

Chapter 2.2

REPORTS OF *SALMONELLA* IN SHEEP AND GOATS

Sheep

33.5 million sheep were kept in GB in 2002. In general the number of diagnostic submissions from sheep reported to the VIDA database has decreased in recent years, but more samples were submitted in 2002 (9,165) than in 2001 (6,545) when many sheep were slaughtered for control and welfare reasons during FMD, but remain below the number in 2000 (11,000).

There was a 56% increase in the number of *Salmonella* incidents reported in sheep, compared with 2001, back to similar levels observed in the years preceding the FMD outbreak during which submission numbers were markedly reduced. The majority (91%) of the reports originate from diagnostic submissions and most of these are from sheep on farms (Table 1, Chapter 1).

Salmonella enterica* subspecies *diarizonae

Salmonella enterica subspecies *diarizonae* serovar 61:k:1,5,7 (and associated incomplete antigenic structures) continues to be the most common serovar reported in sheep, increasing to 62 % of all incidents (Table 25). There were changes in the relative proportion of the different types (eg, increase in 61:-:1,5 and decrease in 61:k:1,5,7) compared with 2001, and 61:k:1,7 was isolated for the first time in sheep .

Salmonella diarizonae is associated with diarrhoea and abortions, but can be isolated from sheep with other infections (eg coccidiosis) and from healthy sheep.

***Salmonella* Dublin**

As observed in cattle, reports of *S. Dublin* continue to increase (to 19% from 5% in 2000; Table 25, Figure 19) despite falling submission numbers. This serotype has been the second most common serotype isolated from sheep in recent years. The majority of *S. Dublin* incidents occurred during the lambing season (31 of 39 incidents occurred in December to March). Incidents have occurred throughout GB, but particularly in the North and West with the highest number in Wales. Some outbreaks have occurred on farms after re-stocking following FMD culling. There was an increase in the proportion of abortions that were attributed to *S. Dublin* in 2002 (2.5%) compared with 2001 (1.4%) (VIDA 2002). *S. Dublin* is usually considered to be a cattle-adapted serotype however, most outbreaks have not been associated with

outbreaks in cattle and some have occurred in sheep kept without contact with cattle.

***Salmonella* Typhimurium**

The proportion of incidents due to *S. Typhimurium* continues to fall (now 4%; Figure 19) due to declining numbers of DT104. However, DT104 remains the most common (5 of 9 incidents) definitive type (Figure 20) and in one incident the organism could have been acquired from pigs. No definitive types that had not been reported in the last five years were reported in 2002. *S. Typhimurium* was more commonly associated with sudden death and diarrhoea than abortion.

Other serotypes

There continue to be changes in the relative frequency of different serotypes. *S. Kottbus* was isolated for the first time in sheep since 1996 and *S. enterica* subspecies *diarizonae* serovar 61:k:1,7 (incomplete antigenic structure) has never been reported in sheep previously. There were no isolations of *S. Newport*, *S. Enteritidis* or *S. Thompson*. There have been no reports of *S. Hadar*, *S. Virchow*, *S. Amsterdam*, *S. Mbandaka*, *S. Reading*, *S. Rubislaw* or *S. Stourbridge* in the last five years.

Goats

90,000 goats were kept in Great Britain in 2002. There was one incident of *Salmonella* (*S. Dublin*) reported for goats in 2002 and this was not apparently linked with incidents in other species. Although there was an increase in the number of diagnostic submissions from goats in 2002 (521) compared to 2001 (472), numbers remain lower than in previous years (eg 752 in 2000; VIDA 2002).

