

Advisory Committee on the Microbiological Safety of Food

Annual Report 2002

Advises the Food Standards Agency on the
Microbiological Safety of Food

Further copies may be obtained from:

Food Standards Agency
PO Box 369
Hayes
Middlesex
UB3 1UT

Telephone: 0845 606 0667

Fax: 0208 867 3225

Minicom: 0845 606 0678

E-mail: foodstandards@eclogistics.co.uk

Contents

| Subject | Paragraph |
|---|--------------|
| Foreword | |
| Introduction | 1 |
| Chapter 1: Administrative matters | 2-20 |
| Membership | 2-12 |
| Appointments | 2 |
| Periods of appointment | 3 |
| Spread of expertise | 4-5 |
| Appointments in 2002 | 6 |
| Retirements in 2002 | 7 |
| Committee and Group meetings | 8-10 |
| Current membership and Declarations of Interests | 11-12 |
| ACMSF Code of Practice | 13 |
| Personal liability | 14 |
| Openness | 15-18 |
| Improving public access | 15-16 |
| Third open meeting | 17 |
| Quarterly ACMSF meetings from 2003 onwards | 18 |
| Work of the other advisory committees and cross-membership | 19 |
| Review of scientific advisory committees | 20 |
| Chapter 2: The Committee's work in 2001 | 21-54 |
| <i>Campylobacter</i> | 21-30 |
| <i>Campylobacter</i> workshop | 21-22 |
| <i>Campylobacter</i> Working Group | 23-29 |
| FSA <i>Campylobacter</i> strategy | 30 |
| <i>Clostridium botulinum</i> | 31-32 |
| Sewage sludge, manures and slurries | 33-36 |
| Manures and slurries | 33 |
| Safe Sludge Matrix | 34 |
| Microbial risks associated with applying biosolids to agricultural land | 35-36 |
| Risk assessment | 37 |
| Getting ahead of the curve | 38-39 |

| | |
|---|--------------|
| Surveillance | 40-41 |
| Surveillance Working Group | 40 |
| Ready-to-eat burgers | 41 |
| Research | 42-46 |
| Microbiological Safety of Food Funders' Group | 42-43 |
| Food Standards Agency (FSA) research programme | 44 |
| FSA Advisory Committee on Research | 45 |
| Epidemiology of Foodborne Infections Group | 46 |
| Briefings | 47-53 |
| FSA food hygiene campaign | 48 |
| The making of hygiene legislation | 49 |
| Food law enforcement | 50 |
| <i>Salmonella</i> Newport | 51 |
| Burden of foodborne disease in England and Wales | 52 |
| Multi-strain <i>Salmonella</i> outbreaks | 53 |
| Information papers | 54 |
| Chapter 3: Forward Look | 55-65 |
| Future work programme | 55-58 |
| Horizon scanning | 59-65 |
| ACMSF horizon scanning | 59-62 |
| Longer-term sequelae | 63 |
| Health effects of UK climate change | 64 |
| DEFRA horizon scanning | 65 |
| Annex I Membership of the ACMSF, its Working Groups and its <i>Ad Hoc</i> Groups | |
| Annex II Register of Members' Interests | |
| Annex III Code of Practice for Members of the ACMSF | |
| Annex IV ACMSF contribution to the First Report to the Food Standards Agency on implementation of the recommendations of the Report on the Review of Scientific Committees | |
| Annex V Advice to the FSA on <i>Campylobacter</i> | |
| Annex VI | |
| Annex VII ACMSF comments on Chief Medical Officer's strategy: Getting Ahead of the Curve | |
| Annex VIII References | |

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 on any matters relating to the microbiological safety of food.

The various issues addressed by the Committee are detailed in its previous Annual Reports¹⁻¹⁰ and in a series of subject-specific reports.¹¹⁻²⁰

Foreword

1. I am pleased to present this, the 2002 Annual Report of the Advisory Committee on the Microbiological Safety of Food (ACMSF).

2. The major task occupying the Committee in 2002 has been its review of *Campylobacter*, the organism which has, in recent years, become the biggest identified cause of bacterial infectious intestinal disease in the United Kingdom. The Committee published an Interim Report on *Campylobacter* in 1993,¹³ noting that a major problem with human campylobacteriosis was that most cases are sporadic and unconnected, and that this made it difficult to establish the role of different foods. A key thrust of that Report was therefore the need for research and surveillance, particularly in relation to isolation, identification and typing; disease-causing potential; prevalence; transmission; and infection.

3. In October 2001, the ACMSF took the decision to set up a Working Group to revisit *Campylobacter* with a view to identifying any gaps and omissions in both action taken to reduce the organism in food and food sources, and in the knowledge base. Our aim is to develop advice which will assist the Food Standards Agency (FSA) in evolving a strategy for reducing the incidence of foodborne *Campylobacter* infection in humans.

4. As a first step the Committee held an extremely useful *Campylobacter* workshop in London Docklands in February 2002. The 3 broad objectives of the workshop were to take stock of research findings here and abroad; to identify any major gaps in knowledge justifying on-going research; and, most importantly, to decide whether there were any food chain interventions which could reduce consumer exposure to *Campylobacter* and help the FSA achieve its foodborne disease and chicken targets. There were around 40 participants in the workshop. Those making presentations were drawn from the Public Health Laboratory Service, the FSA, the Veterinary Laboratories Agency, the London School of Hygiene and Tropical Medicine, the Scottish Centre for Infection and Environmental Health, the Netherlands National Institute of Public Health and the Environment, the Department of Food, Environment and Rural Affairs, the University of Bristol, and Lancaster University. I am extremely grateful to all those who attended the workshop, particularly those who presented papers. I am sure that the ACMSF's work on *Campylobacter* will benefit enormously from the papers presented, the ensuing discussion, and the ideas which emerged from the workshop.

5. The Working Group, which I am chairing, is currently taking evidence, both oral and written. We have decided that it will be most helpful to the FSA, whose foodborne disease and chicken strategies are time-bound, if we feed in advice from the Group as and when it emerges, rather than holding it until

our final report is published. Our early work has centred on the on-farm control of *Campylobacter* in chickens, and this was the subject of the first tranche of advice, which was cleared with the full Committee and forwarded to the Agency in September. We are not certain beyond all doubt of the association of poultry with human illness; but we are satisfied that it plays a significant role in the causal chain of events leading to human foodborne illness. We are also convinced that reducing *Campylobacter* carriage in broilers is now a practical proposition.

6. The Working Group will continue its in-depth review of *Campylobacter* and further advice will be prepared for the Food Standards Agency as soon as possible. We hope that we shall soon be able to offer something on *Campylobacter* detection and typing, which are very important elements in the fight against this organism.

7. Another major area of the Committee's work has involved horizon scanning. I regard this process of looking forward to see whether there are particular areas which might prove problematical in the short to medium-term in relation to the microbiological safety of food as very important. As part of our horizon scanning, ACMSF members were invited to identify areas they thought would merit further consideration and, through a process of discussion and refinement, we were able to settle upon an initial list of 3 areas which seemed amenable to action in the shorter-term. These are imported foods, newly-emerging pathogens, and changing social habits relating to food (including overseas travel). As a first step, *Ad Hoc* Groups will undertake scoping exercises and will report back to the full Committee.

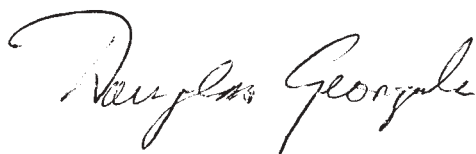
8. The use of small *Ad Hoc* Groups enables very detailed technical issues which can usually be dealt with quickly to be considered in the first instance outside the full Committee. Once the ground work has been done, the issues can then come back to the full Committee for final decision. In addition to the 3 *Ad Hoc* Groups dealing with horizon scanning issues, 2 more have been set up to undertake special tasks. One, on Risk Assessment, is charged with considering whether the Committee would be helped by following a more formal structure for the risk assessment process; and, if so, with recommending an appropriate structure which the full Committee can consider for adoption. The other has the task of assisting with the peer review of a microbiological risk assessment to determine whether the application of sewage sludge to agricultural land poses a significant incremental pathogen risk to foods produced in or on such land. This is an area of understandable public concern. The Government is providing further regulatory safeguards against the transfer of pathogens from sewage sludge to the food chain, and these have already been reflected in a voluntary agreement – the Safe Sludge Matrix²¹ – between the water companies and the food retailers. We believe that sewage sludge applied to agricultural land in accordance with the Safe Sludge Matrix should not present an unacceptable risk to food safety.

9. Another important area of work which the full Committee has addressed on a regular basis over many years is the risk of growth of *Clostridium botulinum* in food and the production of toxin. Botulism is extremely rare as a cause of illness in the UK. If and when it does occur, however, the consequences can be fatal. One of the activities which give cause for concern is the home bottling of vegetables in oil. The Food Standards Agency has advised that the home production of vegetable-in-oil preparations should be discouraged. The ACMSF strongly supports this view. We recognise, however, that, notwithstanding this advice, some people will continue with home bottling. The FSA has therefore made a start in drawing up guidance to enable this to be done safely. The ACMSF has offered some preliminary comments and we look forward to seeing a final draft of the guidance as soon as possible. We have also indicated to the Agency that we believe that there is a need for parallel guidance for those engaged in the commercial production of vegetable-in-oil products.

10. Turning to the way in which the Committee conducts its business, I have been very concerned to open up the ACMSF to increased public scrutiny, in line with the Government's own policy in this area. For some time now, the agendas, papers and minutes for our quarterly meetings have been publicly-available through our website. Since 2000, we have also held 1 of our quarterly meetings in public each year. From 2003 onwards, all our quarterly meetings will be held in public. This reflects a recommendation of the FSA's review of scientific committees.²² There are also other areas, flowing from the Agency's review, where we are taking further steps on openness. These are summarised in Annex IV.

11. As regards the membership of the ACMSF, it is worth recalling that 2001 was a year of great change. Thirteen new members were appointed to the Committee following public advertising of the vacancies, the sifting of applications, and the short-listing and interviewing of candidates. It bears great testament to these new appointees that we were able to conduct our business in 2002 in an efficient and professional manner, and that the transition was made seamlessly. I am very grateful to members for the cooperation I have received as Chairman and for the way they have worked together to ensure "business as usual".

12. I must add my very special thanks to the Committee's Secretariat which helps ensure the smooth organisation of our meetings, high quality papers for our agendas, and accurate and useful minutes of our discussions.



Professor Douglas L. Georgala
Chairman

Introduction

1. This is the eleventh Annual Report of the Advisory Committee on the Microbiological Safety of Food (ACMSF) and covers the calendar year 2002.

Chapter 1: Administrative Matters

Membership

Appointments

2. Appointments to the ACMSF are made by the Food Standards Agency (FSA), after consultation with United Kingdom Health Ministers (ie. 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 Principles²³ and the guidance issued by the Office of the Commissioner for Public Appointments (OCPA).²⁴ The FSA is not bound to follow OCPA guidance, as the guidelines only cover appointments made by Ministers. However, although ACMSF appointments are not made by Ministers, the Agency has decided that it would be right to comply with OCPA guidance.

Periods of appointment

3. To ensure continuity, appointments to the ACMSF are staggered (usually for periods of 2, 3 or 4 years) so that only a proportion of Members falls to be appointed or to retire each year.

Spread of expertise

4. A wide spectrum of skills and expertise is available to the ACMSF through its Members. Members are drawn from commercial catering, environmental health, food microbiology, food processing, food research, food retailing, human epidemiology, medical microbiology, public health medicine, veterinary medicine, and virology. The Committee also has an overseas representative, a Member with knowledge of small and medium size enterprises, and 2 lay/consumer Members.

