Chapter 6

ANTIMICROBIAL SENSITIVITY IN SALMONELLAS 2007

Salmonella isolates received for serological identification at VLA Weybridge and Lasswade are tested for their *in vitro* sensitivity to 16 antimicrobials. All of these isolates originate from animals and their environment in England and Wales. The choice of antimicrobials, which is reviewed periodically, is designed to comprise a core set which has been used in veterinary practice for many years, as well as some of the more recently licensed antimicrobials and some of limited usage in Great Britain but which are used in other European countries. In 2001, the 30µg cefuroxime disc that had been used in previous years, was replaced with a 30 µg ceftazidime disc and in 2004 the 30µg cefoperazone and 25µg colistin discs were replaced with 30µg cefotaxime and 1µg ciprofloxacin discs respectively. These changes were made to enhance the detection of resistance to third generation cephalosporins and fluoroquinolones. In 2007, the interpretative criterion was changed for ciprofloxacin from the historical VLA veterinary breakpoint of resistant $\leq$ 13mm used in previous years, to the British Society for Antimicrobial Chemotherapy (BSAC) breakpoint of resistant or intermediate $\leq$ 19mm (this breakpoint was that recommended by BSAC on 1/1/2007, see www.bsac.org.uk). Trends in ciprofloxacin resistance should therefore be interpreted taking into account this change to the breakpoint.

From 1st January 2007 some of the breakpoints used in assessing antimicrobial resistance, which were previously set at less than or equal to 13, have changed. These new breakpoints are: Ceftazidime (CAZ) less than or equal to 27, Amikacin (AK) less than or equal to 18, Ciprofloxacin (CIP) less than or equal to 19 and Cefotaxime (CTX) less than or equal to 29. This may result in an increased number of isolates resistant to these antimicrobials in 2007 in comparison with previous years. The breakpoint for all other antimicrobials used remain at less than or equal to 13.

All tests are performed using a disc diffusion technique on Oxoid "Isosensitest" agar using antibiotic discs as follows:

	Antimicrobial	Concentration (µg per ml)	Code
1	Nalidixic acid	30	NA
2	Tetracycline	10	T
3	Neomycin	10	N
4	Ampicillin	10	AM

5	Furazolidone	15	FR
6	Ceftazidime	30	CAZ
7	Sulphamethoxazole/trimethoprim	25	TM
8	Chloramphenicol	10	C
9	Amikacin	30	AK
10	Amoxicillin/clavulanic acid	30	AMC
11	Gentamicin	10	CN
12	Streptomycin	25	S
13	Sulphonamide compounds	300	SU
14	Cefotaxime	30	CTX
15	Apramicin	15	APR
16	Ciprofloxacin	1	CIP

Prior to 1996, all *Salmonella* isolates received were tested for antimicrobial susceptibility, but since then only the first isolate from each incident has been tested. The number of cultures received from a farm varies enormously, especially in the case of those received from poultry premises. Some poultry companies have a continuous monitoring programme and large numbers of *Salmonella* isolates may be received from a particular company. Thus the numbers of a particular serovar and its antimicrobial susceptibility may not reflect its prevalence in the animal population as a whole but rather the intensity of the monitoring programme on a farm or group of farms. Therefore, to better indicate the prevalence of resistance, only the first isolate from each incident has been tested since the start of 1996.

***SALMONELLA* DUBLIN**

Of the 381 *Salmonella* Dublin cultures tested during 2007, 98.7% were susceptible to all 16 antimicrobial drugs (Table 79). The percentage of *S.* Dublin isolates sensitive to all 16 antimicrobials has shown only slight fluctuations over the period 2000 - 2007 and the majority of isolates remain susceptible; this has been the situation since surveillance began in 1971. Most *S.* Dublin isolates originate from cattle. Resistance to ampicillin, which had been observed for the first time for several years in a very low number of bovine isolates in 2000, was not recorded in 2001 or 2002 and then re-appeared in 2003 - 2007. Resistance to furazolidone, which had also not been detected for several years in *S*. Dublin, was observed for the first time in recent years in 2002 and again in 2003, but was not detected in 2004 - 2007. A single resistant isolate resistant to trimethoprim/sulphonamides was detected in 2006 but no further resistant isolates were detected in 2007. No isolates resistant to either chloramphenicol or sulphonamide compounds were reported in 2007. Resistance to streptomycin increased in 2003, with 1.4% of cultures resistant, though the prevalence of resistance has subsequently

declined. The prevalence of nalidixic acid resistance was 1.5% in 2006, higher than the levels reported since 1999 but no nalidixic acid resistant isolates were detected in 2007. There was no resistance in 2007 reported to any of the antimicrobials in the panel of 16 which were tested but which are not shown in Table 79.

