

Chapter 2.1

REPORTS OF *SALMONELLA* IN CATTLE

Results are given for adult cattle (10 months of age and older), calves (less than 10 months of age) and cattle of all ages (adult cattle, calves and cattle of unknown age). All isolations are recorded by the age of the individual animal. If an incident involves both adult cattle and calves then the age of the index case is used to classify the incident. For example, an incident affecting calves and adults in which the first case was reported in a calf would be reported as a calf-associated incident, but all isolations would be recorded separately for calves and adult cattle. It is therefore possible that the number of incidents of a particular serovar in one age class may be zero, although several isolations are listed.

There were 8.63 million cattle in Great Britain in 2006, 1.1% less than in 2005 and 3% less than in 2004.

The number of diagnostic submissions from cattle reported to the VIDA database in 2006 decreased to 37,745, a 4% decrease compared to 2005, 6% decrease compared to 2004 and 16% less than in submissions recorded in 2003.

There is no routine *Salmonella* monitoring of cattle in Great Britain, therefore the majority of isolates come from cattle with clinical disease. The number of reports is dependent on the total cattle population and number of diagnostic submissions to government veterinary laboratories. As in previous years, the majority (95%) of *Salmonella* reports (n=750) in cattle were from samples taken from clinical diagnostic purposes (see Table 1, Chapter 1) and came from animals on farms.

There were 6% less *Salmonella* incidents in cattle reported in 2006 (750) as compared to 2005 (799), probably due to a decrease in diagnostic submission numbers. Of the 750 incidents in cattle, 44% were in adult cattle, 39% in calves and 17% in cattle of unknown age. For the eighth year, in 2006 *S. Dublin* was the most common (61% of incidents) serovar reported in cattle, but its relative proportion has decreased compared to 2005 (69% of the *Salmonella* incidents in cattle).

***Salmonella* Dublin**

For the eighth consecutive year, *S. Dublin* was the most common serotype in adult cattle (52% of incidents; Table 12) and calves (69% of incidents; Table 14). The relative proportions of *S. Dublin* both in adult cattle and calves decreased in 2006 compared to 2005 (63% and 77% respectively). There continues to be a seasonal increase in the number of incidents in the autumn months (Figure 9). This is likely to be associated with housing stress as well as stress associated with an increased number of calvings and abortions seen at that time. *S. Dublin* was the 4th most common infectious cause of bovine fetopathy in GB (6.8% of diagnosed submissions; VIDA 2006). *Salmonella* Dublin infection is associated with sporadic cases as well as outbreaks of disease, including enteric or reproductive disease in adult cattle and enteric disease, pneumonia or septicaemia in calves. Nervous signs have been recorded in calves.

***Salmonella* Typhimurium**

Salmonella Typhimurium continues to be the second most common *Salmonella* serotype reported from cattle in 2006 with 161 incidents reported (Table 10). The proportion of *Salmonella* incidents due to this serovar increased in 2006 both in adult cattle (25.3%) (Table 12) and calves (16.2%) (Table 14) compared to 2005 (16.8% and 13.2% respectively). *Salmonella* Typhimurium definitive types DT2, DT7 and DT208 were reported from cattle in 2006 for the first time. Definitive type DT2 was last reported from cattle in 2002, DT208 in 2003 and DT7 has not been reported from cattle previously. Definitive types DT69, DT103 and undefined type U308a have not been reported from cattle since 2001. In 2006 there were no incidents reported in cattle due to *S. Typhimurium* U310, a type linked predominantly with pigs, while there were five incidents of this type reported in 2005 and ten incidents reported in 2004. Reports of *Salmonella* Typhimurium DT104 appear to fluctuate during the year with a first peak in spring and a second peak in the autumn months (Figure 16). DT104 remains the most common definitive type (65% of incidents) and is usually found in dairy cattle. Incidents reported due to *S. Typhimurium* DT104 increased by 23% in 2006 compared to 2005. Twenty-two per cent of incidents were due to non-DT104 phage types, although 78% were DT104 and related strains (DT104b, DT12, U302).

Other serovars

Salmonella Enteritidis, *S. Hadar*, *S. Thompson* and *S. Virchow* are phage typed routinely. There were no reported incidents of *S. Enteritidis* in 2006, while there were four reported incidents in cattle in 2005 (Table 18). These comprised one incident of PT6a in adult cattle, one incident of PT4 in a calf and single incidents of phage types PT1 and PT4 in cattle of unknown age (Tables 18, 19 and 20). There were no incidents of *S. Hadar*, *S. Thompson* or *S. Virchow* reported from cattle in 2006, same as in 2005 (Tables 21, 22 and 23). Reports of *S. Infantis* from cattle are sporadic. In 2006 there were 2 reports made of this strain (both from adult cattle). An investigation and advisory visit was conducted in a dairy herd following a report of *S. Infantis* resistant to nalidixic acid from a recently calved cow with pyrexia. Following investigation of this case by faecal and environmental sampling, sewage sludge, and in particular an overflowing septic tank, was thought to be the most likely source of the infection.

The increase in number of incidents of *S. Anatum* in 2005 was sustained in 2006, both in adult cattle (5.4% of incidents; Table 12) and in calves (3.1% of incidents; Table 14). An outbreak of *S. Anatum* with high case fatality rate was reported for the first time on a dairy farm. An investigation visit was carried out and the results of the sampling showed that salmonellosis was widespread on the premises. The drinking water system was suggested to be a possible source of infection, even though this was not established for certain.

Salmonella Butantan, *S. Concord*, *S. Riggil* and *S. Eboko* had never been reported from cattle previously during routine surveillance in Great Britain but they were reported for the first time in cattle (adult cattle and calves, calves, adult cattle, and calves respectively) in 2006. *S. Eboko*, *S. Concord* and *S. Riggil* had also never been reported from any other animals or animal feed in GB before 2006, while *S. Butantan* had previously been reported from seals at a zoo. Other new serovars reported from cattle in 2006 included: *S. Berta* (in adult cattle), which was last reported in 2000, *S. Braenderup* (in calves), which was last reported in 2001, *S. Bredeney* (in adult cattle), which was last reported in 2002, *S. Durham* (in adult cattle), which was last reported in 2003, *S. Kimuenza* (in adult cattle and calves), which was last reported in 2004, *S. Kottbus* (in adult cattle), which was last reported in 2004, *S. Nagoya* (in calves), which was last reported in 2003, and *S. Reading* (in calves), which was last reported in 2004. *S. Tees* has not been reported from cattle since 2001.

Reports of *Salmonella* Montevideo in cattle increased in 2006 (seventeen incidents and 2.3% of all incident reports) compared to 2005

(twelve incidents and 1.5% of all incident reports). In 2006 the majority of the reports originated from adult cattle (12 incidents and 3.6% of all incident reports).

There were twelve incidents of *Salmonella* Newport reported in cattle in 2006 (six in adult cattle, four in calves and two in cattle of unknown age), representing 1.8% of incidents in adult cattle and 1.4% of incidents in calves; all were susceptible to all antimicrobials tested. In 2005 there were nine incidents of *S. Newport* reported, representing 1.7% of incidents in adult cattle and 0.73% of incidents in calves. The multiple drug resistant *Salmonella* Newport (MDRSN) has not been reported in Great Britain, but has caused concern in the USA because of its effect in livestock, particularly cattle and its public health importance (Rankin and others, 2002).

In 2006 there were two *Salmonella* reports from cattle of non-GB origin. Both were of serovar *S. Dublin* and are included in the tables and figures of this publication.

