

## Chapter 2.2

### REPORTS OF *SALMONELLA* IN SHEEP AND GOATS

#### Sheep

28.4 million sheep were kept in Great Britain in 2005, 6.3% lower than the figure in 2004 (30.3m). The number of sheep diagnostic submissions reported to the VIDA database was 10,754 in 2005 compared with 10,728 in 2004. This sustained the increasing trend seen since the FMD epidemic in 2001 when submissions to VLA laboratories were constrained.

There was a 13% decrease in the number of *Salmonella* incidents reported in sheep in 2005 (226) compared with 2004 (260), mainly due to the decrease in the number of reports of *Salmonella enterica* subspecies *diarizonae* serovar 61:k:1,5,7 and associated incomplete antigenic structures (151 in 2005 compared with 184 in 2004). The majority (96%) of the reports originated from diagnostic submissions and all were from sheep on farms and premises other than slaughterhouses.

#### ***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 constituting 66.8% of all incidents in 2005 compared to 70.8% in 2004 (Table 24). The significance of *S. diarizonae* is uncertain as the organism may be associated with abortion and diarrhoea. However, it can also be isolated from sheep with other infections (e.g. coccidia, *Nematodirus* and fluke) as well as healthy sheep. *Salmonella diarizonae* was isolated from the nasal chambers from 2 ewes from a flock of approximately 300, presented with chronic nasal discharge over a period of several months. Post-mortem examination revealed a polyp like growth attached to the nasal mucosa in one ewe and grossly thickened mucosa / sub-mucosa lining the nasal passages in the other.

#### ***Salmonella* Dublin**

The proportion of incidents associated with *S. Dublin* increased from approximately 6% in 2004 to 7% in 2005. *S. Dublin* continues to be the third most common serovar isolated from sheep. The most commonly reported clinical signs associated with *S. Dublin* in sheep included abortion and diarrhoea.

## ***Salmonella* Typhimurium**

*Salmonella* Typhimurium was the second most common serovar (24 incidents) reported in sheep in 2005. The proportion of incidents associated with this serovar increased to 10.6% compared with 3.8% in 2004 (Table 25). This was due to an increase in the number of incidents of DT104 compared to 2004, as well as due to enhanced discrimination of phage types within the VLA *Salmonella* database. Definitive phage type DT104 remains the most common (fifteen of twenty-four incidents) definitive type (Figure 20). Definitive phage types DT8 (commonly associated with ducks) and DT195 were reported for the first time in 2005. DT8 was last reported from sheep in 1989, while DT195 was last reported in 1993. The most commonly reported clinical signs associated with *S. Typhimurium* in sheep included diarrhoea, abortion, as well as mortality, malaise and reproductive problems.

## **Other serovars**

*Salmonella* Montevideo was the fourth most common serovar (10 incidents) reported in sheep in 2005. The proportion of incidents associated with this serovar decreased to 4.4% compared with 7.3% in 2004. An outbreak of abortion caused by *S. Montevideo* infection in Welsh Mountain ewes was investigated in 2005. The number of incidents due to *Salmonella* Derby (3) decreased in 2005 compared with 2004 (9 reports). There were three incidents due to *Salmonella* Newport, same as in 2004. *Salmonella* Enteritidis and *S. Thompson* were not reported in sheep in 2005, as was the case in 2004, while there were three incidents of *S. Enteritidis* (Table 27) and one incident of *S. Thompson* in 2003 (Table 28). Serovars recorded in 2004, but not reported in 2005 were *Salmonella* Ajiobo and *Salmonella* Berta. There were single reports of *S. Goldcoast* and *S. Kottbus*; these were last reported in 2002. *Salmonella* Duesseldorf was reported for the first time from a sheep in Scotland. An uncommon *Salmonella* serotype, *S. Durham* was isolated from faeces from a group of 10 month old lambs in north west Wales showing diarrhoea and ill-thrift. All of the group of 50 were affected with 12 deaths recorded. A concurrent parasitic gastroenteritis was also diagnosed.

