ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

EPIDEMIOLOGY OF FOODBORNE INFECTIONS GROUP (EFIG)

1. The group met on 7 December 2015 and the following is a combined summary of the animal and human data and other topics that were discussed at the meeting.

Animal data

Great Britain: *Salmonella* Summary January – September 2015 (Provisional)

2. Key points from the January – September 2015 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) report on *Salmonella* in livestock production in Great Britain provides further details including the reasons for collection of this data. The latest report is for 2014 and is available at. https://www.gov.uk/government/statistics/salmonella-in-livestock-production-in-great-britain-2014

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 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).

5. Between January and September 2015, there were 815 reports of *Salmonella* from livestock species not subject to *Salmonella* National Control Plans (NCPs), which is 4% lower than during January - September 2014 (849 reports) and 5% lower than in the same period in 2013 (859 reports). The decline since 2014 is largely attributable to a decrease in *Salmonella* reports from cattle. The top serovars in cattle, pigs, sheep and ducks were Dublin, 4,12:i:-, 61:k:1,5,(7) and Indiana respectively.

6. There were 13 reports of *S*. Enteritidis during January – September 2015 compared with six during January – September 2014. Most reports were from non-food animals. There were 3 reports of S.Enteritidis PT9b from ducks and 1 of *S*.Enteritidis from cattle which could not be phage typed.

7. Reports of *S*. Typhimurium have decreased by 27% compared with the same period in 2014 (77 vs. 105 incidents), whilst reports of *Salmonella* 4,5,12:i:- have remained at a similar level (39 vs. 38 incidents). Phage type U288 was the most

commonly reported phage type of non-monophasic *S*. Typhimurium with all reports being from pigs.

8. Reports of *Salmonella* 4,12:i:- have almost doubled compared with January – September 2014 (47 vs. 24 incidents). The most common definitive phage type for these monophasic strains was DT193 which was found in 81% of the *S.* 4,12:i:- incidents and 92% of the *S.* 4,5,12:i:- incidents. More than two thirds of the monophasic *Salmonella* isolates (63/86) were from pigs.

9. There were 10% fewer APHA/SRUC submissions to VIDA between January and September 2015 (52,676 submissions) compared with January - September 2014 (58,341 submissions) and 23% fewer compared to the same period of 2013 (68,221 submissions). Much of the decrease relative to 2014 was attributable to fewer submissions from cattle (17%) and pigs (5%); submissions from sheep, birds and miscellaneous species were roughly comparable to January – September 2014.

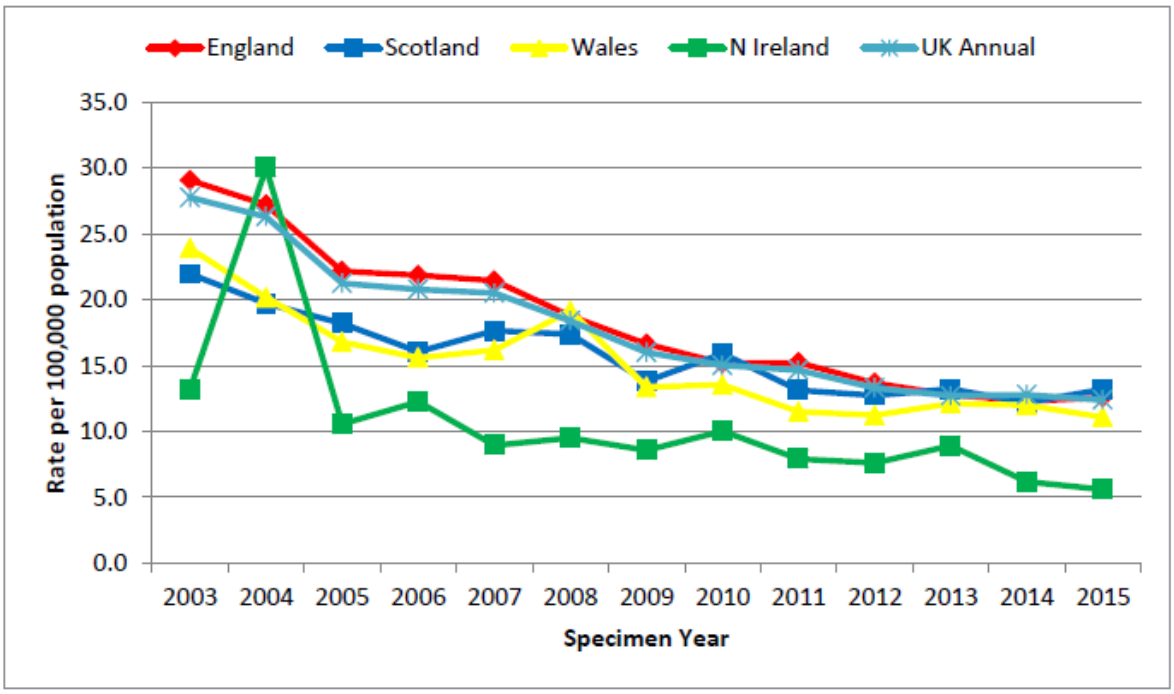
Human data - Summary for key pathogens in 2015 Quarters 1-3 (January - September

