

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 standardized 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 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 41, 42, 51, 52, 56, 57, 62 and 63. The uncertain effect of the GB outbreak of Foot and Mouth Disease on the tendency for diagnostic sampling and laboratory submissions for *Salmonella* examination limits comparability of 2001 data with previous years. Statutory monitoring of chicken breeding flocks and hatcheries for *Salmonella* continued during the FMD outbreak but with some disruption. The number of poultry diagnostic submissions to VLA/SAC laboratories fell by 10.1% in 2002 compared with a fall of 6.1% in 2001.

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

Chickens

Table 41 shows that the number of reported incidents of *Salmonella* in chickens in 2002 was similar to 2001. The majority of incidents arose from private surveillance of broiler flocks by the poultry industry. Because the amount of private testing has increased by an unknown quantity in recent years it is difficult to interpret long term trends.

Approximately 23,884 *Salmonella* tests were performed under the monitoring requirements of the PBFHO 1993 and 52 (0.22%) were positive for *Salmonella*. This compares to 0.33% positive in 2001. The organism was isolated most frequently from day old chick carcasses and

was isolated from three out of 2,923 composite faeces samples (0.1%) collected when the chicks were four weeks of age.

The number of reports of *Salmonella* from statutory monitoring of chicken breeding flocks continued to decline and only 19 incidents were reported in 2002. There was an increase in reports associated with voluntary surveillance activities, which in 2002 represented 94% of all reports from chickens and there was a marked decrease in reports associated with clinical disease to 5.6% of all reports (Table 1).

***Salmonella* Enteritidis**

Numbers of reports of this serotype have declined steadily since 1996, except for a small increase in reports in 1997 (Fig 33). In 2002, only 11 incidents were reported; there were no incidents reported in breeding flocks, five incidents were reported from broiler flocks (PT's 4, 6 and 8) and six incidents in laying flocks (PT's 4 and RDNC). These represented 1.3% of all *Salmonella* incident reports in chickens.

***Salmonella* Typhimurium**

There were 36 reported incidents of *Salmonella* Typhimurium in 2002 (from 21 flocks), a decrease of 33% compared with 2001. Reports of *S. Typhimurium* represented 4% of all reports, similar to recent years (Fig 33). The major phage type was DT104 (67%). There was one report of DT104 from a layer flock in 2002 and the remainder were isolated from broiler flocks.

Most reports of Typhimurium arise from voluntary surveillance of broiler flocks. There were no reports of Typhimurium in breeding flocks in 2002.

Other Serotypes

The most common serotype isolated from chickens in 2002 was *S. Livingstone* (14% of all chicken incidents). Reports of this serotype have risen in recent years. Most reports were from broiler flocks but the serotype was isolated from a single layer breeder flock and there were 23 incidents reported in a total of four broiler breeder flocks.

There has also been an increase in reports of *S. 6,7,-:-* (to 67), a related strain. The number and proportion of reports of *S. Senftenberg* fell in 2002, however it was the second most commonly reported

serotype. Other common serotypes (6 -7% of total each) were S. Kedougou, S. Montevideo, S. Binza and S. Mbandaka. There was a decrease in reports of S. Liverpool, S. Heidelberg and S. Thompson compared with 2001.

There were 17 reports of S. Hadar (PT's 2, 10, 14 and 22) in 2002, all from broiler flocks. There were 47 reports of S. Virchow and the most common phage types were PT2 and PT4. There was a single report from a broiler breeder flock and the remainder were from broiler flocks, mainly associated with a single poultry company. This represented an increase from recent years. There was a single report of S. Pullorum from a layer breeder flock. There were 8 reports of S. Newport in 2002, all from broiler flocks, and two of these were associated with multiple antibiotic resistant strains (resistance to ≥ 4 antibiotics). However, there was no evidence of resistance to third generation cephalosporins.

S. Ajiobo and S. Wangata were isolated from chickens for the first time since recording began and since 1996 respectively. There was an increase in reports of S. Goldcoast and S. Orion. Both serotypes were isolated from broiler breeder flocks as well as broiler flocks in 2002. Most of the reports of S. Orion were from a single poultry company but reports of S. Goldcoast were from a number of different companies in all areas of the country.

National trends in *Salmonella* for chickens are difficult to interpret since a large proportion of reports of a specific serotype may originate from a small number of large integrated companies. Most incidents were identified by private environmental sampling of broiler farms when the birds were 2 to 5 weeks of age.

Turkeys

Table 51 shows a decrease (48%) in the number of incidents of *Salmonella* reported in turkey flocks in 2002. 30% of reports were associated with clinical disease; the remainder arose through voluntary surveillance activities. The increase in reports of S. Agona seen in 2001 was not sustained in 2002. The most common serotype reported in 2002 was S. Typhimurium. However, although the proportion of reports increased to 19%, the number of reports was a third less than 2001. Most isolates (74%) were DT104. There were no reports of DT104b; this previously common phage type was also not reported from chickens in 2002. U308a was reported for the first time in 2002. This strain has been reported with increasing frequency from pig herds in recent years.

There were no reports of *S. Enteritidis* from turkey flocks in 2002.

There was an increase in number and proportion of reports of *S. Newport* (18% of reports) but little evidence for any trend over the last five years and no reported resistance to 3rd generation cephalosporins. Other common serotypes reported were *S. Derby* and *S. Montevideo*. Reports of *S. Agona* decreased markedly, similar to the trend in chickens. *S. Stanley* was reported for the first time in turkeys since 1991 and *S. Taksony* was reported for the first time. Both serotypes were also reported in chicken broiler flocks for the first time in recent years. *S. Anatum* and *S. Meleagridis* were reported for the first time since 1996. There were no further reports of *S. Hato* or *S. Teddington*, which were isolated for the first time in 2001.

Ducks and Geese

There was a large increase in reports of *Salmonella* from ducks during 2002. These represented 1.5% of all reports in 2001 compared with 8.3% in 2002. This is the result of enhanced voluntary surveillance activities by the duck industry (Table 1). There has therefore been a marked change in serotype relativity as only a small proportion of incidents (7%) are reported to be associated with clinical disease. Comparison with previous years is therefore of limited value.

The most common serotypes reported were *S. Indiana* (26%), *S. Orion* (13%), *S. Binza* (13%), *S. Hadar* (11%) and *S. Livingstone* (6%). The most common phage types of *S. Hadar* were PT2 and PT22. A variety of other serotypes were reported, a number for the first time in recent years (*S. Bredeney*, *S. Give*, *S. Havana*, *S. Muenchen*).

There were 11 reports of *S. Enteritidis*, a similar number to 2001. The most common phage type was PT9b.

There were also 11 reports of *S. Typhimurium*, a similar number to previous years. The most common phage type was DT8. There were no reports of DT104 or DT104b.

Game Birds

Reports of *Salmonella* in game birds decreased by 36% in 2002, continuing a long term trend. Most reports were associated with clinically diseased pheasants and pigeons and, as in previous years, most reports were associated with *S. Binza/S. Orion* (58%). There was a single incident of *S. Enteritidis* PT13a reported from pheasants.

There were only three reports of *S. Typhimurium* (DTs 56, 104, 193) from guinea fowl, pheasants and partridges respectively. There were three reported incidents of *S. Pullorum* associated with clinical disease in pheasants. *S. Stanley* was isolated for the first time since recording began in 1985.

Table 41: *Salmonella* in chickens on all premises

<i>Salmonella</i> Incidents (Isolations)	1998		1999		2000		2001*		2002	
ENTERICA ENTERICA										
Agama	1	(1)	1	(1)	4	(4)	2	(2)	1	(1)
Agona	6	(9)	17	(21)	18	(18)	14	(15)	3	(3)
Ajiobo	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Anatum	5	(5)	5	(5)	4	(4)	7	(7)	1	(1)
Bardo	-	(-)	2	(4)	-	(-)	-	(-)	-	(-)
Binza	4	(4)	4	(4)	8	(9)	24	(26)	54	(57)
Braenderup	4	(10)	9	(12)	-	(-)	-	(-)	1	(1)
Brandenburg	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Bredeney	25	(36)	47	(55)	53	(58)	6	(6)	12	(13)
Carmel	-	(-)	1	(2)	-	(-)	-	(-)	-	(-)
Champaign	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Cubana	1	(1)	2	(2)	-	(-)	1	(1)	-	(-)
Derby	1	(1)	-	(-)	-	(-)	3	(4)	3	(4)
Dublin	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Ealing	-	(-)	2	(2)	-	(-)	1	(1)	-	(-)
Eimsbuettel	-	(-)	4	(4)	-	(-)	6	(7)	1	(1)
Enteritidis	163	(250)	44	(60)	11	(23)	7	(7)	11	(15)
Fischerkietz	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
Give	2	(2)	34	(44)	144	(160)	18	(18)	18	(18)
Goldcoast	1	(1)	-	(-)	-	(-)	1	(1)	10	(11)
Hadar	29	(32)	35	(42)	39	(53)	6	(8)	17	(17)
Havana	-	(-)	1	(1)	1	(1)	2	(2)	2	(2)
Heidelberg	19	(21)	41	(47)	63	(83)	50	(57)	23	(23)
Idikan	-	(-)	6	(6)	-	(-)	1	(1)	1	(1)
Indiana	12	(32)	13	(25)	8	(12)	7	(12)	7	(8)
Infantis	-	(-)	7	(7)	-	(-)	3	(5)	3	(3)
Kedougou	87	(105)	103	(119)	81	(86)	42	(49)	60	(70)
Kentucky	-	(-)	5	(13)	12	(19)	10	(15)	2	(3)
Kottbus	1	(1)	1	(1)	6	(7)	2	(2)	1	(1)
Larochelle	-	(-)	33	(35)	16	(18)	2	(2)	2	(2)
Lexington	-	(-)	1	(1)	-	(-)	1	(1)	1	(1)
Lille	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Liverpool	16	(19)	29	(33)	31	(31)	60	(73)	31	(35)
Livingstone	35	(46)	86	(109)	47	(61)	75	(90)	122	(200)
Manhattan	3	(4)	3	(10)	2	(3)	-	(-)	-	(-)
Mbandaka	61	(80)	126	(151)	42	(50)	58	(78)	51	(58)
Montevideo	104	(129)	99	(134)	74	(121)	56	(94)	56	(112)

