

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 8.66 million cattle in Great Britain in 2007, a slight increase on 2006 (8.63 million).

The number of diagnostic submissions from cattle reported to the VIDA database in 2007 was 35,394, a decrease of 6% compared to 2006. This continues a progressive downward trend of diagnostic submissions since 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 the number of diagnostic submissions to government veterinary laboratories. As in previous years, the majority (95%) of *Salmonella* reports (n=654) in cattle were from samples taken from clinical diagnostic purposes (see Table 1) and came from cattle on farms.

There were 25% fewer *Salmonella* incidents in cattle reported in 2007 (685) compared to 2006 (908). Incidents of *Salmonella* Typhimurium and *Salmonella* Dublin decreased by 54% and 23% respectively compared to 2006. Of the 685 incidents in cattle, 46% were in adult cattle, 31% in calves and 23% in cattle of unknown age. *Salmonella* Dublin remains the most common serotype isolated from cattle (59% of incidents), followed by *S. Typhimurium* (14% of incidents) and *S. Anatum* (6% of incidents). Five incidents involving *S. Enteritidis* have been reported in 2007 in cattle (none in 2006). In 2007, isolates of *Salmonella* Adelaide, *Salmonella* Sinstorf and *Salmonella* Duesseldorf were made from cattle for the first time ever and *Salmonella* Newington was reported for the first time since 2001.

***Salmonella* Dublin**

For the ninth consecutive year, *S. Dublin* was the most common serotype in adult cattle (50.5% of incidents; Table 12) and in calves (69.5% of incidents; Table 14). As in previous years, there was a seasonal association of incidents due to *S. Dublin* in the autumn, largely related to winter housing and calving cows (Fig 9). *Salmonella* Dublin is the most common serotype associated with abortion in cattle although the number of incidents of *S. Dublin* abortion in cattle decreased in 2007 compared to 2006 (VIDA 2007).

***Salmonella* Typhimurium**

Salmonella Typhimurium continued to be the second most common serotype in cattle in 2007, although the proportion of incidents in adult cattle (15.7% of incidents; Table 12) and calves (11.3% of incidents; Table 14) decreased compared to 2006 where *S. Typhimurium* represented 25.2% of *Salmonella* incidents in adult cattle and 17.7% of *Salmonella* incidents in calves. Of all *S. Typhimurium* incidents in 2007, half (49) were recorded in adult cattle, a quarter (24) in calves, and the remainder in cattle of unknown age. As in previous years, DT104 was the most frequently recorded definitive type, representing 46.9% of *S. Typhimurium* incidents in adult cattle (Fig 17) and 50% of *S. Typhimurium* incidents in calves (Fig 19). During 2007, there was a clear seasonal peak of *S. Typhimurium* DT104 incidents in cattle in the late summer/autumn months and notably fewer incidents in the late winter/spring months compared to 2006, where no such clear peak was observed (Fig 16). As in 2006, *Salmonella* Typhimurium DT193 was the second most common definitive type in 2007, behind DT104 (including related strains). Reports of both *S. Typhimurium* DT193 and U302 have risen despite the overall decreasing trend of *Salmonella* Typhimurium.

Salmonella Typhimurium definitive type DT1 was reported for the first time in cattle since 1998. This isolate was made from a recently calved beef suckler cow that had presented with recumbency, pyrexia and a haemorrhagic diarrhoea.

Other serovars

Incidents of *S. Enteritidis* and *S. Thompson* were recorded in cattle in 2007. There were five incidents of *S. Enteritidis*; with single incidents of phage types PT8, PT11 (both were last isolated from cattle in 2003) and

PT14b (last isolated from cattle in 2004). The PT14b incident was investigated at the farm, as human illness was also reported to be associated with the outbreak. Sampling of the cattle and environment indicated that the organism was widely distributed on the farm. There were two incidents of PT13, which prior to 2007, had never before been reported in livestock species. Both incidents, on different holdings, were in the Midlands and associated with clinical signs of diarrhoea and malaise – one in a dairy calf and the other in two dairy heifers around calving. In the latter incident, there was reported human illness in farm and veterinary staff after assisting with a case of dystokia in one of the affected heifers. Sampling showed *S. Enteritidis* to be widespread on the farm and this continued to be the case at a further follow up visit six months later. However there had been no further cases of clinical disease or associated human illness.

There was a single incident of *S. Thompson* PT1, which was last recorded in cattle in 2004. There were no incidents of *S. Hadar* in 2007, which means that this serovar has not been isolated from cattle since 2003.

Salmonella Anatum continued to be the third most common isolate from all cattle in 2007, representing 5.5% of incidents (5.8% in adults and 7.5% in calves); this was mainly in calves and likely to be due to contaminated milk replacer in many cases. There is a continuing increase in the proportion of incidents of *S. Anatum* in cattle, from 2.8% in 2003, 2.9% in 2004, 3.1% in 2005 and 3.6% in 2006. *Salmonella* Anatum has been previously associated with wild birds and one farm, which had a *S. Anatum* isolate from a scouring calf, was investigated. Testing of environmental swabs identified *S. Anatum* in the collecting yard, calving pens and calf accommodation.

Between 2004 and 2006 incidents of *S. Mbandaka* represented 0.2-0.6% of all *Salmonella* incidents in cattle, but in 2007 they represented 4.2% of all cattle incidents (6.7% in adults and 2.8% in calves). Although 29 incidents of *S. Mbandaka* were recorded in 2007 (compared to six in 2006, three in 2005 and two in 2004), they occurred on 12 holdings, with six holdings having multiple isolates, and two incidents were reported as the result of ZO4 on-farm investigation visits. All incidents were in the South West of England with the exception of a single incident in Wales. *Salmonella* Mbandaka is typically a feed related serovar (e.g. rape seed meal, soya bean meal) and has been associated with clinical disease in stressed or immuno-suppressed cattle. Incidents were recorded in January - March and June - November with the peak count of incidents occurring in September, which in many herds may coincide with the calving period. Incidents of *S. Mbandaka* were associated with clinical signs of abortion, diarrhoea

and malaise in adult cattle and diarrhoea in calves. The restricted geographical distribution of incidents may suggest contamination of feed followed by spread in carrier animals or local spread, although no detailed investigation was undertaken.

Salmonella Montevideo was isolated from both adult cattle (11 reports) and calves (five reports) during 2007 and whilst numbers remained similar to previous years in adult cattle (18 reports in 2006 and 12 reports in 2005) representing 3.5% of incidents (Table 12) it represented an increased proportion of 2.3% of *Salmonella* incidents in calves in 2007, compared to 0.9% (three reports) in 2006, no incidents in 2005 and 2006, and 0.4% (two reports) in 2003 (Table 14).

Incidents of *Salmonella* Newport continued to occur in 2007, with 13 incidents reported (compared to 14 in 2006). Isolates of *S.* Newport from GB continue to be monitored for multiple drug resistance following the emergence of MDR *S.* Newport in the USA where some strains have shown resistance to at least nine antimicrobials. One *S.* Newport isolate made from GB cattle in 2007 showed resistance to five antimicrobials, but not including cephalosporins or the typical pentavalent resistance pattern, with the remaining isolates being sensitive to all antimicrobials tested.

Salmonella Adelaide was reported in cattle for the first time ever in 2007 – this is the first reported isolate of this serovar in any livestock species in Great Britain and was made from an investigation into an abortion from a young dairy cow. Similarly, *S.* Duesseldorf was reported for the first time and this cattle isolate was made from a bought in suckler cow with weight loss and diarrhoea, where Johnes disease was also diagnosed. *Salmonella* Sinstorf was also reported for the first time ever in cattle, having last been reported in chickens in 1990. The *S.* Sinstorf isolate was made from a beef suckler animal with diarrhoea. There were other sporadic incidents of unusual serotypes reported in cattle during 2007, including; *S.* Eboko from a beef suckler animal with diarrhoea, *S.* Carno from a dairy cow with malaise and *S.* Ajiobo from an abortion investigation from a dairy cow.

A total of 56 investigation and advisory visits were carried out in 2007 to follow up various *Salmonella* isolates. Twenty-six visits were made to *S.* Dublin incidents, 22 of which were in Scotland, and twenty-three visits were made to *S.* Typhimurium incidents. Other incidents investigated included *S.* Enteritidis, *S.* Anatum, *S.* London, *S.* Mbandaka and *S.* Schwarzengrund.