10. It should be noted that the data used represent reports received at laboratories in each country in the first three quarters of each year, and as such may not be truly representative of the annual picture.

11. Figures 1-8 show the trends in laboratory reports for non-typhoidal *Salmonella*, *Campylobacter*, *Listeria monocytogenes* and *E.coli* O157 in the UK for the first three quarters (January–September) 2005-2015. Overall *Listeria monocytogenes*, *Salmonella* and verocytotoxigenic *Escherichia coli* (VTEC) O157 notifications have declined marginally and *Campylobacter* increased slightly, based on data for the first three quarters in 2015, compared to the same period in 2014.

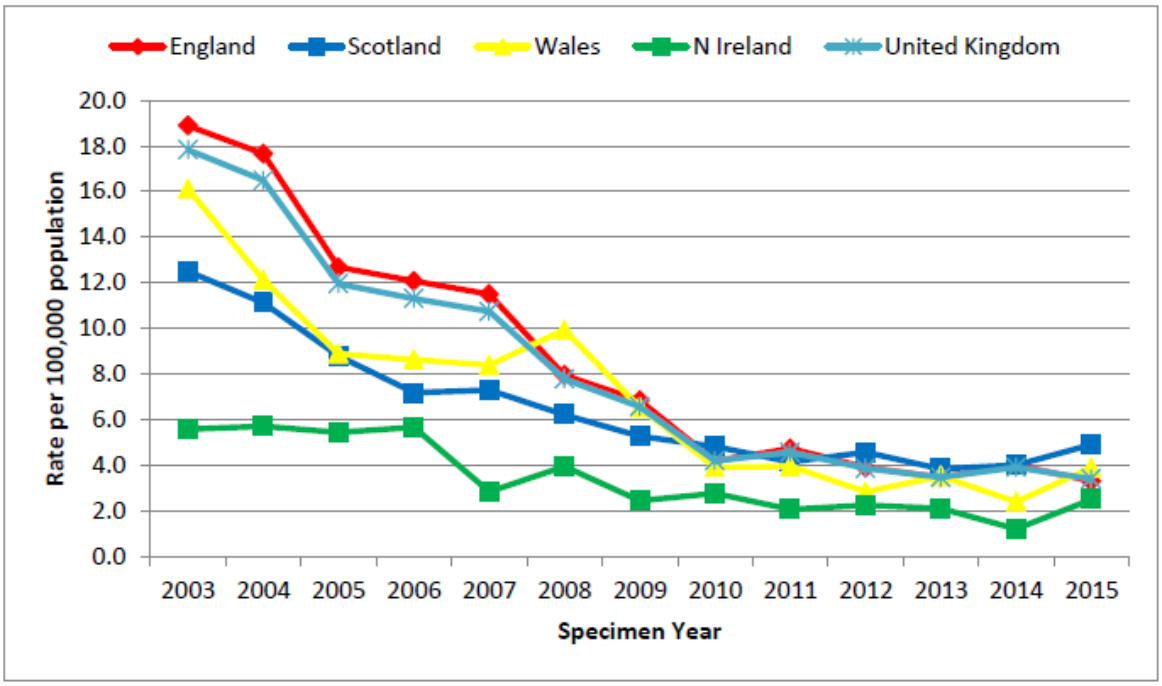
12. *Salmonella* reports continued to decline in 2015, with 6,400 isolates reported in the UK compared to 6,605 reports in the same time frame in 2014, a 3% reduction and equivalent to a 52% decline for the same period in 2003 (13,235 reports) (Figure 1). However, there is variation between countries with an increase in reports of *Salmonella* from Scotland and Wales but a reduction in reports from England and Northern Ireland. The predominant cause of the decline remains the reduction in the number of reports of *Salmonella* Enteritidis (Figures 2 and 3), but in 2015, a decline was also seen in S*almonella* Typhimurium in all countries (Figure 4). The number of reports of *S*. Typhimurium DT 193 in the UK for January-September 2015 was marginally higher than in the same period in 2014 although there were marked differences in rates between countries, presumably due to the relatively small numbers of reports.