Table 41: *Salmonella* in chickens on all premises

<i>Salmonella</i> Incidents (Isolations)	1998		1999		2000		2001*		2002	
ENTERICA ENTERICA										
New Brunswick	-	(-)	1	(1)	-	(-)	1	(1)	-	(-)
Newport	16	(25)	17	(22)	13	(14)	5	(5)	8	(10)
Ohio	35	(56)	74	(103)	35	(65)	23	(27)	38	(49)
Orion	1	(1)	2	(2)	-	(-)	-	(-)	15	(15)
Panama	-	(-)	1	(1)	1	(1)	-	(-)	-	(-)
Poona	2	(2)	-	(-)	1	(1)	1	(1)	-	(-)
Pullorum	2	(2)	6	(6)	2	(2)	1	(1)	1	(1)
Redhill	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Saint Paul	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
Senftenberg	112	(144)	169	(235)	256	(351)	146	(263)	107	(150)
Stanley	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Taksony	2	(2)	1	(1)	-	(-)	-	(-)	1	(1)
Tennessee	-	(-)	2	(2)	-	(-)	1	(1)	4	(4)
Thomasville	-	(-)	1	(1)	-	(-)	1	(1)	-	(-)
Thompson	52	(57)	73	(84)	74	(76)	57	(57)	31	(31)
Typhimurium	74	(92)	92	(152)	41	(56)	54	(64)	36	(44)
Virchow	37	(42)	29	(36)	30	(33)	23	(24)	47	(48)
Wangata	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Worthington	-	(-)	1	(1)	3	(3)	1	(1)	-	(-)
ENTERICA DIARIZONAE										
unspecified "arizona" ⁺	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
UNSPECIFIED										
untypeable	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
structure only	56	(66)	130	(158)	52	(52)	90	(113)	82	(92)
rough strain	3	(3)	7	(7)	6	(6)	3	(3)	2	(2)
Untyped	2	(2)	5	(5)	5	(5)	-	(-)	-	(-)
TOTAL	980	(1289)	1374	(1769)	1186	(1489)	873	(1147)	869	(1111)

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

⁺ antigenic structure not stated

Fig 28: Incidents of *Salmonella* serotypes in chickens in 2002

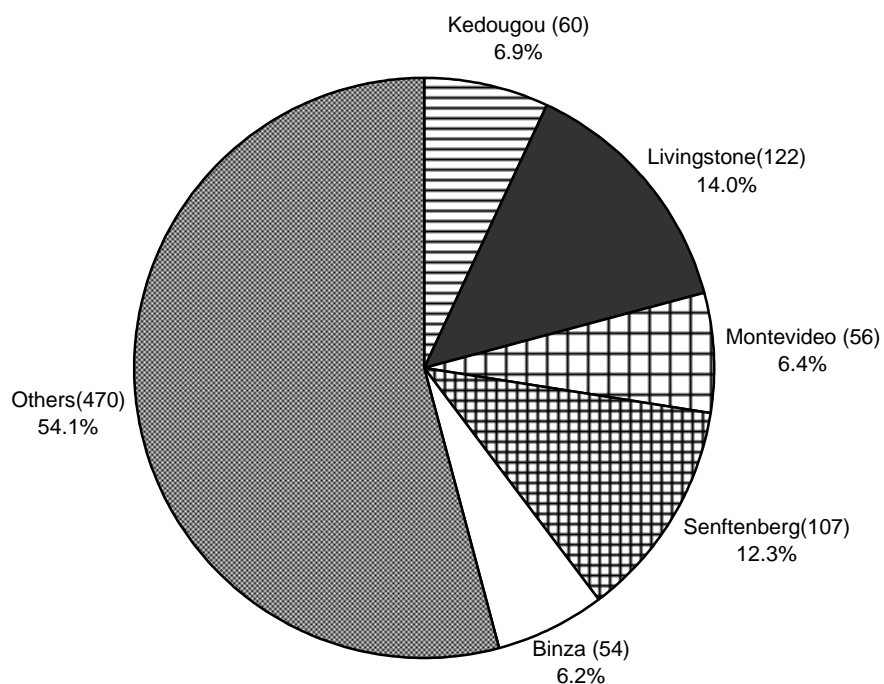
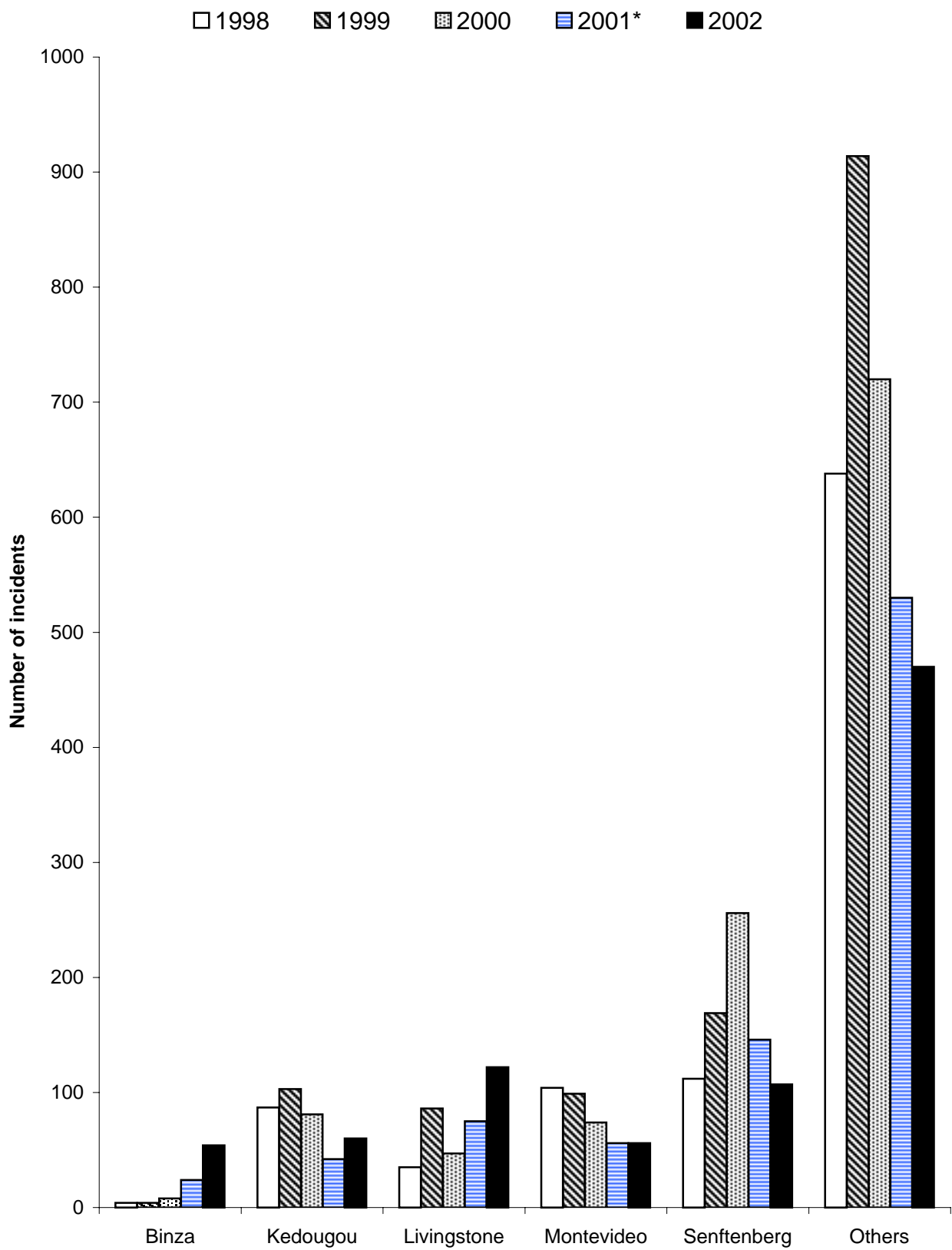


Table 42: Incidents of the top 5 *Salmonella* serotypes in chickens in 2002 as a % of all incidents compared to previous years

Serotype	1998	1999	2000	2001	2002
S. Livingstone %	3.6	6.3	4.0	8.6	14.0
S. Senftenberg %	11.4	12.3	21.6	16.7	12.3
S. Kedougou %	8.9	7.5	6.8	4.8	6.9
S. Montevideo %	10.6	7.2	6.2	6.4	6.4
S. Binza %	0.4	0.3	0.7	2.7	6.2
Total no. incidents	980	1374	1186	873	869

Fig 29: Incidents of *Salmonella* serotypes in chickens (1998 - 2002)



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

Table 43: S. Typhimurium in chickens on all premises

Definitive Types Incidents (Isolations)	1998	1999	2000	2001*	2002
2	- (-)	1 (1)	- (-)	- (-)	- (-)
3	- (-)	1 (6)	- (-)	- (-)	- (-)
8	1 (1)	- (-)	- (-)	- (-)	- (-)
12	- (-)	2 (2)	- (-)	- (-)	- (-)
40	- (-)	- (-)	1 (1)	- (-)	- (-)
49	1 (2)	1 (1)	- (-)	- (-)	- (-)
49b	- (1)	- (-)	- (-)	- (-)	- (-)
85	- (-)	2 (3)	1 (1)	- (-)	1 (1)
99	- (-)	1 (1)	- (-)	- (-)	- (-)
104	46 (58)	58 (93)	24 (33)	30 (34)	24 (30)
104b	5 (5)	9 (14)	7 (10)	5 (6)	- (-)
120	2 (2)	1 (1)	- (-)	2 (2)	- (-)
141	1 (1)	- (-)	- (-)	- (-)	- (-)
146	- (-)	1 (2)	- (-)	- (-)	- (-)
193	8 (11)	2 (3)	1 (1)	- (-)	1 (1)
208	- (-)	1 (1)	2 (2)	- (-)	1 (1)
3AER	- (-)	3 (7)	- (-)	- (-)	- (-)
U302	2 (2)	2 (3)	2 (5)	9 (12)	6 (8)
RDNC	1 (1)	3 (3)	- (-)	3 (3)	1 (1)
NOPT	3 (4)	- (-)	- (-)	- (-)	- (-)
UNTY	2 (2)	4 (11)	3 (3)	5 (7)	2 (2)
Untyped	2 (2)	- (-)	- (-)	- (-)	- (-)
TOTAL	74 (92)	92 (152)	41 (56)	54 (64)	36 (44)

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

Fig 30: Incidents of *Salmonella* Typhimurium definitive types in chickens in 2002

