ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

EPIDEMIOLOGY OF FOODBORNE INFECTIONS GROUP (EFIG)

1. The group met on 13 January 2021 and the following is a combined summary of the animal and human data and food surveillance activities that were discussed at this meeting.

Animal data

Animal *Salmonella* data for January – September 2020 (provisional data)

2. Key points from the January – September 2020 data were highlighted. The data are related to numbers of incidents rather than flocks or herds.

3. There are currently two separate data reporting requirements for *Salmonella* in livestock in Great Britain - data reported as having been collected under the National Control Programmes (NCPs) for *Salmonella* in flocks of laying hens, breeding chickens, broilers and turkeys and data from other livestock species not subject to a *Salmonella* NCP. Paragraphs 7 to 12 only covers non-NCP species. NCP comments are at paragraphs 13 to 17.

4. The data held in the *Salmonella* database are continuously updated. Figures in this paper show the most recent data available.

5. The data presented in this report are provisional and relate to numbers of 'incidents' rather than 'flocks' or 'herds'.

6. In livestock species not subject to a *Salmonella* NCP (i.e. there is no routine *Salmonella* monitoring) isolations of *Salmonella* are usually derived from clinical diagnostic material. Therefore, the number of reports is dependent on the total animal population and the number of diagnostic submissions to veterinary laboratories. It must be noted that trends in surveillance intensity within companies/organisations (including pet re-homing centres) and by farmers/private veterinarians have a significant influence on the number of reported incidents from livestock species not subject to a *Salmonella* NCP.

7. Between January and September 2020, there were 684 reports of *Salmonella* from livestock, excluding chickens and turkeys, which is 27% higher than during January – September 2019 (538 reports) and higher than the equivalent period of 2018 (461 reports).

8. There were 7 reports of *S*. Enteritidis during January – September 2020 (1 duck, 1 horse and 5 were non statutory species) compared with 14 reports during January – September 2019 (4 were in horses, one was in quail and 9 were non statutory species).

9. Reports of *S*. Typhimurium in species other than chickens and turkeys increased by 15% compared with January – September 2019 (92 vs. 80 reports). An

increase compared with the equivalent period of 2018 (72 reports). The most common phage types were U288 (29 reports; 31% of total *S*. Typhimurium reports), DT193 (22 reports; 23% of total *S*. Typhimurium reports), DT2 (13 reports; 14% of total *S*. Typhimurium reports) and DT104 (11 reports; 11% of total *S*. Typhimurium reports). Highest incidents were in pigs: 52 (2020), 27 (2019) and 29 (2018).

10. Reports of *Salmonella* 4,5,12:i:- in species other than chickens and turkeys increased by 23% (37 vs.30 incidents) compared with January – September 2019. There was a decrease of 42% in the number of reports of *Salmonella* 4,12:i: (24 vs. 42 incidents) in species other than chickens or turkeys compared with January – September 2019. The number of incidents in the equivalent period of 2018 was similar to the number of incidents in 2020 (24 incidents).

11. EFIG acknowledged that the increase of *S*. Typhimurium in pigs despite reduction in submission was a concern. Also highlighted as a concern was the increase in multi-drug resistant *S*. 4,5,12:i:- variant of monophasic Typhimurium with resistance to 9 different antimicrobials spreading among different breeding companies. It was underlined that this situation needs close attention.

12. Additional area of concern highlighted was the ability of small abattoirs to contain carcass contamination in the face of a high level of *Salmonella* in pigs. Public Health England (PHE) agreed to liaise with Animal and Plant Health Agency (APHA) on the AMR profile detected in the incidents relating to pigs.

Salmonella National Control Programme (NCP) results 2019 and 2020 (January – September 2020)

13. An overview of the *Salmonella* NCP results for the above period was provided to the group.

14. EFIG noted that NCP testing continues to provide a good indication of the *Salmonella* status of chicken and turkey flocks in the NCP although there are official concerns about the sensitivity of operator sampling with testing in private laboratories. Operator sampling and official sampling means a lot of testing is carried out in the poultry industry. Official sampling resumed in all sectors following lock-down in spring 2020. It was noted that as of 7 January 2021 it was too early to say if official sampling targets in 2020 have been met.

15. Few broiler flocks with regulated serovars were identified in 2020, however, flocks with non-regulated serovars continued to increase; these were mostly feed-related serovars.