Figure 1. Non-Typhoidal *Salmonella* all cases



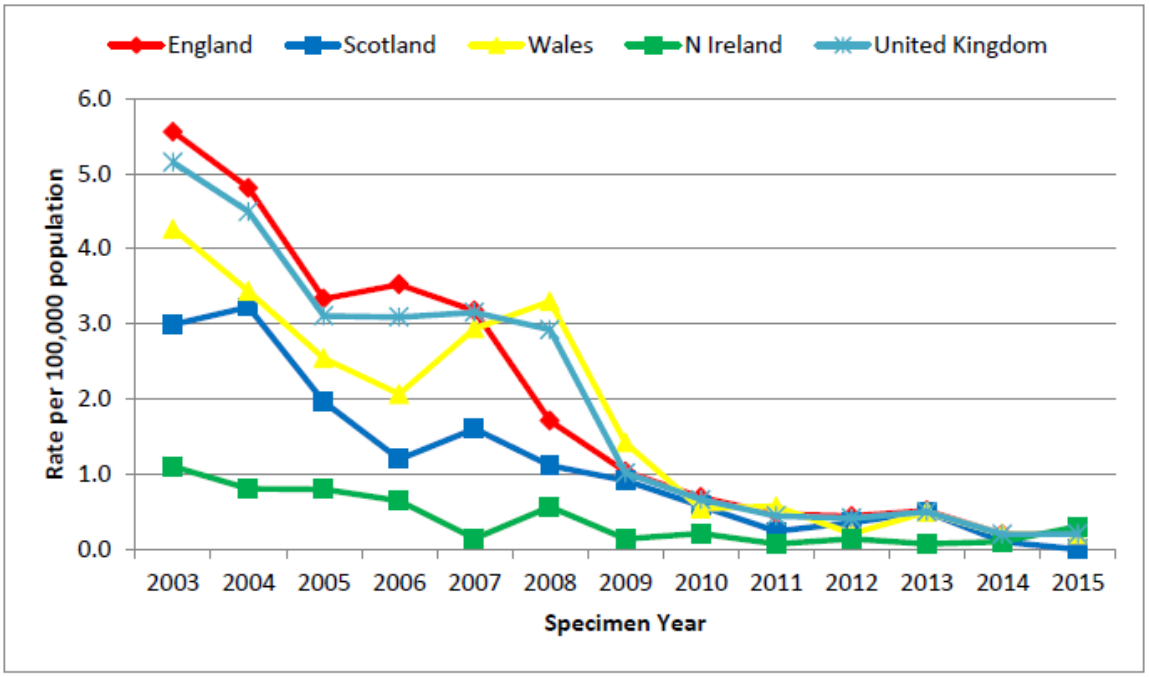
Source: PHE

Figure 2.*Salmonella* Enteritidis all isolates, to third quarter



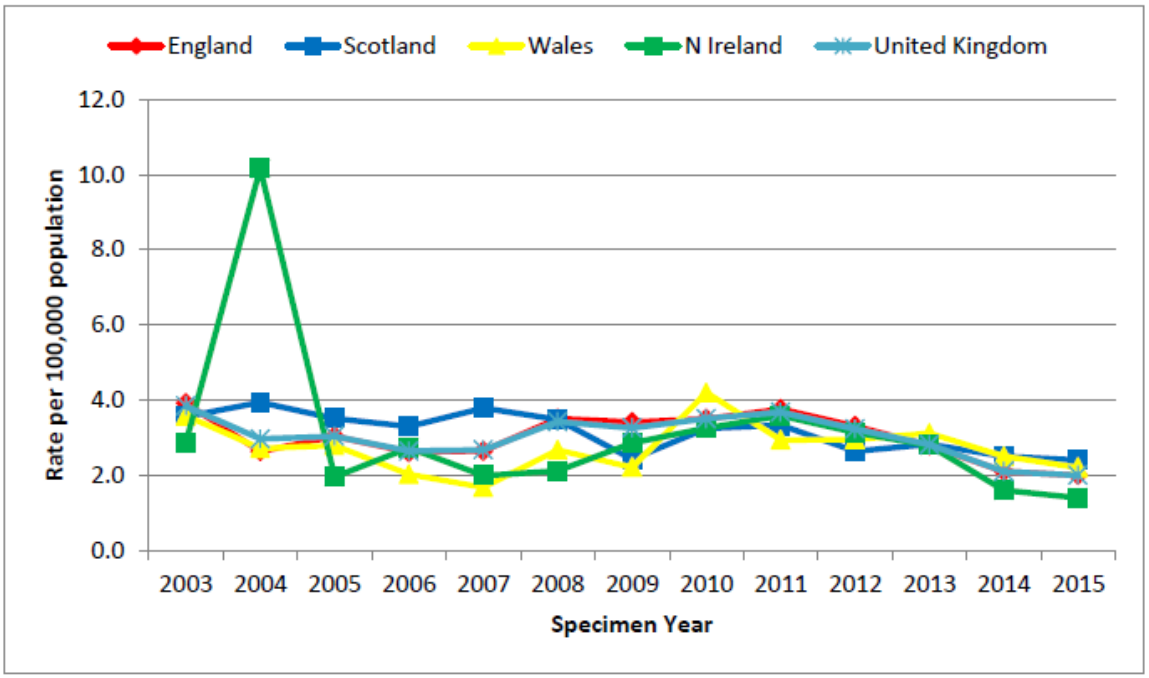
Source: PHE