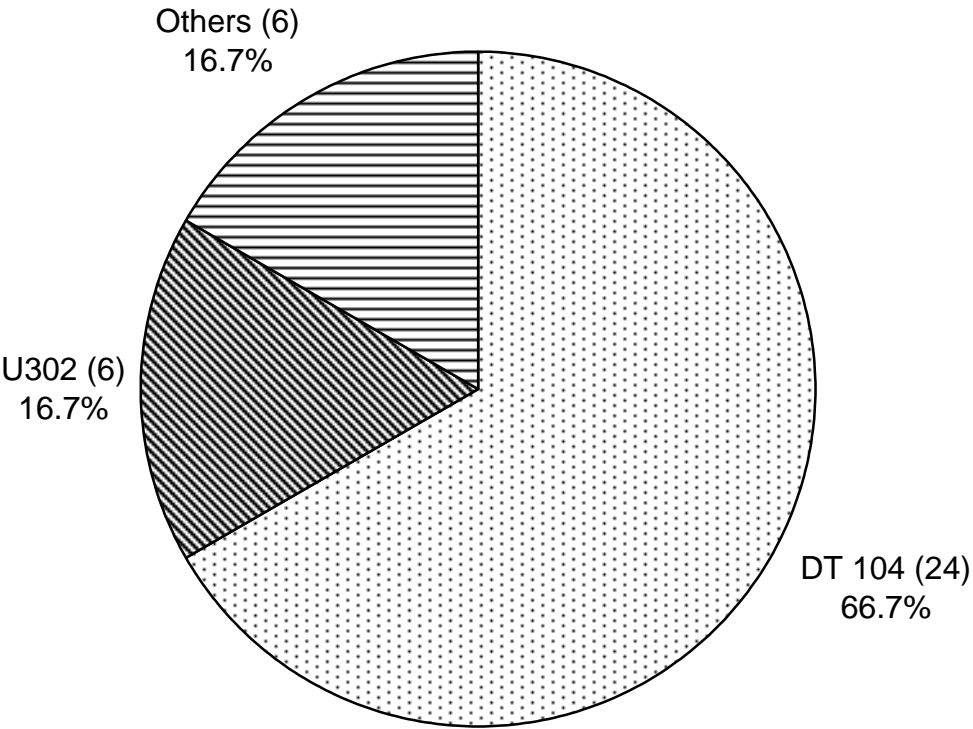
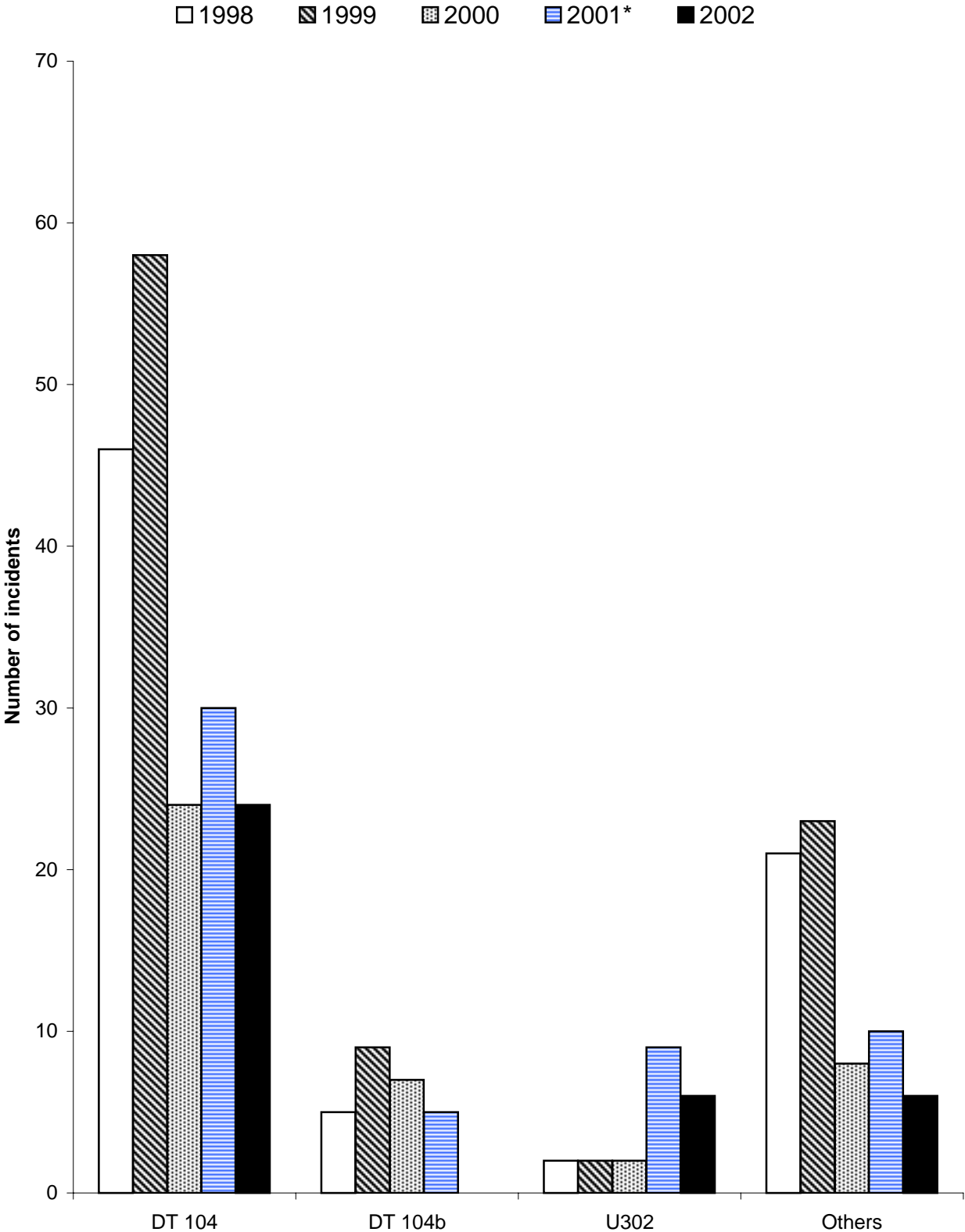


Fig 31: Incidents of *Salmonella* Typhimurium definitive types in chickens (1998 - 2002)



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

Table 44: Incidents of *S. Typhimurium* definitive types in chickens in 2002 by flock type

	Number of incidents by definitive type				Total
	DT 104	DT 193	U302	Others	
Breeding flocks	0	0	0	0	0
Broiler production flocks	23	1	6	5	35*
Egg layer flocks	1	0	0	0	1

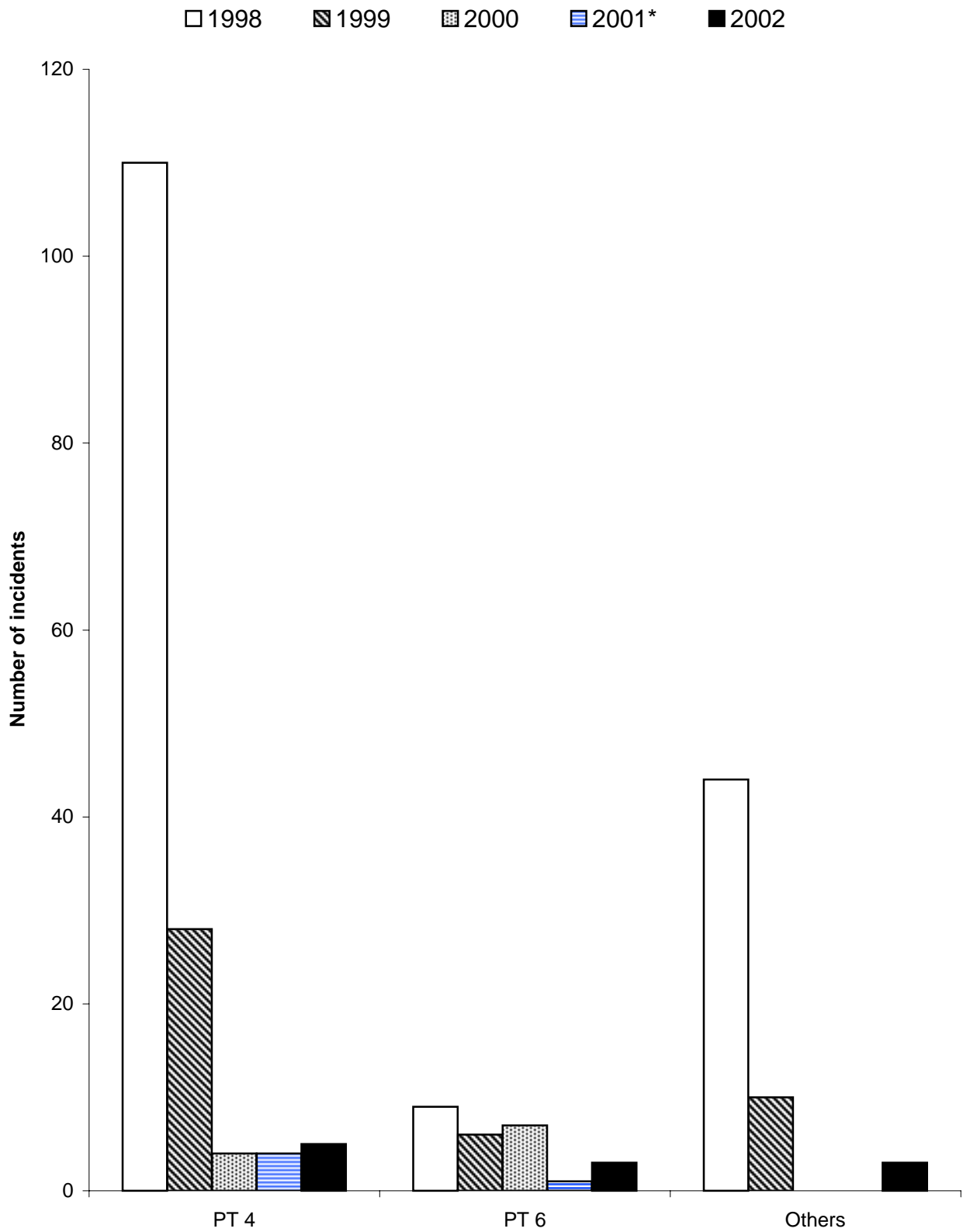
* From a total of 21 broiler production flocks

Table 45: S. Enteritidis in chickens on all premises

Phage Types Incidents (Isolations)	1998		1999		2000		2001*		2002	
1	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
1b	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
4	110	(179)	28	(40)	4	(6)	4	(4)	5	(5)
4a	2	(3)	-	(-)	-	(-)	-	(-)	-	(-)
5	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
5a	3	(4)	-	(-)	-	(-)	-	(-)	-	(-)
6	9	(15)	6	(9)	7	(17)	1	(1)	3	(7)
6a	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
7	5	(6)	3	(3)	-	(-)	-	(-)	-	(-)
7a	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
8	2	(2)	-	(-)	-	(-)	-	(-)	1	(1)
9	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
9b	-	(-)	2	(2)	-	(-)	-	(-)	-	(-)
14b	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
21	8	(13)	-	(-)	-	(-)	1	(1)	-	(-)
29	1	(1)	-	(1)	-	(-)	-	(-)	-	(-)
30	1	(1)	1	(1)	-	(-)	-	(-)	-	(-)
35	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
RDNC	2	(3)	-	(-)	-	(-)	-	(-)	1	(1)
NOPT	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
UNTY	8	(11)	2	(2)	-	(-)	-	(-)	1	(1)
Untyped	3	(3)	-	(-)	-	(-)	-	(-)	-	(-)
TOTAL	163	(250)	44	(60)	11	(23)	7	(7)	11	(15)

