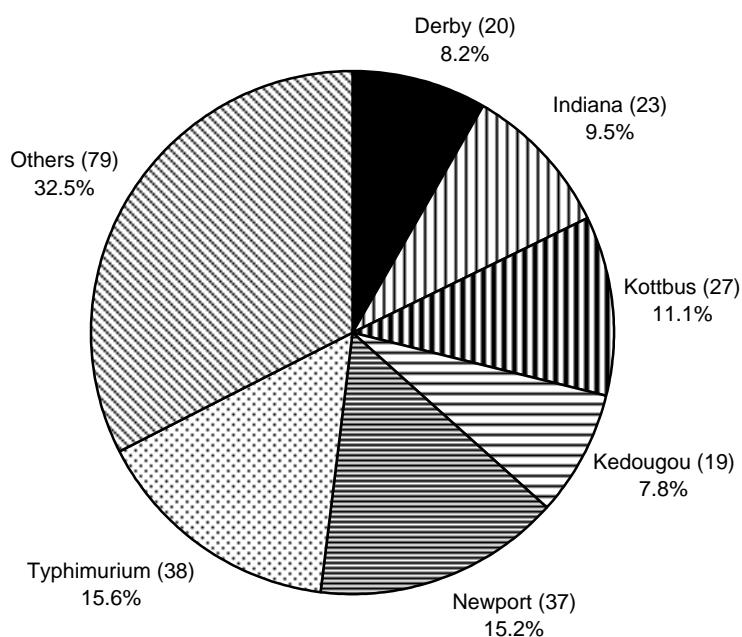
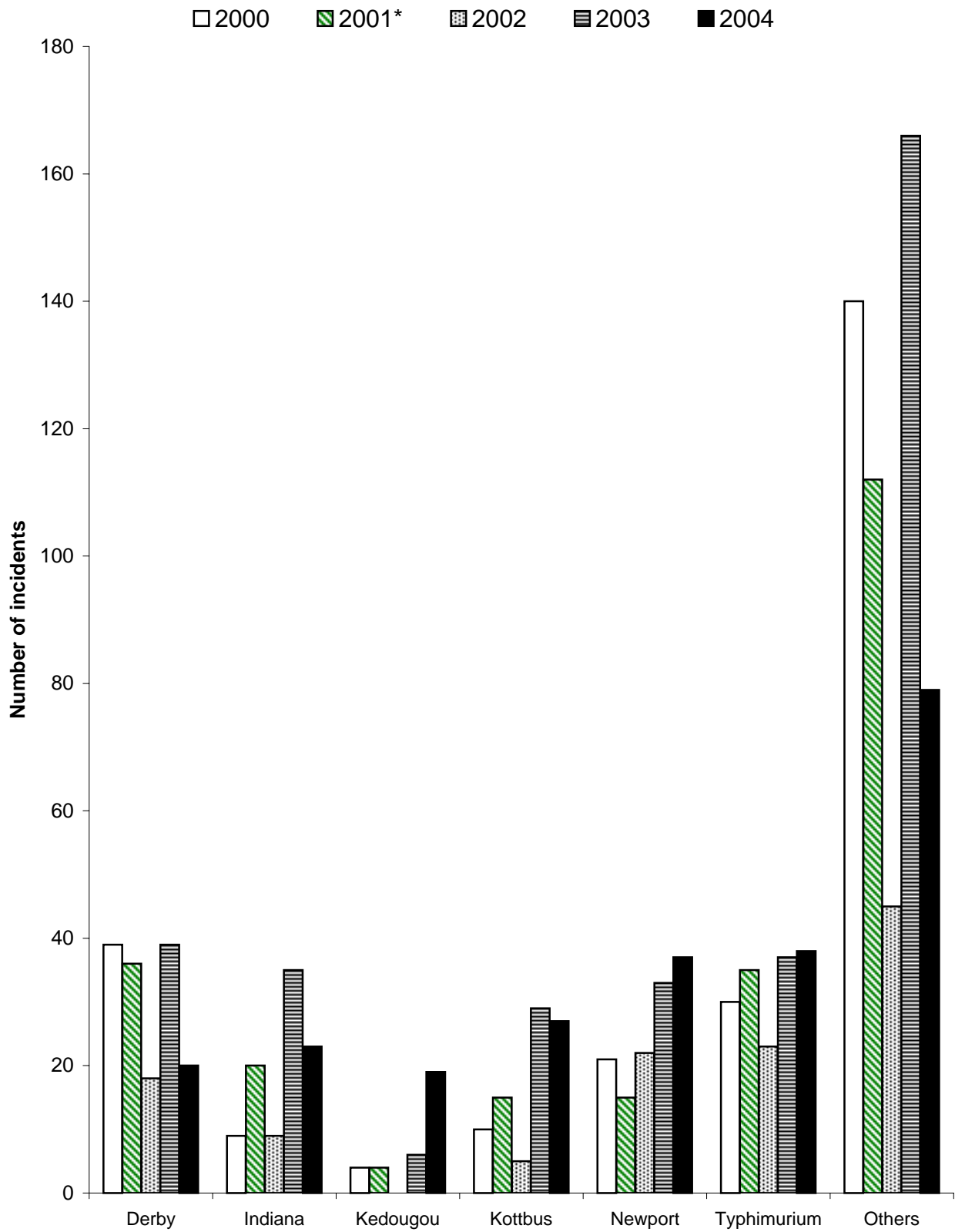