16. Monophasic *Salmonella* Typhimurium associated with dust from pig farms was not a problem in 2019 or 2020 as it was in 2018 and also because industry has used *Salmonella* vaccines more widely.

17. There was discussion on the high number of non-regulated serovars relating to broilers. APHA confirmed that these isolates partly reflect issues relating to contamination in feed. These isolations were attributed to the dissemination and

persistence of certain serovars that are also persistent in the environment. These serovars may be persistent in broiler farms when farms are not using the correct concentration of disinfectant in practices relating to farm hygiene.

Control of Salmonella in Feed

18. The effect of the EU's ban on the use of formaldehyde in feed has been flagged at EFIG and ACMSF meetings. At the October 2020 ACMSF meeting a member raised whether there should be an assessment on the impact of the ban on use of formaldehyde in relation to the risk of *Salmonella* in the food chain.

19. APHA gave a presentation on the Control of *Salmonella* in feed to address the above mentioned ACMSF comments. See information paper ACM/1362 *Salmonella* contamination and its control in animal production.

20. On ACMSF's specific point on whether there should be an assessment on the impact of the formaldehyde ban in relation to the risk of *Salmonella* in the food chain, APHA's response was that the EU ban appeared to have made a minor contribution to the increase in *Salmonella* infections. Persistent contamination in farms is a high priority for farmers and feed mills have been using a variety of approaches to mitigate against the ban. In terms of assessing the impact of the ban of formaldehyde, APHA would need to look to see whether there is a correlation between isolates from specific serovars in feed and those seen in people.

21. APHA has provided other relevant papers regarding the committee's comment on the impact of the formaldehyde ban. See papers ACM/1363: Control of *Salmonella* and pathogenic *E. coli* contamination of animal feed using alternatives to formaldehyde-based treatments and ACM/1364: An observational and educational study package on the epidemiology and control of *Salmonella* in broiler production**.**

Human Infection Data – Summary of key pathogens for 2020 (quarters 1-3)

Trend in laboratory reports

Data for 2020

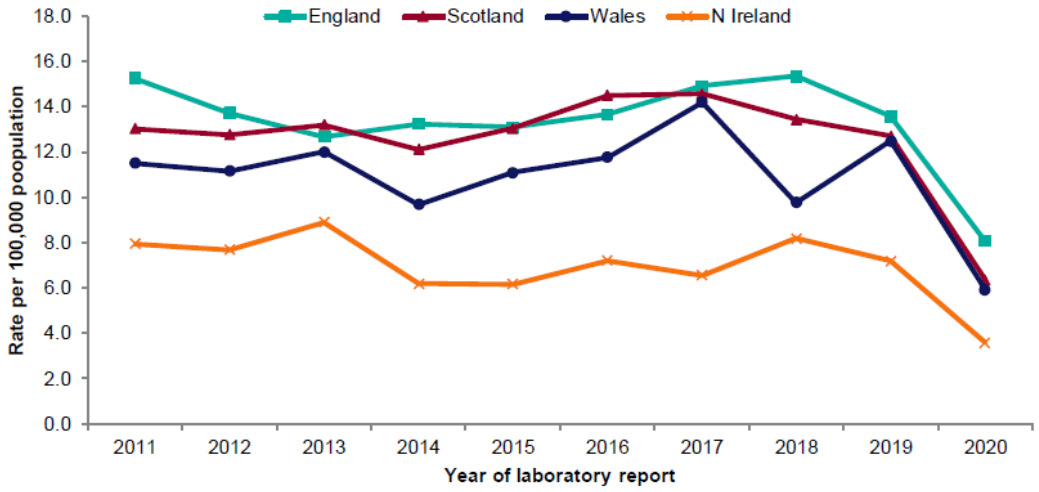
22. The data for 2020 cannot be compared to the data for previous years, as a substantial and often sustained reduction has been observed in reporting of the major GI pathogens to national surveillance coinciding with the SARS-CoV-2 (COVID-19) pandemic. This is likely due to multi-factorial influences on surveillance systems for the detection and reporting of GI pathogens as well as changes in behaviours and implementation of non-pharmaceutical interventions (NPIs) to control the pandemic, the effect of which will be variable depending on the pathogen. Additional explanatory note on data is at annex 1.

Report of annual human infection data quarters 1-3, 2020

All non-typhoidal *Salmonella* infections

23. There were 4107 reports of non-typhoidal *Salmonella* in quarters 1-3 of 2020 in the UK, a decrease from the 7053 cases reported in quarters 1-3 of 2019 (Figure 1). The decrease in reporting rate was seen across all nations.