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

Fig 32: Incidents of *Salmonella* Enteritidis phage types in chickens (1998 - 2002)



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

Fig 33: *S. Enteritidis* and *S. Typhimurium* as a proportion of all incident reports in chickens (1985 - 2002)

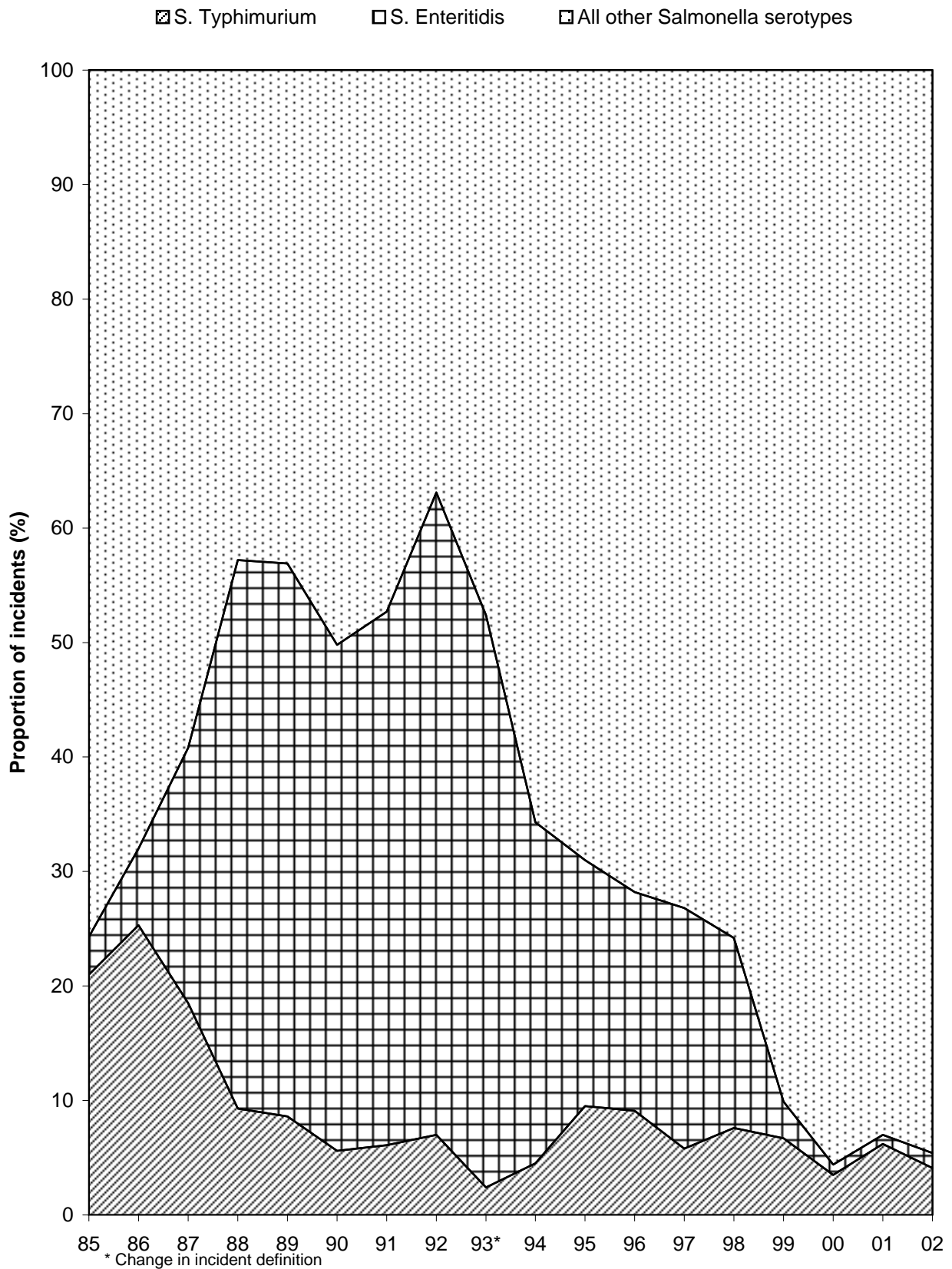


Table 46: Incidents of *S. Enteritidis* phage types in chickens in 2002 by flock type

	Number of incidents by phage type			Total
	PT 4	PT 6	Others	
Breeding flocks	0	0	0	0
Broiler production flocks	1	3	1	5
Egg layer flocks	4	0	2	6

Table 47: S. Hadar in chickens on all premises

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
2	- (-)	2 (3)	1 (1)	1 (1)	1 (1)
5	13 (15)	7 (7)	13 (15)	- (-)	- (-)
9	4 (4)	- (-)	- (-)	- (-)	- (-)
10	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)
11	- (-)	- (-)	1 (1)	- (-)	- (-)
14	- (-)	- (-)	1 (1)	- (-)	1 (1)
17	- (-)	- (-)	1 (1)	- (-)	- (-)
22	9 (10)	16 (16)	7 (7)	1 (1)	3 (3)
23	- (-)	1 (1)	- (-)	- (-)	- (-)
41	- (-)	2 (8)	10 (22)	3 (5)	- (-)
50	- (-)	- (-)	1 (1)	- (-)	- (-)
RDNC	2 (2)	- (-)	- (-)	- (-)	6 (6)
NOPT	- (-)	6 (6)	3 (3)	- (-)	5 (5)
UNTY	- (-)	- (-)	- (-)	- (-)	- (-)
TOTAL	29 (32)	35 (42)	39 (53)	6 (8)	17 (17)

Table 48: S. Pullorum in chickens on all premises

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
1	- (-)	- (-)	2 (2)	- (-)	- (-)
7	- (-)	- (-)	- (-)	1 (1)	- (-)
NOPT	2 (2)	6 (6)	- (-)	- (-)	1 (1)
TOTAL	2 (2)	6 (6)	2 (2)	1 (1)	1 (1)

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

Table 49: S. Thompson in chickens on all premises

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
1	1 (1)	- (-)	1 (1)	1 (1)	2 (2)
1a	- (-)	- (-)	14 (14)	24 (24)	6 (6)
3	- (-)	- (-)	1 (1)	1 (1)	1 (1)
6	- (-)	- (-)	1 (1)	4 (4)	9 (9)
14	- (-)	- (-)	- (-)	1 (1)	- (-)
23	- (-)	- (-)	- (-)	1 (1)	- (-)
49	- (-)	1 (1)	- (-)	- (-)	- (-)
RDNC	- (-)	- (-)	1 (1)	2 (2)	1 (1)
NOPT	50 (55)	71 (82)	55 (57)	23 (23)	12 (12)
Untyped	- (-)	1 (1)	1 (1)	- (-)	- (-)
TOTAL	51 (56)	73 (84)	74 (76)	57 (57)	31 (31)

Table 50: S. Virchow in chickens on all premises

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
2	- (-)	2 (2)	6 (6)	8 (8)	22 (22)
4	- (-)	- (-)	1 (2)	3 (3)	9 (9)
19	- (-)	1 (3)	- (-)	- (-)	- (-)
26	7 (10)	3 (4)	4 (5)	5 (6)	- (-)
30	1 (1)	- (-)	- (-)	- (-)	- (-)
31	- (-)	- (-)	- (-)	1 (1)	- (-)
35	- (-)	- (-)	6 (7)	2 (2)	- (-)
37	- (-)	1 (1)	- (-)	1 (1)	- (-)
47	2 (2)	- (-)	- (-)	- (-)	- (-)
RDNC	- (-)	- (-)	- (-)	1 (1)	- (-)
NOPT	25 (26)	22 (26)	13 (13)	2 (2)	16 (17)
TOTAL	35 (39)	29 (36)	30 (33)	23 (24)	47 (48)

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

Table 51: *Salmonella* in turkeys on all premises

<i>Salmonella</i> Incidents (Isolations)	1998		1999		2000		2001*		2002	
ENTERICA ENTERICA										
Agama	1	(1)	3	(10)	2	(3)	1	(3)	-	(-)
Agona	4	(5)	7	(12)	30	(38)	46	(58)	9	(10)
Ajiobo	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Anatum	-	(-)	-	(-)	-	(-)	-	(-)	2	(2)
Binza	5	(6)	8	(11)	15	(24)	11	(13)	2	(2)
Braenderup	-	(-)	-	(-)	2	(2)	-	(-)	-	(-)
Bredeney	-	(-)	4	(6)	1	(1)	-	(-)	1	(2)
Champaign	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Derby	6	(16)	39	(56)	39	(69)	36	(50)	18	(22)
Dublin	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Enteritidis	12	(18)	5	(6)	-	(-)	1	(1)	-	(-)
Fischerkietz	4	(4)	2	(2)	17	(21)	2	(3)	1	(1)
Goldcoast	-	(-)	-	(-)	2	(8)	2	(4)	-	(-)
Hadar	1	(1)	2	(2)	7	(7)	1	(1)	4	(4)
Hato	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Havana	1	(2)	-	(-)	-	(-)	-	(-)	-	(-)
Heidelberg	-	(-)	5	(6)	8	(11)	-	(-)	-	(-)
Indiana	15	(19)	11	(13)	9	(12)	20	(22)	9	(11)
Kedougou	1	(1)	1	(1)	4	(4)	4	(5)	-	(-)
Kentucky	1	(1)	3	(4)	1	(1)	-	(-)	-	(-)
Kottbus	-	(-)	6	(9)	10	(10)	15	(16)	5	(5)
Larochelle	-	(-)	-	(-)	5	(6)	-	(-)	1	(1)
Mbandaka	2	(4)	-	(-)	2	(2)	-	(-)	1	(1)
Meleagridis	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Montevideo	1	(1)	2	(2)	14	(20)	32	(36)	14	(16)
Muenster	-	(-)	4	(4)	-	(-)	-	(-)	-	(-)
Newington	2	(4)	-	(-)	-	(-)	-	(-)	-	(-)
Newport	19	(24)	30	(39)	21	(28)	15	(16)	22	(22)
Ohio	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Orion	-	(-)	3	(3)	1	(1)	-	(-)	-	(-)
Poona	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Saint Paul	3	(3)	-	(-)	2	(2)	-	(-)	2	(2)
Schwarzengrund	-	(-)	-	(-)	5	(6)	3	(4)	1	(2)
Senftenberg	16	(35)	17	(26)	12	(15)	7	(10)	2	(2)

