ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

EPIDEMIOLOGY OF FOODBORNE INFECTIONS GROUP (EFIG)

1. The group met on 6 June 2017 and the following is a combined summary of the animal and human data and other topics that were discussed at the meeting.

Animal data

Animal *Salmonella* data January – December 2016 and January – March 2017 (provisional data)

2. Key points from the January – December 2016 data and January – March 2017 data were highlighted. The data were provisional and related to numbers of incidents rather than flocks or herds. The annual Animal and Plant Health Agency (APHA), reports on *Salmonella* in livestock provide further details including the reasons for collection of this data. The latest report (2016) is available at:
https://www.gov.uk/government/publications/salmonella-in-livestock-production-in-great-britain-2016

3. Although not presented here, some data is available for other pathogens from clinical diagnoses of non-statutory zoonoses and from other infections shared between animals and humans from specimens submitted to APHA and Scotland's Rural College (SRUC) laboratories.

4. An <u>isolation</u> is defined as the report of the first isolate of a given *Salmonella* (defined by serovar, and/or phage type, if available) from the same group of animals on a given occasion. If two submissions from the same group of animals on different dates give the same serovar, this is reported as two isolations. An <u>incident</u> comprises the first isolation and all subsequent isolations of the same serovar or serovar and phage/definitive type combination of a particular *Salmonella* from an animal, group of animals or their environment on a single premises, within a defined time period (usually 30 days).

5. During January – December 2016, reports of *Salmonella* in livestock fell by 5% in comparison to January – December 2015 and by 8% in comparison to January – December 2014. There were seven reports of *S*. Enteritidis compared with nine during the equivalent period of 2015. Reports of *S*. Typhimurium and the monophasic strain *Salmonella* 4,5,12:i:- increased (by 12% and 18% respectively) during January – December 2016 compared with the equivalent period of 2015, but reports of *Salmonella* 4,12:i:- decreased by 44%. The most commonly reported phage types of *S*. Typhimurium were DT2, DT104 and U288 whilst phage type DT193 was the most commonly reported phage type for both *Salmonella* 4,5,12:i:- and *Salmonella* 4,12:i:-.

6. During January – March 2017 reports of *Salmonella* in livestock increased by 25% compared with January – March 2016 and by 17% compared with the equivalent period of 2015. The increase since 2016 was largely due to an increase in reports from ducks and non-statutory species. There was a single report of *S*. Enteritidis, the same as during January – March 2016. Reports of *S*. Typhimurium and *Salmonella* 4,5,12:i:- both decreased (by 27% and 13%, respectively) compared with January – March 2017 but reports of *Salmonella* 4,12:i:- remained the same (5 reports). The most common phage type of *S*. Typhimurium was DT2; DT193 was the most common phage type of both *Salmonella* 4,5,12:i:- and *Salmonella* 4,12:i:-.

7. There were 5% fewer APHA/ SRUC submissions to VIDA between January – December 2016 (63,505 submissions) than during January – December 2015 (67,031submissions) and 18% fewer than during the equivalent period of 2014 (77,729). Relative to 2015 there was a decline in the number of submissions from cattle (11%) and birds (8%), but an increase in submissions from pigs (9%) and sheep (6%). The number submissions relating to miscellaneous species during 2016 (10,434) were very similar to those in 2015 (10,419).

8. There were 15% more APHA/ SRUC submissions to VIDA between January – March 2017 (17,573 submissions) than during January – March 2016 (15,229 submissions) but 12% fewer than during the equivalent period of 2015 (19,980). Relative to January – March 2016 the number of submissions from all species groups increased: sheep (33% increase), pigs (20% increase), cattle (13% increase), birds (6% increase) and miscellaneous species (4% increase).

9. On non-statutory zoonoses, the number of diagnoses of *Listeria* from sheep during January – May 2017 was 48% lower than during January – May 2016 (58 reports vs. 112 reports). There were no VTEC O157-related visits carried out by APHA during January – March 2017.

Salmonella **National Control Programme results 2016**

An overview of the *Salmonella* NCP results for 2016 was provided to the group:

Breeding chickens

10. 1396 flocks were tested (1080 GB and 316 NI). 2 adult flocks were positive for regulated serovars – both *S*.Typhimurium. The EU target prevalence is below 1%, UK prevalence 0.14%. 25 flocks were positive for non-regulated serovars (10 GB and 15 NI) with *S*.Mbandaka and *Salmonella* 13,23;i- most frequently found. UK prevalence for all non-regulated serovars was therefore 1.9%.

Laying chickens

11. 4286 flocks were tested in the UK (3793 GB, 493 NI). None were positive for regulated serovars in 2016. The EU NCP prevalence target is less than

2%. 26 flocks were positive for non-regulated serovars (22 GB; 4 NI) with *S*.Agona, *S*.Anatum and *S*.Agama found most frequently. UK prevalence for all non-regulated *Salmonella* serovars was 0.6%.

