# ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

## EPIDEMIOLOGY OF FOODBORNE INFECTIONS GROUP (EFIG)

1. The group met on 17 January 2018 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 – September 2017 (provisional data)

2. Key points from the January – September 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 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 single premises, within a defined time period (usually 30 days).

5. During January – September 2017 the number of reports of *Salmonella* in livestock increased by 20% in comparison to January – September 2016, by 8% compared with January – September 2015 and by 4% compared with January – September 2014. There were 10 reports of *S*. Enteritidis compared with 4 during the equivalent period of 2016 and 13 during the equivalent period of 2015. Reports of *S*. Typhimurium during January – September 2017 increased by 5% compared with January – September 2016 (85 vs. 81 reports). There was also an increase (46%) in reports of the monophasic strain *Salmonella* 4,12:i:-. Reports of the monophasic strain *Salmonella* 4,5,12:i:- however, decreased by 19% compared with January – September 2016. The most common phage types of *S*. Typhimurium and the two monophasic strains during January – September 2017 were DT104 and DT 193. There were 21 x DT104, 20 x U288 and 68 x DT193; DT104 and DT193 are the most common. For S. Typhimurium alone, DT104 and U288 are the most common.

6. During January – December 2017, the percentage of total diagnostic submissions to APHA from premises in England and Wales that were carcase samples was higher for cattle and small ruminants than during the equivalent period of 2016, but lower for pigs, birds and miscellaneous species (including horses and camelids amongst other species). However, these data should be treated with caution as they are provisional.

7. The number of diagnoses of *Listeria* from sheep during January – December 2017 was 48% lower than during January – December 2016 (76 reports vs. 146 reports). Clinical disease in cattle and sheep is related to the environment (e.g. silage or dumped rubbish); however, as clinical *Listeria* is easily diagnosed on the farm it may not get reported to APHA. A breakdown of APHA *Listeria* diagnoses by region during 2015, 2016 and 2017 shows that, in general, there are a greater percentage of reports originating from premises in England and Wales than from Scotland.

8. There were no VTEC O157-related visits carried out by APHA during January – December 2017.

## *Salmonella* National Control Programme results 2017

9. It was highlighted that the results were provisional data for the number of positive flocks with regulated and non-regulated serovars in 2017. The data was taken from the quarterly NCP reports and as such may not account for duplicates appearing in different quarters. It was underlined that data was subject to change prior to APHA's official reporting of the annual statistics.

10. Overall the total number of regulated and non-regulated serovars in poultry flocks is higher in 2017 compared to 2016. For chicken and turkey breeders no regulated serovars were identified in 2017 compared to 1 chicken breeder in 2016. The number of flocks with non-regulated serovars has increased slightly for turkey breeders and decreased slightly for chicken breeders.

11. The number of layer flocks with regulated serovars in this sector in 2017 (n=6) is higher than in 2016 and the highest since 2011. All incidents involved *Salmonella* Enteritidis and not *Salmonella* Typhimurium (or the monophasic strains). The number of flocks with non-regulated serovars is slightly higher than 2016. For broilers there was a small reduction in the number of regulated serovars in this sector in 2017 compared to 2016 although there was a large increase (approx. 28%) in the number of non-regulated serovars, related to feed and hatchery contamination. The top four serovars in 2017 were the same as 2016 (*S.* Mbandaka, *S.* Kedougou, *S.* 13,23:i:- and *S.* Senftenberg). For turkey fatteners there

were 7 flocks identified with regulated serovars in 2017, four with *S.* Enteritidis and three with monophasic *Salmonella* Typhimurium.

## Human Infection Data – Summary of key pathogens for quarters 1-3 2017

### Trend in laboratory reports

12. 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.

13. 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.

14. Figures 1-7 show the trends for non-typhoidal *Salmonella* infections, *Campylobacter*, *Listeria monocytogenes*, Shigatoxin producing *E.coli* (STEC) O157 and foodborne outbreaks in the UK.

#### Non-typhoidal *Salmonella*

15. The group was informed that there were 7722 reports of non-typhoidal *Salmonella* reported in the first three quarters of 2017, an increase from the 7063 reported in quarters 1-3 2016. An increase in the reporting rate was seen in England and Wales while a decrease was seen in Scotland and Northern Ireland. Compared to the previous year, the overall number of reported infections increased in the UK by 659.

