ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

EPIDEMIOLOGY OF FOODBORNE INFECTIONS GROUP (EFIG)

1. The group met on 7 June 2016 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 2015 and January – March 2016 (provisional data)

2. Key points from the January – December 2015 data and January – March 2016 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 (2014) is available at: **https://www.gov.uk/government/statistics/salmonella-in-livestock-production-in-great-britain-2014**. The report for 2015 is expected to be published later this year. 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.

3. An isolation 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 incident 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).

4. Between January and December 2015, there were 1,067 reports of *Salmonella* from livestock, which is 5% fewer than during January - December 2014 (1,127 reports) and 9% fewer than the same period of 2013 (1,168 reports). The top serovars in cattle, sheep, pigs and ducks in 2015 were Dublin, 61:k:1,5,(7), Typhimurium and Indiana respectively.

5. Between January and March 2016, there were 217 reports of *Salmonella* from livestock, which is 5% fewer than the same period of 2015 (231 reports) and 13% fewer than the same period of 2014 (248 reports). The decline since 2015 is largely attributable to a decrease in *Salmonella* reports from ducks (38 vs. 65 incidents) and pigs (29 vs. 39 incidents). The top serovars in cattle, sheep, pigs and ducks in the first 3 months of 2016 were Dublin, Montevideo, 4,5,12:i:- and Indiana respectively.

6. There were 18 reports of *S.* Enteritidis during January – December 2015 compared with nine during January – December 2014. There was a single report of *S.* Enteritidis during January – March 2016.

7. Reports of *S.* Typhimurium (110 reports) in 2015 (Jan – Dec) fell by 20% compared with the same period in 2014. Phage type U288 was the most commonly reported phage type of *S*. Typhimurium. Reports of *S.* Typhimurium (Jan – March 2016) have increased by 30% compared with the same period in 2015 (26 vs. 20 incidents) but are largely similar to 2014 (25 incidents). The most common phage types were DT193, U288 and U302.

8. Reports of monophasic *Salmonella* 4,5,12:i:- also fell (50 reports: 15% decrease) however, reports of *Salmonella* 4,12:i:- have increased compared with January – December 2014 by (59 vs. 35 incidents). The most common definitive phage type was DT193 which was found in 92% of the *S.* 4,5,12:i:- incidents and 81% of the *S.* 4,12:i:- incidents.

9. Reports of *Salmonella* 4,5,12:i:- in January-March 2016 were 45% higher (16 vs. 11 incidents) compared with the same period in 2015 whilst reports of *Salmonella* 4,12:i:- decreased by 76% (5 vs. 21 incidents). All 21 incidents were phage type DT193.

10. There were 14% fewer APHA/SRUC submissions to VIDA between January and December 2015 (67,031submissions) compared with January - December 2014 (77,729 submissions) and 24% fewer compared to the same period of 2013 (88,723 submissions). Much of the decrease relative to 2014 was attributable to fewer submissions from cattle (22% fewer), pigs (17% fewer) and sheep (9% fewer).

11. There were 24% fewer APHA/SRUC submissions to VIDA between January and March 2016 (15,229 submissions) compared with the first quarter of 2015 (19,980 submissions) and 32% fewer compared to the first quarter of 2014 (22,403 submissions).

12. On the non statutory zoonoses APHA was involved in three outbreak Verocytotoxin-producing *E.coli* (VTEC) investigations in 2015. These included an outbreak of 15 cases of VTEC O157 PT21/28 in people who purchased ready to eat food from two branches of a local butcher outlet in North East England and investigation of an outbreak of approximately 40 cases of VTEC O157 PT8 in England during the summer period.