Much of the fluctuation in the prevalence of antimicrobial resistance is probably related to the clonal spread of particular strains as a result of husbandry and animal movement factors, in addition to the variation in the selective pressure exerted by antimicrobial usage which is the same for all serovars even though *S*. Dublin is less likely than most to exhibit resistance.

SALMONELLA TYPHIMURIUM

The number of cultures of *Salmonella* Typhimurium examined in 2007 was 1057. The eight most frequent definitive or undefined types subjected to susceptibility testing at VLA are given in Figure 47. 17.1% of these isolates were definitive type (DT) 104, DT104b or U302 (Table 80). The percentage of these eight most common types of *Salmonella* Typhimurium sensitive to all 16 antimicrobial agents in 2007 is given in Figure 48. Only 11.4% of all *Salmonella* Typhimurium isolates were sensitive to all of the antimicrobials tested (Table 80), which is a decline from 2006. The generally high level of resistance of *Salmonella* Typhimurium isolates is partly a reflection of the contribution of DT104 and its variants DT104b and U302, only 3.8% of which were sensitive to all the antimicrobials tested in 2007. However, the proportion of *Salmonella* Typhimurium isolates comprising DT104 and its variants has declined significantly in recent years and this has been reflected in a decrease in resistance to several antimicrobials, particularly those conferring the pentavalent resistance pattern that is typical of *Salmonella* Typhimurium DT104. This change was particularly marked over the period 1996 -1998 and has been commented on in previous reports.

S. Typhimurium U288 and DT193 from pigs comprise 35.4% (374) and 22.6% (239) of the total numbers of *S*. Typhimurium isolates; none of the U288 and DT193 isolates from pigs were fully susceptible in 2007. AM,C,S,Su,T,Tm remained the commonest resistance pattern in DT193 isolates from pigs (69 isolates), followed by AM,S,Su,T (64 isolates) and AM,C,Su,T,Tm (26 isolates). The commonest resistance pattern in U288 isolates from pigs was AM,C,S,Su,T,Tm (276 isolates).

The typical pentavalent resistance pattern AM,C,S,SU,T was the commonest pattern seen in *S*. Typhimurium DT104 isolates recovered from cattle, occurring in 69% of 33 isolates examined. In 2006 this

resistance pattern with additional trimethoprim resistance was observed but no similar resistance patterns were recorded in 2007. The commonest resistance pattern for *S*. Typhimurium DT104 isolates from turkeys was AM,C,S,SU,T,NA accounting for ten of the 11 isolates examined from this species.

There were no *Salmonella* Typhimurium isolates resistant to ceftazidime, cefotaxime or amikacin recovered in 2007.

In 2007, 10.4 % (13/125) of DT104 and 104b isolates were resistant to nalidixic acid and 8.8% resistant to sulphamethoxazole/trimethoprim. This can be compared to the figures for 2006, when 16.1% of DT104 and 104b isolates were resistant to nalidixic acid and 18.3% resistant to sulphamethoxazole/trimethoprim. Nalidixic acid resistance in *S.* Typhimurium DT104 by species of origin is listed in Table 81, which shows that the highest prevalence of resistance to nalidixic acid in 2007 in this phage type occurred in isolates from turkeys. Table 82 gives the equivalent figures for trimethoprim/sulphamethoxazole resistance by species of origin in *S.* Typhimurium DT104 for the period 2003 - 2007.