### *Salmonella* serovars

16. Reports of *S.* Enteritidis increased in the UK overall in the first three quarters of 2017 compared to the same period in 2016, predominately due to an increase in England (reporting rate 4.1 per 100,000 population compared to 3.6 in 2016). Decreases were seen in Scotland and Northern Ireland and the reporting rate was approximately the same in Wales compared to the previous year.

17. An increase in the reporting rate of *S.* Typhimurium in the UK overall was seen in Q1 – Q3 compared to the same period in 2016. This increase was due to an increase in England (reporting rate 3.4 per 100,000 population compared to 2.9 in 2016) while the reporting rate in Scotland and Northern Ireland decreased and the reporting rate was approximately the same in Wales compared to the previous year.

18. As in previous years, the most commonly reported *Salmonella* serovar in the UK for quarters 1-3 2017 was *S.* Enteritidis. Together S. Enteritidis and S. Typhimurium constituted ~49% of all non-typhoidal Salmonellae reported in the United Kingdom for which a serovar result was available.

19. PHE are further investigating these trends. It was highlighted that there have been several outbreaks of *S.* Enteritidis recently, with long duration clusters associated with a variety of vehicles. There have also been two recent outbreaks of S. Typhimurium in England and Wales that PHE, FSA and APHA have been investigating.

20. Members noted the number of the ten most common non-typhoidal *Salmonella* serovars isolated by country for quarters 1-3 2017. *S*. Enteritidis and *S*. Typhimurium make up ~50% of the case isolates. It was noted that *Salmonella* travel related cases were not included in the report but will be included in the annual report to be presented at the July 2018 meeting. There was discussion on further assessment of other *Salmonella* serovars and PHE indicated that would be considering general *Salmonella* spp. trends in the assessment.

**Figure 1. Rate of reported non-typhoidal *Salmonella* infections by country per 100,000 population for quarters 1-3, 2008-2017**

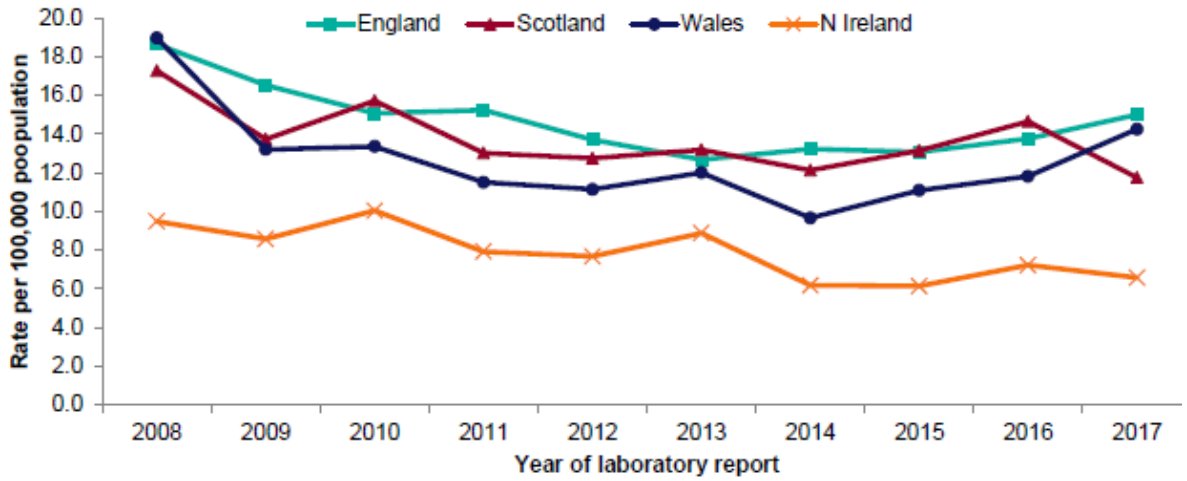


**Figure 2. Rate of reported *Salmonella* Enteritidis infections in the United Kingdom and by nation per 100,000 population for quarters 1-3, 2008-2017**