## **Goats**

93,294 goats were kept in Great Britain in 2005. There was one incident of salmonellosis recorded in goats during 2005. This was a report of *Salmonella enterica* subspecies *diarizonae* serovar 61:-:1,5,7. The last incident of *Salmonella* from goats was reported in 2002. That was a report of *S. Dublin*. The number of goat diagnostic submissions in 2005 decreased slightly to 629 compared with 630 in 2004.

**Table 24: *Salmonella* in sheep on all premises**

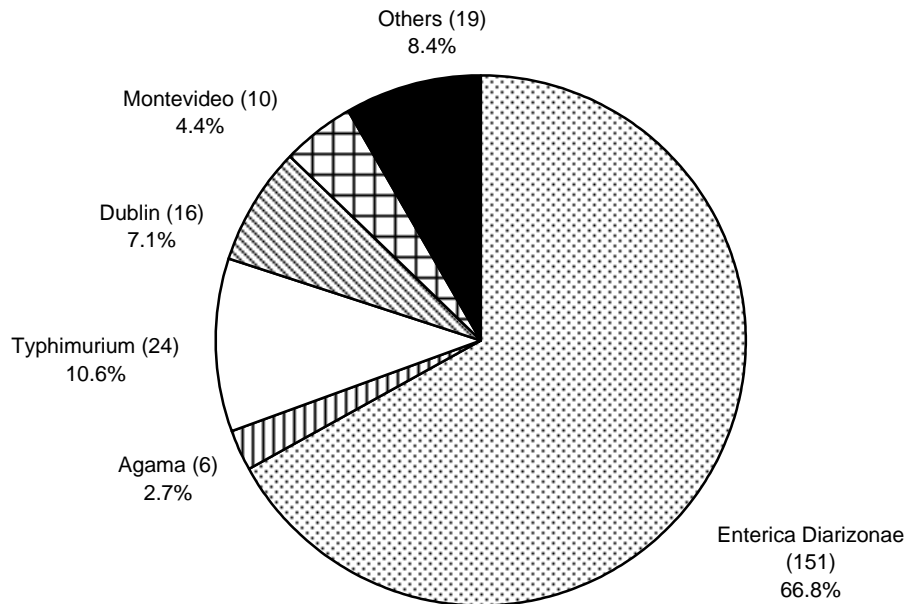
| <i>Salmonella</i><br>Incidents (Isolations) | 2001*           | 2002            | 2003              | 2004            | 2005            |
|---|-----------------|-----------------|-------------------|-----------------|-----------------|
| <b>ENTERICA ENTERICA</b>                    |                 |                 |                   |                 |                 |
| Agama                                       | 7 ( 9)          | 10 ( 12)        | 15 ( 15)          | 5 ( 5)          | 6 ( 6)          |
| Agona                                       | 1 ( 1)          | 1 ( 1)          | 4 ( 4)            | - ( -)          | - ( -)          |
| Ajiobo                                      | 1 ( 1)          | - ( -)          | - ( -)            | 1 ( 1)          | - ( -)          |
| Anatum                                      | - ( -)          | - ( -)          | - ( -)            | 1 ( 1)          | 4 ( 4)          |
| Berta                                       | - ( -)          | - ( -)          | - ( -)            | 1 ( 1)          | - ( -)          |
| Brandenburg                                 | 1 ( 1)          | 1 ( 1)          | - ( -)            | - ( -)          | - ( -)          |
| Derby                                       | 6 ( 9)          | 1 ( 1)          | 11 ( 14)          | 9 ( 10)         | 3 ( 3)          |
| Dublin                                      | 19 ( 19)        | 38 ( 42)        | 37 ( 47)          | 15 ( 18)        | 16 ( 20)        |
| Duesseldorf                                 | - ( -)          | - ( -)          | - ( -)            | - ( -)          | - ( 1)          |
| Durham                                      | 1 ( 1)          | - ( -)          | 1 ( 1)            | - ( -)          | 1 ( 1)          |
| Enteritidis                                 | 1 ( 1)          | - ( -)          | 3 ( 3)            | - ( -)          | - ( -)          |
| Give  | - ( -)          | - ( -)          | 1 ( 1)            | - ( -)          | - ( -)          |
| Goldcoast                                   | - ( -)          | 1 ( 1)          | - ( -)            | - ( -)          | 1 ( 1)          |