Broiler chickens

12. Of the 42,122 flocks tested in the UK (36,505 GB, 5617 NI). 7 flocks were positive for regulated serovars (5 GB (3 *S*.Typhimurium, 1 monophasic *S*.Typhimurium, 1 *S*.Enteriditis); 2 NI (2 monophasic *S*.Typhimurium)). The EU NCP target is less than 1% with the UK prevalence being 0.02%. 645 flocks were positive for non-regulated serovars (556 GB; 89 NI) *S*.Kedougou (162 UK) and *S*.Mbandaka (182 UK) being most prevalent. UK prevalence for all non-regulated *Salmonella* serovars was 1.5%.

Breeding turkeys

13. Of the 233 flocks tested in the UK (223 GB and 10 NI) none were positive for regulated serovars in 2016. The EU NCP target prevalence is less than 1%. 5 flocks were positive for non-regulated serovars (all GB) 3 *S.*Derby; 2 *S*.Senftenberg. UK prevalence all serovars was 2.1%.

Fattening turkeys

14. Of the 2684 flocks tested in the UK (2270 GB; 414 NI) 6 were positive for regulated serovars all from GB. 4 monophasic *S*.Typhimurium (on 3 holdings. 2 flocks on a single sheep farm, one flock on a pig farm), 2 *S*.Typhimurium (on one holding). The EU NCP target prevalence is less than 1% with the UK prevalence being 0.22%. 396 flocks were positive for non-regulated serovars (390 GB; 6 NI) of which 335 were confirmed or presumptive *S*.Derby. The UK prevalence all for all non-regulated serovars was 15.0%.

Human Infection Data – Summary of key pathogens for 2016

Trend in laboratory reports

15. It should be noted that these data are provisional and were extracted from different data sources, therefore caution is required in interpreting trends over time and differences between countries.

16. England and Wales data for *Campylobacter* and *Salmonella* was extracted from the laboratory surveillance system SGSS, the laboratory reporting system PHE implemented in 2015. *Listeria monocytogenes* data are from the enhanced *Listeria* surveillance database, STEC data are from the enhanced STEC surveillance database (England only), and foodborne outbreak data are from the enhanced foodborne outbreaks surveillance system, all of which are Public Health England databases. Data for Northern Ireland were supplied by the Public Health Agency Northern Ireland.

17. Figures 1-8 show the trends for non-typhoidal *Salmonella* infections, *Campylobacter*, *Listeria monocytogenes*, Shigatoxin producing *E.*coli (STEC) O157 and foodborne outbreaks in the UK.

***Salmonella* infections**

18. The group was informed that there were 9619 reports of non-typhoidal *Salmonella* in 2016, a small increase (1.3%) from the 9492 reported in 2015 . An increase in the reporting rate was seen in all constituent countries.

***Salmonella* serovars**

19. Reports of *S.* Enteritidis decreased in the UK, driven primarily by a decrease in cases reported in England; increases were seen in Wales and Scotland from 2015. Scotland reported the largest increase, with the reporting rate rising from 5.9 to 6.9 per 100,000 population.

20. An increase in the reporting rate of *S.* Typhimurium was seen in 2016 compared to 2015 with an increase of 75 cases. An increase in reporting rate was seen in England (from 2.3 per 100,000 in 2015 to 3.1 per 100,000 in 2016) and Northern Ireland (from 1.6 per 100,000 in 2014 to 2.8 per 100,000 in 2016) for the second year, while the reporting rate in Wales and Scotland decreased.

21. England, Wales and Scotland reported more *S.*Enteritidis cases than any other serovar, while Northern Ireland reported more *S*.Typhimurium cases. Scotland reported the largest proportion of *S.* Enteritidis cases compared to all *Salmonella* spp. reported (43%), compared to 37% in Wales, 27% in England and 25% in Northern Ireland. Together *S.* Enteritidis and *S.* Typhimurium constituted 49% of the non-typhoidal *Salmonella* reported in the United Kingdom. In addition to these, *S.* Infantis and *S.* Agona are within the top 10 most commonly identified serovars in all four countries. The top 10 serovars comprised 63% of all reported *Salmonella* infections in England, 71% in Wales, 77% in Northern Ireland (Table 1).

Travel

22. In 2016 the serovars with the highest proportion of cases reporting travel prior to infection were *S.* Kentucky and *S.* Stanley (55% reported travel) (Figure 4). In 2015 the serovar with the highest proportion reporting travel was also *S.* Kentucky (56%). A greater proportion of *S.* Enteritidis cases reported travel than *S.* Typhimurium cases (34% versus 17%). A rise in the number of travel associated cases in 2016 was noted. As the reason for this increase was not clear, PHE agreed to consider feasibility of reporting on travel destination information in future reports.