Table 10: *Salmonella* in cattle on all premises (adults, calves & age unknown)

<i>Salmonella</i> Incidents (Isolations)	2002		2003		2004		2005		2006	
ENTERICA ENTERICA										
Agama	13	(19)	14	(16)	16	(16)	15	(17)	16	(19)
Agona	4	(4)	4	(4)	6	(6)	1	(1)	4	(9)
Ajiobo	2	(2)	1	(1)	2	(2)	1	(1)	1	(1)
Anatum	15	(26)	36	(40)	31	(34)	23	(30)	28	(35)
Ank	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
Berta	-	(-)	-	(-)	-	(-)	-	(-)	1	(2)
Binza	-	(-)	-	(-)	3	(3)	-	(-)	-	(-)
Bovis morbificans	-	(-)	-	(-)	1	(1)	2	(4)	3	(6)
Bradford	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Braenderup	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Bredeney	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Butantan	-	(-)	-	(-)	-	(-)	-	(-)	4	(7)
Carno	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Coeln	-	(-)	-	(-)	-	(-)	1	(1)	2	(2)
Concord	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Derby	-	(-)	2	(2)	2	(2)	1	(1)	1	(1)
Dublin	768	(985)	1012	(1166)	761	(797)	551	(672)	454	(541)
Durham	-	(-)	1	(1)	-	(-)	-	(-)	1	(1)
Eboko	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Enteritidis	6	(6)	11	(14)	7	(7)	4	(7)	-	(-)
Give	1	(1)	-	(-)	2	(2)	2	(4)	-	(-)
Goldcoast	3	(5)	7	(8)	3	(4)	2	(3)	2	(2)
Hadar	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Havana	-	(-)	1	(1)	-	(-)	2	(2)	-	(-)
Heidelberg	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
Indiana	1	(1)	-	(-)	-	(-)	1	(1)	-	(-)
Infantis	2	(2)	1	(1)	1	(1)	1	(2)	2	(3)
Jangwani	-	(-)	-	(-)	-	(-)	2	(4)	-	(-)
Kedougou	-	(-)	10	(12)	5	(5)	2	(2)	-	(-)
Kentucky	1	(1)	-	(-)	-	(-)	1	(1)	2	(2)
Kiambu	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Kimuenza	-	(-)	2	(4)	1	(1)	-	(-)	2	(2)
Kokomlemlle	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Kottbus	1	(1)	1	(1)	1	(1)	-	(-)	2	(2)
Larochelle	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Liverpool	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
London	-	(-)	-	(-)	4	(6)	2	(3)	2	(5)
Mbandaka	2	(2)	(-)	(-)	2	(2)	3	(3)	6	(6)

Table 10: *Salmonella* in cattle on all premises (adults, calves & age unknown)

<i>Salmonella</i> Incidents (Isolations)	2002		2003		2004		2005		2006	
ENTERICA ENTERICA										
Montevideo	3	(3)	6	(7)	7	(17)	12	(15)	17	(27)
Nagoya	2	(2)	1	(1)	-	(-)	-	(-)	1	(1)
Newport	11	(15)	5	(7)	5	(7)	9	(11)	12	(14)
Ohio	-	(-)	-	(-)	-	(-)	1	(1)	3	(7)
Oslo	-	(-)	5	(5)	-	(-)	-	(-)	-	(-)
Paratyphi B	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Paratyphi B var java	-	(-)	3	(3)	-	(-)	-	(-)	-	(-)
Poona	-	(-)	1	(1)	1	(1)	-	(-)	-	(-)
Reading	-	(-)	-	(-)	1	(1)	-	(-)	3	(3)
Riggil	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Saint Paul	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Schwarzengrund	1	(2)	-	(-)	6	(6)	-	(-)	-	(-)
Senftenberg	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Stanley	-	(-)	-	(1)	2	(2)	-	(-)	-	(-)
Stourbridge	-	(-)	2	(2)	1	(1)	2	(2)	2	(2)
Thompson	4	(5)	1	(1)	4	(4)	-	(-)	-	(-)
Typhimurium	140	(188)	147	(182)	149	(160)	131	(175)	161	(225)
Uganda	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Vejle	4	(8)	4	(4)	8	(8)	-	(-)	-	(-)
Virchow	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
ENTERICA DIARIZONAE										
61:k:1,5,7	1	(1)	2	(2)	-	(-)	4	(4)	1	(1)
61:-:1,5	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
61:-:1,5,7	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)
structure only	8	(11)	7	(7)	10	(10)	8	(9)	6	(6)
rough strain	2	(2)	4	(5)	5	(7)	8	(8)	5	(5)
untyped	3	(4)	-	(-)	-	(-)	-	(-)	-	(-)
untypable	-	(-)	-	(1)	-	(-)	-	(-)	-	(-)
TOTAL	1004	(1302)	1293	(1502)	1051	(1117)	799	(991)	750	(943)

**Fig 9: Seasonality of *Salmonella* Dublin in cattle
(2002 - 2006)**

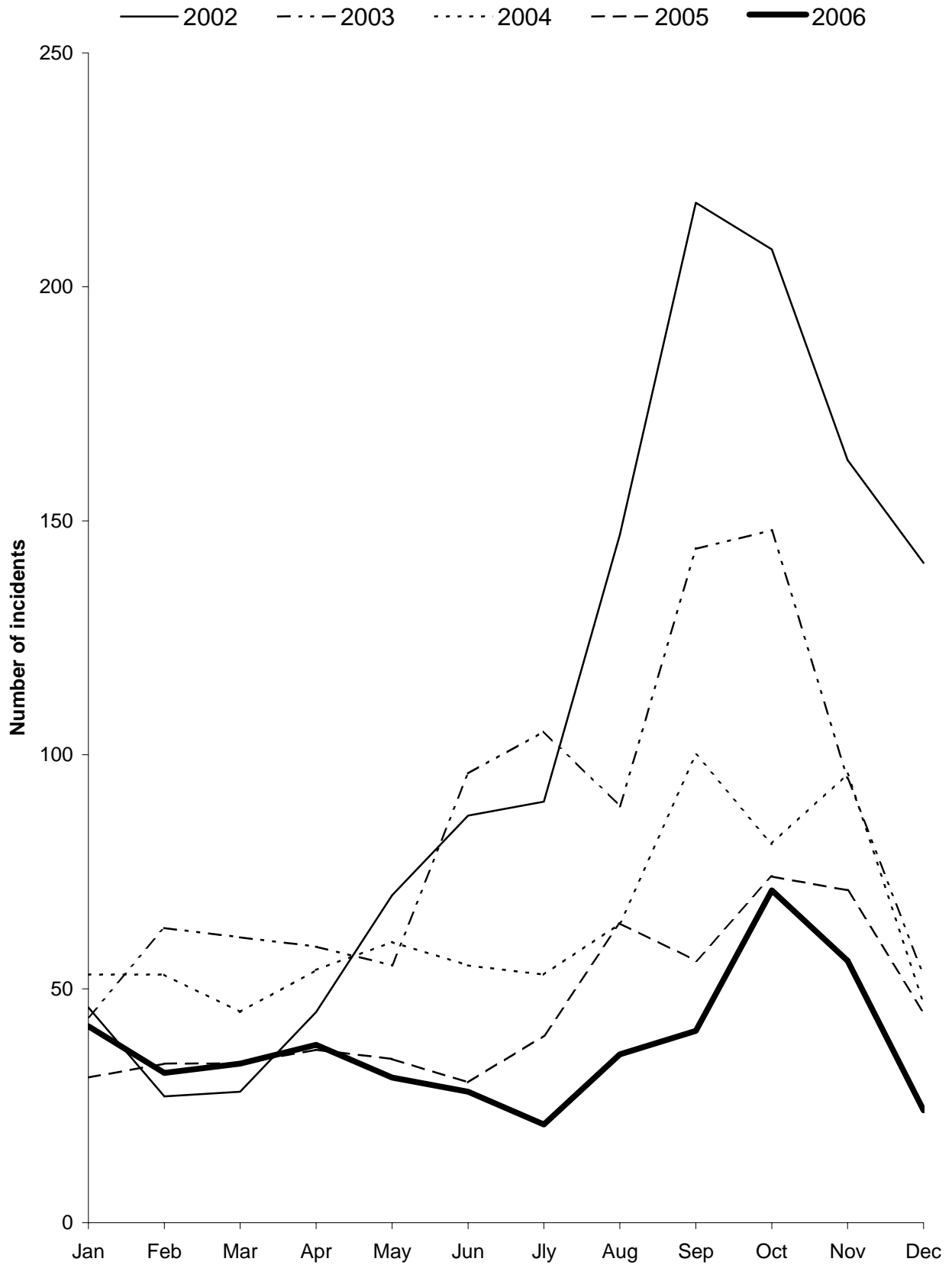


Fig 10: S. Enteritidis, S. Typhimurium and S. Dublin as a proportion of all incident reports in cattle (1986 - 2006)

