

## Chapter 2.2

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

#### Sheep

32.7 million sheep were kept in Great Britain in 2006, 1.8% lower than the figure in 2005 (33.3 million). The number of sheep diagnostic submissions reported to the VIDA database was 11,143 in 2006 compared with 10,782 in 2005.

There was a 3% decrease in the number of *Salmonella* incidents reported in sheep in 2006 (213) compared with 2005 (219), mainly due to the decrease in the number of reports of *S. Dublin* (14 in 2006 compared with 19 in 2005) and *S. Montevideo* (9 in 2006 compared with 13 in 2005). The majority (97%) 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 71.4% of all incidents in 2006 compared to 66.7% in 2005 (Table 24). The organism may be associated with abortion and diarrhoea but it can also be incidental to concurrent disease in affected individuals and it can also be isolated from healthy sheep.

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

The proportion of incidents associated with *S. Dublin* decreased from 8.7% in 2005 to 6.6% in 2006. *S. Dublin* was the third most common serovar isolated from sheep. Clinical signs reported included abortion and diarrhoea and in some incidents there was high morbidity and mortality. Morbidity in abortion outbreaks due to *S. Dublin* can be significant and maternal mortality has also been reported.

#### ***Salmonella Typhimurium***

*Salmonella Typhimurium* was the second most common serovar (17 incidents) reported in sheep in 2006. The proportion of incidents associated with this serovar remained approximately the same in 2006 (8.0%) compared with 7.8% in 2005 (Table 25). Definitive phage type DT104 remains the most common (twelve of seventeen incidents) definitive type (Figure 23). Definitive phage types DT41 and DT56, both

of which are wild bird related strains, were reported for the first time in 2006 (these were last reported in 2003 and in 2004 respectively), while DT135, which was last reported in 1997, was also reported for the first time in 2006. The most commonly reported clinical signs associated with *S. Typhimurium* in sheep included diarrhoea and mortality.

### **Other serovars**

*Salmonella* Montevideo was the fourth most common serovar (9 incidents) reported in sheep in 2006. The proportion of incidents associated with this serovar decreased from 5.9% in 2005 to 4.2% in 2006. *S. Agama*, a strain which has been associated with badgers, was the fifth most common serovar (8 incidents) reported from sheep in 2006. The proportion of incidents associated with this serovar increased from 2.7% in 2005 to 3.8% in 2006. In 2006 there were three incidents in sheep due to *Salmonella* Havana. A premises was visited to investigate possible sources of this serovar which had been isolated in association with a low grade clinical problem involving abortion and ill thrift cases in ewes. Culture results indicated that wild bird droppings were the probable source of infection and measures to exclude wild birds and to clean up the environment were recommended. This serovar was last reported in 1997. There was one incident due to *Salmonella* Newport in 2006, while there were three reports of this serovar in 2005. There were two reports of *Salmonella* Enteritidis from sheep in 2006. These were one report of phage type PT11, which was last reported from sheep in 2003 and one report of phage type PT35 which has never been reported previously from sheep. PT35 has been associated with chickens and it has also been reported from ducks, cattle and pigs. There was one report of *S. Thompson* (of phage type PT1) from sheep in 2006.

Fifteen incidents of Salmonellosis in sheep were investigated in 2006. Nine of the investigation and advisory visits were carried out to follow up reports of *S. Typhimurium*, the majority of which were of the definitive type DT104, three were carried out to follow up *Salmonella enterica* subspecies *diarizonae* reports and there were single visits to follow up reports of *S. Dublin*, *S. Havana* and *S. Montevideo*.