| Indiana                                     | - ( -)          | 1 ( 5)          | - ( -)            | 1 ( 2)          | - ( 3)          |
| Kottbus                                     | - ( -)          | 1 ( 1)          | - ( -)            | - ( -)          | 1 ( 1)          |
| Livingstone                                 | - ( -)          | - ( -)          | 1 ( 1)            | - ( -)          | - ( -)          |
| Montevideo                                  | 22 ( 27)        | 13 ( 14)        | 19 ( 31)          | 19 ( 33)        | 10 ( 21)        |
| Nagoya                                      | - ( -)          | - ( -)          | 1 ( 1)            | - ( -)          | - ( -)          |
| Newington                                   | 1 ( 1)          | - ( -)          | - ( -)            | - ( -)          | - ( -)          |
| Newport                                     | 1 ( 2)          | - ( -)          | 1 ( 1)            | 3 ( 3)          | 3 ( 3)          |
| Oslo  | - ( -)          | - ( -)          | 1 ( 1)            | 1 ( 1)          | 1 ( 1)          |
| Schwarzengrund                              | 2 ( 2)          | - ( -)          | - ( -)            | - ( -)          | - ( -)          |
| Stourbridge                                 | - ( -)          | - ( -)          | - ( -)            | 1 ( 1)          | 1 ( 1)          |
| Thompson                                    | - ( -)          | - ( -)          | 1 ( 1)            | - ( -)          | - ( -)          |
| Typhimurium                                 | 10 ( 12)        | 9 ( 12)         | 13 ( 15)          | 10 ( 10)        | 24 ( 25)        |
| <b>SUBTOTAL</b>                             | <b>73 ( 86)</b> | <b>76 ( 90)</b> | <b>109 ( 136)</b> | <b>67 ( 86)</b> | <b>71 ( 91)</b> |
| <b>ENTERICA DIARIZONAE</b>                  |                 |                 |                   |                 |                 |
| 61:k:1,5                                    | 10 ( 10)        | 22 ( 22)        | - ( 9)            | - ( 1)          | - ( -)          |
| 61:k:1,5,7                                  | 24 ( 26)        | 77 ( 79)        | 119 ( 120)        | 136 ( 139)      | 100 ( 100)      |
| 61:k:1,7                                    | - ( -)          | 1 ( 1)          | - ( -)            | - ( -)          | 4 ( 4)          |
| 61:-:1,5                                    | 3 ( 3)          | 23 ( 25)        | 2 ( 2)            | - ( -)          | - ( -)          |
| 61:-:1,5,7                                  | 20 ( 22)        | 3 ( 3)          | 29 ( 29)          | 48 ( 48)        | 47 ( 47)        |
| 61:-:1,7                                    | - ( -)          | - ( -)          | 1 ( 1)            | - ( -)          | - ( -)          |