S. Typhimurium
 S. Enteritidis
 S. Dublin
 All other Salmonella serotypes

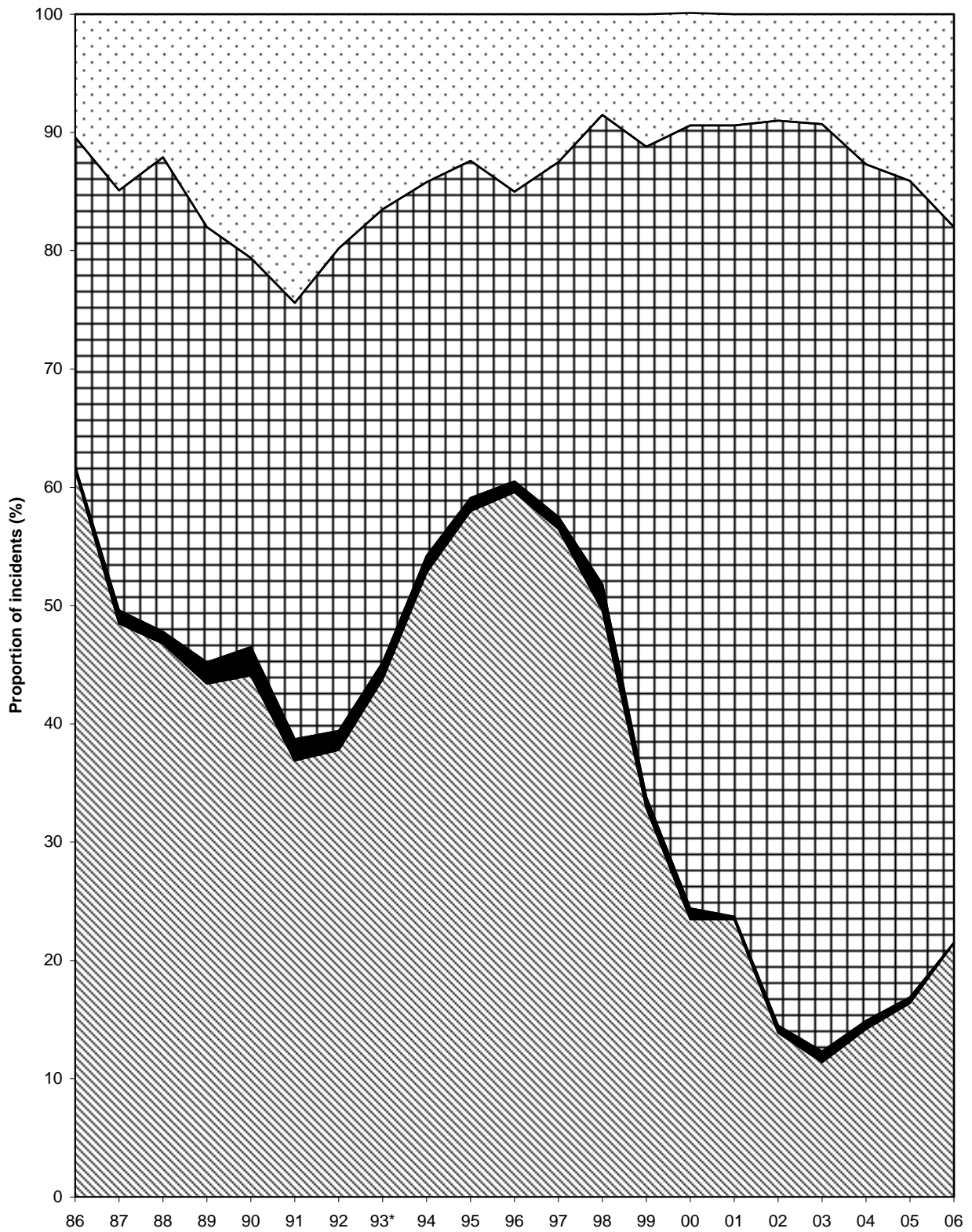


Table 11: *Salmonella* in adult cattle on all premises

<i>Salmonella</i> Incidents (Isolations)	2002		2003		2004		2005		2006	
ENTERICA ENTERICA										
Agama	10	(12)	7	(8)	10	(10)	8	(9)	10	(11)
Agona	1	(1)	1	(1)	3	(3)	1	(1)	3	(6)
Ajiobo	1	(1)	1	(1)	-	(-)	-	(-)	-	(-)
Anatum	11	(20)	25	(29)	22	(23)	18	(25)	18	(23)
Ank	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
Berta	-	(-)	-	(-)	-	(-)	-	(-)	1	(2)
Bovismorbificans	-	(-)	-	(-)	-	(-)	2	(4)	1	(1)
Bradford	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Bredeney	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Butantan	-	(-)	-	(-)	-	(-)	-	(-)	2	(3)
Carno	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Derby	-	(-)	1	(1)	2	(2)	1	(1)	-	(-)
Dublin	388	(509)	400	(455)	282	(293)	227	(286)	171	(203)
Durham	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Enteritidis	1	(1)	5	(6)	6	(6)	1	(3)	-	(-)
Give	1	(1)	-	(-)	2	(2)	2	(3)	-	(-)
Goldcoast	1	(1)	5	(6)	2	(3)	2	(3)	-	(-)
Havana	-	(-)	1	(1)	-	(-)	1	(1)	-	(-)
Infantis	-	(-)	1	(1)	-	(-)	1	(2)	2	(2)
Kedougou	-	(-)	7	(7)	4	(4)	1	(1)	-	(-)
Kentucky	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Kimuenza	-	(-)	-	(-)	1	(1)	-	(-)	1	(1)
Kokomlemle	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Kottbus	-	(-)	-	(-)	1	(1)	-	(-)	1	(1)
Larochelle	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Liverpool	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
London	-	(-)	-	(-)	2	(3)	-	(-)	1	(3)
Mbandaka	1	(1)	-	(-)	1	(1)	3	(3)	5	(5)
Montevideo	1	(1)	1	(2)	4	(4)	9	(12)	12	(18)
Nagoya	1	(1)	1	(1)	-	(-)	-	(-)	-	(-)
Newport	7	(8)	4	(5)	4	(6)	6	(7)	6	(7)
Ohio	-	(-)	-	(-)	-	(-)	1	(1)	3	(6)
Oslo	-	(-)	3	(3)	-	(-)	-	(-)	-	(-)
Poona	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Riggil	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)

Table 11: *Salmonella* in adult cattle on all premises

<i>Salmonella</i> Incidents (Isolations)	2002		2003		2004		2005		2006	
ENTERICA ENTERICA										
Saint Paul	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Schwarzengrund	1	(1)	-	(-)	5	(5)	-	(-)	-	(-)
Senftenberg	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Stanley	-	(-)	-	(-)	2	(2)	-	(-)	-	(-)
Stourbridge	-	(-)	2	(2)	1	(1)	1	(1)	-	(-)
Thompson	3	(4)	-	(-)	1	(1)	-	(-)	-	(-)
Typhimurium	74	(89)	69	(83)	79	(86)	60	(75)	84	(106)
Uganda	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Vejle	2	(4)	3	(3)	6	(6)	-	(-)	-	(-)
ENTERICA DIARIZONAE										
61:k:1,5,7	1	(1)	2	(2)	-	(-)	2	(2)	1	(1)
61:-:1,5	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
61:-:1,5,7	-	(-)	-	(-)	1	(1)	-	(-)	1	(1)
structure only	2	(3)	2	(2)	6	(6)	3	(3)	3	(3)
rough strain	1	(1)	2	(2)	1	(1)	3	(3)	2	(2)
untyped	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
TOTAL	513	(665)	544	(622)	451	(474)	358	(451)	332	(409)

Fig 11: Incidents of *Salmonella* serotypes in adult cattle in 2006

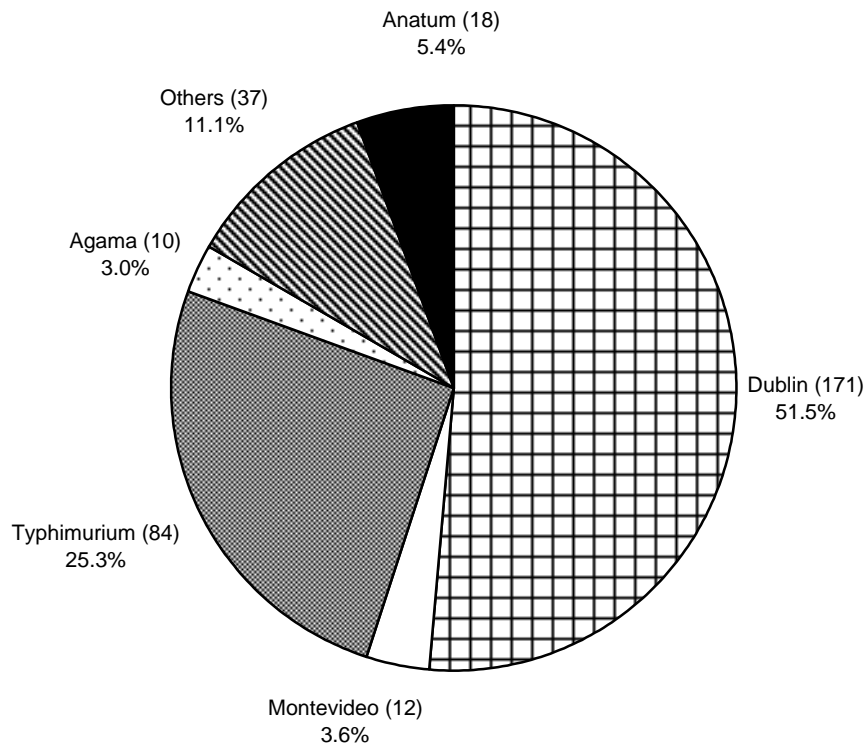


Table 12: Incidents of the top 5 *Salmonella* serotypes in adult cattle in 2006 as a % of all incidents compared to previous years

