

## Chapter 2.3

### REPORTS OF *SALMONELLA* IN PIGS

The British pig industry's decline continued in 2003 and the June census showed that there were 510,000 breeding sows. This was a 2% decrease since the end of 2002 compared to an approximately 5% reduction when data from 2002 were compared to 2001, suggesting that the rate of the decline may have reduced. There were 9.11 million clean pig slaughterings, a fall of 11% on the previous year and the lowest level recorded since 1956. Consumer demand increased by 2% overall and this combined with the reduced British production resulted in a 22% increase in pork imports.

During 2003 there were 3,269 submissions to VLA's Regional Laboratories for the investigation of clinical disease on pig farms. A total of 213 incidents of *Salmonella* infection were detected although these were not all associated with clinical disease. Clinical signs were most commonly reported as diarrhoea with respiratory disease being the second most frequently reported clinical sign. In one case, on an organic farm, multiresistant *Salmonella* Typhimurium DT193 was isolated from weaners that were experiencing ill-thrift, respiratory disease and death. This unit was also affected by post-weaning multisystemic wasting syndrome (PMWS).

The Zoonoses Action Plan (ZAP) Salmonella Programme is run by an industry body, the British Pig Executive (BPEX). It monitors the exposure of pigs to *Salmonella* through an enzyme-linked immunosorbent assay (ELISA test) for antibodies to group B and C1 *Salmonella* in meat juice. In the year to the end of June 2003, approximately 25% of 83,094 meat juice samples were positive. Since July 2003, all farm assured holdings where 15 samples were reported in the previous three months were assigned a ZAP level as follows:

- ZAP level 3: 85% or more of meat-juice samples were positive
- ZAP level 2: Between 65% and 85% of meat-juice samples were positive
- ZAP level 1: Less than 65% of meat-juice samples were positive.

Farms with ZAP level 2 or 3 designations must act to reduce these or ultimately face the loss of their quality assured status. Further information is available from the BPEX website [www.bpex.org](http://www.bpex.org).

A cross-sectional study of 107 randomly selected British pig farms was conducted in 2003 by VLA as part of a Defra-funded research project. Pooled faecal samples were collected from up to 30 pens on each farm

and up to 40 meat juice samples were collected from slaughtered pigs from each farm. The results showed that on 56 of these farms (52%), fewer than 10% of pooled pen faecal samples were positive for culture of *Salmonella*. The predominant serovars were *S. Typhimurium* and *S. Derby*. The two most frequent phage types of *Salmonella Typhimurium* to be identified were U288 (21 farms) and DT193 (20 farms). As noted later, U288 was the most frequent phage type found in surveillance data in 2003 whilst DT193 was the most frequent phage type to be identified in 2002. The prevalence of meat juice positive samples was 20% or less on 52 of 101 of these farms (51%). It should be noted that samples obtained for research purposes are not included in the surveillance data presented in the remainder of this chapter.

The number of incidents and isolations of *Salmonella* reported from pigs is shown in Table 31. Table 32 gives the proportion of the five most frequently isolated serovars in 2003 and of these serovars in the preceding four years. *Salmonella Typhimurium* remains the most frequent isolate and was detected in 153 incidents (71.8%), which is virtually identical to 2002 when it was isolated from 71% of incidents. *Salmonella Derby* was once again the second most frequent serovar to be isolated (28 incidents; 13.1%), which was an increase on 2002 when it was isolated from 7.7% of incidents.

Six serovars have not been isolated from pigs since 1998 and these have been dropped from Table 31. These were *S. Carno*, *S. Give*, *S. Kentucky*, *S. Newington*, *S. Schwarzengrund* and *S. enterica diarizonae* (a single unspecified "arizona" was isolated in 1998). *S. Idikan* and *S. Saint Paul* were each isolated on one occasion and these were the first isolates from pigs since 1997 and 1998 respectively.

Table 33 reports the definitive phage types of *S. Typhimurium* that were isolated between 1999 and 2003. Three definitive types have not been isolated since 1998 and are not listed. These were DT29, DT30 and DT204. The most frequently isolated serovar was *Salmonella Typhimurium* U288 which was identified in 51 incidents (33.3%) compared to 8 out of 148 incidents (5.4%) in 2002.