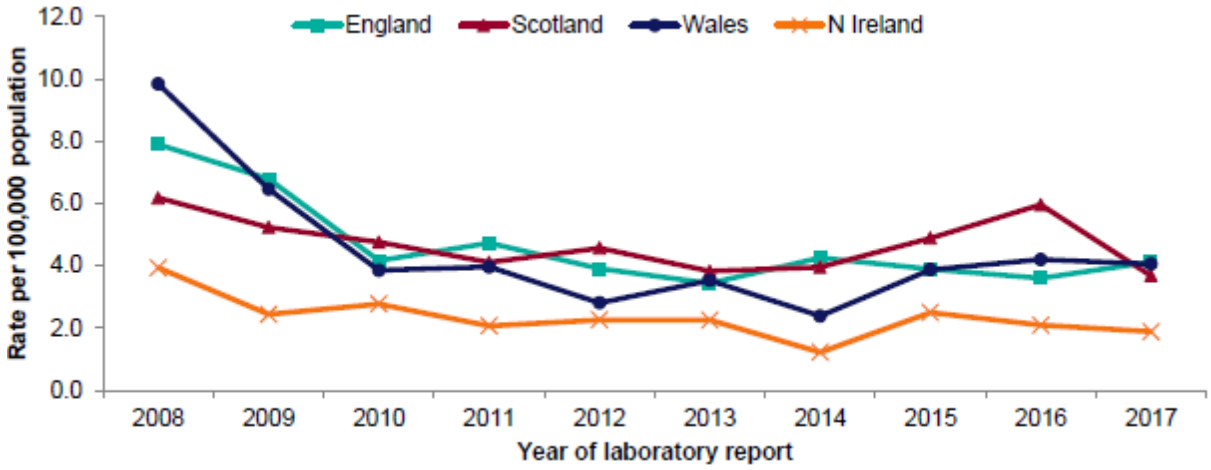



**Figure 3. Rate of reported *Salmonella* Typhimurium infections by country per 100,000 population for quarters 1-3, 2008-2017**