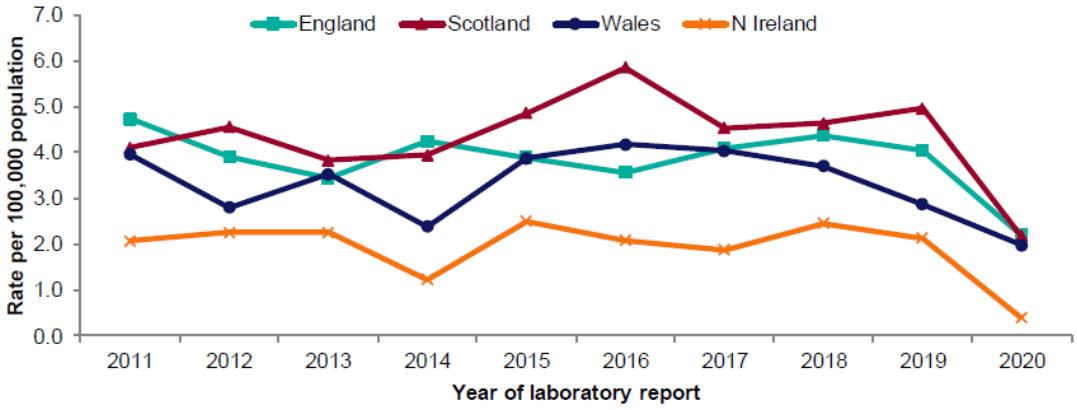
Figure 1. Rate of reported non-typhoidal *Salmonella* infections by country per 100,000 population for quarters 1-3, 2011-2020



Salmonella servovars

24. Reports of *S.* Enteritidis decreased in the UK in quarters 1-3 of 2020 in comparison with quarters 1-3 of 2019, with decreases in reporting rates in all nations (Figure 2).

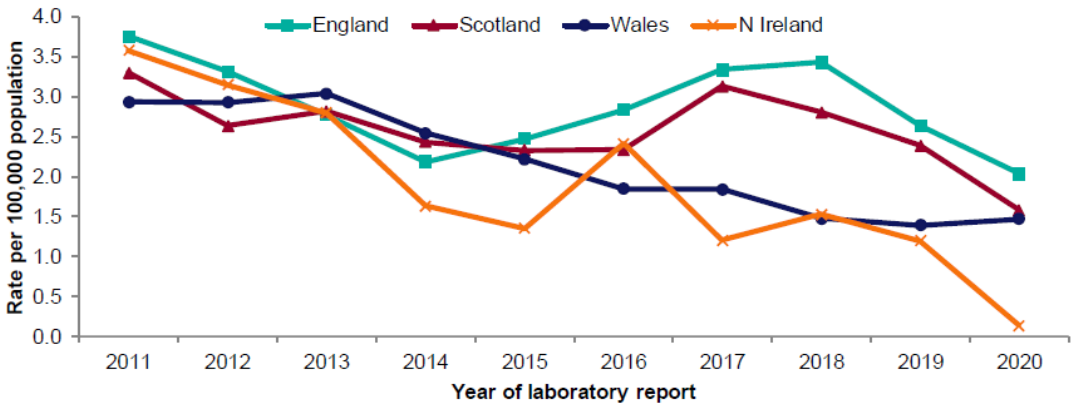
Figure 2. Rate of reported *Salmonella* Enteritidis infections in the United Kingdom and by nation per 100,000 population for quarters 1-3, 2011-2020*



*In Northern Ireland, a large number of *Salmonella* sp. reports have not yet been fully characterised in the surveillance database

25. The reporting rate for *S*. Typhimurium decreased in 2020 in quarters 1-3 compared to 2019, with case numbers decreasing from 1340 in quarters 1-3 of 2019 to 1026 in the same period in 2020 (Figure 3).