Serotype	2002	2003	2004	2005	2006
S. Dublin %	75.6	73.5	62.5	63.4	51.5
S. Typhimurium %	14.4	12.7	17.5	16.8	25.3
S. Anatum %	2.1	4.6	4.9	5.0	5.4
S. Montevideo %	0.2	0.2	0.9	2.5	3.6
S. Agama %	1.9	1.3	2.2	2.2	3.0
Total no. incidents	513	544	451	358	332

Fig 12: Number of incidents of *Salmonella* serotypes in adult cattle (2002 - 2006)

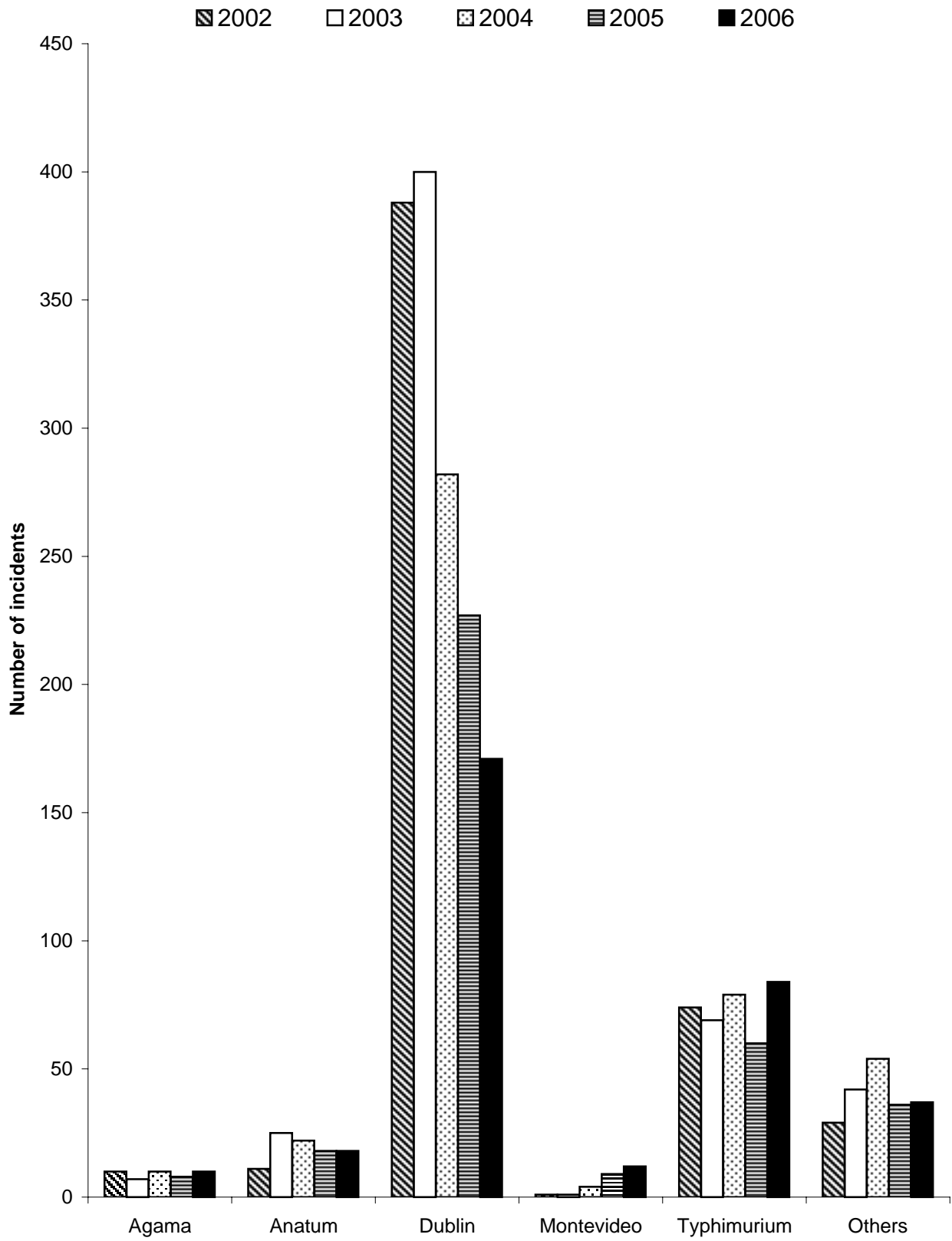


Table 13: *Salmonella* in calves on all premises

<i>Salmonella</i> Incidents (Isolations)	2002		2003		2004		2005		2006	
ENTERICA ENTERICA										
Agama	2	(5)	4	(4)	2	(2)	3	(4)	4	(6)
Agona	2	(2)	3	(3)	3	(3)	-	(-)	1	(2)
Ajiobo	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Anatum	4	(5)	7	(7)	5	(7)	4	(4)	9	(10)
Binza	-	(-)	-	(-)	2	(2)	-	(-)	-	(-)
Bovis morbificans	-	(-)	-	(-)	1	(1)	-	(-)	1	(2)
Braenderup	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Butantan	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Coeln	-	(-)	-	(-)	-	(-)	1	(1)	1	(1)
Concord	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Derby	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Dublin	300	(353)	384	(434)	336	(347)	209	(243)	202	(218)
Eboko	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Enteritidis	4	(4)	3	(4)	1	(1)	1	(1)	-	(-)
Goldcoast	-	(-)	1	(1)	1	(1)	-	(-)	2	(2)
Infantis	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
Kedougou	-	(-)	1	(3)	1	(1)	1	(1)	-	(-)
Kentucky	-	(-)	-	(-)	-	(-)	1	(1)	1	(1)
Kimuenza	-	(-)	2	(4)	-	(-)	-	(-)	1	(1)
Kottbus	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
London	-	(-)	-	(-)	1	(1)	2	(2)	1	(1)
Mbandaka	1	(1)	-	(-)	1	(1)	-	(-)	1	(1)
Montevideo	-	(-)	2	(2)	-	(-)	-	(-)	2	(3)
Nagoya	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Newport	2	(2)	-	(-)	1	(1)	2	(2)	4	(4)
Oslo	-	(-)	2	(2)	-	(-)	-	(-)	-	(-)
Paratyphi B	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Paratyphi B var java	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Poona	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Reading	-	(-)	-	(-)	1	(1)	-	(-)	2	(2)
Stourbridge	-	(-)	-	(-)	-	(-)	-	(-)	2	(2)
Thompson	1	(1)	-	(-)	2	(2)	-	(-)	-	(-)
Typhimurium	45	(56)	44	(50)	33	(33)	36	(42)	47	(56)

Table 13: *Salmonella* in calves on all premises

<i>Salmonella</i> Incidents (Isolations)	2002	2003	2004	2005	2006
Vejle	- (-)	- (-)	1 (1)	- (-)	- (-)
ENTERICA DIARIZONAE					
61:k:1,5,7	- (-)	- (-)	- (-)	2 (2)	- (-)
UNKNOWN					
structure only	5 (7)	2 (2)	4 (4)	5 (6)	2 (2)
rough strain	1 (1)	1 (2)	2 (2)	5 (5)	2 (2)
untyped	1 (1)	- (-)	- (-)	- (-)	- (-)
TOTAL	372 (442)	458 (520)	399 (412)	273 (315)	291 (322)

Fig 13: Incidents of *Salmonella* serotypes in calves in 2006

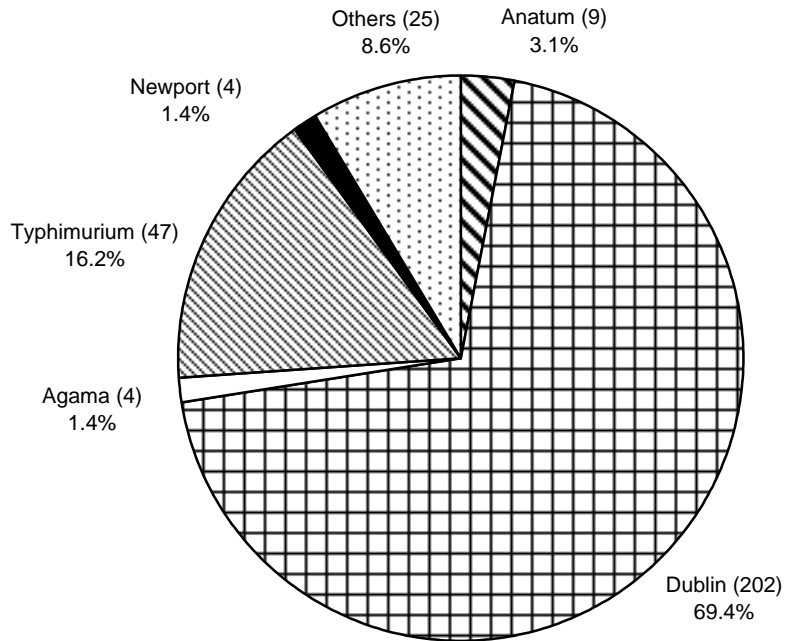


Table 14: Incidents of the top 4 *Salmonella* serotypes in calves in 2006 as a % of all incidents compared to previous years