Table 51: *Salmonella* in turkeys on all premises

<i>Salmonella</i> Incidents (Isolations)	1998	1999	2000	2001*	2002
ENTERICA ENTERICA					
Stanley	- (-)	- (-)	- (-)	- (-)	1 (1)
Taksony	- (-)	- (-)	- (-)	- (-)	1 (1)
Teddington	- (-)	- (-)	- (-)	1 (1)	- (-)
Tennessee	- (-)	1 (1)	- (-)	- (-)	- (-)
Typhimurium	76 (99)	53 (83)	30 (47)	35 (40)	23 (34)
UNSPECIFIED					
structure only	3 (3)	- (-)	8 (13)	1 (3)	1 (1)
rough strain	- (-)	1 (1)	3 (4)	2 (2)	1 (1)
Untyped	1 (1)	1 (1)	- (-)	1 (1)	1 (1)
TOTAL	174 (248)	210 (300)	253 (358)	237 (290)	123 (145)

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

Fig 34: Incidents of *Salmonella* serotypes in turkeys in 2002

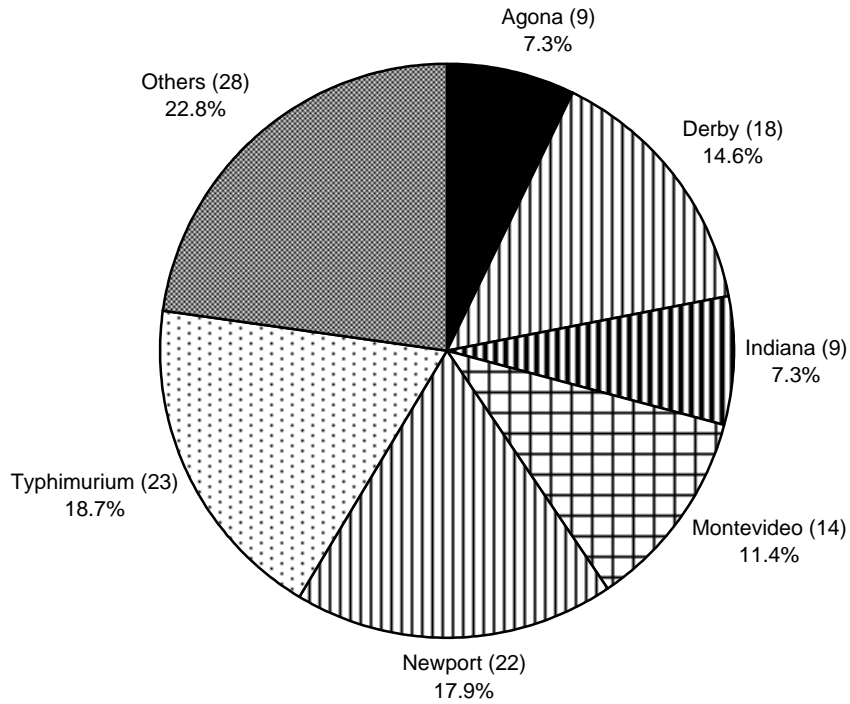
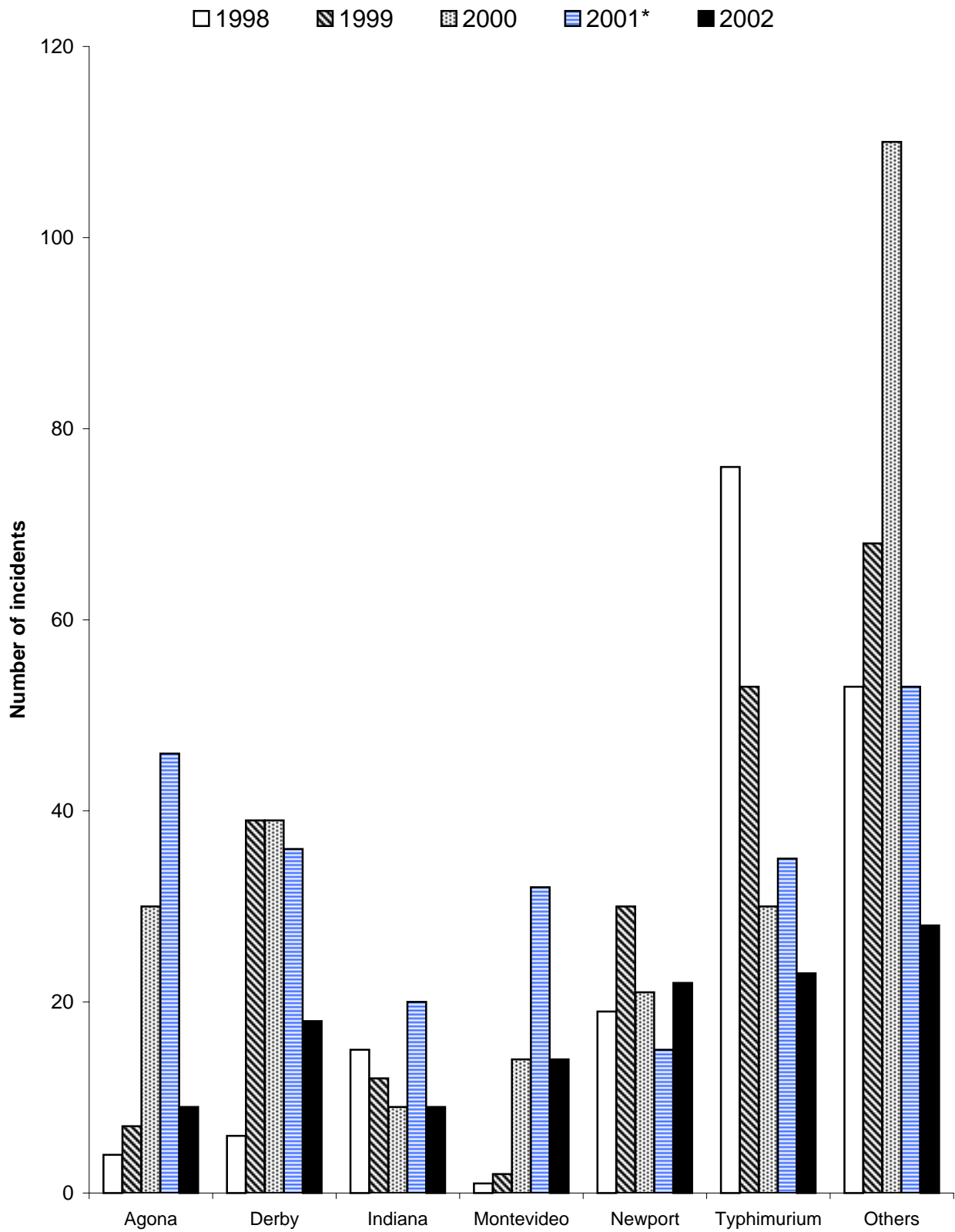


Table 52: Incidents of the top 6 *Salmonella* serotypes in turkeys in 2002 as a % of all incidents compared to previous years

Serotype	1998	1999	2000	2001	2002
S. Typhimurium %	43.7	25.2	11.9	14.8	18.7
S. Newport %	10.9	14.3	8.3	6.3	17.9
S. Derby %	3.4	18.6	15.4	15.2	14.6
S. Montevideo %	0.6	1.0	5.5	13.5	11.4
S. Agona %	2.3	3.3	11.9	19.4	7.3
S. Indiana %	8.6	5.2	3.6	8.4	7.3
Total no. incidents	174	210	253	237	123

Fig 35: Incidents of *Salmonella* serotypes in turkeys (1998 - 2002)



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

Table 53: S. Typhimurium in turkeys on all premises

Definitive Types Incidents (Isolations)	1998	1999	2000	2001*	2002
2	- (-)	- (-)	- (-)	1 (1)	- (-)
30	- (-)	- (-)	1 (1)	1 (1)	- (-)
40	- (-)	- (-)	1 (3)	- (-)	- (-)
56	- (-)	- (-)	- (-)	1 (1)	- (-)
99	- (-)	- (-)	- (-)	1 (1)	- (-)
104	54 (69)	24 (33)	10 (13)	16 (18)	17 (28)
104b	19 (27)	27 (48)	11 (21)	7 (7)	- (-)
120	1 (1)	- (-)	- (-)	- (-)	1 (1)
193	- (-)	- (-)	2 (4)	1 (1)	- (-)
U302	- (-)	- (-)	- (-)	6 (9)	1 (1)
U308a	- (-)	- (-)	- (-)	- (-)	1 (1)
NOPT	- (-)	- (-)	- (-)	- (-)	2 (2)
UNTY	2 (2)	2 (2)	5 (5)	1 (1)	1 (1)
TOTAL	76 (99)	53 (83)	30 (47)	35 (40)	23 (34)

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

Fig 36: Incidents of *Salmonella* Typhimurium definitive types in turkeys in 2002