Table 51: Incidents of the top 6 *Salmonella* serotypes in turkeys in 2004 as a % of all incidents compared to previous years

Serotype	2000	2001	2002	2003	2004
S. Typhimurium %	11.9	14.8	18.8	10.7	15.6
S. Newport %	8.3	6.3	18.0	9.6	15.2
S. Kottbus %	4.0	6.3	4.1	8.4	11.1
S. Indiana %	3.6	8.4	7.4	10.1	9.5
S. Derby %	15.4	15.2	14.8	11.3	8.2
S. Kedougou %	1.6	1.7	0.0	1.7	7.8
Total no. incidents	253	237	122	345	243

Fig 35: Incidents of *Salmonella* serotypes in turkeys (2000 - 2004)



* 2001 data may not be comparable due to uncertain impact of FMD epidemic

Table 52: S. Typhimurium in turkeys on all premises

Definitive Types Incidents (Isolations)	2000	2001*	2002	2003	2004
2	- (-)	1 (1)	- (-)	- (-)	- (-)
30	1 (1)	1 (1)	- (-)	- (-)	- (-)
40	1 (3)	- (-)	- (-)	- (-)	- (-)
41	- (-)	- (-)	- (-)	- (-)	1 (1)
56	- (-)	1 (1)	- (-)	- (-)	1 (1)
99	- (-)	1 (1)	- (-)	- (-)	5 (6)
104	10 (13)	16 (18)	17 (28)	36 (38)	29 (31)
104b	11 (21)	7 (7)	- (-)	- (-)	- (-)
120	- (-)	- (-)	1 (1)	- (-)	2 (2)
193	2 (4)	1 (1)	- (-)	- (-)	- (-)
U288	- (-)	- (-)	- (-)	1 (1)	- (-)
U302	- (-)	6 (9)	1 (1)	- (-)	- (-)
U308a	- (-)	- (-)	1 (1)	- (-)	- (-)
NOPT	- (-)	- (-)	2 (2)	- (-)	- (-)
RDNC	- (-)	- (-)	- (-)	- (-)	- (2)
UNTY	5 (5)	1 (1)	1 (1)	- (-)	- (1)
untyped	- (-)	- (-)	- (-)	- (-)	- (2)
TOTAL	30 (47)	35 (40)	23 (34)	37 (39)	38 (46)

* 2001 data may not be comparable due to impact of FMD epidemic

Fig 36: Incidents of *Salmonella* Typhimurium definitive types in turkeys in 2004