**Table 24: *Salmonella* in sheep on all premises**

| <i>Salmonella</i><br>Incidents (Isolations) | 2001*      | 2002       | 2003       | 2004       | 2005       |
|---|------------|------------|------------|------------|------------|
| unspecified arizonae                        | - ( -)     | - ( -)     | - ( -)     | - ( -)     | - ( 1)     |
| SUBTOTAL                                    | 57 ( 61)   | 126 ( 130) | 151 ( 161) | 184 ( 188) | 151 ( 152) |
| UNSPECIFIED                                 |            |            |            |            |            |
| structure only                              | - ( -)     | - ( -)     | 6 ( 6)     | 9 ( 10)    | 4 ( 4)     |
| rough strain                                | - ( -)     | 1 ( 1)     | - ( 1)     | - ( -)     | - ( -)     |
| TOTAL                                       | 130 ( 147) | 203 ( 221) | 266 ( 304) | 260 ( 284) | 226 ( 247) |

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

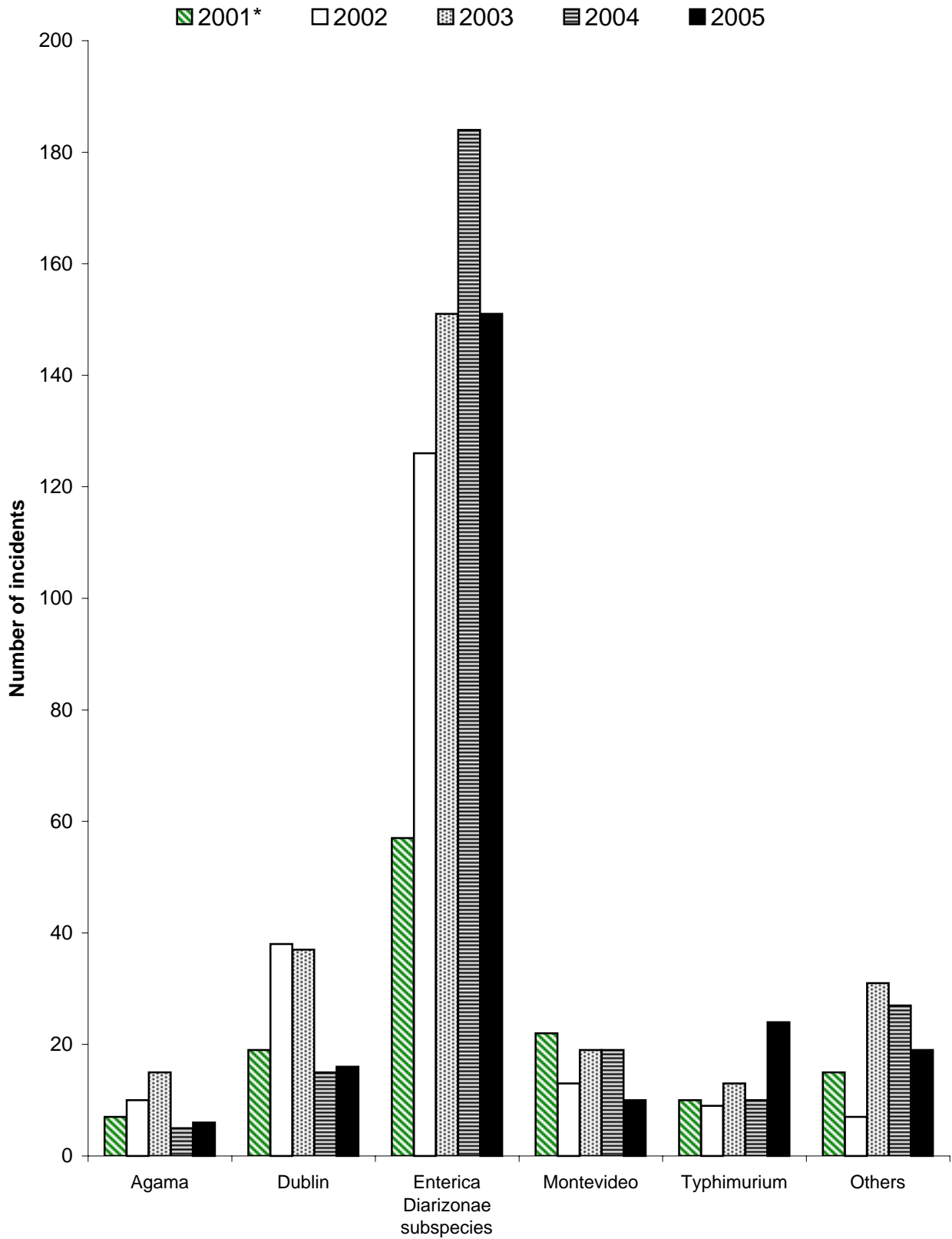
**Fig 18: Incidents of *Salmonella* serotypes in sheep in 2005**