National Control Programmes for *Salmonella* in chickens in the UK

13. A report was provided on the 2015 *Salmonella* National Control Programmes (NCP) for chickens and turkeys.

14. Broilers – there were 50 flocks positive for *S*.Enteritidis in 2015 compared with none in 2014, one report of *S*. Typhimurium, the same as 2014 and one of *S*. 4,12:i:- compared with none in 2014. There were no flocks positive for *S*.4,5,12:i compared with 8 in 2014. The estimated prevalence of regulated serovars for 2015 was 0.14% (0.02% in 2014), with the increase being due to a hatchery-derived broiler outbreak although still within the EU target of <1%. The hatchery incident involved *S*. Enteritidis PT21 (fully sensitive) and this accounted for the majority of the reports involving broilers and a low number of occupationally affected humans and foodborne cases. Eggs were imported to the hatchery from

several countries, and despite concerted efforts, the definitive source of the infection has not been established.

15. Breeders – No adult breeding flocks were positive for regulated *Salmonella* serovars (*S*. Enteritidis, *S*. Typhimurium (including monophasic strains), *S*. Hadar, *S*. Infantis or *S*. Virchow) in 2015. The EU prevalence target is <1% for regulated serovars. The estimated prevalence of all *Salmonella* spp. in adult breeding flocks in 2015 was 0.44%.

16. Layers – There was one flock positive for a regulated serovar (*S*. 4,12:i:-.) in 2015, giving an estimated prevalence of 0.03%. The EU target is <2%. The estimated prevalence of all *Salmonella* spp. in adult flocks of laying hens within the NCP in 2015 was 0.60%

17. Turkey breeders – No adult breeding flocks tested positive for regulated *Salmonella* serovars (*S*. Enteritidis, *S*. Typhimurium (including monophasic strains), *S*. Hadar, *S*. Infantis or *S*. Virchow) in 2015. The EU target is <1%. The estimated prevalence for all *Salmonella* serovars was 2.04%

18. Turkey fatteners - One turkey fattening flock was positive for *S*. Enteritidis and eight turkey fattening flocks were positive for the monophasic strain of *S*. Typhimurium *S*. 4,5,12:i:- in 2015, giving an estimated prevalence for the regulated serovars of 0.34% (EU target <1%). The prevalence of turkey fattening flocks positive for all *Salmonella* serovars increased substantially in 2015 to 10.2%, which exceeded levels seen in 2013 (8.8%) and 2014 (3.7%). This was largely due to a substantial increase in the number of flocks positive for *S*. Derby.

Human data - Summary of key pathogens for 2015

Trends in laboratory reports

19. 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. Data from 2006-2014 for all countries was extracted from the previous annual EFIG reports. In 2015 the data for England and Wales was extracted from enhanced surveillance databases or from the Second Generation Surveillance System (SGSS), a new laboratory reporting system that includes all reports from both clinical microbiology laboratories as well as from the national reference laboratories. *Salmonella* and *Campylobacter* data were extracted from this SGSS database. *Listeria monocytogenes* data is from the enhanced *Listeria* surveillance database, VTEC data is from the enhanced VTEC surveillance database (England only), and foodborne outbreak data is from the enhanced foodborne outbreaks surveillance system (eFOSS), all of which are Public Health England (PHE) databases. Data for Scotland was provided by Health Protection Scotland and data from Northern Ireland was provided by Health and Social Care Northern Ireland.

20. Figures 1-8 show the trends for non-typhoidal *Salmonella* infections, *Campylobacter*, *Listeria monocytogenes* and *E.coli* O157 in the UK for 2015.