Figure 1. Rate of reported non-typhoidal *Salmonella* infections by country per 100,000 population, 2007-2016

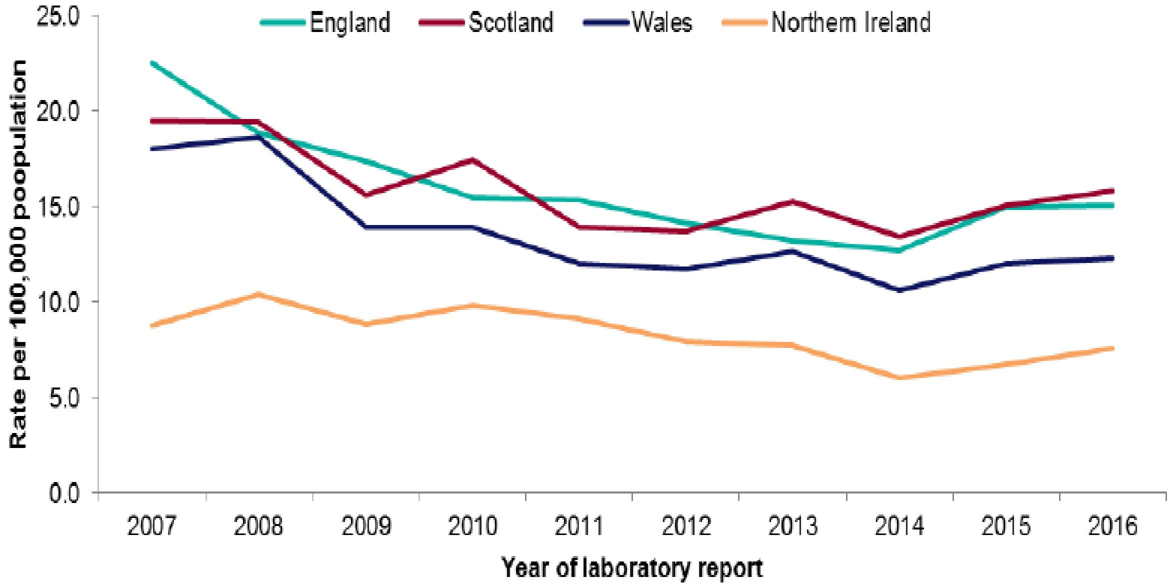


Figure 2. Rate of reported *Salmonella* Enteritidis infections in the United Kingdom and by nation per 100,000 population, 2007-2016.

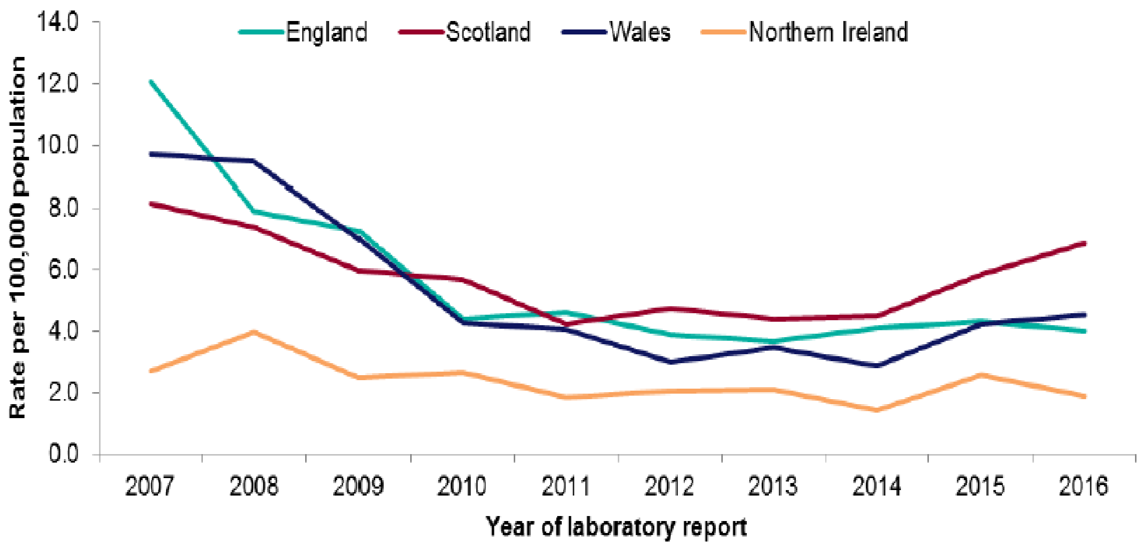


Figure 3. Rate of reported *Salmonella* Typhimurium infections by country per 100,000 population, 2007-2016