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

Appointments in 2002

6. No Members were appointed or re-appointed during 2002.

Retirements in 2002

7. The term of appointment of one Member, Professor Cairns Smith, ended on 31 March 2002. Professor Smith retired from the Committee from that date. The Chairman recorded his appreciation for the service which Professor Smith had given the Committee over his 6 year membership.

Committee and Group meetings

8. The full Committee met 4 times in 2002 – on 21 March, 27 June, 19 September and 5 December. All meetings were chaired by Professor Georgala. The 5 December meeting was the third occasion on which the Committee had met in public (see paragraph 17).

9. The *Campylobacter* Working Group met 6 times, all under the chairmanship of Professor Georgala (see paragraphs 23-29). The standing Surveillance Working Group (chairman, Professor Humphrey) considered a draft protocol for an FSA survey of *Salmonella* contamination of UK shell eggs (see paragraph 40).

10. *Ad Hoc* Groups were set up to consider risk assessment (chair, Professor Georgala – see paragraph 37) and, as part of the horizon scanning process (see paragraphs 59-64), imported foods (chair, Ms Davies), newly-emerging pathogens (chair, Professor Hunter), and changing social habits in relation to food, including overseas travel (chair, Dr Andrews).

Current membership and Declarations of Interests

11. Full details of the membership of the Committee and its Working and *Ad Hoc* Groups are given in Annex I. A Register of Members' Interests is at Annex II. In addition to the interests notified to the Secretariat and recorded at Annex II, 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 (see paragraph 13 and Annex III). Declarations made are recorded in the minutes of each meeting.

12. At the request of the FSA, the Secretariat reminded Members in May of the need to ensure that Registers of Interests were accurate and kept up to date. Members were asked to review their current entries and to advise the Secretariat of any necessary amendments and/or additions.

ACMSF Code of Practice

13. In 1999, the ACMSF adopted a code of practice reflecting the Government's commitment to improving standards in public life (Annex IV of Annual Report 1999⁸). The Code was adopted at a time when the ACMSF reported to UK Health and Agriculture Ministers. The Code was amended and re-issued in 2002, reflecting the fact that, since 2000, the Committee has reported to the FSA (Annual Report 2000,⁹ paragraphs 9-10). A copy of the amended Code is at Annex III.

Personal liability

14. 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 1999⁸ paragraph 6 and Annex III). The Secretariat, in collaboration with officials from the FSA and HM Treasury, began a review of this undertaking by the Secretary of State in 2002, to reflect the changed reporting lines mentioned in paragraph 13 above. A revised undertaking will be issued by the FSA as soon as possible in 2003.

Openness

Improving public access

15. The ACMSF is committed to continuing to open 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 Committee's quarterly meetings are publicly available and are posted on the FSA website at:

<<http://www.food.gov.uk/science/ouradvisors/microbiogsafety>>

16. The Committee also has an e-mail address:

<acmsf@foodstandards.gsi.gov.uk>

Third open meeting

17. The Committee held its third open meeting on 5 December 2002, at Trinity House, Trinity Square, Tower Hill, London EC3. Twenty one members of the public and others attended the meeting. As in previous years, time was set aside at the end of the meeting for public statements and for questions about agenda items or about the Committee more generally. A list of those members of the public and others attending, together with a note of points addressed in the question and answer session, are given in paragraph 14 and Annex I of the minutes of the December meeting (ACM/MIN/46), available on the ACMSF's web pages (see paragraph 15).

Quarterly ACMSF meetings from 2003 onwards

18. The Board of the Food Standards Agency has agreed (see paragraph 20) that all of the independent scientific committees which advise the Agency should move to a position where they conduct as much of their business as possible in open session.²² The ACMSF has therefore decided that, from December 2002 onwards, all of its quarterly meetings should be held in public. The Secretariat will consider how best this decision can be implemented. Budgetary constraints militate against holding all 4 meetings externally. It is therefore likely that those in March, June and September each

year will be held at the FSA's London headquarters, Aviation House. This may, depending on interest, mean limiting public attendance on a 'first come first served' basis. The December meeting each year will continue to be held externally and it should therefore not be necessary to limit numbers of members of the public wishing to attend.

Work of the other advisory committees and cross-membership

19. Members received regular reports throughout the year of the work of the other advisory committees. Professor Johnston continued to serve as a member of the Advisory Committee on Novel Foods and Processes, providing a direct link between ACMSF and ACNFP.

Review of scientific advisory committees

20. The Food Standards Agency commissioned a review of the role, methods of operation and effectiveness of the independent scientific committees which advise the Agency on food issues. The FSA Board accepted the recommendations made by the Review Group.²² Committees were required to implement them and the Board called for 6-monthly implementation reports. ACMSF Members discussed the impact of the relevant recommendations on the work of their Committee and agreed a contribution to the first implementation report going to the FSA Board in October 2002. A copy is at Annex IV.

Chapter 2: The Committee's Work in 2002

Campylobacter

***Campylobacter* workshop**

21. As a precursor to the first meeting of the *Campylobacter* Working Group (see paragraphs 23-29), the ACMSF held a *Campylobacter* workshop at the Britannia International Hotel in London Docklands on 13 and 14 February 2002. The workshop had 3 broad objectives, namely to:

- take stock of research findings both in the UK and elsewhere in the World;
- identify any major gaps in knowledge justifying on-going research; and
- decide, on the basis of current knowledge, whether there were food chain interventions which would reduce consumer exposure to *Campylobacter* and suggestions which would assist the FSA to achieve its foodborne disease and chicken meat microbiological contamination reduction targets.

22. The workshop proved very useful in helping identify a number of lines of thought and enquiry which participants felt would benefit the work of the *Campylobacter* Working Group.

***Campylobacter* Working Group**

23. The *Campylobacter* Working Group held the first of 6 meetings in 2002 on 22 February. During the year, the Group took oral evidence from representatives of Assured Chicken Production Ltd, the British Poultry Council, the Institute of Animal Health, Lloyd Maunder Ltd, Marks and Spencer plc, and the University of Nottingham School of Biosciences.

24. A presentation on the situation in Northern Ireland was made jointly by representatives from O'Kane Poultry Group, Moy Park Ltd and the Northern Ireland Department of Agriculture and Rural Development.

25. In addition to the oral evidence taken, the Working Group received written submissions and other information from the Danish Zoonosis Centre, the Food and Drink Federation, Local Authorities Coordinators of Regulatory Services (LACORS), Meyn Poultry Processing FPT and the Norwegian Zoonosis Centre.

26. Three Members of the *Campylobacter* Working Group (Professor Humphrey, Professor Johnston and Mr Kyriakides) accompanied by the Working Group's Scientific Secretary (Dr Back from the FSA's Microbiological Safety Division) visited Denmark and Norway in November and met Government and poultry industry representatives. The aim was to see whether there were lessons from the way *Campylobacter* was being tackled in Denmark and Norway which could be applied in a UK context. The ACMSF representatives regarded the visits as very useful. It seemed to them that things were not markedly different in Denmark and Norway than in the UK. The best UK farms compared favourably with their Danish and Norwegian counterparts. The real difference was that the Danes and Norwegians had had control arrangements in place for longer, and producers had thus had more time to adapt. The ACMSF group nevertheless thought that there were lessons which UK producers could learn and was encouraged that the UK industry had expressed its willingness to embrace appropriate Scandinavian methods. Fuller details of the group's report to the full ACMSF are given in paragraphs 7.4-7.9 of the minutes of the December meeting (ACM/MIN/46).

27. The ACMSF's subject-specific reports are very detailed and comprehensively referenced. In the process of developing them, Working Groups take extensive written and oral evidence. 2-3 years can easily elapse between a Working Group commencing its work and the full Committee adopting a final draft report. Given the importance of *Campylobacter* in the context of the FSA's foodborne disease and poultry meat targets, which are time-bound, the Committee therefore agreed that any advice which might emerge during the course of the *Campylobacter* Working Group's deliberations should be fed into the Agency immediately, rather than waiting until a final report had been prepared.

28. The first such tranche of advice was sent to the Food Standards Agency in September and centred on the on-farm control of *Campylobacter* in poultry. The ACMSF concluded that control of *Campylobacter* on-farm was now a practical proposition, given a commitment by producers to rigorous biosecurity combined with high standards of stockmanship and attention to good flock health and stress control. The Committee listed a number of key principles which it felt were likely to reduce the incidence of *Campylobacter* on well-run broiler farms. In the Committee's view, broiler farms should be species monospecific. Birds should have access to potable water. Houses should be properly cleaned and disinfected between flocks and should be proof against entry by wild birds and rodents. Feed should have been treated to eradicate *Salmonella* (and, hence, *Campylobacter*). Transport crates and vehicles should be properly cleaned and disinfected. General biosecurity and hygiene barriers should be maintained at a high level, to prevent infection from the farm environment. The Committee drew attention to the threat posed to biosecurity by the practice of thinning (ie. removing a cohort of birds from houses at around 4 weeks in order to comply with welfare recommendations for stocking density). Whilst noting that, in an

ideal world, the practice of thinning would be discontinued, the Committee recognised that the economic pressures on the industry made this impossible at the present time. The Committee therefore recommended that the FSA (and DEFRA, as appropriate) should explore with the industry the conditions which might allow the ending of the practice of thinning in the longer-term. Alternatively, it was recommended that the possibility should be examined of modifying thinning procedures so as to reduce the threat to the biosecurity of broiler houses.

29. The Committee believed that a lower incidence of *Campylobacter* in broiler flocks would be reflected in lower numbers of organisms in individual birds in the flock, and on finished carcasses. Members noted that an important factor in consumer exposure to *Campylobacter* was the frequency and level of contamination of the chicken brought into the home or catering kitchen. While noting that measures to control *Campylobacter* in chicken implied additional costs, the Committee also pointed to the links between the general health status of birds and their susceptibility to infection. The maintenance of good flock health was seen to convey economic benefits, and it was felt that *Campylobacter* control measures were likely to reduce the risk of introducing other infections into the flock. A copy of the full advice sent to the Agency under cover of Professor Georgala's letter to Dr Jon Bell, the FSA's Deputy Chief Executive, is at Annex V. A copy of the letter from Professor Georgala to FSA Chairman Sir John Krebs, setting out the broader perspectives, is at Annex VI.

FSA *Campylobacter* strategy

30. At its December meeting, the Committee was briefed by Dr Back on the progress made by the Food Standards Agency in developing a strategy for tackling *Campylobacter* in chickens. Full details are given in paragraphs 7.10-7.15 of the minutes of the December meeting (ACM/MIN/46) which are available on the Committee's web pages (see paragraph 15 for website address).

Clostridium botulinum

31. In 2000, the ACMSF considered draft FSA guidance on the risk of growth of *Clostridium botulinum*, and toxin production, in vacuum and modified atmosphere packaged foods (Annual Report 2000⁹ paragraphs 35-37). The FSA sought the Committee's comments in March 2002 on further *Cl. botulinum* guidance, this time in relation to home-produced, vegetables-in-oil.

32. Botulism is extremely rare in the UK as a cause of illness but, when it does occur, it is extremely serious and is associated with a significant fatality rate. Against this background, the ACMSF strongly supported the FSA's view that the home production of vegetable-in-oil preparations should be

discouraged. However, it was accepted that some people might nevertheless wish to undertake home bottling of this sort. Members therefore recommended that the guidance should be further developed to the stage where, if followed, it would enable those determined to preserve vegetables in oil in the domestic setting to do so safely. Members also stressed the need for the FSA to develop parallel guidance in relation to the commercial production of vegetable-in-oil products. The Committee's comments can be found in greater detail in the minutes of the 21 March meeting (ACM/MIN/43 (FINAL), paragraph 10).