Salmonella

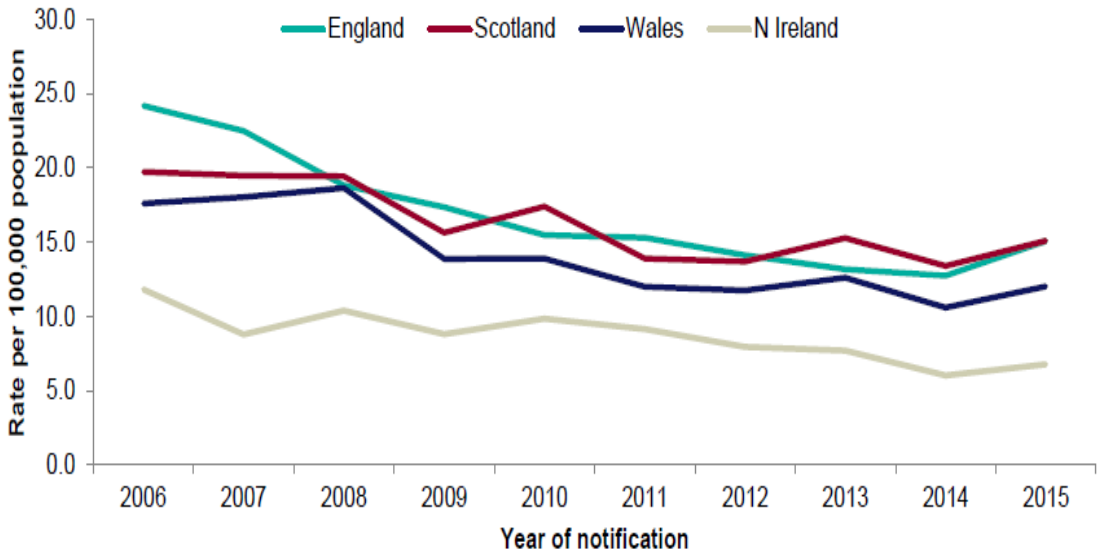
21. There were 9492 reports of non-typhoidal *Salmonella*, an increase on the 8078 reported in 2014. An increase in the reporting rate was seen in all constituent countries (Figure 1) and was due partly to increases in reports of *S.* Enteritidis and *S.* Typhimurium

22. Reports of *S.* Enteritidis increased in all constituent countries, with the largest increases occurring in Scotland, Wales and Northern Ireland (Figure 2). This reverses the general trend of a year on year reduction in reports of *S.* Enteritidis seen in the last decade. The largest increase in number of cases from 2014 to 2015 occurred in England (120) and Scotland (75).

23. The increase in the reporting rate of *S.* Typhimurium is greater than that of *S.*Enteritidis, with a total of 1621 reports in 2015 in the UK compared to 1261 in 2014. This increase was mostly attributable to the increase in the number of cases reported in England (360). A large increase in reporting rate per population was also seen in Northern Ireland from 2014 to 2015 (1.6 per 100,000 to 2.3 per 100,000). The reporting rate in Wales increased marginally, however the rate in Scotland decreased (Figure 3). Northern Ireland has nearly equal numbers of *S.* Enteritidis and *S.* Typhimurium, while Scotland has nearly 2.4 times the number of *S.* Enteritidis infections reported compared to *S.* Typhimurium.

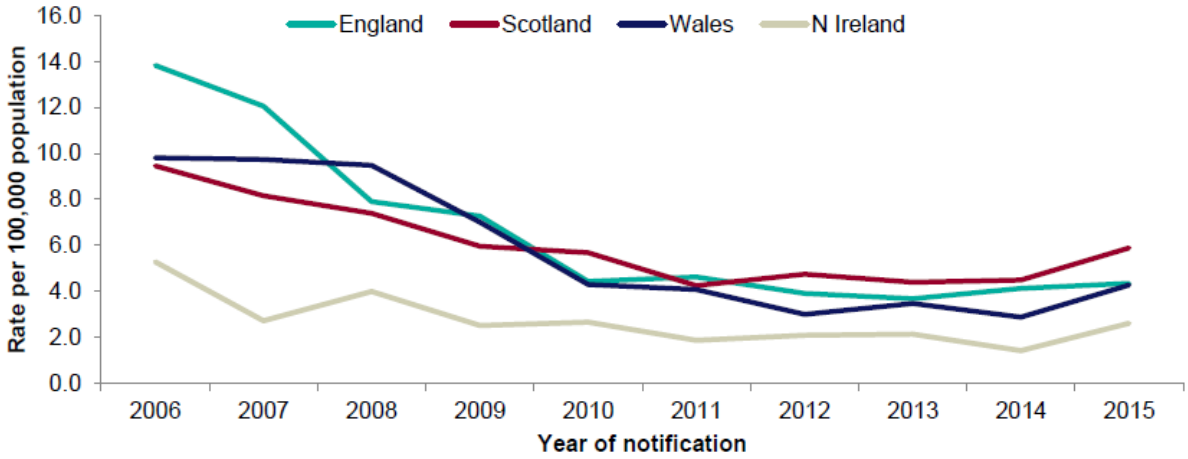
24. *Salmonella* Enteritidis and Typhimurium were the most commonly reported serovars in UK countries (Table 4). The top 10 serovars comprise 71% of all reported *Salmonella* infections in England, 77% in Wales, 80% in Scotland, and 98% in Northern Ireland for which serovar information was available. A greater proportion of *S.* Enteritidis cases reported travel than *S.* Typhimurium cases (36% versus 21%).

