ACMSF

Advisory Committee on the Microbiological Safety of Food

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Annual Report 2019

Advises the Food Standards Agency on the Microbiological Safety of Food

Contents

The Advisory Committee on the Microbiological Safety of Food (ACMSF) was established in 1990 to provide the Government with independent expert advice on the microbiological safety of food.

The Committee's terms of reference are: -

to assess the risk to humans from microorganisms which are used, or occur, in or on food, and to advise the Food Standards Agency (FSA) on any matters relating to the microbiological safety of food.

The various issues addressed by the Committee since its inception are detailed in this and previous Annual Reports[1-27] and in a series of subject-specific reports.[28-49]

Foreword

1. Following my appointment as ACMSF Chair in July 2019, I am pleased to present my first report which summarises the work of ACMSF in 2019. The Committee's activities during the year involved plenary and subgroup meetings.

2. Details of membership, agenda and minutes are published on the ACMSF webpage (https://acmsf.food.gov.uk/).

3. After over a decade of publishing a report on *Campylobacter*, the Committee published a comprehensive report on this subject because of the continued dominance of *Campylobacter* as the leading bacterial cause of foodborne disease in the UK. The report that had several recommendations updated the Committee's second report on *Campylobacter* published in 2005. The subgroup on *Campylobacter* at the request of the Food Standards Agency (FSA) also assisted in the prioritisation of the report's recommendations. 13 high priority recommendations were identified by the group that were viewed to have the highest impact in terms of reducing foodborne illness.

4. At the Committee's horizon scanning workshop in 2018, members identified the need to develop a two-dimensional framework for use in risk assessments as it was recognised that the one-dimensional approach to risk assessment based on the probability of an adverse effect occurring has not always supported clear decision making and communication. In October 2019, a two-dimensional framework for use in risk assessments (produced by the subgroup on representation of risks) was adopted by the Committee. We agreed to henceforth use this two-dimensional qualitative approach when reviewing and preparing risk assessments.

5. We reviewed (and endorsed) a risk assessment prepared by the Animal and Plant Health Agency (APHA) for the use of *Mycobacterium bovis* BCG Danish Strain 1331 in cattle. Our review covered the issue of ingestion of Cattle BCG via the food chain through the consumption of minced beef and raw milk from vaccinated cattle.

6. At the request of FSA risk managers, the Committee was asked to revisit the issue of botulism in cattle, sheep and goats to identify any new information since the Committee's 2006 and 2009 reports. We did not recommend a change to current advice which

advises voluntary restrictions to cattle, sheep and goats and the potential risk to human health.

7. We considered the FSA's literature review on alternative interventions in poultry processing. Our comments strengthen a working document for FSA Risk Managers should they need a UK position on this subject.

8. In preparation for the UK's exit from European Union, the Committee commented on the FSA and Food Standards Scotland's (FSS) risk analysis process/guidelines. This framework provides the basis for the FSA/FSS bringing issues to Scientific Advisory Committees.

9. At the request of the FSA, the Newly Emerging Pathogens Group's reviewed the risks associated with the consumption of human placenta - considering microbiological, clinical and food safety issues. The group's opinion will be used by the FSA in providing advice on this subject.

10. The Committee was updated on the activities of the Epidemiology of Foodborne Infections Group (EFIG). EFIG updates included: reports of Salmonella from livestock species, *Salmonella* National Control Programme and trends in laboratory reports for *Salmonella, Campylobacter*, *Listeria monocytogenes* and *E. coli* O157 in humans.

11. Looking to the future, the newly established Ad Hoc Group on non-proteolytic *Clostridium botulinum* and vacuum and modified atmosphere packaged foods will work towards publishing the outputs of its work early in 2020.

12. In preparation for the UK's exit from the European Union, the capacity of the Committee has been significantly expanded. We welcomed five new Members to the Committee. These new Members are Dr Wayne Anderson, Dr Jane Gibbens, Dr Edward Fox and Professor Francis Butler. Mr Martin Briggs also joined the Committee but his appointment is specifically for matters related to the Joint Expert Group on Animal Feed and Feed Additives. Three Joint Expert Groups were established as part of the FSA Scientific Advisory Committee (SAC) structure which will advise the FSA on regulated products; along with other SACs.

13. I should like to thank Members of the Committee and its subgroups, without whom the ACMSF would not operate effectively, as well as the many other individuals that have helped the Committee in our work in 2019.

Professor Bill Keevil
Chair

Introduction

1. This is the twenty-eighth Annual Report of the Advisory Committee on the Microbiological Safety of Food and covers the calendar year 2019.

Chapter 1: Administrative Matters

Membership

Appointments

2. Appointments to the ACMSF are made by the FSA, after consultation with United Kingdom Health Ministers (i.e. the "Appropriate Authorities") in compliance with Paragraph 3(1) of Schedule 2 to the Food Standards Act 1999. The Agency has resolved that appointments to the ACMSF should be made in accordance with Nolan Principles[50], the guidance issued by the Office of the Commissioner for Public Appointments (OCPA)[51] and the Government Office for Science Code of Practice for Scientific Advisory Committees[52]. The FSA is not bound to follow OCPA guidance, as ACMSF appointments do not come within the remit of the Commissioner for Appointments and the guidance applies only to appointments made by Ministers. However, although ACMSF appointments are not made by Ministers, the Agency has decided that it would nevertheless be right to comply with OCPA guidance as best practice.

Periods of appointment

3. To ensure continuity, appointments to the ACMSF are staggered (usually for periods of 3 or 4 years) so that only a small proportion of Members require to be appointed, re-appointed or retire each year.

Spread of expertise

4. A wide spectrum of skills and expertise is available to the ACMSF through its Members. They are currently drawn from, food microbiology, food processing, food research, food retailing, commercial catering, environmental health, human epidemiology, medical microbiology, public health medicine, veterinary medicine, and virology. The Committee also has one consumer Member.

5. Members are appointed on an individual basis, for their personal expertise and experience, not to represent a particular interest group.

New appointments in 2019

6. Five new Members were appointed to the ACMSF during 2019[53]: Dr Wayne Anderson (expertise: food safety microbiology and food science), Dr Jane Gibbens (expertise: veterinary public health and epidemiology), Dr Edward Fox (expertise: food microbiology and genomics) and Professor Francis Butler (expertise: Food safety with a particular focus on quantitative risk assessment/modelling of microbiological hazards in food). Mr Martin Briggs (expertise: animal feed) appointed specifically for matters related to the Joint Expert Group on Animal Feed and Feed

Additives. Their period of appointments runs from May 2019 until 31 March 2023.

Re-appointments in 2019

7. The periods of appointments for Drs Bob Adak, Gwen Lowe and Rob Betts, Professor Miren Iturriza-Gómara, Mr Alec Kyriakides, Miss Heather Lawson and Mrs Emma Hill expired on 31 March 2019. Drs Adak and Betts were reappointed for 2 years (they would have served for 10 years at the end of this reappointment). Mr Kyriakides, Dr Lowe, Miss Lawson, Prof Iturriza-Gómara and Mrs Hill were reappointed for 4 years. The reappointments are from 1 April 2019.

Committee and Sub-Group meetings

8. The full Committee met twice in 2019. The first meeting was chaired by Interim Chair Professor David McDowell and the second meeting chaired by Professor Bill Keevil who was appointed as permanent chair in July 2019.

9. The *Ad Hoc* Group on *Campylobacter* (Chair: Professor Sarah O'Brien) met twice in 2019. They had other intersessional business via correspondence. See paragraphs 72 – 73.

10. The Ad Hoc Group QACs and Biocides used in food processing (Chair: Dr Gary Barker) met once in 2019. Other group business was carried out via correspondence. See paragraphs 74 – 80.

11. The Ad Hoc Group on non-proteolytic *Clostridium botulinum* and vacuum and modified atmosphere packaged foods (Chair: Professor David McDowell) met twice in 2019. See overview of meeting discussions at paragraphs 81 - 82.

12. The Ad Hoc Group on representation of risks (Chair: Dr Gary Barker) met twice in 2019. They had other intersessional business via correspondence.

13. The Working Group on Antimicrobial Resistance (Chair: Professor David McDowell) met once in 2019 and carried out other activities via correspondence. Overview of the group's meeting is available at paragraph 83.

14. The Working Group on Newly Emerging Pathogens (Chair: Dr Dan Tucker) met once in 2019. Other activities were carried out via correspondence. See summary of group's activities is at paragraph 84.

Current membership and Declarations of Interests

15. Full details of the membership of the Committee and its Working and *Ad Hoc* Groups are given in Annex III. A Register of Members' Interests is at Annex IV. In addition to the interests notified to the Secretariat and recorded at Annex IV, Members are required to declare any direct commercial interest in matters under discussion at each meeting, in accordance with the ACMSF's Code of Practice (Annex V). Declarations made are recorded in the minutes of each meeting.

Personal liability

16. In 1999, the Secretary of State for Health undertook to indemnify ACMSF Members against all liability in respect of any action or claim brought against them individually or collectively by reason of the performance of their duties as Members (Annual Report 1999[8] paragraph 6 and Annex III). In 2002, the Secretariat asked the FSA to review this undertaking, given the fact that, since 2000, the ACMSF had reported to the FSA where previously it had reported to UK Health and Agriculture Ministers. In March 2004, the Food Standards Agency gave a new undertaking of indemnification in its name, which superseded the earlier undertaking given by the Secretary of State (see Annex IV of 2004 Annual Report[14]).

Openness

Improving public access

17. The ACMSF is committed to opening up its work to greater public scrutiny. The agendas, minutes and papers (subject to rare exceptions on grounds of commercial or other sensitivity) for the full Committee's meetings are publicly available and are posted on the ACMSF website. Also, on the Committee's website are summaries of meetings of the Working and *Ad Hoc* groups. ACMSF's website can be found at:

    http://acmsf.food.gov.uk/

18. The Committee also has an e-mail address

    acmsf@foodstandards.gov.uk

19. In accordance with the Freedom of Information Act 2000, ACMSF has adopted the model publication scheme which sets out information about the Committee's publications and policies.

Open meetings

20. Following the recommendations flowing from the FSA's Review of Scientific Committees[54], the ACMSF decided that from 2003 onwards all its full Committee meetings should be held in public.

21. The plenary meetings in 2019 were held in London on 27 June at the Grand Wellington Hotel, 71 Vincent Square, London SW1P 2PA and 17 October at Clive House 70 Petty France Westminster London.

22. ACMSF open meetings follow a common format. Time is set aside following the day's business for members of the public and others present to make statements and to ask questions about the ACMSF's work. The names of participants, the organisations they represent, and details of any statements made, questions asked and the Committee's response, are recorded in the minutes of the meeting.

Work of the other advisory committees and cross-membership

23. The Secretariat provided Members with regular reports of the work of other Scientific Advisory Committees advising the FSA in 2019. David Nuttall is a member of the Social Science subgroup on the Food and You Surveys. Professor Stephen Forsythe member of the Advisory Committee on Animal feedingstuff is a member of the ACMSF Working group on Antimicrobial Resistance.

Chapter 2: The Committee's Work in 2019

ACMSF Report on *Campylobacter* (Third report on *Campylobacter*)

24. In June the Committee's interim Chair (Prof David McDowell) presented the above report[55] to members. This report produced by the committee's Ad Hoc Group on *Campylobacter* underwent a 10-week public consultation between March and May 2019. Members were provided with a copy of the report (that reflected stakeholders comments), summary of consultation responses and a cover paper that outlined why the committee was considering the report. Prof McDowell reported that few amendments have been made to the report following the public consultation, but no substantive changes have been made to the report since the last time the committee considered it. He went through the comments submitted by the industry responders. It was noted that industry responses to the report were positive. The committee was asked to indicate whether it was content for the final draft (subject to some minor editorial amends) to be published and whether it had any further comments to include.

25. The following comments were made:

- A member drew attention to a comment by the *Ad Hoc* Group where it acknowledged improvements made by the UK poultry industry in reducing the use of antibiotics (ACM/1295a, page 2 column 3 last sentence). The member suggested underpinning this statement with an appropriate reference. Members noted that as the ACMSF task and finish group on AMR's report (published in March 2018) highlighted the advances made by the poultry industry in the usage of antibiotics, this could be used to address the queried statement.

- A member pointed out that a measuring unit was missing in one of the group's responses to the British Retail Consortium's comments (page 3 column 3 last sentence). The secretariat noted this point and will insert the appropriate measuring unit.