**Table 25: Incidents of the top 5 *Salmonella* serotypes in sheep in 2005 as a % of all incidents compared to previous years**

| Serotype                                   | 2001 | 2002 | 2003 | 2004 | 2005 |
|--|------|------|------|------|------|
| <i>S. Enterica Diarizonae</i> subspecies % | 43.8 | 62.1 | 56.8 | 70.8 | 66.8 |
| <i>S. Typhimurium</i> %                    | 7.7  | 4.4  | 4.9  | 3.8  | 10.6 |
| <i>S. Dublin</i> %                         | 14.6 | 18.7 | 13.9 | 5.8  | 7.1  |
| <i>S. Montevideo</i> %                     | 16.9 | 6.4  | 7.1  | 7.3  | 4.4  |
| <i>S. Agama</i> %                          | 5.4  | 4.9  | 5.6  | 1.9  | 2.7  |
| Total no. incidents                        | 130  | 203  | 266  | 260  | 226  |

**Fig 19: Incidents of *Salmonella* serotypes in sheep (2001 - 2005)**



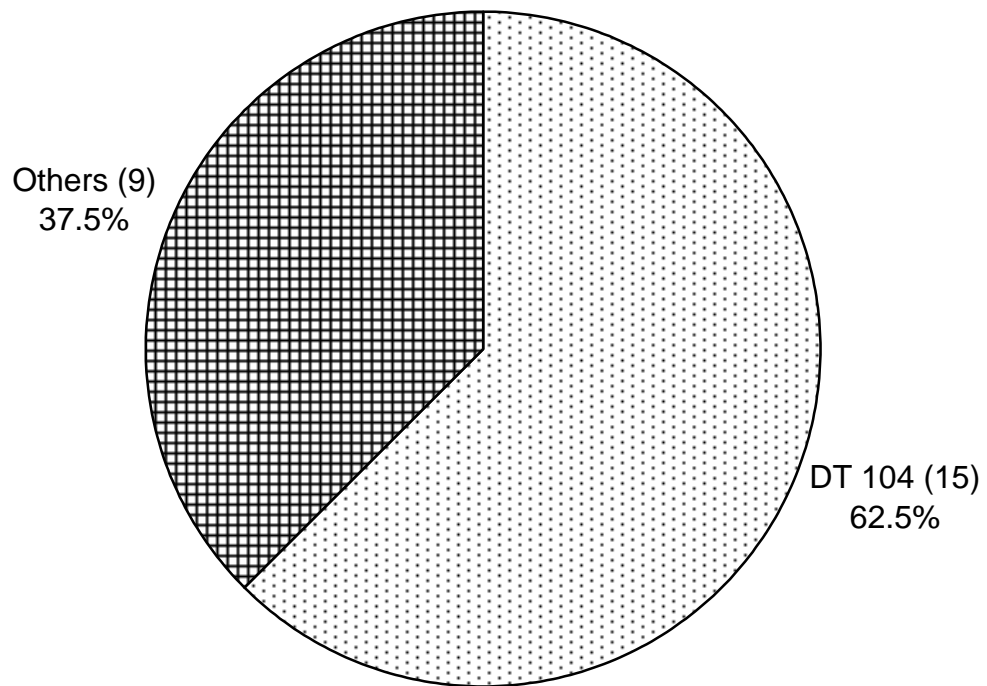
\* 2001 data may not be comparable due to uncertain impact of FMD epidemic