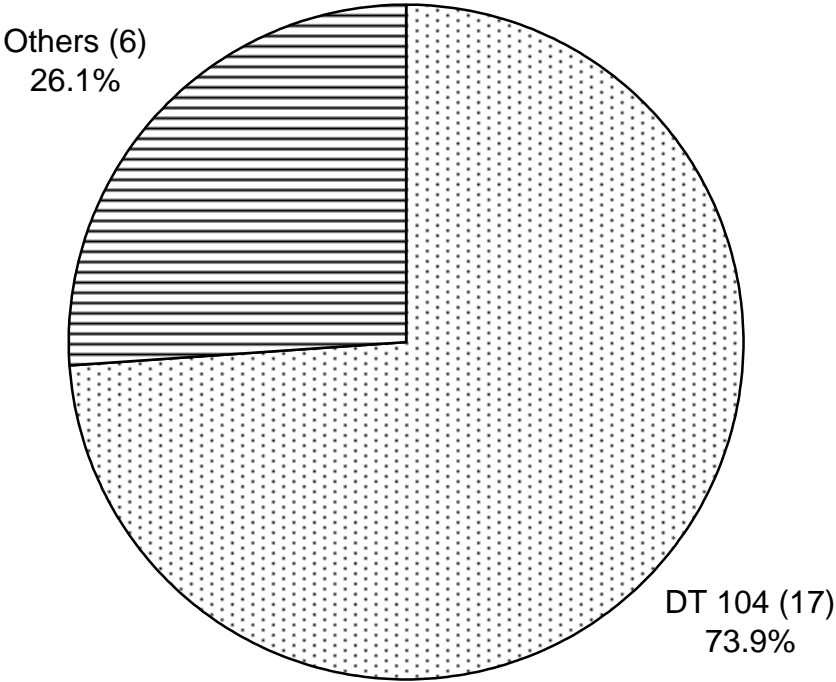
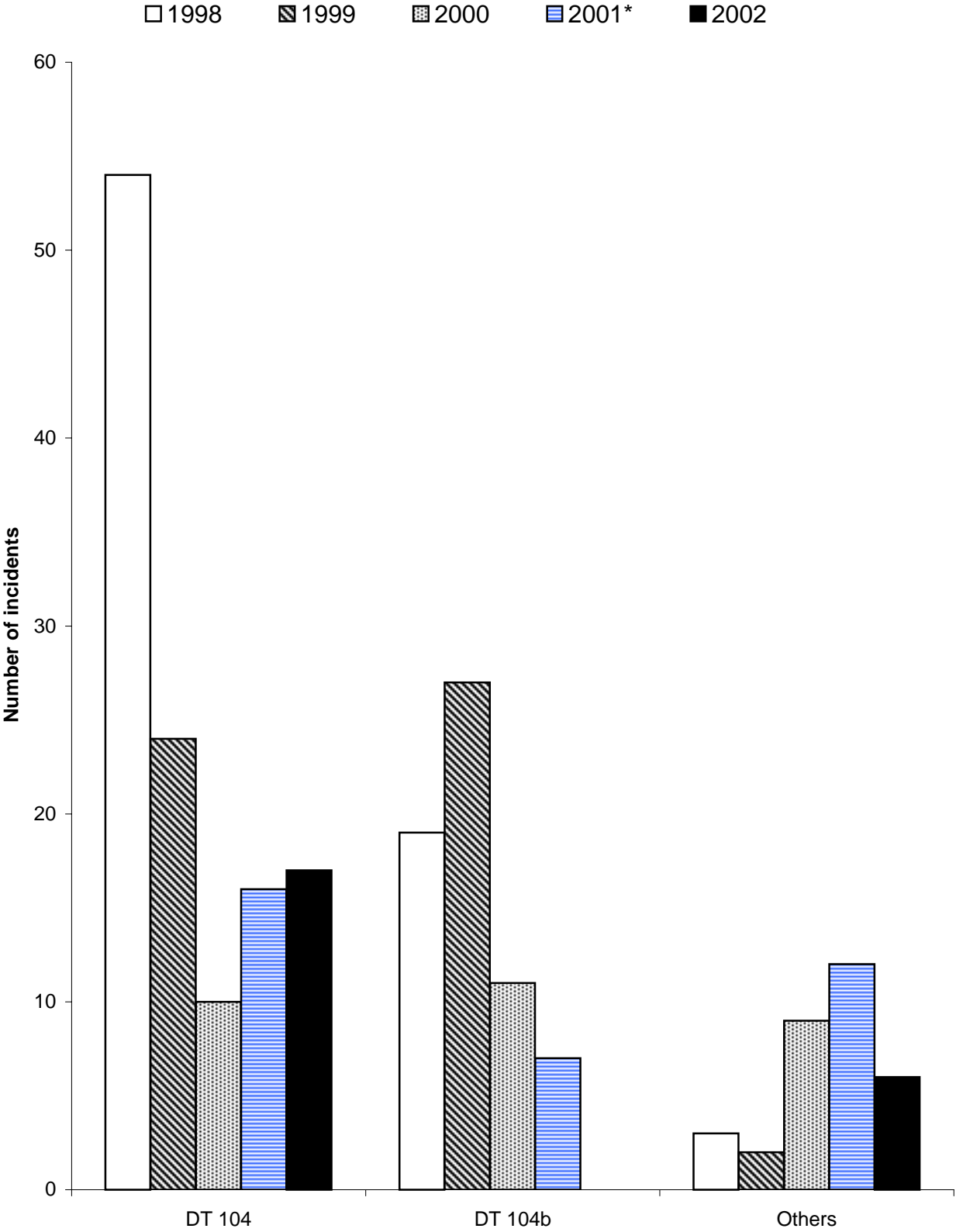


Fig 37: Incidents of *Salmonella* Typhimurium definitive types in turkeys (1998 - 2002)



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

Fig 38 : S. Enteritidis and S. Typhimurium as a proportion of all reports in turkeys (1985 - 2002)

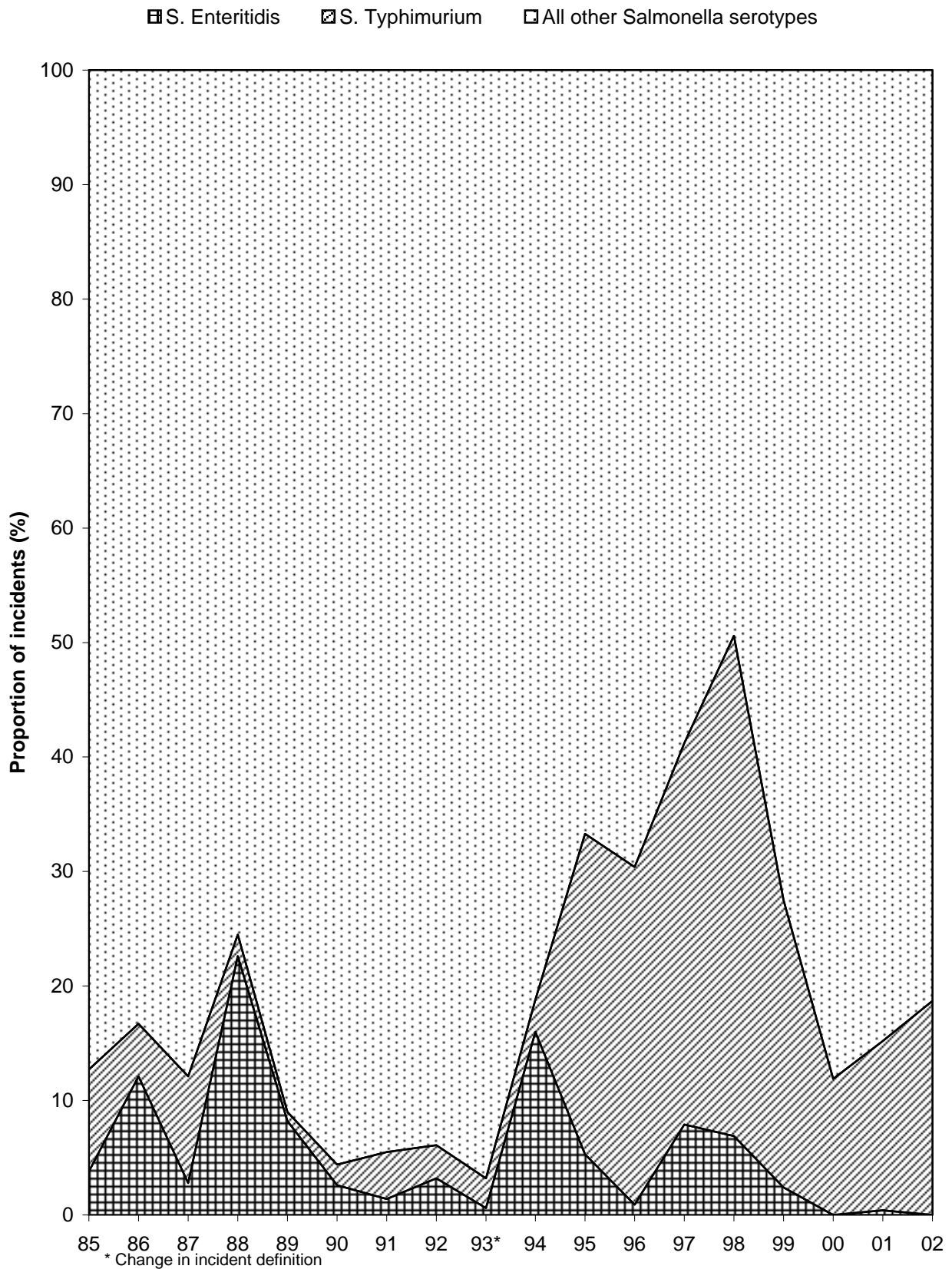


Table 54: S. Enteritidis in turkeys on all premises

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
1	- (-)	1 (2)	- (-)	- (-)	- (-)
4	7 (12)	2 (2)	- (-)	1 (1)	- (-)
6	1 (2)	- (-)	- (-)	- (-)	- (-)
7	3 (3)	- (-)	- (-)	- (-)	- (-)
9b	- (-)	1 (1)	- (-)	- (-)	- (-)
36	1 (1)	- (-)	- (-)	- (-)	- (-)
UNTY	- (-)	1 (1)	- (-)	- (-)	- (-)
TOTAL	12 (18)	5 (6)	- (-)	1 (1)	- (-)

Table 55: S. Hadar in turkeys on all premises

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
2	1 (1)	- (-)	3 (3)	- (-)	1 (1)
4	- (-)	- (-)	1 (1)	- (-)	- (-)
10	- (-)	- (-)	1 (1)	1 (1)	1 (1)
16	- (-)	1 (1)	- (-)	- (-)	- (-)
UNTY	- (-)	- (-)	- (-)	- (-)	- (-)
NOPT	- (-)	1 (1)	2 (2)	- (-)	2 (2)
TOTAL	1 (1)	2 (2)	7 (7)	1 (1)	4 (4)

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

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

<i>Salmonella</i> Incidents (Isolations)	1998	1999	2000	2001*	2002
ENTERICA ENTERICA					
Agona	- (-)	1 (1)	- (-)	- (-)	1 (1)
Anatum	1 (1)	- (-)	- (-)	- (-)	1 (1)
Binza	1 (1)	1 (1)	- (-)	3 (3)	30 (55)
Bredeney	- (-)	- (-)	- (-)	- (-)	1 (1)
Derby	- (-)	1 (1)	- (-)	- (-)	1 (1)
Enteritidis	30 (41)	22 (29)	17 (18)	13 (14)	11 (14)
Give	- (-)	- (-)	- (-)	- (-)	13 (13)
Goldcoast	1 (1)	- (-)	- (-)	- (-)	3 (3)
Hadar	2 (5)	6 (6)	- (-)	1 (1)	27 (35)
Havana	- (-)	- (-)	- (-)	- (-)	2 (4)
Indiana	7 (10)	3 (3)	3 (3)	4 (4)	62 (89)
Kedougou	- (-)	- (-)	- (-)	- (-)	4 (4)
Kottbus	2 (3)	4 (4)	3 (3)	1 (2)	3 (3)
Livingstone	1 (1)	1 (1)	2 (2)	- (-)	15 (20)
Muenchen	- (-)	- (-)	- (-)	- (-)	1 (1)
New Brunswick	1 (1)	- (-)	- (-)	- (-)	- (-)
Newport	- (-)	2 (2)	- (-)	- (-)	- (-)
Orion	- (-)	2 (2)	1 (1)	- (-)	31 (52)
Panama	1 (1)	- (-)	- (-)	- (-)	- (-)
Paratyphi B var java	- (-)	- (-)	1 (1)	- (-)	- (-)
Saint Paul	3 (3)	1 (1)	2 (2)	4 (4)	3 (3)
Senftenberg	1 (2)	- (-)	- (-)	- (-)	8 (8)
Typhimurium	37 (43)	7 (11)	11 (11)	10 (11)	11 (13)
Virchow	- (-)	- (-)	1 (1)	- (-)	- (-)
ENTERICA DIARIZONAE					
61:k:1,5,7	1 (1)	- (-)	- (-)	- (-)	- (-)
61:-:1,5,7	- (-)	1 (1)	- (-)	- (-)	- (-)
UNSPECIFIED					
structure only	- (-)	- (-)	1 (1)	- (-)	5 (6)