### **Goats**

95,400 goats were kept in Great Britain in 2006, 1.2% higher than the figure in 2005 (94,294). There were three incidents of salmonellosis recorded in goats during 2006, all of which were the result of investigation of clinical disease. These were a report of *Salmonella enterica* subspecies *diarizonae* serovar 61:k:1,5,7 from three abortion cases in a herd of 400 goats. *Chlamydophila abortus* was detected concurrently and may have been the primary pathogen. There were

also two reports of *S. Anatum* from goats in 2006. Neither *S. enterica* subspecies *diarizonae* serovar 61:k:1,5,7 nor *S. Anatum* was reported from goats prior to 2006. The number of goat diagnostic submissions in 2006 increased to 684 compared to 630 in 2005.

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

<i>Salmonella</i> Incidents (Isolations)	2002		2003		2004		2005		2006	
<b>ENTERICA ENTERICA</b>										
Agama	10	( 12)	15	( 15)	5	( 5)	6	( 6)	8	( 12)
Agona	1	( 1)	4	( 4)	-	( -)	-	( -)	-	( -)
Ajiobo	-	( -)	-	( -)	1	( 1)	-	( -)	-	( -)
Anatum	-	( -)	-	( -)	1	( 1)	2	( 4)	1	( 1)
Berta	-	( -)	-	( -)	1	( 1)	-	( -)	-	( -)
Brandenburg	1	( 1)	-	( -)	-	( -)	-	( -)	-	( -)
Derby	1	( 1)	10	( 14)	10	( 10)	2	( 3)	3	( 3)
Dublin	38	( 42)	46	( 47)	18	( 18)	19	( 20)	14	( 17)
Duesseldorf	-	( -)	-	( -)	-	( -)	1	( 1)	-	( -)
Durham	-	( -)	1	( 1)	-	( -)	1	( 1)	-	( -)
Enteritidis	-	( -)	3	( 3)	-	( -)	-	( -)	2	( 2)
Give	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Goldcoast	1	( 1)	-	( -)	-	( -)	1	( 1)	-	( -)
Havana	-	( -)	-	( -)	-	( -)	-	( -)	3	( 4)
Indiana	1	( 5)	-	( -)	2	( 2)	-	( 3)	-	( -)
Kottbus	1	( 1)	-	( -)	-	( -)	1	( 1)	-	( -)
Livingstone	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Montevideo	13	( 14)	26	( 31)	29	( 33)	13	( 21)	9	( 12)
Nagoya	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Newport	-	( -)	1	( 1)	3	( 3)	3	( 3)	1	( 1)
Oslo	-	( -)	1	( 1)	1	( 1)	1	( 1)	-	( -)
Stourbridge	-	( -)	-	( -)	1	( 1)	1	( 1)	1	( 1)
Thompson	-	( -)	1	( 1)	-	( -)	1	( 1)	1	( 1)
Typhimurium	9	( 12)	12	( 15)	10	( 10)	17	( 25)	17	( 24)
<b>ENTERICA DIARIZONAE</b>										
61:k:1,5	22	( 22)	9	( 9)	1	( 1)	1	( 1)	2	( 2)
61:k:1,5,7	77	( 79)	118	( 120)	136	( 139)	94	( 100)	85	( 87)
61:k:1,7	1	( 1)	-	( -)	-	( -)	4	( 4)	-	( -)
61:-:1,5	23	( 25)	1	( 2)	-	( -)	-	( -)	5	( 5)
61:-:1,5,7	3	( 3)	29	( 29)	48	( 48)	47	( 47)	56	( 57)
61:-:1,7	-	( -)	1	( 1)	-	( -)	-	( -)	4	( 4)

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

<i>Salmonella</i> Incidents (Isolations)	2002	2003	2004	2005	2006
UNSPECIFIED					
structure only	- ( -)	6 ( 6)	10 ( 10)	4 ( 4)	1 ( 1)
rough strain	1 ( 1)	- ( 1)	- ( -)	- ( -)	- ( -)
TOTAL	203 ( 221)	287 ( 304)	277 ( 284)	219 ( 248)	213 ( 234)