Considering all definitive types of *S*. Typhimurium, there has also been a marked increase in resistance to sulphamethoxazole/trimethoprim from levels of around 16-24% in 1996-2001 to 44.1% in 2002, 37.5% in 2003, 32.7% in 2004, 36.1% in 2005, 39.8% in 2006 and 57.9% in 2007. The contribution from DT104 to this overall figure is shown in Table 82. In relation to other phage types of *S*. Typhimurium it is predominantly isolates from pigs that account for this rise in sulphamethoxazole/ trimethoprim resistance (Table 83); a high percentage of many definitive types of *S*. Typhimurium isolated from pigs are resistant to sulphamethoxazole/trimethoprim, a situation that was also observed in 2002 - 2006. The definitive and undefined types of *S*. Typhimurium resistant to sulphamethoxazole/trimethoprim and recovered from pigs in 2007 include DT193 and U288. The total numbers of isolates of these types and the percentage resistant to trimethoprim/ sulphonamides are shown in Table 84. Three factors continue to influence the sulphamethoxazole/ trimethoprim resistance figures for *S*. Typhimurium isolates from pigs over the last few years: (i) The numbers of incidents involving strains which have been highly resistant to TM in previous years, have increased. (ii) The proportion of TM-resistant isolates from some definitive types that have previously shown TM resistance has increased. (iii) There has also been a minor contribution from some definitive types of *S*. Typhimurium from pigs that have not previously shown sulphamethoxazole/ trimethoprim resistance in recent years (eg DT12), but which have apparently developed resistance in recent years.

A single *S*. Typhimurium DT104b isolate and two U302 isolates were resistant to neomycin in 2007; the main contribution to the overall levels of neomycin resistance seen in *Salmonella* Typhimurium in 2007 (as in 2006) came from isolates of porcine origin belonging to DT193 and U288. Furazolidone resistance was observed in isolates of *S*. Typhimurium 104b, where two of 16 isolates from pigs (12.5%) were resistant; it was also observed in a single *S*. Typhimurium 104b from a dog. Furazolidone resistance was not detected in the related type U302 in 2007, although it had been seen in 59% of U302 isolates in 2005.

Multiple antibiotic resistance (i.e. resistance to four or more unrelated antimicrobial agents in the panel of 16) was detected in DTs 12, 104, 104b, 193 and U302 from cattle; in DTs 104, 104b, 193 and U302 from poultry (i.e. chickens and/or turkeys); in DT104 and 193 from sheep and in DTs 6 variant, 56 variant, 97, 101 variant, 104, 104b, 120, 193, 193a, 195, U288, U288 variant,U302 and U309 from pigs. Of the 36 different definitive and undefined types detected, 12 (namely 1, 2a, 7, 8, 30, 40, 99, 153, 161, 170, 170b and U313) were fully susceptible to all of the antimicrobials in the test panel.

SEROTYPES OTHER THAN *SALMONELLA* DUBLIN AND *SALMONELLA* TYPHIMURIUM

Of the 2248 isolates of serotypes other than *S*. Dublin and *S*. Typhimurium tested, 63.4% were sensitive to all the antimicrobials in the panel (Table 85), a slight increase from the figure recorded in 2006, when 58.7% were fully sensitive. 218 (9.7%) of these cultures were *S.* Enteritidis, of which 90 were *S.* Enteritidis Phage Type 4 and of these *S.* Enteritidis Phage Type 4 isolates, 92% were sensitive to all of the antimicrobials in the test panel, with two isolates resistant to streptomycin, one to sulphonamide compounds and four with a T, AM, SU resistant pattern. *S.* Enteritidis Phage Type 1 is a strain which is commonly resistant to nalidixic acid and of six isolates of this phage type tested, five were nalidixic acid resistant.

Levels of resistance to furazolidone and neomycin were higher than those observed in 2001 and earlier, maintaining the trend observed over the period 2002-2006, although levels observed in 2007 were lower than in 2006. Neomycin resistant isolates originated mainly from poultry (7.5% of 953 isolates from poultry were resistant in 2007, similar to the figure for 2006 when 10.3% of 1622 isolates from poultry were resistant). The majority of these neomycin resistant poultry isolates were from ducks, where some resistant clones have developed resistance after earlier treatment, with lower numbers from chickens and turkeys. Furazolidone-resistant isolates also originated mainly from poultry. In 2007, 7.6%, of

953 isolates from poultry were resistant and this is similar to the figure for 2006, when 9.4% of 1622 isolates from poultry were resistant to furazolidone. The majority of these isolates were *Salmonella* Indiana and originated from ducks. This is discussed further below.