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

<i>Salmonella</i> Incidents (Isolations)	2003		2004		2005		2006		2007	
ENTERICA ENTERICA										
Adelaide	-	(-)	-	(-)	-	(-)	-	(-)	1	(2)
Agama	16	(16)	16	(16)	15	(17)	19	(19)	10	(10)
Agona	4	(4)	6	(6)	1	(1)	9	(9)	1	(1)
Ajiobo	1	(1)	2	(2)	1	(1)	1	(1)	1	(1)
Anatum	40	(40)	31	(34)	29	(30)	33	(36)	38	(40)
Berta	-	(-)	-	(-)	-	(-)	2	(2)	1	(1)
Binza	-	(-)	3	(3)	-	(-)	-	(-)	-	(-)
Bovismorbificans	-	(-)	1	(1)	3	(4)	4	(6)	-	(-)
Bradford	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Braenderup	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Bredeney	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Butantan	-	(-)	-	(-)	-	(-)	5	(7)	5	(7)
Carno	-	(-)	-	(-)	1	(1)	-	(-)	1	(1)
Coeln	-	(-)	-	(-)	1	(1)	2	(3)	-	(-)
Concord	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Derby	2	(2)	2	(2)	1	(1)	1	(1)	1	(1)
Dublin	1098	(1166)	777	(798)	644	(672)	522	(545)	404	(428)
Duesseldorf	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Durham	1	(1)	-	(-)	-	(-)	1	(1)	4	(4)
Eboko	-	(-)	-	(-)	-	(-)	1	(1)	1	(1)
Enteritidis	13	(14)	7	(7)	6	(7)	-	(-)	5	(8)
Give	-	(-)	2	(2)	4	(4)	-	(-)	1	(1)
Goldcoast	8	(8)	3	(4)	3	(3)	2	(2)	3	(4)
Hadar	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
Havana	1	(1)	-	(-)	2	(2)	-	(-)	-	(-)
Indiana	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Infantis	1	(1)	1	(1)	2	(2)	3	(3)	-	(-)
Jangwani	-	(-)	-	(-)	3	(4)	-	(-)	-	(-)
Kedougou	11	(12)	5	(5)	2	(2)	-	(-)	2	(2)
Kentucky	-	(-)	-	(-)	1	(1)	2	(2)	1	(1)
Kiambu	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Kimuenza	4	(4)	1	(1)	-	(-)	2	(2)	3	(4)
Kokomlemlle	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Kottbus	1	(1)	1	(1)	-	(-)	2	(2)	1	(1)
Larochelle	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Liverpool	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
London	-	(-)	5	(6)	3	(3)	5	(5)	3	(3)
Mbandaka	-	(-)	2	(2)	3	(3)	6	(6)	29	(30)

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

<i>Salmonella</i> Incidents (Isolations)	2003		2004		2005		2006		2007	
ENTERICA ENTERICA										
Montevideo	7	(7)	10	(17)	15	(15)	27	(27)	19	(20)
Nagoya	1	(1)	-	(-)	-	(-)	1	(1)	-	(-)
Newington	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Newport	7	(7)	5	(7)	11	(11)	14	(14)	13	(13)
Ohio	-	(-)	-	(-)	1	(1)	7	(7)	7	(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	-	(-)	6	(6)	-	(-)	-	(-)	1	(1)
Senftenberg	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Sinstorf	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Stanley	1	(1)	2	(2)	-	(-)	-	(-)	-	(-)
Stourbridge	2	(2)	1	(1)	2	(2)	2	(2)	-	(-)
Thompson	1	(1)	4	(4)	-	(-)	-	(-)	1	(1)
Typhimurium	171	(182)	151	(162)	161	(175)	213	(230)	98	(105)
Uganda	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Vejle	4	(4)	8	(8)	-	(-)	-	(-)	-	(-)
ENTERICA DIARIZONAE										
61:k:1,5,7	2	(2)	-	(-)	4	(4)	1	(1)	2	(2)
61:-:1,5,7	1	(1)	1	(1)	1	(1)	1	(1)	-	(-)
structure only	7	(7)	10	(10)	9	(9)	8	(8)	23	(25)
rough strain	4	(5)	4	(5)	8	(8)	5	(5)	2	(2)
untypable	-	(1)	-	(-)	-	(-)	-	(-)	-	(-)
TOTAL	1419	(1502)	1073	(1120)	943	(991)	908	(956)	685	(730)

**Fig 9: Seasonality of *Salmonella* Dublin in cattle
(2003 - 2007)**

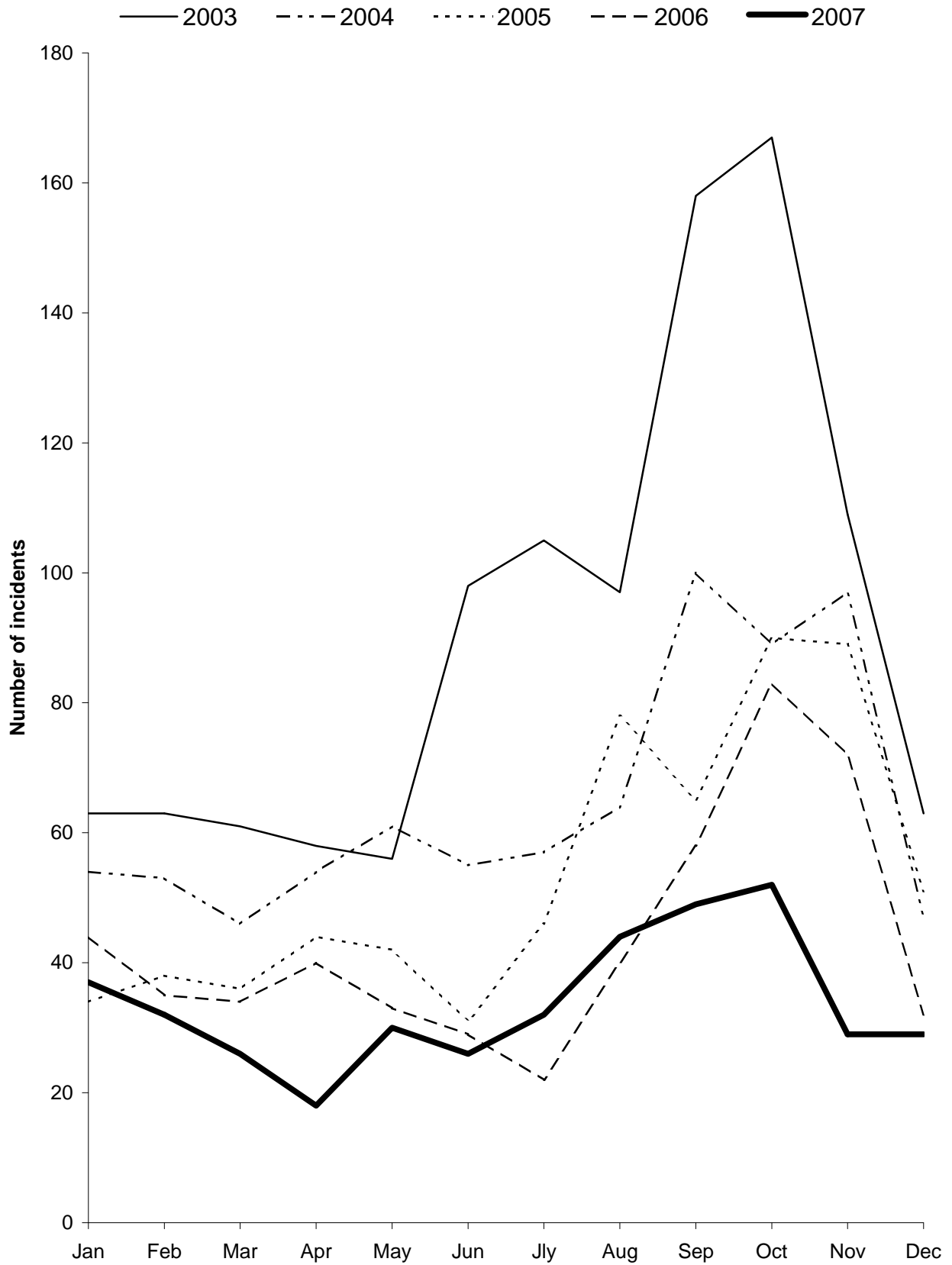


Fig 10: S. Enteritidis, S. Typhimurium and S. Dublin as a proportion of all incident reports in cattle (1987 - 2007)