Fig 21: Incidents of *Salmonella* serotypes in sheep in 2006

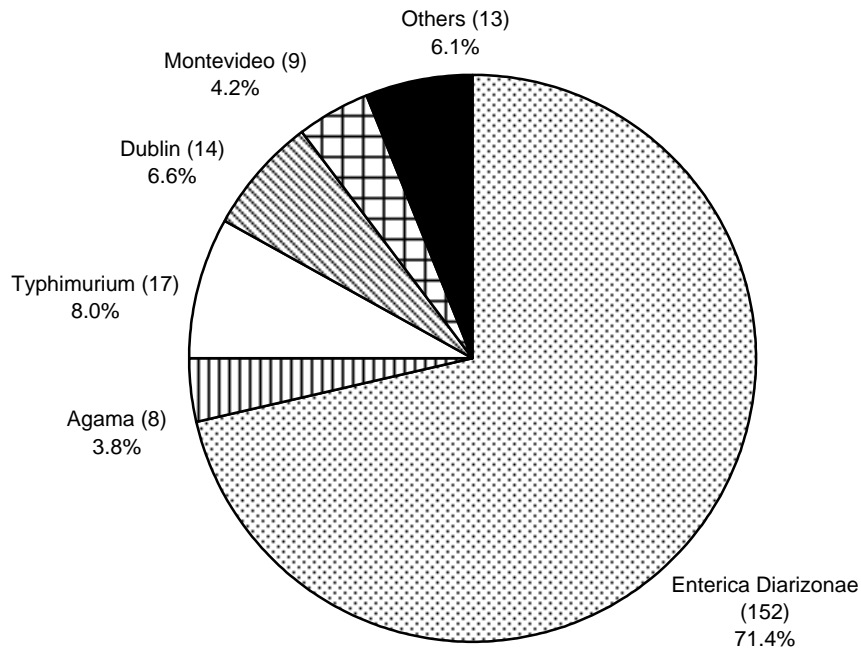
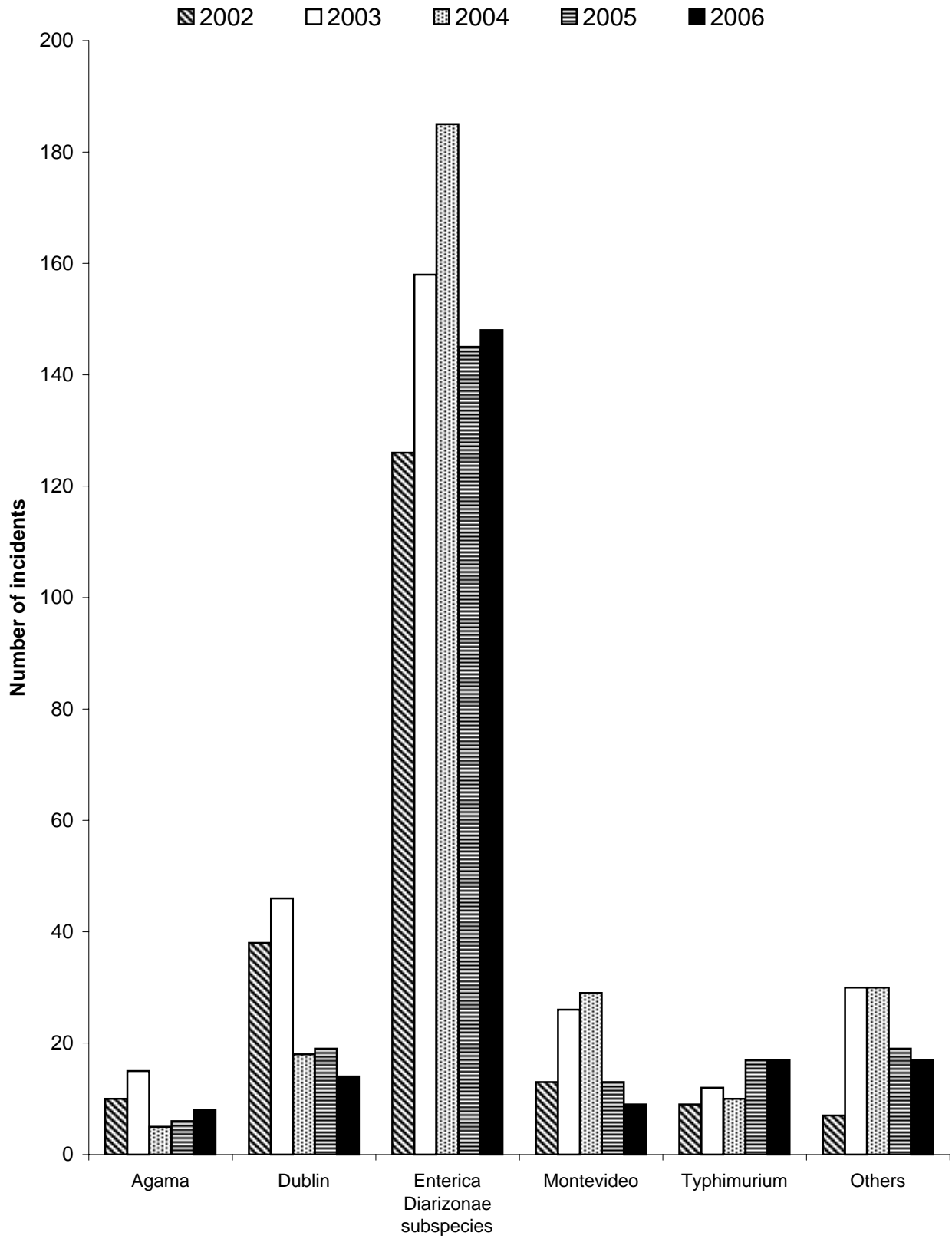