Figure 3. *Salmonella* Enteritidis Phage type 4 all isolates to third quarter



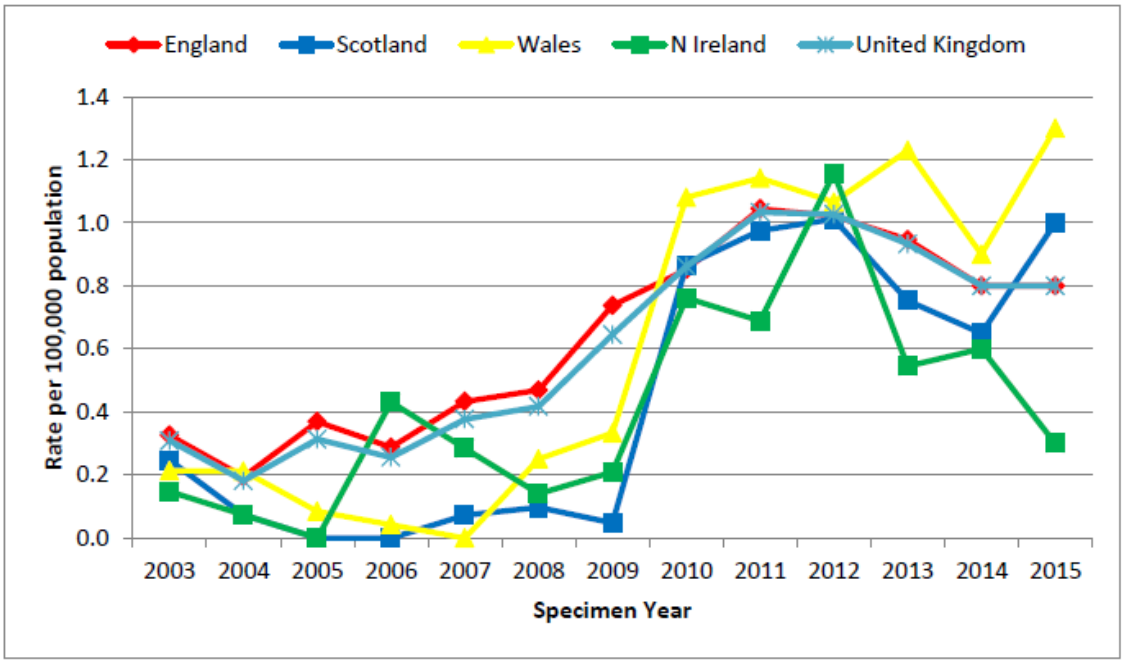
Source: PHE

Figure 4. *Salmonella* Typhimurium all isolates to third quarter



Source: PHE

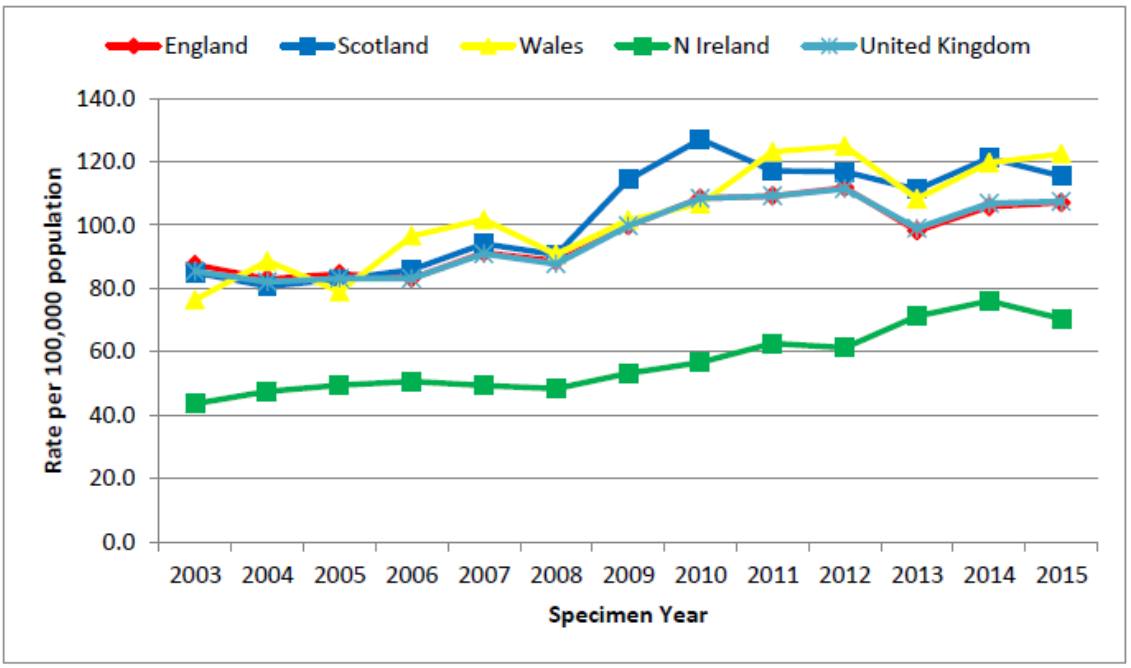
Figure 5. *Salmonella* Typhimurium DT 193 all isolates to third quarter



Source: PHE

13. Reported *Campylobacter* infections (Figure 6) increased marginally in the first three quarters of 2015 in England and Wales but decreased slightly in Scotland and Northern Ireland.