**Table 31: *Salmonella* in pigs on all premises**

<i>Salmonella</i> Incidents (Isolations)	1999		2000		2001*		2002		2003	
ENTERICA ENTERICA										
Agama	-	( -)	2	( 2)	-	( -)	-	( -)	-	( -)
Agona	2	( 2)	2	( 2)	-	( -)	1	( 1)	1	( 1)
Ajiobo	-	( -)	-	( -)	-	( -)	1	( 1)	-	( -)
Anatum	-	( -)	1	( 4)	-	( -)	1	( 1)	-	( -)
Bovis morbificans	1	( 1)	-	( -)	1	( 1)	1	( 1)	-	( -)
Brandenburg	2	( 2)	-	( -)	2	( 2)	-	( -)	-	( -)
Bredeney	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Cerro	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Cholerae-suis	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Cholerae-suis-vk	2	( 2)	-	( -)	1	( 1)	-	( -)	-	( -)
Derby	33	( 44)	34	( 44)	26	( 27)	16	( 16)	28	( 34)
Dublin	2	( 2)	-	( -)	1	( 1)	2	( 2)	-	( -)
Enteritidis	1	( 1)	-	( -)	2	( 2)	1	( 1)	2	( 2)
Goldcoast	8	( 11)	5	( 5)	3	( 3)	4	( 4)	1	( 1)
Hadar	1	( 1)	-	( -)	-	( -)	-	( -)	1	( 1)
Havana	1	( 1)	-	( -)	-	( -)	-	( -)	-	( -)
Heidelberg	-	( -)	2	( 2)	1	( 1)	-	( -)	1	( 1)
Idikan	-	( -)	-	( -)	-	( -)	-	( -)	1	( 1)
Indiana	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Infantis	-	( -)	1	( 1)	1	( 1)	2	( 2)	-	( -)
Kedougou	6	( 6)	12	( 12)	14	( 14)	10	( 11)	7	( 7)
Kimuenza	-	( -)	-	( -)	-	( -)	1	( 1)	-	( -)
Kissi	1	( 1)	-	( -)	-	( -)	-	( -)	-	( -)
Lille	1	( 1)	-	( -)	-	( -)	-	( -)	-	( -)
Livingstone	-	( -)	2	( 2)	-	( -)	-	( -)	-	( -)
London	-	( -)	2	( 2)	1	( 1)	5	( 5)	2	( 2)
Manhattan	6	( 8)	-	( -)	-	( -)	-	( -)	1	( 1)
Mbandaka	1	( 1)	-	( -)	1	( 1)	1	( 1)	-	( -)
Montevideo	-	( -)	-	( -)	-	( -)	-	( -)	3	( 3)
Muenchen	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Newport	1	( 1)	2	( 2)	3	( 3)	-	( -)	-	( -)
Panama	4	( 5)	3	( 4)	1	( 1)	2	( 2)	-	( -)
Poona	1	( 1)	-	( -)	-	( -)	-	( -)	-	( -)
Reading	2	( 3)	2	( 2)	1	( 1)	5	( 5)	6	( 6)

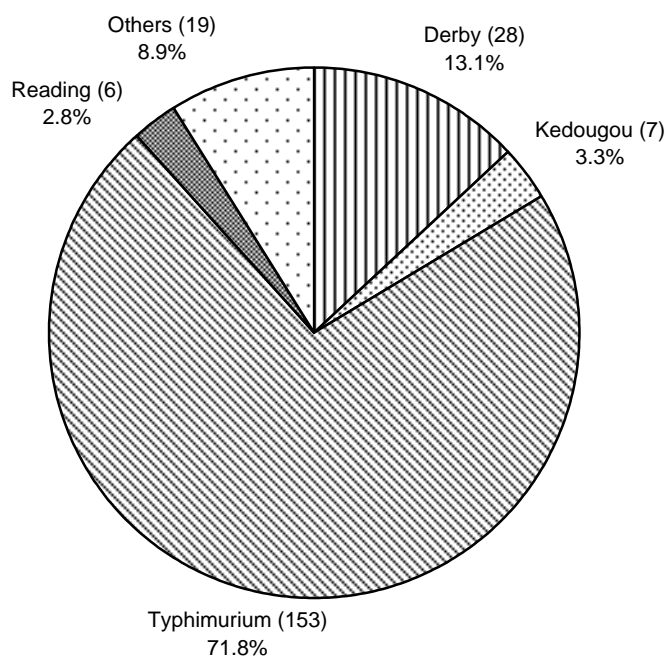
**Table 31: *Salmonella* in pigs on all premises**