Table 25: Incidents of the top 5 *Salmonella* serotypes in sheep in 2006 as a % of all incidents compared to previous years

Serotype	2002	2003	2004	2005	2006
<i>S. Enterica Diarizonae</i> subspecies %	62.1	55.1	66.8	66.7	71.4
<i>S. Typhimurium</i> %	4.4	4.2	3.6	7.8	8.0
<i>S. Dublin</i> %	18.7	16.0	6.5	8.7	6.6
<i>S. Montevideo</i> %	6.4	9.1	10.5	5.9	4.2
<i>S. Agama</i> %	4.9	5.2	1.8	2.7	3.8
Total no. incidents	203	287	277	219	213

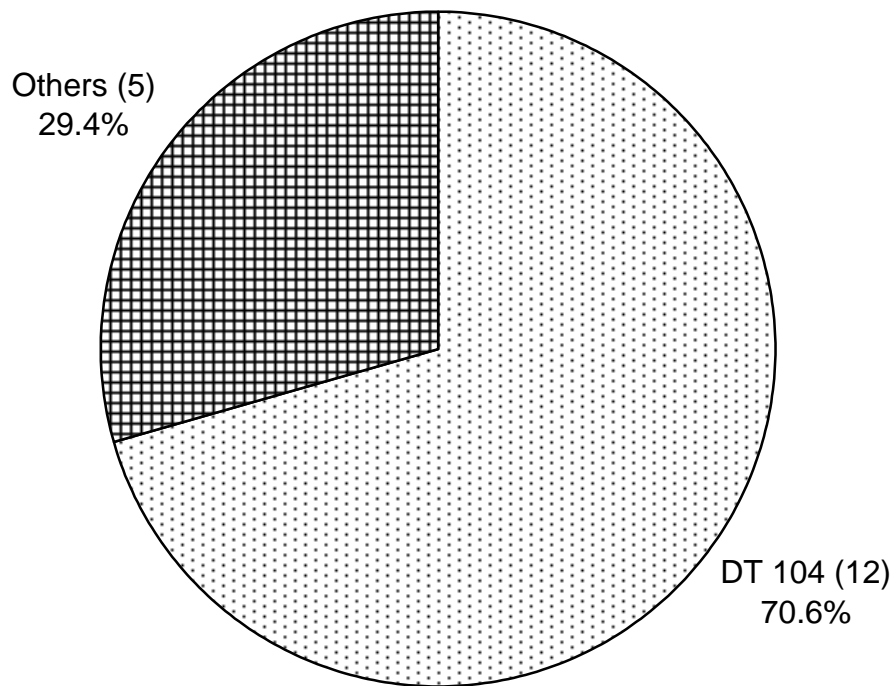
**Fig 22: Incidents of *Salmonella* serotypes in sheep (2002 - 2006)**