▨ S. Typhimurium ■ S. Enteritidis ▤ S. Dublin □ All other Salmonella serotypes

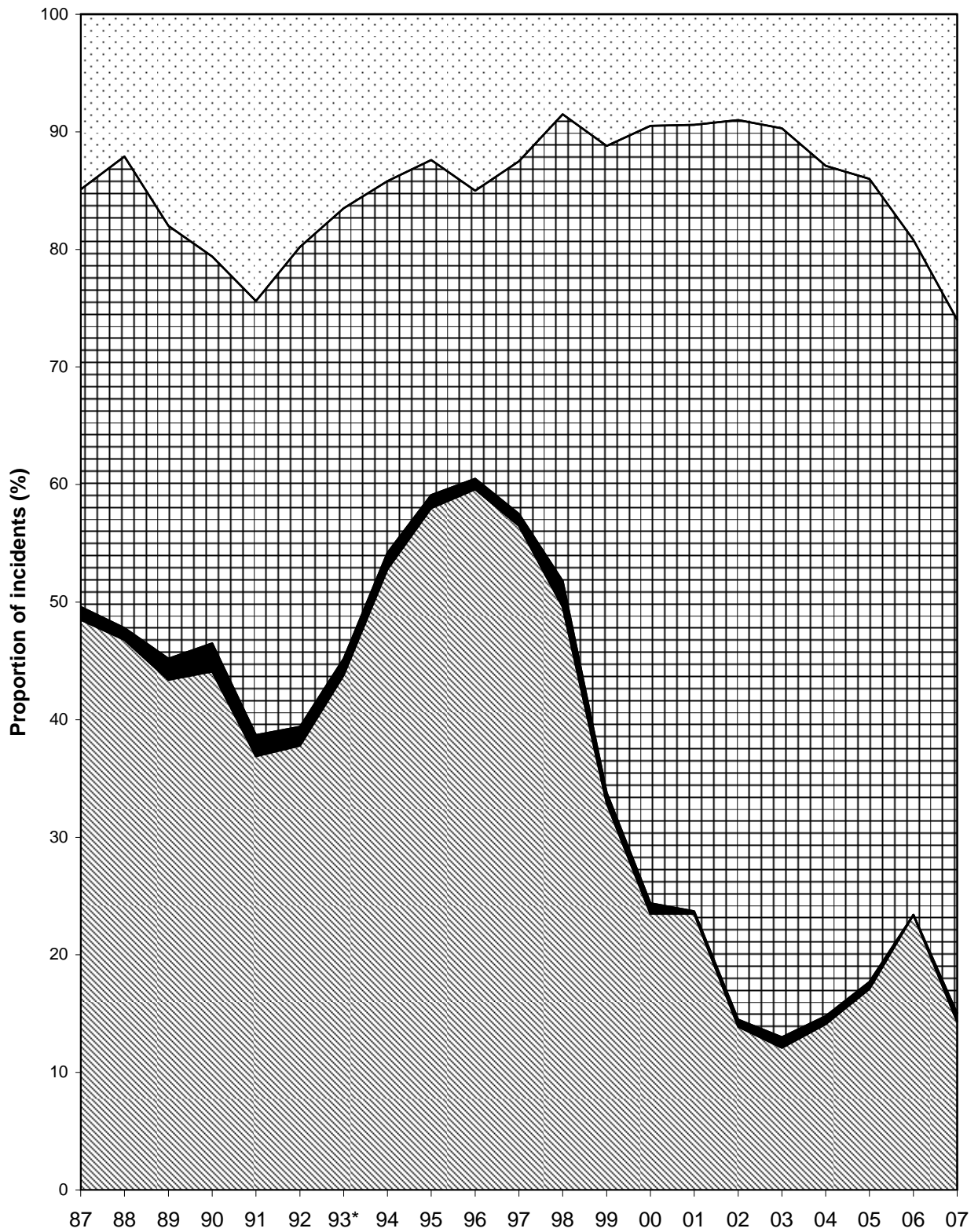


Table 11: *Salmonella* in adult cattle on all premises

<i>Salmonella</i> Incidents (Isolations)	2003		2004		2005		2006		2007	
ENTERICA ENTERICA										
Adelaide	-	(-)	-	(-)	-	(-)	-	(-)	1	(2)
Agama	8	(8)	10	(10)	8	(9)	11	(11)	9	(9)
Agona	1	(1)	3	(3)	1	(1)	6	(6)	-	(-)
Ajiobo	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
Anatum	29	(29)	22	(23)	24	(25)	21	(23)	18	(18)
Berta	-	(-)	-	(-)	-	(-)	2	(2)	-	(-)
Bovismorbificans	-	(-)	-	(-)	3	(4)	1	(1)	-	(-)
Bradford	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Bredeney	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Butantan	-	(-)	-	(-)	-	(-)	3	(3)	-	(-)
Carno	-	(-)	-	(-)	1	(1)	-	(-)	1	(1)
Derby	1	(1)	2	(2)	1	(1)	-	(-)	-	(-)
Dublin	438	(455)	291	(293)	277	(286)	204	(206)	158	(165)
Durham	-	(-)	-	(-)	-	(-)	1	(1)	4	(4)
Enteritidis	6	(6)	6	(6)	2	(3)	-	(-)	3	(5)
Give	-	(-)	2	(2)	3	(3)	-	(-)	1	(1)
Goldcoast	6	(6)	2	(3)	3	(3)	-	(-)	1	(1)
Havana	1	(1)	-	(-)	1	(1)	-	(-)	-	(-)
Infantis	1	(1)	-	(-)	2	(2)	2	(2)	-	(-)
Kedougou	6	(7)	4	(4)	1	(1)	-	(-)	2	(2)
Kentucky	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Kimuenza	-	(-)	1	(1)	-	(-)	1	(1)	2	(3)
Kokomlemle	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Kottbus	-	(-)	1	(1)	-	(-)	1	(1)	1	(1)
Larochelle	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Liverpool	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
London	-	(-)	2	(3)	-	(-)	3	(3)	-	(-)
Mbandaka	-	(-)	1	(1)	3	(3)	5	(5)	21	(22)
Montevideo	2	(2)	4	(4)	12	(12)	18	(18)	11	(12)
Nagoya	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
Newington	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Newport	5	(5)	4	(6)	7	(7)	7	(7)	9	(9)
Ohio	-	(-)	-	(-)	1	(1)	6	(6)	5	(5)
Oslo	3	(3)	-	(-)	-	(-)	-	(-)	-	(-)
Poona	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)

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

<i>Salmonella</i> Incidents (Isolations)	2003		2004		2005		2006		2007	
ENTERICA ENTERICA										
Riggil	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Saint Paul	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Schwarzengrund	-	(-)	5	(5)	-	(-)	-	(-)	-	(-)
Senftenberg	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Sinstorf	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
Stanley	-	(-)	2	(2)	-	(-)	-	(-)	-	(-)
Stourbridge	2	(2)	1	(1)	1	(1)	-	(-)	-	(-)
Thompson	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
Typhimurium	79	(83)	80	(87)	70	(75)	102	(109)	49	(52)
Uganda	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
Vejle	3	(3)	6	(6)	-	(-)	-	(-)	-	(-)
ENTERICA DIARIZONAE										
61:k:1,5,7	2	(2)	-	(-)	2	(2)	1	(1)	1	(1)
61:-:1,5,7	-	(-)	1	(1)	-	(-)	1	(1)	-	(-)
structure only	2	(2)	6	(6)	3	(3)	4	(4)	12	(13)
rough strain	2	(2)	1	(1)	3	(3)	2	(2)	1	(1)
no viable organisms	-	(2)	-	(-)	-	(-)	-	(-)	-	(-)
TOTAL	600	(624)	461	(475)	433	(451)	405	(416)	313	(330)

Fig 11: Incidents of *Salmonella* serotypes in adult cattle in 2007

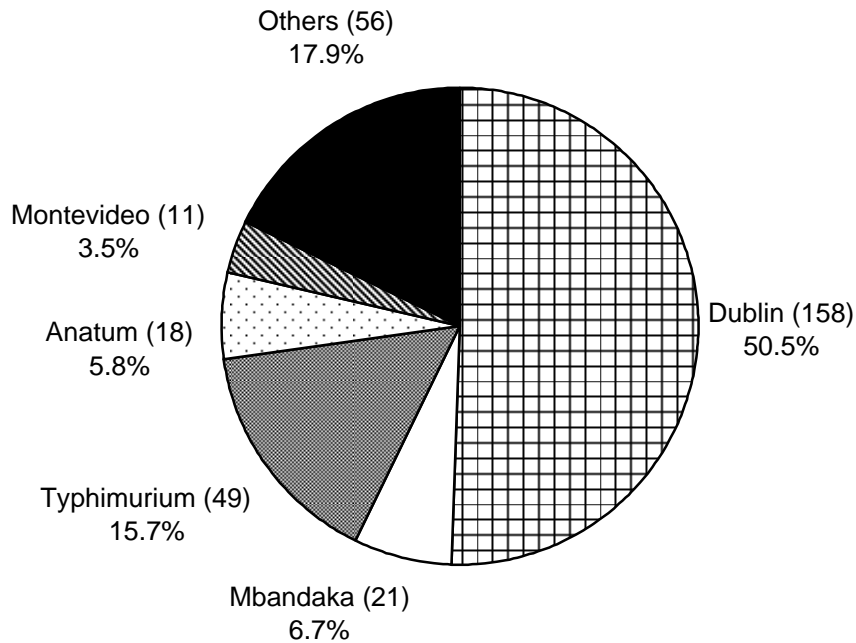


Table 12: Incidents of the top 5 *Salmonella* serotypes in adult cattle in 2007 as a % of all incidents compared to previous years