- It was noted that data in the Epidemiology section of the report (Epidemiology of *Campylobacter* infection in humans) was dated (2016 data) for a report that will be published in 2019. As it was pointed out that 2018 data was available in the report on the activities of the Epidemiology of Food Infections Group (EFIG), members welcomed the suggestion to cross-reference the Third *Campylobacter* Report to the EFIG paper (ACM/1296) via an addendum.

- A member queried recommendation 8.88 in the report highlighting that the sentence concerning the preparing parfait and pâté needed rephrasing as it was not clear which of the two methods **mentioned** was effective in eliminating *Campylobacter*.

- Members agreed for the report to be published once the suggested amendments had been reflected on the report.

26. In conclusion, the Chair thanked Prof Sarah O'Brien (Chair of the *Ad Hoc* Group) and members of the group for all their work in drafting the report.

27. On a separate matter relating to the above report, the Chair informed the committee that the FSA has asked for the *Ad Hoc* Group's assistance in the prioritisation of the above report's recommendations (the FSA appreciated the prioritisation of recommendations carried out by the ACMSF task and finish group on AMR on their recent report). He explained that the group, mindful of the committee's remit had agreed to assist the FSA in carrying out this exercise. He added that the outcome of the task will be reported to the committee at a future meeting.

28. At the public question and answer session Karen Job (Marks and Spencer) referring to the reductions in *Campylobacter* in chicken sold at retail outlets asked if the FSA have analysed these recent human cases of *Campylobacter* to see if these are linked to particular food sources. Although it was mentioned that the ACMSF report on *Campylobacter* has a chapter on source attribution on human campylobacteriosis, Dr Cook confirmed that the FSA has ongoing research that may address the question raised on the sources of human cases of campylobacteriosis.

Ad Hoc Group on Risk Assessment Report

29. The ACMSF subgroup on representation of risks was established in November 2018. Dr Manisha Upadhyay was invited (at the June plenary meeting) to give a short introduction about the group[56]. She reported that at a committee's horizon scanning workshop early in 2018 the committee identified the need to develop a multi-dimensional risk assessment framework for microbiological risks associated with food. Dr Upadhyay highlighted that the committee felt the current one-dimensional approach to risk assessment based on the probability of an adverse effect occurring (to estimate the level of risk) did not always support clear decision making and communication.

30. Dr Upadhyay provided background information on the composition of the group including their terms of reference then invited Dr Gary Barker to update members on the subgroup's proposed new risk assessment framework.

31. Dr Barker gave an overview of the committee's current approach to risk and uncertainty assessment which was adopted from EFSA and is used by reputable organisations. This approach assigns risk based on the appreciation of the available evidence using standard probability and uncertainty categories. Dr Barker defined multi-dimensional representation of risk highlighting that the aim of the group was to address the limitations of the current approach revise it and have an improved system that will

effectively support decision making. He outlined the features of two-dimensional risk assessment and talked through the group's proposed assessment of risk which had 5 steps.

- Assessment of frequency of occurrence of an adverse event using the established ACMSF (EFSA) categorisation of risk
- Assessment of detriment of an adverse event using a descriptive four category scale used by International Commission on Microbiological Specifications for Foods (ICMSF)
- Assessment of uncertainty associated with the frequency of occurrence of an adverse event using a three-category scale used by EFSA
- Assessment of the uncertainty in detriment
- Assessment of confidence in evidence

32. Members welcomed the draft framework and made the following comments.

- If this framework is adopted how will it interface with previous ACMSF risk assessments or FSA risk assessments approved by ACMSF. Dr Barker explained that the framework will show the validity of previous risk assessments but will underline how risk assessments could be improved as additional variables will be taken into account. It was noted that the new framework won't necessarily mean reopening previous risk assessments that have been published.
- How would circumstances where there are irreconcilable differences in evidence and certainty levels be addressed. It was acknowledged that in the event of deep levels of uncertainty complicating the evidence, risk assessors may have to give a remark on the situation to the best of their ability such as indicating what they think about the science on the issue they have considered.
- Reference was made to the National Institute for Health and Care Excellence (NICE) risk assessment framework as NICE's approach is known to be robust. It was mentioned that NICE's system was noted in the group's deliberations.
- A member mentioned that it would be good to have examples of where multi-dimensional approaches have been used in risk assessment and include these in the final report that the group is drafting.

33. The Chair thanked Dr Barker for his presentation highlighting that the group was working towards presenting its final report at the committee's October 2019 plenary meeting.

34. At the October plenary meeting[57] members were reminded about the update (provided in June 2019) they received on the activities of the above group. As the group had produced a draft report, Dr Manisha Upadhyay underlined that it was at a horizon scanning workshop, that the Committee identified the need to develop a two-dimensional framework for use in risk assessments (considered by ACMSF) as that the current one-dimensional approach to risk assessment based on the probability of an adverse effect occurring (to estimate the level of risk) did not always support clear decision making and communication. Members were reminded that this proposed

risk assessment framework was welcomed at the June 2019 plenary meeting. Dr Upadhyay explained that the group's approach has been a 5-step procedure using a default qualitative approach to estimating risk, based on the likelihood of an adverse effect occurring, the impact of that effect and a more meaningful consideration of uncertainty beyond data uncertainty. It was pointed out that the proposed framework (presented in ACM/1309 Appendix A) will be revised after the meeting to include the group's position on the use of Disability Adjusted Life Years (DALYs) as an indicator of detriment.

35. Dr Upadhyay informed members of comments submitted by a member who was unable to attend the meeting. The member questioned the new approach's assessment of uncertainty pointing out the possible risks of contradictions. The member also made suggestions for the qualitative scale of frequency. Dr Upadhyay mentioned that Dr Gary Barker, Chair of the Group will address these queries.

36. Before introducing the proposed framework, Dr Barker, talked about the current one-dimensional approach where frequency is the sole indicator of risk (he highlighted the drawbacks of this approach). He outlined the 5 steps in the proposed two-dimensional risk assessment framework:

    - Assign the assessment of the frequency of occurrence for an adverse event to one of six exclusive and exhaustive categories for frequency (Negligible, Very Low, Low, Medium, High, Very High)
    - Assign the assessment of the severity of the detriment for an adverse event to one of four exclusive and exhaustive categories of severity (Negligible, Low, Medium, High)
    - Assign the statistical uncertainty associated with the assessment of the frequency of occurrence to one of three exclusive and exhaustive categories of uncertainty (Low, Medium, High) and identify the exposed population that underlies the frequency assessment.
    - In a remark assign the statistical uncertainty associated with the assessment of the detriment to one of three exclusive and exhaustive categories of uncertainty (Low, Medium, High) and identify variabilities in the populations that underlie the assessment of severity of detriment (particularly the populations of exposed individuals and harmful agents).
    - In a remark address the level of confidence, doubt and caution surrounding the science that underlies the assessment of risk.

37. Dr Barker explained that this framework that separates frequency of occurrence (which has six category scales) and severity of detriment (that has four category scales) is increasingly becoming popular in the risk assessment arena. These assessments also have three remarks that cover: uncertainty in occurrence, uncertainty in detriment and deeper uncertainty. He reported that the subgroup proposed a qualitative framework because of the variety of expertise on ACMSF. Dr Barker highlighted that the variation in expertise means this is the only universal framework that the experts on the Committee have in common. Members noted that this approach has

indicative quantitative scales that can be used alongside each of the qualitative scales representing frequency and detriment.

38. The Committee noted that the subgroup agreed to adopt DALYs (instead of QALYs: the quality-adjusted life year) for this framework as this appears to be widely used in recent reviews/publications in the assessment of the burden of foodborne disease. Dr Barker explained that he was aware that the FSA's Economics Team have a preference for expressing burden of foodborne disease in QALYs. The subgroup's approach would be clearly stated in the report but it will be acknowledged that in the assessment of the UK population burden of food borne illness, the FSA adopts the closely related QALY scale to quantify detriments.

39. Members noted that separation of frequency and detriment would be beneficial to ACMSF in the event of complex risk assessments that the Committee may be asked to consider in the future.

40. In response to the aforementioned comments (from the member who could not attend the meeting), Dr Barker provided clarification. For the comment relating to apparent contradiction in the expression of uncertainty made by remarks 1 and 3 in the framework case study, remarks 1 and 3 refer to different kinds of uncertainty. Remark 1 estimates the uncertainty associated with the assessment of the frequency of occurrence and remark 3 is an additional step to address deeper uncertainty or unknown unknowns. The suggestion to attach an indication of actual time scale to the qualitative scale of frequency was turned down as it was felt there were no universal scales that can be used for these categories. The categories are purely indicative and "fuzzy" and it would be misleading to use them by default.

41. Dr Barker thanked members of the Ad Hoc Group for their contributions in drafting the report highlighting the significant contribution of the co-opted members of the group (Mr John Bassett and Dr Emma Snary).

42. The following comments were made by members on the framework:

- Excellent report: support the suggested qualitative approach.

- A member queried paragraph 17 (last sentence)*:* "The upper boundary of the category representing negligible risk is consistent with a 'safe' condition, a probability of 10^{-8} per event, that is widely accepted in consideration of foodborne botulism. He suggested this should be 10^{-12}". Following discussion, it was confirmed that although 10^{-12} is a recognised figure in relation to foodborne *Clostridium botulinum* kill, analysis of this in several studies has moved majority opinion to conclude that a 10^{-8}-10^{-9} probability of growth approximates to the 12-log inactivation of proteolytic *C. botulinum* in phosphate buffer (as described in the original study by Esty and Meyer, J Infect Dis., vol 31, pp. 650-663, 1922), and is an acceptable food safety objective. It was suggested that this point should be clarified in the report as a lot of people are familiar with 10^{-12} in this context.

- On the question of whether ACMSF should simultaneously carry out quantitative risk assessment with the preferred default qualitative approach to estimating risk, there was no objection to this taking place if good quality evidence was available to carry out quantitative risk estimation. It was noted that if there was strong quantitative evidence the expectation is for the outcome to be consistent with the qualitative risk estimation. However, it was emphasised that ACMSF's default risk estimation should be the qualitative approach.

43. In conclusion as the question to members was whether they were content for this approach (two-dimensional qualitative approach) to be adopted by ACMSF when reviewing and preparing all future risk assessments, members unanimously endorsed the new approach.

Risk assessment for the use of *Mycobacterium bovis* BCG Danish Strain 1331 in cattle: Risks to public health (ACM/1310)

44. In June 2015, the Committee was asked to comment on a risk assessment prepared by the Animal and Plant Health Agency (APHA) that assessed the risks to public health from the possibility of Cattle BCG vaccine being present in the food chain and in particular, milk and beef products. Members discussion on the risk assessment raised a few queries for APHA to consider which included the following:

    - Is the strain of Cattle BCG being assessed a standard human BCG organism or is it cattle adapted? Members also asked for information on what dose is given to cattle and how this compares to a standard human dose.
    - Is oral ingestion the only potential route of transmission of Cattle BCG or could handling/preparation of meat from vaccinated animals also play a role in transmission via the cutaneous or ocular routes?
    - The risk estimate should be recalculated using alternative scenarios such as pasteurisation failures.

45. As APHA had considered the queries raised by ACMSF, Dr Paul Gale (APHA) gave a presentation to members seeking to address the Committee's queries (at the October plenary meeting)[58]. Regarding query 1, it was noted that the strain of CattleBCG is Danish strain 1331 which is an attenuated strain of *Mycobacterium bovis*. This is used extensively as a vaccine in humans against disease caused by pathogenic *Mycobacterium tuberculosis* complex organisms (mainly *M. tuberculosis*, but also others such as *M. africanum* or *M. bovis*). The dose given to cattle is within a range of 1-4 × 10^6 colony forming units (cfu) and a standard human dose is within the range of 2-8 × 10^5 cfu. As a result when compared to the HumanBCG dose, the dose in cattle is only 5-fold higher on average.

46. Query 2: the risk of illness in humans through the cutaneous and ocular routes via the handling/preparing of raw meat or raw milk from cattle

vaccinated with CattleBCG. Dr Gale stated that APHA calculated risks to consumers handling/preparing raw beef and raw milk. The risk through inhalation was also considered. It was mentioned that the main difficulty in addressing query 2 was the lack of dose-response data for CattleBCG infection through the cutaneous, ocular and inhalation routes. The approach had access to limited data in the literature for *M. bovis*/*M. tuberculosis* infection in humans and converted to CattleBCG by applying an attenuation factor. The concentrations of CattleBCG in meat and raw milk estimated previously were used to calculate exposures to humans through the cutaneous and ocular routes, assuming that 1% of persons handling milk or meat had a skin abrasion or cut through which 0.01 cm^3 of liquid entered.