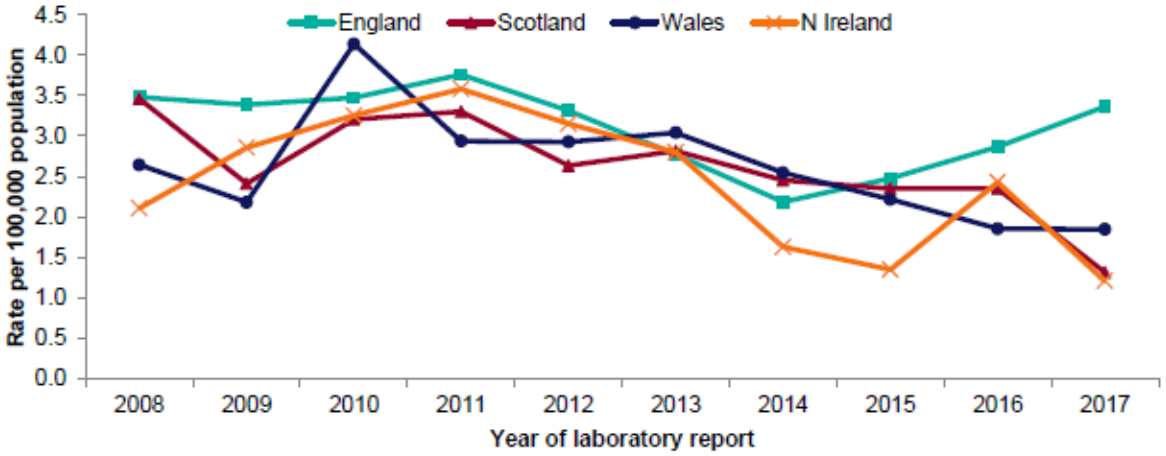


**Table 1: Number of the ten most common non-typhoidal salmonella serovars isolated, by country for quarters 1-3 2017**

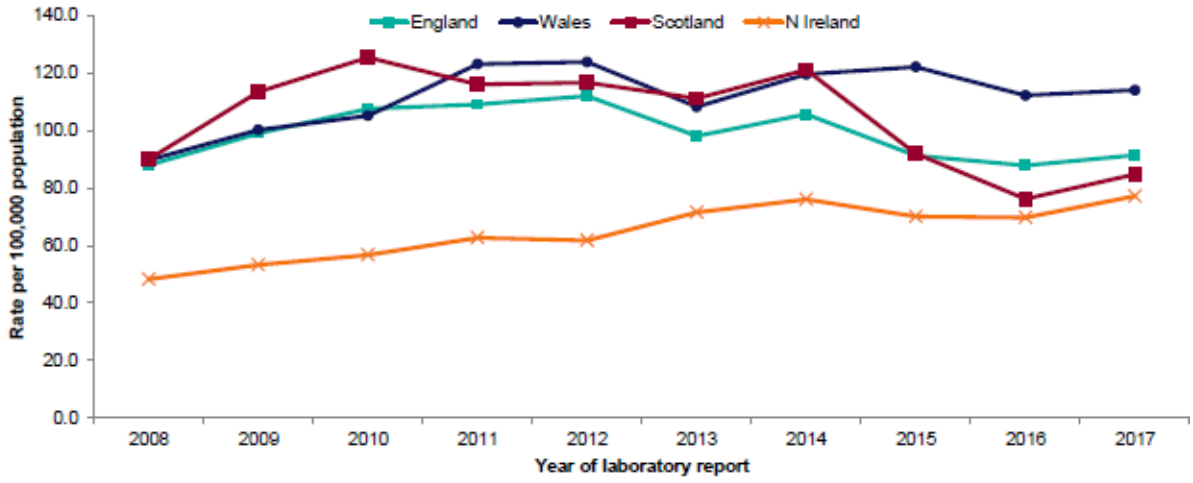
| England | | Wales | | Scotland | | Northern Ireland | |
|---|---|---|---|---|---|---|---|
| Serovar | n | Serovar | n | Serovar | n | Serovar | n |
| Enteritidis | 1820 | Enteritidis | 101 | Enteritidis | 199 | Enteritidis | 28 |
| Typhimurium | 1487 | Typhimurium | 46 | Group B* | 100 | Typhimurium | 18 |
| Newport | 268 | Newport | 15 | Typhimurium | 71 | Stanley | 4 |
| Agona | 167 | Arizonae | 8 | Group C1** | 19 | Mikawasima | 4 |
| Infantis | 147 | Infantis | 8 | Java | 16 | Infantis | 4 |
| Stanley | 130 | Java | 8 | Group C2** | 15 | Saint-Paul | 3 |
| Kentucky | 105 | Agona | 6 | Newport | 14 | Newport | 3 |
| Virchow | 102 | Corvallis | 5 | Bovis-morbificans | 11 | Agona | 3 |
| Java | 89 | Hadar | 5 | Kentucky | 11 | Java | 2 |
| Bareilly | 72 | Kentucky | 5 | Stanley | 11 | Indiana | 2 |

*Group B includes S. Agama, Agona, Bredeney, Coeln, Derby, Gloucester, Heidelberg, Indiana, Kiambu, Kimuenza, Mons, Reading, Saint Paul, Schwarzengrund, Stanley, and Typhimurium.
**Group C1 and C2 includes S. Braenderup, Cerro, Choleraesuis, Colindale, Concord, Infantis, Larochelle, Livingstone, Mbandaka, Menston, Montevideo, Ohio, Oslo, Riggil, Rissen, Tennessee, Thompson, and Virchow.

### *Campylobacter*

21. The reporting rate for *Campylobacter* increased in the UK from 89.1 per 100,000 population in quarters 1-3 of 2016 to 93.3 per 100,000 in quarters 1-3 in 2017. Every country reported more cases in Q1 – 3 of 2017 than in the same period for 2016, with the largest increase in reporting rate in Scotland. Wales still reports the highest rate of all UK countries (114.2 per 100,000 population in 2017). Northern Ireland continues to report rates lower than the rest of the United Kingdom. Overall, there was a notable reduction in reports of *Campylobacter* infections to national surveillance for the period Q1 – Q3 of 2014 to 2016 but this decline in reports has not been sustained for the same period in 2017. It was reported that PHE will liaise with other the UK countries to see how the *Campylobacter* data could be explored in more detail.

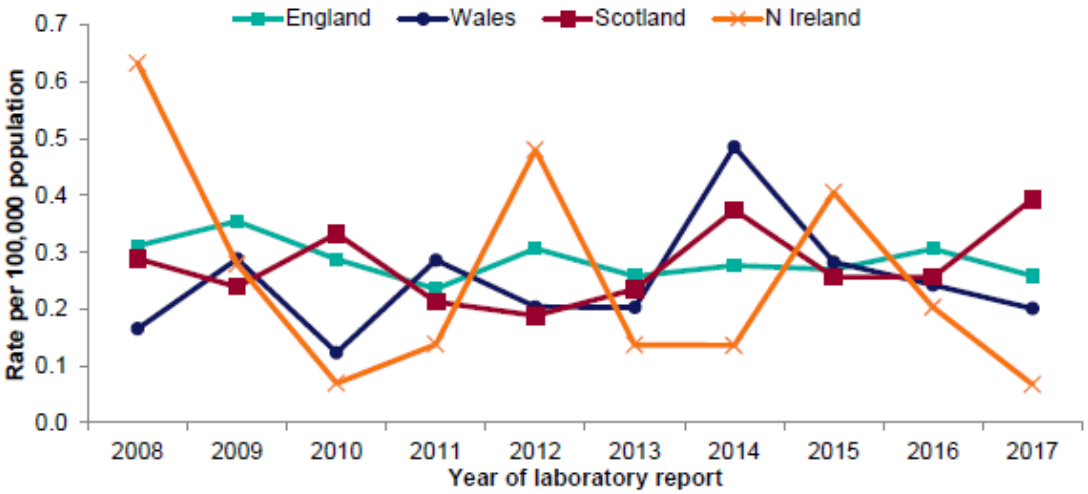
**Figure 4. Rate of reported Campylobacter infections by country per 100,000 population for quarters 1-3, 2008-2017**