Serotype	2002	2003	2004	2005	2006
S. Dublin %	80.6	83.8	84.2	76.6	69.4
S. Typhimurium %	12.1	9.6	8.3	13.2	16.2
S. Anatum %	1.1	1.5	1.3	1.8	3.1
S. Agama %	0.5	0.9	0.5	1.1	1.4
S. Newport %	0.5	0	0.3	0.7	1.4
Total no. incidents	372	458	399	273	291

Fig 14: Number of incidents of *Salmonella* serotypes in calves (2002 - 2006)

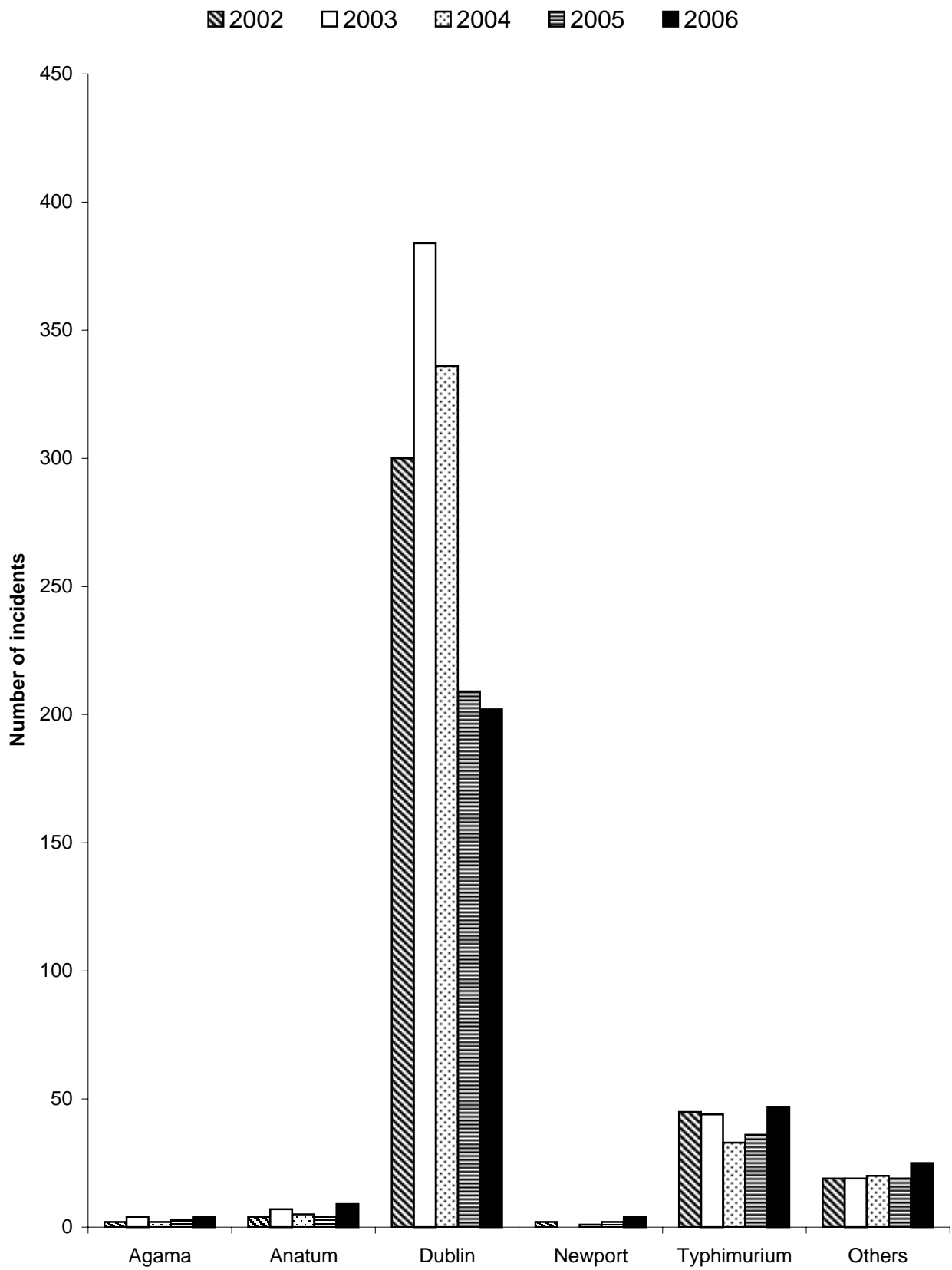
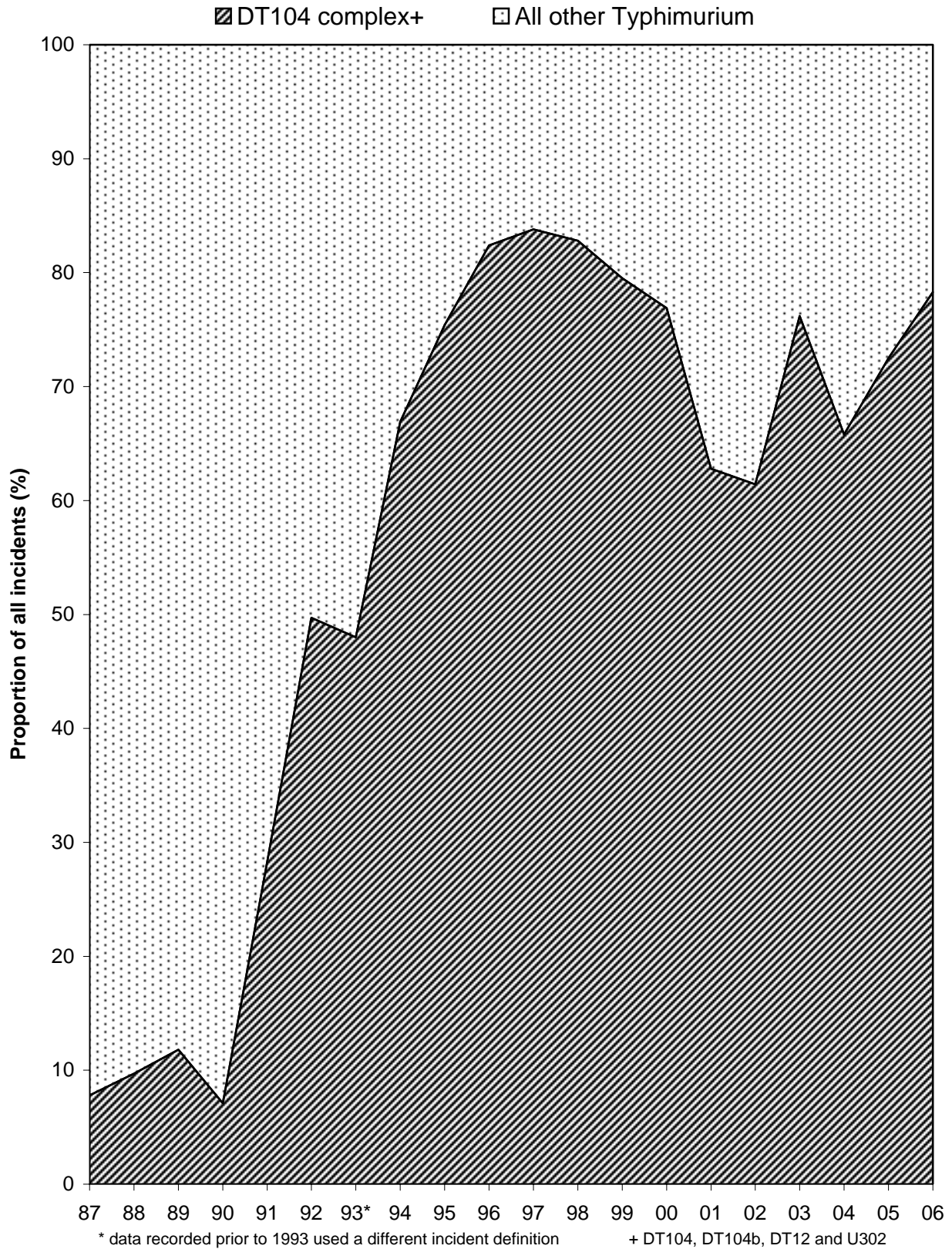