<i>Salmonella</i> Incidents (Isolations)	1999		2000		2001*		2002		2003	
ENTERICA ENTERICA										
Saint Paul	-	( -)	-	( -)	-	( -)	-	( -)	1	( 1)
Senftenberg	-	( -)	1	( 1)	-	( -)	-	( -)	1	( 1)
Stanley	1	( 1)	-	( -)	-	( -)	-	( -)	-	( -)
Stanleyville	1	( 1)	-	( -)	-	( -)	-	( -)	-	( -)
Taksony	-	( -)	-	( -)	2	( 2)	-	( -)	-	( -)
Thompson	-	( -)	1	( 1)	-	( -)	-	( -)	-	( -)
Typhimurium	189	( 223)	248	( 287)	134	( 152)	147	( 156)	153	( 163)
Virchow	-	( -)	-	( -)	1	( 1)	-	( -)	-	( -)
UNSPECIFIED										
structure only	8	( 9)	2	( 2)	5	( 5)	5	( 5)	4	( 4)
rough strain	2	( 2)	1	( 1)	1	( 1)	2	( 2)	-	( -)
Untyped	-	( -)	2	( 2)	-	( -)	-	( -)	-	( -)
TOTAL	277	( 330)	330	( 383)	202	( 221)	207	( 217)	213	( 229)

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

+ antigenic structure not stated

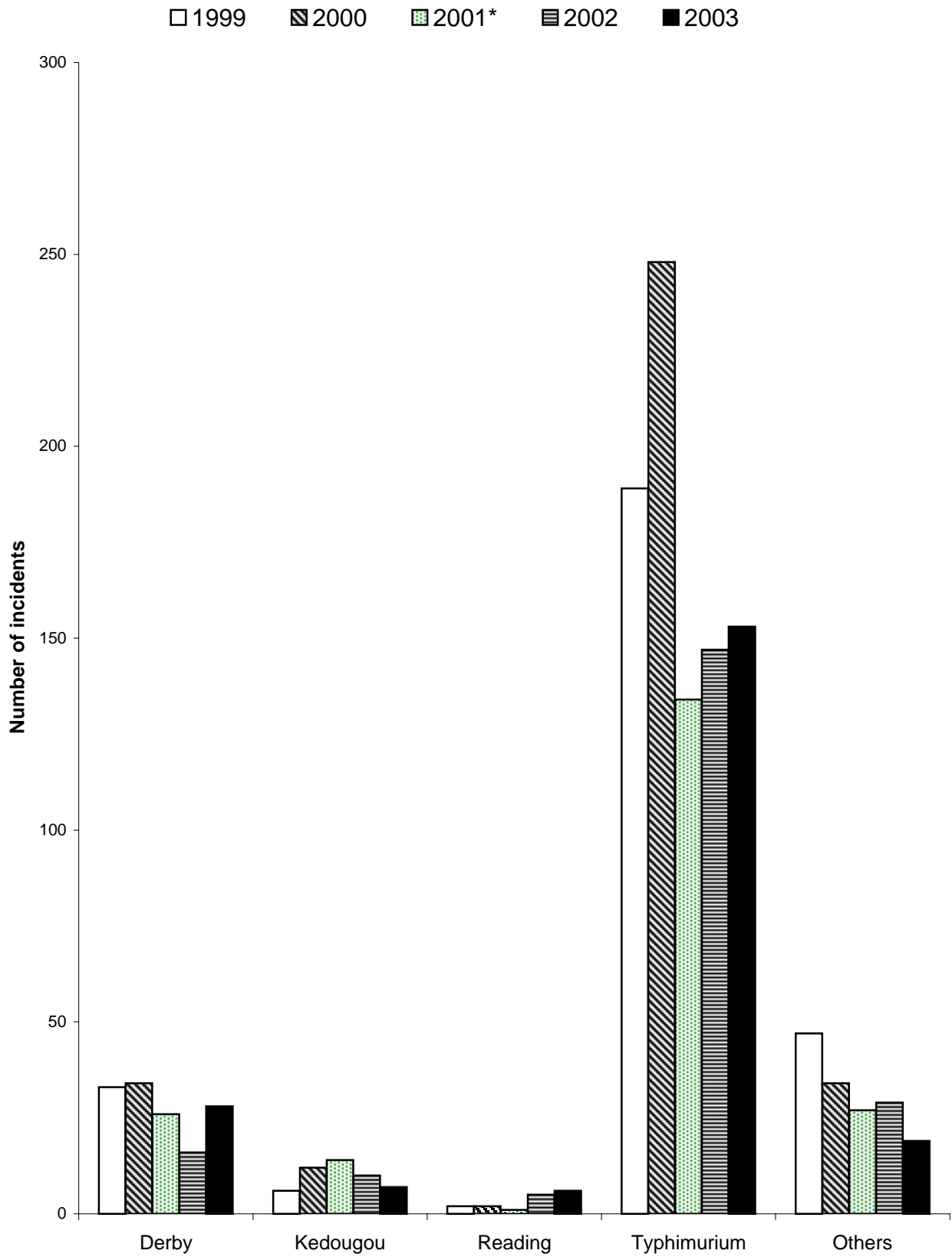
**Fig 23: Incidents of *Salmonella* serotypes in pigs in 2003**