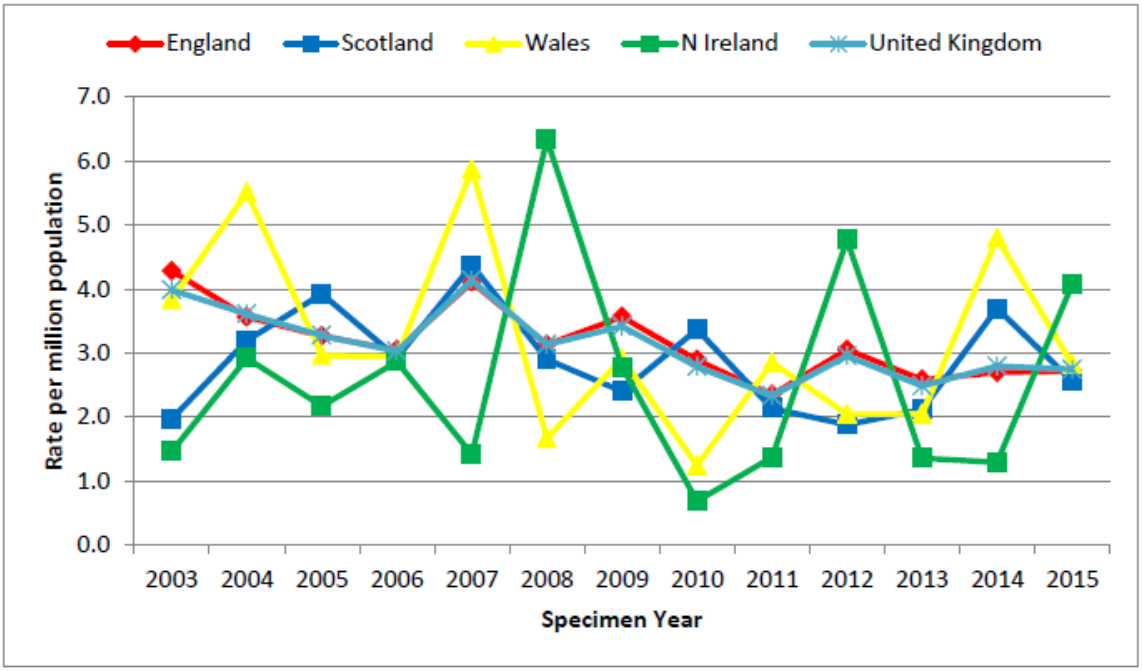
Figure 6. *Campylobacter* spp. all isolates to third quarter



Source: PHE

14. *Listeria monocytogenes*, though stochastic due to the relatively small numbers reported annually, decreased slightly in the UK overall in the first 3 quarters of 2015 compared to the same period in 2014 (Figure 7). The rates in Wales and Northern Ireland show considerable year to year variation.

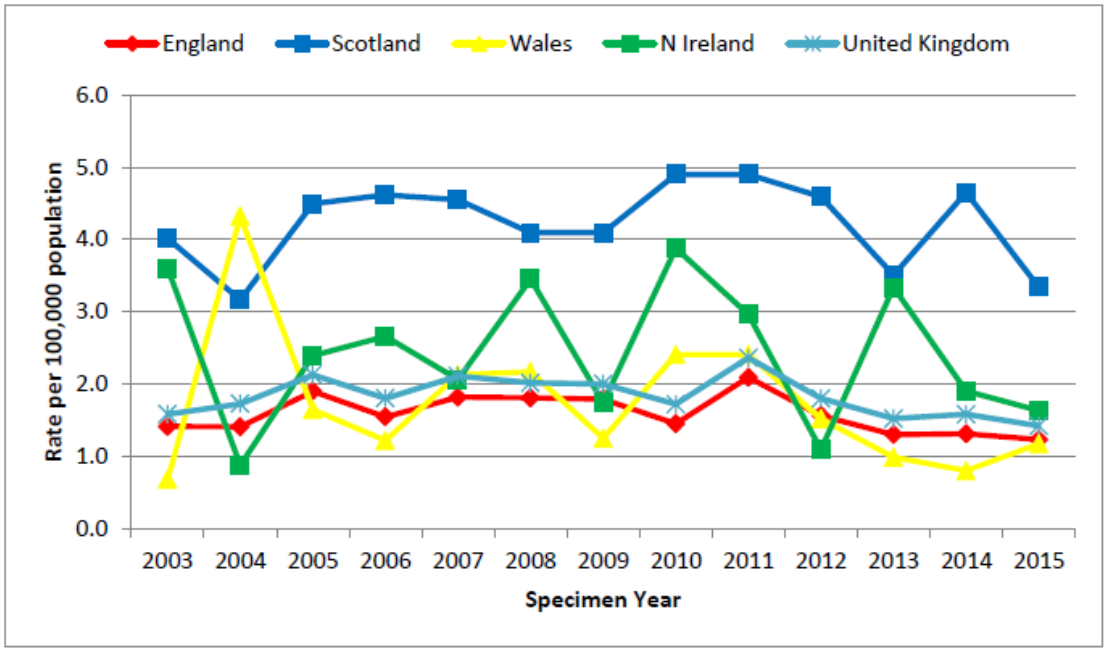
Figure 7. *Listeria monocytogenes* all isolates to third quarter



Source: PHE

15. Verocytotoxigenic *Escherichia coli* (VTEC) O157 notifications for the first three quarters of 2015 decreased in England, Scotland, Northern Ireland and United Kingdom generally, but have increased in Wales, compared to the same period in 2014. The largest decreases were seen in Scotland and Northern Ireland. The number of notifications from Wales has been 50 or lower since 2008; consequently the slight increase seen for the first three quarters may not remain once data for the fourth quarter has been added.