Table 24: *Salmonella* in sheep on all premises

| <i>Salmonella</i> Incidents (Isolations) | 1998 | 1999 | 2000 | 2001* | 2002 |
|---|-------------------|-------------------|------------------|-----------------|-----------------|
| ENTERICA ENTERICA | | | | | |
| Agama | 9 (12) | 12 (15) | 8 (8) | 7 (9) | 10 (12) |
| Agona | - (-) | 1 (1) | 3 (4) | 1 (1) | 1 (1) |
| Ajiobo | - (-) | - (-) | - (-) | 1 (1) | - (-) |
| Anatum | 1 (1) | - (-) | - (-) | - (-) | - (-) |
| Bovis morbificans | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| Brandenburg | - (-) | 1 (1) | - (-) | 1 (1) | 1 (1) |
| Bredeney | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| Derby | 13 (14) | 5 (6) | 6 (7) | 6 (9) | 1 (1) |
| Dublin | 13 (17) | 13 (14) | 10 (12) | 19 (19) | 38 (42) |
| Durham | - (-) | - (-) | - (-) | 1 (1) | - (-) |
| Enteritidis | 2 (2) | 2 (4) | - (-) | 1 (1) | - (-) |
| Goldcoast | - (-) | - (-) | 1 (2) | - (-) | 1 (1) |
| Heidelberg | 1 (1) | - (-) | - (-) | - (-) | - (-) |
| Indiana | 3 (6) | 3 (4) | 2 (3) | - (-) | 1 (5) |
| Infantis | - (-) | 2 (3) | - (-) | - (-) | - (-) |
| Kottbus | - (-) | - (-) | - (-) | - (-) | 1 (1) |
| Livingstone | - (-) | 1 (2) | 1 (1) | - (-) | - (-) |
| Manhattan | 1 (1) | - (-) | - (-) | - (-) | - (-) |
| Montevideo | 21 (28) | 12 (13) | 15 (21) | 22 (27) | 13 (14) |
| Newington | - (-) | - (-) | - (-) | 1 (1) | - (-) |
| Newport | - (-) | - (-) | 1 (1) | 1 (2) | - (-) |
| Poona | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| Schwarzengrund | - (-) | - (-) | - (-) | 2 (2) | - (-) |
| Thompson | - (-) | 1 (1) | 1 (1) | - (-) | - (-) |
| Typhimurium | 53 (78) | 46 (63) | 30 (54) | 10 (12) | 9 (12) |
| SUBTOTAL | 117 (160) | 102 (130) | 78 (114) | 73 (86) | 76 (90) |
| ENTERICA DIARIZONAE | | | | | |
| 61:k:1,5 | 10 (10) | 49 (51) | 47 (49) | 10 (10) | 22 (22) |
| 61:k:1,5,7 | 23 (23) | 17 (17) | 48 (48) | 24 (26) | 77 (79) |
| 61:k:1,7 | - (-) | - (-) | - (-) | - (-) | 1 (1) |
| 61:-:1,5 | 4 (4) | 8 (8) | 11 (11) | 3 (3) | 23 (25) |
| 61:-:1,5,7 | 15 (15) | 10 (10) | 7 (8) | 20 (22) | 3 (3) |

Table 24: *Salmonella* in sheep on all premises

| <i>Salmonella</i> Incidents (Isolations) | 1998 | 1999 | 2000 | 2001* | 2002 |
|---|------------|------------|------------|------------|------------|
| unspecified "arizona" + | 14 (14) | 1 (1) | - (-) | - (-) | - (-) |
| SUBTOTAL | 66 (66) | 85 (87) | 113 (116) | 57 (61) | 126 (130) |
| UNSPECIFIED | | | | | |
| structure only | 2 (2) | - (-) | 3 (3) | - (-) | - (-) |
| rough strain | - (-) | - (-) | - (-) | - (-) | 1 (1) |
| Untyped | 1 (1) | - (-) | - (-) | - (-) | - (-) |
| TOTAL | 186 (229) | 187 (217) | 194 (233) | 130 (147) | 203 (221) |