Figure 1. Rate of reported non-typhoidal *Salmonella* infections by country per 100,000 population, 2006-2015



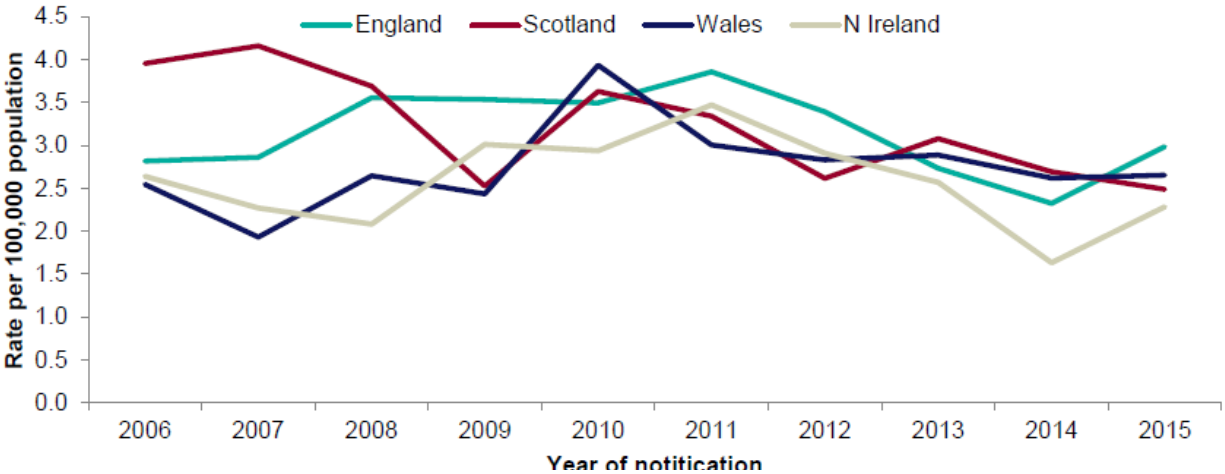
Source: SGSS (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

Figure 2. Rate of reported *Salmonella* Enteritidis infections in the United Kingdom and by nation per 100,000 population, 2006-2015



Source: SGSS (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

Figure 3. Rate of reported *Salmonella* Typhimurium infections by country per 100,000 population, 2006-2015



Source: SGSS (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

Table 1. Number of human isolates for the ten most common non-typhoidal *Salmonella* serovars by country in 2015.

England		Wales		Scotland		Northern Ireland	
Serovar	n	Serovar	n	Serovar	n	Serovar	n
Enteritidis	2362	Enteritidis	132	Enteritidis	315	Enteritidis	48
Typhimurium	1621	Typhimurium	82	Typhimurium	133	Typhimurium	42
Newport	219	Infantis	15	Group B†	41	Infantis	3
Virchow	185	Newport	12	Stanley	20	Stanley	3
Stanley	158	Java	10	Infantis	19	Agona	2
Infantis	153	Kentucky	8	Agona	16	Heidelberg	2
Kentucky	132	Virchow	7	Arizonae	16	Muenchen	2
Agona	131	Agona	5	Group C1‡	15	Nachshonim	2
Oranienburg	101	Saint Paul	5	Newport	14	Saint Paul	2
Braenderup	100	Stanley	5	Virchow	13	*	