Serotype	2003	2004	2005	2006	2007
S. Dublin %	73.0	63.1	64.0	50.4	50.5
S. Typhimurium %	13.2	17.4	16.2	25.2	15.7
S. Mbandaka %	0	0.2	0.7	1.2	6.7
S. Anatum %	4.8	4.8	5.5	5.2	5.8
S. Montevideo %	0.3	0.9	2.8	4.4	3.5
Total no. incidents	600	461	433	405	313

Fig 12: Number of incidents of *Salmonella* serotypes in adult cattle (2003 - 2007)

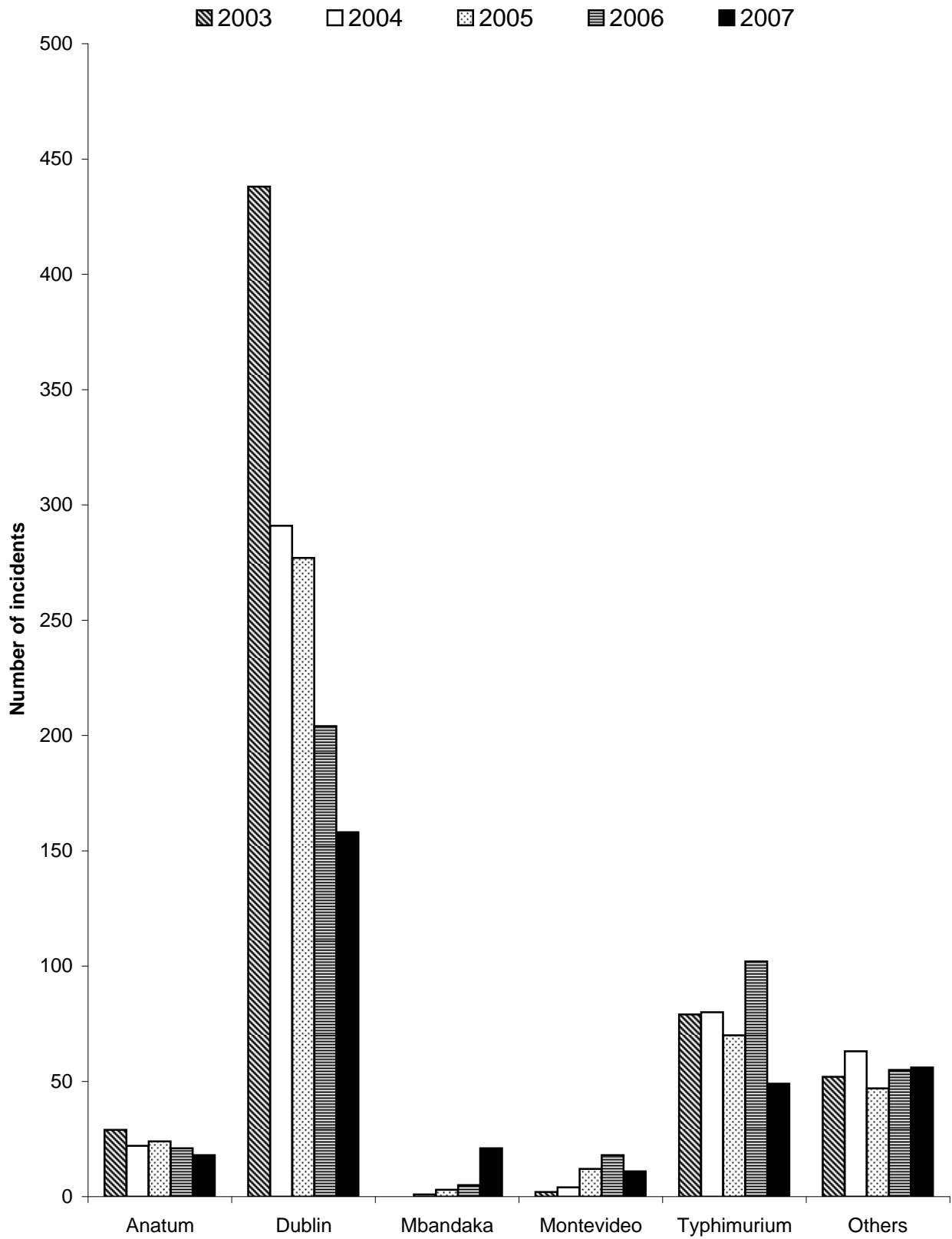


Table 13: *Salmonella* in calves on all premises

<i>Salmonella</i> Incidents (Isolations)	2003		2004		2005		2006		2007	
ENTERICA ENTERICA										
Agama	4	(4)	2	(2)	4	(4)	6	(6)	-	(-)
Agona	3	(3)	3	(3)	-	(-)	2	(2)	-	(-)
Ajiobo	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Anatum	7	(7)	5	(7)	4	(4)	11	(11)	16	(17)
Berta	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
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)	-	(-)	-	(-)	-	(-)	1	(1)
Dublin	415	(434)	339	(348)	242	(243)	216	(219)	148	(155)
Eboko	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Enteritidis	4	(4)	1	(1)	1	(1)	-	(-)	1	(1)
Goldcoast	1	(1)	1	(1)	-	(-)	2	(2)	-	(-)
Kedougou	3	(3)	1	(1)	1	(1)	-	(-)	-	(-)
Kentucky	-	(-)	-	(-)	1	(1)	1	(1)	-	(-)
Kimuenza	4	(4)	-	(-)	-	(-)	1	(1)	1	(1)
London	-	(-)	1	(1)	2	(2)	1	(1)	1	(1)
Mbandaka	-	(-)	1	(1)	-	(-)	1	(1)	6	(6)
Montevideo	2	(2)	-	(-)	-	(-)	3	(3)	5	(5)
Nagoya	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
Newport	-	(-)	1	(1)	2	(2)	4	(4)	2	(2)
Ohio	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
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	-	(-)	2	(2)	-	(-)	-	(-)	1	(1)
Typhimurium	50	(50)	34	(34)	42	(42)	57	(57)	24	(25)

Table 13: *Salmonella* in calves on all premises

<i>Salmonella</i> Incidents (Isolations)	2003	2004	2005	2006	2007
Vejle	- (-)	1 (1)	- (-)	- (-)	- (-)
ENTERICA DIARIZONAE					
61:k:1,5,7	- (-)	- (-)	2 (2)	- (-)	- (-)
UNKNOWN					
structure only	2 (2)	4 (4)	6 (6)	3 (3)	4 (4)
rough strain	1 (2)	2 (2)	5 (5)	2 (2)	1 (1)
TOTAL	500 (520)	403 (414)	314 (315)	322 (326)	213 (222)

Fig 13: Incidents of *Salmonella* serotypes in calves in 2007

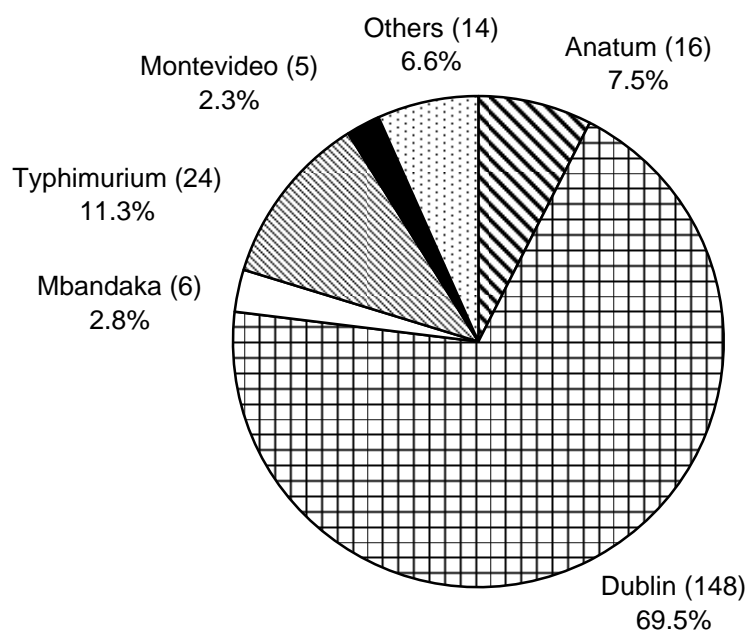


Table 14: Incidents of the top 5 *Salmonella* serotypes in calves in 2007 as a % of all incidents compared to previous years