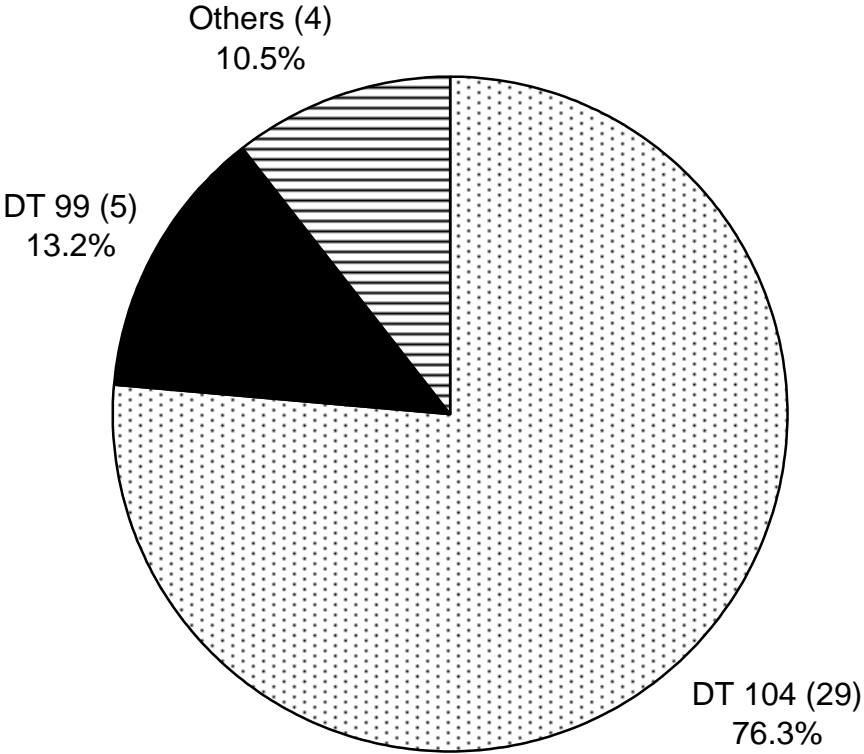
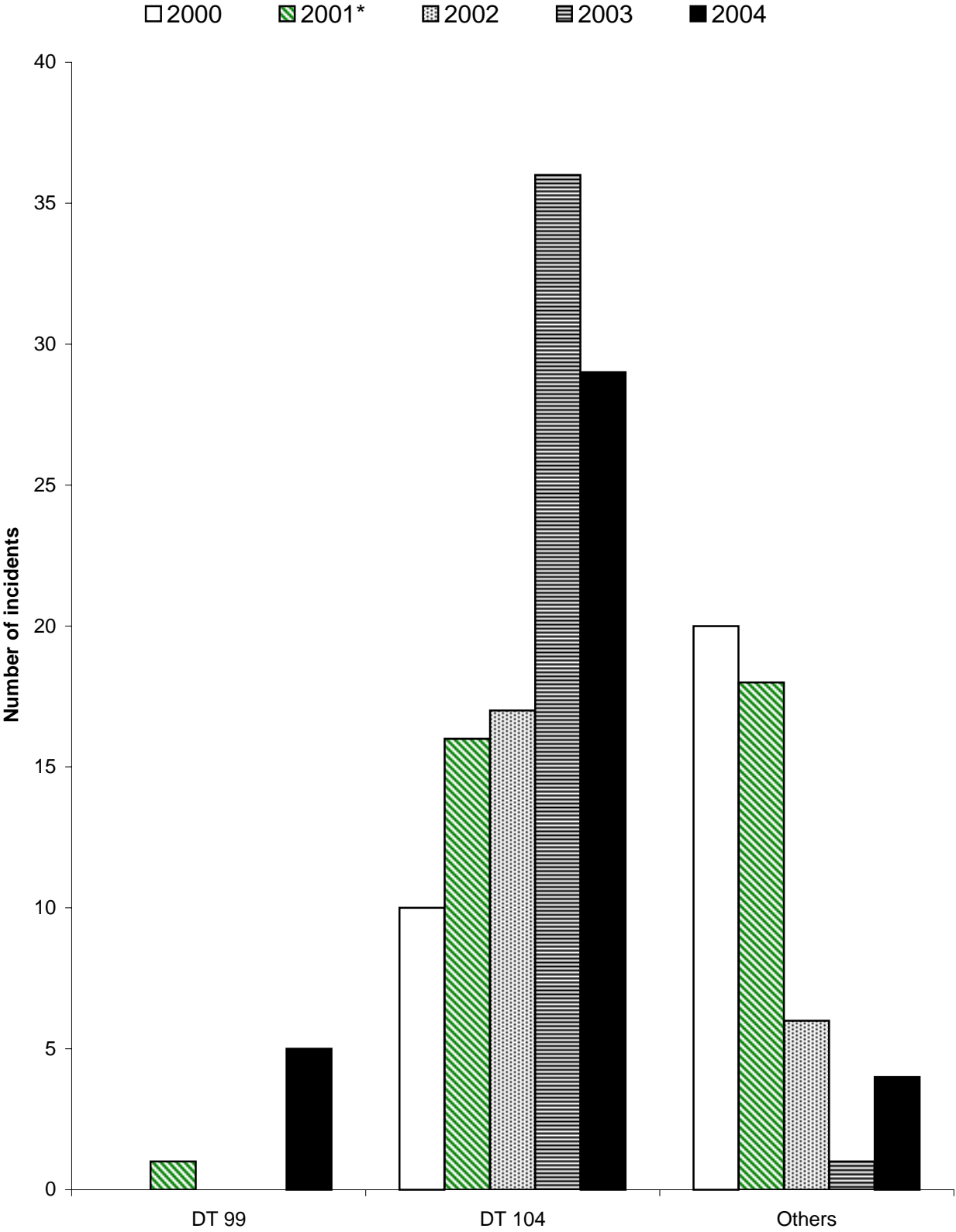


Fig 37: Incidents of *Salmonella* Typhimurium definitive types in turkeys (2000 - 2004)



* 2001 data may not be comparable due to uncertain impact of FMD epidemic

Fig 38 : S. Enteritidis and S. Typhimurium as a proportion of all reports in turkeys (1985 - 2004)