**Table 26: S. Typhimurium in sheep on all premises**

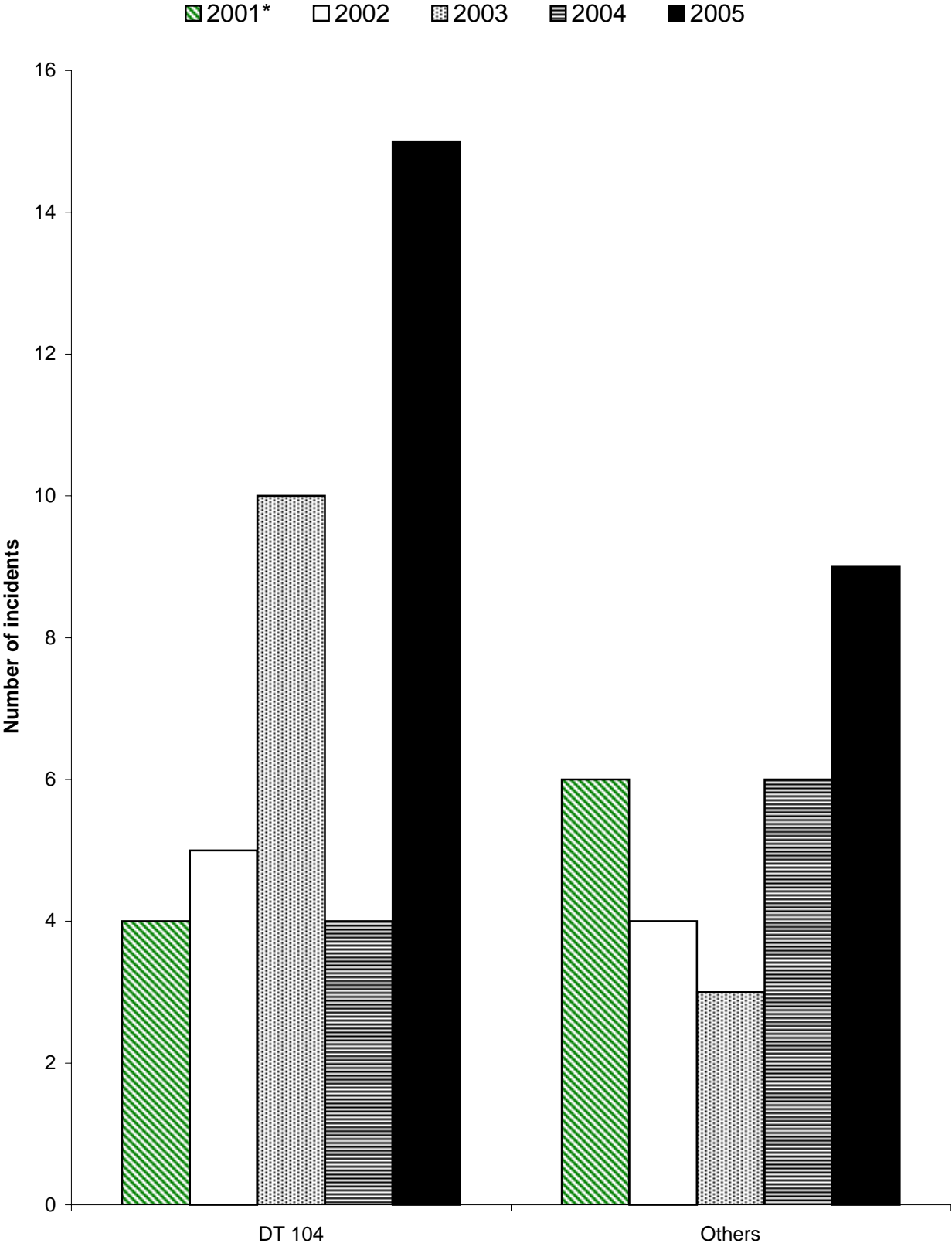
| Definitive Types<br>Incidents (Isolations) | 2001*    | 2002    | 2003     | 2004     | 2005     |
|--|----------|---------|----------|----------|----------|
| 8  | - ( -)   | - ( -)  | - ( -)   | - ( -)   | 1 ( 1)   |
| 40   | - ( -)   | - ( -)  | - ( 1)   | - ( -)   | - ( -)   |
| 41   | 2 ( 2)   | - ( -)  | 2 ( 3)   | - ( -)   | - ( -)   |
| 56   | - ( -)   | - ( -)  | - ( -)   | 1 ( 1)   | - ( -)   |
| 104  | 4 ( 6)   | 5 ( 6)  | 10 ( 10) | 4 ( 4)   | 15 ( 15) |
| 104b                                       | - ( -)   | 1 ( 2)  | - ( -)   | - ( -)   | - ( -)   |
| 170b                                       | - ( -)   | - ( -)  | - ( -)   | 1 ( 1)   | - ( -)   |
| 193  | 1 ( 1)   | - ( -)  | - ( -)   | 1 ( 1)   | 1 ( 1)   |
| 195  | - ( -)   | - ( -)  | - ( -)   | - ( -)   | 1 ( 1)   |
| 208  | - ( -)   | - ( -)  | - ( -)   | 1 ( 1)   | - ( -)   |
| U288                                       | - ( -)   | - ( -)  | 1 ( 1)   | 2 ( 2)   | - ( -)   |
| U302                                       | 1 ( 1)   | 2 ( 3)  | - ( -)   | - ( -)   | 1 ( 1)   |
| U308a                                      | 1 ( 1)   | - ( -)  | - ( -)   | - ( -)   | - ( -)   |
| UNTY                                       | 1 ( 1)   | 1 ( 1)  | - ( -)   | - ( -)   | 5 ( 6)   |
| TOTAL                                      | 10 ( 12) | 9 ( 12) | 13 ( 15) | 10 ( 10) | 24 ( 25) |

