Chapter 1

OVERVIEW OF SALMONELLA IN LIVESTOCK AND PEOPLE

This chapter provides information on *Salmonella* isolated from livestock from samples taken on all types of premises, including farms, hatcheries, veterinary practices, zoos and slaughterhouses. An overview of the number of isolations of *Salmonella* reported in farm animal species is given in Table 1.1 (poultry refers to reports from chickens, turkeys and ducks).

It is important to note that data for the different species are not directly comparable. Most *Salmonella* reports from cattle, sheep and pigs result from the investigation of clinically diseased animals whereas reports from chickens and turkeys are mostly from statutory surveillance. However, trends over time within species are largely comparable, especially for chickens and turkeys since the introduction of the *Salmonella* National Control Programmes (NCPs).

For comparison purposes, data have been reproduced here on the number of laboratory reports of human isolations of *Salmonella* reported in England and Wales to Public Health England (PHE), Colindale and in Scotland to Health Protection Scotland (HPS) (Figure 1.1). There are a number of factors that influence the reporting of these data by clinical microbiology laboratories. These are discussed in the Zoonoses Report UK 2016 (PHE 2017)1.

Figure 1.1 shows the most common *Salmonella* serovars isolated from livestock in Great Britain in 2017 alongside the most common serovars isolated from human cases of salmonellosis in Great Britain. Figures 1.2 and 1.3 provide data for phage types of *S. Typhimurium* and *S. Enteritidis* in livestock; human data are not shown in these figures as phage types are not available following the discontinuation of phage typing by PHE. Apart from *S. Typhimurium* (including monophasic variants) and *S. Enteritidis*, serovars commonly associated with human cases are reported relatively rarely from British livestock. *Salmonella Newport* and *S. Agona* were the only other serovars that occurred amongst the most common serovars in both humans and individual livestock species in 2017.

In 2017, a total of 9,961 isolations of *Salmonella* from humans were reported to PHE (representing both England and Wales) and HPS; this is 5.1% higher than in 2016 (9,479 isolations) and 2.0% higher than in 2015 (9,765 isolations).

Figures showing the relative frequency of the most common *Salmonella* serovars in each animal species during 2017 (Figure 1.1), should be considered alongside absolute numbers of isolations (Table 1.1), as the relative proportions may remain similar despite a change in number of isolations, in which case we assume that the change in number of isolations is likely to be constant across serovars. Similarly, if there is a change in serovar relativity, it is only by examining changes in absolute numbers that we can ascertain the size of any increase or decrease. In 2017, the total number of *Salmonella* isolation reports from cattle, sheep, pigs and poultry increased by 8.3% compared with 2016 and by 11.7% compared with 2015 (Table 1.1). This was mainly due to an increase in isolations from chickens, cattle and ducks. Increases in the number of reports were, however, not consistent across serovars; for example, reports of *S. Senftenberg*, *S. Typhimurium* and *S. Mbandaka* increased by 63.5%, 48% and 29.4%, respectively compared with 2016 whereas reports of *S. Newport*, *S. Orion var. 15* and *S. Derby* fell by 65.4%, 37.8% and 31%, respectively. In addition, reports of *S. Enteritidis* were eleven times higher (45 isolations vs. 4 isolations) during 2017 compared with 2016 but 51% lower compared with 2015 (45 isolations vs. 92 isolations).

The most important factor which may bias the number of *Salmonella* reports from species not covered by NCPs (i.e. species other than chickens and turkeys) is the submission rate. This report presents numerator data but the denominator, in most cases, is unknown and may change over time. However, we use the number of diagnostic submissions to APHA and SRUC as a proxy to understand if the denominator may have significantly changed. Most *Salmonella* reports from cattle, sheep and pigs result from the investigation of clinically diseased animals, and economic factors may exert a strong influence on diagnostic practices, such as whether a veterinary surgeon is consulted and whether samples are submitted for laboratory examination. The *Salmonella* data from these species is likely to be most influenced by changes in submission rate.

The number of diagnostic submissions to the Animal and Plant Health Agency (APHA) and Scotland’s Rural College (SRUC) decreased by 10.7% in 2017 compared with 2016. This decrease was seen for all species apart from goats, poultry and miscellaneous species. As most of the data from species other than poultry relate to clinical investigations, the prevalence of subclinical infection in these species of
livestock is not known. Most sample submissions from poultry are associated with statutory or voluntary surveillance activities. Although trends in *Salmonella* reports from species not covered by NCPs can be compared with diagnostic submission rates to APHA/ SRUC, it should be remembered that not all submissions will have been examined for *Salmonella*. Private laboratories also report the isolation of *Salmonella* and the total number of submissions to these laboratories is unknown.