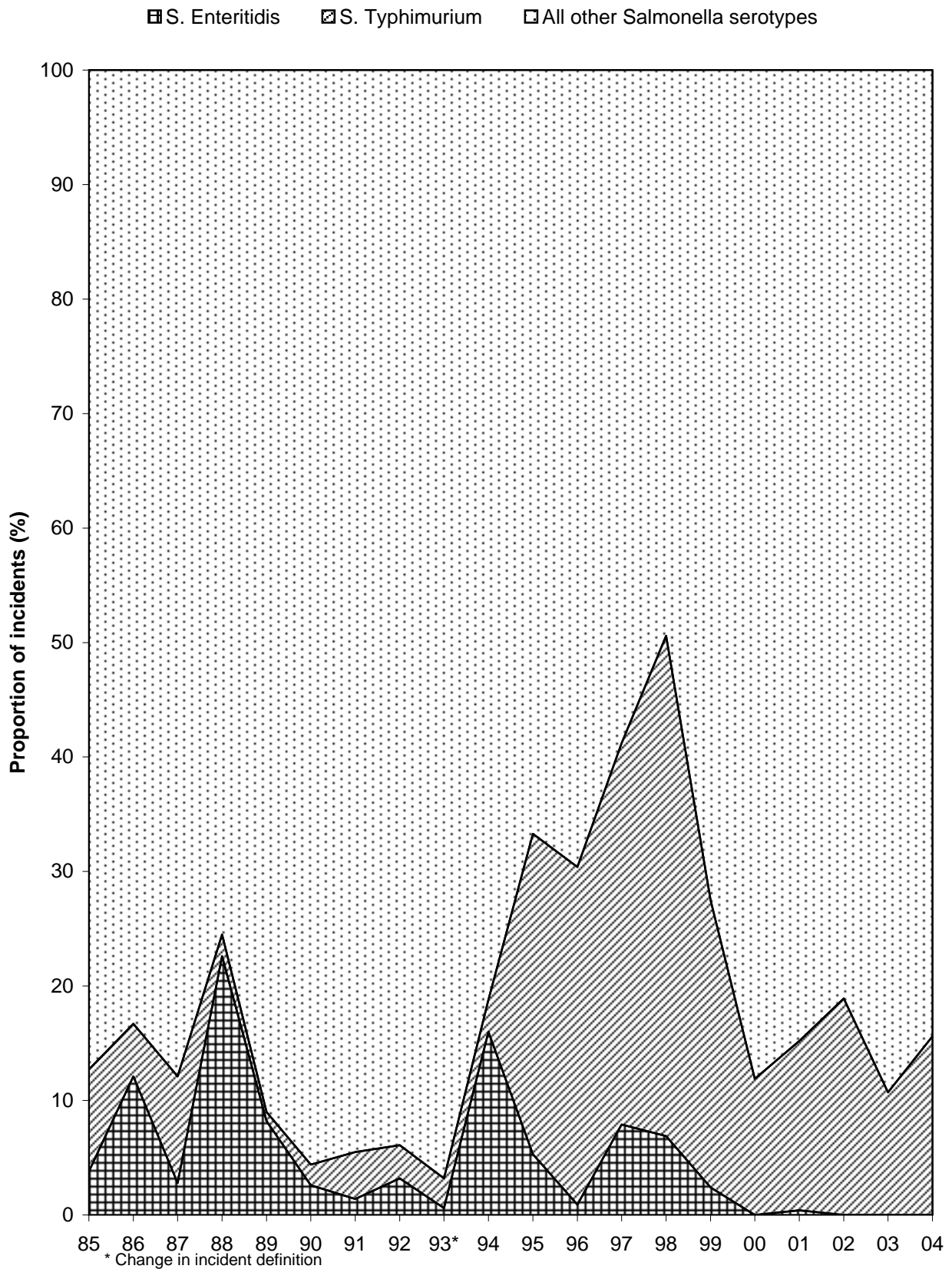


Table 53: S. Enteritidis in turkeys on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
4	- (-)	1 (1)	- (-)	- (-)	- (-)
UNTY	- (-)	- (-)	- (-)	- (-)	- (1)
TOTAL	- (-)	1 (1)	- (-)	- (-)	- (1)

Table 54: S. Hadar in turkeys on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
2	3 (3)	- (-)	1 (1)	1 (1)	- (-)
4	1 (1)	- (-)	- (-)	- (-)	- (-)
10	1 (1)	1 (1)	1 (1)	12 (12)	8 (8)
18	- (-)	- (-)	- (-)	1 (1)	- (-)
NOPT untyped	2 (2) - (-)	- (-) - (-)	2 (2) - (-)	- (-) - (-)	- (-) - (1)
TOTAL	7 (7)	1 (1)	4 (4)	14 (14)	8 (9)

Table 55: S. Virchow in turkeys on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
19	- (-)	- (-)	- (-)	- (-)	1 (1)
26	- (-)	- (-)	- (-)	13 (13)	10 (10)
TOTAL	- (-)	- (-)	- (-)	13 (13)	11 (11)

* 2001 data may not be comparable due to impact of FMD epidemic

Table 56: *Salmonella* in ducks & geese on all premises

<i>Salmonella</i> Incidents (Isolations)	2000	2001*	2002	2003	2004
ENTERICA ENTERICA					
Agona	- (-)	- (-)	1 (1)	3 (3)	2 (3)
Anatum	- (-)	- (-)	1 (1)	- (-)	3 (3)
Binza	- (-)	3 (3)	30 (55)	71 (73)	82 (86)
Bredeney	- (-)	- (-)	1 (1)	- (-)	- (-)
Derby	- (-)	- (-)	1 (1)	2 (2)	2 (2)
Enteritidis	17 (18)	13 (14)	11 (14)	6 (6)	7 (8)
Give	- (-)	- (-)	13 (13)	23 (23)	16 (16)
Goldcoast	- (-)	- (-)	3 (3)	2 (2)	2 (2)
Hadar	- (-)	1 (1)	27 (35)	31 (33)	46 (58)
Havana	- (-)	- (-)	2 (4)	6 (6)	5 (5)
Idikan	- (-)	- (-)	- (-)	- (-)	1 (1)
Indiana	3 (3)	4 (4)	62 (89)	128 (133)	131 (137)
Kedougou	- (-)	- (-)	4 (4)	22 (22)	31 (33)
Kottbus	3 (3)	1 (2)	3 (3)	4 (4)	5 (5)
Livingstone	2 (2)	- (-)	15 (20)	47 (47)	96 (98)
Muenchen	- (-)	- (-)	1 (1)	- (-)	- (-)
Newport	- (-)	- (-)	- (-)	- (-)	1 (1)
Orion	1 (1)	- (-)	31 (52)	39 (40)	38 (40)
Paratyphi B var java	1 (1)	- (-)	- (-)	- (-)	- (-)
Saint Paul	2 (2)	4 (4)	3 (3)	2 (2)	3 (3)
Senftenberg	- (-)	- (-)	8 (8)	- (-)	1 (1)
Typhimurium	11 (11)	10 (11)	11 (13)	13 (13)	7 (9)
Virchow	1 (1)	- (-)	- (-)	- (-)	- (-)
UNSPECIFIED					
structure only	1 (1)	- (-)	5 (6)	11 (11)	19 (19)
rough strain	- (-)	1 (1)	2 (2)	1 (1)	- (-)