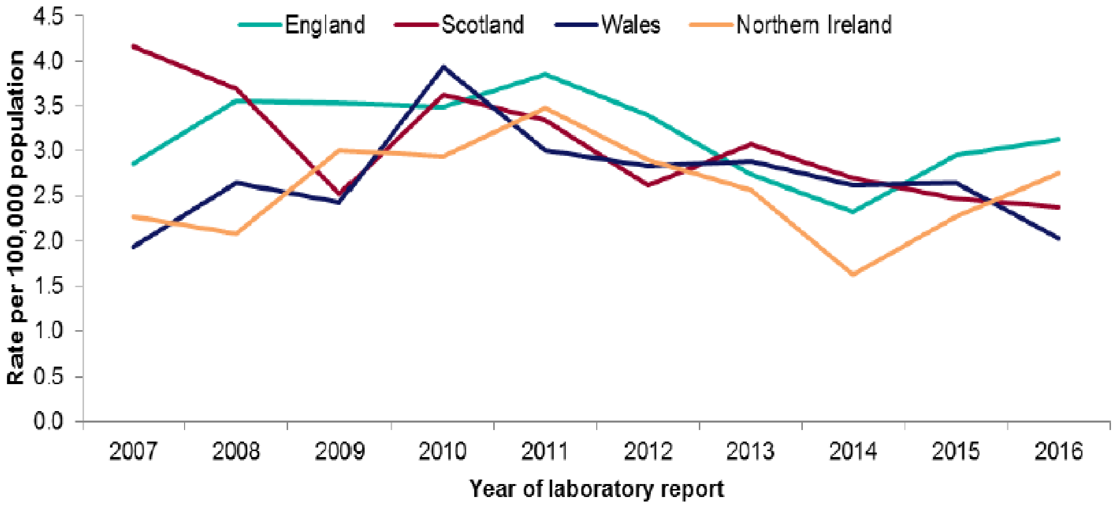
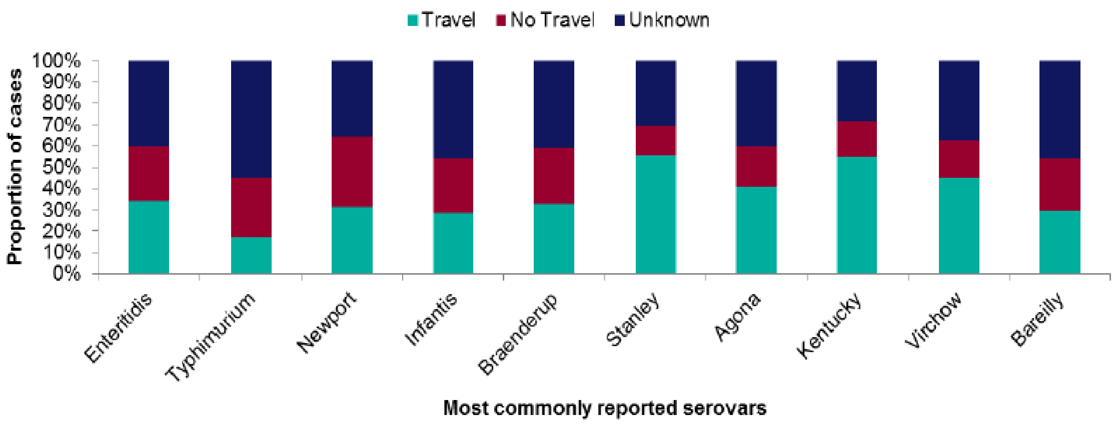


Table 1. Number of the ten most common non-typhoidal *Salmonella* serovars isolated, by country, 2016

England		Wales		Scotland		Northern Ireland	
Serovar	n	Serovar	n	Serovar	n	Serovar	n
Enteritidis	2215	Enteritidis	141	Enteritidis	369	Typhimurium	51
Typhimurium	1711	Typhimurium	63	Typhimurium	128	Enteritidis	35
Newport	226	Infantis	13	Group B†	28	Infantis	7
Braenderup	179	Stanley	12	Stanley	20	Oranienburg	3
Infantis	173	Newport	10	Virchow	20	Agona	3
Stanley	142	Braenderup	9	Agona	19	Bredeney	2
Agona	141	Agona	7	Braenderup	15	Hadar	2
Kentucky	136	Arizonae	6	Infantis	15	Newport	2
Bareilly	126	Bareilly	6	Java	13	Stanley	2
Virchow	125	Saint-Paul	6	Group C1‡	12	*	

†Group B includes *S.* Agama, Agona, Bredeney, Coeln, Derby, Gloucester, Heidelberg, Indiana, Kiambu, Kimuenza, Mons, Reading, Saint Paul, Schwarzengrund, Stanley, and Typhimurium.
‡Group C1 includes *S.* Braenderup, Cerro, Choleraesuis, Colindale, Concord, Infantis, Larochelle, Livingstone, Mbandaka, Menston, Montevideo, Ohio, Oslo, Riggil, Rissen, Tennessee, Thompson, and Virchow.
*No other serovars have more than one case reported

Figure 4. Proportion of travel in the ten most common non-typhoidal *Salmonella* serovars isolated in Great Britain*2016



* Serovars included are the ten most commonly reported serovars in the UK and are reported in order of the number of infections