INDIVIDUAL ANTIMICROBIALS

Of the 3686 salmonellas tested in 2007, 1921 (52.1%) were sensitive to all of the antimicrobials tested (Table 86). This is a reduction in comparison with previous years. In 2006, 53.7% of salmonellas were sensitive to all of the antimicrobials tested; the figure was 62.5% for 2005. Levels of resistance to tetracyclines in isolates from all sources decreased from 33.3% in 1999 to 21.1% in 2000 and further declined to 20.5% in 2001; the prevalence of resistance to tetracyclines was 21.2% in 2002, 19.9% in 2003 and 21.0% in 2004; though increased to 28.5% in 2005 and 36.4% in 2006 and was 41.0% in 2007. The decline in tetracycline resistance over the period 1999-2000 reflected both the proportionate decrease in *Salmonella* isolates of all serotypes recovered from pigs and also the declining numbers of *S*. Typhimurium DT104. The main contribution to tetracycline resistance in 2007 came from *Salmonella* isolates primarily from pigs, and to a lesser extent from turkeys and ducks. The prevalence of resistance to neomycin in all *Salmonella* serovars was 3.7% in 2007, 5.7% in 2006, 3.3% in 2005, 5.9% in 2004, 5.1% in 2003 and 3.9% in 2002, an increase on the figure of 1.2% recorded in 2001.

Levels of resistance to furazolidone remained at 0.3% in 1999 and 2000, though increased slightly to 0.5% in 2001 and increased further in 2002 when levels of 2.9% were recorded. In 2003, 6.3% of all isolates were resistant to furazolidone, with 5.9% of isolates resistant in 2004, 5.2% of isolates resistant in 2005 and 3.9% of isolates in 2006. The prevalence of furazolidone resistance was 2.3% in 2007.

The observed increase in furazolidone resistance was considered to reflect increased surveillance of *Salmonella* isolates from ducks rather than a genuine increase in resistance to this antimicrobial, since *Salmonella* Indiana is a frequent *Salmonella* isolate from ducks and is commonly resistant to furazolidone. Numbers of *Salmonella* isolates received from ducks have increased over this period as surveillance of this species has increased. Examination of records from previous years shows that furazolidone-resistant *Salmonella* Indiana has been present in poultry in England and Wales for many years. *Salmonella* Indiana isolates from ducks are also commonly resistant to neomycin.

Resistance of *S.* Virchow isolates to furazolidone declined from 53% in 1998 to 28.5% in 1999, although the numbers of *S.* Virchow isolates tested each year were relatively low at 15 in 1998 and 7 in 1999. Thirty-nine isolates of *S*. Virchow were examined in 2001 and 12.8% were resistant to furazolidone; 59 isolates of *S*. Virchow were examined in 2002 and only 1.7% were resistant to furazolidone. In 2003, 132 isolates of *S*. Virchow were examined and 0.8% were resistant to furazolidone, whilst in 2004, 48 isolates were examined and 2.1% were resistant to furazolidone. In 2005, 2006 and 2007 there were 22, 15 and 10 isolates of *S.* Virchow examined respectively and all were susceptible to furazolidone. In 2005, furazolidone resistance was detected in *S*. Typhimurium U302, with 19 of 32 isolates (59%) from pigs resistant; furazolidone resistance was not seen in U302 in 2006 or 2007 in isolates from any species.

Resistance to apramycin in all *Salmonella* serovars was 0.5% in 2007, similar to the figure of 0.4% observed in 2006. In 2007, 3.4% of all *Salmonella* isolates were resistant to nalidixic acid – similar to the figure of 4.5% of all *Salmonella* isolates resistant to nalidixic acid recorded in 2006. This can be compared with 2.4% of all *Salmonella* isolates which were resistant to nalidixic acid in 2002, 3.2% in 2001, 4.9% in 2000, 5.3% in 1999, 7.0% in 1998 and 6.5% in 1997. 0.5% of *Salmonella* isolates from all species were resistant to gentamicin in 2007.

No resistance was detected to amoxicillin/clavulanate, amikacin, cefotaxime or ceftazidime.