Sewage sludge, manures and slurries

Manures and slurries

33. In March, Members were briefed by Dr Back of the FSA on the Agency's work on the agricultural use of manures and slurries. They also considered draft FSA guidelines for growers, designed to minimise the risks of microbiological contamination of ready-to-eat crops by farm manures. Members offered a number of comments on the draft guidance, including in relation to suggested delay periods between application of manures and sludges, and grazing of livestock or harvesting of crops; and on the importance of proper composting and batch storage to ensure that appropriate temperatures were achieved to kill pathogens. Further details can be found in paragraph 6 of the minutes of the Committee's 21 March meeting (ACM/MIN/43 (FINAL)).

Safe Sludge Matrix

34. In September, the Committee was consulted by the FSA about the Agency's position on the recycling of sewage sludge to agricultural land. The background is that, as a result of increased concerns about the disposal of sewage sludge to agricultural land, the Government initiated a wide-ranging review of the scientific literature. Following publication of the review in 1998,^{25,26} the Government announced its intention of revising current regulations²⁷ to provide further safeguards against the transfer of pathogens from sewage sludge to the food chain. However, the proposed changes have already been reflected in the Safe Sludge Matrix,²¹ a voluntary agreement between Water UK (representing the UK water and sewage operators) and the British Retail Consortium. Government-funded research shows that conventional sewage treatments produce a 2-log reduction in pathogens, while enhanced treatments give a reduction of 6-logs or better. On the basis of the log-reductions in pathogens demonstrated by the research, the Food Standards Agency has generally concluded that the Safe Sludge Matrix provides an adequate margin of safety. However, the ACMSF was invited in September 2002 to advise on the adequacy of the Safe Sludge Matrix in the light of the results of the research programme. While the difficulty of offering

a definitive view in the absence of a risk assessment (see paragraph 35) was noted, Members felt that the Matrix followed a very cautious approach. They were satisfied that sewage sludge applied to agricultural land in accordance with the requirements of the Safe Sludge Matrix should not present any unacceptable risks to food safety.

Microbial risks associated with applying biosolids to agricultural land

35. For many years, and at the Government's request, the ACMSF has assisted with the Government-funded review of the agricultural use of sewage sludge (see Annual Reports 1997⁶ (paragraph 34), 1998⁷ (paragraph 32), 2000⁹ (paragraph 59) and 2001¹⁰ (paragraphs 64-65)). This work has been undertaken by an *Ad Hoc* Group specially created for the purpose. Towards the end of 2002, the Group was approached by the water industry contractor for the work to review the findings of an extended risk assessment. A meeting was held with the contractor in November 2002 to consider the second phase of the risk assessment, covering *Salmonella*, *E. coli* O157, *Campylobacter*, *Listeria monocytogenes*, *Cryptosporidium parvum*, *Giardia* and Enteroviruses. The scope of the risk assessment presented to the Group had been extended to include estimated risks of human infection arising from the consumption of root crops in sewage sludge-treated soil.

36. The *Ad Hoc* Group had been asked for its opinion on the science underpinning the risk assessment and the relative importance of the risk estimates within the overall burden of foodborne infectious disease. The Group's preliminary view had been that the risk assessment was based on a very conservative approach embodying large margins of safety. The risk to human health from consuming root crops grown on agricultural land on which treated sewage sludge had been spread seemed very small. However, the Group had noted that there were several important elements missing from the risk assessment for *Campylobacter* which would serve to materially reduce the estimate of the annual number of potential human infections. Further contact was required with the contractor to explore how proper account could be taken of these various factors. If and when matters are satisfactorily resolved, the *Ad Hoc* Group on Sewage Sludge will present a briefing paper to the full ACMSF recommending the terms of a formal response which the Committee could send to the water industry contractor.

Risk assessment

37. As noted in paragraph 58 of the Committee's Annual Report 2000,⁹ the ACMSF acknowledged, in response to the report by the then Chief Scientific Adviser to the Government, Sir Robert (later Lord) May,²⁸ the potential advantages which might flow from the adoption of a more formal structure to the process of risk assessment. It was agreed that the Committee should

explore the options more carefully. It was felt that the ACMSF did not require a complex framework for conducting a full quantitative risk assessment, but a check list of factors which the Committee needed to address in developing its risk assessment advice. To take matters forward, Members agreed in March 2002 that, as a first step, an *Ad Hoc* Group should be set up:

- to consider whether the ACMSF would be helped by following a formal structure for the process of risk assessment;
- if so, to recommend an appropriate structure which might be adopted; and
- to report back, with recommendations, to the ACMSF.

The Group has now been established – membership details are given in Annex I – and expects to complete its work in 2003.

Getting ahead of the curve

38. In March, Members' attention was drawn to the Chief Medical Officer (CMO)'s strategy "Getting ahead of the curve", in particular the proposals for creating a new Health Protection Agency and their impact on the structure of the Public Health Laboratory Service. Members noted that the proposal could adversely affect the ability to gather information on, and manage, foodborne illness. They also noted that the FSA had already established informal contact with the relevant officials in the Department of Health to alert them to concerns over what the proposals would mean in terms of such aspects as foodborne disease monitoring; the role of reference laboratories; the routine testing of food, water and environmental samples in support of local authority enforcement work, food hazard investigation and microbiological food surveillance; epidemiological support for foodborne disease outbreaks; etc.

39. The point was made that the CMO's strategy was not a consultative document and that decisions were likely to be taken very quickly. It was therefore seen as important that any ACMSF comments should not be delayed. It was felt that, although the strategy itself was not open for discussion, there were significant gaps needing to be filled in the implementation strategy, on which Department of Health officials might welcome ACMSF input. It was agreed that any ACMSF comments should be sent to the FSA for deployment with the Department of Health, as necessary. A copy of the letter sent by the Committee is at Annex VII.

Surveillance

Surveillance Working Group

40. The Surveillance Working Group was kept apprised of developments in relation to the FSA's planned survey of *Salmonella* contamination of UK-produced shell eggs, and commented on an ADAS validation for a protocol for the isolation of *Salmonella* from external shell surfaces of eggs. The Group's comments can be found on the Committee's website (see paper ACM/587).

Ready-to-eat burgers

41. Members noted the results from a 1999 Public Health Laboratory Service (PHLS)/Local Authority Coordinating body on Food and Trading Standards (LACOTS – now LACORS) survey of ready-to-eat (RTE) burgers sampled anonymously at the point of sale in the UK.²⁹ Examination of 3,128 RTE burgers found that 2,868 (92%) were of acceptable quality and 260 (8%) were of unsatisfactory quality.

Research

Microbiological Safety of Food Funders' Group (MSFFG)

42. In a discussion during 2001 of research (ACM/MIN/41 (FINAL) paragraph 5.3), Members stressed the need for good coordination across Government Departments, among funders and throughout the UK, not least to avoid overlaps and duplication. By way of follow up to that discussion, Members were provided in March 2002 with an FSA briefing paper explaining the coordinating role of the MSFFG, in particular its function in bringing together the public funders of microbiological food safety work.

43. Members were also provided with the MSFFG's Report on UK publicly-funded research relating to *Salmonella*.

FSA research programme

44. Members received for information copies of the Food Standards Agency's Research Programme Annual Report for 2001.³⁰

FSA Advisory Committee on Research

45. Members received a copy of the FSA's press release³¹ announcing the setting up of a Research Advisory Committee to guide the Agency's £30.8 million research programme.

Epidemiology of Foodborne Infections Group (EFIG)

46. EFIG is an FSA Group whose role is to collate and assess available information on animal and human infection, to identify through the evaluation of that information the need to ensure the microbiological safety of food, and to advise accordingly. The ACMSF receives regular progress reports on EFIG's work. Details of the report provided in September 2002 are given in ACM/605.

Briefings

47. The Committee received a number of briefings during the year.

FSA food hygiene campaign

48. Members were briefed in March by Ms Claire Boville (FSA Microbiological Safety Division) on the Agency's 5 year food hygiene campaign (which was launched on 11 February 2002). Members were also provided with copies of the resources made available to caterers at that time (ie. an information pack entitled "Your Guide to Safer Food and a Better Business" which included a poster and sticker, and 2 booklets – one, a "Guide to Food Hygiene" and the other, "Food Safety Regulations". The ACMSF has consistently stressed the importance of high standards of food hygiene in reducing the risks of food poisoning and fully supports the Agency's initiative. Members made a number of detailed comments which are recorded in paragraph 9.3 of the minutes of the 21 March 2000 meeting (ACM/MIN/43 (FINAL)). The question of food hygiene advice for caterers and consumers has been addressed in a number of the ACMSF's reports. The Committee will watch with interest the way in which the FSA's campaign develops. In this connection, the second phase of the campaign was launched on 30 October 2002. Members were informed of progress and received copies of a second resource pack for catering businesses. This comprised:

- a video, "Bacteria Bites Business";
- a booklet, "Food Safety: a Practical Guide for Managers"; and
- wall stickers promoting the "4Cs" (ie. cleaning, cooking, chilling and cross-contamination) on which the campaign is based.

The making of hygiene legislation

49. As part of the orientation process for new Members, Ms Catherine Bowles (FSA Microbiological Safety Division) provided briefing in June on the making of food hygiene legislation and responded to Members' questions. Fuller details appear in paragraph 9 of the minutes of the 27 June 2002 meeting (ACM/MIN/44 (FINAL)).

Food law enforcement

50. In December, Ms Ann Goodwin, Head of the FSA's Local Authority Enforcement Division, briefed Members, at their request, on food law enforcement in the UK and also answered their questions. Fuller details are given in paragraph 6 of the minutes of the December meeting (ACM/MIN/46).

Salmonella Newport

51. Members were briefed in June 2002 by the Department for Environment, Food and Rural Affairs (DEFRA) assessor, Mr Paul Gayford, on multi-resistant strains of *Salmonella* Newport which were giving cause for considerable concern in the USA and had also been reported in Canada. It was reported that the strains had not been introduced into the UK, and Members were informed of the UK's contingency plans. Fuller details on the briefing can be found in the minutes of the ACMSF's June meeting (ACM/MIN/44 (FINAL), paragraph 11).

Burden of foodborne disease in England and Wales

52. Dr Bob Adak from the Gastrointestinal Diseases Division of the Public Health Laboratory Service Communicable Disease Surveillance Centre attended the Committee's December meeting to brief Members on the method developed by the PHLS to estimate the burden of indigenous foodborne disease occurring in England and Wales over the period 1992-2000.³² Dr Adak also brought Members up to date on current trends in foodborne disease, and responded to their questions. Full details are given in paragraph 9 of the minutes of the December meeting (ACM/MIN/46).

Multi-strain *Salmonella* outbreaks

53. Dr Hilton provided details for Members in December of the then current state of the investigation of a number of outbreaks of *Salmonella* Enteritidis in England, many of which were associated, or suspected of being associated, with the consumption of eggs. These included a large nationwide outbreak of *S. Enteritidis* PT14b, a prolonged hospital outbreak involving both *S. Enteritidis* PT6a and PT1, a newly-emerging nation-wide outbreak of *S. Enteritidis* PT6d, and a number of localised outbreaks caused by a range of unusual phage types. Fuller details are given in ACM/611 and paragraph 10 of the minutes of the December meeting (ACM/MIN/46: for website address see paragraph 15).