There were 3,049 isolations of *Salmonella* in livestock in 2017 which represents an increase of 7.2% compared with 2016 (2,845 isolations). This comprised 2,821 isolations from species covered by the statutory reporting requirements of the Zoonoses Order 1989 (1,154 isolations from chickens, 499 isolations from turkeys, 440 isolations from cattle, 395 isolations from ducks, 138 isolations from pigs, 110 isolations from sheep, 39 isolations from horses, 20 isolations from pheasants, 15 isolations from pigeons, six isolations from geese and five isolations from partridges) plus 228 isolations from non-statutory species (e.g. cats, dogs and reptiles).

Relative to 2016, there were fewer isolations from turkeys (499 vs. 607 isolations), pigs (138 vs.146 isolations), horses (39 vs. 48 isolations) and pigeons (15 vs. 28 isolations). However, reports from chickens, cattle, ducks, sheep, geese and pheasants increased.

The surveillance data for 2017 shows that only 30.4% of the isolations of *Salmonella* reported to Defra resulted from samples taken due to clinical disease in livestock. This contrasts with data for *Salmonella* in humans where reports usually originate from cases of clinical disease.

The majority of the isolations reported from chicken and turkey flocks (70.0% and 86.4%, respectively) during 2017 were the result of statutory surveillance activities due to the NCPs that are in place for these sectors (further information on the NCPs is included in Chapter 6 and Chapter 7). This differs from years prior to the introduction of the NCPs when the majority of chicken and turkey isolations originated from voluntary surveillance.

Voluntary *Salmonella* surveillance of healthy flocks is common practice in the duck industry. In 2017, 100.0% of *Salmonella* isolations from ducks resulted from voluntary surveillance.

The majority of *Salmonella* isolations reported from species other than poultry are the result of examinations carried out to diagnose clinical disease, although the *Salmonella* found may not always be the primary cause of the illness.
The number of S. Typhimurium isolations from cattle, sheep, pigs and poultry increased by 48.0% in 2017 (123 isolations) relative to 2016 (86 isolations). This was primarily attributable to the number of reports from cattle increasing from 21 to 56 isolations and a 45.5% increase in number of reports from sheep (16 vs. 11 incidents) (Figure 1.5). A cluster of DT104 detections, largely from sheep and cattle, is subject to an ongoing epidemiological investigation. Isolations of the monophasic strain Salmonella 4,12:i:- also increased (by 23.8%) in 2017 (Figure 1.7) but Salmonella 4,5,12:i:- decreased by 13.8% compared with 2016; this was largely due to a 12.8% decrease in isolations from pigs (41 vs. 47 isolations) (Figure 1.6). Reports of S. Enteritidis increased considerably in 2017 compared with 2016 (45 vs. 4 isolations), but were still 51.1% lower than during 2015 (92 isolations). Isolations were reported from cattle, chickens, ducks and turkeys (Figure 1.4).
Highlights

Cattle

- *Salmonella* isolations from cattle in 2017 were 16.4% higher compared to 2016 (440 vs. 378 isolations) (Table 2.1).

- *Salmonella* Dublin remained the most commonly reported serovar (responsible for 66.1% of total cattle isolations) and reports of this serovar increased by 13.2% compared with 2016 (291 vs. 257 isolations) and by 22.3% compared with 2015 (238 isolations).

- The second most common serovar was *S. Typhimurium* (56 isolations; 12.7% of total cattle isolations), which is different from 2016 when the second most common serovar was *S. Mbandaka* (10.1% of total cattle isolations). Of the 56 isolations of *S. Typhimurium*, 41 (73.2%) were phage type DT104.

- Due to the increase in *S. Typhimurium* in cattle, *S. Mbandaka*, which has been the second most common serovar since 2010 fell to the third most common during 2017 (28 isolations; 6.4% of total cattle isolations).

- The combined number of reports of the monophasic variant strains of *S. Typhimurium* increased during 2017 (3.0% of total cattle isolations) compared with 2016 and 2015 (both 2.6% of total cattle submissions) with five isolations of *Salmonella* 4,5,12:i:- and eight isolations of *Salmonella* 4,12:i:-.

- There were three isolations of *S. Enteritidis*, compared with none during 2016 and two during 2015. The phage types reported were single isolations of PT8, PT28 and PT33.