## Listeria

22. The number of cases in the UK has remained relatively stable since 2008. There was a decrease in the number of reported *Listeria* cases for quarters 1-3 of 2017 compared to the same period in 2016. It was agreed that with these small numbers it was difficult to have any meaningful trend interpretation.

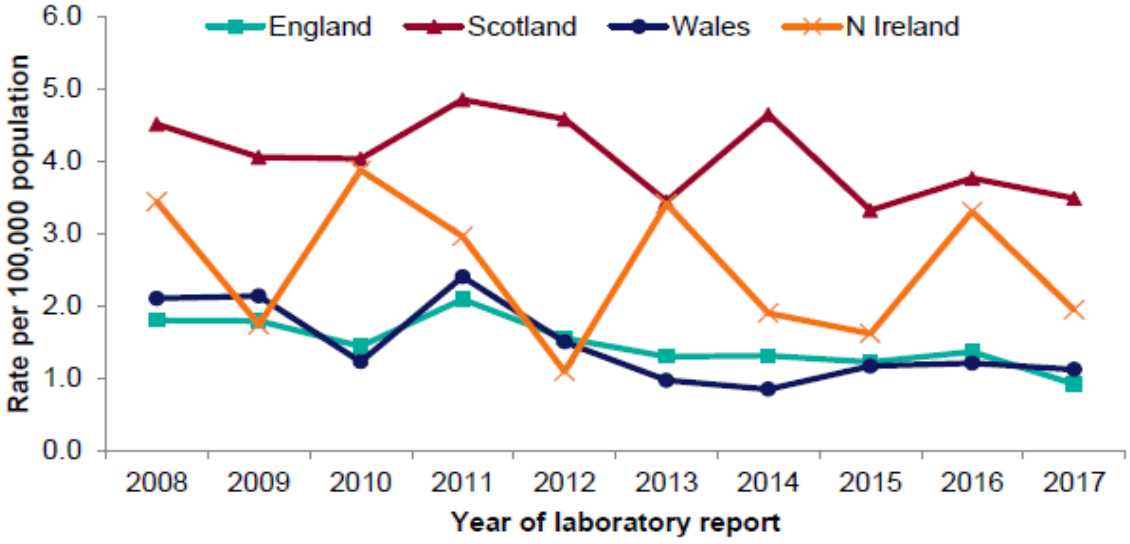
**Figure 5. Rate of reported Listeria cases by country per 100,000 population for quarters 1-3, 2008-2017**




## STEC

23. Compared to the same period in previous years (quarters1-3), STEC O157 incidence decreased in England and Northern Ireland in 2017, although this decrease was not observed in Wales or Scotland.