Table 56: *Salmonella* in ducks & geese on all premises

<i>Salmonella</i> Incidents (Isolations)	2000	2001*	2002	2003	2004
untyped	- (-)	- (-)	1 (1)	- (-)	- (-)
untypable	- (-)	- (-)	- (-)	1 (1)	- (-)
TOTAL	42 (43)	37 (40)	236 (330)	412 (422)	498 (530)

* 2001 data may not be comparable due to impact of FMD epidemic

Fig 39: Incidents of *Salmonella* serotypes in ducks and geese in 2004

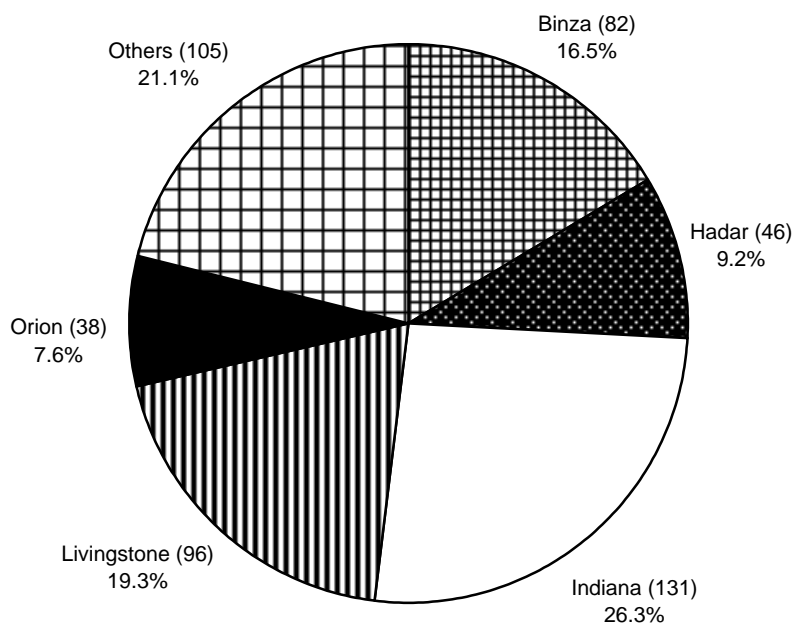
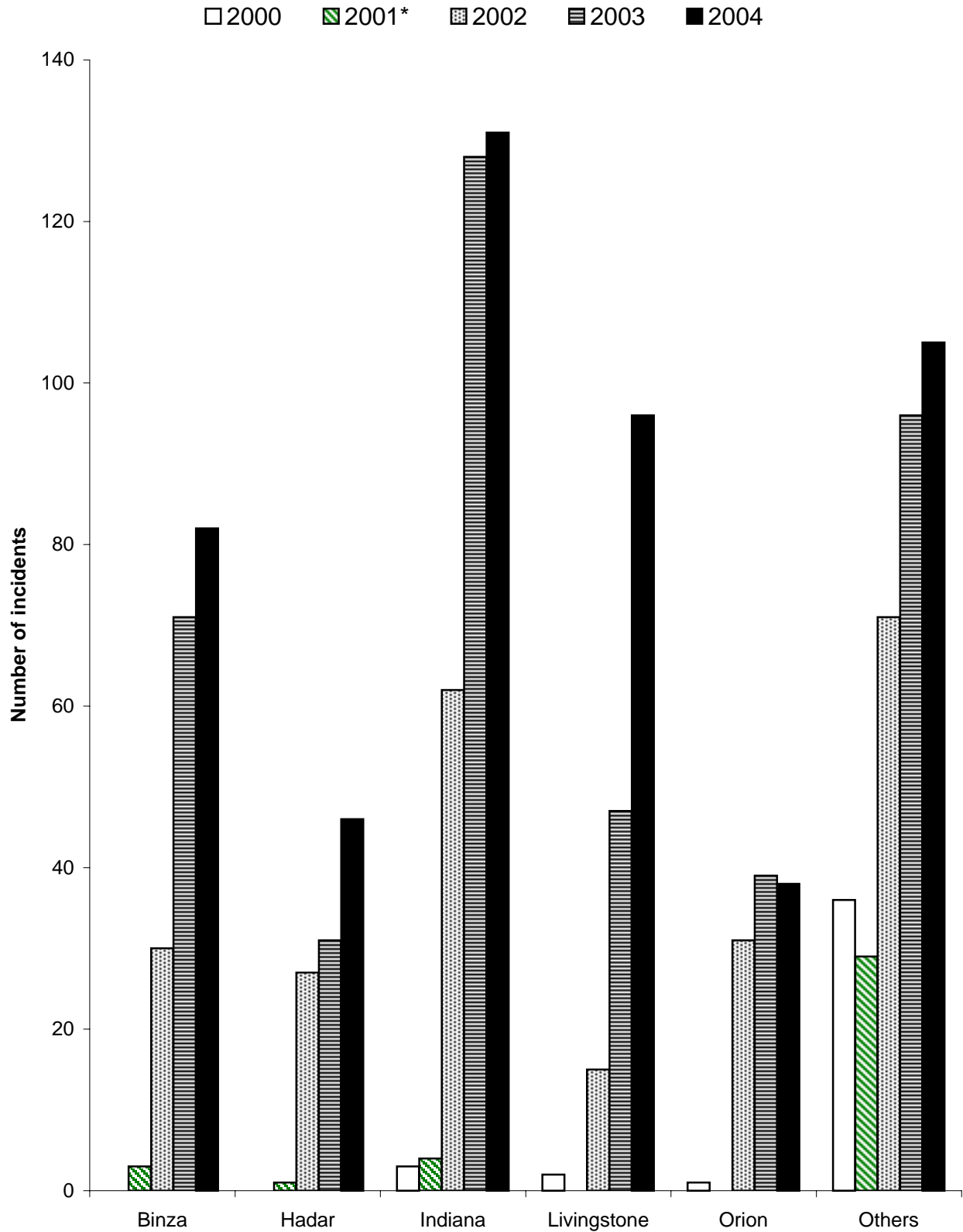