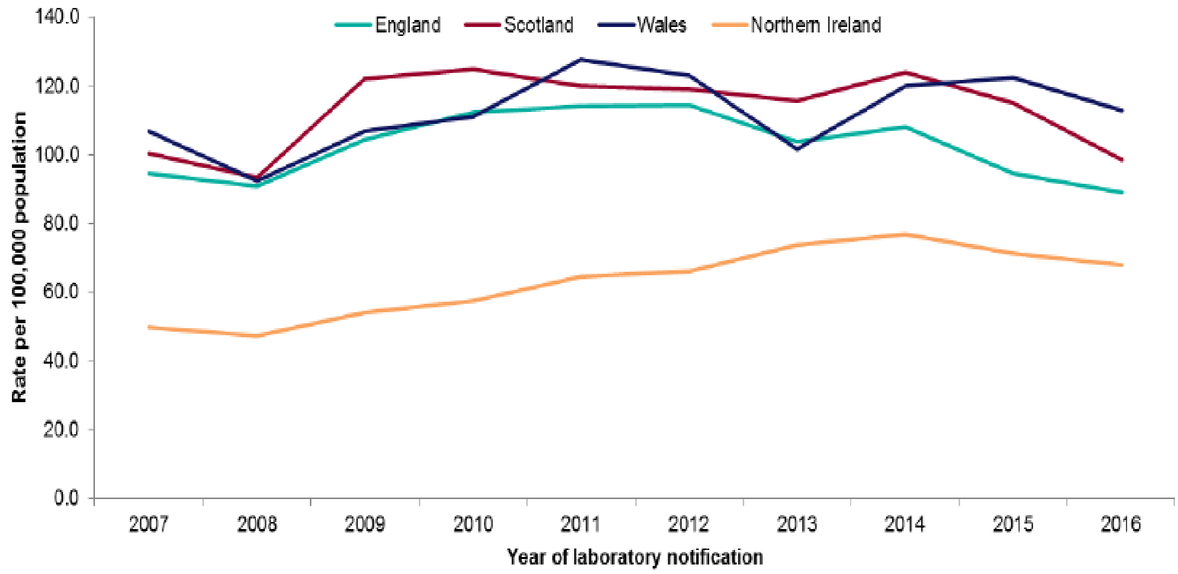
Campylobacter infections

23. The reporting rate for *Campylobacter* has decreased in the UK from 96.9 per 100,000 population in 2015 to 90.5 per 100,000 in 2016. The rate of reported *Campylobacter* infections in England over the last decade has decreased to the lowest rate reported since 2008, and remains below the rate observed in Wales and Scotland. Northern Ireland continues to report rates lower than the rest of the United Kingdom (67.9 cases per 100,000 population). Every country reported fewer cases in 2016 than in 2015, with the largest decrease in reporting rate being in Scotland

24. It was reported that in England the region with the highest number of reported cases of *Campylobacter* in 2016 was the South East with just over 9000 cases, however the highest rate of cases was in the South West with 120 cases per 100,000 population. The second highest rate of cases was in the North East with 109 cases per 100,000 population

25. More male *Campylobacter* cases were reported than female cases (55% vs 45%) in England in 2016. This trend was consistent throughout all age groups, with the proportion of female cases within each age group ranging from 39% (ages 10-19) to 48% of cases (ages 80 and over). The age groups with the highest number of cases reported were 50-59 and 60-69, comprising 32% of all *Campylobacter* reports.

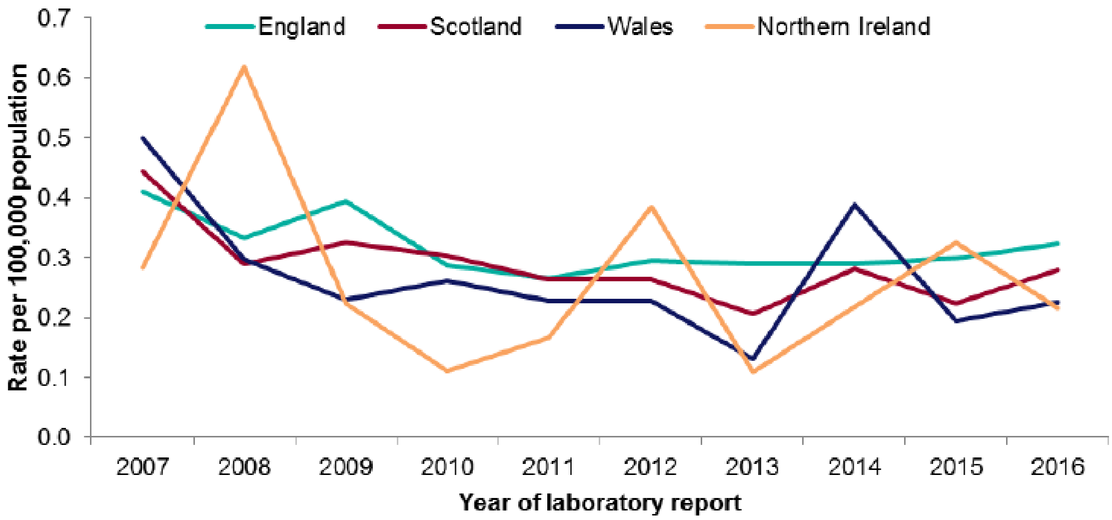
Figure 5. Rate of reported *Campylobacter* infections by country per 100,000 population, 2007-2016



Listeria monocytogenes infections

26. It was highlighted that although there was an increase in the number of reported *Listeria monocytogenes* infections in 2016 (15 more cases compared to 2015), the significance of this is difficult to assess because of the small numbers involved.

Figure 6. Rate of reported *Listeria* infections by country per 100,000 population, 2007-2016



STEC infections

27. Reports of STEC O157 in the UK increased by 84 cases in 2016 compared to 2015 with half of these cases being in England. Increases were seen in all countries other than Scotland, with the largest increase in reporting rate in Northern Ireland where nearly two times more cases were reported in 2016 compared to 2015. Overall in the UK however, rates were comparable to or lower than pre-2015 levels, when the rate of infection in England and Wales had fallen to its lowest since 2002.