47. The highest predicted risk is through inhalation of meat juice. For inhalation of meat juice, combining the probabilities of each exposure scenario occurring, the risks of disease per meat handling event were assessed to be negligible. Overall, the risks from raw meat juices are orders of magnitude higher than for raw milk reflecting the higher predicted concentrations of CattleBCG in the meat juice compared to milk. For raw milk across all three exposure routes, namely cutaneous, ocular and inhalation, the risk of disease was estimated to be negligible. The risks from inhalation were predicted to be higher than those for the ocular and cutaneous routes, although there is uncertainty in this conclusion. The risks previously predicted for the oral route through consumption of minced beef and raw milk were estimated to be higher than those predicted here for the ocular, cutaneous and inhalation routes.

48. In alternative scenarios for the third query, the risks through consumption of pasteurised milk allowing for a 1% failure of pasteurisation, was assessed to be negligible.

49. The following comments were made by members:

- Clarification was requested on the three raw meat juice exposure scenarios (query 2). Dr Gale explained that 3 scenarios (3 to 5) revealed where the maximum BCG concentration was detected in positive cattle muscle at the injection site 21 days post injection. Max concentration observed was 3116 cfu/cm^3.
- As ACMSF had adopted (in its earlier discussion) the two-dimensional qualitative approach to risk estimation, a member suggested using this new framework on this revised risk assessment on the use of *M.bovis* BCG Danish strain 1331 in cattle.
- Members discussed the point in the response to query 3 relating to pasteurisation of milk (the risks through consumption of pasteurised milk allowing for a 1% failure of pasteurisation are negligible (99% is inactivated reducing risks from raw milk by 100-fold). It was remarked that although this may possibly be an over estimation, this statement could be misinterpreted. Following discussion, it was suggested that as issues relating to consumption of raw milk were sensitive any statement relating to unpasteurised milk should be properly referenced. Members

noted the point made on STEC outbreaks (in the 1990s) associated with dairy farms and how these were linked to pasteurisation failure.

- On the request for evidence that in the event of pasteurisation failure consumers would be exposed to unpasteurised milk homogenously mixed with pasteurised milk, it was confirmed that dilution does not alter the risk of pasteurisation failures.

- Clarification was provided on the observation made on the following sentence in the report's abstract "Thus compared to the HumanBCG dose, the dose in cattle is only 5-fold higher on average". The query word "only" will stay in the report.

- A member cautioned on how the answers to the committees' questions may be interpreted as the responses highlighting that there is negligible risk to public health due to cattle being injected with the BCG vaccine may be misleading (suggesting that vaccination should not be portrayed as a risk). It was stated that as the Committee are in support of vaccination of cattle against infections the risk assessment should be very clear that vaccination is not a risk but beneficial to animals and humans. It was also pointed out that as the strain of Cattle BCG Danish strain 1331 is an attenuated strain, if the Committee are comfortable with humans being injected with vaccine strains of up 10^8, it was irrelevant to calculate the risk in relation to consumption of cattle that has been injected with the cattle BCG vaccine.

- A member praised APHA for including the inhalation route in the risk assessment and commended the clarity and accessibility of the report.

50. Members endorsed the revised risk assessment as it was agreed APHA had satisfactorily addressed the three queries put to them in June 2015. It was agreed that as members were happy with these responses the earlier suggestion whether to try the newly adopted risk estimation framework on this revised risk assessment was unnecessary.

Proposed working group on non-proteolytic *Clostridium botulinum* and vacuum and modified atmosphere packaged foods

51. The Committee at its previous meetings considered the issue of non-proteolytic *Clostridium botulinum* (*C. botulinum*) and vacuum and modified atmosphere packaged (VP/MAP) foods. Dr Paul Cook was invited to introduce paper ACM/1293 that proposed a way forward for the committee to review non-proteolytic *C. botulinum* risks in the context of the FSA's guidance. The paper[59] in its background highlighted the current FSA guidelines in this area which indicates that, unless suitable grounds for extension are proven, the shelf-life of VP and MAP chilled foods, including fresh meat, held at temperatures from 3 to 8°C is a maximum of 10 days.

52. Paper ACM/1293 outlined the committee's previous discussions where members agreed to review new evidence (via a subgroup) when available. As findings from one of the industry funded studies were now available it was appropriate for the committee to consider establishing a short-life group to review the evidence on key aspects relating to the risk of non-proteolytic *C. botulinum* and VP/MAP foods. The draft terms of reference were:

- Review the risk posed by non-proteolytic *C. botulinum* and the FSA guidelines for the shelf-life of vacuum and modified atmosphere packaged foods.
- Specifically review the industry funded risk assessment of botulism from chilled, VP/MAP (Vacuum Packed/Modified Atmosphere Packed) fresh meat held at 3°C to 8°C (ACM/1304).
- Where appropriate consider other risk-related evidence relevant to this topic made available to the FSA and the ACMSF during the lifetime of the group.

53. It was noted that group would be chaired by Professor David McDowell. Members would be drawn from existing membership of the ACMSF together with additional co-opted experts. It was envisaged that this would be a short-term working group and would last for about 7 months. The expectation was that the outputs of the group will be in the form of a paper presented to the main committee in early 2020.

54. Members were asked to:

- Indicate whether they are content to proceed with establishing a short-term working group as outlined in this paper.
- Identify the priority issues which the working group will need to address.
- Comment on the draft TOR, approach and timescale envisaged for this task

55. The following comments were made:

- Members were supportive of this proposal to carry out the review with the new evidence available.

- Referring to the first bullet of the terms of reference (review the risk posed by non-proteolytic *C. botulinum* and the FSA guidelines for the shelf-life of vacuum and modified atmosphere packaged foods) a member raised that, as the FSA guidance was drawn from a previous ACMSF report (1992 report), whether the subgroup would make reference to previous ACMSF reviews/reports. Dr Cook commented that the FSA was not expecting an extensive report for this task but a paper or series of papers on the particular areas the group considers. It was explained that the group would have to scope out what is manageable to achieve within the confines of its terms of reference and timescale for the delivery of the task. It was added that the group would

have to determine whether they have enough time to cover all the issues that may arise during deliberations.

- In terms of the proposed group's terms of reference highlighted above, it was noted that not all of the FSA guidance on this subject had input from ACMSF reports. The response clarified that the terms of reference covers the FSA current guidance and other issues that may come to light in the course of the group's discussion.

- As the terms of reference specifically refers to *C. botulinum*, a member questioned the rationale of just looking at one pathogen as it was felt that the review should cover other pathogens that could make food unsafe in relation to shelf-life extension. The member underlined that the terms of reference should not be restrictive in its phraseology stressing that it should be clear that other relevant pathogens would be considered in the review. Dr Cook explained that although the FSA guidelines focussed on *C. botulinum* in terms of food safety management, other microbiological hazards are covered in the guidance.

- The Chair commented that, as *C. botulinum* appears to be the current key issue in relation to the shelf-life of these foods and considering the proposed subgroup have been given seven months for this task, it would be sensible to focus on *C. botulinum* for now. Other pathogens that are revealed in the course of the group's discussions could be given attention after the delivery of this task.

- It was highlighted (by Dr Cook) that the third bullet in the terms of reference gives the group sufficient flexibility to expand the scope should anything emerge during deliberations.

- Although the second bullet in the terms of reference is to "specifically review the industry funded risk assessment of botulism from chilled, VP/MAP (Vacuum Packed/Modified Atmosphere Packed) fresh meat held at 3°C to 8°C", Dr Cook clarified that the review was not exclusively for meat. It was pointed out that the publication mentioned forms part of the evidence the group would consider.

- Other issues raised for the group to consider include what happens to VP/MAP chilled products not stored properly by consumers and catering practices relating to these products.

56. The committee approved the setting up of the group and agreed the proposed terms of reference. It was noted that the secretariat will work with the Chair in the practicalities of setting up the group.

57. At the questions and answers session open to the public, Kaarin Goodburn, Chilled Food Association, welcomed the committee's decision to review non-proteolytic *Clostridium botulinum* risks in the context of the FSA's guidance on vacuum and modified atmosphere packed chilled foods via a subgroup. She asked if the FSA will suspend the use of the 2017 guidance

that Environmental Health Officers use for enforcement while carrying out its review. Kaarin Goodburn also asked for details on the group (membership) that will carry out the review. The Chair confirmed that membership of the group was yet to be settled but it will include experts outside of ACMSF. On the suggestion to suspend the use of the 2017 guidance, Dr Cook confirmed that this would not happen whilst the group is conducting its review adding that the FSA will reflect on the outcome of the review before there is any change to the advice.

Botulism in Cattle, Sheep and Goats

58. At the request of FSA risk managers, the committee was asked to revisit the issue of botulism in cattle, sheep and goats to identify any new information since the Committee's 2006 and 2009 reports. To do this, the FSA carried out a systematic literature review. Dr Rachael Oakenfull (FSA Microbiological Risk Assessment Branch) introduced the literature review (paper ACM/1311)[60]. The review covered the following areas:

- *Clostridium botulinum* the organism;
- Diagnosis and epidemiology of botulism in animals.
- The link between poultry waste and botulism outbreaks in cattle, sheep and goats.
- Contamination of food products through the transfer of spores, toxins or bacteria from groups of animals with botulism or suspected botulism.
- The associated risk to public health from food products derived from these animals.

59. Dr Oakenfull reported that the review question was split into five sub questions which followed the topics of the 2006 and 2009 reports to allow ease of comparison. Key developments identified include:

- The introduction of *C. botulinum* vaccinations for cattle in the UK.
- The improvement of laboratory-based diagnosis methods.
- Asymptomatic cattle may be carriers of *C. botulinum*.
- Further updates to the link between poultry and animal cases of botulism.

60. The committee was specifically asked:

- To comment on the findings of the literature review.
- Consider whether the advice on voluntary restrictions to cattle, sheep and goats, and the potential risk to human health, is still supported.

61. The following comments were made:

    - Some of the values and translations from the papers used for the literature review are not correct (e.g. inaccurate pH mentioned in paper). There is concern about the interpretation of data from studies cited in the literature review. For example, information in the literature review relating to asymptomatic carriers should be verified (it is not new

that cattle and goats carry spores of botulism). Critical information relating to the various studies cited in the review should be clearly expressed in the report's conclusions.

- It was noted that the description given to table 13 (non C and D toxin types described in the literature) in the report is incorrect.

- Although the review identified cases of healthy cattle being asymptomatic carriers of botulism, it was noted that there were no recent cases of botulism in humans that can be attributed to the drinking of raw milk or pasteurised milk. It was remarked that although the findings of the review may be interesting, public health professionals were not seeing cases of botulism ascribed to asymptomatic infection with C*. botulinum*. It was added that the increasing consumption of raw drinking milk may possibly have an effect on the number of future cases of botulism in humans.

- With the requirement to vaccinate livestock since 2006, members attributed the absence of human cases to the effectiveness of vaccination.

- A member who was in the subgroup that produced the 2006 and 2009 reports informed the committee that the focus of the ad hoc group that produced both reports was the potential for transmission of the toxin to cattle and goats via poultry litter. The group in its conclusion viewed it as negligible that the toxin could be transferred to human from animals. It was suggested that the emphasis of this review should be on the toxin as opposed to the organism.

- Referring to the places in the review that new methodology was used, it was suggested that would be good to separate these out into the methods that detect toxin and methods that detect the organism.

- Table 1: amend the wording to more accurately describe the incidence of types C and D toxin causing illness in humans.

- Review made reference to human toxin types found in cattle in Germany. Dr Oakenfull was asked to indicate that these findings were in Germany not the UK.

- A member queried the use of fussy English (such as occasionally) and Figures in the review. He suggested the use of precise terms.

- Figure 1: reported botulism/suspected botulism incidents in the UK between 2008 and 2018, a member asked if there were any background data on previous incidents particularly when incidents peaked and when they started to drop and which subset of species human or animal were reductions observed.

- Although the committee commended the structure of the report, Dr Oakenfull was asked to reflect on the points that came out of the discussions and revise the report as appropriate.

- A member volunteered to send suggestions on the areas in the report that needs correction.

62. In conclusion, the committee did not recommend a change to current advice which advises voluntary restrictions to cattle, sheep and goats and the potential risk to human health.

Review of alternative interventions in poultry processing

63. In June the committee reviewed the FSA's literature review of alternative interventions in poultry processing. This item was discussed as reserved business.

***Salmonella* Enteritidis t5.2669 outbreak**

64. At the October meeting, the committee was updated on the outbreak of *Salmonella* Enteritidis t5.2669 linked to eggs. This item was discussed as reserved business.