Table 15: S. Typhimurium in cattle on all premises (all ages)

Definitive Types Incidents (Isolations)	2002		2003		2004		2005		2006	
2	1	(1)	-	(-)	-	(-)	-	(-)	1	(3)
2a	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
7	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
8	-	(-)	1	(1)	-	(-)	1	(1)	2	(2)
12	6	(8)	4	(6)	6	(6)	8	(9)	5	(7)
40	2	(2)	2	(2)	3	(3)	2	(3)	1	(1)
41	1	(1)	2	(2)	3	(3)	2	(2)	4	(5)
49	-	(-)	1	(2)	3	(3)	3	(5)	2	(2)
56	2	(2)	1	(1)	3	(3)	3	(3)	-	(-)
104	60	(89)	89	(106)	74	(81)	79	(109)	105	(152)
104b	5	(10)	8	(10)	8	(8)	7	(9)	9	(12)
120	4	(4)	1	(1)	6	(6)	2	(2)	2	(2)
135	-	(-)	-	(-)	-	(-)	3	(5)	6	(6)
166	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
169	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
170	6	(7)	2	(2)	2	(2)	1	(1)	-	(-)
170b	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
193	3	(6)	2	(4)	8	(8)	4	(6)	8	(10)
193a	2	(3)	2	(6)	6	(6)	1	(1)	-	(-)
195	-	(-)	1	(1)	2	(2)	-	(-)	-	(-)
208	5	(6)	4	(4)	-	(-)	-	(-)	1	(1)
U288	-	(-)	2	(2)	-	(-)	-	(-)	-	(-)
U302	15	(19)	11	(16)	10	(10)	1	(1)	7	(7)
U310	-	(-)	6	(6)	10	(10)	5	(6)	-	(-)
U311	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
RDNC	10	(11)	-	(1)	-	(1)	-	(2)	-	(-)
NOPT	-	(-)	-	(1)	-	(1)	-	(-)	-	(2)
UNTY	9	(9)	5	(5)	5	(5)	7	(7)	7	(10)
Untyped	9	(10)	-	(-)	-	(1)	-	(-)	-	(2)
TOTAL	140	(188)	147	(182)	149	(160)	131	(175)	161	(225)

Fig 15: *Salmonella* Typhimurium DT104 and related strains as a proportion of all reports of *Salmonella* Typhimurium in cattle 1987 - 2006



**Fig 16: Seasonality of *S. Typhimurium* DT104 in cattle
(2002 - 2006)**

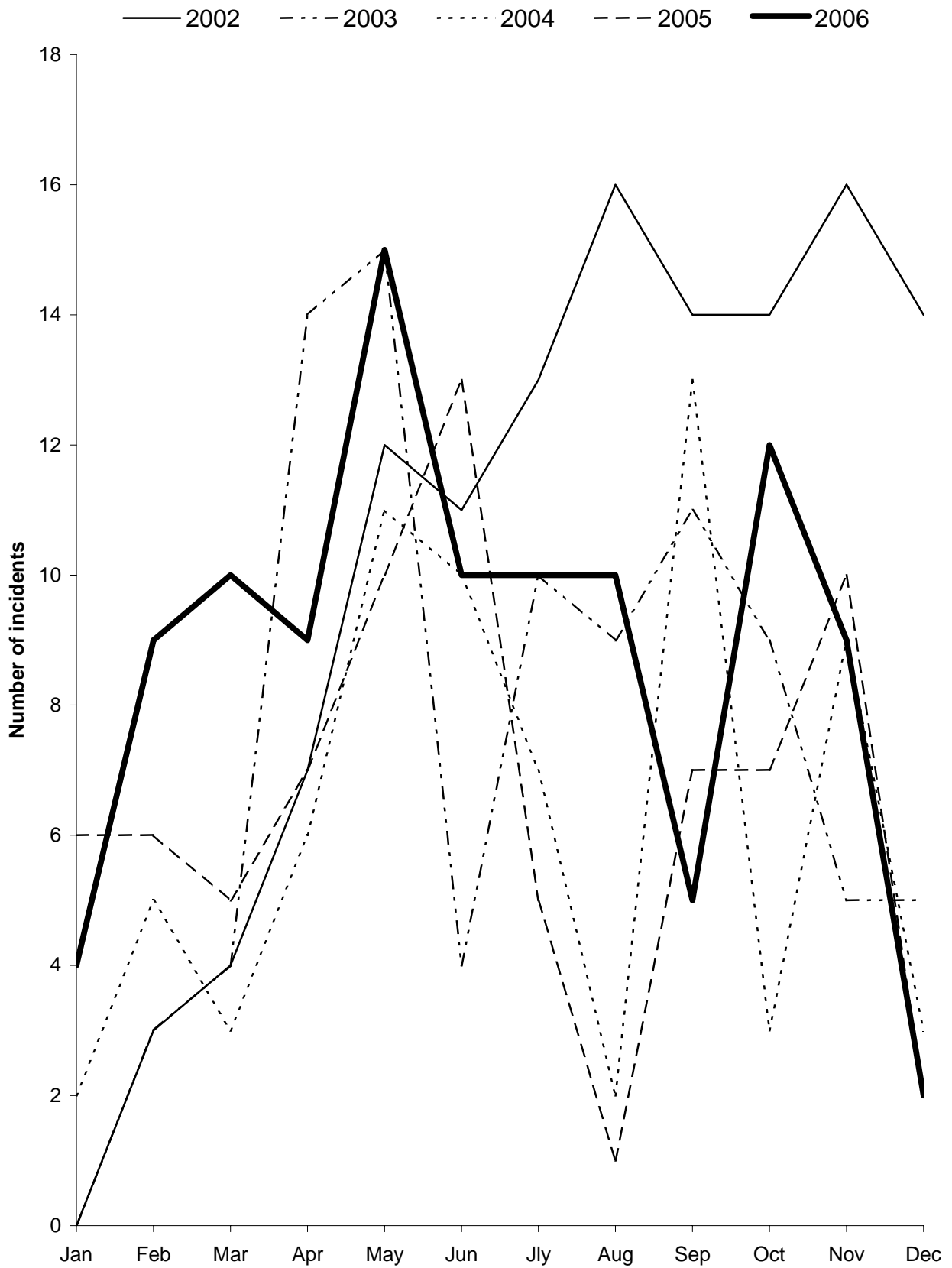


Table 16: S.Typhimurium in adult cattle on all premises

Definitive Types Incidents (Isolations)	2002		2003		2004		2005		2006	
2a	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
7	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
8	-	(-)	-	(-)	-	(-)	-	(-)	2	(2)
12	3	(4)	4	(6)	4	(4)	5	(6)	2	(3)
40	2	(2)	-	(-)	2	(2)	1	(2)	-	(-)
41	1	(1)	1	(1)	2	(2)	1	(1)	4	(4)
49	-	(-)	1	(2)	2	(2)	2	(3)	2	(2)
56	-	(-)	-	(-)	1	(1)	3	(3)	-	(-)
104	28	(38)	37	(41)	38	(43)	35	(42)	50	(68)
104b	2	(3)	3	(4)	4	(4)	-	(-)	5	(6)
120	2	(2)	-	(-)	4	(4)	1	(1)	1	(1)
135	-	(-)	-	(-)	-	(-)	3	(3)	5	(5)
166	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
169	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
170	5	(5)	-	(-)	-	(-)	-	(-)	-	(-)
170b	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
193	1	(1)	2	(4)	5	(5)	3	(5)	4	(4)
193a	1	(2)	2	(4)	3	(3)	1	(1)	-	(-)
195	-	(-)	1	(1)	1	(1)	-	(-)	-	(-)
208	3	(4)	3	(3)	-	(-)	-	(-)	1	(1)
U302	10	(11)	6	(8)	5	(5)	-	(-)	2	(2)
U310	-	(-)	4	(4)	5	(5)	1	(2)	-	(-)
U311	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
RDNC	7	(7)	-	(-)	-	(-)	-	(2)	-	(-)
NOPT	-	(-)	-	(-)	-	(1)	-	(-)	-	(1)
UNTY	5	(5)	2	(2)	3	(3)	2	(2)	5	(6)
Untyped	4	(4)	-	(-)	-	(1)	-	(-)	-	(-)
TOTAL	74	(89)	69	(83)	79	(86)	60	(75)	84	(106)