Information papers

54. The Committee is routinely provided with information papers dealing with topics which may be of interest to Members. This affords them an opportunity to identify particular items for discussion at future meetings. Among the documents provided to Members during 2002 were:-

- a report on the effect of HTST pasteurisation on the viability of *Mycobacterium avium* subsp. *paratuberculosis* (MAP) in cows' milk;³³
- a copy of the FSA's strategy for controlling MAP in cows' milk (ACM/586);
- sales of antimicrobial products used as veterinary medicines, growth promoters and coccidiostats in the UK in 2000;³⁴
- a draft Defra strategy for the surveillance of antimicrobial resistance in animals;³⁵
- FSA Science and Innovation Strategy;³⁶
- FSA Board paper on traceability in the food chain (ACM/578);
- a European Commission risk profile on the microbiological contamination of raw fruit and vegetables;³⁷
- an FSA briefing paper on race equality in the work of advisory committees.

Chapter 3: A Forward Look

Future work programme

55. The Committee will continue its work on *Campylobacter* in 2003, looking to feed advice into the FSA expeditiously. It is hoped that this will assist the Agency in evolving its strategy for reducing the incidence of foodborne *Campylobacter* infection in humans.

56. Progress will be made on consideration of the question of the ACMSF adopting a formal structure for the process of risk assessment. The Committee also stands ready to lend further assistance, as necessary, in connection with the peer review of the microbiological risk assessment to determine whether the application of sewage sludge to agricultural land poses a significant incremental pathogen risk to foods produced in or on such land.

57. The Committee will, through the medium of its standing Surveillance Working Group, continue to provide advice, as and when necessary, in connection with the Government's microbiological food surveillance programme and other surveillance relevant to foodborne disease.

58. The Committee will continue to respond promptly to any FSA requests for advice on the microbiological safety of food, in accordance with its terms of reference. Work will continue with horizon scanning (see paragraphs 59-63).

Horizon scanning

ACMSF horizon scanning

59. As part of the process of planning its future work programme, the ACMSF embarked upon a horizon scanning exercise during 2002. The aim was to identify topics which might merit detailed attention by the Committee in the short to medium term, so that a view could be taken of whether or not such topics might pose a problem in terms of the microbiological safety of food. Members held a preliminary discussion in March and offered a number of candidates for further consideration on whether they were likely to pose problems in the future. Members were asked to submit short lists of priority topics which were discussed in June. In September, following a further refining step, Members focused in on 3 topics (imported foods, opportunistic (ie. newly-emerging) pathogens, and changing social habits in relation to food (including overseas travel)) which seemed amenable to action in the shorter-term. The criteria for choosing these topics was that they had

attracted the interest or concern of ACMSF Members; that it seemed important for the Committee to inform itself of the current situation on them; and that they seemed amenable to some form of practical action. It was agreed that other topics previously suggested by Members should be revisited by the Committee at a future round of horizon scanning.

Imported foods

60. Members had earlier signalled that EU enlargement and the increasing globalisation of markets could potentially result in the UK population being exposed to new pathogenic challenges. In September, they agreed to set up an *Ad Hoc* Group which should, amongst other things, seek to identify the imported foods of concern, or potential concern, the principal countries of origin, and the key foodborne pathogens in terms of public health. To avoid any overlap with overseas travel (paragraph 62), the Committee decided that the *Ad Hoc* Group should focus on the commercial movement of large volumes of food around the globe. Members noted that the FSA had established an Imported Food Branch to take forward the Agency's ten point plan on imported food controls. Members felt that it would be helpful to be briefed on what the FSA was doing on imported food controls and also on traceability and on the constraints imposed by European Union legislation on country of origin marking and Agency activity in this area. The Group will begin its work in 2003.

Opportunistic pathogens, including carriage in food animals

61. In earlier discussion, Members had expressed mixed views on the need for the Committee to consider opportunistic pathogens. On the one hand, some felt that the Committee should concentrate on those microorganisms known to be of importance in food safety terms. On the other, it was recognised that microorganisms not traditionally regarded as important in relation to infectious intestinal disease might pose a risk to humans, particularly in specific food matrices. The Committee agreed to set up an *Ad Hoc* Group to consider this topic further. Members agreed that, as a first step, the Group should undertake a literature review and consider the adequacy of existing UK national alerting systems. In terms of the ACMSF's work, Members agreed that "opportunistic pathogens" should be defined as organisms which might constitute a potential new food poisoning threat in the shorter-term but which had not previously been regarded as problematical. Examples might be the organisms like *Aeromonas*, *Salmonella* Newport, or parasites. To avoid confusion, Members felt that it might be better to refer to "newly emerging pathogens" rather than to "opportunistic pathogens". The latter term was seen as carrying a more precise definition in the clinical setting (eg. organisms which occurred as part of the normal body flora but which might adopt a pathogenic role if, for example, the normal antimicrobial defence mechanisms of the host had become impaired). The work of this Group will commence in 2003.

Changing social habits in relation to food (including overseas travel)

62. As part of the initial horizon scanning discussions, Members had drawn attention to a number of potential risks associated with travel abroad. These included health risks from hepatitis, typhoid and tuberculosis; and the importation of foods for personal consumption on return from overseas trips. Members had also drawn attention to the need for better detection methods for meat and other illegal imports at sea and air ports. At its September meeting, the Committee agreed to set up an *Ad Hoc* Group (which will start work early in 2003) to assemble information on the extent of human foodborne illness associated with travel abroad. Members also agreed that the Group should consider the need for comprehensive ACMSF advice on the food-related risks to which people are exposed through foreign travel, or whether this already exists in readily-accessible form elsewhere. Members felt that consideration might usefully be extended to eating out generally, and the impact of changing eating habits on food safety. Members noted that there was plentiful expert food safety advice available to those travelling abroad, and some information about the burden of diarrhoeal disease amongst those returning to the UK from foreign travel. However, little hard information was available about the aetiology of such infections, although many were presumed to be water-associated. Members agreed that being able to differentiate between infections acquired abroad and in the UK was important in terms of developing a strategy for reducing foodborne disease. Members noted that the Epidemiology of Foodborne Infections Group was planning to review the data available from routine surveillance, which might assist the ACMSF's consideration of this issue.

Longer-term sequelae

63. In the context of ACMSF horizon scanning, Members received for information the draft of an Infectious Intestinal Disease (IID) Study of England follow-up study looking at the longer-term health effects of food poisoning and IID in the UK (the so-called "chronic sequelae"). The study looked at the persistence of symptoms at 3 weeks and 3 months after the initial IID episode. The study concluded that IID causes a considerable burden of ill health over and above the initial event. Members noted that new work was appearing in the medical and scientific literature in relation to long-term sequelae and agreed to take stock of recent developments with a view to returning to the question at a future meeting.

Health effects of UK climate change

64. Also of interest to Members in the horizon scanning context was a Report on the Health Effects of Climate Change in the UK,³⁸ extracts of which were presented to the Committee in September 2002. The report derived from a request by Health Ministers that an expert group should be set up to identify environmental factors that could affect the health of the

population, and to assist the Government in its long-term planning on issues of climate change and health. Some ACMSF Members expressed reservations about the quality of the foodborne disease section of the Report.

Defra horizon scanning

65. Members were briefed on the initiative by Defra to establish a new horizon scanning research programme and to develop its approach to horizon scanning in relation to policy development and the scientific advice process.

**Annex 1: Membership of the Advisory
Committee on the Microbiological
Safety of Food, its Working Groups and
its *Ad Hoc* groups**

| | ACMSF | Campylobacter Working Group | Surveillance Working Group | Ad Hoc Group on: | | | | |
|---------------------------|---|--|--|---|--|--|--------------------------|--|
| | | | | Sewage sludge | Risk assessment | Imported foods | Newly-emerging pathogens | Changing social habits in relation to food (including overseas travel) |
| Terms of reference | 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. | To identify any important gaps and omissions in action taken to reduce <i>Campylobacter</i> in food and food sources and in the knowledge base; and to develop advice which will assist the Food Standards Agency in evolving its strategy for reducing the incidence of foodborne <i>Campylobacter</i> infection in humans. | 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. | To assist with the peer review of a microbiological risk assessment to determine whether the application of sewage sludge to agricultural land poses a significant incremental pathogen risk to foods produced in/on such land. | To consider whether the ACMSF would be helped by following a formal structure for the process of risk assessment; if so, to recommend an appropriate structure which might be adopted; and to report back, with recommendations, to the ACMSF. | To assemble information on the current situation on these topics 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. | | |
| Chairman | | | | | | | | |
| Professor D L Georgala | ✓ | ✓ | | | ✓ | | | |
| Members | | | | | | | | |
| Dr G R Andrew | ✓ | | | | | | | ✓ ¹ |
| Dr D W G Brown | ✓ | | | ✓ | | | ✓ | |

¹ Dr Andrews is Chairman of the Ad Hoc Group on Changing Social Habits (including overseas travel).

| | ACMSF | Campylobacter Working Group | Surveillance Working Group | Ad Hoc Group on: | | | | |
|------------------------|-------|-----------------------------|----------------------------|------------------|-----------------|----------------|--------------------------|--|
| | | | | Sewage sludge | Risk assessment | Imported foods | Newly-emerging pathogens | Changing social habits in relation to food (including overseas travel) |
| Ms S Davies | ✓ | ✓ | | | ✓ | ✓ ² | | |
| Professor M J Gasson | ✓ | ✓ | ✓ | | | | | |
| Dr K M Hadley | ✓ | | | | | | ✓ | |
| Professor T J Humphrey | ✓ | ✓ | ✓ ³ | | | | | ✓ |
| Professor P R Hunter | ✓ | ✓ | | | | ✓ | ✓ ⁴ | |

² Ms Davies is Chair of the Ad Hoc Group on Imported Foods.

³ Professor Humphrey is Chairman of the Surveillance Working Group.

⁴ Professor Hunter is Chairman of the Ad Hoc Group on New-Emerging Pathogens.

| | | ACMSF | Campylobacter Working Group | Surveillance Working Group | Ad Hoc Group on: | | | | |
|------------------------|---|-------|-----------------------------|----------------------------|------------------|-----------------|----------------|--------------------------|--|
| | | | | | Sewage sludge | Risk assessment | Imported foods | Newly-emerging pathogens | Changing social habits in relation to food (including overseas travel) |
| Mrs P Jefford | Head of Environmental and Public Health Services, Gravesham Borough Council | ✓ | | ✓ | | | | | ✓ |
| Professor A M Johnston | Professor of Veterinary Public Health, Royal Veterinary College, University of London | ✓ | ✓ | | | | ✓ | | |
| Mr A Kyriakides | Head of Product Safety, Sainsbury's Supermarkets Ltd. | ✓ | ✓ | ✓ | | ✓ | | | |
| Ms E Lewis | Computer consultant. Consumer representative | ✓ | ✓ | | | | | | |
| Professor P Mensah | Head of Bacteriology Unit, Noguchi Memorial Institute for Medical Research, University of Ghana. Visiting E P Abraham Research Fellow, St Hilda's College, Oxford | ✓ | | | | | | ✓ | |
| Dr S J O'Brien | Head of Gastrointestinal Diseases Division, Public Health Laboratory Service Communicable Disease Surveillance Centre | ✓ | ✓ | ✓ | | | | ✓ | |
| Mr B J Peirce | Hotel owner. Caterer | ✓ | ✓ | | | | | | ✓ |

| | ACMSF | Campylobacter Working Group | Surveillance Working Group | Ad Hoc Group on: | | | | |
|------------------------------------|-------|-----------------------------|----------------------------|------------------|-----------------|----------------|--------------------------|--|
| | | | | Sewage sludge | Risk assessment | Imported foods | Newly-emerging pathogens | Changing social habits in relation to food (including overseas travel) |
| Mr D J T Piccaver | ✓ | | | ✓ | | ✓ | | |
| Dr Q D Sandifer | ✓ | | | ✓ | | | | |
| Professor W C S Smith ⁵ | ✓ | | | | | | | |
| Dr T D Wyatt | ✓ | | | | ✓ ⁶ | ✓ | | |
| Mr M Attenborough | | ✓ | | | | | | |
| Dr E Berndtson ⁷ | | ✓ | | | | | | |
| Assessors | | | | | | | | |
| Dr L Doherty | ✓ | | | | | | | |

⁵ Until 31 March 2002.