Serotype	2003	2004	2005	2006	2007
S. Dublin %	83.0	84.1	77.1	67.1	69.5
S. Typhimurium %	10.0	8.4	13.4	17.7	11.3
S. Anatum %	1.4	1.2	1.3	3.4	7.5
S. Mbandaka %	0	0.2	0	0.3	2.8
S. Montevideo %	0.4	0	0	0.9	2.3
Total no. incidents	500	403	314	322	213

Fig 14: Number of incidents of *Salmonella* serotypes in calves (2003 - 2007)

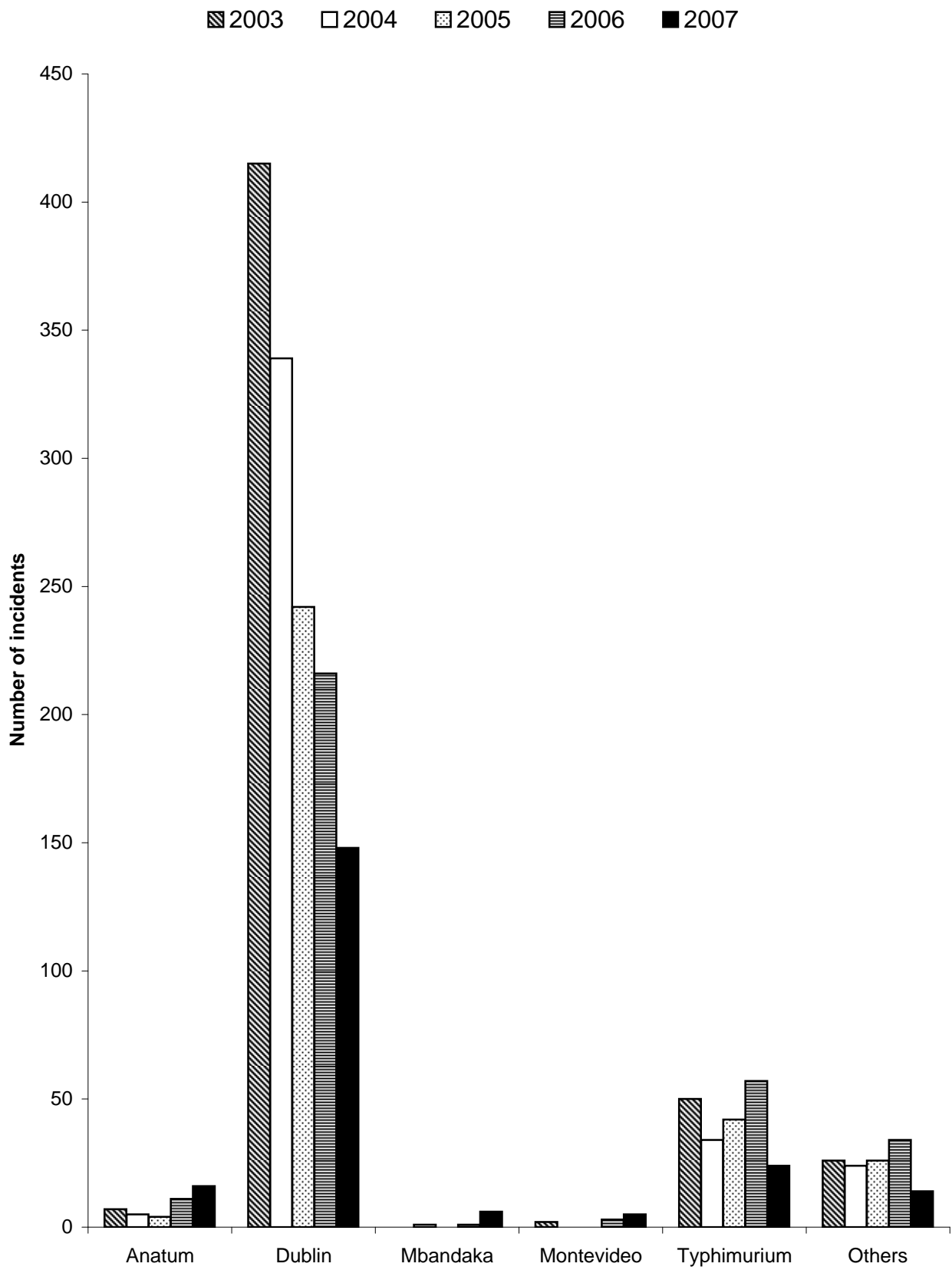
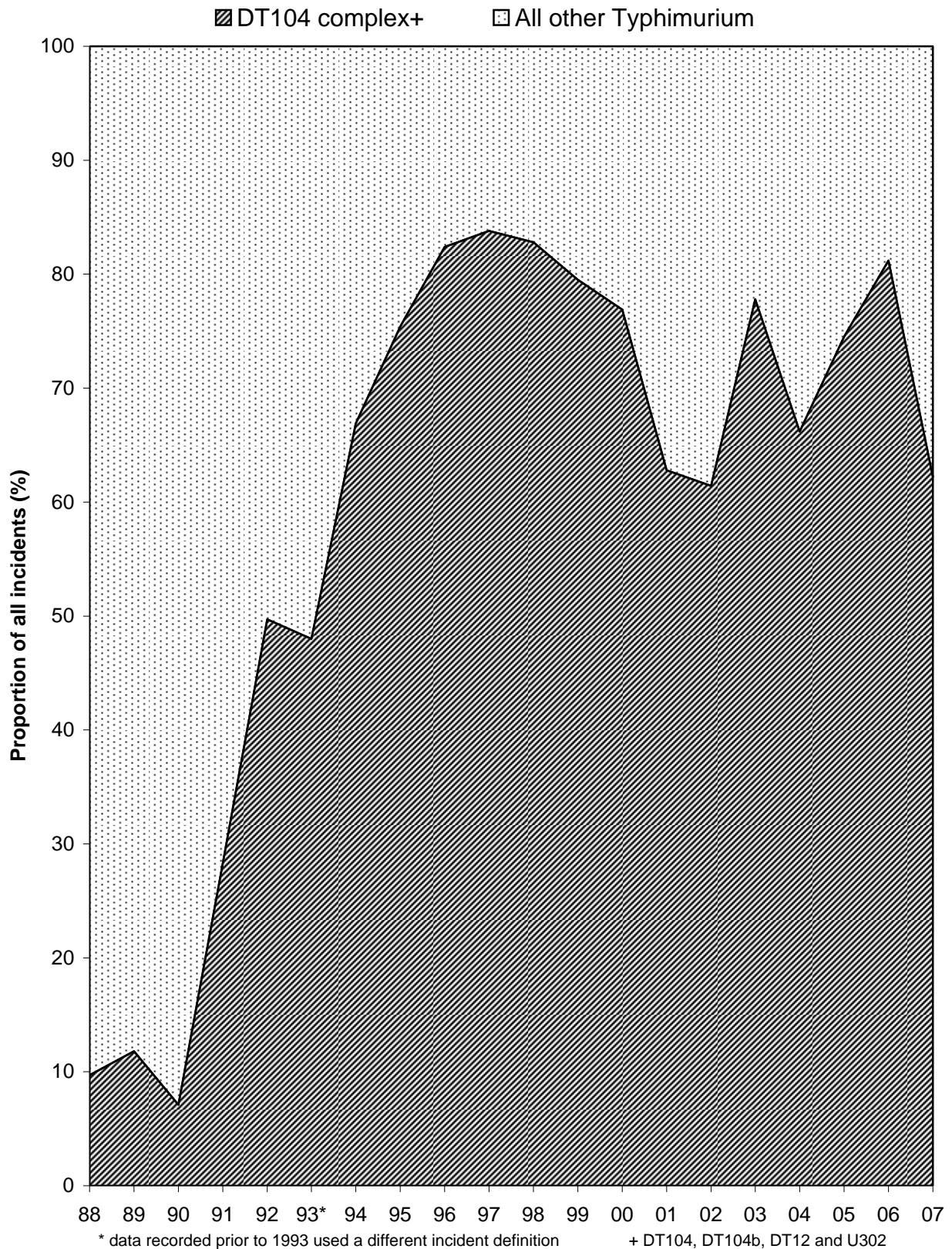


Table 15: S. Typhimurium in cattle on all premises (all ages)