Fig 17: Incidents of *Salmonella* Typhimurium definitive types in adult cattle in 2006

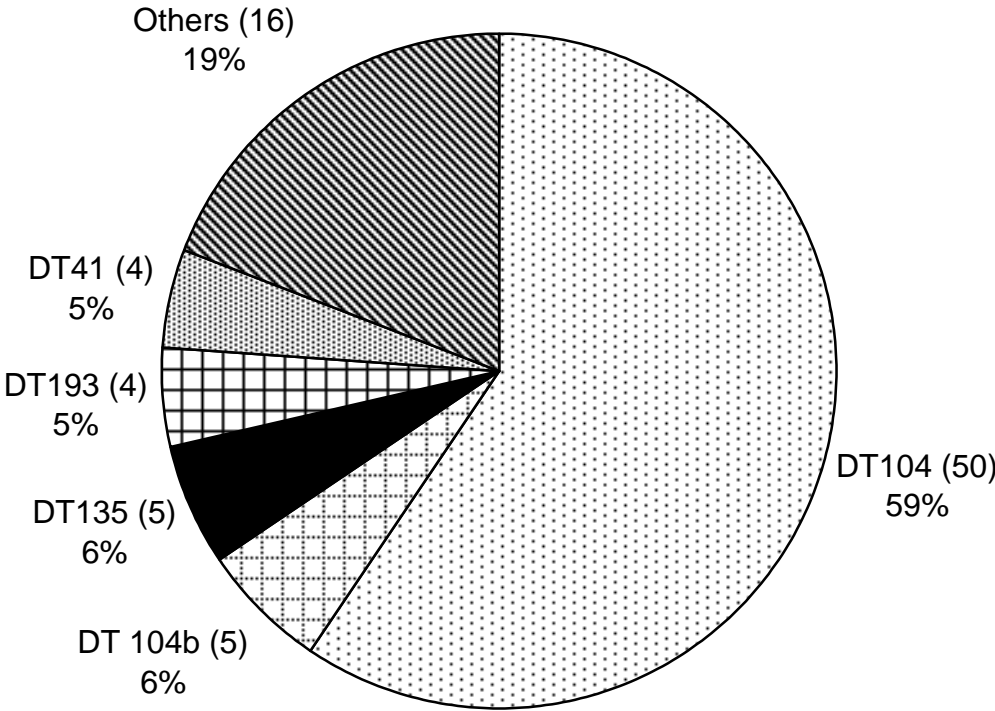


Fig 18: Incidents of *Salmonella* Typhimurium definitive types in adult cattle (2002 - 2006)

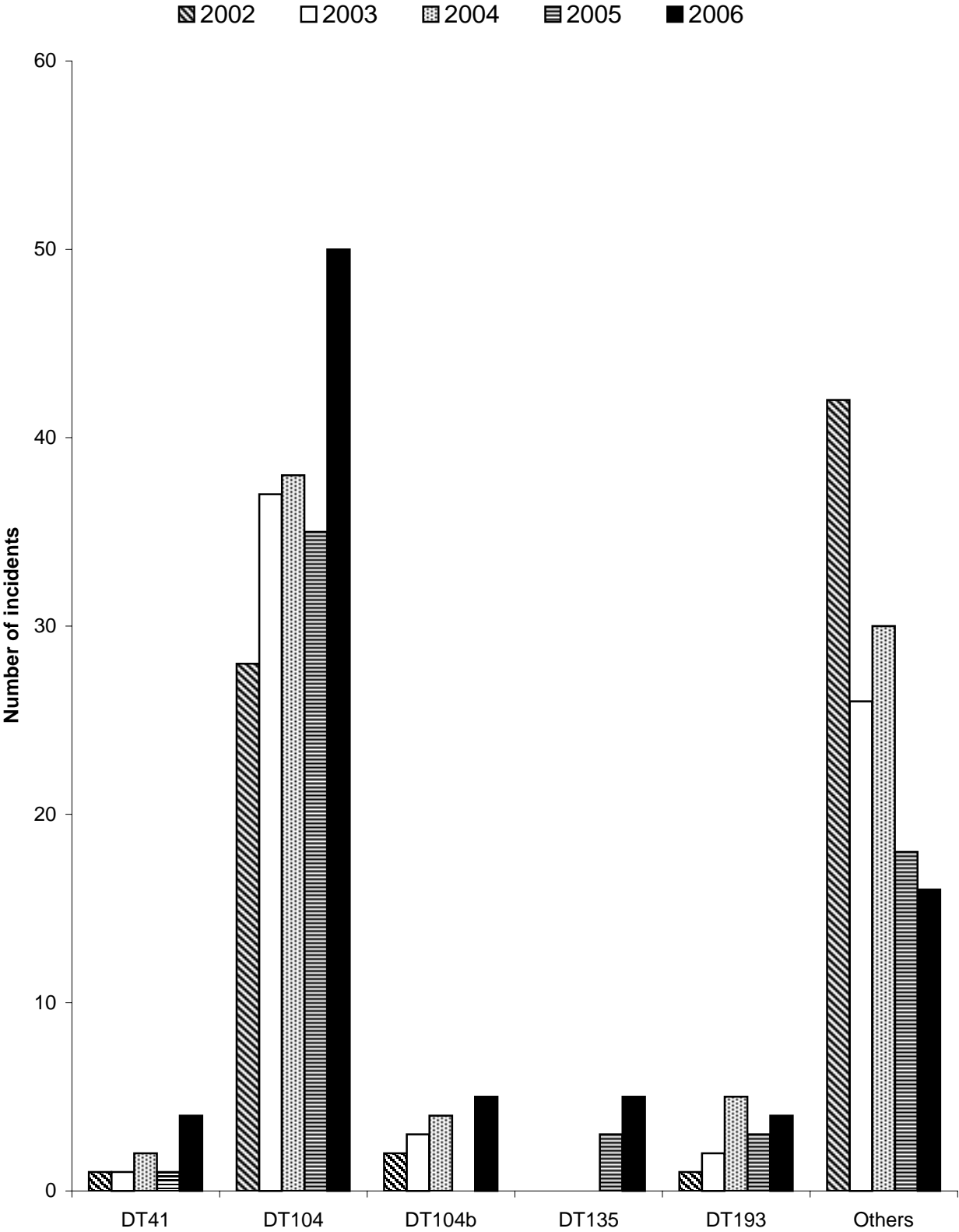


Table 17: S.Typhimurium in calves on all premises

Definitive Types Incidents (Isolations)	2002		2003		2004		2005		2006	
8	-	(-)	1	(1)	-	(-)	1	(1)	-	(-)
12	1	(2)	-	(-)	-	(-)	1	(1)	2	(3)
40	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
41	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
49	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
56	2	(2)	1	(1)	1	(1)	-	(-)	-	(-)
104	25	(32)	29	(32)	20	(20)	20	(26)	34	(41)
104b	2	(4)	4	(4)	1	(1)	6	(6)	3	(4)
120	2	(2)	-	(-)	-	(-)	-	(-)	1	(1)
135	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
170	-	(1)	-	(-)	-	(-)	-	(-)	-	(-)
193	1	(1)	-	(-)	2	(2)	1	(1)	2	(2)
193a	1	(1)	-	(1)	2	(2)	-	(-)	-	(-)
208	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
U288	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
U302	4	(4)	4	(6)	3	(3)	-	(-)	4	(4)
U310	-	(-)	1	(1)	1	(1)	2	(2)	-	(-)
RDNC	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
UNTY	3	(3)	2	(2)	2	(2)	4	(4)	-	(-)
untyped	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
TOTAL	45	(56)	44	(50)	33	(33)	36	(42)	47	(56)