Food Standards Agency and Food Standards Scotland Risk Analysis Guidelines

65. At the committee's June and October meetings committee members were updated on the work being undertaken on risk analysis by FSA and FSS in preparation for the UK's Exit from the EU. The risk analysis process, risk analysis guidelines and other documents circulated to members provided context to the future work of the Scientific Advisory Committees.

66. This item was discussed as reserved business.

Epidemiology of Foodborne Infections Group

67. The Chair invited Dr Paul Cook to present the report[61] which summarised the main items from the EFIG meetings held on 18 January and 14 June 2019. The update covered trends in animal and human data in 2018 and 2019 (animal data only). Highlights of the report include:

- Between January and December 2018 there were 1,090 reports of *Salmonella* from livestock which is 2% lower than during January – December 2017 (1,116 reports). Between January to March 2019 there were 276 reports of *Salmonella* from livestock which is 42% higher than during January – March 2018 (194 reports).

- There were 10,299 reports of non-typhoidal *Salmonella* in the UK in 2018, a small increase on the 10,089 reported in 2017, increasing the overall UK reporting rate from 15.3 in 2017 to 15.6 in 2018. An increase in the reporting rate was seen in England and Northern Ireland, and a decrease in Scotland and Wales.
- *Salmonella* Enteritidis was the most commonly reported serovar across all constituent countries, comprising 30% of all reported *Salmonella* cases in the UK.
- The serovars with the highest proportion of cases reporting travel prior to infection are S. Kentucky (44% of cases reported foreign travel) and *Salmonella* Virchow (41% of cases reported foreign travel).
- The reporting rate for *Campylobacter* has increased in the UK from 96.8 per 100,000 population in 2017 to 101.6 per 100,000 in 2018. The rate of reported *Campylobacter* infections in England has increased from 2016 after a steady decline in the reporting rate since 2012. The reporting rate has also increased across all other countries for the second year in a row. Northern Ireland continues to report rates lower than the rest of the United Kingdom (79.2 cases per 100,000 population).
- Reports of STEC O157 in the UK increased from a rate of 1.2 cases per 100,000 population in 2017 to 1.3 cases per 100,000 population in 2018. Increases were reported in England and Northern Ireland, while decreases were reported in Wales and Scotland. Despite the increase in reporting rate in England in 2018 compared to 2017, the trend of a lower reporting rate since 2015 has continued.
- In 2018, 46 foodborne outbreaks were reported to national surveillance systems in England, Wales, Scotland and Northern Ireland compared to 40 reported in 2017.

68. Other items EFIG considered include: Epidemiology of *Cryptosporidium* spp. in England and Wales, Burden of gastrointestinal disease in Scotland: *Campylobacter* data linkage, Food Surveillance in England, Scotland and Wales and Update on the FSA's AMR activities.

69. Referring to the report on *Campylobacter* cases (human data), a member asked if the FSA had any concerns on the continuing increase in the trend of *Campylobacter* cases bearing in mind the Agency's interventions. Dr Cook stated that the FSA is exploring what was driving these increases but noted that first quarter figures for 2019 indicate that numbers of laboratory reports may have fallen.

70. A member questioned why *Campylobacter* cases in Northern Ireland were now going up as they have consistently had a lower incidence rate than other parts of the UK. Dr Cook replied that reason for the difference in *Campylobacter* figures between Northern Ireland and the rest of the UK is unclear, but it is perhaps timely to look at this again. It was mentioned that the committee should continue to closely monitor the trend in the number of *Campylobacter* cases in relation to changing the current advice if necessary. A member stressed the need to clearly understand the analyses on *Campylobacter* understanding the sources of infections before decisions are made on changing of advice.

71. A member questioned how the data in paper ACM/1296 was presented pointing out that this could be presented in a more informative way, in particular clarifying whether the changes reported matter and their likely or actual impact on human disease rates. Changes in absolute numbers may be small and so could have happened by chance or could be large enough to suggest a true change that may need action (i.e. preference was a statistical approach). The member suggested a simple traffic light approach, highlighting in amber or red the changes that could be significant and might need action; this would enable ACMSF members to focus their time on the more concerning changes presented in the report. Reporting longer time trends than just comparison with the previous year, and an indication of rates in other countries, would also help members to assess whether changes were of concern. The member also stated that it would be good for the paper to show actions being taken on the trends being highlighted together with relevant points from EFIG members discussions. Secretariat to relay these to the EFIG secretariat to consider.

ACMSF Ad Hoc and Working Groups

Ad Hoc Group on *Campylobacter*

72. Prof McDowell reported that the above group's report (Third report on *Campylobacter*) that was presented to the Committee at the June 2019 plenary meeting was published on 2 September 2019. As the FSA requested for the Ad Hoc group's assistance in the prioritisation of the report's recommendations, members noted that 13 high priority recommendations were identified by the group that were viewed to have the highest impact in terms of reducing foodborne illness. Members were informed that the secretariat will circulate these to the Committee for information. Prof McDowell acknowledged the role Prof Sarah O'Brien who led the group in producing a comprehensive report which has been well received by the FSA. A member of the group echoed the role of Prof O'Brien in efficiently leading the group and shared his appreciation of the role of social science in understanding the barriers to change in the processes in the food supply chain. The Chair underlined the role of social science in risk assessment and congratulated the Ad Hoc Group for their authoritative report. He added that should this comprehensive report need updating in the future producing an annex may be a way to achieve this.

73. A member referring to the *Campylobacter* Reduction Programme (information paper ACM/1318 circulated at the October plenary meeting) discussed at the September 2019 FSA Board meeting asked for feedback (from Dr Cook) on how the discussion went as this was the first time the FSA Board discussed the increasing number of *Campylobacter* in human cases. He asked if the FSA Board had any concerns. Dr Cook agreed to update the Committee at the next meeting plenary meeting as he did not attend the Board meeting.

Ad Hoc Group on QACs and Biocides used in food processing

74. At the June plenary meeting, Dr Gary Barker (Chair of the above group) updated members on the activities of his group which was setup in October 2018 following the responses sent by industry to the committee's request seeking evidence on Food Business Operators concerns on the implications of changes to the maximum residue levels for quaternary ammonium compounds (QACs), chlorate and biocidal actives. He reported that the group has a cross Scientific Advisory Committee (SAC) membership and recognised industry's concern on this subject from the responses sent to the consultation. However, he explained that the group's discussions identified areas where it was felt additional information was needed as they were unable to quantify the level of impact on microbiological food safety due to these changes. The group felt that having information on the efficacy of the products to which FBOs have switched would be helpful. It was noted that the group (through the secretariat) has been liaising with industry on the issue of additional evidence. The group is of the view that case studies on the alternative chemicals to which FBOs have switched would be the appropriate means of delivering this request for additional information.

75. It was highlighted that the group responded to the European Commission's request seeking comments on its proposal to amend Annex III to Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards maximum residue levels for chlorate in or on certain products.

76. Further to the above update (at the public question and answer session), Kaarin Goodburn (CFA) provided clarification on how chlorates should be associated with residues. She welcomed the involvement of the subgroup on this subject and asked for advice on what was their next line of action stating that industry has produced a raft of documents that the group may find useful in its deliberations. Dr Gary Barker (Chair of the subgroup) welcomed any material that will assist the group's work but cautioned that the group could only assess microbiological issues which is missing in the majority of the material the group have received. Ms Goodburn was asked to send the group material she feels the group would find useful.

77. Peter Littleton (Christeyns Food Hygiene) referring to the comprehensive response he provided in response to the biocides subgroup's letter of 24 May to industry reiterated the role QACs and biocides play in ensuring safe food for the consumers and the difficulties regarding the alternative to QACs products. He encouraged the group to quicken the pace of its work and not wait for food poisoning outbreaks to occur before providing its opinion.

78. At the October plenary meeting, Dr Barker updated that members the group had not met formally since the June 2019 plenary meeting. In relation to QACs and biocides he reported that further attempts to gather relevant evidence relating to food safety have been unsuccessful. Although there have been changes in disinfection and the use of biocides it had not been

possible to source evidence that links these changes to changes in food microbiology. Dr Barker stated that although many organisations disagree with the interaction of Plant Protection Product (PPP) regulations (EC Regulations 396/2005) with food safety considerations, the nature of the cross-over is outside the scope of the subgroup. He highlighted that UK monitoring data (from the Health and Safety Executive) for DDAC/BAC (didecyldimethylammonium chloride and benzalkonium chloride) is expected to be largely compliant with the current temporary MRL (0.1 mg/kg) and there is no evidence of PPP use. The EU process for consideration of the temporary MRL is ongoing.

79. Regarding chlorate, members were informed that the EU has not published any comments relating to the public consultation on Chlorate MRL that was concluded in February 2019 (submission from the subgroup and other UK organisations). The draft document that concerns changes in the MRL for Chlorate in food was considered at the European Commission's Standing Committee on Animals, Plants, Food and Feed meeting in September 2019 (the UK did not attend). There was a change to a footnote concerning the interpretation of monitoring results (possibly separating non-PPP sources) but it is not clear how this will impact on guidance. EU legislation regarding the new MRL was expected to be finalised later in 2019.

80. Kaarin Goodburn (CFA) noted the update provided by Dr Barker. She expanded the point made by Dr Barker on the outcome of the September 2019 meeting of the European Commission's Standing Committee on Animals, Plants, Food and Feed (the EC are in the process of deciding whether to extend the validity of the current temporary MRL (0.1 mg/kg) set for benzalkonium chloride and didecyldimethylammonium chloride). She underlined that QACs are the most effective hygiene biocides with respect to *Listeria monocytogenes.* On the point Dr Barker made on the unavailability of microbiological food safety data in relation to QACs/biocides, Kaarin Goodburn pointed out that there were lots of examples in the public domain that have shown that ineffective hygiene controls have led to outbreaks of foodborne infections such as botulism and STEC. Peter Littleton (Christeyns Food Hygiene UK) endorsed the points Kaarin Goodburn made regarding the dangers of further reduction in QACs MRLs. He explained that QACs and biocides play a key role in microbiological food safety and it was difficult to find alternatives to the existing effective products. The Chair indicated that the proposed reduction of QACs MRLs is a concern. He explained that as soon as you start reducing concentration of biocides or antibiotics you open the way for evolution/mutation of microorganisms and they can acquire resistance to the particular QAC and antibiotic.

ACMSF subgroup on non-proteolytic *Clostridium botulinum* and vacuum and modified atmosphere packaged foods

81. Prof David McDowell (Chair of the above group) updated members on the activities of his group which was setup in June 2019. He reported that the group had two face to face meetings in 2019. It was noted that the first meeting held on 31 July 2019 focussed on the group's terms of reference, scope of work and the group's work plan. At the second meeting held on 9 September 2019 the group agreed its terms of reference, received a presentation on an industry funded study (Risk Assessment of Botulism from Chilled, Vacuum Packed/Modified Atmosphere Packed Fresh Meat held at 3°C to 8°C, discussed available evidence on the subject of non-proteolytic *C. botulinum* and vacuum and modified atmosphere packaged foods and revised their work plan. It was noted that the group has agreed to invite the Chilled Food Association (Kaarin Goodburn) to present the findings of the SUSSLE (enhancing sustainability in chilled prepared foods) project and any other relevant information to the group.

82. Members noted the group's agreed terms of reference:

- Review the Food Standards Agency guidelines for the shelf-life of vacuum and modified atmosphere packaged foods and the risk posed by non-proteolytic *C. botulinum*, and other pathogens where appropriate, from these foods. This group will consider the 1992 ACMSF Report on Vacuum Packaging and Associated Processes, but it is outside the scope of this group to review that document.
- Specifically review the industry funded risk assessment of botulism from chilled, VP/MAP (Vacuum Packed/Modified Atmosphere Packed) fresh meat held at 3°C to 8°C.
- Where appropriate consider other risk-related evidence relevant to this topic made available to the FSA and the ACMSF during the lifetime of the group.

Working Group on Antimicrobial Resistance

83. It was reported that the above group had a face to face meeting in November 2018, a teleconference in February 2019 and considered two FSA survey (monitoring AMR in the food chain) reports via correspondence in May 2019. The subjects they have considered in the above period include:
    - FSA funded surveys for AMR in UK retail meat samples
    - FSA Board paper on AMR including the report of the ACMSF Task and Finish Group and new research
    - UK Veterinary Antibiotic Resistance and Sales Surveillance Report (UK-VARSS 2017)
    - Update on recent activities relating to AMR (UK AMR Strategy and update on the activities of Defra Antimicrobial Resistance Coordination covering January to September 2018)
    - *E.coli* ST131-H22 as a foodborne Uropathogen
    - A draft literature review on alternative interventions in poultry processing.