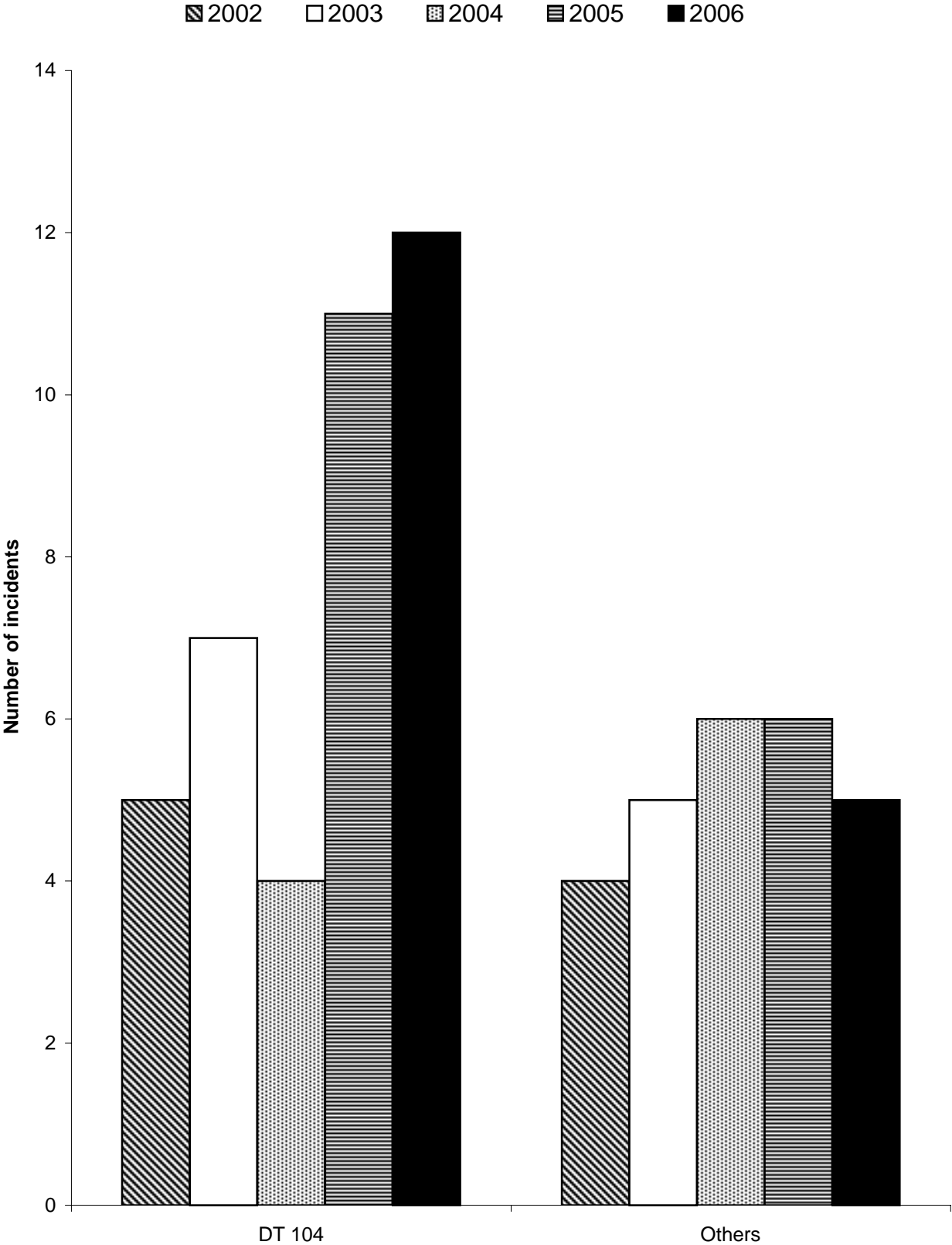
**Table 26: S. Typhimurium in sheep on all premises**