Figure 3. Rate of reported *Salmonella* Typhimurium infections by country per 100,000 population for quarters 1-3, 2011-2020*



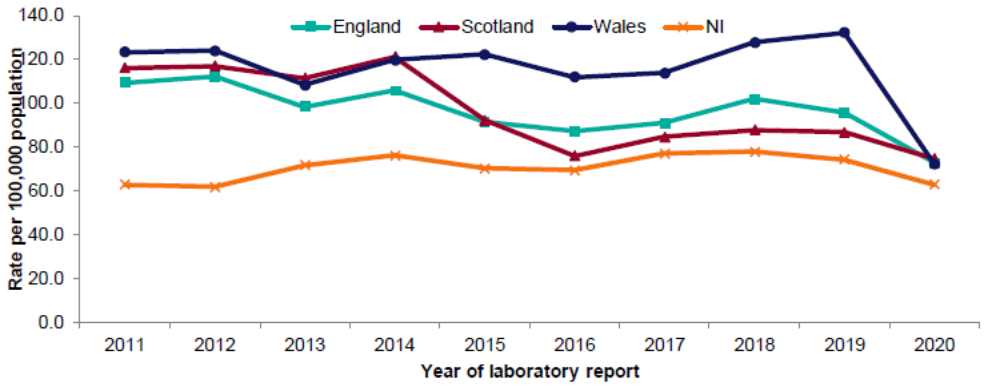
*In Northern Ireland, a large number of *Salmonella* sp. reports have not yet been fully characterised in the surveillance database

26. The most commonly reported *Salmonella* serovar in the UK for quarters 1-3 of 2020 was *S*. Enteritidis in all four countries (making up 28% of all non-typhoidal *Salmonella* reports), with *S*. Typhimurium being the second most common (comprising 25% of all reports). The proportion of *S*. Typhimurium reports increased from the same period in 2019, in which 19% of all reports were *S*. Typhimurium. *S*. Enteritidis and *S*. Typhimurium combined comprise 53% of reported non-typhoidal *Salmonella* cases, an increase from the same period in 2019 (49%). The only other serovars all three nations report amongst their top ten most commonly reported serovars are *S*. Infantis. *S*. Agona and *S*. Stanley. These were reported by three of the four nations in their top ten most commonly reported serovars.

Campylobacter Infections

27. The reporting rate for *Campylobacter* decreased in the UK from 97.8 per 100,000 population in quarters 1-3 of 2019 to 74.0 per 100,000 in quarters 1-3 of 2020. The decrease in 2020 was seen across all nations (Figure 4).

Figure 4. Rate of reported *Campylobacter* infections by country per 100,000 population for quarters 1-3, 2011-2020



Campylobacter spp. trends in England, 2010-2019

28. EFIG discussed a PHE paper (*Campylobacter* spp. Trends in England, 2010-2019) which provided an update from a previous report on *Campylobacter* spp. trends produced with data up to 2018. Data for quarters 1-3 2020 was not included in the report, as 2020 data is not comparable to data for previous years. A substantial reduction has been observed in reports for *Campylobacter* spp. to national surveillance coinciding with the SARS-CoV-2 (COVID-19) pandemic.

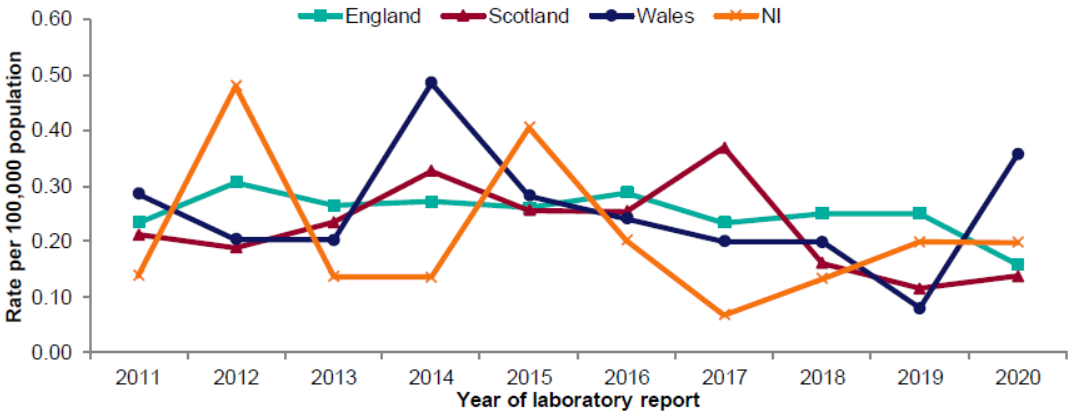
29. The highest number of annual reports from 2010-2019 was in 2012. There was a decline in case reporting from 2014-2016, however reporting increased in 2017, 2018 before falling slightly in 2019.

30. EFIG members noted that with the efforts to reduce *Campylobacter* in chicken produced in the UK, it would be good to see the effect of this in terms of case numbers. Data on *Campylobacter* in the food chain was being collected by government and industry and bringing these together as part of a stock take of the situation could be helpful.