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

+ antigenic structure not stated

Fig 18: Incidents of *Salmonella* serotypes in sheep in 2002

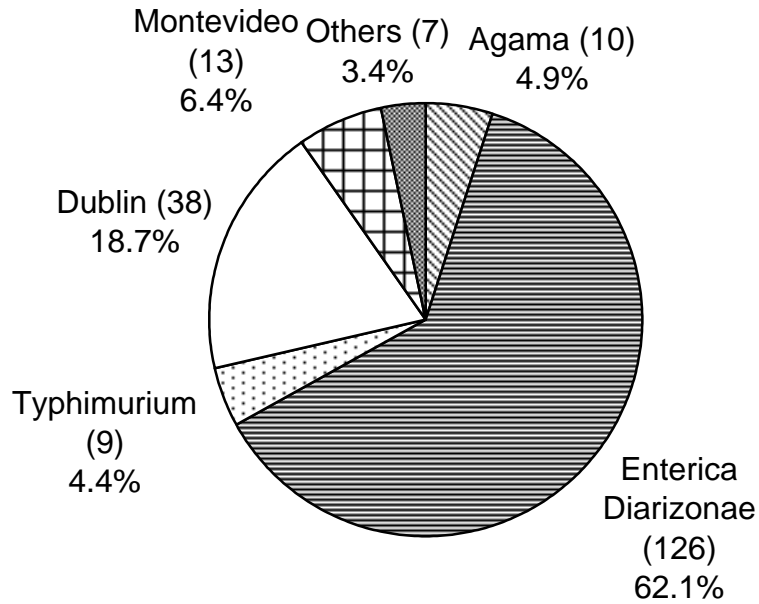
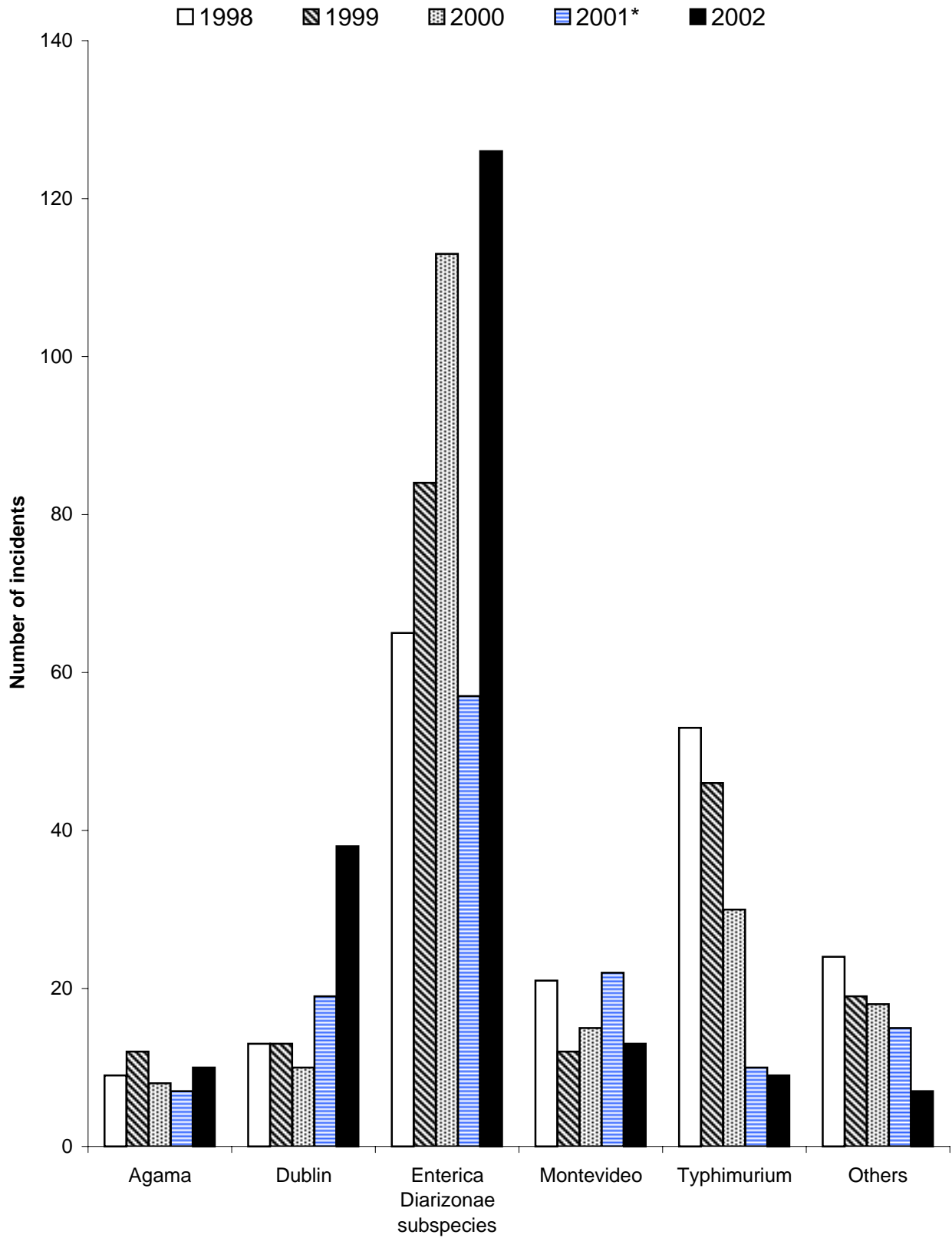