28. Members noted the number of cases detected with the 10 most commonly detected STEC serotypes across the UK in 2016 (Table 2). Serotype O157 is the most common. It was underlined that population incidence was not calculated as serotypes other than O157 are likely to have been under-detected due to current laboratory testing methods. Serotype O26 is the most commonly detected non-O157 serotype in the UK. There was discussion on the number of labs testing for O157 and non-O157.

Figure 7. Rate of reported STEC O157 infections by country per 100,000 population, 2007-2016

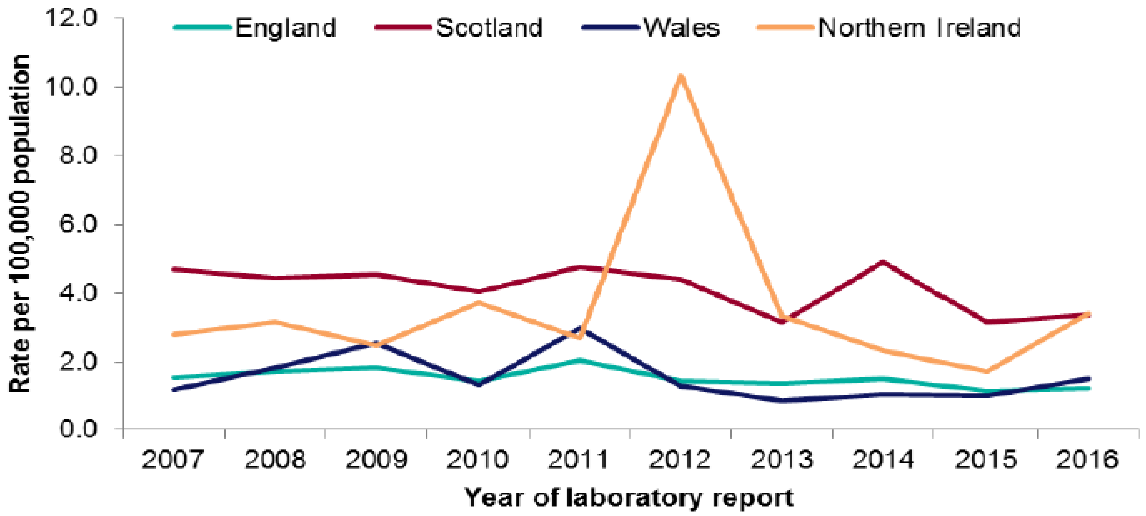


Table 2. Numbers of the ten most commonly reported STEC serotypes among clinical infections in the United Kingdom and by country, 2016*

Serotype	England#	Wales	Scotland	Northern Ireland	United Kingdom
O157	672	46	181	63	962
O26	43	0	12	32	87
O146	50	0	0	0	50
O91	37	0	4	0	41
O128ac	15	0	0	0	15
O128ab	13	0	0	0	13
O103	9	0	4	0	13
O145	10	0	1	3	14
O76	12	0	1	0	13
O117	10	0	0	0	10

*Testing for non-O157 STEC infections varies by laboratory; totals presented do not represent the prevalence of infections in the population.

Multiple serotypes are recovered from some patients and these figures include two individuals infected with more than one non-O157 STEC strain.

Foodborne outbreaks

29. In 2016, 48 foodborne outbreaks were reported to eFOSS in England and Wales and to Health Protection Scotland (Figure 8; Table 3). There were no reported outbreaks in Northern Ireland in 2016. There were 901 laboratory confirmed cases and 117 reported hospitalisations. Eleven national outbreaks were reported. The same number of *Salmonella* outbreaks was reported in 2016 as in 2015, and there were reductions in the number of *Campylobacter* and *C. perfringens* outbreaks. *Salmonella* was the most commonly implicated pathogen (12/48, 25%), however other/unknown pathogens comprised more outbreaks (13/48, 27%). These include ten norovirus outbreaks, one *Staphylococcus aureus* outbreak, one Enteroinvasive *E. coli* outbreak and one outbreak of unknown aetiology.

30. The majority of foodborne outbreaks occurred in the food service sector (34/48, 71%), followed by community (6/48, 13%). Of the food service sector outbreaks, the majority of these occurred in restaurants, pubs and takeaways (25/34, 74%).

31. There were no reports of foodborne outbreaks of *Cryptosporidium* in 2016. However, a total of 13 outbreaks were reported during the year as non-foodborne, involving 120 laboratory confirmed cases. Of these, eight outbreaks were associated with recreational water activities and five were associated with direct animal contact. In relation to outbreaks linked to *Campylobacter* it was noted that chicken liver pâté is still an issue.