Listeria infections

31. Reports of *Listeria monocytogenes* infection have decreased in the UK from 122 cases in quarters 1-3 of 2019, to 89 cases in quarters 1-3 of 2020 (Figure 5). This drop is attributed to a reduction in cases reported in England; increases in case reports were seen in Wales and Scotland, and there was no change in case reports in Northern Ireland compared to 2019.

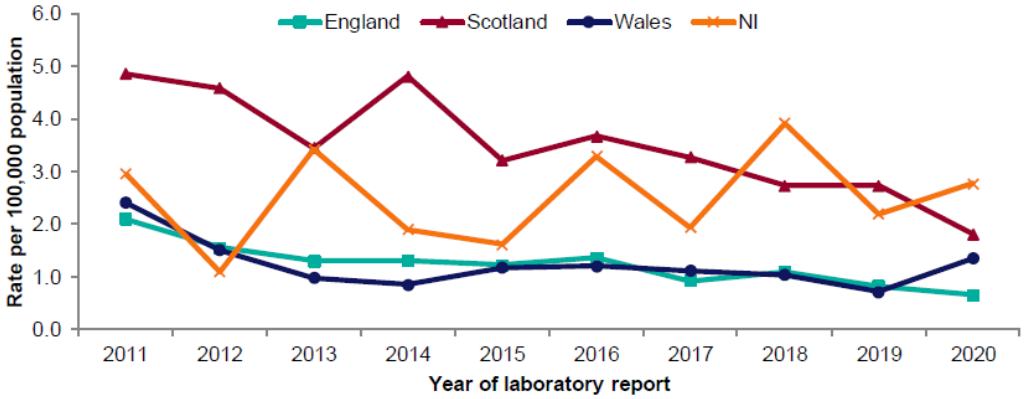
Figure 5. Rate of reported Listeria infections by country per 100,000 population for quarters 1-3, 2011-2020



STEC Infections

32. Reporting of STEC O157 cases in the UK has decreased from 540 in quarters 1-3 2019 to 451 in quarters 1-3 2020 (Figure 6). Decreases in cases were reported by England and Scotland, while increases were reported in Wales and Northern Ireland.

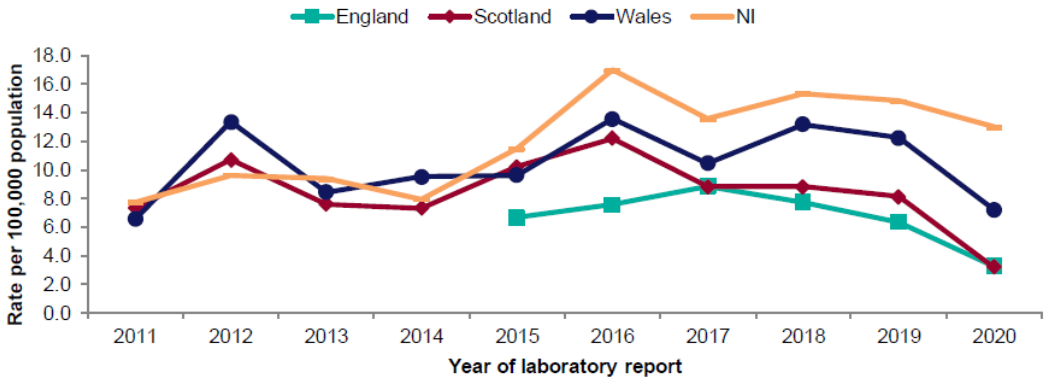
Figure 6. Rate of reported STEC O157 infections by country per 100,000 population for quarters 1-3, 2011-2020



Cryptosporidium infections

33. *Cryptosporidium* spp. reporting in the UK decreased in quarters 1-3 of 2020 compared to the same period in 2019 (Figure 7). The reporting rate decreased in all four nations.

Figure 7. Rate of reported *Cryptosporidium* spp. infections by country per 100,000 population for quarters 1-3, 2011-2020



Foodborne outbreaks

34. In quarters 1-3 of 2020, 32 foodborne outbreaks were reported to eFOSS in England and Wales and to Public Health Scotland and Public Health Agency Northern Ireland (Table 1). The pathogen implicated in the largest number of outbreaks was *Salmonella* (15/32 outbreaks, 47%), followed by STEC (7/32 outbreaks, 22%). In quarters 1-3 of 2019, there were 39 foodborne outbreaks reported. The pathogen implicated in the greatest number of outbreaks for the same period in 2019 was norovirus (14/39).