Fig 19: Incidents of *Salmonella* Typhimurium definitive types in calves in 2006

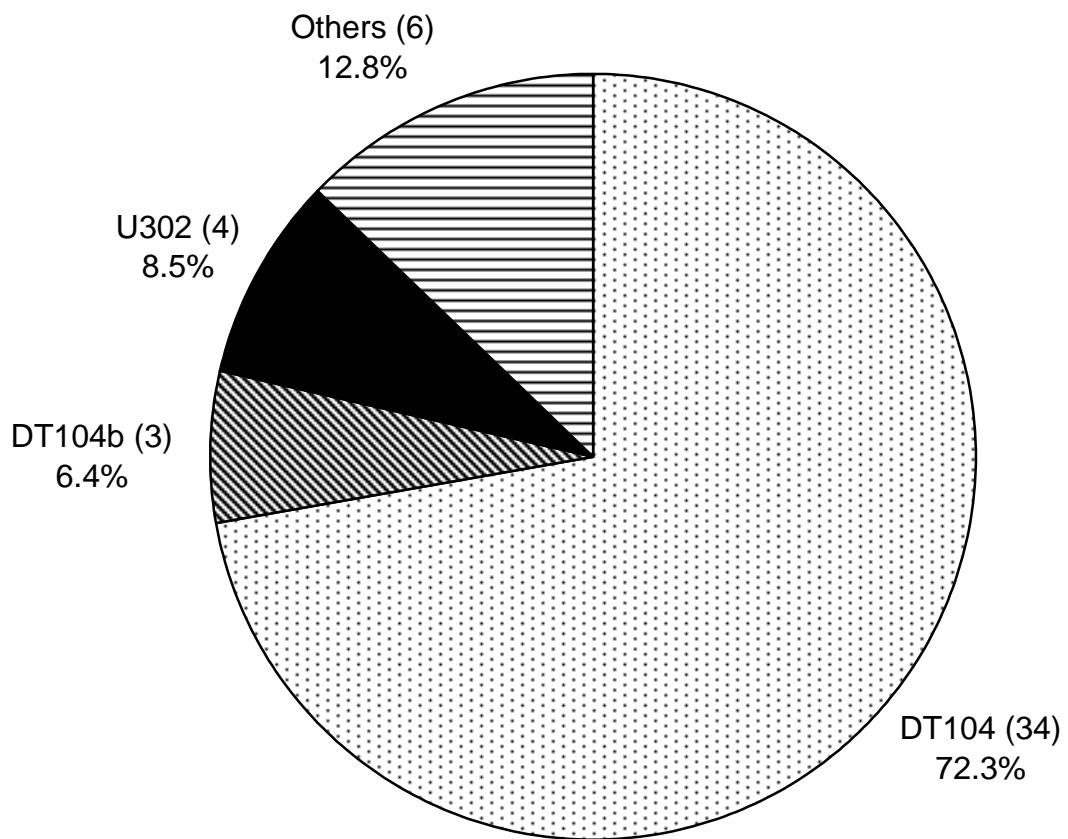


Fig 20: Incidents of *Salmonella* Typhimurium definitive types in calves (2002 - 2006)

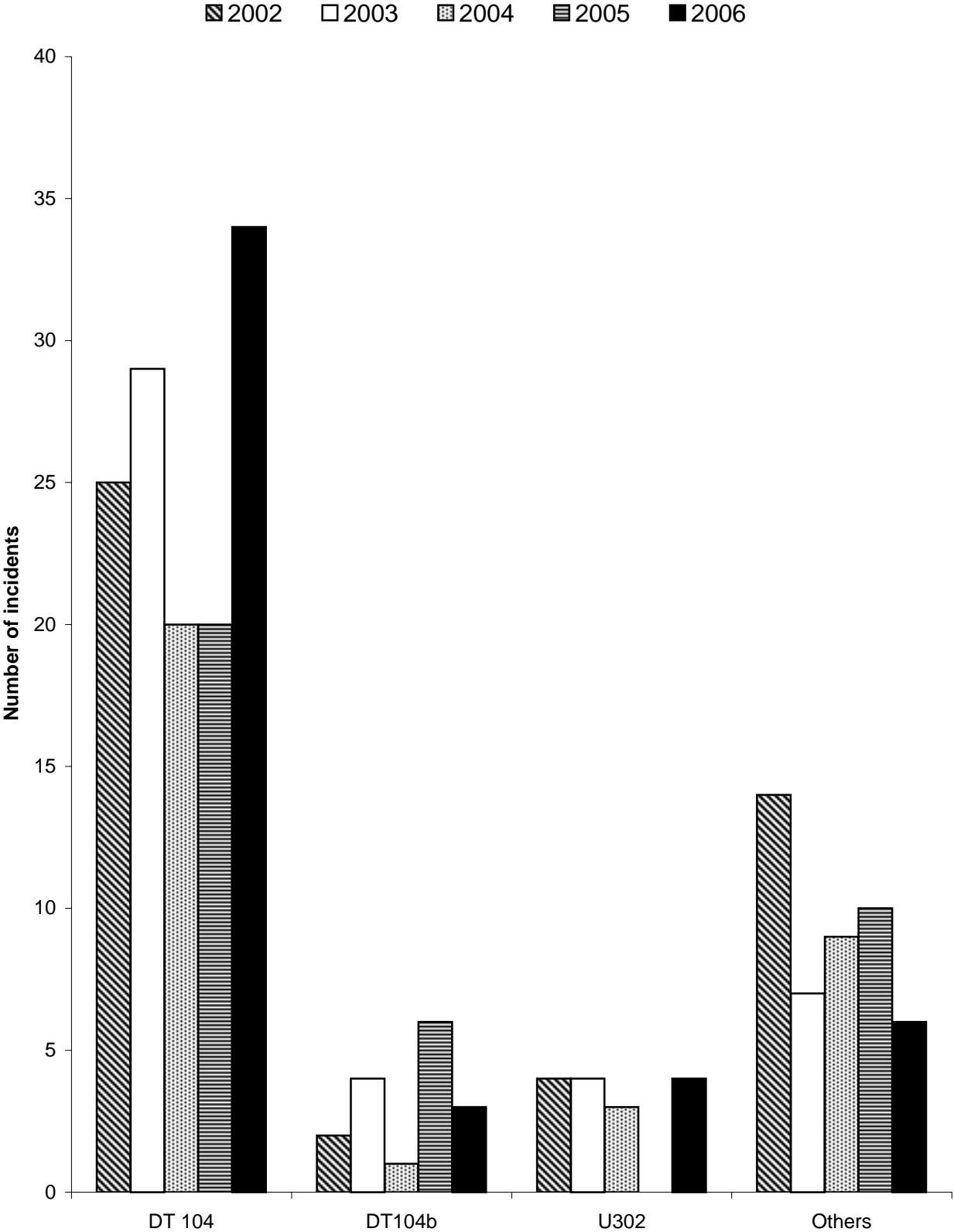


Table 18: S. Enteritidis in cattle on all premises (all ages)

Phage Types Incidents (Isolations)	2002		2003		2004		2005		2006	
1	-	(-)	1	(3)	2	(2)	1	(1)	-	(-)
4	2	(2)	1	(1)	1	(1)	2	(3)	-	(-)
6	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
6a	1	(1)	1	(1)	-	(-)	1	(2)	-	(-)
7	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
8	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
11	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
13a	1	(1)	5	(6)	1	(1)	-	(-)	-	(-)
14b	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
35	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
NOPT	-	(-)	-	(-)	-	(-)	-	(1)	-	(-)
UNTY	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
TOTAL	6	(6)	11	(14)	7	(7)	4	(7)	-	(-)

Table 19: S. Enteritidis in adult cattle on all premises

Phage Types Incidents (Isolations)	2002		2003		2004		2005		2006	
1	-	(-)	1	(2)	2	(2)	-	(-)	-	(-)
4	1	(1)	1	(1)	1	(1)	-	(-)	-	(-)
6a	-	(-)	-	(-)	-	(-)	1	(2)	-	(-)
7	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
8	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
13a	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
14b	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
35	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
NOPT	-	(-)	-	(-)	-	(-)	-	(1)	-	(-)
UNTY	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
TOTAL	1	(1)	5	(6)	6	(6)	1	(3)	-	(-)

Table 20: S. Enteritidis in calves on all premises

Phage Types Incidents (Isolations)	2002		2003		2004		2005		2006	
4	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
6	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
6a	1	(1)	1	(1)	-	(-)	-	(-)	-	(-)
13a	1	(1)	2	(3)	1	(1)	-	(-)	-	(-)
TOTAL	4	(4)	3	(4)	1	(1)	1	(1)	-	(-)

Table 21: S. Hadar in cattle on all premises (all ages)

Phage Types Incidents (Isolations)	2002	2003	2004	2005	2006
9	- (-)	1 (1)	- (-)	- (-)	- (-)
TOTAL	- (-)	1 (1)	- (-)	- (-)	- (-)

Table 22: S. Thompson in cattle on all premises (all ages)

Phage Types Incidents (Isolations)	2002	2003	2004	2005	2006
1	- (-)	- (-)	4 (4)	- (-)	- (-)
3	- (-)	1 (1)	- (-)	- (-)	- (-)
untyped	4 (5)	- (-)	- (-)	- (-)	- (-)
TOTAL	4 (5)	1 (1)	4 (4)	- (-)	- (-)

Table 23: S. Virchow in cattle on all premises (all ages)

Phage Types Incidents (Isolations)	2002	2003	2004	2005	2006
26	1 (1)	- (-)	- (-)	- (-)	- (-)
TOTAL	1 (1)	- (-)	- (-)	- (-)	- (-)