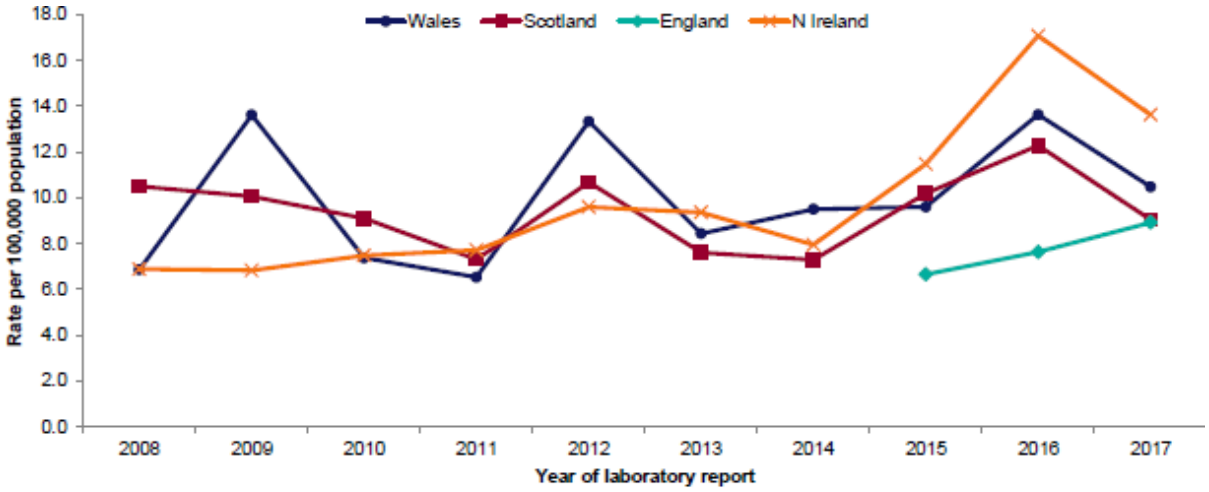
**Figure 6. Rate of reported STEC O157 infections by country per 100,000 population for quarters 1-3, 2008-2017**



### Cryptosporidium

24. Members noted the number and rate of reported Cryptosporidium infections in the UK and per country per 100,000 population for quarters 1-3, 2008-2017. It was highlighted that data for England for 2008-2014 had not been included as further work was ongoing on data quality. It was envisaged that speciation information could be included in future reports.

**Figure 7. Rate of reported Cryptosporidium infections by country per 100,000 population for quarters 1-3, 2008-2017**




### Foodborne outbreaks

25. In quarters 1-3 2017, 25 foodborne outbreaks were reported to eFOSS in England and Wales and to Health Protection Scotland. There were no foodborne outbreaks reported from Northern Ireland during this period. *Campylobacter* was the most frequently implicated or suspected causative agent in reported foodborne outbreaks (5/25, 20%). Full data to be included in the annual report to be presented at the July 2018 meeting.

**Table 2. Number of foodborne outbreaks attributed to specific pathogens reported in the UK for quarters 1-3, 2017***

| Agent | England and Wales | Scotland | Northern Ireland |
|---|---|---|---|
| *S.* Enteritidis | 3 | 2 | 0 |
| *S.* Stanley | 1 | 0 | 0 |
| *Campylobacter* | 5 | 0 | 0 |
| *C. perfringens* | 2 | 0 | 0 |
| STEC | 2 | 2 | 0 |
| *Cryptosporidium* | 0 | 0 | 0 |
| Norovirus | 3 | 1 | 0 |
| *Bacillus cereus* | 1 | 0 | 0 |
| Other/Unknown | 2 | 1 | 0 |

*Number of outbreaks reported may exceed total number for the UK as national outbreaks with cases in both Scotland and England/Wales are reported separately therefore a total is not given for the UK for provisional data for 2017

TO NOTE: foodborne outbreak data are highly provisional due to the method of data collection.

26. It was reported that Public Health Wales was introducing molecular diagnostics for GI pathogens from April 2018. This will cover all PH Wales laboratories. It was explained that the benefits of this would be timely availability of data and improved sensitivity. However, it was noted that the change was likely to result in increased detection/isolation rate with the suggestion that *Campylobacter*, *Salmonella* and *E.coli* levels may increase by about 15%.

**Burger Watch 2016: Report on excess burger consumption amongst STEC cases in England, 2014-2017**

27. EFIG was updated on PHE's report on excess burger consumption amongst STEC cases in England, 2014-2017. 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. 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. The report updated members on the methods developed to address the second mechanism and provided results from for the period 2014 to 2017 amongst cases resident in England.

28. It was confirmed that over a three-year period, reported excess burger consumption was detected in six single week periods. None of the linked outbreaks were associated with contaminated meat or burgers and none of the cases linked to an outbreak in 2016 reported eating undercooked burgers. Time series showed self-reported levels of burger consumption amongst STEC cases and characterisation of STEC activity during alert weeks (SNP cluster designation and outbreak membership of STEC cases contributing to excess burger consumption alerts, England 2014-2017). It was reported that the adopted methodology successfully detected 6 weeks in which reported burger consumption exceeded the expected distribution. However, none of the reporting cases in alert weeks were linked with an outbreak thought to be due to contaminated or undercooked burgers. Future developments of this approach will consider simultaneous exceedances of other exposures (such as salad leaves) to improve the specificity of the alerts. The group agreed with the suggestion that after an update has been provided at the next EFIG meeting with the enhancement that has been made to the system subsequent updates should be when there is exceedance of significance.