⁶ Dr Wyatt is Chairman of the Ad Hoc Group on Sewage Sludge.

⁷ Until December 2002.

| | ACMSF | Campylobacter Working Group | Surveillance Working Group | Ad Hoc Group on: | | | | |
|-------------------------------------|-------|-----------------------------|----------------------------|------------------|-----------------|----------------|--------------------------|--|
| | | | | Sewage sludge | Risk assessment | Imported foods | Newly-emerging pathogens | Changing social habits in relation to food (including overseas travel) |
| Mr P J R Gayford | ✓ | ✓ | | | | | | |
| Dr J Hilton | | ✓ | | ✓ | | | | |
| Dr G McIlroy ⁸ | ✓ | | | | | | | |
| Professor C H McMurray ⁹ | ✓ | ✓ | | | | | | |
| Dr S Neill ¹⁰ | | ✓ | | | | | | |
| Dr S Pryde | ✓ | | | | | | | |
| Dr R Skinner | ✓ | | | | | | | |
| Mrs J Whinney | ✓ | | | | | | | |
| Secretariat | | | | | | | | |
| Medical Secretary | | | | | | | | |
| Dr J Hilton | ✓ | | | | | | | |
| Administrative Secretary | | | | | | | | |
| Mr C R Mylchreest | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

⁸ From 19 August 2002.

⁹ Until 16 August 2002.

¹⁰ From October 2002.

| | ACMSF | Campylobacter Working Group | Surveillance Working Group | Ad Hoc Group on: | | | | | |
|-----------------------------------|-------|-----------------------------|----------------------------|------------------|-----------------|----------------|--------------------------|--|---|
| | | | | Sewage sludge | Risk assessment | Imported foods | Newly-emerging pathogens | Changing social habits in relation to food (including overseas travel) | |
| Administrative Secretariat | | | | | | | | | |
| Mrs E A Stretton | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Miss C L Wilkes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mr S Rahman | | | | | | | | | |
| Scientific Secretariat | | | | | | | | | |
| Dr J P Back | | ✓ | | | | | | | |
| Dr P E Cook | | | | | ✓ | | | | |
| Ms G V Hoad | | | ✓ | | | | | | |
| Dr S Molnar | | | | | | ✓ | | | |

Annex II: Advisory Committee on the Microbiological Safety of Food Register of Members' Interests

| Member | Personal interests | | Non-personal interests | |
|------------------------|--|--|--|--|
| | Name of company | Nature of interest | Name of company | Nature of interest |
| Professor D L Georgala | Marks and Spencer plc ¹ Unilever plc | Consultant Shareholder | None | |
| Dr G R Andrews | Chilled Foods Association | Chairman | None | |
| Dr D W G Brown | None | | Various | PHLS industry-funded research and laboratory investigations |
| Ms S Davis | None ² | | None | |
| Professor M J Gasson | Danisco Venture | Member of scientific forum | Various | IFR Food Safety Science Division industry-funded research projects |
| Dr K M Hadley | None | | None | |
| Professor T J Humphrey | J Sainsbury plc British Egg Industry Council | Ad hoc consultancy work Ad hoc consultancy work | Various | Funding for research projects |
| Professor P R Hunter | Buxton Mineral Water Company Zenith International Manchester Port Health Authority | Consultant Consultant Port Medical Officer | Drinking Water Inspectorate and United Utilities plc | Cryptosporidium research |

¹ Until June 2002

² Ms Davies has no interests of her own to declare but has declared shares held by her father in Marks and Spencer.

| Member | Personal interests | | Non-personal interests | |
|------------------------|--|---|------------------------|---|
| | Name of company | Nature of interest | Name of company | Nature of interest |
| Mrs P. Jefford | Chartered Institute of Environmental Health Environmental Health Officers' Registration Board Chadwick House Group Ltd Chadwick Holdings Incorporated Chadwick Group Florida Incorporated Chadwick Group Colorado Incorporated | Trustee Director Director Director Director Director | None | |
| Professor A M Johnston | Humane Slaughter Association Tesco Stores Ltd | Veterinary adviser Consultant | Various | Independent advice and research involving industry, on behalf of the Royal Veterinary College |
| Mr A Kyriakides | J Sainsbury plc | Shareholder | None | |
| Ms E Lewis | None | | None | |
| Professor P Mensah | None | | None | |
| Dr S J O'Brien | None | | None | |
| Mr B J Peirce | None | | None | |

| Member | Personal interests | | Non-personal interests | |
|------------------------------------|--|---|------------------------|--------------------|
| | Name of company | Nature of interest | Name of company | Nature of interest |
| Mr D J T Piccaver | J E Piccaver & Co (Gedney Marsh) Piccaver Farms Ltd QV Foods Ltd Lingarden Ltd Lingarden Flowers Ltd Horticulture Research International Holbeach Marsh Cooperative Ltd | Managing Director Managing Director Non Executive Director Non Executive Director Non Executive Director Non Executive Director Chairman. Non Executive Director | British Potato Council | Council member |
| Dr Q D Sandifer | None | | None | |
| Dr T D Wyatt | None | | None | |
| Campylobacter Working Group | | | | |
| Mr M Attenborough | None | | None | |
| Dr E Berndtson | None | | None | |

Annex III: 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 organisations; 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 Chairman 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 Chairman of the Agency if, in the view of the Chairman 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.

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 is 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.

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.

March 2002

(cm 6767)

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

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 eg.:

- (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 IV: ACMSF Contribution to the
First Report to the Food Standards
Agency Board on Implementation of
the Recommendations of the
Report on the Review of
Scientific Committees²²**

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD | | | | | | |
|--|---|--|----------|-------------|------------|--|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| | <i>Role of the secretariat</i> | | | | | |
| 1 | each secretariat should include, or have immediate access to, people with relevant scientific / technical expertise (para 20) | <u>Secretariats</u> with support from HoD | ✓ | | | The ACMSF Secretariat includes a Medical Secretary. Secretariats of Working/ <i>Ad Hoc</i> Groups have Scientific Secretaries. The Secretariat also has access to medical, scientific, veterinary and other specialist expertise through its Departmental Assessors and from within the FSA and other Government Departments. |
| 2 | committee papers should be drafted by the secretariat, drawing on the expertise of members as appropriate (para 21) | <u>Secretariats</u> | ✓ | | | ACMSF members do not draft ACMSF papers; although they do draft parts of ACMSF subject-specific reports. The Secretariat will continue to produce drafts, drawing on the detailed expertise of members, where this is practicable. In addition, many checks and balances exist to prevent unrepresentative views being advanced in the collective name of the ACMSF. |
| | <i>Appointment of Committee Members</i> | | | | | |
| 5 | the Agency should actively search for suitable experts and encourage them to apply (para 31) | <u>Secretariats</u> are best placed to identify suitable experts | ✓ | | | The ACMSF Secretariat already supplements open competition with other means of identifying potential candidates for ACMSF appointment (eg. Cabinet Office Public Appointments Unit lists). |
| 6 | the possibility of learned societies and Research Councils helping to identify individuals with particular expertise should be explored further with them (para 31) | <u>Secretariats</u> to contact the societies and Councils when advertising for members | | | ✓ | ACMSF will take forward this recommendation, which will add to the existing suite of options. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|---|--|---|----------|-------------|------------|---|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 7 | each advisory committee should have at least two non-specialist members, one of which should have a background in consumer affairs (para 33) | Secretariats | ✓ | | | ACMSF has 2 non-specialist members, one a past member of the MAFF/DH Consumer Panel and the other from the Consumers' Association. |
| 8 | the Agency should specify clearly what is expected of all members, focussing particularly on the role of non-specialist members (para 34) | Secretariats (with advice from Consumer Branch) | | ✓ | | ACMSF Secretariat has prepared guidance notes for members and also issues an information pack when advertising membership vacancies. These are being reviewed in the light of this recommendation and will be updated as necessary. |
| | <i>Training and support for members</i> | | | | | |
| 10 | the Agency should provide induction for new committee members and this should include training in consumer issues for scientific members, and possibly facilitated sessions in effective committee functioning (paras 37, 38 & 40) | Secretariats (with advice from Consumer Branch) | | | ✓ | The Secretariat will identify appropriate induction and training opportunities, in consultation with FSA. |
| 12 | training in media skills should be offered to Chairs and certain other committee members (para 39) | Secretariats (with support from COMS) | | | ✓ | The Secretariat will identify appropriate training opportunities, in consultation with FSA. The ACMSF's Chair and some members already have media experience/training but would welcome refresher opportunities. |
| 13 | the Agency should obtain feedback from committee members on the adequacy of the support and training they receive and should take the necessary action to address any deficiencies (para 41) | Secretariats (some overlap with #3 above?) | | | ✓ | The Secretariat will liaise with the ACMSF Chair and members. This recommendation will also be reflected in the action taken in relation to Recommendation 3. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|---|--|---|----------|-------------|------------|---|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| | <i>Cross-membership of committees</i> | | | | | |
| 17 | where appropriate, permanent links should be maintained between Committees in the form of cross-membership through ex-officio appointments (para 48) | Secretariats to consider whether such links are needed and identify suitable members | ✓ | | | An ACMSF member currently provides ex-officio cross-membership with ACNFP. |
| | <i>Remuneration of members</i> | | | | | |
| 18 | the Agency should make employers aware of the valuable contributions made by committee members (para 51) | Secretariats to draft letters for FSA Chairman to write to relevant employers when appointment/re-appointments are made [and when members reach the end of their period of office?] | | | ✓ | ACMSF Secretariat will incorporate this into the appointments procedures. |
| | <i>Indemnities</i> | | | | | |
| 20 | statements of indemnity should be drawn up and kept up to date for committees, their sub-groups and other <i>ad hoc</i> expert groups (para 55) | Secretariats to ensure indemnities are kept up to date | | ✓ | | The ACMSF indemnity appears as Annex III of the ACMSF's 1999 Annual Report. The ACMSF Secretariat is currently reviewing the indemnity with FSA's Legal Services, and Corporate Resources and Strategy Group. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|---|---|--|----------|-------------|------------|---|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| | <i>Devolution and international issues</i> | | | | | |
| 21 | committees should receive regular updates on the work of their EU and international counterparts (para 59) | <u>Secretariats</u> | ✓ | | | The ACMSF Secretariat regularly provides the Committee with information papers on developments in international fora (most recently, in CODEX and WHO). In addition, FSA made a presentation to the ACMSF in June 2002 on EU food hygiene legislation and consolidation. The Secretariat will continue to provide briefing/presentations on similar issues, including those identified by members as of particular interest. The next planned briefing will deal with food law enforcement. |
| THE COMMITTEES' RESPONSIBILITIES – CONDUCT OF COMMITTEE BUSINESS | | | | | | |
| | <i>Openness</i> | | | | | |
| 22 | committees should follow standard practices in making their documents available, by publishing agendas and committee papers in advance of each meeting, and minutes and/or summary reports afterwards (para 63) | <u>Secretariats</u> to implement as appropriate for each committee | | ✓ | | ACMSF complies, except that papers are not currently made available until after they have been considered by members. This will be rectified from the ACMSF's next meeting. |
| 23 | the data used as the basis for risk assessments and other committee opinions should be made freely available (para 64) | <u>Secretariats</u> to implement as appropriate for each committee | ✓ | | | ACMSF papers are already made available (with few exceptions on grounds of confidentiality). Full supporting data, including risk assessment material and a comprehensive reference section, are provided in the Committee's subject-specific reports. |
| 24 | applications to committees [for approval of new products] are published for public comment prior to any substantive discussion by the committee (para 64) | <u>Secretariats</u> to implement as appropriate for each committee | ✓ | | | The ACMSF has no role in the approval of products. It is a risk assessment body and its function is purely advisory. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|--|--|---|----------|-------------|------------|--|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 25 | whenever possible, draft opinions are published for all interested parties to comment (para 65) | Secretariats to implement as appropriate for each committee | ✓ | | | <p>This seems impracticable for handling important/urgent issues concerning the microbiological safety of food. For example, Annex B of the Code of Practice for Scientific Advisory Committees stipulates that 12 weeks should be the standard minimum period for public consultations. Delays of this magnitude would be unacceptable where urgent advice on the microbiological safety of food was required.</p> <p>The ACMSF proposes to adopt an alternative approach, as follows:</p> <ul style="list-style-type: none"> • ACMSF issues “provisional” advice to FSA; • minutes and papers posted on website and public comment invited (through ACMSF e-mail address); • ACMSF considers any comments at following meeting; • ACMSF issues supplemental advice to FSA, as necessary. <p>The ACMSF could post its subject-specific reports in draft on its website prior to submission to FSA. However, this would add significantly (>6 months) to the timetable and could result in unacceptable delay in the submission of urgent food safety advice.</p> |
| 26 | all committees should move to a position where they conduct as much of their business as possible in open sessions (para 66) | Secretariats to implement as appropriate for each committee | | ✓ | | <p>The ACMSF currently holds 1 of its 4 meetings each year as an open meeting. From 5 December 2002, all of its meetings will be held in public. Budgetary constraints mean that 3 of the meetings will be held in Aviation House, which may mean limiting attendance. The fourth will however be held externally and it should not be necessary to limit numbers of members of the public wishing to attend external meetings.</p> |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|---|--|---|----------|-------------|------------|---|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 27 | committees should draw up clear guidelines to define what material can justifiably be regarded as confidential (para 68) | Secretariats to tailor guidelines for individual committees | ✓ | | | The guidance for ACMSF members drawn up by the ACMSF Secretariat covers this point. |
| | Setting agendas/work programmes | | | | | |
| 28 | committees should, at least once a year, publish a forward work plan (para 72) | Secretariats | ✓ | | | All ACMSF Annual Reports contain a Forward Look section, and horizon scanning will be a routine feature of future ACMSF business. The horizon scanning process for 2002 is already under way. It should be noted, however, that much of the Committee's work is demand-determined and is not always foreseeable. As the FSA seeks <i>ad hoc</i> advice from the ACMSF, the Committee hopes that the Agency will be able to contribute to the forward planning process by identifying areas of work/topics on which it expects to seek ACMSF advice in the outlook period. |
| | Communicating the committee's conclusions | | | | | |
| 29 | committee advice in complex areas should be accompanied by a summary that sets out the main points of the committee's conclusions in simple language (para 74) | Secretariats (with advice from COMS) | ✓ | | | The ACMSF already endeavours to do this, and will continue to do so. The Committee's press releases assist this process. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|---|---|--|----------|-------------|------------|---|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 30 | committee chairs should be offered professional advice on publicity and media handling and should normally act as the Committee's spokesperson (para 76) | Secretariats (with advice from COMS) | ✓ | | | The ACMSF Chair is the Committee's spokesperson. The ACMSF Secretariat will liaise with FSA's Communications Directorate to ensure that the ACMSF Chair has appropriate professional support as and when required. FSA has already provided appropriate assistance in the past (eg. in connection with the press launch of the ACMSF's Second Report on <i>Salmonella</i> in Eggs). |
| | <i>Handling conflicts of interest</i> | | | | | |
| 31 | committee guidelines should reflect that relevant declarable interests include links from which members benefit materially, including those with pressure groups and non-governmental organisations as well as industry (para 80) | Secretariats to tailor guidelines for individual committees, as necessary | ✓ | | | The ACMSF already operates on the basis of Cabinet Office model guidance. ¹ The Secretariat reviewed the ACMSF's code of practice in March 2002, in consultation with FSA legal advisers, and issued a revised version. |
| 32 | the Agency should produce guidelines upon which decisions can be made on the handling of members' interests (para 82) | | ✓ | | | The ACMSF operates on the basis of Cabinet Office model guidance. |
| 33 | interests should be declared by prospective committee members to enable a sensible balance to be achieved on the committee at the time that appointments are made (para 83) | Secretariats to obtain information and use it during appointment procedure | | | ✓ | The ACMSF Secretariat will consult the Office of the Commissioner for Public Appointments on how best to amend the application form it sends to applicants for ACMSF vacancies to reflect this recommendation. |