Table 1. Number of foodborne outbreaks attributed to specific pathogens reported by country*, quarters 1-3, 2020

Pathogen	England and Wales	Scotland	Northern Ireland
Salmonella	9	6	0
S. Enteritidis	4	3	0
S. Typhimurium	2	2	0
Campylobacter	2	0	0
C. perfringens	2	0	0
STEC	5	2	0
Cryptosporidium	0	0	0
Norovirus	1	1	0
Listeria	1	1	0
Other/Unknown	2	0	0

*National outbreaks may be counted twice if reported by multiple countries

Summary of the Foodborne Outbreaks in 2020

35. PHE updated the group on foodborne outbreaks in 2020.

Salmonella Typhimurium associated with brazil nuts

- Outbreak of *Salmonella* Typhimurium identified by WGS investigated in 2020
- 106 cases from August 2019-October 2020, most cases occurring in 2020.

- Epidemiological investigation identified nut bars, specifically nut bars containing brazil nuts as commonly consumed.
- Sampling by FW&E at the manufacturer and the manufacturer's supplier identified the outbreak strain as well as a strain of *Salmonella* Anatum (2 human cases). The implicated nuts were all supplied by the same company in South America.
- Five nut/nut product recalls were carried out in August in the UK.
- Multi-country outbreak - joint EFSA/ECDC rapid outbreak assessment was published and further recalls were carried out internationally
- Case reporting stopped and the outbreak was declared over late 2020.

Salmonella Enteritidis associated with chicken products

- Two outbreak strains of *Salmonella* Enteritidis investigated in 2020
- Very large outbreak with a total of 435 cases across the two strains in 2020 alone. Cases from previous years linked by WGS but investigations focussed on recent (2020) cases.
- Epidemiological investigation identified raw breaded chicken products as commonly consumed by cases. Children predominately affected (46%).
- Sampling of various chicken products, from case's freezers, retailers, and as part of the FW&E survey identified both the outbreak strains and multiple other serovars of *Salmonella* in a wide variety of raw frozen breaded chicken products. Food chain investigations focussing on the two *S*. Enteritidis outbreak strains identified links to production of these poultry products in Poland.
- Some product recalls/withdrawals have been undertaken for products found to be contaminated with *Salmonella*, and consumer advice relating to these types of product was published by the FSA.
- Cases identified in other countries, and a joint ECDC/EFSA ROA (Rapid Outbreak Assessment) covering one of the *S*. Enteritidis outbreak strains was being prepared for publication (note: now published https://www.ecdc.europa.eu/sites/default/files/documents/salmonella-enteritidis-rapid-outbreak-assessment-united-kingdom-poultry-2021.pdf)
- Cases continue to be reported in the UK and the investigation is ongoing.

Salmonella Enteritidis associated with UK eggs

- Outbreak of *S*. Enteritidis with a total of 80 cases since 2019, with most cases reported in the second half of 2020.
- The strain has been identified on four English farms in total between 2019 and 2020 and in environmental isolates from an egg packing centre.
- UK produced eggs were implicated as the likely food vehicle based on case interviews and the FSA issued precautionary safety and handling advice for specific egg batches to consumers.

National investigation into increased reports of D&V/GI illness associated with oyster consumption

- Between November 2019 and February 2020, PHE was notified of at least 270 cases of gastrointestinal illness in 84 groups of diners associated with consumption of raw or lightly cooked oysters at 40 premises across UK.
- Food chain investigations identified at least 15 suppliers distributing oysters from at least 20 oyster harvesters.
- Escalation of national COVID response hampered the outbreak investigation and eventually resulted in standing down of the IMT but PHE hope to pick up on some of the lessons learnt during the response in future.

Listeria monocytogenes outbreak

- Between Jan-Oct 2020, four cases of *Listeria monocytogenes* infection were identified by PHE which fell into the same 5 single nucleotide polymorphism (SNP) cluster.
- Epidemiology investigations identified hospital-acquired infection was feasible so investigations into the food supply chain into four hospital trusts linked to the cases was initiated.
- No food/environmental samples obtained
- Identified linked samples by WGS from smoked salmon in 2019/2020 which were traced back to a UK supermarket chain. One case had reported consumption of smoked salmon.
- Hospital-acquired infection has been discounted, but the food chain investigations are ongoing.