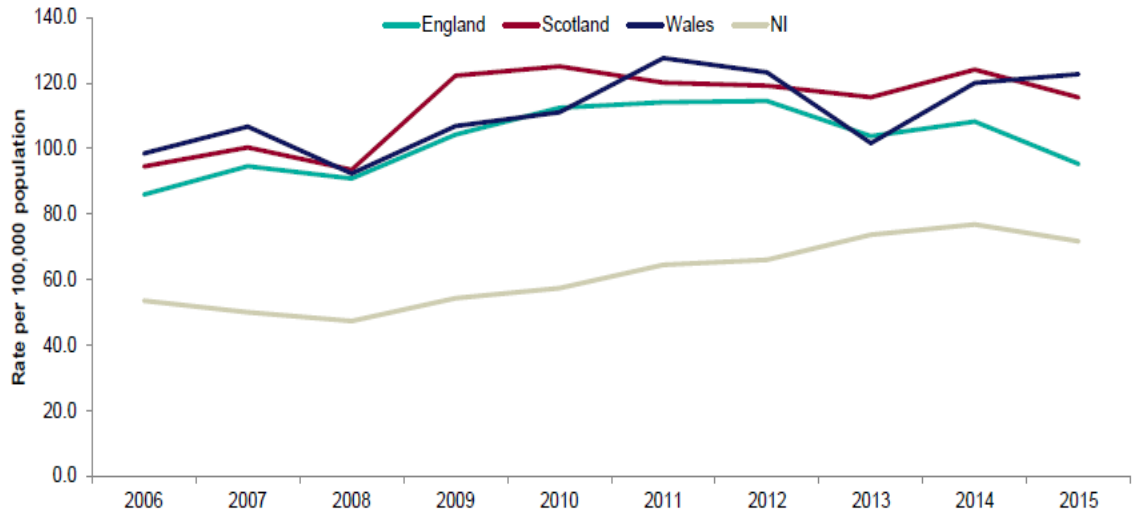
†Group B includes *S.* Agama, Agona, Bredeney, Coeln, Derby, Gloucester, Heidelberg, Indiana, Kiambu, Kimuenza, Mons, Reading, Saint Paul, Schwarzengrund, Stanley, and Typhimurium.
‡Group C1 includes *S.* Braenderup, Cerro, Choleraesuis, Colindale, Concord, Infantis, Larochelle, Livingstone, Mbandaka,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

Source: SGSS (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

Campylobacter

25. The reporting rate for *Campylobacter* has decreased in the UK from 109.2 per 100,000 population in 2014 to 97.7 per 100,000 in 2015. The rate of reported *Campylobacter* infections in England has decreased to the lowest rate reported since 2008, and remains below the rate observed in Wales and Scotland (Figure 5). Northern Ireland continues to report rates lower than the rest of the United Kingdom. Wales is the only country to have reported a higher rate in 2015. Rates of reported infection in Scotland remain similar to that reported in recent years.

Figure 5. Rate of reported *Campylobacter* infections by country per 100,000 population, 2006-2015