Definitive Types Incidents (Isolations)	2002	2003	2004	2005	2006
8	- ( -)	- ( -)	- ( -)	1 ( 1)	- ( -)
40	- ( -)	1 ( 1)	- ( -)	- ( -)	- ( -)
41	- ( -)	3 ( 3)	- ( -)	- ( -)	1 ( 1)
56	- ( -)	- ( -)	1 ( 1)	- ( -)	1 ( 1)
104	5 ( 6)	7 ( 10)	4 ( 4)	11 ( 15)	12 ( 18)
104b	1 ( 2)	- ( -)	- ( -)	- ( -)	1 ( 2)
135	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
170b	- ( -)	- ( -)	1 ( 1)	- ( -)	- ( -)
193	- ( -)	- ( -)	1 ( 1)	1 ( 1)	- ( -)
195	- ( -)	- ( -)	- ( -)	1 ( 1)	- ( -)
208	- ( -)	- ( -)	1 ( 1)	- ( -)	- ( -)
U288	- ( -)	1 ( 1)	2 ( 2)	- ( -)	- ( -)
U302	2 ( 3)	- ( -)	- ( -)	1 ( 1)	1 ( 1)
UNTY	1 ( 1)	- ( -)	- ( -)	2 ( 6)	- ( -)
TOTAL	9 ( 12)	12 ( 15)	10 ( 10)	17 ( 25)	17 ( 24)