**Raw drinking milk – incidents and outbreaks**

29. EFIG considered a paper from the FSA on incidents and outbreaks relating to raw drinking milk: "assessment of whether the microbiological risk associated with consumption of raw drinking milk (and certain raw milk products) made in the UK has changed since 2015". The purpose of the paper was to:

    - introduce work the FSA is carrying out to assess the microbiological risk associated with raw drinking milk (and certain raw milk products), which is currently at an interim stage, and:
    - describe the initial data that has been considered, and:
    - seek views in relation to the key issues that will be assessed (as described in the background section), and:
    - seek views on other types of data and analysis that may inform the assessment.

30. It was reported that in July 2015, following a policy review, the FSA Board agreed with recommendations to continue with existing controls governing the sale and marketing of raw drinking milk (RDM). However, in the last 12-18 months, there has been a noticeable increase in the number of RDM producers and RDM-related outbreaks. It was noted that the FSA was looking at different strands of information (microbiological, economic and social science aspects) to inform a wider work programme including a FSA Board discussion.

31. EFIG was asked to note the recent outbreaks in England and Wales associated with RDM and invited to:

    - Comment on the outbreak data and other types of data presented in the paper
    - Suggest any other data or types of analysis that may inform the assessment

32. EFIG welcomed the assessment pointing out that it was valuable pulling together evidence relating to RDM incidents/outbreaks. Members discussed and commented on the paper and it was noted that risk assessment will also be considered by ACMSF.

**FSA: Regulating Our Future Segmentation**

33. EFIG received a presentation on the FSA's regulating our future (RoF) programme. It was reported that the programme aims to change/transform food regulation in England, Wales and Northern Ireland. The current approach used by Local Authorities to assess risk in food business establishments was outlined. EFIG noted the types of risk assessment carried out by LAs (after they have carried out an inspection), the make-up of the current system, the weighting employed and how these are aggregated. It was explained that although the current system is

standardised (used in the EU and some third countries) it was not a complex form of risk analysis system and was not designed to track foodborne disease.

34. Members were informed that the FSA (RoF unit) was in the process of developing a risk engine which would have two key features: risk assessment and scoring model and create differing risk-based intervention plans through assessing food business' risk attributes and scoring their food related risk. The data challenges in relation to the development of this risk engine was highlighted which includes: quality of data, use of business type descriptors, lack of details, consistency of use of terms, other sources of information on food businesses and databases linked to outbreak information.

35. EFIG discussed and commented RoF's proposals. EFIG encouraged close collaboration between FSA's RoF and PHE's surveillance teams.

## Surveillance and Data Sharing

### FSA surveillance strategy

36. The Head of FSA's Surveillance, Methods and Laboratory Policy briefed EFIG on the Agency's future food surveillance system. The purpose was to encourage the analysis of data to understand where there might be issues before significant problems arise with the aim of designing a flexible evolving system to account for possible risks and challenges. The FSA's vision (where they want to be?) by March 2019 is to have a Surveillance Capability (core service) that:
    - Supports the wider ambition that food is safe to eat and is what it says on the tin
    - Helps us to understand risks (safety/authenticity/assurance) and identify both gaps and risks that are changing or not being managed, followed by a plan of action
    - Drives decision making and prioritisation across all parts of the FSA and beyond
    - Uses evidence-based analytics to deliver the appropriate level of confidence / certainty to drive decision-making

37. It was reported that the new FSA's approach for surveillance uses a high-level model encompassing the key phases of 'scan', 'spot', 'narrow' and 'evaluate' in a feedback loop. Information and intelligence generated during the various phases can be shared with internal and external stakeholders and when appropriate action is taken. "Scan" refers to the high-level review or sweep of a variety of data sources to provide an information base. "Spot" refers to the targeted review of data to spot a potential emerging risk/issue. "Narrow" is where analysis is carried out to determine if/what action is needed. "Share/publish" is providing access to data as a way of disseminating information and driving activity and "Evaluation" is harvested from surveillance activities to improve the process or identify where new data is required. The approach is supported

throughout by data/digital and evidence-based analytics where intelligence will be drawn from numerous sources such as electronic media, big data sources, internal networks already in existence (e.g. Food Crime Unit and FSA imports/exports).