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

**Fig 20: Incidents of *Salmonella* Typhimurium definitive types in sheep in 2005**

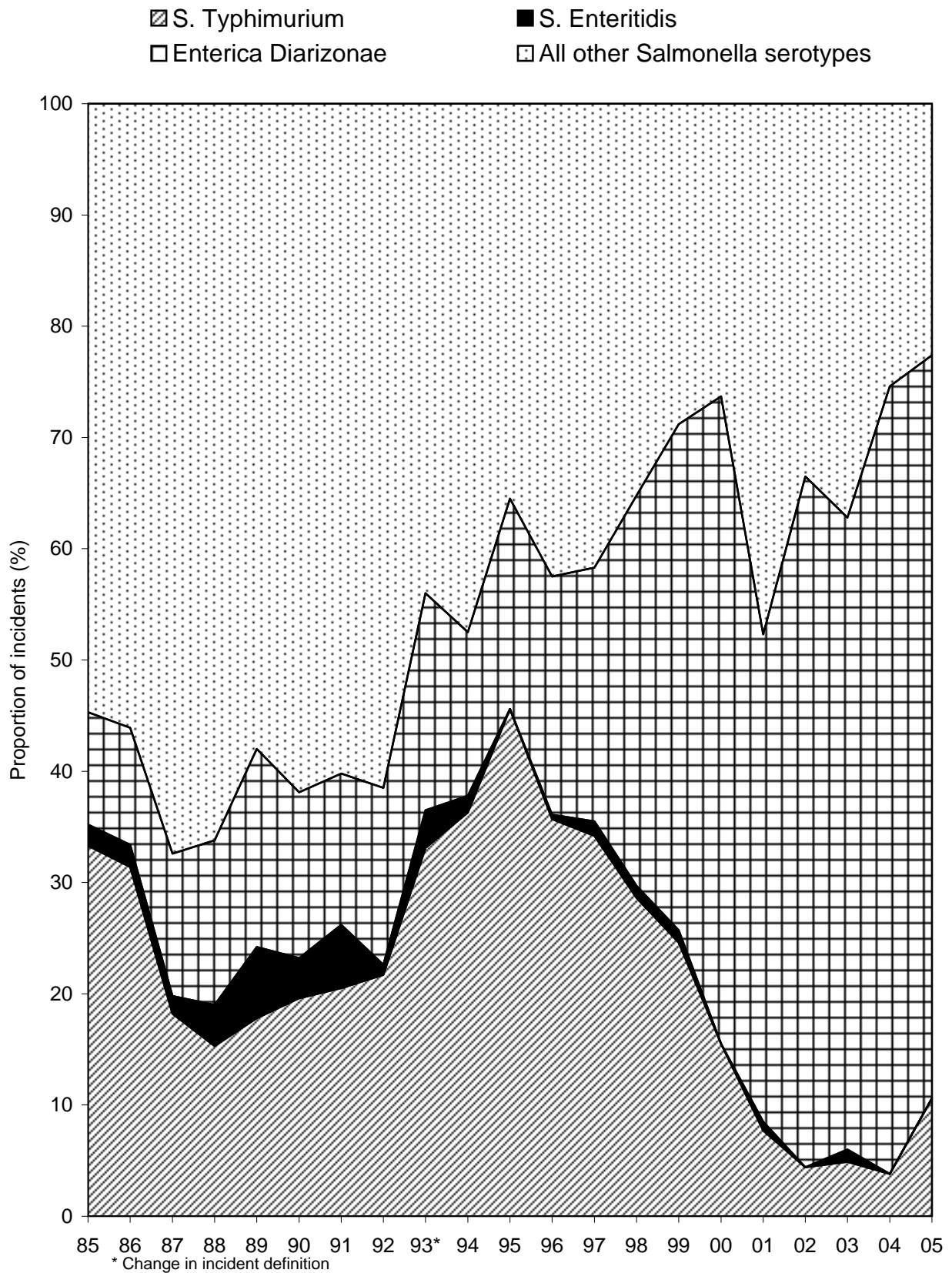


**Fig 21: Incidents of *Salmonella* Typhimurium definitive types in sheep (2001 - 2005)**



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

**Fig 22: *S. Enteritidis*, *S. Typhimurium* and *S. Enterica Diarizonae* as a proportion of all incident reports in sheep (1985 - 2005)**



**Table 27: S. Enteritidis in sheep on all premises**

| Phage Types<br>Incidents (Isolations) | 2001*  | 2002   | 2003   | 2004   | 2005   |
|---------------------------------------|--------|--------|--------|--------|--------|
| 1                                     | - ( -) | - ( -) | 1 ( 1) | - ( -) | - ( -) |
| 11                                    | - ( -) | - ( -) | 1 ( 1) | - ( -) | - ( -) |
| 14b                                   | 1 ( 1) | - ( -) | 1 ( 1) | - ( -) | - ( -) |
| TOTAL                                 | 1 ( 1) | - ( -) | 3 ( 3) | - ( -) | - ( -) |

**Table 28: S. Thompson in sheep on all premises**

| Phage Types<br>Incidents (Isolations) | 2001*  | 2002   | 2003   | 2004   | 2005   |
|---------------------------------------|--------|--------|--------|--------|--------|
| 1                                     | - ( -) | - ( -) | 1 ( 1) | - ( -) | - ( -) |
| TOTAL                                 | - ( -) | - ( -) | 1 ( 1) | - ( -) | - ( -) |

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

**Table 29: *Salmonella* in goats on all premises**

| <i>Salmonella</i><br>Incidents (Isolations) | 2001*  | 2002   | 2003   | 2004   | 2005   |
|---|--------|--------|--------|--------|--------|
| ENTERICA ENTERICA                           |        |        |        |        |        |
| Dublin                                      | - ( -) | 1 ( 2) | - ( -) | - ( -) | - ( -) |
| ENTERICA DIARIZONAE                         |        |        |        |        |        |
| 61:-:1,5,7                                  | - ( -) | - ( -) | - ( -) | - ( -) | 1 ( 1) |
| TOTAL                                       | - ( -) | 1 ( 2) | - ( -) | - ( -) | 1 ( 1) |