Figure 8. Number of outbreaks attributed to specific pathogens reported in the UK, 2007-2016

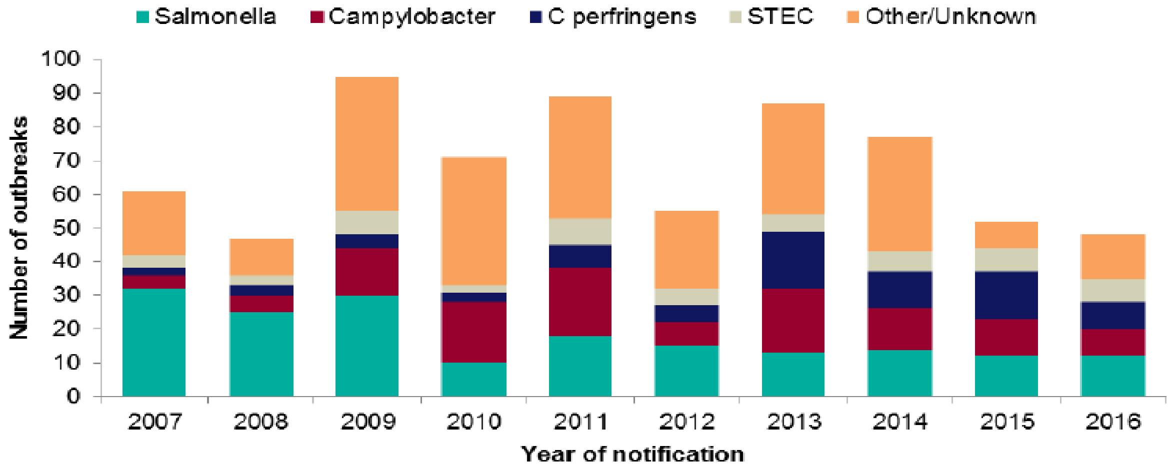


Table 3. Number of outbreaks attributed to specific pathogens reported in the UK, 2016

Year	England and Wales	Scotland	Northern Ireland	United Kingdom*
Salmonella	12	2	0	12
S. Enteritidis	8	2	0	8
S. Typhimurium	0	0	0	0
Campylobacter	8	0	0	8
C. perfringens	8	0	0	8
Norovirus	10	1	0	10
STEC O157	4	3	0	6
STEC non-O157	1	0	0	1
Other/unknown	3	0	0	3

*Number of outbreaks reported exceeds total number for the UK as national outbreaks with cases in both Scotland and England/Wales reported separately

Burger Watch 2016 - report on excess burger consumption amongst shiga toxin producing *Escherichia coli* (STEC) cases in England, 2014-2016

32. EFIG considered PHE's report on excess burger consumption amongst STEC cases in England, 2014-2016. It was reported that in May 2016, the FSA published revised guidelines for food business operators allowing the provision of medium/rare cooked burgers to consumers provided certain food preparation conditions were met.

33. PHE agreed to monitor the impact of this change and established two reporting mechanisms; (1) real-time notification to FSA of all STEC cases and outbreaks linked to consumption of undercooked burgers at commercial premises and (2) prospective detection of acute events that may be linked to undercooked burger consumption via the STEC enhanced surveillance system for further investigation.

34. PHE described the methods developed to address the second mechanism and the results of the application of these methods for the period 2014 to 2016 amongst cases resident in England.

35. On the results, the group noted that that over a three-year period, reported excess burger consumption was detected in five single week periods; weeks 42 – 43 in 2014, week 52 in 2015 and weeks 25 – 26 in 2016. The highest excess amongst all alert weeks was detected in 2016 (exceedance score 2.51). Cases contributing to the exceedance were linked to six outbreaks, but only one outbreak (STEC O157 PT 34 linked to consumption of salad leaves) contributed multiple cases. Reports of salad leaf consumption also exceeded in weeks 25 – 26, 2016. None of the linked outbreaks were associated with contaminated meat or burgers and none of the cases linked to the 2016 outbreak reported eating undercooked burgers.

36. The report concluded that this approach successfully detected 5 weeks in which reported burger consumption exceeded the expected distribution; however, none of the reporting cases in alert weeks were linked with an outbreak due to contaminated or undercooked burgers. Future developments of this methodology will consider simultaneous exceedances of other exposures to improve the specificity of the alerts. The group was mindful that this is an ongoing study still accumulating data. Future elements being considered and limitations of the study were noted.

Estimating the burden of gastrointestinal disease in Scotland: new opportunities using data linkage (Results from analysis of *Campylobacter* and *Salmonella* data)

37. EFIG was updated by Health Protection Scotland (HPS) on the above ongoing study funded by Food Standards Scotland (FSS) and National Health Service Scotland. The study is linking laboratory data (including demographic information) for all confirmed cases of infectious intestinal disease (IID) to deprivation, hospitalisation, cancer, mortality, and prescribing data to estimate the burden of IID by pathogen, and determine risk factors and clinical outcomes. EFIG had been briefed on the purpose of the study and had some preliminary results at the December 2016 meeting. This meeting focused on the results from analysis of *Campylobacter* and *Salmonella* data (analysis complete for

Campylobacter and near completion for *Salmonella*). The study is expected to cover 9 gastrointestinal pathogens (*Campylobacter, Salmonella, Shigella*, STEC, *Listeria*, Hepatitis E, Hepatitis A, *Cryptosporidium* and *Giardia*).