38. EFIG noted FSA's reasoning for using prototyping, how #hackathon was used to produce actionable insights into high-risk commodities such as olive oil adulteration and *Vibrio* species in shellfish and the internal/external networks involved in the exercises they carried out.

39. EFIG discussed and commented on the presentation. It was mentioned that the FSA's aim is to continue trialling with small projects then move into bigger more sensitive/sophisticated areas. The Agency was encouraged to consider areas where it had access to data but were not exploiting this such as testing in border inspection posts and inspections carried out slaughter houses. The FSA was urged to look at data available to it through its statutory role and utilise the resulting data in a smart way as this may have a beneficial effect for the consumer.

**Reflections on collaboration between APHA and PHE**

40. The group noted the benefits from recent close collaboration between APHA and PHE. It was underlined that this has been useful in dealing with outbreaks investigations. Going forward they plan to setup a system of sharing of information in real time such as sequencing data and carrying out joint analysis on findings from outbreaks. It was noted that both organisations were collaborating on some of the Horizon 2020 projects and the one health zoonoses initiative including discussing the benefits of sharing animal movement data.

41. As EFIG has an unresolved issue concerning access to human and animal data it was agreed to have a separate meeting to discuss developing a potential model, probably through a workshop to consider the challenges relating to data usage. The outcome of the discussion would be brought back to EFIG.

**Food surveillance**

42. PHE updated the group on their recent food surveillance studies. These include:

43. Paper published on the assessment of the microbiological quality and safety of raw drinking milk on retail sale in England (Journal Appl Micro 2017).

44. Rapid response co-ordinated study, Ovens used for cooking meat joints in catering premises, with a specific focus on slow cooking ovens and *Salmonella* (January – March 2018). It was highlighted that this study was in response to recent outbreaks of salmonellosis that have occurred over a protracted period as opposed to a single point source episode involving a

contaminated food. Complex cooking equipment that is not being effectively cleaned can lead to a wider low-level contamination of the kitchen environment that leads to sporadic cases. The aim of study was to provide microbiological data on ovens used for the cooking of meat joints in catering premises using environmental samples including pathogen swabs.

45. PHE Food Study 60: Microbiological quality of imported leaves collected at retail. It was noted that a total of 279 imported leaves (banana leaves, curry leaves, paan leaves and other leaves) were collected between April and December 2017. 266 were from retail outlets, 5 were from distributors or wholesalers, and the remaining 8 were from caterers. The microbial pathogens tested for included *E.coli*, *Salmonella* and STEC. It was stated that some of the leaves were subject to restriction order and there was ongoing investigation on supply routes for these leaves.

46. Food Standards Scotland (FSS) provided an update on surveillance of food in Scotland. It was noted that FSS has provided funding this financial year to public analysts and local authorities in Scotland to undertake sampling and surveillance of food under 14 key recommendations. Sampling began in July 2016 and results are uploaded to the UK Food Surveillance System.

47. In the food sampling undertaken in 2016/17 a total of 9122 samples were collected during the 12 months between 1 July 2016 to 30 June 2017. 5006 samples were submitted for microbiological testing. Number of samples giving an overall satisfactory result was 3775 (75.4%) and unsatisfactory samples (24.6%). Results for hygiene indicators to assess the contamination of foods due to poor hygiene controls during with production, processing and preparation indicate a relatively low failure rate. The majority of unsatisfactory results were due to high aerobic colony counts and Enterobacteriaceae (7% and 5% of all hygiene indicator tests respectively). As in previous years, unsatisfactory and borderline results were identified in a range of ready to eat foods including sandwiches, cooked meats, ice cream and desserts. The results also identified cross contamination issues through swabs taken at butcher's premises.

48. In 2016/17 Local Authorities received grant funding from FSS to undertake microbiological sampling in a number of targeted areas.

- Microbiological quality of eggs in catering establishments;
- Microbiological quality of pre-packed sandwiches;
- Microbiological quality of ready-to-eat (RTE) cooked sliced meats both pre-packed and non- pre-packed;
- Cross contamination in butchers and catering establishments – Swabs from slicing machines;
- Cross contamination in butchers and catering establishments – Prepared salads;

- Cross contamination in butchers and catering establishments – Grated cheese;
- Cross contamination in butchers and catering establishments – RTE foods.

49. The highest failure rates were for hygiene indicators from slicing machine swabs (7.7%) and cooked sliced meats (7.3%) from butcher's shops and catering establishments.

**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 January 2018 meeting.

**Secretariat**
**May 2018**