Table 25: Incidents of the top 5 *Salmonella* serotypes in sheep in 2002 as a % of all incidents compared to previous years

| Serotype | 1998 | 1999 | 2000 | 2001 | 2002 |
|--|------|------|------|------|------|
| <i>S. Enterica Diarizonae</i> subspecies % | 35.5 | 45.5 | 58.2 | 43.8 | 62.1 |
| <i>S. Dublin</i> % | 7.0 | 7.0 | 5.2 | 14.6 | 18.7 |
| <i>S. Montevideo</i> % | 11.3 | 6.4 | 7.7 | 16.9 | 6.4 |
| <i>S. Agama</i> % | 4.8 | 6.4 | 4.1 | 5.4 | 4.9 |
| <i>S. Typhimurium</i> % | 28.5 | 24.6 | 15.5 | 7.7 | 4.4 |
| Total no. incidents | 186 | 187 | 194 | 130 | 203 |

Fig 19: Incidents of *Salmonella* serotypes in sheep (1998 - 2002)



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

Table 26: S. Typhimurium in sheep on all premises

| Definitive Types Incidents (Isolations) | 1998 | 1999 | 2000 | 2001* | 2002 |
|--|-----------------|-----------------|-----------------|-----------------|----------------|
| 7 | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| 12 | - (-) | 3 (4) | - (-) | - (-) | - (-) |
| 40 | 1 (1) | - (-) | - (-) | - (-) | - (-) |
| 41 | - (-) | - (-) | - (-) | 2 (2) | - (-) |
| 104 | 39 (50) | 27 (38) | 20 (34) | 4 (6) | 5 (6) |
| 104b | 7 (14) | 1 (1) | 1 (1) | - (-) | 1 (2) |
| 120 | - (-) | 1 (1) | 1 (6) | - (-) | - (-) |
| 193 | 1 (1) | 3 (6) | - (1) | 1 (1) | - (-) |
| 193a | - (-) | 2 (4) | - (-) | - (-) | - (-) |
| 208 | 1 (6) | - (-) | 1 (1) | - (-) | - (-) |
| U302 | - (-) | 1 (1) | 3 (6) | 1 (1) | 2 (3) |
| U308a | - (-) | - (-) | - (-) | 1 (1) | - (-) |
| RDNC | - (-) | - (-) | 1 (1) | - (-) | - (-) |
| NOPT | 1 (1) | 1 (1) | - (-) | - (-) | - (-) |
| UNTY | 3 (5) | 5 (5) | 3 (4) | 1 (1) | 1 (1) |
| Untyped | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| TOTAL | 53 (78) | 46 (63) | 30 (54) | 10 (12) | 9 (12) |