- The issue of burden of AMR genes in selected ready-to-eat Foods (AMR genes of interest).
- FSA AMR survey reports: EU Harmonised Surveillance of Antimicrobial Resistance in *E. coli* from Retail Meats in UK (2018 - Year 4, chicken) and;
- AMR in *Campylobacter jejuni* and *Campylobacter coli* from retail chilled chicken in the UK (Year 4: 2017 – 18). Forming part of the project: A microbiological survey of *Campylobacter* contamination in fresh whole UK produced chilled chickens at retail sale (2015-18)

Newly Emerging Pathogens group

84. It was reported that at the request of the FSA, the group considered the risks associated with the consumption of human placenta - considering microbiological, clinical and food safety issues. The group met in January 2019 and a paper summarising the group's discussions has been circulated electronically to the main committee for information and final comments to be submitted by mid-July 2019.

Outcome and Impact of ACMSF Advice

85. Feedback on the outcome of ACMSF recommendations are provided to the Committee through matters arising papers, information papers and oral updates at meetings.

86. Third report on *Campylobacter*: The committee at its June plenary meeting approved this report produced by the Ad Hoc Group on *Campylobacter*. The report that had several recommendations updated the committee's second report on *Campylobacter* published in 2005. It provided a more up to date picture on *Campylobacter* in the food chain to inform the FSA's *Campylobacter* reduction programme. As the subgroup prioritised the recommendations in its report so that those which are high priority in terms of reducing foodborne illness were identified, the FSA is using this to guide how to direct resources most effectively in reducing *Campylobacter* in the food chain.

87. Report on multidimensional representation of risks: The full committee at its October plenary meeting, adopted the report produced by its Ad Hoc Group on representation of risks. This report which is a two-dimensional qualitative approach will be employed when reviewing and preparing risk assessments. The committee had recognised that the one-dimensional approach to risk assessment based on the probability of an adverse effect occurring (to estimate the level of risk) has not always supported clear decision making and communication.

88. Risk assessment for the use of *Mycobacterium bovis* BCG Danish Strain 1331 in cattle: Risks to public health**:** the committee commented/endorsed a revised risk assessment concerning the issue of ingestion of Cattle BCG

via the food chain through the consumption of minced beef and raw milk from vaccinated cattle. APHA welcomed the committee's endorsement.

89. At the request of FSA risk managers, the committee revisited the issue of botulism in cattle, sheep and goats to identify any new information since the Committee's 2006 and 2009 reports. We did not recommend a change to current advice which advises voluntary restrictions to cattle, sheep and goats and the potential risk to human health.

90. Review of alternative interventions in poultry processing: The committee discussed the FSA's literature review on alternative interventions in poultry processing. Comments provided by the committee were welcomed by the FSA. It was noted that the finalised document will be used as a working document (evidence on this subject) for FSA Risk Managers should they need a UK position on this subject.

91. FSA and FSS Risk Analysis guidelines: FSA and FSS asked the committee to comment on the draft risk analysis guidelines that have produced in preparation for the UK's Exit from the EU. The committee discussed the risk analysis process/guidelines and provided comments which were welcomed by FSA/FSS.

92. Risks associated with the consumption of human placenta - considering microbiological, clinical and food safety issues: the Newly Emerging Pathogens group's considered this subject as requested by the FSA. The paper the group produced that summarised their discussion was welcomed by the FSA in providing advice on this subject.

Information papers

93. The ACMSF is routinely provided with information papers on topics which the Secretariat considers may be of interest to Members. This affords them the opportunity to identify particular issues for discussion at future meetings. Among the documents provided for information during 2019 were:

PAPER NUMBER	NAME OF PAPER	MEETING NUMBER	DATE OF MEETING
ACM/1300	ACMSF Workplan	94th	27 June 2019
ACM/1301	Update from other committees	94th	27 June 2019
ACM/1302	Items of interest from the literature	94th	27 June 2019

ACM/1303	Food and You Surveys	94th	27 June 2019
ACM/1304	Risk Assessment of Botulism from chilled, Vacuum packed/modified atmosphere packed meat	94th	27 June 2019
ACM/1305	ACAF paper on raw pet food (best practice guidance)	94th	27 June 2019
ACM/1306	ACMSF response to the EC consultation on maximum level of chlorate in food	94th	27 June 2019
ACM/1307	Raw diets for dogs and cats: a review, with particular reference to microbiological hazards	94th	27 June 2019
ACM/1314	ACMSF Work plan	95th	17 October 2019
ACM/1315	Update from other Scientific Advisory Committees	95th	17 October 2019
ACM/1316	Items of interest from the literature	95th	17 October 2019
ACM/1317	ACMSF Report: Third Report *Campylobacter*	95th	17 October 2019
ACM/1318	FSA Board Paper: Campylobacter reduction programme	95th	17 October 2019
ACM/1319	Progress update on antimicrobial resistance	95th	17 October 2019

Chapter 3: A Forward Look

Future work programme

94. The Committee will keep itself informed of developing trends in relation to foodborne disease through its close links with the FSA, Food Standards Scotland, Public Health England and the Department of Environment, Food and Rural Affairs. We will continue to respond promptly with advice on the food safety implications of issues referred to the Committee by the FSA.

95. The newly established group on non-proteolytic *Clostridium botulinum* and vacuum and modified atmosphere packaged foods is working on a defined timescale to produce a report by early 2020.

96. The cross-SAC group setup to consider the effect on microbiological food safety of the changes made to the maximum residue levels for quaternary ammonium compounds and biocidal actives will continue to collaborate with industry to obtain relevant evidence that can be used to assess the impact of these changes on food safety.

97. At the FSA's request, the subgroup on microbiological risk assessments in relation to food incidents will review the FSA's risk assessments if this is needed.

98. The Working Group on AMR will to continue provide advice to the FSA on issues relating to AMR and the food chain.

99. The Committee, through its standing Surveillance Working Group, will continue to provide advice as required on the Government's microbiological food surveillance programme and any other surveillance relevant to foodborne disease.

100. The Working Group on emerging pathogens will keep a watching brief on developments concerning the risks to human health from newly emerging or re-emerging pathogens through food chain exposure pathways.

101. Details of the Committee's work plan for 2019/20 can be found at Annex II.

Annex I

Papers Considered by ACMSF in 2019

PAPER NUMBER	NAME OF PAPER	MEETING NUMBER	DATE OF MEETING
ACM/1292	Matters arising	94th	27 June 2019
ACM/1293	FSA's guidance on vacuum and modified atmosphere packed chilled foods	94th	27 June 2019
ACM/1294	*Ad Hoc* Group on Risk Assessment Report	94th	27 June 2019
ACM/1295	*Ad Hoc* Group on *Campylobacter* Report	94th	27 June 2019
ACM/1296	Epidemiology of Foodborne Infections Group	94th	27 June 2019
ACM/1297	Dates of future meetings	94th	27 June 2019
ACM/1298	Review of alternative interventions in poultry processing (Reserved Business)	94th	27 June 2019
ACM/1299	Food Standards Agency and Food Standards Scotland Risk Analysis Guidelines (Reserved Business)	94th	27 June 2019
ACM/1300	ACMSF Workplan	94th	27 June 2019
ACM/1301	Update from other committees	94th	27 June 2019
ACM/1302	Items of interest from the literature	94th	27 June 2019
ACM/1303	Food and You Surveys	94th	27 June 2019
ACM/1304	Risk Assessment of Botulism from chilled, Vacuum packed/modified atmosphere packed meat	94th	27 June 2019
ACM/1305	ACAF paper on raw pet food (best practice guidance)	94th	27 June 2019

ACM/1306	ACMSF response to the EC consultation on maximum level of chlorate in food	94th	27 June 2019
ACM/1307	Raw diets for dogs and cats: a review, with particular reference to microbiological hazards	94th	27 June 2019
ACM/1308	Matters arising	95th	17 October 2019
ACM/1309	Ad Hoc Group on Risk Assessment	95th	17 October 2019
ACM/1310	Risk assessment for the use of *M.bovis* BCG Danish Strain 1331 in cattle: Risks to public health	95th	17 October 2019
ACM/1311	Botulism in Cattle, Sheep and Goats	95th	17 October 2019
ACM/1312	Dates of future meetings	95th	17 October 2019
ACM/1313	FSA and FSS risk analysis guidelines	95th	17 October 2019
ACM/1314	ACMSF Work plan	95th	17 October 2019
ACM/1315	Update from other committees	95th	17 October 2019
ACM/1316	Items of interest from the literature	95th	17 October 2019
ACM/1317	ACMSF Report: Third Report on *Campylobacter*	95th	17 October 2019
ACM/1318	FSA Board Paper: *Campylobacter* reduction programme	95th	17 October 2019
ACM/1319	Progress update on antimicrobial resistance	95th	17 October 2019

Annex II

ACMSF Forward Work Plan 2019/20

Last reviewed October 2019

This work plan shows the main areas of ACMSF's work over the next 12 to 18 months. It should be noted that the Committee must maintain the flexibility to consider urgent issues that arise unpredicted and discussions scheduled in the work programme may therefore be deferred.

ACMSF Terms of reference

To assess the risk to humans of microorganisms which are used, or occur, in or on food, and to advise the Food Standards Agency on any matters relating to the microbiological safety of food.

	Topic	Progress	Expected Output
1	**Horizon scanning** Horizon scanning workshop for members to assess emerging microbiological issues of concern and rank issues in terms of strategic priority and urgency	**Workshop was held in January 2018** Horizon scanning workshop was held in January 2018 where the Committee highlighted and shortlisted key issues for consideration. At follow-up discussions it was agreed to setup a subgroup to consider a two-dimensional approach in defining risk assessment outputs.	The Ad Hoc Group on Risk Assessment will produce a 2D risk assessment report for the FSA's consideration.

Other topics that had high numerical ranking in terms of urgency include:

- Increased raw fruit and veg consumption and outbreaks associated with fresh fruit, veg and bagged salads
- Joined up effort needed on areas of waste and food safety
- Understanding the microbiological risks of new packaging
- Possible changes in *modus operandi* for SACs including ACMSF in terms of resources and expertise and possible need to respond to an increasing number of fast paced issues
- Loss of technical expertise/skill base and EU National reference labs

		disappearing (being out of the EU network) • Do ACMSF assessments have a life span e.g. non-proteolytic *C. botulinum* in chilled foods?	
2	**Newly Emerging Pathogens**		
	The Newly Emerging Pathogens Working Group provides advice on the significance and risks from newly emerging or re-emerging pathogens through food chain exposure pathways.	Continuous.	The Committee to draw the FSA's attention to any risks to human health from newly emerging pathogens via food.
3	**Microbiological Surveillance of food**		
	The Surveillance Working Group provides advice as required in connection with the FSA's microbiological food surveillance programme and any other surveillance relevant to foodborne disease.	Working group activities are continuous.	Surveillance Working Group/Committee comments on survey protocols and survey results for consideration by FSA in their microbiological food surveillance activities.

4	**Developing trends in relation to foodborne disease** The Committee receives updates on research, surveys, investigations, meetings and conferences of interest.	As issues arise. Updates will be provided based on the June and December 2019 EFIG[1] meetings.	 ACMSF provides comments on the updates it receives for the FSA's consideration.
5	**International and EU developments on the microbiological safety of food** The Committee is updated on issues of relevance and significant developments at an EU and international level on microbiological food safety, such as EFSA opinions and Codex Committee on Food Hygiene meetings.	 As issues arise.	 ACMSF to note updates and provide comments if desired.

[1] Epidemiology of Foodborne Infections Group

6	**Microbiological incidents and outbreaks** The views of the Committee will be sought where necessary and updates provided on outbreaks of significance.	As issues arise.	ACMSF assessment of the risks in relation to significant microbiological outbreaks/incidents.
7	**Antimicrobial resistance** ACMSF's role through its Working Group on AMR is to assess the risks to humans from foodborne transmission of antimicrobial-resistant microorganisms and provide advice to the FSA.	The subgroup considers developments and emerging issues in relation to antimicrobial resistance and the food chain. Working group activities are continuous. Summaries of discussions and recommendations are provided at plenary meetings.	ACMSF assessment of the key risks to the food chain which may have consequences for human health and identification of key research or surveillance gaps in relation to the food chain.
8	***Ad Hoc* Group on *Campylobacter*** In June 2015, the FSA and ACMSF agreed that as it was 10 years since the Committee issued its last report on *Campylobacter* in the food chain, an expert subgroup should be set up to revisit this area and provide a more up to date picture, given that reducing	The group's draft report was issued for a 10-week public consultation in March 2019. Report was considered (and approved for publication) by the full Committee at the June 2019 plenary. As the FSA asked for the subgroup's assistance in the prioritization of the report's	ACMSF's update on the Second *Campylobacter* report published in 2005. Report was published on the ACMSF's webpage in September 2019.