Figure 8. *E. coli* O157 all isolates to third quarter



Note: The method used to collate and calculate VTEC counts has been updated. The updated method has been applied to data from quarter 4 2014 to present.

Source: PHE

Foodborne outbreak data

16. Provisional data for the first 9 months of 2015 indicated that there were 8 *Campylobacter,* 7 *Salmonella*, 7 (5 plus 2 suspected) *Clostridium perfringens* and 4 VTEC O157 foodborne outbreaks. Three of the *Campylobacter* outbreaks were associated with chicken liver pate/parfait and 4 with poultry or other meats. The group discussed the issues regarding the investigation and capturing of *C perfringens* cases in relation to regional laboratories and the national surveillance system and agreed to revisit this at the June 2016 meeting.

Other items of interest

Update on STEC

17. Richard Elson (PHE) gave a presentation on STEC O157 surveillance, response and research. In reviewing data over the past 25-30 years it was noted that infections went up in 1990s but dropped in subsequent years due to various activities aimed at controlling these organisms; currently there were about 800 cases a year with increases tending to be due to occasional large outbreaks. During this time the predominant phage type in cases had shifted from PT2 in the 1990s to PT21/28 and PT8. There had also been a shift in the mode of transmission in outbreaks 61% of outbreaks from 1992 to 2000 being foodborne whereas from 2001 to 2013 it was 32%. The burden of morbidity of STEC O157 in England in Wales was highest in children under 10 years of age and

particularly those aged 1 to 4.

18. Enhanced surveillance for STEC was introduced in 2009 and analysis of this data supports the findings of previous epidemiological studies in England. It was noted that rates of infection are higher in:

    - People living in rural areas compared to urban areas
    - Rural cases report higher levels of exposure to private water supplies, open fresh water, livestock or their faeces
    - Urban cases are more likely to report visiting a farm, rural cases more likely to report living on or working at a farm or having access via family members.
    - Non-O157 STEC strains were associated with higher hospitalization and HUS rates than STEC O157 strains but are under ascertained. Work is underway to improve detection of these strains at local laboratories using PCR.
    - STEC incidence associated with higher cattle density, higher ratio of cattle to people and higher minimum temperature.

19. It was highlighted that the enhanced surveillance data could be used to identify hotspots where there are high rates of infections and their alignment with other factors such as cattle locations, urban areas and regional signals for particular strains of STEC.

20. It was also highlighted that STEC enhanced surveillance could be valuable in monitoring cases of STEC in the light of the recent FSA Board decision on the serving of rare burgers. Enhanced surveillance could provide data on food and non-food exposures and could be useful in detecting patterns alongside the monitoring of rare burger consumption trends.

21. Whole Genome Sequencing (WGS) had made it possible to link cases more accurately which was particularly helpful in outbreak detection and investigation. In the light of these developments and the availability of enhanced surveillance EFIG agreed that it would be timely to consider data on non O157 STEC. However, it was agreed that appropriate caveats would need to be attached to any data provided as there was variation in laboratory detection methods and which laboratories were actively looking for non-O157 STEC. It was anticipated that data for non O157 STEC infections will be provided for the next EFIG meeting in June 2016.

Stock take of whole genome sequencing

22. Kathie Grant (PHE Gastrointestinal Bacteria Reference Unit) provided an update on PHE's WGS activities. She reported that the move to WGS has provided a single one step method for identification and typing and provides a wealth of additional information. This includes: reduced time and costs, potential for rapid global comparability, improved resolution for strain discrimination, able to provide phylogenetic information, improved cluster detection, ability to rapidly screen

large number of isolates for virulence genes including AMR genes. This information leads to an improved understanding of GI pathogens and outbreaks.