Definitive Types Incidents (Isolations)	2003		2004		2005		2006		2007	
1	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
2	-	(-)	-	(-)	-	(-)	3	(3)	3	(3)
2a	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
7	-	(-)	-	(-)	-	(-)	1	(1)	2	(2)
8	1	(1)	-	(-)	1	(1)	2	(2)	-	(-)
12	6	(6)	6	(6)	9	(9)	7	(7)	3	(3)
40	2	(2)	3	(3)	2	(3)	1	(1)	-	(-)
41	2	(2)	3	(3)	2	(2)	5	(5)	1	(1)
49	1	(2)	3	(3)	3	(5)	1	(1)	-	(-)
56	1	(1)	3	(3)	3	(3)	-	(-)	-	(-)
66	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
104	102	(106)	75	(82)	102	(109)	146	(152)	43	(44)
104b	10	(10)	9	(9)	8	(9)	13	(14)	6	(7)
120	1	(1)	6	(6)	2	(2)	2	(2)	1	(1)
135	-	(-)	-	(-)	5	(5)	6	(6)	5	(5)
166	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
169	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
170	2	(2)	2	(2)	1	(1)	-	(-)	-	(-)
170b	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
193	4	(4)	8	(8)	6	(6)	10	(10)	14	(14)
193a	4	(6)	6	(6)	1	(1)	-	(-)	-	(-)
195	1	(1)	2	(2)	-	(-)	-	(-)	-	(-)
208	4	(4)	-	(-)	-	(-)	1	(1)	-	(-)
U288	2	(2)	-	(-)	-	(-)	-	(-)	-	(-)
U302	15	(16)	10	(10)	1	(1)	7	(7)	9	(9)
U310	6	(6)	10	(10)	6	(6)	-	(-)	-	(-)
U311	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
RDNC	-	(1)	-	(1)	-	(2)	-	(2)	-	(-)
NOPT	-	(1)	-	(1)	-	(-)	-	(2)	-	(3)
UNTY	4	(5)	5	(5)	7	(7)	7	(10)	10	(12)
Untyped	-	(-)	-	(2)	-	(1)	-	(3)	-	(-)
TOTAL	171	(182)	151	(162)	161	(175)	213	(230)	98	(105)

Fig 15: *Salmonella* Typhimurium DT104 and related strains as a proportion of all reports of *Salmonella* Typhimurium in cattle 1988 - 2007



**Fig 16: Seasonality of *S. Typhimurium* DT104 in cattle
(2003 - 2007)**

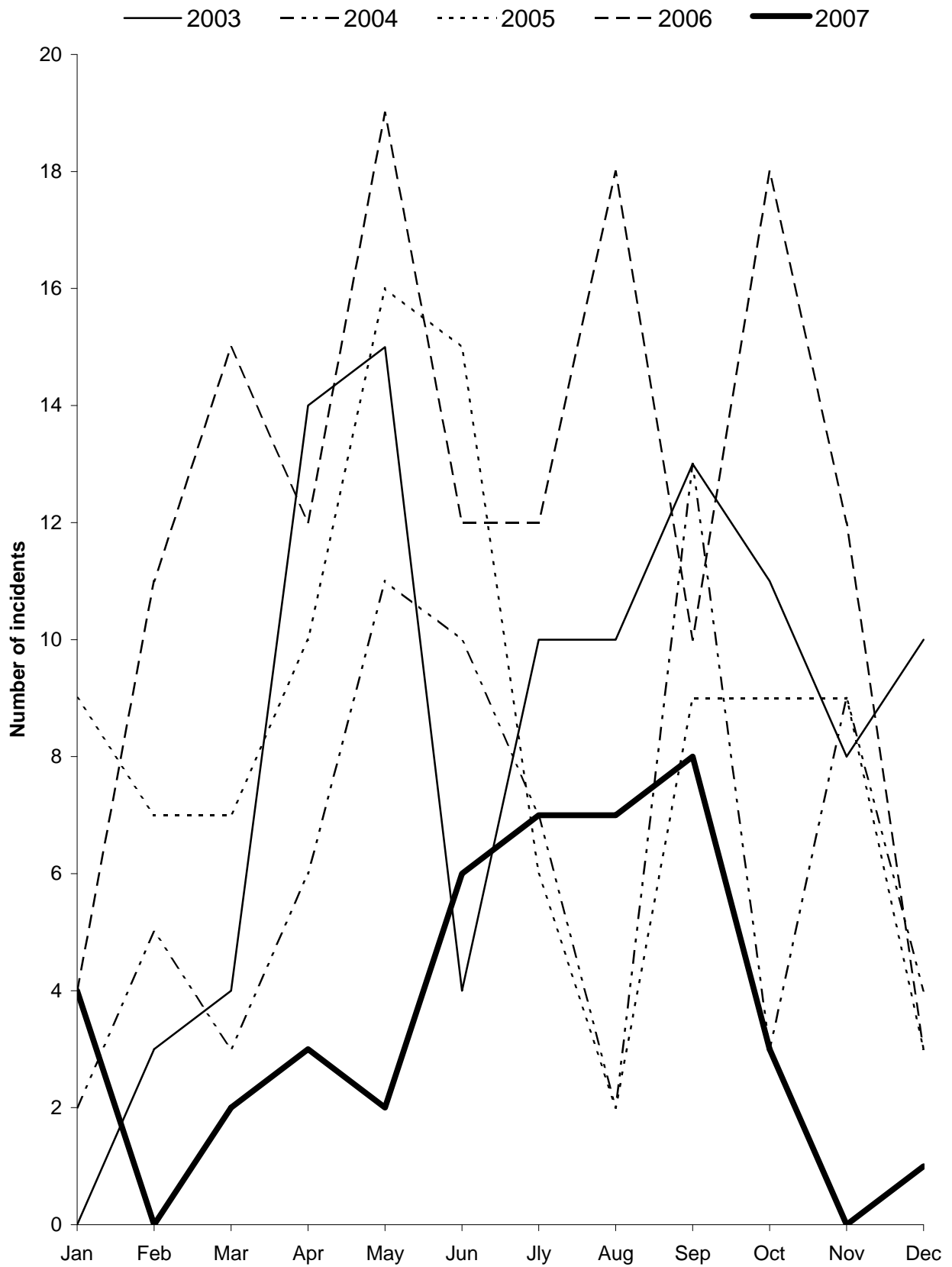


Table 16: S.Typhimurium in adult cattle on all premises

Definitive Types Incidents (Isolations)	2003		2004		2005		2006		2007	
1	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
2a	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
7	-	(-)	-	(-)	-	(-)	1	(1)	2	(2)
8	-	(-)	-	(-)	-	(-)	2	(2)	-	(-)
12	6	(6)	4	(4)	6	(6)	3	(3)	1	(1)
40	-	(-)	2	(2)	1	(2)	-	(-)	-	(-)
41	1	(1)	2	(2)	1	(1)	4	(4)	-	(-)
49	1	(2)	2	(2)	2	(3)	1	(1)	-	(-)
56	-	(-)	1	(1)	3	(3)	-	(-)	-	(-)
66	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
104	39	(41)	38	(43)	41	(42)	66	(68)	23	(24)
104b	4	(4)	5	(5)	-	(-)	6	(6)	3	(4)
120	-	(-)	4	(4)	1	(1)	1	(1)	-	(-)
135	-	(-)	-	(-)	3	(3)	5	(5)	4	(4)
166	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
169	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
170b	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
193	4	(4)	5	(5)	5	(5)	4	(4)	5	(5)
193a	3	(4)	3	(3)	1	(1)	-	(-)	-	(-)
195	1	(1)	1	(1)	-	(-)	-	(-)	-	(-)
208	3	(3)	-	(-)	-	(-)	1	(1)	-	(-)
U302	8	(8)	5	(5)	-	(-)	2	(2)	3	(3)
U310	4	(4)	5	(5)	2	(2)	-	(-)	-	(-)
U311	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
RDNC	-	(-)	-	(-)	-	(2)	-	(2)	-	(-)
NOPT	-	(-)	-	(1)	-	(-)	-	(1)	-	(1)
UNTY	2	(2)	3	(3)	2	(2)	5	(6)	7	(7)
Untyped	-	(-)	-	(1)	-	(-)	-	(1)	-	(-)
TOTAL	79	(83)	80	(87)	70	(75)	102	(109)	49	(52)

Fig 17: Incidents of *Salmonella* Typhimurium definitive types in adult cattle in 2007