	Campylobacter in chicken was a key strategic priority for the Agency in recent years.	recommendations, members will receive an update on this.	
9	**Social science research relating to microbiological food safety risks**	The Committee will receive updates on the findings of social science research which may have a bearing on the assessment of microbiological food safety risks.	ACMSF to note updates and provide comments if desired.
10	**FSA Board's New Approach in relation to Rare Burgers**	The Committee will be updated on work the FSA is undertaking following the FSA Board's decision on rare burgers.	Committee to be kept informed of progress and to contribute to the work where appropriate.

11	**Changes to plant protection product MRLs: potential impact on food safety**	Members were alerted to this issue of changes to maximum residue levels (MRLs) for two quaternary ammonium compounds (QACs), chlorate and biocidal actives which are used as disinfectants/sanitisers in the food industry at their October 2015, January 2016 and January 2017 meetings. The Committee agreed to the FSA's suggestion to setup a cross SAC working group to facilitate a full discussion to take place. Committee will receive an update on this issue at the October 2019 meeting.	ACMSF to consider the evidence in this area with respect to impacts on food safety and to provide advice to the FSA.
12	**FSA's guidance on vacuum and modified atmosphere packed chilled foods**	Committee to consider current evidence on vacuum and modified atmosphere packed chilled foods in the past 10 years and the ongoing work. ACMSF at the June 2019 plenary meeting members agreed to setup a subgroup to consider this issue. Group is expected to produce its report early in 2020.	ACMSF assessment on whether to refresh its advice on this subject.

13	**Botulism in Cattle, Sheep and Goats**	A systematic literature review will be presented to the Committee concerning botulism in cattle, sheep and goats. ACMSF published reports on these issues in 2006 and 2009.	ACMSF to consider the evidence in this systematic literature review and provide advice to the FSA.
14	**Food Standards Agency and Food Standards Scotland Risk Analysis guidelines** FSA and FSS are drafting risk analysis guidelines in preparation for the UK's Exit from the EU.	The Committee will be updated on the FSA and FSS's risk analysis guidelines at the October 2019 plenary meeting.	ACMSF's comments on the risk analysis guidelines for FSA and FSS to consider.
15	**Risk assessment for the use of *Mycobacterium bovis* BCG Danish Strain 1331 in cattle: Risks to public health**	ACMSF commented on this risk assessment in 2015. Animal and Plant Health Agency has considered these comments and made additions to the risk assessment in the form of an addendum and would like ACMSF's views on the changes that has been made. This will be presented to the Committee at the October 2019 plenary meeting.	ACMSF will comment on the revised risk assessment particularly on the issue of ingestion of Cattle BCG via the food chain through the consumption of minced beef and raw milk from vaccinated cattle.

Annex III

Terms of Reference and Membership of the Advisory Committee on the Microbiological Safety of Food, its Working Groups and its *Ad Hoc* Groups

Terms of reference

ACMSF

To assess the risk to humans from microorganisms which are used or occur in or on food and to advise the Food Standards Agency on any matters relating to the microbiological safety of food.

Surveillance Working Group

To facilitate the provision of ACMSF advice to government in connection with its microbiological food surveillance programme and other surveillance relevant to foodborne disease, particularly in relation to the design, methodology, sampling and statistical aspects; and to report back regularly to the ACMSF.

Newly Emerging Pathogens Working Group

To assemble information on the current situation on this topic in order to decide whether there is a potential problem in relation to the microbiological safety of food; and to recommend to the ACMSF whether the Committee needs to undertake further action.

Antimicrobial Resistance Working Group

- To brief ACMSF on developments in relation to antimicrobial resistance and the food chain and identify evidence that will assist the group in assessing the risks.

- To review key documents and identify the risks for the UK food chain and relevant aspects of the feed chain in relation to antimicrobial resistance which may have consequences for human health.

- To comment on progress in understanding the issue of antimicrobial-resistant microorganisms and the food chain since the ACMSF produced its report in 1999 and subsequent reviews in 2005 and 2007, including the relevance of any outstanding recommendations.

- To highlight key research or surveillance gaps in relation to antimicrobial-resistant microorganisms and the food/feed chain and identify those which are considered a priority.

Ad Hoc Group on *Campylobacter*

To assess the actions that have taken place since the publication of the Second *Campylobacter* Report and make proposals to advise the FSA in evolving its strategy for reducing the incidence and risk of foodborne *Campylobacter* infection in humans.

Ad Hoc Group on representation of risks

- To propose a multidimensional representation of risk and total uncertainty that is suitable for food risks considered by ACMSF.
- The group's remit will include continued communication of its work and outputs to the ACMSF and the FSA.
- The group's remit will **not** include consideration of issues relating to risk management and risk communication (including perception).

ACMSF subgroup on non-proteolytic *Clostridium botulinum* and vacuum and modified atmosphere packaged foods

Review the Food Standards Agency guidelines for the shelf-life of vacuum and modified atmosphere packaged foods and the risk posed by non-proteolytic C. botulinum, and other pathogens where appropriate, from these foods. This group will consider the 1992 ACMSF Report on Vacuum Packaging and Associated Processes, but it is outside the scope of this group to review that document.

- Specifically review the industry funded risk assessment of botulism from chilled, VP/MAP (Vacuum Packed/Modified Atmosphere Packed) fresh meat held at 3°C to 8°C.
- Where appropriate consider other risk-related evidence relevant to this topic made available to the FSA and the ACMSF during the lifetime of the group.

Subgroup on microbiological risk assessments in relation to food incidents

Reviews the FSA's risk assessments in relation to incidents.

Subgroup on quaternary ammonium compounds and biocides used in food processing

Setup to review evidence on Food Business Operators concerns on the implications of changes to the maximum residue levels for QACs, biocidal actives and chlorate residues on food hygiene and safety.

Membership Tables

		ACMSF	Surveillance	Newly Emerging Pathogens	AMR	QACs and Biocides	Incidents	Risk Assessment	Campylobacter	Non-proteolytic *C.*Botulinum and Vac Pac foods
Chair										
Professor Bill Keevil	Professor of Environmental Healthcare, Head of the Microbiology Group, at the University of Southampton	✓								
Former Chair Professor S J O'Brien[2]	Professor of Infection Epidemiology and Zoonoses, University of Liverpool	✓							✓	
Interim Chair Professor D McDowell[3]	Emeritus Professor of Food Studies University of Ulster	✓	✓	✓	✓	✓	✓	✓	✓	✓

[2] Appointment ended 31 March 2017, but continued to Chair *Ad Hoc* Group on Campylobacter

[3] Interim Chair from 1 April 2017 – July 2019

		ACMSF	Surveillance	Newly Emerging Pathogens	AMR	QACs and Biocides	Incidents	Risk Assessment	Campylobacter	Non-proteolytic *C.*Botulinum and Vac Pac foods
Members										
Dr Bob Adak	Former Head of Gastrointestinal Infection Surveillance, Department of Gastrointestinal, Emerging & Zoonotic Infections, Health Protection Services Colindale (PHE)	✓	✓			✓	✓			
Dr G Barker	Research Scientist	✓		✓		✓	✓	✓		✓
Dr R Betts	Head of Food Microbiology, Campden BRI	✓	✓			✓	✓			✓
Mrs J Dobbs[4]	Member of the Social Science Research Committee	✓								✓

[4] *Ex officio* appointment (Member of Social Science Research Committee)

Dr G Godbole	Consultant Medical Microbiologist and Parasitologist Public Health England	✓			✓			✓		✓
Mrs E Hill	Head of Food, Health, Safety and Environment, CH&Co Group Ltd	✓								
Professor M Iturriza-Gómara	Professor of Virology, University of Liverpool	✓		✓				✓		
Mr A Kyriakides	Head of Product Quality, Safety and Supplier Performance, Sainsburys	✓		✓		✓	✓		✓	✓
Miss H Lawson	Senior Environmental Health Officer, Royal Borough of Greenwich	✓	✓			✓				✓

Dr G Lowe	Consultant in Communicable Disease Control, Public Health Wales	✓		✓			✓	✓		
Dr R Manuel	Consultant Clinical Microbiologist Public Health Laboratory, London	✓			✓					
Professor P McClure	Microbiologist and Microbiology Department Manager, Mondelēz International R&D Ltd	✓	✓					✓	✓	
Mr D Nuttall	Catering Manager Harper Adams University College	✓							✓	
Dr D Tucker	Senior Lecturer in Veterinary Public Health/pig medicine, University of Cambridge	✓		✓	✓			✓	✓	

Mrs A Williams	Consumer representative	✓							✓	
Dr Wayne Anderson	Director of the Food Science and Standards Division at the Food Safety Authority of Ireland	✓								
Dr Jane Gibbens	Consultant veterinary epidemiologist	✓								
Dr Edward Fox	Senior Lecturer at Northumbria University	✓								
Prof Francis Butler	Professor in the School of Biosystems and Food Engineering at University College Dublin and a Principal Investigator in the UCD Centre for Food Safety.	✓								
Mr Martin Briggs	Animal feeds expert (GLW Feeds Ltd)	✓								

		ACMSF	Surveillance	Newly Emerging Pathogens	AMR	QACs and Biocides	Incidents	Risk Assessment	Campylobacter	Non-proteolytic *C.*Botulinum and Vac Pac foods
Co-opted members										
Dr John Points	Member of Expert Committee on Pesticides Residues in Food					✓				
Prof Mike Peck	QIB Extra									✓
Prof S Forsythe	Member of Advisory Committee on Animal Feedingstuffs (ACAF)				✓					
Mr C Teale	Animal and Plant Health Agency				✓					
Prof J Threlfall	Formerly Health Protection Agency (PHE)				✓					

Prof R La Ragione	School of Veterinary Medicine, University of Surrey				✓					
Prof T Humphrey	Professor of Bacteriology and Food Safety, University of Swansea								✓	
Prof N Strachan	University of Aberdeen								✓	
Prof N McCarthy	University of Warwick								✓	
Prof M C J Maiden	University of Oxford								✓	
Mr John Bassett	Independent Consultant (Food Safety Risk Assessment)							✓		
Dr Emma Snary	APHA							✓		

		ACMSF	Surveillance	Newly Emerging Pathogens	AMR	QACs and Biocides	Incidents	Risk Assessment	Campylobacter	Non-proteolytic *C.*Botulinum and Vac Pac foods
Departmental representatives										
Dr S Wyllie	Department for Environment, Food and Rural Affairs	✓		✓	✓					
Dr C Schulte	Department of Health									
Dr K Healey	Veterinary Medicines Directorate				✓					
Mr A Hardgrave	FSA								✓	
Dr David Mortimer	FSA					✓				
Helena Cooke	HSE					✓				
Scientific Secretaries										
Dr Paul Cook	FSA	✓		✓	✓		✓			✓
Dr Manisha Upadhyay	FSA	✓	✓	✓	✓		✓	✓	✓	
Dr Andrew Day	FSA									✓
Administrative Secretariat										
Mr A Adeoye	FSA	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ms Azuka Aghadiuno	FSA	✓								

Annex IV

ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD – REGISTER OF MEMBERS' INTERESTS

Chair

Professor Bill Keevil		
Personal Interests	**Employee** University of Southampton	**Scientific Advisor** JVS Products Ltd
Non-Personal Interests	**Grants** Various research grants from public and private sector	

Members

Professor David McDowell		
Personal Interests	**Employee** University of Ulster Emeritus Professor	
Non-Personal Interests	**Grants** Various Research funding in collaboration with industrial partners	
Dr Bob Adak		
Personal	None	
Non-personal Interests		
Mr David Nuttall		
Personal Interests	**Employee** Harper Adams University College	
Non-Personal Interests		

Professor M Iturriza-Gómara		
Personal	**Employee** University of Liverpool	
Non-personal Interests	**Grants** Various Research grants from pharmaceutical industry (vaccine related work)	
Dr Gary Barker		
Personal Interests	None	
Non-Personal Interests	**Grants** Research Funding in collaboration with industrial partners	
Dr R Betts		
Personal	**Employee** Campden Group Services	
Non-personal Interests	**Work for Campden BRI's members** A range of food producers/providers and associated service industries	
Dr Gauri Godbole		
Personal Interests	**Employee** Public Health England	
Non-Personal Interests		