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

Fig 20: Incidents of *Salmonella* Typhimurium definitive types in sheep in 2002

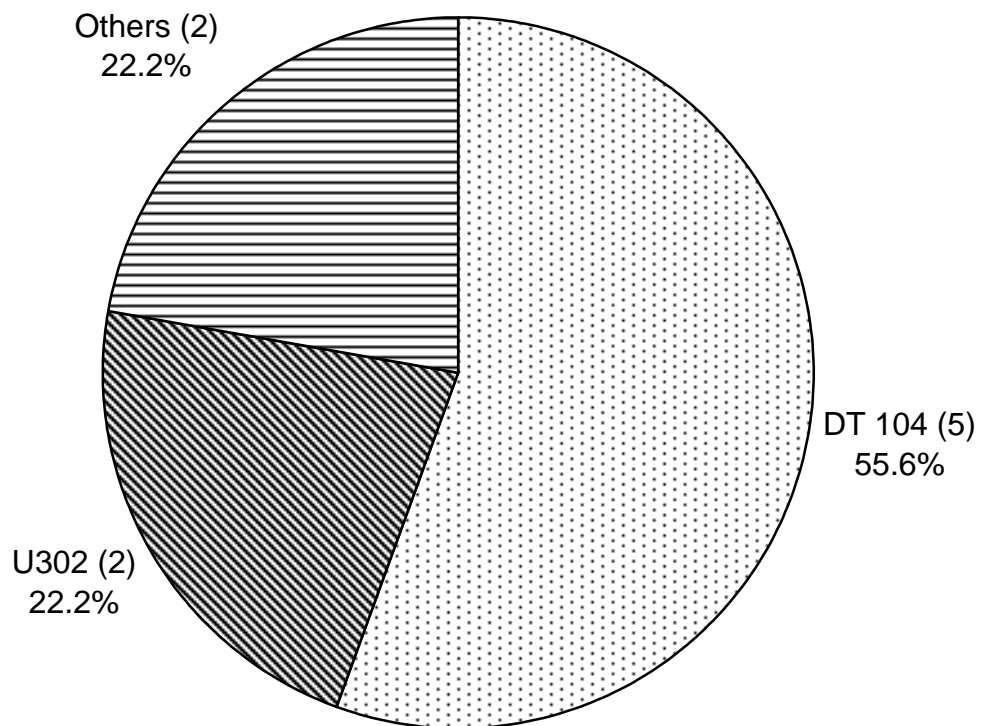
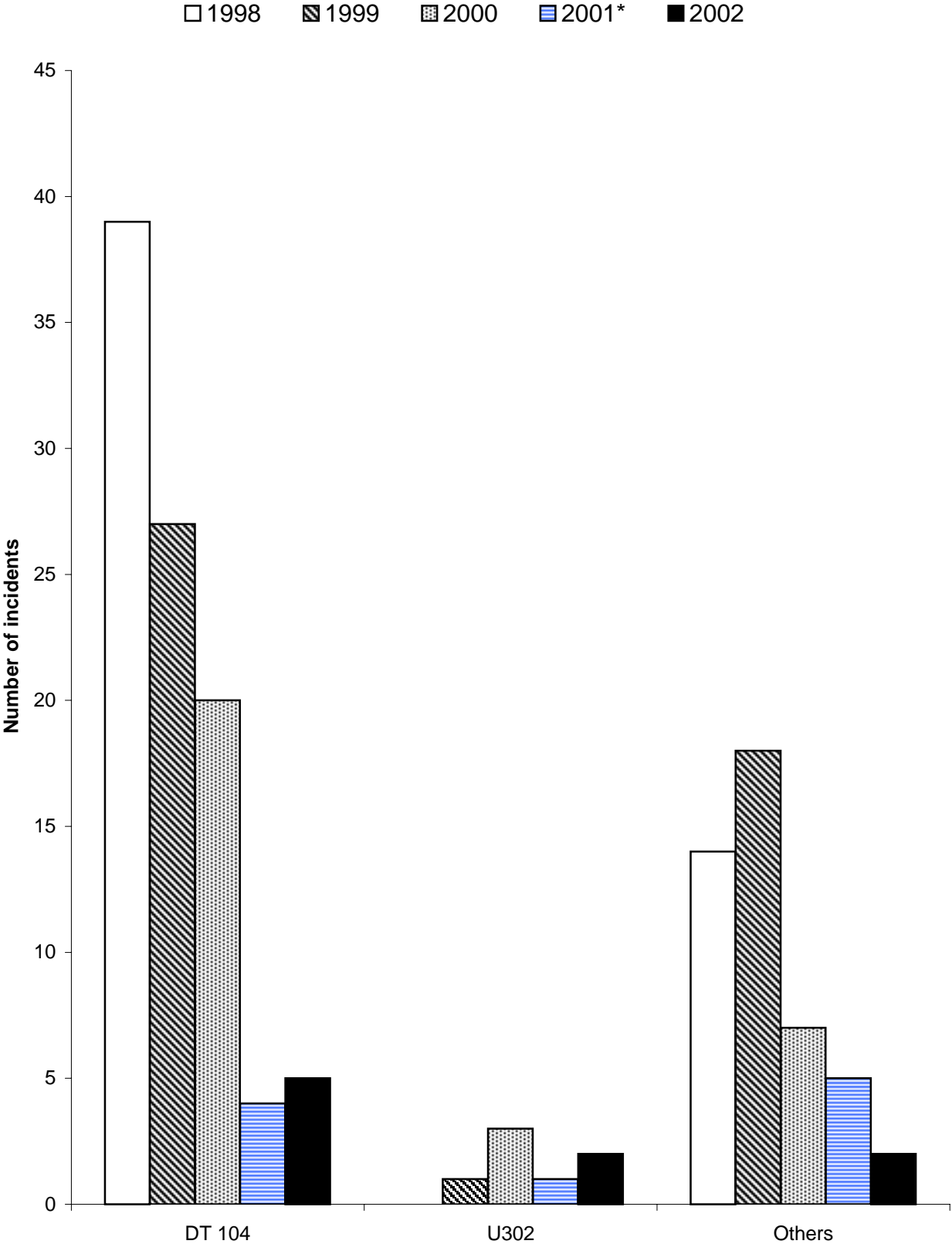