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

<i>Salmonella</i> Incidents (Isolations)	1998	1999	2000	2001*	2002
rough strain	- (-)	- (-)	- (-)	1 (1)	2 (2)
Untyped	- (-)	- (-)	- (-)	- (-)	1 (1)
TOTAL	89 (114)	52 (63)	42 (43)	37 (40)	236 (330)

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

Fig 39: Incidents of *Salmonella* serotypes in ducks and geese in 2002

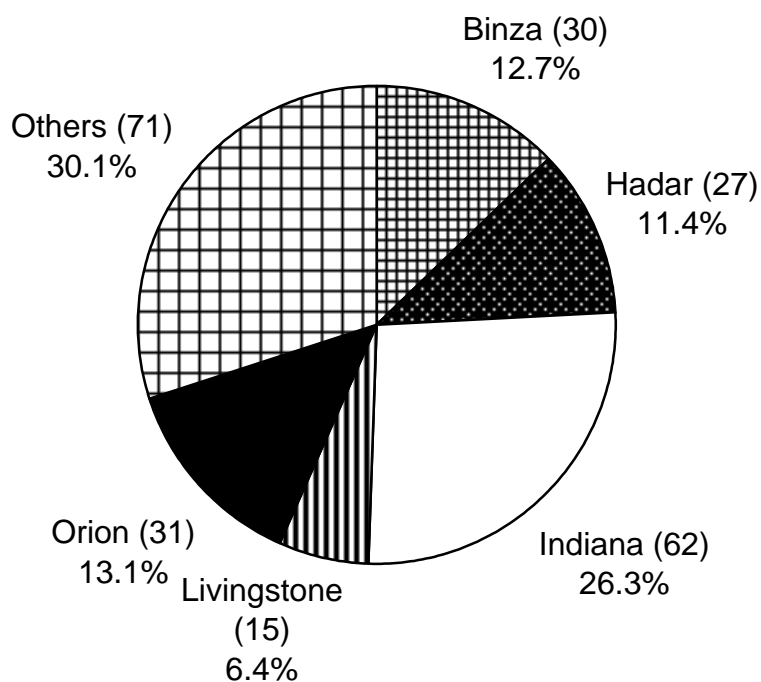
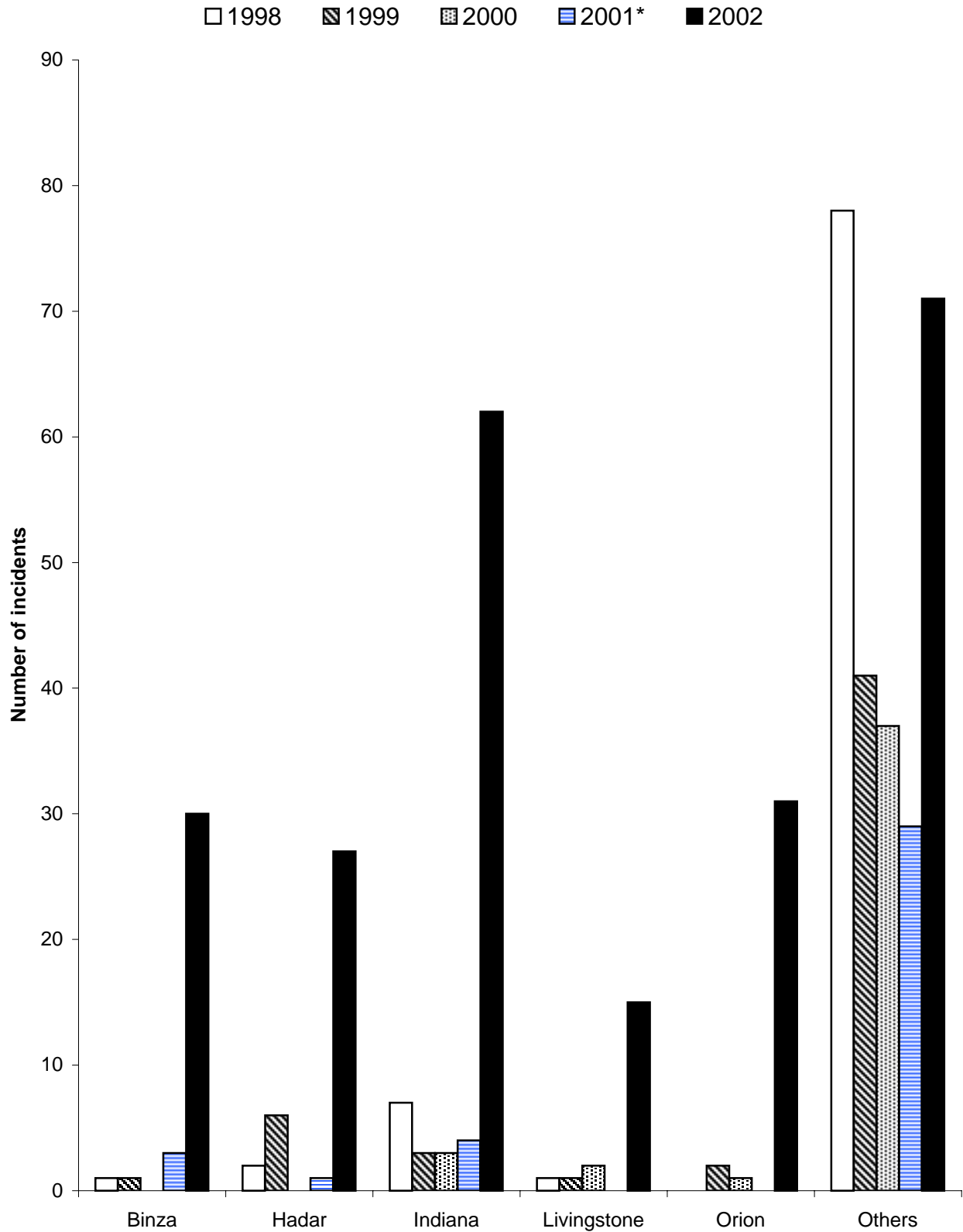


Table 57: Incidents of the top 5 *Salmonella* serotypes in ducks & geese in 2002 as a % of all incidents compared to previous years

Serotype	1998	1999	2000	2001	2002
S. Indiana %	7.9	5.8	7.1	10.8	26.3
S. Orion %	0	3.8	2.4	0	13.1
S. Binza %	1.1	1.9	0	8.1	12.7
S. Hadar %	2.2	11.5	0	2.7	11.4
S. Livingstone %	1.1	1.9	4.8	0	6.4
Total no. incidents	89	52	42	37	236

Fig 40: Incidents of *Salmonella* serotypes in ducks and geese (1998 - 2002)



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

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

Definitive Types Incidents (Isolations)	1998	1999	2000	2001*	2002
1	1 (1)	- (-)	- (-)	- (-)	- (-)
8	22 (24)	5 (7)	6 (6)	6 (7)	8 (10)
9	- (-)	- (-)	- (-)	1 (1)	- (-)
30	5 (6)	1 (2)	2 (2)	1 (1)	2 (2)
40	- (-)	- (-)	1 (1)	- (-)	- (-)
99	3 (3)	- (-)	- (-)	- (-)	- (-)
104	5 (7)	1 (2)	1 (1)	- (-)	- (-)
104b	1 (1)	- (-)	1 (1)	- (-)	- (-)
125	- (-)	- (-)	- (-)	1 (1)	- (-)
195	1 (1)	- (-)	- (-)	- (-)	1 (1)
208	- (-)	- (-)	- (-)	- (-)	- (-)
U310	- (-)	- (-)	- (-)	1 (1)	- (-)
TOTAL	38 (43)	7 (11)	11 (11)	10 (11)	11 (13)

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

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
4	10 (12)	7 (7)	7 (7)	2 (2)	- (-)
5a	- (-)	1 (2)	- (-)	- (-)	- (-)
8	8 (10)	3 (6)	3 (3)	- (-)	- (-)
9	1 (1)	- (-)	- (-)	- (-)	- (-)
9a	- (-)	1 (1)	2 (2)	- (-)	- (-)
9b	9 (16)	8 (11)	3 (3)	9 (10)	8 (11)
13a	- (-)	- (-)	- (-)	- (-)	1 (1)
21	- (-)	- (-)	1 (2)	- (-)	- (-)
29	1 (1)	- (-)	- (-)	- (-)	- (-)
RDNC	- (-)	1 (1)	- (-)	- (-)	- (-)
UNTY	1 (1)	1 (1)	1 (1)	2 (2)	2 (2)
Untyped	- (-)	- (-)	- (-)	- (-)	- (-)
TOTAL	30 (41)	22 (29)	17 (18)	13 (14)	11 (14)

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

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

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
2	2 (2)	2 (2)	- (-)	- (-)	10 (12)
4	- (3)	- (-)	- (-)	1 (1)	1 (1)
10	- (-)	- (-)	- (-)	- (-)	1 (1)
11	- (-)	- (-)	- (-)	- (-)	2 (2)
16	- (-)	2 (2)	- (-)	- (-)	- (-)
22	- (-)	- (-)	- (-)	- (-)	5 (11)
46	- (-)	- (-)	- (-)	- (-)	1 (1)
RDNC	- (-)	1 (1)	- (-)	- (-)	3 (3)
NOPT	- (-)	1 (1)	- (-)	- (-)	4 (4)
TOTAL	2 (5)	6 (6)	- (-)	1 (1)	27 (35)

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

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
26	- (-)	- (-)	1 (1)	- (-)	- (-)
TOTAL	- (-)	- (-)	1 (1)	- (-)	- (-)