As indicated previously, in 2007 the interpretative criterion was changed for ciprofloxacin to the BSAC breakpoint of $\leq$ 19mm (as recommended by BSAC on 1/1/2007, see www.bsac.org.uk). Trends in ciprofloxacin resistance should therefore be interpreted taking into account this change to the breakpoint. In 2007 ciprofloxacin resistance was detected in 0.5% (n=30) of isolates. The ciprofloxacin-resistant isolates were from chickens (n=2; both rough strains), horse (n=1; *S.* Typhimurium DT 104),other birds (*S.* Binza (n=2) and *S.* Typhimurium DT193 (n=1)), pigs (n=3; all *S.* Typhimurium U288) and turkeys (n=21; all *S*. Newport).

Table 79: *Salmonella* Dublin: antimicrobial sensitivity monitoring 2000 - 2007

Year	No of cultures	Percentage sensitive to all 16 anti-microbials	Percentage of cultures resistant to:								
			S	C	SU	T	N	AM	FR	TM	NA
2000	863	98.7	0.7	0.6	0.7	0.5	-	0.1	-	0.2	0.2
2001	467	98.3	0.2	0.6	1.3	-	-	-	-	0.2	0.2
2002	687	97.5	0.3	0.4	0.7	0.6	0.4	-	0.6	0.9	-
2003	949	96.4	1.4	1.3	1.2	0.8	0.2	0.6	0.4	0.4	0.2
2004	516	97.9	1	0.8	1.2	0.4	-	0.2	-	0.8	0.2
2005	365	98.1	1.1	0.3	0.3	0.3	-	0.8	-	-	-
2006	468	96.4	0.4	0.6	1.3	0.6	0.2	0.9	-	0.2	1.5
2007	381	98.7	0.8	-	-	0.2	-	0.2	-	-	-

Table 80: *Salmonella* Typhimurium: antimicrobial sensitivity monitoring 2000 – 2007

Year	No of cultures	Percentage sensitive to all 16 anti-microbials	Percentage of cultures resistant to:									
			S	SU	T	N	AM	FR	TM	C	APR	NA
2000	864 [a]	15.3	63.2	70.8	80.4	2.5	63.8	0.1	23.4	56.5	3.2	7.5
2001	519 [b]	20.6	57.8	71.7	75.5	2.9	66.7	0.4	24.3	55.9	2.3	11.9
2002	533 [c]	14.5	61	77.9	80.1	3.4	70.5	2.6	44.1	62.1	2.4	7.1
2003	613 [d]	19.6	61.7	73.1	74.2	6.2	68.5	0.7	37.5	58.9	3.8	13.5
2004	468 [e]	26.7	55.8	63.7	65.6	4.5	58.5	0.6	32.7	49.4	1.5	10
2005	552 [f]	24.1	60	71.6	71	1.3	67.2	4.2	36.1	53.1	0.7	8.9
2006	1136 [g]	24.2	54.2	70.2	69.2	5.1	65.9	1	39.8	57	1	6.9
2007	1057[h]	11.4	70.6	85.3	81.6	4.5	78.4	0.6	57.9	58.8	1.5	4.5

[a] 460 (53.2%) of these strains were DT104 and its variants
[b] 274 (52.8%) of these strains were DT104 and its variants
[c] 239 (44.8%) of these strains were DT104 and its variants
[d] 73 (44.5%) of these strains were DT104 and its variants
[e] 126 (53.8%) of these strains were DT104 and its variants
[f] 144 (26.1%) of these strains were DT104 and its variants
[g] 316 (27.8%) of these strains were DT104 and its variants
[h] 181 (17.1%) of these strains were DT104 and its variants

Table 81: Nalidixic acid resistance in *Salmonella* Typhimurium DT104 from domestic livestock. Number of cultures tested (percentage resistant to nalidixic acid) 2000 - 2007