23. Members were provided with an overview of the WGS workflow including how *Salmonella* serotypes are derived from MLST data. Single Nucleotide Polymorphism (SNP) analysis is used to detect clusters and outbreaks and examples where SNP analysis had been used successfully for outbreak investigation included an International outbreak of *Salmonella* Enteritidis PT14b in the summer 2014 linked to eggs from Germany and a *Salmonella* Enteritidis PT8 cluster in September 2015. Although WGS had initially focused on *Salmonella*, since June 2015 it had been applied to STEC isolates in parallel with conventional methods and had proved valuable in investigating a number of outbreaks. WGS had been used for all *Campylobacter* isolates received by the reference laboratory since January 2015. PHE are part of an EFSA funded project to sequence 1000 *Listeria* isolates from the EU baseline survey from 2010-11 and EU clinical isolates from the same year.

24. Following the recent report of a plasmid-encoded colistin resistance gene (*mcr-1*) in *E.coli* from pigs, raw meat and human infections in China PHE were able to rapidly screen their archive of thousands of genomes for the *mcr-1* gene. This demonstrated the power of WGS for rapid screening for antimicrobial resistance genes.

25. In conclusion the group were informed that WGS is being used to deliver reference microbiology for GI pathogens in real time – *Salmonella*, *E. coli*, *Shigella*, *Campylobacter* and with *Listeria monocytogenes* from March 2016. WGS is producing the highest degree of resolution for typing plus phylogenetic information thereby enabling:

- Real time monitoring of clusters, of virulence and AMR of all strains
- Detecting more outbreaks – smaller outbreak, geographically spread, over longer time frame
- Accurate and robust outbreak definition – finds cases and rules out unrelated cases from an outbreak – refines outbreak investigation
- Increased case ascertainment and indication of location/source of infection

Campylobacter retail survey

26. The group were presented with the first quarter results of the year 2 survey investigating the prevalence and levels of *Campylobacter* contamination on fresh whole chilled chickens and their packaging (sampling began in July 2015). The survey aims to examine more than 4,000 samples of whole chickens bought from UK retail outlets and smaller independent stores and butchers.

27. The results for the first quarter of testing, from July to September 2015, showed 15% of chickens testing positive for the highest level of contamination, down

from 22% for the same period in 2014. *Campylobacter* was present on 76% of chicken samples, down from 83% for the same period in 2014.

28. The results for the year 2 first quarter show:

- 15% of chickens tested positive for *Campylobacter* within the highest band of contamination[+]
- 76% of chickens tested positive for the presence of *Campylobacter*
- 0.3% of packaging tested positive at the highest band of contamination[+]
- 6% of packaging tested positive for the presence of *Campylobacter*

[+] More than 1,000 colony forming units per gram (cfu/g). These units indicate the degree of contamination on each sample.

29. In the first quarter 1,032 samples of fresh whole chilled UK-produced chickens and packaging were tested. The chickens were bought from large UK retail outlets and smaller independent stores and butchers. As with the previous survey carried out between February 2014 and February 2015, the data shows variations between the retailers. Members discussed how the survey data is collected and the factors that may have influenced the reductions seen.

Food Surveillance

30. The Government's announcement on 25th November concerning PHE laboratories at Colindale and Porton and a consultation on reconfiguration of PHE's Food Water and Environment (FW&E) laboratories was noted. Recently published papers resulting from FW&E surveys concerned a follow-up study of hygiene in catering premises at large scale events in the United Kingdom (J. Appl. Microbiol., 2015;**118**:222-32) and an assessment of the microbiological safety of fresh whole leaf herbs from retail premises in the United Kingdom with a focus on *Salmonella* spp. (J. Appl. Microbiol., 2015;**119**:827-33). Papers either in press, submitted or due to be submitted shortly concerned *Salmonella* in raw and ready-to-eat bean-sprouts and sprouted-seeds on retail sale, the microbiological safety of pre-cut fruit from retail and catering premises in the United Kingdom and an assessment of the microbiological safety of duck eggs in England with a focus on *Salmonella* spp. PHE had recently completed a study on the microbiological quality of meat-pies from retail sale in England.

Other issues

31. Members again touched on the issue of how to make data considered by the group more accessible. It was acknowledged that a summary of EFIG's discussions is provided to ACMSF via a paper that is published on the ACMSF webpage although this does not include the raw data on laboratory reports for key pathogens. Members agreed to discuss access to EFIG data at its next meeting.

Action

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

Secretariat
January 2016