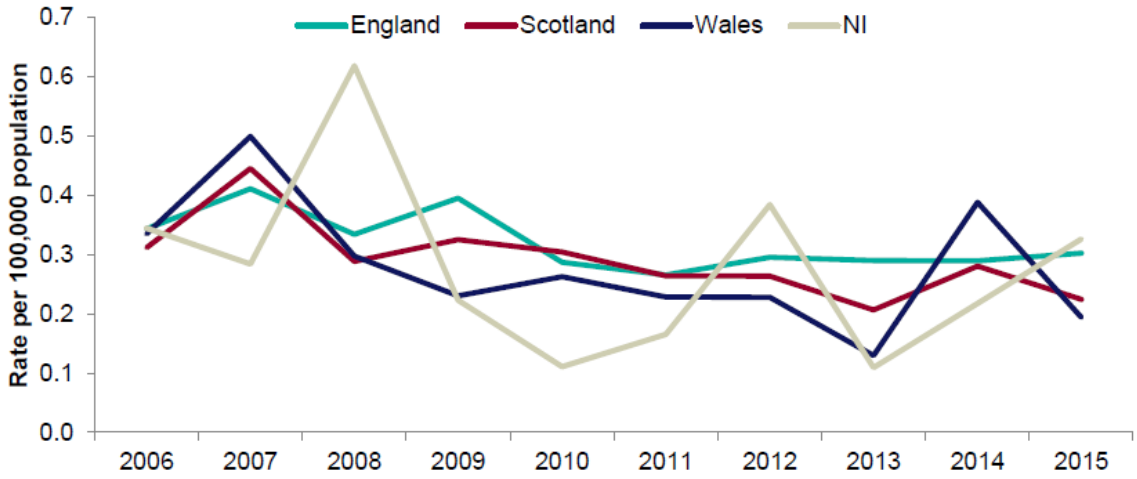


Source: SGSS (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

Listeria monocytogenes

26. The number of *Listeria monocytogenes* infections in the UK has remained stable since the overall decline that was seen from 2010 (Figure 6), however small numbers limit meaningful trend interpretation.

Figure 6. Rate of reported *Listeria* infections by country per 100,000 population, 2006-2015

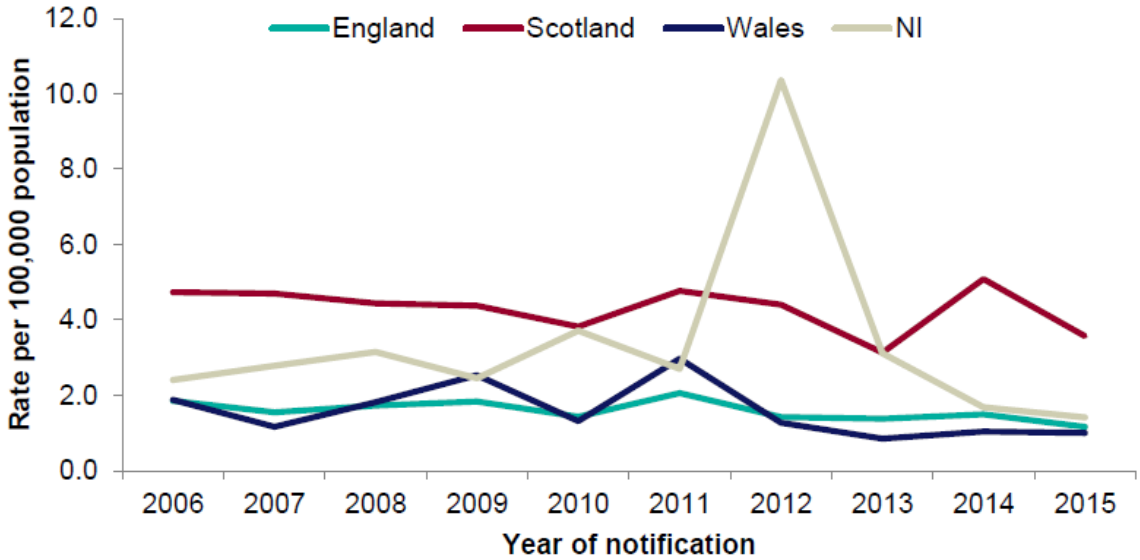


Source: Enhanced Listeria surveillance database (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

VTEC O157

27. VTEC O157 incidence decreased between 2014 and 2015, with the largest decrease being detected in Scotland. In addition, there have been notably fewer VTEC outbreaks over the past year; the reasons for this lower level of activity are unclear.

Figure 7. Rate of reported VTEC O157 infections by country per 100,000 population, 2006-2015



Source: enhanced VTEC database (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

28. Table 2 represents the number of cases detected with the 10 most commonly detected VTEC serotypes across the UK in 2015. This data is being presented for the first time in order to increase awareness of circulating non-O157 serotypes and their contribution to the VTEC disease burden in the UK. Population incidence has not been calculated as serotypes other than O157 are likely to have been under-detected; VTEC culture methods are specific to serotype O157 and the majority of front-line laboratories have not yet implemented molecular testing (PCR to detect toxin genes and genes specific to other serotypes). In England, only 5 - 10% of frontline laboratories have developed this capacity to date. With this caveat, O26 is the most commonly detected non-O157 serotype. Clinical severity amongst all serotypes is variable; for O157 the rate of progression to haemolytic uraemic syndrome (HUS) is 5%, while for O55 a rate of 43% progression to HUS was detected over the past two years (predominantly in connection with an outbreak in Dorset of unknown source / origin).