Small ruminants

- Reports of *Salmonella* from sheep in 2017 were similar to 2016 (110 vs. 108 isolations) but increased by 66.7% compared with 2015 (66 isolations) (Table 3.1).

- *Salmonella enterica* subspecies *diarizonae* serovar 61:k:1,5,(7) (and variants) remained the most common serovar (60 reports; 54.5% of total sheep isolations).

- *Salmonella* Montevideo and *S. Typhimurium* were the second most commonly reported serovars from sheep during 2017, each making up 14.5% of total *Salmonella* reports from sheep. Although *S. Montevideo* has risen to the second most common serovar in sheep
compared with the third most common during 2016, the number of isolations was almost the same (16 isolations vs. 15 isolations).

- *Salmonella* Dublin was the fourth most common serovar in 2017 making up 8.2% of total *Salmonella* reports from sheep. The number of isolations of *S. Dublin* from sheep fell by 47.1% compared with 2016 (9 isolations vs. 17 isolations) but was similar to 2016 (7 isolations).

- There were 16 isolations of *S. Typhimurium* in 2017 compared with eleven in 2016 and none in 2015. Seven isolations (43.8% of the total) were DT104. There were no isolations of either *Salmonella* 4,12:i:- or *Salmonella* 4,5,12:i:- compared with one isolation of *Salmonella* 4,12:i:- and none of *Salmonella* 4,5,12:i:- in 2016.

- There were no isolations of *Salmonella* from goats in 2017 compared with one isolation (*S. Coeln*) during 2016. Prior to 2016, the last reports of any *Salmonella* serovar from goats were in 2014 (*S. Anatum*) and 2010 (*S. Dublin*).

**Pigs**

- The number of *Salmonella* isolations from pigs in 2017 was 5.5% lower than during 2016 (138 isolations vs. 146 isolations) and 4.8% lower than during 2015 (145 isolations) (Table 4.1).

- *Salmonella* Typhimurium (including the monophasic variants, 4,[5],12:i:-) were together responsible for 87.0% of all isolations, compared with 82.2% in 2016 and 89.7% in 2015. This increase was largely attributable to an increase in monophasic *Salmonella* 4,12:i:- (38 vs. 30 in 2016) partially offset by a decrease in reports of *S. 4,5,12:i:-* (41 vs. 47 in 2016) and *Salmonella* Typhimurium (41 vs. 43 in 2016).

- The most common phage type of *S. Typhimurium* was U288 (24 isolations; 58.5% of total *S. Typhimurium* isolations in pigs). Phage type DT193 was the most common phage type of both *Salmonella* 4,5,12:i:- and *Salmonella* 4,12:i:-, with 37 isolations (90.2% of total) and 33 isolations (86.8% of total), respectively.

**Deer, Horses and Rabbits**

- There were no reports of *Salmonella* from deer during 2017 compared with two reports during 2016 (single reports of *S. Newport* and a rough strain of *Salmonella*). Prior to 2016, the last reports of *Salmonella* from deer were in 2012.
• There were no reports of *Salmonella* from rabbits during 2017, compared with one report in 2016 (*Salmonella* 21:g,t:-) (Table 5.2) which was the first isolation from rabbits since 2012.

• There were 39 isolations from horses in 2017, a decrease of 18.8% compared with 2016 (48 isolations), and a decrease of 17.0% compared with 2015 (47 isolations) (Table 5.3).

• There were 13 isolations of *S. Typhimurium* from horses during 2017 (making it the most common serovar reported from horses), a reduction of 23.5% compared to 2016; two isolations of *Salmonella* 4,5,12:i:- and three isolations of *Salmonella* 4,12:i:-. The most common phage types of *S. Typhimurium* were DT40, DT41 and DT104 (2 isolations; 15.4% of total, each); all the isolations of *Salmonella* 4,5,12:i:- and *Salmonella* 4,12:i:- were phage type DT193.

**Chickens**

• Including both NCP and non-statutory surveillance data, isolations of *Salmonella* from chickens increased by 21.5% compared with 2016 and 24.2% compared with 2015 (Table 6.1).

• The most commonly reported serovars were:
  – *S. Mbandaka* (272 isolations; 23.6% of total chicken isolations).
  – *S. Senftenberg* (238 isolations; 20.6% of total chicken isolations).
  – *Salmonella* 13,23:i:- (179 isolations; 15.5% of total chicken isolations).
  – *S. Kedougou* (150 isolations; 13.0% of total chicken isolations).
  – *S. Montevideo* (105 isolations; 9.1% of total chicken isolations).