Food Surveillance

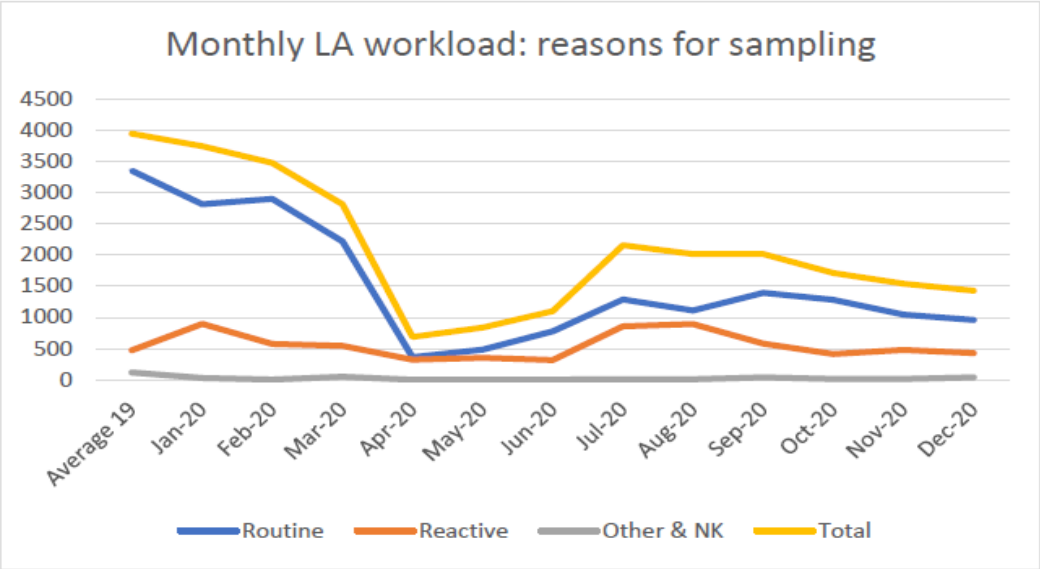
Public Health England Food, Water and Environment (FWE) Microbiology Services

36. PHE FWE provided an update on its activities at the meeting in January. This covered the following areas:

Impact of Covid-19

37. Members were presented with a graph (see below) that illustrated PHE FWE microbiology services monthly monitoring of the workload (samples) they were receiving from LAs. This excluded imported food testing and statutory shellfish testing which has not seen dramatic changes. The data was separated into routine, reactive and other surveillance. The graph below shows that from week 13 in 2020 the number of samples collected for routine purposes went down from over 3000 per month to about 500. Samples increased somewhat over the summer and declined in the last 4 months of 2020. This includes several hundred samples collected as part of a PHE frozen breaded chicken study. Members noted the reactive sampling which averages about 500 samples per month and the increases seen are in response to outbreaks during summer. This includes responses to *Legionella* problems as a response to stagnant water

systems over the summer and *Salmonella* testing of foods (Brazil nuts, frozen breaded chicken) over the summer in response to outbreaks.



38. Members attention was drawn to the following PHE papers published since the last EFIG meeting:

- Microbiological quality of cooked chicken: results of routine food monitoring in England 2013-17.
- *Listeria monocytogenes* in cooked chicken: Detection of an outbreak in the UK (2016-2017) and analysis of *L. monocytogenes* from unrelated monitoring of foods (2013-2017).
- An outbreak of human listeriosis associated with frozen sweet-corn consumption: investigations in the UK.
- Occurrence of *Listeria* and *Escherichia coli* in frozen fruit and vegetables collected from retail and catering in England 2018-2019.

39. **PHE Study 72** (interim final report): *Salmonella* in reformulated chicken and other products (all data preliminary and subject to verification) was presented to the group. This study was initiated in response to the *S*. Enteritidis outbreaks associated with frozen breaded chicken products to help inform the outbreak investigation and risk management measures.

40. In the national study 481 samples were collected between 2 October and 21 December 2020. Ninety-five percent of all the samples were (reformulated) chicken and the remaining 25 samples (5%) were either reformulated turkey, chicken and turkey or chicken and beef. Four hundred and fifty-eight (95%) of the samples were collected from retail while the remaining 23 samples (5%) were collected from catering establishments.