Table 2. Number of the ten most commonly reported VTEC infections in the UK and by country, 2015*

Serotype	England	Wales	Scotland	Northern Ireland	United Kingdom
O157	630	31	191	26	878
O26	35	0	19	16	70
O103	12	0	3	1	16
O91	14	0	0	1	15
O146	13	0	0	0	13
O145	6	0	0	4	10
O55	9	0	0	0	9
O128	7	0	0	0	7
O166	3	0	4	0	7
O76	5	0	0	0	5

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

Source: PHE

Foodborne outbreaks data

29. In 2015, 49 foodborne outbreaks were reported to eFOSS in England and Wales and to Health Protection Scotland (Table 3). There were no reported foodborne outbreaks in Northern Ireland in 2015.

30. For the first time, *Clostridium perfringens* was the most frequently implicated or suspected causative agent in reported foodborne outbreaks (14/49, 29%), followed by *Salmonella* (12/49, 24%). The majority of foodborne outbreaks occurred in the food service sector (24/49, 49%), followed by institutional/residential (7/49, 14%). Of the food service sector outbreaks, half occurred at restaurants, pubs and takeaways (12/49, 24%).

Table 3. Number of outbreaks attributed to specific pathogens reported in the UK, 2015

Year	England and Wales	Scotland	Northern Ireland	United Kingdom*
Salmonella	12	4	0	12
S. Enteritidis	9	3	0	9
S. Typhimurium	1	0	0	1
Campylobacter	11	0	0	11
C. perfringens†	14	0	0	14
VTEC O157	5	2	0	7
VTEC non-O157	2	0	0	2
Cryptosporidium	1	0	0	1

*Number of outbreaks reported exceeds total number for the UK as national outbreaks with cases in both Scotland and England/Wales reported separately
†Includes two suspected C. perfringens outbreaks

Source: eFOSS (England and Wales), Health Protection Scotland and Health and Social Care Northern Ireland

Clostridium perfringens – foodborne outbreaks reported 2005 to 2015

31. From 2005 to 2015, there were 76 foodborne outbreaks attributed to *Clostridium perfringens* reported to eFOSS. In these outbreaks, 2189 people were affected and of these, there were 387 laboratory confirmed cases, 11 hospitalisations and four deaths. Most outbreaks were reported from the North East of England (28). No national outbreaks were reported. The majority of *Clostridium perfringens* foodborne outbreaks occurred in the food service sector (39/76, 51%), followed by institutional/residential (28/76, 37%), and other foodborne settings (5/76, 7%) settings. Of the food service sector outbreaks, almost half occurred at restaurants and takeaways. A food vehicle was identified in 88% (67/76) of outbreaks with red meat and poultry meat the most frequently identified food vehicles.

32. Factors that contributed to the outbreaks that were reported include: inadequate heat treatment/cooking was the most commonly reported factor (37/76, 49%) in the outbreaks followed by storage too long/too warm (32/76, 42%), inadequate chilling (17/76, 22%), cross contamination (11/76, 14%), other factors (9/76,12%), poor hand washing facilities (4/76, 5%), infected food handler (3/76, 4%) and poor personal hygiene (3/76, 3%).

Combined Animal and Human Data

33. Data for 2015 were presented for the top serovars reported from livestock and humans. Most serovars reported in humans are not routinely found in livestock, with the exception of *S.* Newport and *S.* Typhimurium. Phage types of *S.* Enteritidis and *S.* Typhimurium were presented for livestock species only as phage types for human isolates for the first three quarters of 2015 were reported at the December 2015 meeting. Routine phage-typing of human Salmonella isolates in England and Wales ceased in October 2015 so this information is no longer available

Campylobacter retail survey

34. The group received an update on the latest set of results from Quarter 3 of Year 2 of the survey investigating the prevalence and levels of *Campylobacter* contamination on fresh whole chilled chickens and their packaging (sampling began in July 2015). A summary of the results can be found in paper ACM/1229.