Dr Rohini Manuel		
Personal	**Employee** Public Health England	
Non-personal Interests	**Various** Research funding from public and private sector	
Mrs Ann Williams		
Personal Interests	**Employee** Liverpool City Council	
Non-Personal Interests		
Mrs Emma Hill		
Personal	**Employee** CH&Co Group	
Non-personal Interests	**Working partnership** UK Hospitality	
Mr A Kyriakides		
Personal Interests	**Employee** Sainsbury's Supermarkets Ltd	
Non-Personal Interests	**Chairman** Campden BRI	
Professor P McClure		
Personal	**Employee** Mondelēz UK R&D Ltd (Europe Manager)	**Shareholder** Unilever **Royalties for book chapters** Woodhead Publishing and Elsevier

Non-personal Interests		
Dr Gwen Lowe		
Personal Interests	**Employee** Public Health Wales	
Non-Personal Interests	**Publishing contract** Chicken House Books	
Miss Heather Lawson		
Personal	**Employee** Royal Borough of Greenwich **Member** Chartered Institute of Environmental Health	
Non-personal Interests		
Dr D Tucker		
Personal Interests	**Employee** University of Cambridge **Fellow and Trustee** Pembroke College, Cambridge **Membership** Royal College of Veterinary Surgeons and European College of Pig Health Management	**Consultancy** Genus plc **Farming Partnership** WJW Tucker and sons **Shareholder** BP Amoco and Genus plc

Non-Personal Interests	**Grants** Research funding to support pig clinical residency training programs (Zoetis Animal Health and Ceva Animal Health)	
Dr Wayne Anderson		
Personal	**Employee** Food Safety Authority Ireland	
Non-personal Interests		
Dr Jane Gibbens		
Personal Interests	**Consultancy** Fee paid work from relevant organisations and consultancies including: advice to APHA on bovine TB epidemiology, Jan 2018 – Mar 2019 Advice to Northern Ireland CVO on NI veterinary surveillance strategy, Jun-Nov 2018 Advice on data management and interpretation in the preparation of OIE public/private partnership guidelines	
Non-Personal Interests		
Professor Francis Butler		
Personal	**Employee** University College Dublin	**Consultancy**

	Board member Food Safety Authority for Ireland	Fee paid work from relevant organisations and consultancies Occasional fee paying consultancy with the Saudi Food and Drug Authority in relation to risk assessment Occasional food safety consultancy with the Irish Food Industry
Non-personal Interests	**Grants** Partial industry support for research project on dairy products safety (Dairy industry)	
Dr Edward Fox		
Personal Interests	**Employee** University of Northumbria	
Non-Personal Interests	**Grants** Have previously received funding from Australia Eggs and Safefood	
Mr Martin Briggs		
Personal	**Employee** GLW Feeds	
Non-personal Interests		

Co-opted members

Antimicrobial Resistance Working Group		
Professor S Forsythe		
Personal Interests	None	
Non-Personal Interests		

Mr C Teale		
Personal	**Employee** APHA	
Non-personal Interests		
Prof J Threlfall		
Personal Interests	None	
Non-Personal Interests		
Prof R La Ragione		
Personal	**Employee** University of Surrey	
Non-personal Interests		

Co-opted members

Ad Hoc group on *Campylobacter*		
Prof T Humphrey		
Personal Interests	**Consultancy** British Egg Industry Council McDonalds	
Non-Personal Interests	**FSA part-funded project** Involvement with ENIGMA research project	
Prof N Strachan		
Personal	**Employee**	

	University of Aberdeen and Food Standards Scotland	
Non-personal Interests	**FSA part-funded project** Involvement with ENIGMA research project	
Prof N Mccarthy		
Personal Interests	**Employee** University of Warwick	
Non-Personal Interests	**FSA part-funded project** Involvement with ENIGMA research project	
Prof MCJ Maiden		
Personal	**Employee** University of Oxford	
Non-personal Interests		

Annex V

CODE OF PRACTICE FOR MEMBERS OF THE ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

Public service values

The members of the Advisory Committee on the Microbiological Safety of Food must at all times

- observe the highest standards of **impartiality, integrity and objectivity** in relation to the advice they provide and the management of this Committee;

- be accountable, through the Food Standards Agency (the Agency) and, ultimately, Ministers, to Parliament and the public for the Committee's activities and for the standard of advice it provides.

The Ministers of the sponsoring department (the Agency) are answerable to Parliament for the policies and performance of this Committee, including the policy framework within which it operates.

Standards in public life

All Committee members must:

- follow the Seven Principles of Public Life set out by the Committee on Standards in Public Life (Appendix 1);

- comply with this Code, and ensure they understand their duties, rights and responsibilities, and that they are familiar with the functions and role of this Committee and any relevant statements of Government policy. If necessary, members should consider undertaking relevant training to assist them in carrying out their role;

- not misuse information gained in the course of their public service for personal gain or for political purpose, nor seek to use the opportunity of public service to promote their private interests or those of connected persons, firms, businesses or other organizations; and

- not hold any paid or high-profile unpaid posts in a political party, and not engage in specific political activities on matters directly affecting the work of this Committee. When engaging in other political activities, Committee members should be conscious of their public role and exercise proper discretion. These restrictions do not apply to MPs (in those cases where MPs are eligible to be appointed), to local councillors, or to Peers in relation to their conduct in the House of Lords.

Role of Committee members

Members have collective responsibility for the operation of this Committee. They must:

- engage fully in collective consideration of the issues, taking account of the full range of relevant factors, including any guidance issued by the Agency;

- ensure that they adhere to the Agency's Code of Practice on Openness (including prompt responses to public requests for information); agree an Annual Report; and, where practicable and appropriate, provide suitable opportunities to open up the work of the Committee to public scrutiny;

- follow Agency guidelines on divulging any information provided to the Committee in confidence;

- ensure that an appropriate response is provided to complaints and other correspondence, if necessary with reference to the Agency; and

- ensure that the Committee does not exceed its powers or functions.

Individual members should inform the Chair (or the Secretariat on his behalf) if they are invited to speak in public in their capacity as a Committee member.

Communications between the Committee and the Agency will generally be through the Chair except where the Committee has agreed that an individual member should act on its behalf. Nevertheless, any member has the right of access to the Chair of the Agency on any matter which he or she believes raises important issues relating to his or her duties as a Committee member. In such cases, the agreement of the rest of the Committee should normally be sought.

Individual members can be removed from office by the Chair of the Agency if, in the view of the Chair of the Agency, they fail to carry out the duties of office or are otherwise unable or unfit to carry out those duties.

The role of the Chair

The Chair has particular responsibility for providing effective leadership on the issues above. In addition, the Chair is responsible for:

- ensuring that the Committee meets at appropriate intervals, and that the minutes of meetings and any reports to the Agency accurately record the decisions taken and, where appropriate, the views of individual members;

- representing the views of the Committee to the general public, notifying and, where appropriate, consulting the Agency, in advance where possible; and

- ensuring that new members are briefed on appointment (and their training needs considered), and providing an assessment of their performance, on request, when members are considered for re-appointment to the Committee or for appointment to the board of some other public body.

DEPARTMENTAL ASSESSORS AND THE SECRETARIAT

Departmental assessors

Meetings of the ACMSF and its Groups are attended by Departmental Assessors. The Assessors are currently nominated by, and are drawn from, those with relevant policy interests and responsibilities in the Food Standards Agency, Food Standards Scotland and the Department for Environment, Food and Rural Affairs. Assessors are not members of the ACMSF and do not participate in Committee business in the manner of members. The role of the Assessors includes sharing with the secretariat the responsibility of ensuring that information is not unnecessarily withheld from the Committee. Assessors should make the Committee aware of the existence of any information that has been withheld from the Committee on the basis that it is exempt from disclosure under Freedom of Information legislation unless that legislation provides a basis for not doing so. Assessors keep their parent Departments informed about the Committee's work and act as a conduit for the exchange of information; advising the Committee on relevant policy developments and the implications of ACMSF proposals; informing ACMSF work through the provision of information; and being informed by the Committee on matters of mutual interest. Assessors are charged with ensuring that their parent Departments is promptly informed of any matters which may require a response from Government.

The Secretariat

The primary function of the Secretariat is to facilitate the business of the Committee. This includes supporting the Committee by arranging its meetings, assembling and analysing information, and recording conclusions. An important task is ensuring that proceedings of the Committee are properly documented and recorded. The Secretariat is also a source of advice and guidance to members on procedures and processes.

The ACMSF Secretariat is drawn from staff of the Food Standards Agency. However, it is the responsibility of the Secretariat to be an impartial and disinterested reporter and at all times to respect the Committee's independent role. The Secretariat is required to guard against introducing bias during the preparation of papers, during meetings, or in the reporting of the Committee's deliberations.

Handling conflicts of interest

The purpose of these provisions is to avoid any danger of Committee members being influenced, or appearing to be influenced, by their private

interests in the exercise of their public duties. All members should declare any personal or business interest which may, or may be *perceived* (by a reasonable member of the public) to, influence their judgement. A guide to the types of interest which should be declared is at Appendix 2.

(i) Declaration of Interests to the Secretariat

Members of the Committee should inform the Secretariat in writing of their current **personal** and **non-personal** interests (or those of close family members* and of people living in the same household), when they are appointed, including the principal position(s) held. Only the name of the company and the nature of the interest are required; the amount of any salary etc need not be disclosed. Members are asked to inform the Secretariat at any time of any change of their **personal** interests and will be invited to complete a declaration form once a year. It is sufficient if changes in **non-personal** interests are reported in the annual declaration form following the change. (Non-personal interests involving less than £1,000 from a particular company in the previous year need not be declared to the Secretariat).

The register of interests should be kept up-to-date and be open to the public.

(ii) Declaration of Interests and Participation at Meetings

Members of the Committee are required to declare any direct commercial interests, or those of close family members,* and of people living in the same household, in matters under discussion at each meeting. Members should not participate in the discussion or determination of matters in which they have an interest, and should normally withdraw from the meeting (even if held in public) if:-

- their interest is direct and pecuniary; or

- their interest is covered in specific guidance issued by the ACMSF or the Agency which requires them not to participate in, and/or to withdraw from, the meeting.

* Close family members include personal partners, parents, children, brothers, sisters and the personal partners of any of these.

Personal liability of Committee members

A Committee member may be personally liable if he or she makes a fraudulent or negligent statement which results in a loss to a third party; or may commit a breach of confidence under common law or a criminal offence under insider dealing legislation, if he or she misuses information gained through their position. However, the Government has indicated that individual members who have acted honestly, reasonably, in good faith and without negligence will not have to meet out of their own personal resources any personal civil liability which is incurred in execution or purported execution of their Committee functions.

Appendix 1

THE SEVEN PRINCIPLES OF PUBLIC LIFE

Selflessness

Holders of public office should take decisions solely in terms of the public interest. They should not do so in order to gain financial or other material benefits for themselves, their family, or their friends.

Integrity

Holders of public office should not place themselves under any financial or other obligation to outside individuals or organisations that might influence them in the performance of their official duties.

Objectivity

In carrying out public business, including making public appointments, awarding contracts, or recommending individuals for rewards and benefits, holders of public office should make choices on merit.

Accountability

Holders of public office are accountable for their decisions and actions to the public and must submit themselves to whatever scrutiny is appropriate to their office.

Openness

Holders of public office should be as open as possible about all the decisions and actions that they take. They should give reasons for their decisions and restrict information only when the wider public interest clearly demands.

Honesty

Holders of public office have a duty to declare any private interests relating to their public duties and to take steps to resolve any conflicts arising in a way that protects the public interests.

Leadership

Holders of public office should promote and support these principles by leadership and example.

Appendix 2

DIFFERENT TYPES OF INTEREST

The following is intended as a guide to the kinds of interest which should be declared. Where members are uncertain as to whether an interest should be declared, they should seek guidance from the Secretariat or, where it may concern a particular product which is to be considered at a meeting, from the Chair at that meeting. **If members have interests not specified in these notes, but which they believe could be regarded as influencing their advice, they should declare them.** However, neither the members nor the Secretariat are under any obligation to search out links of which they might *reasonably* not be aware - for example, either through not being aware of all the interests of family members, or of not being aware of links between one company and another.