FS101055: *E. coli* O157 super-shedding in cattle and mitigation of human risk: Interim project report

38. To inform EFIG's discussions on STEC infections the group received a presentation on FSS/FSA's STEC super shedding study being undertaken by The Roslin Institute, University of Edinburgh and scheduled to be completed early next year. The study's main objectives are:

    - To determine the excretion dynamics and transmission frequencies of wild type *E. coli* O157 strains under controlled experimental conditions. This focused on the genetic attributes of *E. coli* O157 isolates that enable high excretion levels from cattle and favour onward colonisation of other animals and humans. Specific focus on the role of the type of Shiga toxin.

    - To investigate phylogenomic relationships between human and cattle *E. coli* O157 strains. This required a farm survey to collect field isolates from farms and then to compare these with isolates infecting humans over the same period. It also involved enabling SERL to transition to sequence-based diagnostics for *E. coli* O157. To assess whether we have an issue with super-shedding and/or hyper virulent strains.

    - Intervention testing and modelling the impact of on-farm interventions. This required testing of a vaccine intervention to try and reduce *E. coli* O157 excretion and transmission from and between cattle.

Food surveillance

39. PHE updated the group on the activities of their Food, Water and Environment Microbiology Services. Members were reminded of PHE FW&E's single LIMS system which came into effect in 2013. It was highlighted that it currently has microbiological results and metadata on more than 150,000 food samples and represents a resource for hazard analyses and risk assessments.

40. The group was updated on FSS's food sampling programme which covers sampling and surveillance of food to address 15 key recommendations agreed in 2016/17. FSS is in the process of identifying microbiological and chemical sampling priorities.

41. Public Health Wales updated the group on the reconfiguration of the FWE network in Wales which has been completed. Samples

that had previously been sent to PHE are now being sent to Public Health Wales laboratories. Recent surveys being carried out by PHW included Pies and filled pastry products and RTE foods dispensed from nozzles

Antimicrobial resistance

42. Members received an update on the FSA's antimicrobial resistance activities. This covered:

ACMSF AMR 'Task and Finish' Group

43. Above group recently established by the FSA using expertise from the existing ACMSF AMR group and additional co-opted experts exploring the use of antimicrobials in food production, the incidence of AMR in pathogens and commensals in food production and the growing AMR-related public health burden. It is envisaged the group will report in early 2018.

AMR systematic review

44. Report published by the FSA (in November 2016) assessed the significance of the food chain in the context of antimicrobial resistance (AMR) with reference to pork, poultry meat, dairy products, seafood and fresh produce on retail sale in the UK. This review confirmed that there is a lack of AMR prevalence data for UK-produced food and, to a lesser extent, in countries that export food to the UK. The review recommended developing surveillance programmes that will identify trends in the prevalence of AMR bacteria in foods (for retail poultry and pork meat) which could be used to assess potential risks associated with exposure to such hazards among UK consumers.

AMR surveillance of retail foods

45. Following the AMR systematic review recommendation for further surveillance on AMR bacteria in UK retail chicken and pork, the FSA had published a research call seeking a survey of AMR pathogens and commensal bacteria in retail poultry and in pork mince. It is anticipated that this survey will commence in late 2017.

46. The EC have set-up a 7-year mandatory MS surveillance for specific pathogens within the slaughterhouse environments. The FSA is leading on an additional component of this survey by analysing retail meats (beef, pork and poultry) in the UK for *E. coli* prior to testing for AMR traits of concern. This will include Extended Spectrum Beta Lactamase (ESBL)-producing, AmpC and Carbapenemase-producing *E. coli*. Testing for colistin resistance and the colistin resistant genes (*mcr-1, mcr-2*) in *E. coli* from raw retail poultry meat started in January 2016. Year 1 (pork

and beef) findings were published in September 2016. Year 2 (chicken) is expected to be published in late 2017.

47. The FSA are carrying out a survey of *Campylobacter* contamination in fresh, whole UK produced chilled chicken at retail sale. A subset of the *Campylobacter* isolates from the retail chicken survey were tested for their resistance to a range of antimicrobial agents. Year 1 of this survey was published in September 2016. Year 2 report is expected to be published in late 2017.

MRSA risk assessment

48. In February 2017, the FSA published a qualitative risk assessment on meticillin-resistant *Staphylococcus aureus* (MRSA) in the UK food chain. The assessment concluded that the risk to human health from the preparation, handling and/or consumption of foodstuffs in the UK which are potentially contaminated with LA-MRSA/MRSA is very low, especially when compared to other routes of transmission (such as through direct contact with individuals colonised or infected with MRSA in hospitals or the community).

Codex Alimentarius

49. An international Codex working group was held in London from 29th November to 2nd December 2016 to develop a new work proposals and to develop the terms of reference for a request for scientific advice to FAO and WHO in collaboration with OIE. The findings of the FSA’s systematic review were provided as background information for this meeting.

Action

50. ACMSF Members are invited to comment on the recent trends in animal and human data and other subjects discussed by EFIG at the June 2017 meeting.

Secretariat
January 2018