**Table 32: Incidents of the top 5 *Salmonella* serotypes in pigs in 2003 as a % of all incidents compared to previous years**

Serotype	1999	2000	2001	2002	2003
S. Typhimurium %	68.2	75.2	66.3	71.0	71.8
S. Derby %	11.9	10.3	12.9	7.7	13.1
S. Kedougou %	2.2	3.6	6.9	4.8	3.3
S. Reading %	0.7	0.6	0.5	2.4	2.8
S. Montevideo %	0.0	0.0	0.0	0.0	1.4
Total no. incidents	277	330	202	207	213

**Fig 24: Incidents of *Salmonella* serotypes in pigs (1999 - 2003)**



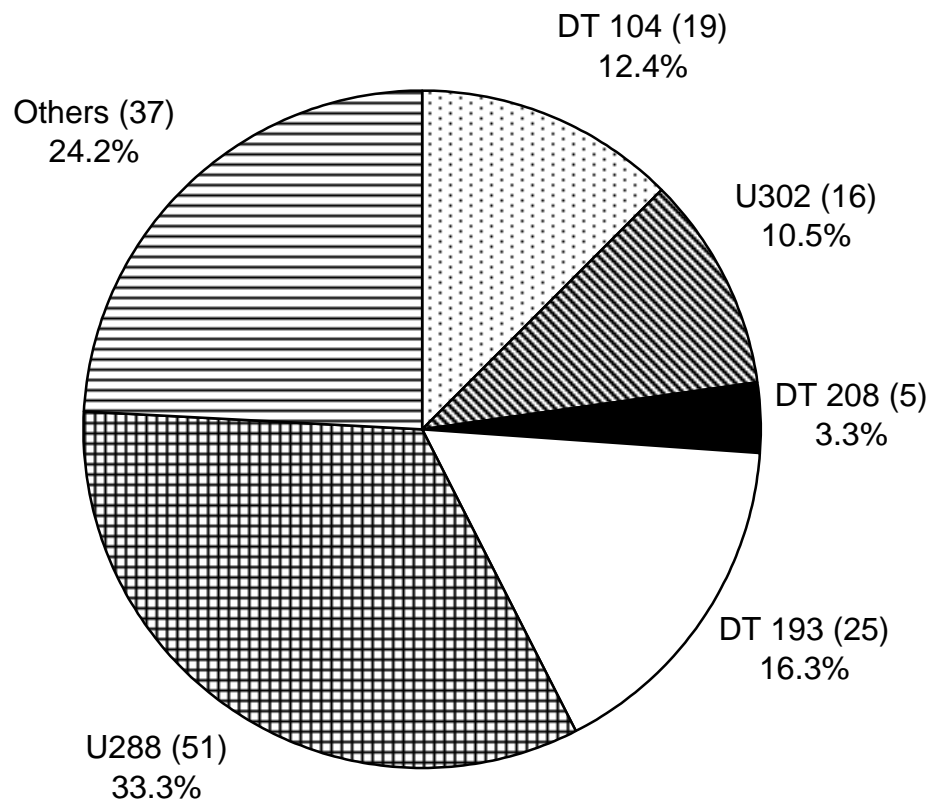
\* 2001 data may not be comparable due to uncertain impact of FMD epidemic