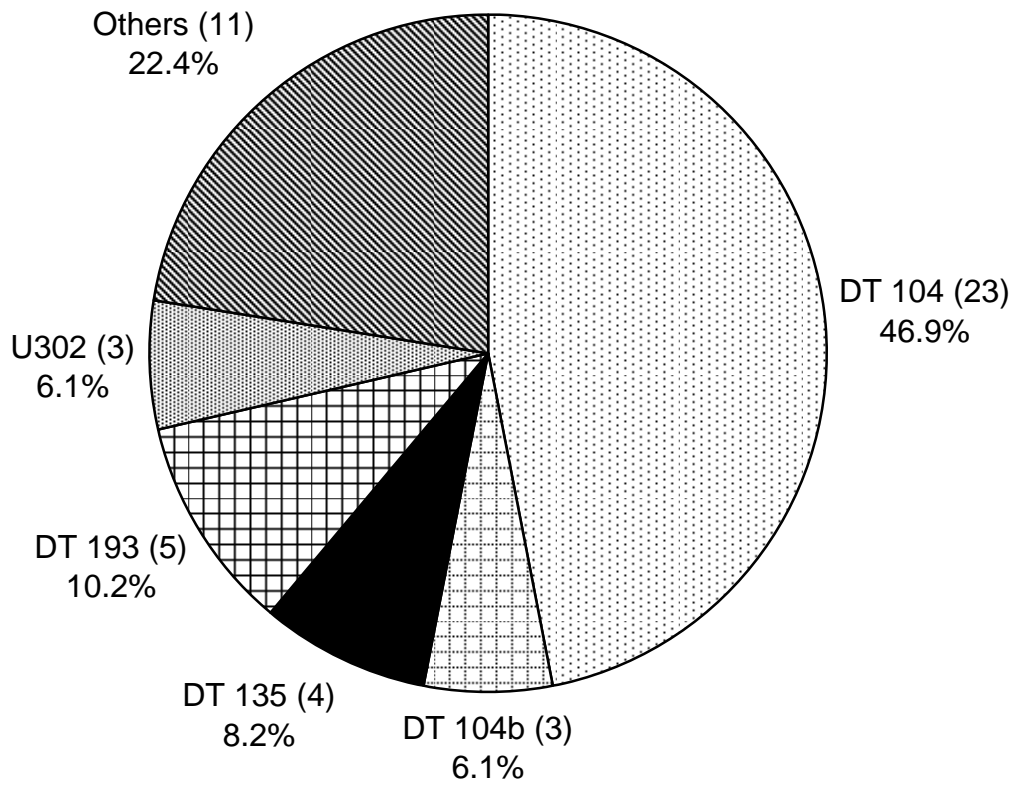


Fig 18: Incidents of *Salmonella* Typhimurium definitive types in adult cattle (2003 - 2007)

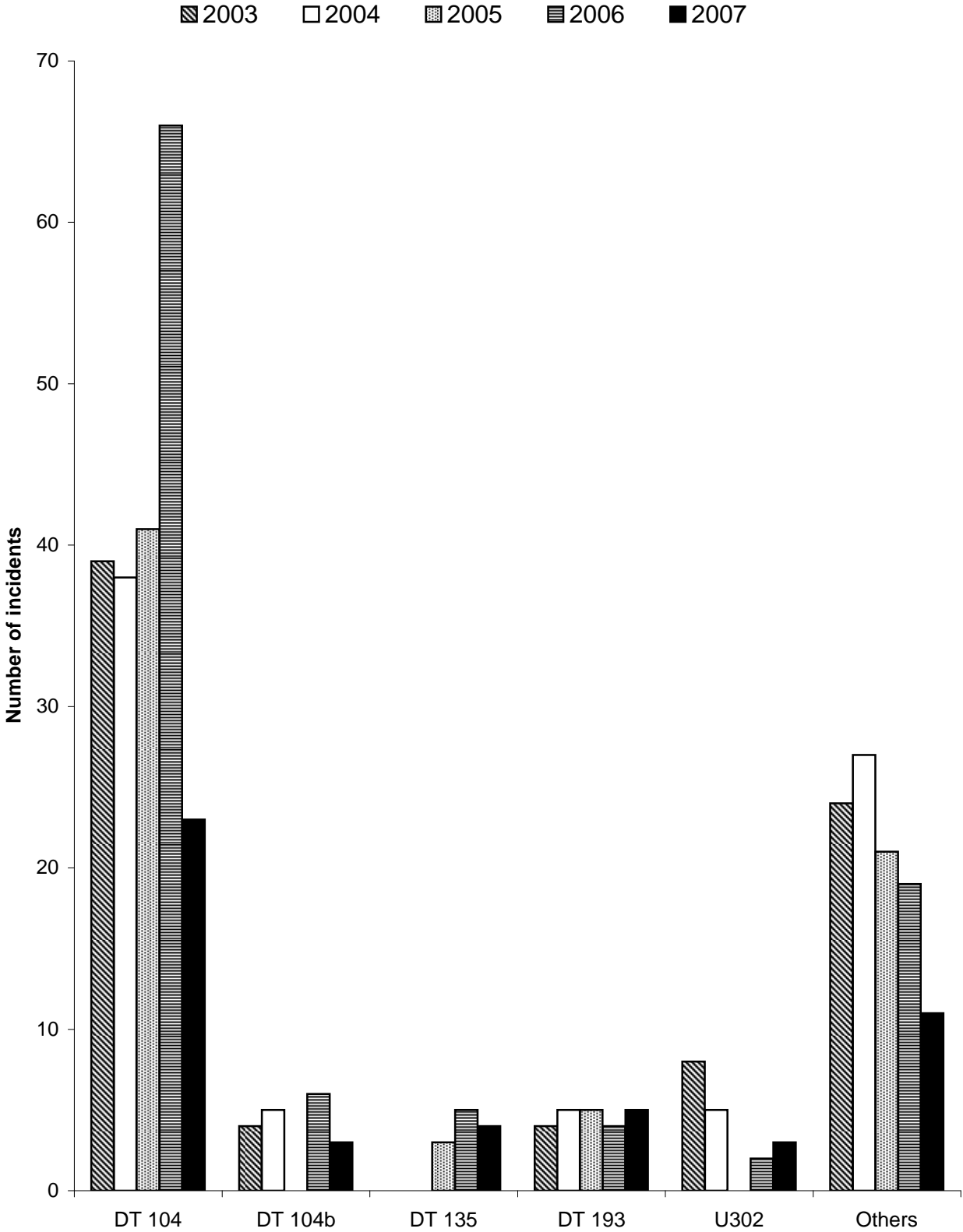


Table 17: S.Typhimurium in calves on all premises

Definitive Types Incidents (Isolations)	2003		2004		2005		2006		2007	
2	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
8	1	(1)	-	(-)	1	(1)	-	(-)	-	(-)
12	-	(-)	-	(-)	1	(1)	3	(3)	-	(-)
40	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
41	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
49	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
56	1	(1)	1	(1)	-	(-)	-	(-)	-	(-)
104	32	(32)	21	(21)	26	(26)	41	(41)	12	(12)
104b	4	(4)	1	(1)	6	(6)	5	(5)	2	(2)
120	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
135	-	(-)	-	(-)	-	(-)	1	(1)	-	(-)
193	-	(-)	2	(2)	1	(1)	2	(2)	4	(4)
193a	-	(1)	2	(2)	-	(-)	-	(-)	-	(-)
U288	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
U302	6	(6)	3	(3)	-	(-)	4	(4)	4	(4)
U310	1	(1)	1	(1)	2	(2)	-	(-)	-	(-)
UNTY	2	(2)	2	(2)	4	(4)	-	(-)	1	(2)
TOTAL	50	(50)	34	(34)	42	(42)	57	(57)	24	(25)