Personal Interests

A personal interest involves the member personally. The main examples are:

- **Consultancies:** any consultancy, directorship, position in or work for the industry, which attracts regular or occasional payments in cash or kind;

- **Fee-Paid Work:** any work commissioned by industry for which the member is paid in cash or kind;

- **Shareholdings:** any shareholding or other beneficial interest in shares of industry. This does not include shareholdings through unit trusts or similar arrangements where the member has no influence on financial management;

- **Membership or Affiliation** to clubs or organisations with interests relevant to the work of the Committee.

Non-Personal Interests

A non-personal interest involves payment which benefits a department for which a member is responsible, but is not received by the member personally. The main examples are:

- **Fellowships:** the holding of a fellowship endowed by the industry;

- **Support by Industry:** any payment, other support or sponsorship by industry which does not convey any pecuniary or material benefit to a member personally, but which does benefit their position or department e.g.

(i) a grant from a company for the running of a unit or department for which a member is responsible;

(ii) a grant or fellowship or other payment to sponsor a post or a member of staff in the unit for which a member is responsible (this does not include financial assistance to students);

(iii) the commissioning of research or other work by, or advice from, staff who work in a unit for which a member is responsible.

Members are under no obligation to seek out knowledge of work done for, or on behalf of, industry by departments for which they are responsible if they would not normally expect to be informed. Where members are responsible for organisations which receive funds from a large number of companies involved in that industry, the Secretariat can agree with them a summary of non-personal interests rather than draw up a long list of companies.

- **Trusteeships:** any investment in industry held by a charity for which a member is a trustee.

Where a member is a trustee of a charity with investments in industry, the Secretariat can agree with the member a general declaration to cover this interest rather than draw up a detailed portfolio.

DEFINITIONS

For the purpose of the Advisory Committee on the Microbiological Safety of Food, 'industry' means:

- Companies, partnerships or individuals who are involved with the production, manufacture, packaging, sale, advertising, or supply of food or food processes, subject to the Food Safety Act 1990;

- Trade associations representing companies involved with such products;

- Companies, partnerships or individuals who are directly concerned with research, development or marketing of a food product which is being considered by the Committee

In this Code, 'the Secretariat' means the Secretariat of the Advisory Committee on the Microbiological Safety of Food.

Annex VI

Good Practice Agreement for Scientific Advisory Committees

INTRODUCTION

The Government Chief Scientific Adviser's *Guidelines on the Use of Scientific and Engineering Advice in Policy Making* set out the basic principles which government departments should follow in assembling and using scientific advice. The key elements are to:

- **identify early** the issues which need scientific and engineering advice and where **public engagement** is appropriate;
- draw on a **wide range of expert advice** sources, particularly when there is uncertainty;
- adopt an **open and transparent approach** to the scientific advisory process and publish the evidence and analysis as soon as possible;
- **explain publicly the reasons for policy decisions**, particularly when the decision appears to be inconsistent with scientific advice; and
- **work collectively** to ensure a joined-up approach throughout government to integrating scientific and engineering evidence and advice into policy making.

The *Code of Practice for Scientific Advisory Committees* and the *Principles of Scientific Advice to Government* provide more detailed guidance on the operation of scientific advisory committees (SACs) and their relationship with their sponsor Departments.

The Food Standards Agency's Board adopted a **Science Checklist** in 2006 (updated in 2012) that makes explicit the points to be considered in the preparation of policy papers and proposals dealing with science-based issues, including those which draw on advice from the SACs.

These **Good Practice Guidelines** were drawn up in 2006 by the Chairs of the independent SACs that advise the FSA based on, and complementing, the Science Checklist. They were updated in 2012 in consultation with the General Advisory Committee on Science (GACS).

The Guidelines apply to the SACs that advise the FSA and for which the FSA is sole or lead sponsor Department:

- Advisory Committee on Animal Feedingstuffs
- Advisory Committee on Microbiological Safety of Foods
- Advisory Committee on Novel Foods and Processes
- Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment
- Committee on Mutagenicity of Chemicals in Food, Consumer Products and the Environment

- Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment
- Science Council
- Social Science Research Committee

For the SACs with a shared sponsorship the Guidelines apply formally to their advice to the FSA; they may opt to follow them also in advising other sponsor Departments.

All these committees share important characteristics. They:

- are independent;
- work in an open and transparent way; and
- are concerned with risk assessment and/or science governance, not with decisions about risk management.

The Guidelines relate primarily to the risk assessment process since this is the main purpose of most of the SACs. However, the SACs may, where appropriate, comment on risks associated with different risk management options, highlight any wider issues raised by their assessment that they feel should be considered (distinguishing clearly between issues on which the SAC has an expert capability and remit, and any other issues), or any evidence gaps and/or needs for research or analysis.

In addition, GACS and SSRC may advise the FSA on aspects of the governance of risk management, or on research that relates to risk management.

Twenty-nine principles of good practice have been developed. However, the different committees have different duties and discharge those duties in different ways. Therefore, not all the principles set out below will be applicable to all of the committees, all of the time.

The SACs have agreed to review their application of the principles annually and report this in their Annual Reports. Compliance with the Guidelines will also be covered in the annual self-assessments by Members and annual feedback meetings between each SAC Chair and the FSA Chief Scientist.

PRINCIPLES

Defining the problem and the approach

1. The FSA will ensure that issues it asks an SAC to address are clearly defined and take account of stakeholder expectations in discussion with the SAC Secretariat and where necessary the SAC Chair. The SAC Chair will refer back to the FSA if discussion suggests that further iteration and discussion of the task is necessary. Where an SAC proposes to initiate a piece of work the SAC Chair and Secretariat will discuss this with FSA to ensure the definition and rationale for the work and its expected use by the FSA are clear.

Seeking input

2. The Secretariat will ensure that stakeholders are consulted at appropriate points in the SAC's considerations. It will consider with the FSA whether and how stakeholder views need to be taken into account in helping to identify the issue and frame the question for the committee.
3. Wherever possible, SAC discussions should be held in public.
4. The scope of literature searches made on behalf of the SAC will be clearly set out.
5. Steps will be taken to ensure that all available and relevant scientific evidence is rigorously considered by the committee, including consulting external/additional scientific experts who may know of relevant unpublished or pre-publication data.
6. Data from stakeholders will be considered and weighted according to quality by the SAC.
7. Consideration by the Secretariat and the Chair (and where appropriate the whole SAC) will be given to whether expertise in other disciplines will be needed.
8. Consideration will be given by the Secretariat or by the SAC, in discussion with the FSA, as to whether other SACs need to be consulted.

Validation

9. Study design, methods of measurement and the way that analysis of data has been carried out will be assessed by the SAC.
10. Data will be assessed by the committee in accordance with the relevant principles of good practice, e.g. qualitative social science data will be assessed with reference to guidance from the Government's Chief Social Researcher[5].
11. Formal statistical analyses will be included wherever appropriate. To support this, each SAC will have access to advice on quantitative analysis and modelling as needed.

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[5] Quality in Qualitative Evaluation: A Framework for assessing research evidence http://www.civilservice.gov.uk/wp-content/uploads/2011/09/a_quality_framework_tcm6-7314.pdf; The Magenta book http://www.hm-treasury.gov.uk/d/magenta_book_combined.pdf

12. When considering what evidence needs to be collected for assessment, the following points will be considered:
    - the potential for the need for different data for different parts of the UK or the relevance to the UK situation for any data originating outside the UK; and
    - whether stakeholders can provide unpublished data.
13. The list of references will make it clear which references have been subject to external peer review, and which have been peer reviewed through evaluation by the Committee, and if relevant, any that have not been peer reviewed.

Uncertainty

14. When reporting outcomes, SACs will make explicit the level and type of uncertainty (both limitations on the quality of the available data and lack of knowledge) associated with their advice.
15. Any assumptions made by the SAC will be clearly spelled out, and, in reviews, previous assumptions will be challenged.
16. Data gaps will be identified and their impact on uncertainty assessed by the SAC.
17. An indication will be given by the SAC about whether the evidence base is changing or static, and if appropriate, how developments in the evidence base might affect key assumptions and conclusions.

Drawing conclusions

18. The SAC will be broad-minded, acknowledging where conflicting views exist and considering whether alternative interpretations fit the same evidence.
19. Where both risks and benefits have been considered, the committee will address each with the same rigour, as far as possible; it will make clear the degree of rigour and uncertainty, and any important constraints, in reporting its conclusions.
20. SAC decisions will include an explanation of where differences of opinion have arisen during discussions, specifically where there are unresolved issues, and why conclusions have been reached. If it is not possible to reach a consensus, a minority report may be appended to the main report, setting out the differences in interpretation and conclusions, and the reasons for these, and the names of those supporting the minority report.
21. The SAC's interpretation of results, recommended actions or advice will be consistent with the quantitative and/or qualitative evidence and the degree of uncertainty associated with it.
22. SACs will make recommendations about general issues that may have relevance for other committees.

Communicating SACs' conclusions

20. Conclusions will be expressed by the SAC in clear, simple terms and use the minimum caveats consistent with accuracy.
21. It will be made clear by the SAC where assessments have been based on the work of other bodies and where the SAC has started afresh and there will be a clear statement of how the current conclusions compare with previous assessments.
22. The conclusions will be supported by a statement about their robustness and the extent to which judgement has had to be used.
23. As standard practice, the SAC secretariat will publish a full set of references (including the data used as the basis for risk assessment and other SAC opinions) at as early a stage as possible to support openness and transparency of decision-making. Where this is not possible, reasons will be clearly set out, explained and a commitment made to future publication wherever possible.
24. The amount of material withheld by the SAC or FSA as being confidential will be kept to a minimum. Where it is not possible to release material, the reasons will be clearly set out, explained and a commitment made to future publication wherever possible.
25. Where proposals or papers being considered by the FSA Board rest on scientific evidence produced by a SAC, the Chair of the SAC (or a nominated expert member) will be invited to the table at the Open Board meetings at which the paper is discussed. To maintain appropriate separation of risk assessment and risk management processes, the role of the Chairs will be limited to providing an independent view and assurance on how their committee's advice has been reflected in the relevant policy proposals, and to answer Board Members' questions on the science. The Chairs may also, where appropriate, be invited to provide factual briefing to Board members about particular issues within their committees' remits, in advance of discussion at open Board meetings.
26. The SAC will seek (and FSA will provide) timely feedback on actions taken (or not taken) in response to the SAC's advice, and the rationale for these.

Glossary of Terms

BCG is an attenuated vaccine strain of virulent Mycobacterium bovis and contains numerous deletions of genes coding for immunogenic proteins which are found in wild type Mycobacterium bovis strains

Botulism: is caused by botulinum toxin, a poison produced by the bacterium Clostridium botulinum. The organism is common in the soil and aquatic sediments and can survive in these environments as a resistant spore.

Campylobacter: Commonest reported bacterial cause of infectious intestinal disease in England and Wales. Two species account for the majority of infections: *C. jejuni* and *C. coli*. Illness is characterized by severe diarrhoea and abdominal pain.

Listeria monocytogenes: Gram-positive pathogenic bacteria that can cause listeriosis in humans.

Pathogen: An infectious microorganism, bacteria, virus or other agent that can cause disease by infection.

Mycobacterium bovis: is a slow-growing (16–20 h generation time), aerobic bacterium, Gram positive and acid-fast, and the causative agent of tuberculosis in cattle (known as bovine TB). Although it can produce infection in other animals (in addition to cattle, important maintenance hosts of the pathogen include goats, bison, deer, and badgers in Ireland and the UK.

Mycobacterium tuberculosis is a pathogenic bacterial species in the genus *Mycobacterium* and the causative agent of most cases of tuberculosis.

Salmonella: A genus of Gram-negative bacteria which can cause salmonellosis in humans. Specific types of *Salmonella* are normally given a name, for example *Salmonella* Typhimurium has full name *Salmonella enterica* serovar Typhimurium.

Toxin: A poison, often a protein produced by some plants, certain animals fungi and pathogenic bacteria, which can be highly toxic for other living organisms.

Glossary of Abbreviations

ACMSF: Advisory Committee on the Microbiological Safety of Food

APHA: Animal and Plant Health Agency

AMR: Antimicrobial Resistance

BCG: Bacille Calmette-Guérin

COC: Committee on Carcinogenicity

COM: Committee on Mutagenicity

Defra: Department for Environment Food and Rural Affairs

DALYs: Disability Adjusted Life Years

EFIG: Epidemiology of Foodborne Infections Group

EFSA: European Food Safety Authority

FOI: Freedom of Information

FSA: Food Standards Agency

OCPA: Office of the Commissioner for Public Appointments

QALYs: The quality-adjusted life year

STEC: Shiga toxin-producing *Escherichia coli*

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