41. Members noted that *Salmonella* was detected in 40 (8%) of samples and only from the chicken-based products and collected at retail. Ten percent of the

samples from national major supermarket chains were contaminated with the rate of contamination from an individual chain varying between 5% to 26% of products. *Salmonella* was detected in 5% of samples from other retail stores. Contamination with *Salmonella* was only detected in samples with production plant codes located in Poland, Ireland, and the UK. Contamination was detected in all four categories of coating as well as from flavoured and unflavoured product.

42. The group noted that the proportion of samples contaminated with *Salmonella* increased in relation to the levels of *E. coli* detected. No sample exceeded the *E.coli* process hygiene criteria for food category 2.1.8. (meat preparations at the end of the manufacturing process: M = 5000 cfu/g) as outlined in the EU Microbiological Criteria (European Commission. 2005. Commission Regulation (EC) No. 2073/2005 on microbiological criteria for foodstuffs).

43. It was highlighted that when *Salmonella* was detected in these products the FSA was notified and product withdrawals (or recalling of products) had taken place. It was agreed that high number of human cases of *Salmonella* Enteritidis linked to these products was a concern particularly since the products were intended to be cooked.

First wave of the IID COVID survey

44. Members received a presentation on the findings of the first wave of the Infectious Intestinal Disease (IID) survey funded by FSA carried out by Ipsos MORI. The FSA highlighted that the study was commissioned as it was felt that data from laboratory reports would be difficult to interpret in 2020-2021 as most people in the COVID-19 pandemic months were less likely to seek medical care should they get ill. EFIG noted that the FSA considered a number of ways to collect data to estimate the impact of the pandemic on IID and foodborne disease and decided to commission this study as a natural experiment where the impact of behaviour change in the population relating to IID could be appraised. Ipsos MORI carried out 2 surveys in the third and fourth quarters of 2020. The presentation covered the following areas:

- Key research questions
- Methodology
- Estimated rates of IID – unadjusted and adjusted
- Symptoms, treatments and causes
- Behavioural and contextual comparisons

45. The research questions were:

- What is the self-reported level of IID in the community during the COVID-19 pandemic compared to a non-pandemic year?
- How many people reporting IID consulted a doctor and/or medical practitioner, and if so, were lab tests undertaken to look for the causative agent of the IID?
- What do people think caused their IID, and how does this compare to a non-pandemic year?

- What are the self-reported differences in major IID risk factors (e.g. eating, lifestyle, travel) between those with and without symptoms, and between a pandemic and non-pandemic year?

46. Ipsos MORI would be invited to present EFIG with the complete analysis of wave 1 findings and results from wave 2 at the EFIG meeting scheduled for June 2021.

Action

52. ACMSF Members are invited to comment on the recent trends in animal and human data and other subjects discussed by EFIG at their January 2021 meeting.

Secretariat
April 2021

Annex 1

Data sources (human infection data)

Data are provisional and provided from numerous sources; caution is required in interpreting trends over time and differences between countries.

Data for 2020 cannot be directly compared to data from previous years; at present it is not possible to ascertain the impact of the current COVID-19 pandemic on ascertainment of gastrointestinal pathogens and reporting of laboratory confirmed results or of outbreaks. Therefore, the apparent decline in reported cases should be interpreted with caution.
Data from 2011-2019 for all countries were extracted from the previous EFIG report (covering data up to quarters 1-3 of 2019).

Data for England in 2020 for Listeria are from the enhanced Listeria surveillance database, STEC data are from the enhanced STEC surveillance database, foodborne outbreak data are from the enhanced foodborne outbreaks surveillance system (eFOSS), and data for Campylobacter, Salmonella and Cryptosporidium are from the Second Generation Surveillance System (SGSS), all of which are Public Health England databases.

Data for Wales for STEC was extracted from GastroDataWarehouse, the reference laboratory database held by Public Health England, data for Listeria was provided by Public Health Wales, and data for Campylobacter, Salmonella and Cryptosporidium were obtained from SGSS. Foodborne outbreak data are from PHE's eFOSS.

Data for 2020 for Scotland and Northern Ireland were supplied by Public Health Scotland and Public Health Agency Northern Ireland, respectively.

Population data
Population data for 2020 are ONS mid-year 2019 estimates; please note the mid-year estimate for 2018 was also used for 2019. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/mid2019estimates.

Rate calculation
As figures used are for the first three quarters of each year, to estimate annual rates the number of infections reported is multiplied by 1.25 prior to rate calculation. Please note this may lead to inaccurate estimates for pathogens for which seasonal trends are observed