Fig 19: Incidents of *Salmonella* Typhimurium definitive types in calves in 2007

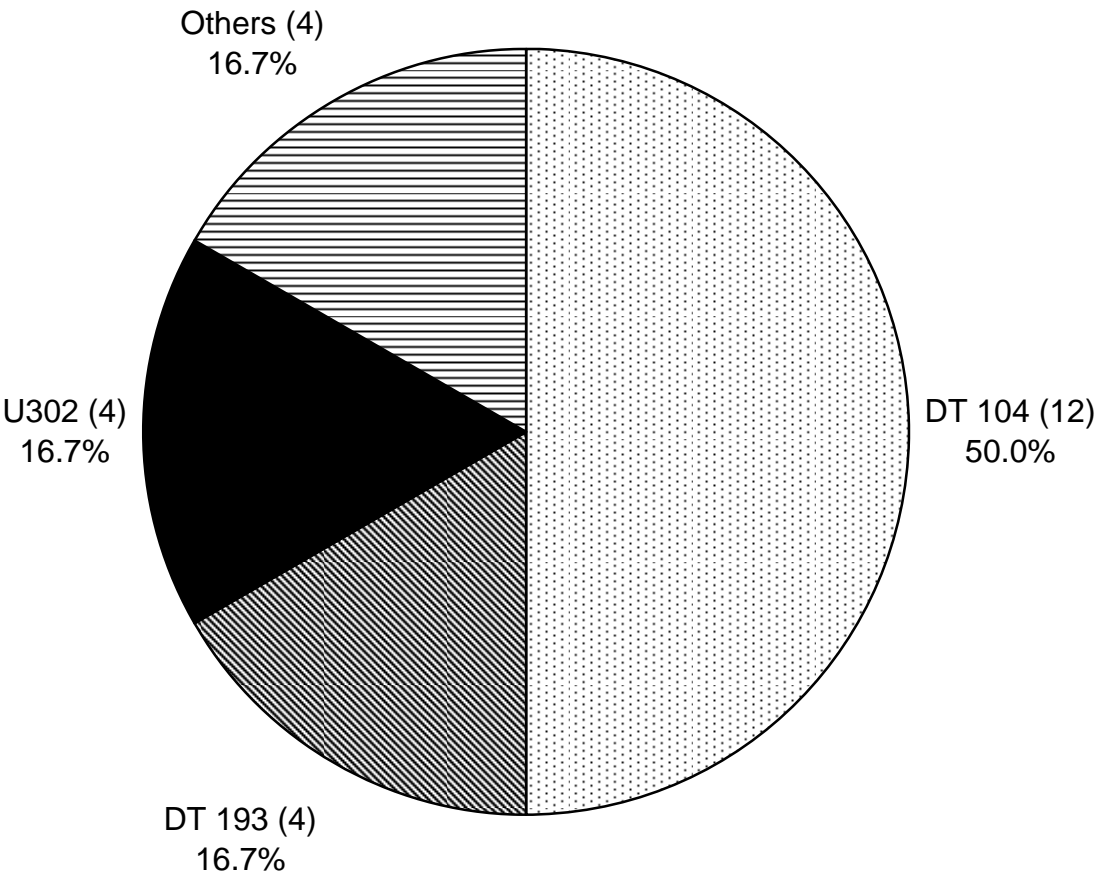


Fig 20: Incidents of *Salmonella* Typhimurium definitive types in calves (2003 - 2007)

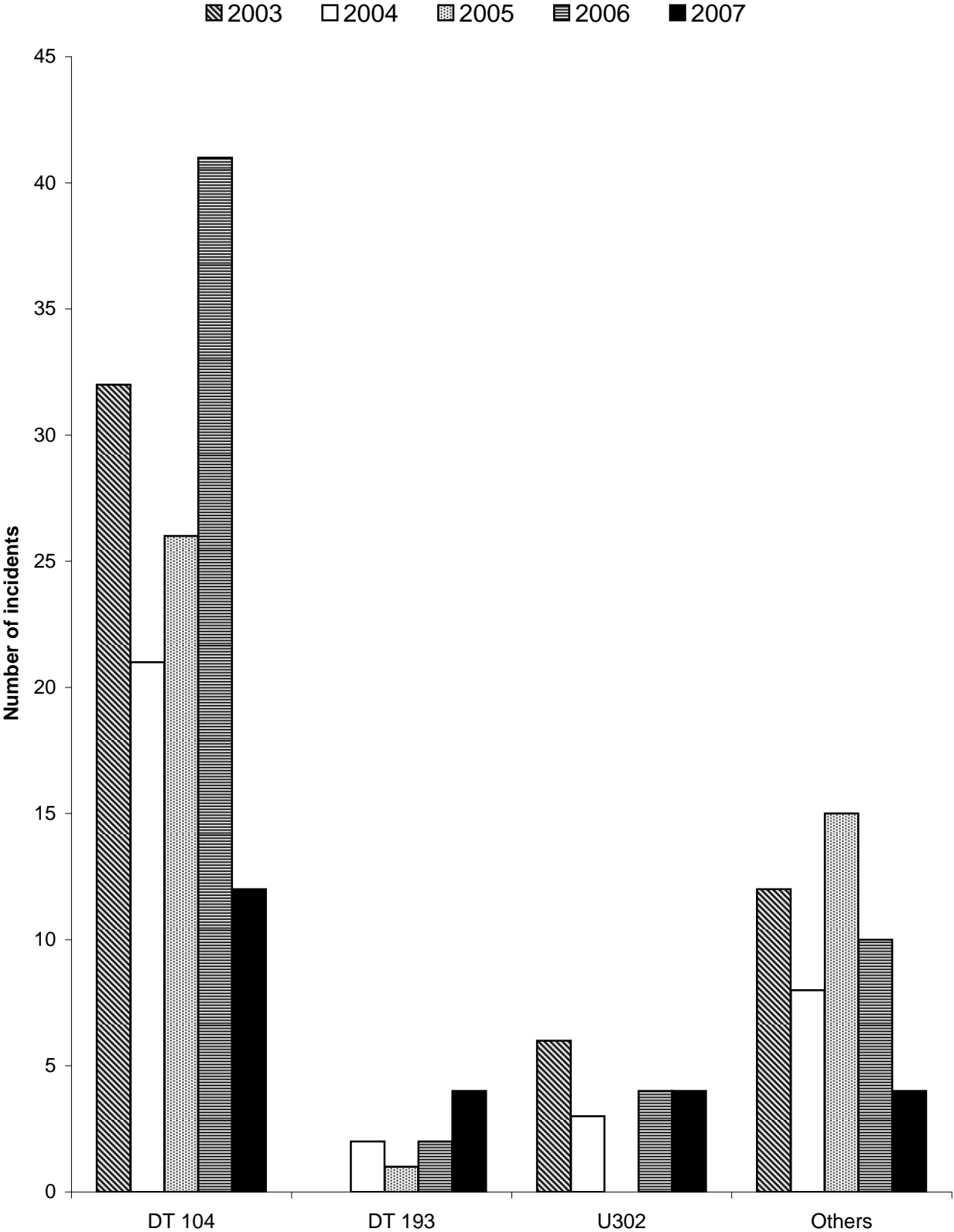


Table 18: S. Enteritidis in cattle on all premises (all ages)

Phage Types Incidents (Isolations)	2003		2004		2005		2006		2007	
1	3	(3)	2	(2)	1	(1)	-	(-)	-	(-)
4	1	(1)	1	(1)	3	(3)	-	(-)	-	(-)
6a	1	(1)	-	(-)	2	(2)	-	(-)	-	(-)
7	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
8	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
11	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
13	-	(-)	-	(-)	-	(-)	-	(-)	2	(4)
13a	5	(6)	1	(1)	-	(-)	-	(-)	-	(-)
14b	-	(-)	1	(1)	-	(-)	-	(-)	1	(1)
35	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
NOPT	-	(-)	-	(-)	-	(1)	-	(-)	-	(1)
UNTY	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
TOTAL	13	(14)	7	(7)	6	(7)	-	(-)	5	(8)

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

Phage Types Incidents (Isolations)	2003		2004		2005		2006		2007	
1	2	(2)	2	(2)	-	(-)	-	(-)	-	(-)
4	1	(1)	1	(1)	-	(-)	-	(-)	-	(-)
6a	-	(-)	-	(-)	2	(2)	-	(-)	-	(-)
7	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
8	1	(1)	-	(-)	-	(-)	-	(-)	1	(1)
13	-	(-)	-	(-)	-	(-)	-	(-)	1	(2)
13a	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
14b	-	(-)	1	(1)	-	(-)	-	(-)	1	(1)
35	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
NOPT	-	(-)	-	(-)	-	(1)	-	(-)	-	(1)
UNTY	-	(-)	1	(1)	-	(-)	-	(-)	-	(-)
TOTAL	6	(6)	6	(6)	2	(3)	-	(-)	3	(5)

Table 20: S. Enteritidis in calves on all premises

Phage Types Incidents (Isolations)	2003		2004		2005		2006		2007	
4	-	(-)	-	(-)	1	(1)	-	(-)	-	(-)
6a	1	(1)	-	(-)	-	(-)	-	(-)	-	(-)
13	-	(-)	-	(-)	-	(-)	-	(-)	1	(1)
13a	3	(3)	1	(1)	-	(-)	-	(-)	-	(-)
TOTAL	4	(4)	1	(1)	1	(1)	-	(-)	1	(1)

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

Phage Types Incidents (Isolations)	2003	2004	2005	2006	2007
9	1 (1)	- (-)	- (-)	- (-)	- (-)
TOTAL	1 (1)	- (-)	- (-)	- (-)	- (-)

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

Phage Types Incidents (Isolations)	2003	2004	2005	2006	2007
1	- (-)	4 (4)	- (-)	- (-)	1 (1)
3	1 (1)	- (-)	- (-)	- (-)	- (-)
untyped	- (-)	- (-)	- (-)	- (-)	- (-)
TOTAL	1 (1)	4 (4)	- (-)	- (-)	1 (1)