• There were 25 isolations of *S. Enteritidis* compared with four isolations during 2016 and 79 isolations during 2015. The most commonly reported phage type in 2017 was PT8 (15 isolations).

• There were five isolations of *S. Typhimurium* compared with seven in 2016; the most commonly reported phage type was DT2 (2 isolations) and there were single isolations of DT1, DT104 and DT193. Isolations of *Salmonella* 4,12:i:- increased slightly (4 isolations vs. 2 isolations in 2016 and 3 isolations in 2015); however, two isolations of *Salmonella* 4,12:i:- were shown not to be *S. Typhimurium* or monophasic *S. Typhimurium* by PCR testing. There was one isolation of *Salmonella* 4,5,12:i:-, the same as during 2016.

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2 The high number of isolations in 2015 was due to an outbreak of this serovar in broiler chickens.
Information and data are given in Chapter 6 (Reports of *Salmonella* in Chickens) on the National Control Programmes (NCPs) for *Salmonella* in breeding flocks, laying hen flocks and broiler flocks. The estimated prevalence of regulated serovars in all three chicken NCPs was well below the EU targets of 1% for breeders, 2% for layers and 1% for broilers (0.00% for breeders, 0.15% for layers and 0.01% for broilers).

**Turkeys**

- Including both NCP and non-statutory surveillance data, isolations of *Salmonella* from turkeys fell by 17.8% compared with 2016 (499 vs. 607 isolations) and by 19.4% compared with 2015 (619 isolations) (Table 7.1).

- As in previous years, the most common serovar reported from turkeys was *S. Derby* (including presumptive *S. Derby*) (351 isolations; 70.3% of total turkey isolations). This is a 29.9% decrease compared with 2016 (501 isolations) and an 18.4% decrease compared with 2015 (430 isolations).

- Isolations of monophasic strains of *S. Typhimurium* remained the same as during 2016, with just five isolations in each year, but lower than during 2015 when there were eight isolations. All were phage type DT193.

- Information and data are given in Chapter 7 (Reports of *Salmonella* in Turkeys) on the National Control Programme (NCP) for *Salmonella* in turkey flocks. Two fattening flocks tested positive for *Salmonella* 4,5,12:i:-, one tested positive for *Salmonella* 4,12:i:- but no flocks tested positive for *S. Typhimurium*. The estimated prevalence of regulated serovars was well below the EU target of 1% for both fatteners and breeders (0.33% for fatteners and 0.00% for breeders).

**Ducks and Geese**

- There were 395 isolations of *Salmonella* from ducks in 2017 compared with 338 isolations in 2016 (16.9% increase). All the isolations resulted from voluntary *Salmonella* monitoring in commercial duck flocks (Table 8.1).

- The most commonly isolated serovars in ducks were *S. Indiana* (117 isolations; 29.6% of total duck isolations), *S. Give var. 15* (70 isolations; 17.7% of total duck isolations) and *S. Kottbus* (47
isolations; 11.9% of total duck isolations). There were five isolations of S. Typhimurium (DT8 (x1) and DT99 (x4)) compared with two in 2016 and one isolation of S. Enteritidis (PT9b) compared with none in 2016.

- There were six isolations of *Salmonella* 4,12:i:- (all DT193) from geese in 2017, compared with four in 2016; all were from voluntary surveillance. Prior to 2016, the last reports of *Salmonella* from geese were in 2013.

**Other Statutory Birds (as specified in the Zoonoses Order)**

- There was a 8.7% increase in reports of *Salmonella* from game birds (guinea fowl, partridges, pheasants and quail) in 2017 (25 isolations) compared with 2016 (23 isolations), but a 44.4% decrease compared with 2015 (45 isolations). This was mainly due to an increase in isolations from pheasants (20 vs. 13 in 2016).

- *Salmonella* Senftenberg was the most commonly reported serovar in game birds (11 isolations; 44.0% of total game bird isolations) and S. Typhimurium was the second most common (6 isolations; 24.0% of total game bird isolations).

- There were 15 *Salmonella* isolations from pigeons in 2017, which was 46.4% lower than in 2016 (28 isolations) and 34.8% lower than in 2015 (23 isolations). All of the isolations in 2017 were S. Typhimurium; the most common phage type was DT2 (12 isolations; 80.0% of total S. Typhimurium isolations from pigeons).