Table 57: Incidents of the top 5 *Salmonella* serotypes in ducks & geese in 2004 as a % of all incidents compared to previous years

Serotype	2000	2001	2002	2003	2004
S. Indiana %	7.1	10.8	26.3	31.1	26.3
S. Livingstone %	4.8	0	6.4	11.4	19.3
S. Binza %	0	8.1	12.7	17.2	16.5
S. Hadar %	0	2.7	11.4	7.5	9.2
S. Orion %	2.4	0	13.1	9.5	7.6
Total no. incidents	42	37	236	412	498

Fig 40: Incidents of *Salmonella* serotypes in ducks and geese (2000 - 2004)



* 2001 data may not be comparable due to uncertain impact of FMD epidemic

Table 58: S. Typhimurium in ducks & geese on all premises

Definitive Types Incidents (Isolations)	2000	2001*	2002	2003	2004
8	6 (6)	6 (7)	8 (10)	10 (10)	5 (5)
9	- (-)	1 (1)	- (-)	- (-)	- (-)
30	2 (2)	1 (1)	2 (2)	3 (3)	1 (1)
40	1 (1)	- (-)	- (-)	- (-)	- (-)
41	- (-)	- (-)	- (-)	- (-)	1 (1)
104	1 (1)	- (-)	- (-)	- (-)	- (-)
104b	1 (1)	- (-)	- (-)	- (-)	- (-)
125	- (-)	1 (1)	- (-)	- (-)	- (-)
195	- (-)	- (-)	1 (1)	- (-)	- (-)
U310	- (-)	1 (1)	- (-)	- (-)	- (-)
RDNC untyped	- (-) - (-)	- (-) - (-)	- (-) - (-)	- (-) - (-)	- (1) - (1)
TOTAL	11 (11)	10 (11)	11 (13)	13 (13)	7 (9)

Table 59: S. Enteritidis in ducks & geese on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
1	- (-)	- (-)	- (-)	- (-)	2 (3)
4	7 (7)	2 (2)	- (-)	- (-)	1 (1)
8	3 (3)	- (-)	- (-)	- (-)	- (-)
9a	2 (2)	- (-)	- (-)	- (-)	- (-)
9b	3 (3)	9 (10)	8 (11)	6 (6)	3 (3)
13a	- (-)	- (-)	1 (1)	- (-)	- (-)
21	1 (2)	- (-)	- (-)	- (-)	- (-)
35	- (-)	- (-)	- (-)	- (-)	1 (1)
UNTY	1 (1)	2 (2)	2 (2)	- (-)	- (-)
TOTAL	17 (18)	13 (14)	11 (14)	6 (6)	7 (8)

* 2001 data may not be comparable due to impact of FMD epidemic

Table 60: S. Hadar in ducks & geese on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
2	- (-)	- (-)	10 (12)	3 (3)	7 (7)
4	- (-)	1 (1)	1 (1)	- (-)	- (-)
5	- (-)	- (-)	- (-)	1 (1)	- (-)
9	- (-)	- (-)	- (-)	- (-)	1 (1)
10	- (-)	- (-)	1 (1)	3 (3)	5 (5)
11	- (-)	- (-)	2 (2)	10 (10)	7 (7)
18	- (-)	- (-)	- (-)	- (-)	1 (1)
22	- (-)	- (-)	5 (11)	12 (12)	22 (24)
46	- (-)	- (-)	1 (1)	- (-)	- (-)
51	- (-)	- (-)	- (-)	1 (1)	1 (1)
58a	- (-)	- (-)	- (-)	1 (1)	- (-)
62	- (-)	- (-)	- (-)	- (-)	2 (2)
RDNC	- (-)	- (-)	3 (3)	- (1)	- (1)
NOPT	- (-)	- (-)	4 (4)	- (-)	- (-)
UNTY	- (-)	- (-)	- (-)	- (-)	- (1)
untyped	- (-)	- (-)	- (-)	- (1)	- (8)
TOTAL	- (-)	1 (1)	27 (35)	31 (33)	46 (58)

Table 61: S. Virchow in ducks & geese on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
26	1 (1)	- (-)	- (-)	- (-)	- (-)
TOTAL	1 (1)	- (-)	- (-)	- (-)	- (-)