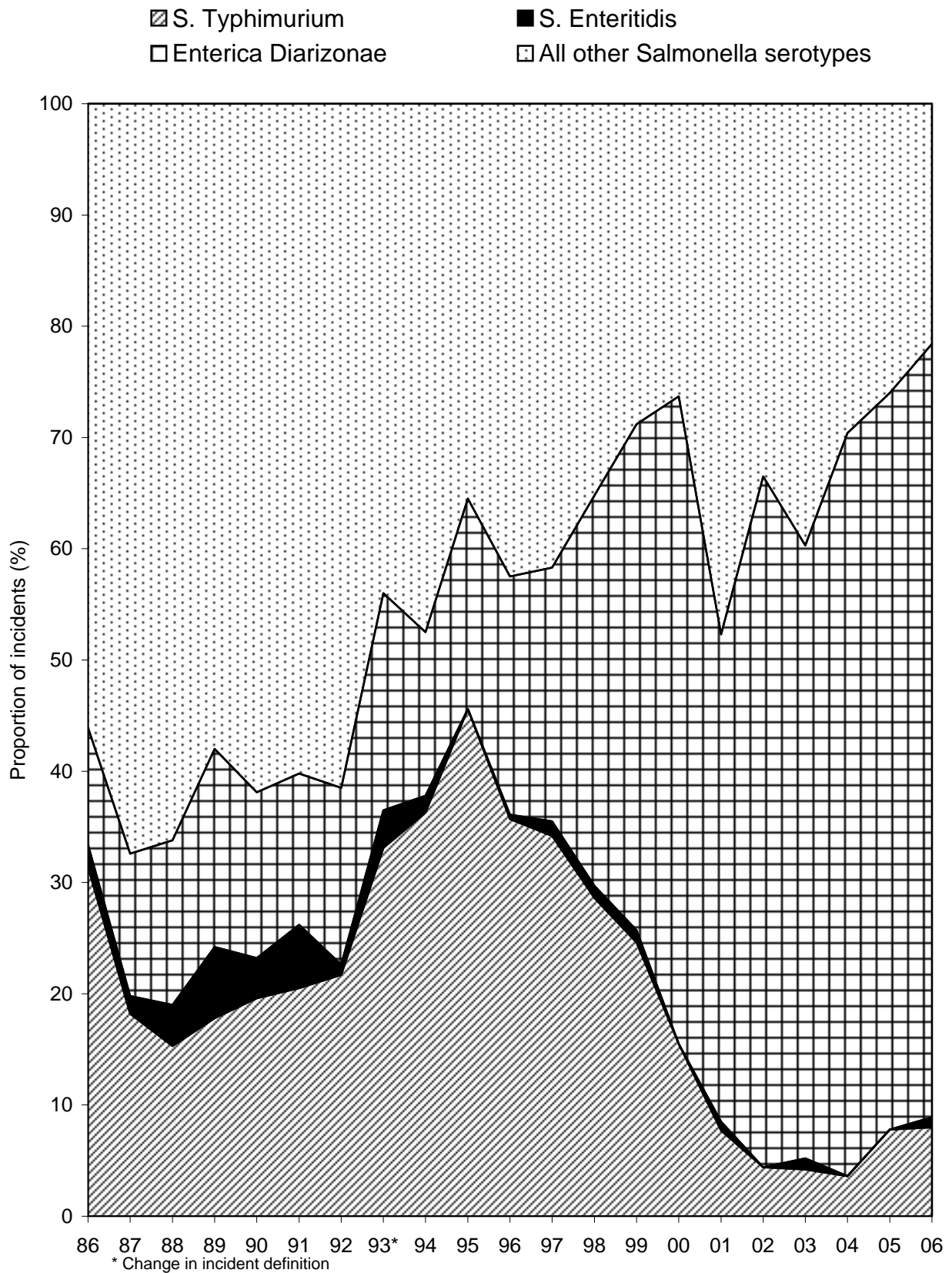
**Fig 23: Incidents of *Salmonella* Typhimurium definitive types in sheep in 2006**



**Fig 24: Incidents of *Salmonella* Typhimurium definitive types in sheep (2002 - 2006)**



**Fig 25: *S. Enteritidis*, *S. Typhimurium* and *S. Enterica Diarizonae* as a proportion of all incident reports in sheep (1986 - 2006)**



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

Phage Types Incidents (Isolations)	2002	2003	2004	2005	2006
1	- ( -)	1 ( 1)	- ( -)	- ( -)	- ( -)
11	- ( -)	1 ( 1)	- ( -)	- ( -)	1 ( 1)
14b	- ( -)	1 ( 1)	- ( -)	- ( -)	- ( -)
35	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
TOTAL	- ( -)	3 ( 3)	- ( -)	- ( -)	2 ( 2)

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

Phage Types Incidents (Isolations)	2002	2003	2004	2005	2006
1	- ( -)	1 ( 1)	- ( -)	- ( -)	1 ( 1)
untyped	- ( -)	- ( -)	- ( -)	1 ( 1)	- ( -)
TOTAL	- ( -)	1 ( 1)	- ( -)	1 ( 1)	1 ( 1)

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

<i>Salmonella</i> Incidents (Isolations)	2002	2003	2004	2005	2006
ENTERICA ENTERICA					
Anatum	- ( -)	- ( -)	- ( -)	- ( -)	2 ( 2)
Dublin	1 ( 2)	- ( -)	- ( -)	- ( -)	- ( -)
ENTERICA DIARIZONAE					
61:k:1,5,7	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
61:-:1,5,7	- ( -)	- ( -)	- ( -)	1 ( 1)	- ( -)
TOTAL	1 ( 2)	- ( -)	- ( -)	1 ( 1)	3 ( 3)