Year	Livestock species					
	Cattle	Sheep	Pigs	Chickens	Turkeys	Ducks
2000	223 (10.8)	21 (0)	51 (2.0)	7 (14.3)	7 (0)	1 (0)
2001	115 (15.7)	8 (12.5)	19 (21.1)	22 (0)	25 (60)	0 (0)
2002	67 (7.5)	5 (40)	36 (5.6)	32 (0)	17 (11.8)	0 (0)
2003	100 (20)	6 (0)	27 (11.1)	12 (8.3)	41 (63.4)	0 (0)
2004	44 (0)	2 (0)	10 (10.0)	6 (0)	39 (74.4)	0 (0)
2005	40 (12.5)	8 (0)	2 (0)	6 (33.3)	32 (96.9)	0 (0)
2006	112 (0)	12 (0)	20 (0)	6 (50)	57 (71.9)	0 (0)
2007	33 (3)	7 (0)	22 (0)	5 (0)	11 (100)	0 (0)

Table 82: Trimethoprim/ sulphonamide resistance in *Salmonella* Typhimurium DT104 from domestic livestock in 2003 - 2007. Number of cultures tested (percentage resistant to trimethoprim/sulphonamide)

Year	Livestock species					
	Cattle	Sheep	Pigs	Chickens	Turkeys	Ducks
2003	100 (33)	6 (0)	27 (15)	12 (33)	41 (7.3)	0 (0)
2004	44 (34)	2 (50)	10 (10)	6 (0)	39 (0)	0 (0)
2005	40 (17.5)	8 (37.5)	2 (0)	6 (33.3)	32 (0)	0 (0)
2006	112 (22.3)	12 (41.7)	20 (15)	6 (16.7)	57 (8.8)	0 (0)
2007	33 (0)	7 (0)	22 (4.5)	5 (0)	11 (0)	0 (0)

Table 83: Trimethoprim/sulphonamide resistance in *Salmonella* Typhimurium (all phage types) from domestic livestock in 2004 - 2007. Number of cultures tested (percentage resistant to trimethoprim/sulphonamide)

Year	Livestock species					
	Cattle	Sheep	Pigs	Chickens	Turkeys	Ducks
2004	90 (30)	7 (57)	146 (72)	11 (0)	55 (2)	7 (0)
2005	71 (14)	13 (31)	317 (56)	10 (20)	37 (3)	13 (0)
2006	174 (20)	18 (28)	555 (69)	13 (15)	86 (7)	35 (14)
2007	86 (4.7)	10 (0)	792 (75.4)	10 (0)	24 (0)	3 (0)

Table 84: Trends in Trimethoprim/sulphonamide resistance in certain types of *Salmonella* Typhimurium from pigs over the period 2002- 2007. Number of cultures tested (percentage resistant to trimethoprim/sulphonamide)

Year	Definitive type or undefined type			
	DT193	DT208	U288	U308a
2002	47 (85)	14 (100)	51 (94)	59 (95)
2003	38 (92)	7 (43)	72 (90)	0 (0)
2004	19 (79)	1 (100)	71 (97)	3 (0)
2005	134 (43)	0 (0)	107 (96)	0 (0)
2006	103 (72)	16 (25)	229 (96)	0 (0)
2007	239 (64.9)	7 (14.3)	374 (96.5)	0 (0)

Table 85: *Salmonella* other than *Salmonella* Dublin and *Salmonella* Typhimurium antimicrobial sensitivity monitoring 2000 - 2007

Year	No of cultures	Percentage sensitive to all 16 antimicrobials	Percentage of cultures resistant to:									
			S	SU	T	N	AM	FR	TM	C	APR	NA
2000	2877	70.7	5	18	9.5	0.9	4.8	0.5	13.7	3.5	0.1	5.5
2001	1814	69.8	8.1	20	10	1	5.7	0.6	12.1	6.4	0.2	1.4
2002	2167	60.3	11.2	24	13.7	5.2	6.5	3.7	19.5	8	0.3	1.9
2003	3652	67.7	10	19	15.7	6.2	4.4	8.7	12.4	4.5	0.1	2.2
2004	2942	67.3	11.6	19.1	17.5	7.2	2.2	7.8	14	1.3	0.3	2.1
2005	2683	65.6	10.9	23.7	23.6	4.2	4.6	6.2	12.3	2.5	0.1	2.2
2006	2727	58.7	15.8	25.1	28.8	6.9	7.2	5.7	14.2	3.2	0.2	4
2007	2248	63.4	12.8	22.2	28.8	4	7.7	3.5	11.9	2.2	0.2	3.4