**Wildlife**

- There was only one isolation of *Salmonella* from wildlife during 2017; S. Enteritidis RDNC from a seal. This is lower than 2016 when there were six isolations and 2015 when there were seven isolations.

**Feedingstuffs**

- During 2017, 1.3% of tests carried out under the Animal By-Products Regulations (ABPR) and Defra Codes of Practice were positive for *Salmonella*. This is the higher than during both 2016 when 0.6% of tests were positive for *Salmonella* and 2015 when 0.7% of tests were positive for *Salmonella*.

- There were 31 isolations of regulated *Salmonella* serovars from animal feedingstuffs during 2017, double that of 2016 (n=15) but very similar to 2015 (n=32).
The most commonly reported serovars from animal feedingstuffs and compound feed during 2017 were *S*. Tennessee (39 reports), *S*. Indiana (38 isolations) and by *S*. Ohio (34 isolations).

There were 160 reports of *Salmonella* from pet food which was intended to be fed raw during 2017. This is considerably higher than 2016 when there were 60 reports and 2015 when there were 61 reports. The most common serovars reported during 2017 were *S*. Indiana (33 isolations), *S*. Derby (11 isolations) and *S*. Kottbus (10 isolations).

The isolation rate of *Salmonella* from domestic processed animal protein in 2017 was 1.3%, a very small increase compared to 2016 (0.8%) possibly due to an increase in risk-based testing.

There were no batches of imported processed animal protein tested during 2017, compared with three batches tested during 2016, none of which were positive for *Salmonella*.

**Antimicrobial Susceptibility Testing**

- Of the 3,111 *Salmonella* cultures examined during 2017, 71.5% were susceptible to all 16 antimicrobial drugs tested against.

- A total of 187 cultures of *Salmonella* Typhimurium were examined in 2017, of which 34.2% were susceptible to all the antimicrobials tested against. This is an increase compared with 2016 when 30.1% were susceptible to all antimicrobials tested.

- 2,652 isolates of serovars other than *S*. Dublin or *S*. Typhimurium were tested in 2017 and 71.2% of these were susceptible to all the antimicrobials tested against.

- Resistance to third generation cephalosporins and fluoroquinolones is considered of high importance, since these antimicrobials are used for the treatment of human salmonellosis, if this is required. The percentage of *Salmonella* isolates that were resistant to ciprofloxacin in 2017 was 0.3%; one single isolate (*S*. Typhimurium from a cat) was resistant to ceftazidime and cefotaxime. Ciprofloxacin, cefotaxime or ceftazidime resistance was not detected in *S*. Enteritidis from animals in 2017. No ciprofloxacin resistance was detected in *S*. Typhimurium from animals in 2017. These findings are important since these serovars are of particular public health significance.
Full details of the above highlights can be found in the individual chapters.
Figure 1.1: Isolations of the most common serovars in livestock and people in GB 2017

**Includes both statutory and non-statutory data**

‡ Including presumptive S. Derby (266 isolations)

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‡ On 1 December 2014 PHE moved to a new laboratory reporting system so direct comparisons between the previous system (LabBase2) and the new system (SGSS) may not be valid.

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**People** (n=9,961)

- **Enteritidis**: 27.1%
- **Typhimurium (including monophasic strains)**: 21.4%
- **Newport**: 3.9%
- **Infantis**: 2.8%
- **Agona**: 2.3%
- **Stanley**: 1.6%
- **Kentucky**: 1.5%
- **Virchow**: 1.4%
- **Other serovars**: 36.1%

**Cattle** (n=440)

- **Typhimurium**: 14.5%
- **Montevideo**: 14.5%
- **Dublin**: 8.2%
- **Agama**: 2.7%
- **Other serovars**: 5.5%

**Sheep** (n=110)

- **Montevideo**: 14.5%
- **Typhimurium**: 14.5%
- **Agama**: 2.7%
- **Other serovars**: 5.5%

**Pigs** (n=138)

- **Typhimurium**: 29.7%
- **4,12:i:-**: 27.5%
- **4,5,12:i:-**: 29.7%

**Chickens** (n=1154)

- **Typhimurium**: 13.2%
- **Mbandaka**: 11.9%
- **Senftenberg**: 11.9%
- **Enteritidis**: 9.1%
- **Montevideo**: 9.1%
- **Livingstone**: 1.2%
- **Derby**: 1.2%
- **Senftenberg**: 20.6%
- **Mbandaka**: 23.6%
- **Other serovars**: 9.4%