* 2001 data may not be comparable due to impact of FMD epidemic

Table 62: *Salmonella* in game birds on all premises

<i>Salmonella</i> Incidents (Isolations)	2000	2001*	2002	2003	2004
ENTERICA ENTERICA					
Agona	4 (4)	1 (1)	- (-)	2 (2)	- (-)
Ajiobo	2 (2)	- (-)	- (-)	- (-)	- (-)
Binza	26 (32)	22 (24)	14 (20)	7 (10)	6 (7)
Derby	2 (2)	- (-)	1 (1)	1 (1)	1 (1)
Dublin	1 (1)	- (-)	1 (1)	- (-)	1 (1)
Enteritidis	4 (5)	1 (1)	1 (1)	2 (2)	- (-)
Goldcoast	1 (1)	- (-)	- (-)	- (-)	- (-)
Hadar	- (-)	- (-)	- (-)	1 (1)	- (-)
Indiana	3 (3)	1 (1)	1 (1)	- (-)	- (-)
Infantis	1 (1)	1 (1)	- (-)	- (-)	1 (1)
Kottbus	1 (1)	- (-)	- (-)	1 (1)	- (-)
Mbandaka	1 (1)	1 (1)	- (-)	- (-)	- (-)
Montevideo	- (-)	1 (1)	- (-)	- (-)	- (-)
Newport	- (-)	- (-)	1 (1)	1 (1)	- (-)
Orion	6 (6)	11 (14)	7 (9)	8 (8)	2 (2)
Pullorum	1 (1)	3 (3)	3 (3)	2 (3)	- (1)
Saint Paul	1 (1)	1 (1)	- (-)	- (-)	- (-)
Schwarzengrund	1 (1)	- (-)	- (-)	- (-)	- (-)
Senftenberg	1 (1)	1 (1)	- (-)	1 (1)	- (-)
Stanley	- (-)	- (-)	1 (1)	- (-)	- (-)
Typhimurium	16 (18)	9 (9)	3 (3)	2 (2)	2 (3)
ENTERICA HOUTENAE					
43:z4z23	- (-)	1 (1)	- (-)	- (-)	- (-)
UNSPECIFIED					
structure only	2 (2)	1 (1)	3 (5)	1 (1)	- (-)
rough strain	- (-)	1 (1)	- (-)	- (-)	- (-)
untypable	- (-)	- (-)	- (-)	- (1)	- (-)
TOTAL	74 (83)	56 (61)	36 (46)	29 (34)	13 (16)

* 2001 data may not be comparable due to impact of FMD epidemic

Fig 41: Incidents of *Salmonella* serotypes in game birds in 2004

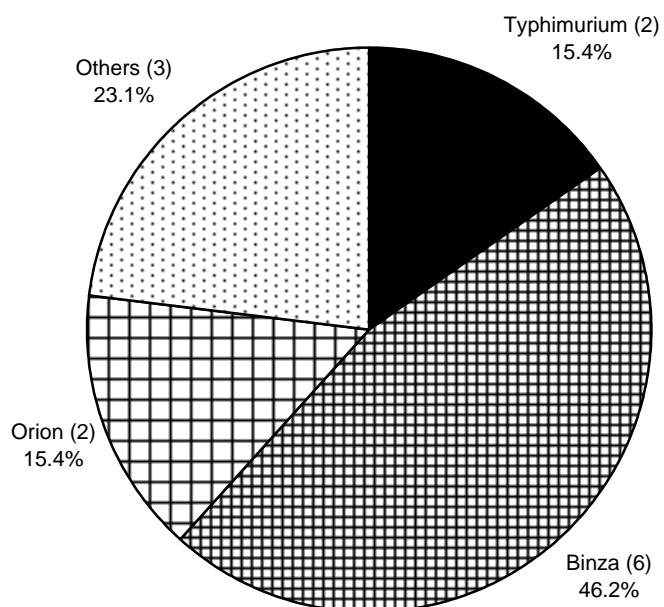
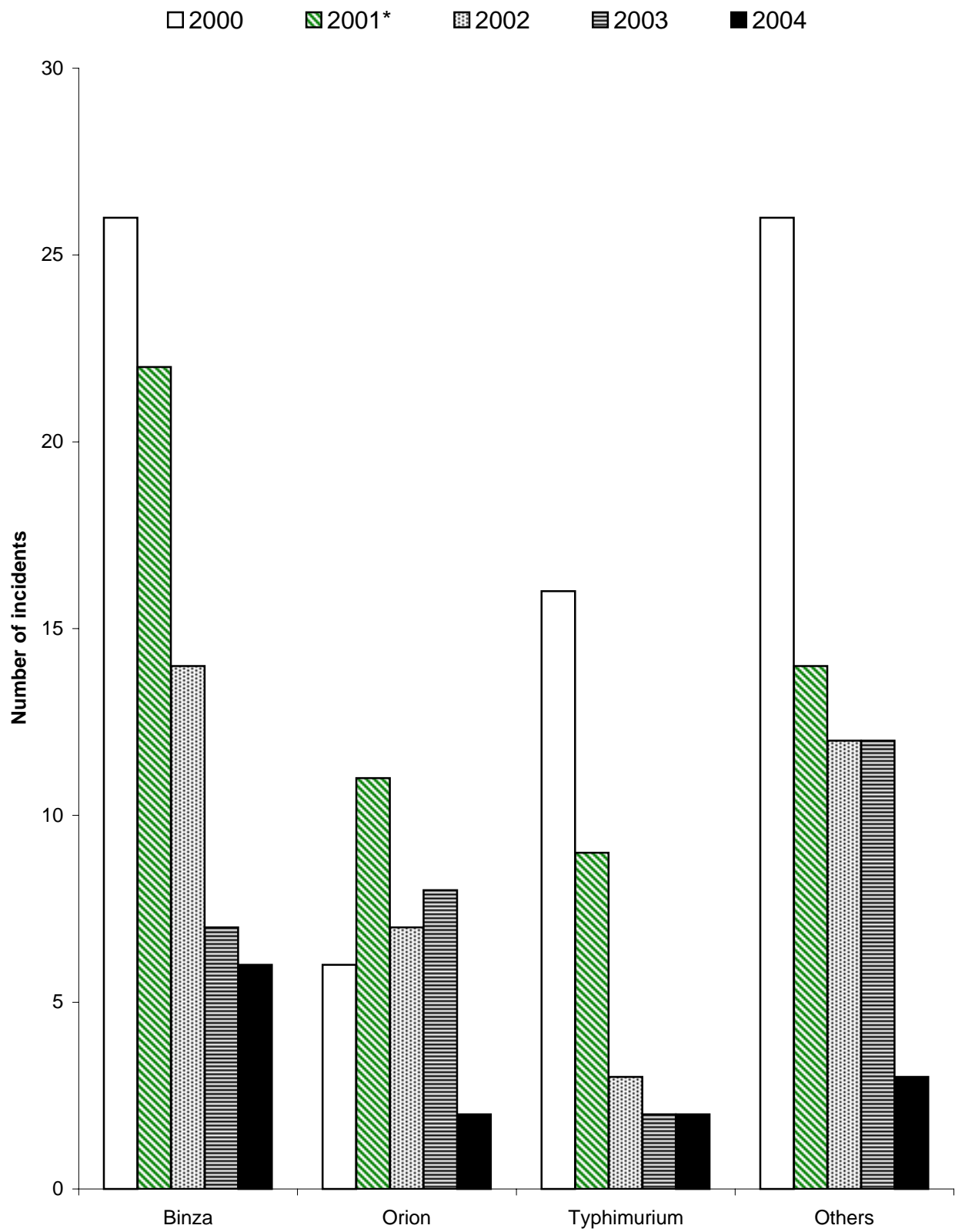