¹ Cabinet Office (2000). Non-Departmental Public Bodies: a guide for Departments, 203.

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (<i>continued</i>) | | | | | | |
|---|--|---|----------|-------------|------------|--|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 34 | chairs of the Agency's advisory committees should not be employed by, or receive personal remuneration from, industrial organisations or pressure groups during their term of appointment (para 85) | Secretariats to apply this principle during appointment procedure and to monitor interests thereafter | | ✓ | | The ACMSF Secretariat will need to state this precondition clearly in future material advertising ACMSF Chair vacancies. The current ACMSF Chair has terminated his industrial consultation work. |
| | <i>Data that has not been reviewed</i> | | | | | |
| 35 | wherever possible, Secretariats should ensure that committees have access to comments from appropriate external experts before considering novel research which has not been peer-reviewed (para 86) | <u>Secretariats</u> | ✓ | | | The ACMSF Secretariat will arrange for data from any novel research of the kind envisaged by the Review Group to be reviewed by external experts whose views can then be considered by ACMSF members alongside those of the researchers. Where appropriate, and with the agreement of the ACMSF chair, the relevant experts will be invited to participate in discussion of the novel research at the meeting at which the issue is to be addressed. |
| | <i>Role of the chair and members</i> | | | | | |
| 36 | committee chairs should ensure that committee decisions include an explanation of where differences of opinion have arisen during discussions and why conclusions have been reached. They should also ensure that any assumptions and uncertainties are clearly spelled out. (para 89) | <u>Secretariats</u> to advise Chairs on best practice | ✓ | | | It is current ACMSF practice to record the main strands of the discussion, the assumptions made, any uncertainties, and the consensus view reached in the minutes of the Committee's meetings. Similarly, the breadth of argument, the assumptions made, and the uncertainties inherent in the conclusions reached are also all detailed in the Committee's subject-specific reports. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|---|--|--|----------|-------------|------------|---|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 37 | when expertise is not available within the committee, the chair, in consultation with the secretariat, is responsible for ensuring advice is sought from additional experts (para 90) | <u>Secretariats</u> (in discussion with Committee chairs) | ✓ | | | <ul style="list-style-type: none"> ACMSF membership is regularly reviewed to identify any shortage of expertise. This process led recently to the appointment of new members with expertise in virology, catering and SMEs. Where, in the past, additional expertise has been required to enable the Committee to advise on a particular issue (eg. infectious salmon anaemia), external expert opinion has been obtained. External experts are routinely co-opted on to ACMSF Working Groups. |
| 38 | at the end of their first year of membership, members should be asked to prepare a report that reflects how they perceive their role within, and contribution towards, the work of the committee (para 91) | <u>Secretariats</u> to arrange meetings between members and Chairs | | ✓ | | Arrangements are already in place for the ACMSF Chair and Secretariat to discuss members' performance when re-appointment is being considered, as part of the information-gathering process to inform the FSA Chairman's decisions. The ACMSF Secretariat will facilitate the discussion of performance between Chairman and members, as required. |
| 39 | Specialist members each committee has access to advice on quantitative analysis and modelling (para 94) | <u>Secretariats</u> with advice from EA Division | | ✓ | | This recommendation will need to be reflected when future ACMSF vacancies are advertised. The ACMSF already has some expertise in these areas within its current membership. In addition, additional advice will continue to be available to the ACMSF from within Departments through Departmental assessors. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|--|---|--|----------|-------------|------------|--|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| | <i>Attendance at meetings</i> | | | | | |
| 40 | the number of officials attending a meeting should be kept to a minimum and their attendance limited to those particular items where they are required (para 97) | Secretariats | ✓ | | | Steps were introduced some years ago to achieve this objective. The attendance of officials not making presentations is rare and at the discretion of the Chair (with advice, as necessary, from the ACMSF Secretariat). |
| 41 | the seating at meetings should be arranged so that the presence of observers does not inhibit the committee's discussions (para 97) | Secretariats | ✓ | | | This is already done. |
| 42 | the Chair should limit contributions by non-members during discussions (para 97) | Secretariats to advise Chairs on best practice | ✓ | | | <ul style="list-style-type: none"> This already happens. Discussions at ACMSF meetings is routinely conducted through the Chair. Guidance on the role of Departmental assessors is contained in the Committee's 1999 Annual Report. Other non-members may attend parts of ACMSF meetings to make presentations and respond to members' questions. |
| | SEEKING AND USING THE COMMITTEES' ADVICE | | | | | |
| | <i>Uncertainty</i> | | | | | |
| 43 | when offering advice, committees should highlight any uncertainties identified during their deliberations, and explain how these uncertainties have been handled in reaching their final conclusions (para 100) | Secretariats to advise Chairs on best practice | ✓ | | | The ACMSF already does this and will continue to do so. A recent example can be seen in the ACMSF's Report on <i>Mycobacterium bovis</i> . ² |

² ACMSF Report on *Mycobacterium bovis*. January 2002. FSA/0400/2002; 25-26.

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|--|--|--|----------|-------------|------------|---|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 44 | committees should spell out the assumptions that have been made in each assessment and identify any gaps in the current knowledge, and the action that might be taken to address them. These should be made public (para 100) | Secretariats to advise Chairs on best practice | ✓ | | | See response to R.43 |
| 45 | the Secretariat, assisted by committee members, should take responsibility for identifying when new data becomes available that might justify the committee reviewing its earlier advice (paras 25 & 101) | Secretariats with Committee | ✓ | | | The ACMSF Secretariat already endeavours to do this, in conjunction with Departmental assessors and other Departmental officials. An example is the regular updating of information on the thermal inactivation of <i>Mycobacterium avium</i> subsp. <i>paratuberculosis</i> in milk. |
| | <i>Relationship between the Committees, executive and the board</i> | | | | | |
| 46 | the current arrangements should continue with information being conveyed from the committees to the Board via the executive. This may be supplemented from time to time by direct briefing of the board by the Chair of the committee (para 102) | Secretariats with Board Secretariat | ✓ | | | This reflects current practice. The ACMSF Chair has provided direct briefing to Board members at their invitation. |
| | <i>Responsibilities for risk assessment/ risk management</i> | | | | | |
| 48 | committees should not be asked to manage risks although they may be asked to consider risk management options and provide scientific advice (para 104) | Secretariats | ✓ | | | This reflects current practice. |

| ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD (continued) | | | | | | |
|---|---|---|----------|-------------|------------|--|
| No | Recommendation | Action/responsibility identified | Complete | In progress | For future | Current position/action towards implementation |
| 49 | the Agency, in consultation with committees, should develop a formal approach to risk assessment (para 105) | Secretariats to take forward in the light of the Agency's risk statement? | | ✓ | | The ACMSF has set up an Ad Hoc Group to develop proposals for taking this forward. |
| | <i>Research</i> | | | | | |
| 50 | the Agency's Advisory Committee on Research should monitor whether committee research recommendations are being suitably implemented by the Agency (para 107) | Secretariats of Policy Divisions to provide information to ACR Secretariat at [annual?] intervals | | | ✓ | Await FSA decision on what is required of ACMSF. |

Colin Mylchreest
Administrative Secretary
28 August 2002
On behalf of the ACMSF

Annex V

Advisory Committee on the Microbiological Safety of Food

Administrative Secretary, Room 813C, Aviation House
125 Kingsway, London WC2B 6NH
Telephone : 0207-276-8951 Fax : 0207-276-8907
E. mail : colin.mylchreest@foodstandards.gsi.gov.uk

Dr J R Bell
Deputy Chief Executive
Food Standards Agency
Room 604
Aviation House
125 Kingsway
London
WC2B 6NH

26 September 2002

ACMSF *CAMPYLOBACTER* WORKING GROUP

1. As you know, the ACMSF has set up a Working Group, which I am chairing, to look afresh at the *Campylobacter* question. The primary aim is to develop advice which will assist the Food Standards Agency in evolving its strategy for reducing the incidence of foodborne *Campylobacter* infection in humans.