**Table 33: S. Typhimurium in pigs on all premises**

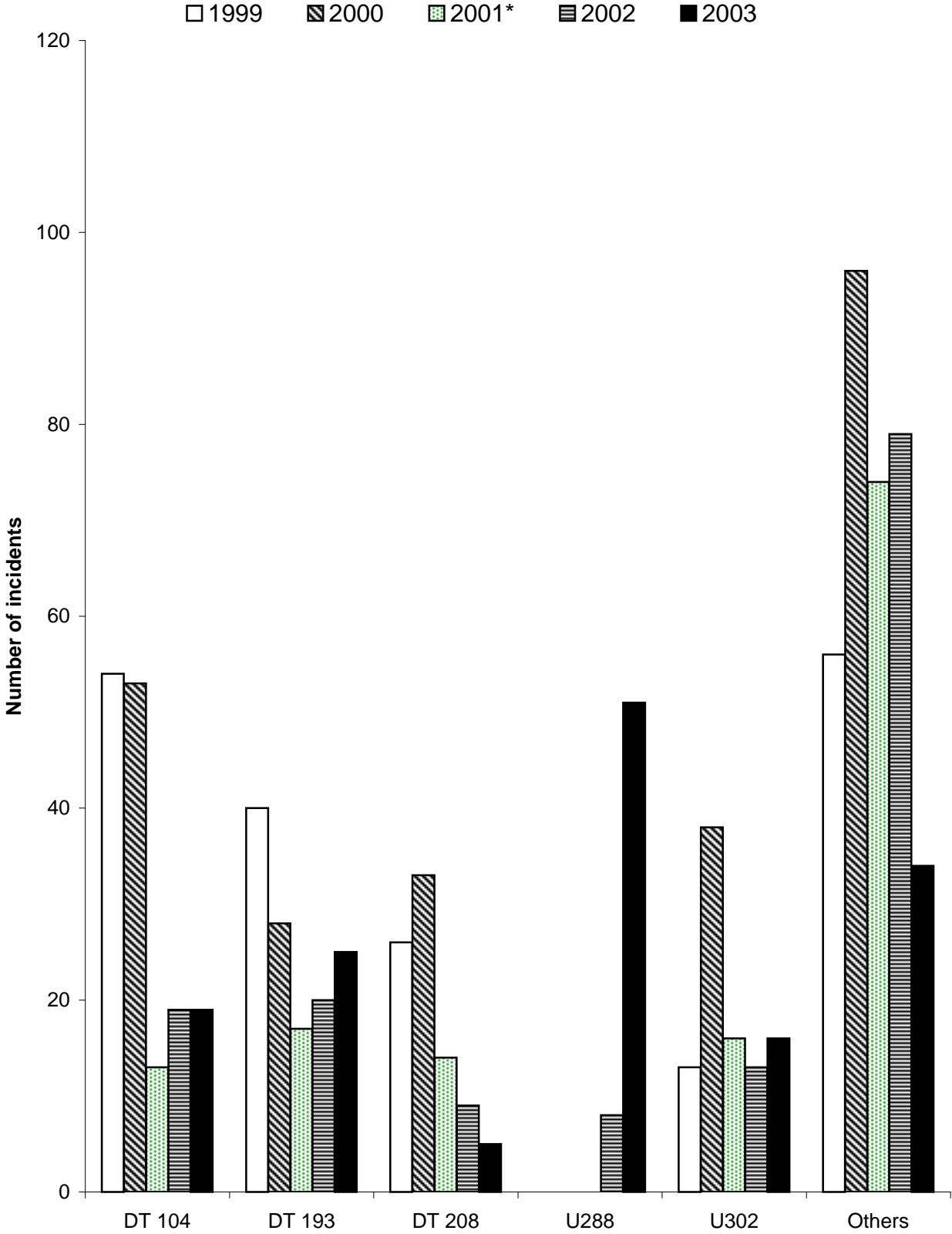
Definitive Types Incidents (Isolations)	1999	2000	2001*	2002	2003
2	- ( -)	1 ( 1)	1 ( 1)	1 ( 1)	- ( -)
12	2 ( 2)	4 ( 7)	2 ( 2)	2 ( 2)	2 ( 2)
12a	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
20	1 ( 1)	- ( -)	- ( -)	- ( -)	- ( -)
99	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
104	54 ( 68)	53 ( 72)	13 ( 15)	19 ( 22)	19 ( 21)
104a	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
104b	6 ( 7)	6 ( 7)	4 ( 4)	2 ( 2)	4 ( 4)
108	- ( -)	1 ( 1)	1 ( 1)	- ( -)	- ( -)
120	2 ( 2)	- ( -)	2 ( 2)	- ( -)	1 ( 1)
126A	- ( -)	1 ( 1)	- ( -)	- ( -)	- ( -)
170	- ( -)	4 ( 4)	- ( -)	- ( -)	1 ( 1)
193	40 ( 44)	28 ( 34)	17 ( 19)	20 ( 23)	25 ( 27)
193A	1 ( 1)	- ( -)	- ( -)	3 ( 3)	3 ( 3)