Table 63: Incidents of the top 3 *Salmonella* serotypes in game birds in 2004 as a % of all incidents compared to previous years

Serotype	2000	2001	2002	2003	2004
S. Binza %	35.1	39.3	38.9	24.1	46.2
S. Orion %	8.1	19.6	19.4	27.6	15.4
S. Typhimurium %	21.6	16.1	8.3	6.9	15.4
Total no. incidents	74	56	36	29	13

Fig 42: Incidents of *Salmonella* serotypes in game birds (2000 - 2004)



* 2001 data may not be comparable due to uncertain impact of FMD epidemic

Table 64: S. Typhimurium in game birds on all premises

Definitive Types Incidents (Isolations)	2000	2001*	2002	2003	2004
8	2 (3)	3 (3)	- (-)	- (-)	- (-)
40	1 (1)	- (-)	- (-)	- (-)	- (-)
56	- (-)	- (-)	1 (1)	- (-)	- (-)
86	1 (1)	- (-)	- (-)	- (-)	- (-)
104	8 (9)	2 (2)	1 (1)	- (-)	1 (1)
104b	1 (1)	- (-)	- (-)	1 (1)	- (-)
120	1 (1)	- (-)	- (-)	- (-)	- (-)
170	- (-)	1 (1)	- (-)	- (-)	- (-)
193	1 (1)	1 (1)	1 (1)	- (-)	- (-)
195	- (-)	1 (1)	- (-)	1 (1)	- (-)
208	- (-)	1 (1)	- (-)	- (-)	- (-)
U310	- (-)	- (-)	- (-)	- (-)	1 (1)
UNTY	1 (1)	- (-)	- (-)	- (-)	- (-)
untyped	- (-)	- (-)	- (-)	- (-)	- (1)
TOTAL	16 (18)	9 (9)	3 (3)	2 (2)	2 (3)

* 2001 data may not be comparable due to impact of FMD epidemic

Table 65: S. Enteritidis in game birds on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2003	2004
4	- (-)	1 (1)	- (-)	- (-)	- (-)
5a	2 (2)	- (-)	- (-)	- (-)	- (-)
13a	1 (2)	- (-)	1 (1)	2 (2)	- (-)
UNTY	1 (1)	- (-)	- (-)	- (-)	- (-)
TOTAL	4 (5)	1 (1)	1 (1)	2 (2)	- (-)

Table 66: S. Pullorum in game birds on all premises

Phage Types Incidents (Isolations)	2000	2001*	2002	2002	2004
7	- (-)	- (-)	- (-)	2 (3)	- (-)
11	- (-)	- (-)	1 (1)	- (-)	- (-)
NOPT	1 (1)	3 (3)	2 (2)	- (-)	- (-)
Untyped	- (-)	- (-)	- (-)	- (-)	- (1)
TOTAL	1 (1)	3 (3)	3 (3)	2 (3)	- (1)

* 2001 data may not be comparable due to impact of FMD epidemic