2. It could easily be another year or so before we are in a position to submit our final report to the Agency. We clearly do not wish to wait that long before letting you have advice. We have therefore resolved to feed our advice in to you as soon as we have developed it, rather than waiting until final report stage.

3. Our early work has centred on on-farm control measures against *Campylobacter* in chickens. I now enclose our advice – which is provisional insofar as we will supplement it, as and where necessary, as the work of the Group proceeds. We are not certain beyond all doubt of the association of poultry with human illness; but we are satisfied that it plays a significant role in the causal chain of events leading to human foodborne illness. We are also

convinced that reducing *Campylobacter* carriage in broilers is now a practical proposition.

4. I hope you will find this first tranche of advice helpful. In recognition of our formal reporting lines, and in parallel with the detailed comments I am sending you, I have written to Sir John Krebs setting out our broader perspectives. I enclose a copy of that letter for information.

5. As regards the Working Group's future work programme, we are hoping to be able to let you have advice on *Campylobacter* detection and typing, which are very important elements in the fight against this organism, before the end of the year. A small sub-group (comprising Tom Humphrey, Mac Johnston and Alec Kyriakides) will be visiting Norway and Denmark in November, on behalf of the Group, to see whether any of the things the Scandinavians are doing to tackle *Campylobacter* in poultry is translatable into a UK context. We will let you know the outcome.

6. I am copying this letter to Roger Skinner.

DOUGLAS L GEORGALA

(cm7032)

ON-FARM CONTROL MEASURES AGAINST CAMPYLOBACTER SPP. IN CHICKENS

Background

1. A Working Group of the Advisory Committee on the Microbiological Safety of Food (ACMSF) is currently investigating the role of foods in the incidence of human *Campylobacter* infections, and possible control measures. The terms of reference and membership of the Group are at Annex A. The background to the ACMSF's interest in *Campylobacter* is summarised in Annex B.

2. Evidence suggests that human *Campylobacter* infections can be acquired from various sources, both food and non-food. However, the Group believes that poultry, particularly broiler chickens, play a significant role in exposing humans to *Campylobacter*. Whether this is directly related to consumption of chicken (or due to cross-contamination of the kitchen environment and other foods from chicken) is not yet certain.

3. Although the scientific evidence is incomplete, we believe that reducing the incidence of *Campylobacter*-positive retail chicken is likely to be an important step in reducing human infections. We also believe that a declining incidence in poultry would reduce the overall number of *Campylobacter* bacteria in the home and catering environment, thus reducing the number of potential 'infectious doses' faced by the consumer.

4. From the evidence gathered so far, it does appear that reducing *Campylobacter* carriage in chicken production is now becoming a practical proposition, particularly with housed birds, whereas previously many thought it totally impossible.

5. *Campylobacter* control is an important aspect of FSA strategy. In view of the above considerations, the ACMSF has decided that the Working Group's current views on control of *Campylobacter* in chickens should be offered as early advice to the FSA.

6. These views are discussed in the draft 'chapter' which follows.

Introduction

7. Although various food vehicles are possible sources of human *Campylobacter* infection, we judge that particular attention needs to be given to poultry meat.

8. *Campylobacter* spp, principally, *Campylobacter jejuni* and, to a lesser extent, *Campylobacter coli*, are common in commercial poultry flocks. Data from current FSA-, and past MAFF-funded, research and from the

international scientific literature indicate that approximately 60% of housed (broiler) poultry flocks are *Campylobacter*-positive at slaughter age. This will vary from company to company, from farmer to farmer, and between flocks. Where numbers of colonised birds are lower than the average for housed poultry, it is likely that *Campylobacter* will only have become established towards the end of the commercial life of the flock. There appears to be a general trend towards lower colonisation rates in the UK, reflecting the fact that farmers are becoming more successful in preventing the entry of this bacterium.

9. *Campylobacter* control is possible for housed birds, as interventions in Scandinavia have illustrated. There is a much more difficult problem, however, with extensive production systems. A high percentage (>90%) of flocks reared in an extensive system have been shown to be *Campylobacter*-positive at slaughter. A recent study in Denmark found that between 37 and 49% of housed broiler flocks were *Campylobacter*-positive compared to 100% of organic flocks. The interventions we have identified are primarily applicable to housed production.

Sources of *Campylobacter* spp. in poultry

10. Over the last 25 years, since the identification of poultry meat as an important source of human infection with *Campylobacter* spp., there have been many studies in many countries into the epidemiology of this zoonotic pathogen in poultry production. As with many areas of science, there is a degree of dispute over the importance of the various routes of infection, which are shown below:

- contaminated water;
- vertical transmission from parent flocks;
- contaminated feed;
- carry-over from a previous flock;
- domestic and/or wild animals;
- contaminated transport crates, vehicles and personnel at flock thinning;
- feed withdrawal; and
- the external environment around the broiler house.

11. Although the epidemiology of *Campylobacter* infection in chickens has some similarities to that of *Salmonella* spp., there is one important difference. *Salmonella* primarily enters poultry flocks when the chicks are very young. *Campylobacter* is rarely found in broiler flocks until the birds are in the third week of life. There is currently no agreement on the reason(s) for this delay but the following have been suggested as having a role:

- maternal antibodies in young chicks, as most broiler-breeder flocks are *Campylobacter*-positive and anti-*Campylobacter* antibodies may be present in egg yolks;
- the presence in young birds of bacterial floras antagonistic to *Campylobacter* spp.

12. The control of *Campylobacter* spp. in poultry production is essentially one of identifying ways by which the three-week *Campylobacter*-free period can be extended until slaughter age.

Contaminated water

13. One study, on a farm in the UK in 1993, and a number of investigations in Scandinavia, have demonstrated that contaminated water, particularly when untreated ground water is used, can be responsible for the introduction of *Campylobacter* spp. into poultry flocks. The 1993 study also raised the intriguing prospect that viable but non-culturable *Campylobacter* (VBNC) were responsible for the initial colonisation event. There is much dispute about the importance of this physiological state. Of all the potential routes, waterborne infection should be the easiest for producers to control. It is very important that all poultry flocks receive only water of potable quality. Additional treatment, in the form of chlorine dioxide or ozone, is also likely to prove beneficial. This approach was part of a package of measures shown to markedly reduce flock colonisation in an on-farm trial in the East of England.

14. Drinking water provided by bell drinkers may also act as a vehicle for horizontal transmission within the broiler house once *Campylobacter* has become established.

Vertical transmission from parent flocks

15. Investigations in the USA provide some evidence to support the view that certain strains of *C. jejuni* may be transmitted vertically from colonised breeder flocks. However, this is a highly contentious area, and it has yet to be demonstrated beyond reasonable doubt that *Campylobacter* spp. can be isolated from newly hatched chicks. It may be that the bacteria track up from the cloaca and become transient colonisers of reproductive tissues. The fact that it is very difficult to isolate *Campylobacter* from birds less than 2-4

weeks of age is also an argument against vertical transmission, although it cannot yet be ruled out as an occasional route. In addition, the fact that some farms continuously produce *Campylobacter*-free flocks also makes vertical transmission less probable. There is a possibility that a small number of chicks are *Campylobacter*-positive at hatching, and that the bacteria take time to spread through the flock to a sufficient level to allow detection.

Contaminated feed

16. It is well established that contaminated feed is a potentially important route of flock infection with *Salmonella* spp. This does not seem to be the case with *Campylobacter*. The ubiquity of *Campylobacter* in food animals and the environment means that raw feed ingredients will often be contaminated with these bacteria. However, *Campylobacter* are very sensitive to dry conditions and have been shown to die quickly when present in poultry feed. Although the *Salmonella* control measures in place in the UK to improve feed hygiene will be adequate to control *Campylobacter* spp., it is important to remember that, as with water, feed can act as a vehicle for horizontal transmission in a broiler house once *Campylobacter* has become established.

Carry-over from a previous flock

17. Some studies have demonstrated that the same type of *Campylobacter* can be isolated from successive flocks. One possible explanation is therefore that the bacteria were carried over from one flock to the next. It is also possible that both flocks were colonised from the same source. However, laboratory-derived data indicate that *Campylobacter* are significantly more sensitive to damaging conditions than *Salmonella*. Thus, if house cleaning and disinfection are undertaken properly, then *Campylobacter* will be absent from cleaned houses, and any regime which removes *Salmonella* spp. will eliminate *Campylobacter*. It is thus unlikely that this potential source is important, although one study in Denmark found that the majority of broiler flocks (11/12) carried identical *Campylobacter* isolates in two or more flocks. As discussed above, it was not possible in this study, to differentiate between carry-over and a common source. Whatever the importance of carry-over, given the ability of *Campylobacter* spp. to colonise, it is essential that house cleaning and disinfection is rigorously carried out.

Domestic and/or wild animals

18. Most warm-blooded animals carry *Campylobacter* spp. Wild animals act largely as an indirect source of flock infection, as a consequence of environmental contamination. Similarly, farms with mixed animal species also run the risk of increased flock infection because farm staff may transmit the bacteria from cattle, sheep or pigs to chickens. The increased risk that this poses may seriously undermine biosecurity, and a potentially important

control measure is to rear chickens on species mono-specific farms. Given that cats and dogs are also frequently *Campylobacter*-positive, it is also important that these animals are not allowed access to poultry flocks. Anti-*Salmonella* control measures which prevent the access of wild birds and rodents will contribute to protecting flocks from *Campylobacter* colonisation too.

Contaminated transport crates, vehicles and personnel at flock thinning

19. Many poultry companies in the UK carry out the practice of “thinning”. Broiler houses are stocked with numbers of birds which would be above the welfare recommendation for stocking density if all the birds remained until slaughter weight. To overcome this, at approximately 4 weeks of age, a cohort of birds is removed for slaughter, with the remainder being kept for 2-3 weeks further. This practice has a number of important public health implications, in relation to contamination introduced on-farm by staff and visitors and on crates, as well as the deleterious effects of stress caused by thinning.

20. During the thinning process, crates that may be contaminated can introduce *Campylobacter* into a previously negative flock. The gloves and clothing of the catchers have also been shown to be *Campylobacter*-positive. The potential ingress of *Campylobacter* is compounded by the fact that the birds often become stressed as a result of the catching process. This may render those remaining in the house more susceptible to colonisation with *Campylobacter* spp.

21. Birds are transported to slaughter in crates by lorry. During catching, loading and transportation to the processing plant, the crate surfaces and the lorry decks become contaminated with faeces from the birds in the crates. The cost of poultry transport crates means that they are used repeatedly. Given the high incidence of *Campylobacter* in broiler chickens, crates are frequently contaminated with these bacteria. Crates must be cleaned and disinfected after use. They are washed at the processing plant, but this process has been shown to be far from ideal. The water is often recycled from the processing plant, is often used at ambient temperature, and the levels of detergents and/or disinfectants are often sub-optimal and may also be quickly neutralised by the high levels of organic matter present in the crate wash water, which will be re-cycled within the crate washer. Crates therefore often leave the washer contaminated with *Campylobacter* spp.