Fig 21: Incidents of *Salmonella* Typhimurium definitive types in sheep (1998 - 2002)



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

Fig 22 : S. Enteritidis and S. Typhimurium as a proportion of all incident reports in sheep (1985 - 2002)

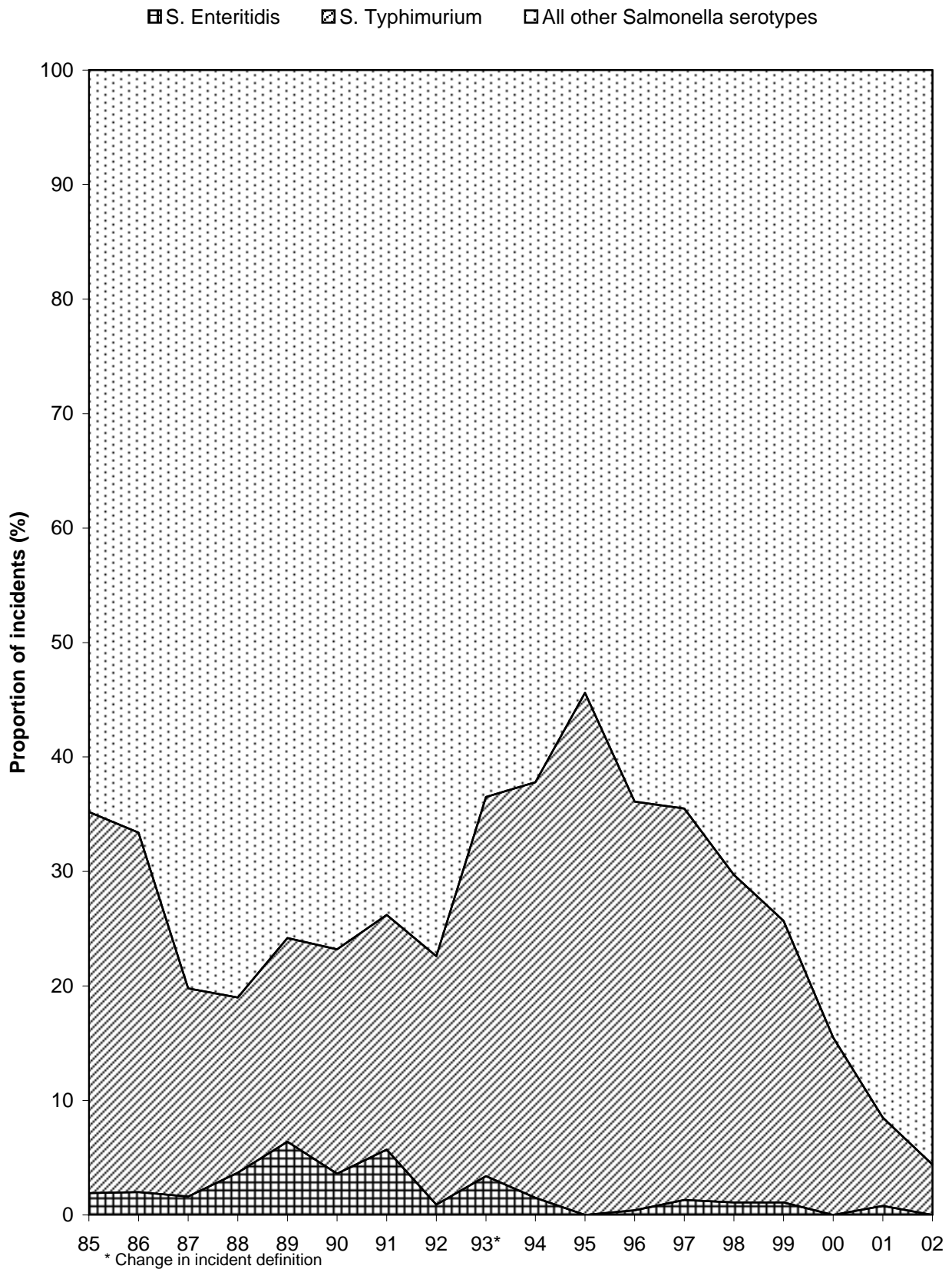


Table 27: S. Enteritidis in sheep on all premises

| Phage Types Incidents (Isolations) | 1998 | 1999 | 2000 | 2001* | 2002 |
|---------------------------------------|--------|--------|--------|--------|--------|
| 4 | 2 (2) | - (-) | - (-) | - (-) | - (-) |
| 6 | - (-) | 1 (3) | - (-) | - (-) | - (-) |
| 8 | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| 14b | - (-) | - (-) | - (-) | 1 (1) | - (-) |
| TOTAL | 2 (2) | 2 (4) | - (-) | 1 (1) | - (-) |

Table 28: S. Thompson in sheep on all premises

| Phage Types Incidents (Isolations) | 1998 | 1999 | 2000 | 2001* | 2002 |
|---------------------------------------|--------|--------|--------|--------|--------|
| 1 | - (-) | - (-) | 1 (1) | - (-) | - (-) |
| NOPT | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| Totals | - (-) | 1 (1) | 1 (1) | - (-) | - (-) |

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

Table 29: *Salmonella* in goats on all premises

| <i>Salmonella</i> Incidents (Isolations) | 1998 | 1999 | 2000 | 2001* | 2002 |
|---|--------|--------|--------|--------|--------|
| ENTERICA ENTERICA | | | | | |
| Agona | - (-) | - (-) | 1 (3) | - (-) | - (-) |
| Dublin | 1 (1) | - (-) | 1 (1) | - (-) | 1 (2) |
| Eastbourne | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| Newport | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| Poona | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| Typhimurium | - (-) | 2 (4) | 1 (1) | - (-) | - (-) |
| TOTAL | 1 (1) | 5 (7) | 3 (5) | - (-) | 1 (2) |

Table 30: *S. Typhimurium* in goats on all premises

| Definitive Types Incidents (Isolations) | 1998 | 1999 | 2000 | 2001* | 2002 |
|--|--------|--------|--------|--------|--------|
| 104 | - (-) | 1 (3) | - (-) | - (-) | - (-) |
| U302 | - (-) | 1 (1) | - (-) | - (-) | - (-) |
| UNTY | - (-) | - (-) | 1 (1) | - (-) | - (-) |
| TOTAL | - (-) | 2 (4) | 1 (1) | - (-) | - (-) |

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