Table 86: All salmonellas: antimicrobial sensitivity 2007

Year	No of cultures	Percentage sensitive to all 16 antimicrobials	Percentage of cultures resistant to:									
			S	SU	T	N	AM	FR	TM	C	APR	NA
Cattle	592	82.8	13	14.2	13.3	-	13.3	-	0.8	7.9	-	0.5
Sheep	177	94.4	4.5	4.5	5.1	-	4.5	-	-	3.9	-	-
Pigs	1306	10.8	55.6	77.1	84.1	4	60.5	0.2	58.9	41.3	1.3	2.9
Chickens	419	77.3	6.2	12.6	9.3	0.2	5	0.2	6.7	4.5	0.2	2.8
Turkeys	216	25	39.3	64.3	61.1	0.8	20.8	0.4	12.9	11.1	-	21.2
Ducks	355	73	13.5	4.2	18.6	12.9	1.7	20	0.2	0.3	-	-
Geese	1	100	-	-	-	-	-	-	-	-	-	-
Goats	1	100	-	-	-	-	-	-	-	-	-	-
Horses	64	79.7	10.9	10.9	20.3	-	9.4	-	0.3	-	-	-
Other non-avian species	300	72	14.6	20.3	20.5	0.3	12.3	2	9	8.3	-	4.7
Other avian species	83	71.1	16.8	22.9	21.7	8.4	14.4	-	8.4	3.6	0.2	12
Feed	172	91.9	36	4.6	3.5	0.6	-	17.4	4.1	0.6	-	0.6
Total	3686	52.1	28.1	38	41	3.7	27.2	2.3	23.9	18.2	0.5	3.4

Fig 47: Number of isolates of *Salmonella* Typhimurium of the eight most frequent definitive or undefined types subjected to susceptibility testing in 2007

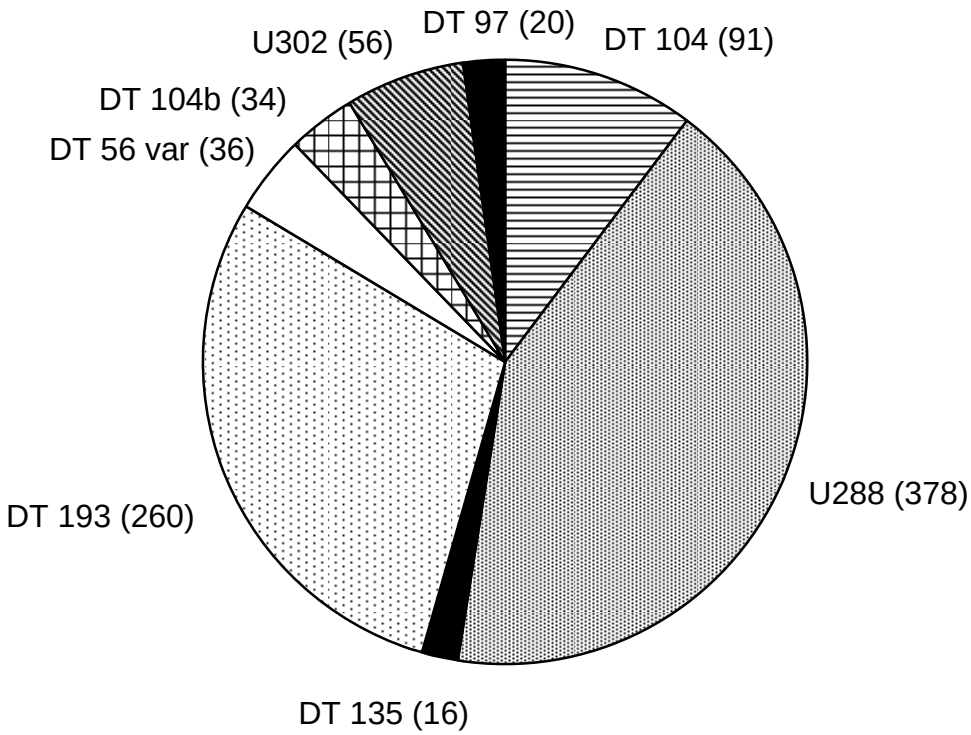

Fig 48: Percentage of the eight most common definitive and undefined types of *Salmonella* Typhimurium sensitive to 16 antimicrobial agents in 2007