Fully integrated, real-time detection, diagnosis and control of community diarrhoeal disease clusters and outbreaks

35. EFIG received a presentation from Professor Sarah O'Brien on the above project which is a collaborative programme of research led by the University of Liverpool. The project (Integrate) is funded by the Department of Health and the Wellcome Trust through the Health Innovation Challenge Fund and further details are available at http://www.integrateproject.org.uk/. The project aims to modernise the approach to surveillance and clinical diagnosis by incorporating cutting edge research techniques within the areas of population sampling, cluster detection, microbiological methods including clinical diagnostics and pathogen discovery and integration with veterinary surveillance systems. The main findings of study will be presented to EFIG when completed in 2017.

Antimicrobial Resistance

36. EFIG members were informed that the report of the FSA's systematic literature review on antimicrobial resistance in the food chain was undergoing review and revision and was expected to be published in September 2016. The next FSA's Chief Scientific Adviser report will also focus on the topic of AMR. The group's attention was also drawn to the final report of the review on AMR led by Economist Jim O'Neill (Tackling Drug-resistant Infections Globally: Final Report and Recommendations) which was published in May 2016 and is available at: http://amr-review.org/sites/default/files/160525_Final%20paper_with%20cover.pdf

Food Surveillance

PHE Food Water and Environment (FW&E) Services Reconfiguration

37. The group was updated on the reconfiguration of PHE FW&E Microbiology Services for England. From April 2016 PHE will be reconfiguring the Microbiology Services onto three sites by retaining PHE FW&E laboratories in London, Porton and York and distributing the work previously sent to the Preston and Birmingham laboratories to the closest alternative site. It was explained that the chosen option delivers the required revenue savings with no change in Local Authority allocation and level of support for Official Control. There will also be appropriate response to outbreaks or public health incidents. PHE FW&E are currently engaged in more detailed planning and there will be further work with stakeholders on how to maintain and deliver the service with a full implementation before the end of March 2017.

38. Food Survey reports published or submitted for peer review since last EFIG meeting included:

- McLauchlin J, Aird H, Charlett A, Elviss N, Fox A, Kaye M, Willis C. An assessment of the microbiological quality of meat-pies from retail sale in England 2013. J Food Protect 2016;**79**:781-88.

- Owen M, Willis C, Jorgensen F, McLauchlin J, Elviss N, Aird H, Fox A, Kaye M, Lane C, de Pinna E. An assessment of the microbiological safety of duck eggs in England with a focus on *Salmonella* spp. (submitted for publication)

- Sadler-Reeves L, Aird H, de Pinna E, Elviss N, Fox A, Kaye M, Jorgensen F, Lane C, Willis C, McLauchlin J. The occurrence of *Salmonella* in raw and ready-to-eat bean-sprouts and sprouted-seeds on retail sale. Lett Appl Microbiol 2016;**62**:126-9.

- Willis C, McLauchlin J, Amar C, Sadler-Reeves L, Elviss N, Aird H, Fox A, Kaye M. An assessment of the microbiological safety of pre-cut fruit from retail and catering premises in the United Kingdom. J Food Protect 2016:**79**:598-604.

Co-ordinated Food Sampling Programme in Scotland 2016/17

39. Food Standards Scotland is making funding available to Scottish local authorities (co-ordinated through liaison groups) for sampling and surveillance of food. This programme aims to provide a co-ordinated, risk-based approach for sampling, and covers both imported and UK-produced food, where relevant. Samples will be taken between July 2016 and March 2017, though consideration will be given to the availability of products and seasonal influences. All results of samples will then be uploaded to the UK Food Surveillance System by 31 May 2017.

Action

40. ACMSF Members are invited to comment on the recent trends in animal and human data and other subjects discussed by EFIG at the June 2015 meeting.

Secretariat
June 2016