**Turkeys** (n=499)

- **Typhimurium**: 71.8%
- **Derby**: 11.9%
- **Senftenberg**: 11.9%
- **Kedougou**: 11.9%
- **Enteritidis**: 3.3%
- **Agona**: 1.4%
- **Senftenberg**: 3.3%
- **Bovis- morbillicans**: 5.5%
- **Kedougou**: 11.9%
- **4,12:i:-**: 0.6%
- **Other serovars**: 1.0%
Figure 1.1: Isolations of the most common serovars in livestock and people in GB 2017 (continued)

Ducks (n=395)

- Indiana 29.6%
- Kottbus 11.9%
- Give var. 15+ ** 17.7%
- Orion var. 15+ * 5.1%
- Give 4.6%
- Orion 6.6%
- Hadar 6.6%
- Lexington 6.6%
- Mbandaka 4.1%
- Other serovars 7.3%
- Mbandaka 4.1%

Ducks (n=395)
Table 1.1: *Salmonella* isolations in cattle, sheep, pigs and poultry† on all premises in Great Britain, including statutory and non-statutory results

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† Poultry includes chickens, turkeys and ducks.
Table 1.1: *Salmonella* isolations in cattle, sheep, pigs and poultry† on all premises in Great Britain, including statutory and non-statutory results (continued)

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† Poultry includes chickens, turkeys and ducks.
Table 1.1: *Salmonella* isolations in cattle, sheep, pigs and poultry† on all premises in Great Britain, including statutory and non-statutory results (continued)

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† Poultry includes chickens, turkeys and ducks.

* Two were not *S*. Typhimurium or monophasic *S*. Typhimurium by PCR
There were no isolations of *S. Typhimurium* from turkeys in 2017.

* Including both statutory and non-statutory data
Figure 1.3: Isolations of the most common *S. Enteritidis* phage types in livestock 2017

**Cattle (n=3)**

- PT33: 33.3%
- PT28: 33.3%
- PT8: 33.3%

**Chickens* (n=25)**

- PT8: 60.0%
- PT4: 20.0%
- PT13a: 12.0%
- PT1: 4.0%
- NOPT: 4.0%

* Including both statutory and non-statutory testing

**Turkeys* (n=16)**

- PT8: 43.8%
- PT13a: 31.3%
- RDNC: 12.5%
- PT4: 12.5%

* Including both statutory and non-statutory testing

**Ducks (n=1)**

- PT9b: 100.0%

* Including both statutory and non-statutory testing

There were no isolations of *S. Enteritidis* from sheep or pigs during 2017
Figure 1.4: Isolations of S. Enteritidis in livestock in GB 2015 - 2017

- **2015**
  - Cattle: 0
  - Chickens*: 90
  - Ducks: 10
  - Pigs: 8
  - Sheep: 3
  - Turkeys*: 2

- **2016**
  - Cattle: 0
  - Chickens*: 20
  - Ducks: 10
  - Pigs: 8
  - Sheep: 3
  - Turkeys*: 2

- **2017**
  - Cattle: 0
  - Chickens*: 40
  - Ducks: 10
  - Pigs: 8
  - Sheep: 3
  - Turkeys*: 2

* Inc. both statutory and non-statutory testing

---

Figure 1.5: Isolations of S. Typhimurium in livestock in GB 2015 - 2017

- **2015**
  - Cattle: 0
  - Chickens*: 80
  - Ducks: 20
  - Pigs: 8
  - Sheep: 3
  - Turkeys*: 2

- **2016**
  - Cattle: 0
  - Chickens*: 40
  - Ducks: 20
  - Pigs: 8
  - Sheep: 3
  - Turkeys*: 2

- **2017**
  - Cattle: 0
  - Chickens*: 100
  - Ducks: 40
  - Pigs: 20
  - Sheep: 3
  - Turkeys*: 2

* Inc. both statutory and non-statutory testing
**Figure 1.6:** Isolations of S. 4,5,12:i:- in livestock in GB 2015 - 2017

- **Cattle**
- **Chickens** *
- **Ducks**
- **Pigs**
- **Sheep**
- **Turkeys** *

* Inc. both statutory and non-statutory testing

**Figure 1.7:** Isolations of S. 4,12:i:- in livestock in GB 2015 - 2017

- **Cattle**
- **Chickens** *
- **Ducks**
- **Pigs**
- **Sheep**
- **Turkeys** *

* Inc. both statutory and non-statutory testing