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

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

<i>Salmonella</i> Incidents (Isolations)	1998	1999	2000	2001*	2002
ENTERICA ENTERICA					
Agona	- (-)	4 (4)	4 (4)	1 (1)	- (-)
Ajiobo	- (-)	- (-)	2 (2)	- (-)	- (-)
Anatum	4 (4)	- (-)	- (-)	- (-)	- (-)
Binza	75 (79)	44 (60)	26 (32)	22 (24)	14 (20)
Brandenburg	- (-)	1 (1)	- (-)	- (-)	- (-)
Derby	- (-)	- (-)	2 (2)	- (-)	1 (1)
Dublin	1 (1)	- (-)	1 (1)	- (-)	1 (1)
Enteritidis	10 (11)	7 (7)	4 (5)	1 (1)	1 (1)
Fluntern	1 (1)	- (-)	- (-)	- (-)	- (-)
Goldcoast	- (-)	- (-)	1 (1)	- (-)	- (-)
Hadar	- (-)	1 (1)	- (-)	- (-)	- (-)
Heidelberg	- (-)	1 (1)	- (-)	- (-)	- (-)
Indiana	3 (3)	1 (1)	3 (3)	1 (1)	1 (1)
Infantis	- (-)	- (-)	1 (1)	1 (1)	- (-)
Kedougou	2 (2)	2 (4)	- (-)	- (-)	- (-)
Kentucky	3 (4)	- (-)	- (-)	- (-)	- (-)
Kottbus	- (-)	1 (1)	1 (1)	- (-)	- (-)
Mbandaka	2 (2)	1 (2)	1 (1)	1 (1)	- (-)
Montevideo	- (-)	- (-)	- (-)	1 (1)	- (-)
Newport	- (-)	1 (1)	- (-)	- (-)	1 (1)
Ohio	1 (1)	- (-)	- (-)	- (-)	- (-)
Orion	6 (6)	10 (10)	6 (6)	11 (14)	7 (9)
Pullorum	6 (6)	7 (7)	1 (1)	3 (3)	3 (3)
Saint Paul	1 (1)	2 (2)	1 (1)	1 (1)	- (-)
Schwarzengrund	- (-)	- (-)	1 (1)	- (-)	- (-)
Senftenberg	- (-)	1 (1)	1 (1)	1 (1)	- (-)
Stanley	- (-)	- (-)	- (-)	- (-)	1 (1)
Typhimurium	13 (15)	16 (19)	16 (18)	9 (9)	3 (3)
Virchow	- (-)	1 (1)	- (-)	- (-)	- (-)
ENTERICA HOUTENAE					
43:z4z23	- (-)	- (-)	- (-)	1 (1)	- (-)

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

<i>Salmonella</i> Incidents (Isolations)	1998	1999	2000	2001*	2002
UNSPECIFIED					
structure only	9 (9)	6 (6)	2 (2)	1 (1)	3 (5)
rough strain	1 (1)	- (-)	- (-)	1 (1)	- (-)
Untyped	- (-)	1 (1)	- (-)	- (-)	- (-)
TOTAL	138 (146)	108 (130)	74 (83)	56 (61)	36 (46)

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

Fig 41: Incidents of *Salmonella* serotypes in game birds in 2002

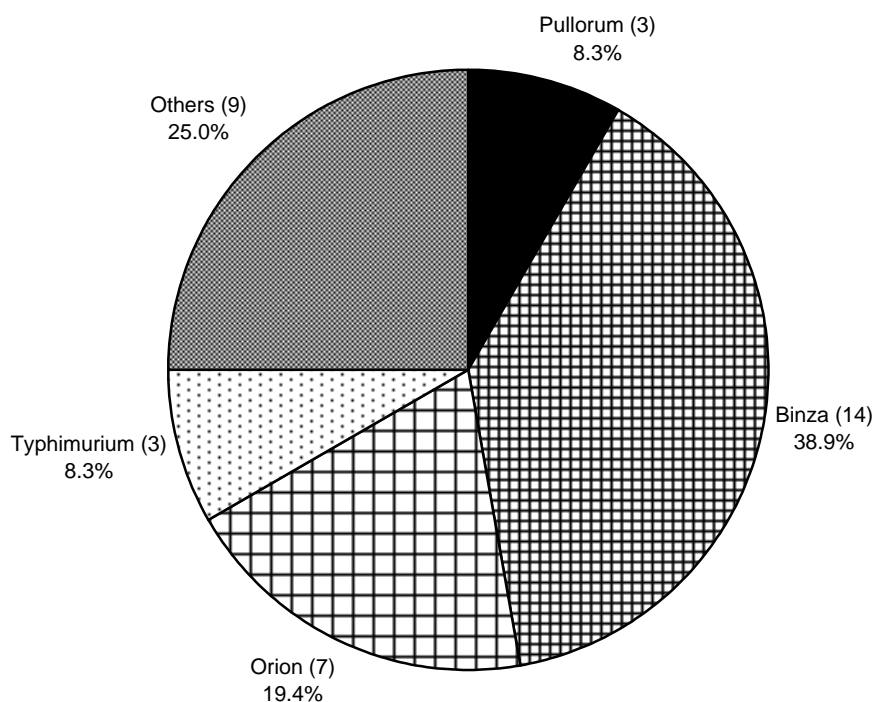
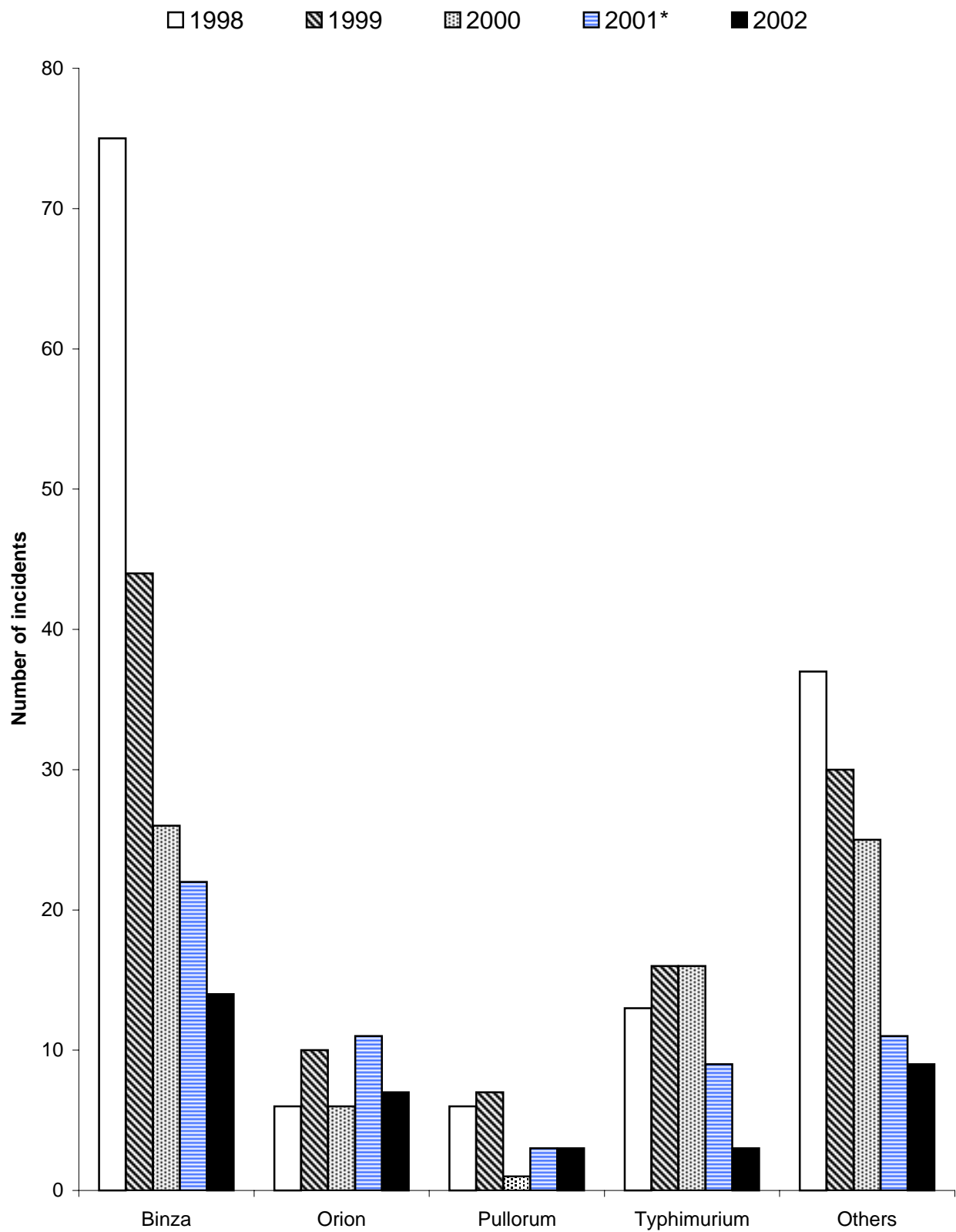


Table 63: Incidents of the top 4 *Salmonella* serotypes in game birds in 2002 as a % of all incidents compared to previous years

Serotype	1998	1999	2000	2001	2002
S. Binza %	54.3	40.7	35.1	39.3	38.9
S. Orion %	4.3	9.3	8.1	19.6	19.4
S. Pullorum %	4.3	6.5	1.4	5.4	8.3
S. Typhimurium %	9.4	14.8	21.6	16.1	8.3
Total no. incidents	138	108	74	56	36

Fig 42: Incidents of *Salmonella* serotypes in game birds (1998 - 2002)



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

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

Definitive Types Incidents (Isolations)	1998	1999	2000	2001*	2002
2	1 (1)	1 (1)	- (-)	- (-)	- (-)
8	- (-)	2 (3)	2 (3)	3 (3)	- (-)
40	1 (1)	1 (1)	1 (1)	- (-)	- (-)
41	1 (1)	- (-)	- (-)	- (-)	- (-)
56	- (-)	- (-)	- (-)	- (-)	1 (1)
86	- (-)	- (-)	1 (1)	- (-)	- (-)
99	- (-)	2 (2)	- (-)	- (-)	- (-)
104	5 (26)	2 (3)	8 (9)	2 (2)	1 (1)
104b	2 (2)	2 (2)	1 (1)	- (-)	- (-)
120	- (-)	- (-)	1 (1)	- (-)	- (-)
146a	1 (1)	- (-)	- (-)	- (-)	- (-)
170	- (-)	- (-)	- (-)	1 (1)	- (-)
193	- (-)	- (-)	1 (1)	1 (1)	1 (1)
195	- (-)	2 (3)	- (-)	1 (1)	- (-)
204c	- (-)	1 (1)	- (-)	- (-)	- (-)
208	- (-)	- (-)	- (-)	1 (1)	- (-)
U302	1 (2)	- (-)	- (-)	- (-)	- (-)
RDNC	- (-)	2 (2)	- (-)	- (-)	- (-)
UNTY	1 (1)	1 (1)	1 (1)	- (-)	- (-)
TOTAL	13 (15)	16 (19)	16 (18)	9 (9)	3 (3)

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

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

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
4	9 (10)	5 (5)	- (-)	1 (1)	- (-)
5a	- (-)	- (-)	2 (2)	- (-)	- (-)
13a	1 (1)	2 (2)	1 (2)	- (-)	1 (1)
UNTY	- (-)	- (-)	1 (1)	- (-)	- (-)
TOTAL	10 (11)	7 (7)	4 (5)	1 (1)	1 (1)

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

Phage Types Incidents (Isolations)	1998	1999	2000	2001*	2002
1	- (-)	1 (1)	- (-)	- (-)	- (-)
7	3 (3)	- (-)	- (-)	- (-)	- (-)
11	- (-)	- (-)	- (-)	- (-)	1 (1)
NOPT	3 (3)	6 (6)	1 (1)	3 (3)	2 (2)
TOTAL	6 (6)	7 (7)	1 (1)	3 (3)	3 (3)

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