195	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
203	- ( -)	2 ( 3)	- ( -)	- ( -)	1 ( 1)
206	- ( -)	- ( -)	1 ( 1)	- ( -)	- ( -)
208	26 ( 32)	33 ( 35)	14 ( 15)	9 ( 9)	5 ( 6)
U288	- ( -)	- ( -)	- ( -)	8 ( 9)	51 ( 52)
U302	13 ( 15)	38 ( 41)	16 ( 17)	13 ( 13)	16 ( 16)
U308	6 ( 8)	20 ( 21)	10 ( 13)	8 ( 8)	1 ( 1)
U308A	5 ( 5)	8 ( 9)	17 ( 21)	16 ( 17)	- ( -)
U310	- ( -)	1 ( 1)	11 ( 13)	7 ( 7)	1 ( 1)
U315	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
untypeable	- ( -)	- ( -)	- ( -)	- ( -)	2 ( 2)
RDNC	8 ( 8)	10 ( 10)	5 ( 5)	5 ( 5)	7 ( 8)
NOPT	- ( -)	- ( -)	- ( -)	1 ( 1)	- ( -)
UNTY	25 ( 30)	37 ( 40)	19 ( 22)	13 ( 13)	6 ( 8)
untyped	- ( -)	- ( -)	1 ( 1)	20 ( 21)	- ( -)
TOTAL	189 ( 223)	248 ( 287)	134 ( 152)	148 ( 156)	150 ( 159)

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

**Fig 25: Incidents of *Salmonella* Typhimurium definitive types in pigs in 2003**

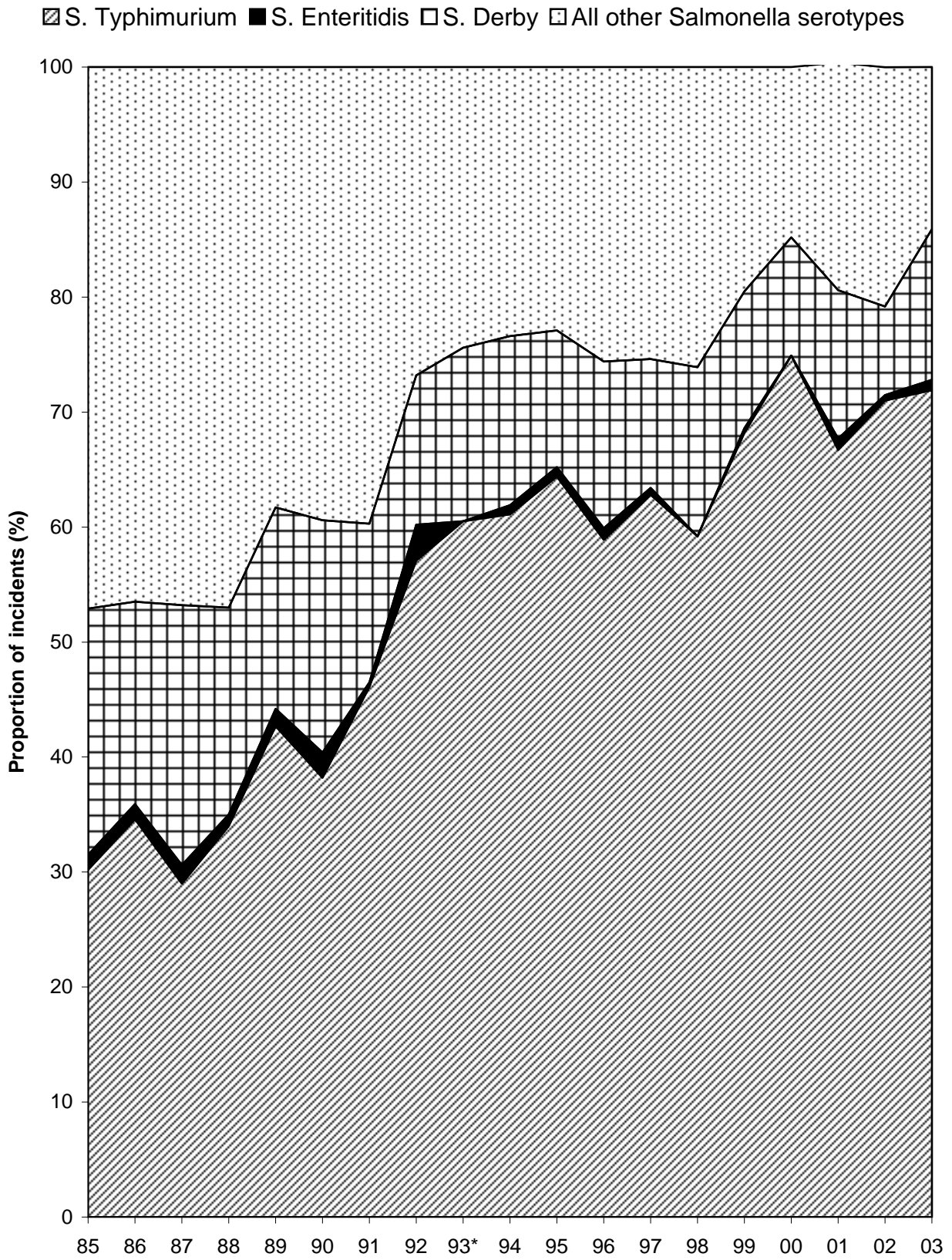


**Fig 26: Incidents of *Salmonella* Typhimurium definitive types in pigs (1999 - 2003)**



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

**Fig 27: S. Enteritidis, S. Typhimurium and S. Derby as a proportion of all incident reports in pigs (1985 - 2003)**



**Table 34: S. Enteritidis in pigs on all premises**

Phage Types Incidents (Isolations)	1999	2000	2001*	2002	2003
4	- ( -)	- ( -)	1 ( 1)	- ( -)	1 ( 1)
8	1 ( 1)	- ( -)	1 ( 1)	1 ( 1)	- ( -)
35	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
TOTAL	1 ( 1)	- ( -)	2 ( 2)	1 ( 1)	2 ( 2)

**Table 35: S. Hadar in pigs on all premises**

Phage Types Incidents (Isolations)	1999	2000	2001*	2002	2003
2	1 ( 1)	- ( -)	- ( -)	- ( -)	- ( -)
4	- ( -)	- ( -)	- ( -)	- ( -)	1 ( 1)
TOTAL	1 ( 1)	- ( -)	- ( -)	- ( -)	1 ( 1)

**Table 36: S. Virchow in pigs on all premises**

Phage Types Incidents (Isolations)	1999	2000	2001*	2002	2003
26	- ( -)	- ( -)	1 ( 1)	- ( -)	- ( -)
TOTAL	- ( -)	- ( -)	1 ( 1)	- ( -)	- ( -)

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