22. Schedule 1 of The Welfare of Animals (Transport) Order 1997, states that means of transport and receptacles shall be constructed, maintained and operated so as to allow appropriate cleaning and disinfection. The Transport of Animals (Cleansing and Disinfection) (England) (No. 2) Order 2000 requires all animal transport vehicles and containers to be cleansed and disinfected after each use and within 24 hours of the journey being

completed. The Assured Chicken Production Scheme (ACP) has produced a leaflet entitled "*Poultry standards: catching, transport and slaughter*". Rule 3.7 states that "*Processing plants must provide cleaning and sanitation provisions for crates and transporters. All transporters and crates must be washed after unloading*". No information is given about perceived best practice.

23. The decks of vehicles used to carry the crates also become contaminated and will spread contamination if they are not adequately cleansed and disinfected between journeys. In addition, as lorry tyres are potential vectors of *Campylobacter*, there should be a disinfectant wheel bath, or each wheel should be sprayed before entry to, and exit from, a poultry unit.

24. In an ideal world, the practice of thinning should be discontinued, to reduce the risks of transmitting *Campylobacter* infection. However, we have received very strong submissions from informed industry sources underlining the difficulties the industry is facing in what is a highly competitive and price-sensitive sector where import penetration is a continuing threat. We believe that, in terms of microbiological safety, if thinning is practised, it is essential that crate and lorry washing is properly carried out and that crates are not contaminated with *Campylobacter* (or, indeed, other pathogenic microorganisms). Other biosecurity measures are also essential, in relation to clothing, footwear, etc. We believe that improved hygiene standards will yield improved benefits in flock health and may help offset the increased costs involved (see paragraph 50).

The effects of feed withdrawal

25. An important hygiene problem in broiler processing is the accidental contamination of the carcass at slaughter by gut contents, particularly faecal material, and, as a consequence, the spread of pathogens such as *Campylobacter*. To reduce the danger, food is withdrawn some time before birds are loaded into their transport crates, whether at thinning or at final depopulation. Fasting periods of 4-10 hours have been recommended, (indeed, in our Report on Poultry Meat, we concluded that, on balance, a period of between 6 and 10 hours should be allowed between feeding and kill). However, the overall period without food will be longer than this because of the time taken to load and transport the birds to the processing plant, and any time spent waiting in lairage before slaughter. These factors must be taken into account by the farmer when deciding when to withdraw feed. The average transport time for broilers in the UK is 3.6 hours, although some birds can spend over 12 hours in crates before slaughter. It is possible that broilers could spend between 7-20 hours without food before slaughter.

26. There is continuing debate about whether these fasting times are, in fact, beneficial. Reducing the gut contents will reduce the pressure on the intestines and any leakage of contents on to the carcass if the gut is

accidentally broken during evisceration. However, even prolonged food withdrawal will not completely prevent defaecation occurring during *ante mortem* handling. Removing food, or both food and water, have similar effects on gut contents. Most reduction in weight occurs in the crop, and least in the caeca and cloaca. An important finding is that the contents of most parts of the gut, but particularly those of the crop and cloaca, get wetter with longer deprivation. In contrast, caecal contents become slightly drier. Fasting tends to progressively increase the number of Enterobacteriaceae and *Campylobacter* in all parts of the gut but especially in the caeca and cloaca.

27. Food withdrawal will not eliminate cross-contamination of the plumage of live birds with faecal matter during transport. Moreover, it may also have unforeseen adverse effects by inducing stress, which may predispose birds to *Campylobacter* infection. Work with *Salmonella* spp. has shown that birds may become systemically infected very rapidly (within 2 hours) after exposure to sources of infection. It is likely, given the commonness of *Campylobacter* in poultry, that infection with this bacterium will be equally rapid. Food withdrawal may also affect the microbiological flora of the gut by modifying the growth of bacteria normally present, such as lactobacilli, with subsequent changes in the pH of the gut contents. Lactobacilli are also known to have the ability to prevent/reduce intestinal colonisation with zoonotic pathogens. For example, a study, which examined the effects of stress in young monkeys, found that this was associated with a reduction in levels of lactic acid bacteria in the gut. Many of the stressed animals became infected with *C. jejuni*, which was endemic in the colony. It is also of interest that longer feed withdrawal times (up to 24 hours) are associated with a higher prevalence of chickens testing positive for *C. jejuni* in cloacal swabs before slaughter, and caecal swabs after. Thus, do the possible increased risks of gut breakage, and greater susceptibility to infection, outweigh perceived benefits on lower carcass contamination levels with zoonotic pathogens like *Campylobacter* spp?

28. Whatever the pros and cons of the above, it would not be unreasonable to postulate that birds remaining after thinning might be more susceptible to infection as a result of a combination of disturbance and feed withdrawal.

The environment as a source of flock colonisation

29. Although flock colonisation is possible by any of the routes identified above, there is a general agreement in the international scientific community that the environment around the broiler house is the most important source of flock colonisation. *Campylobacter* spp. can be isolated with regularity from the farm and the natural environment. It has been shown that *Campylobacter* spp. from the external environment can match those in broiler chickens. The bacteria are present in the environment as a

consequence of faecal contamination from wild and domestic animals. A recent study in Denmark has cast some doubt, however, on the role of wild animals as sources of *Campylobacter* spp. for broiler chickens, but did confirm the importance of the contaminated environment. The use of manures as fertilisers also constitutes an infection risk. Investigations with one UK poultry producer, whose system is typical of UK production, demonstrated that farmers with poor farm hygiene practices were more likely to produce *Campylobacter*-positive flocks than those whose hygiene was good. The inference to be drawn from this work is that “dirty” farms are likely to have a higher loading of *Campylobacter* in the environment, and that “dirty” farmers may be more likely to carry the bacteria into the broiler house.

30. A number of different *Campylobacter* sub-types can be isolated from a broiler flock, and even from the same bird. In general, however, one or two sub-types will dominate the bacterial population. There is some dispute over whether the different subtypes indicate the entry of two different bacteria, or whether the genomic instability of *Campylobacter* leads to changes in the original strain, which produce an identifiably different bacterium. The principal event in the colonisation of a broiler flock is the establishment of the bacterium in the first bird(s). Passage through a chicken has been shown to greatly increase the ability of *Campylobacter* to colonise subsequent birds. Spread can be very rapid in a newly colonised flock, and almost all birds will be *Campylobacter*-positive within a few days of the initial colonisation event. A major component of any control strategy must therefore be to prevent *Campylobacter* from the environment entering the broiler house.

31. The most important anti-*Campylobacter* control measures, falling within the term “biosecurity”, help ensure that the bacterium is kept out of the broiler house. It is important to note that *Campylobacter* is more difficult to exclude from chickens than *Salmonella* spp. Thus, measures which exclude *Salmonella*, may not be successful with *Campylobacter*. With this bacterium, the margins for error are much smaller, and much more attention to detail may be required in order to achieve robust security. Good farming practice and high levels of stockmanship are seen as an essential basis for the successful and continuing avoidance of *Campylobacter* entry and spread.

32. The average broiler flock experiences many visits by different people during the growing cycle. Each one carries with it the risk of allowing *Campylobacter* into the flock. Visits should be limited to essential personnel, with each visit fully justified and recorded. There will still be at least daily visits to the flock by farm staff, and it is vital that these are undertaken as hygienically as possible. One study in SW England found that, when farm staff dipped their footwear in strong phenolic disinfectant, it was possible to either prevent or delay flock colonisation in three flocks. This method may be

difficult to sustain for long periods, as the disinfectant baths may not be changed with sufficient regularity and can become contaminated with soil and other organic matter. A much better approach is to supplement the foot dips by constructing a hygiene barrier at the entrance to the anteroom which adjoins the area housing the birds. Wider, more easily cleaned concreted areas separating the entrance to the houses from the farm environment would also increase the buffer zone. Sets of dedicated outer clothing and footwear should be held on the inside of the hygiene barrier. All people who enter the broiler house should remove their own footwear and put on the protective clothing and shoes/boots. Footwear should also be dipped in disinfectant baths before entry into the flock.

33. The above approach has been shown to be effective in trials in the UK and over a sustained period in the Netherlands and Scandinavia, and we see no reason why this type of *Campylobacter* control requirements cannot be incorporated into farm assurance schemes in the UK. Moreover, these measures have the advantage of being relatively inexpensive. All companies should have standard operating procedures for biosecurity and related matters. There should be a forward looking veterinary health plan which includes appropriate training of all farm staff on how to prevent the introduction of infection into flocks. Farmers also need to be convinced that no emergency, flood and fire apart, is so urgent that the broiler flocks can be entered without outer clothing and footwear being changed. Precautions must encompass all visits to the site, both human and vehicular. A single visit can result in flock colonisation by *Campylobacter* spp.

34. We are confident that properly applied biosecurity will significantly reduce the incidence of *Campylobacter* colonisation in housed chickens.

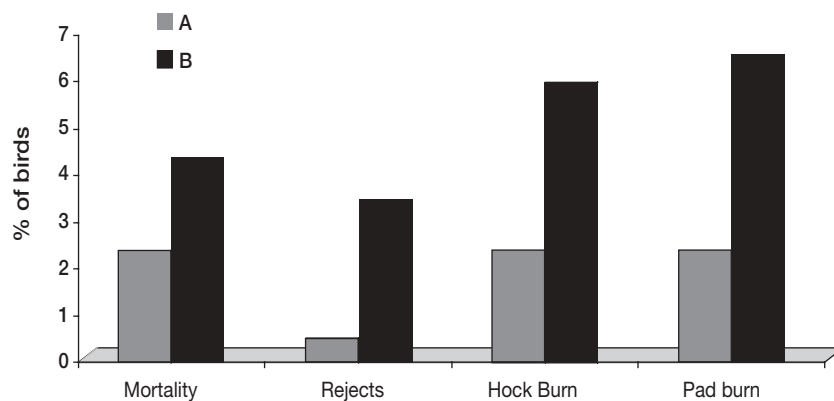
Broiler flock health and *Campylobacter* colonisation

35. It is perhaps natural, given its commonality in poultry, to regard *Campylobacter* as normal gut flora in chickens. Given that it is now possible for many producers in the UK, and elsewhere in Europe, to regularly produce *Campylobacter*-negative chickens, this definition may need to be reviewed. *Campylobacter* in housed chickens does not seem to behave like either, eg., *Escherichia coli* or faecal streptococci which will be found in all chickens, irrespective of their *Campylobacter* status. A more accurate description for *Campylobacter* in housed flocks would perhaps be "frequent coloniser". There have been many studies on risk factors for broiler flock colonisation with *Campylobacter*. One currently in progress in the UK includes an examination of the relationship between flock health and performance, and the presence of *Campylobacter*. An examination of data from poultry companies shows that farmers differ markedly in their ability to produce chickens which, at slaughter age, are *Campylobacter*-free. Some farmers can rear negative flocks with high frequency, whilst, with others, almost all

birds will be *Campylobacter*-positive. These observations give reasons for confidence that practical measures are available for reducing *Campylobacter* on a commercial basis.

36. Data presented in Figure 1 compare two farmers. One (A) had only 1.4% *Campylobacter*-positive chickens over six flock cycles. In contrast, 97% of birds from the other farm (B) were colonised over the same period. The feed was identical and both farms received the same type of birds, albeit possibly from different broiler-breeder flocks and from breeders of different ages. This latter point may be of importance, as industry data suggest that chicks from breeder flocks that are either entering or leaving the period of lay will be of potentially poorer quality than when breeders are in the peak period of productivity. The comparison below shows that there are marked differences between the two flocks in terms of flock mortality, the level of rejects at slaughter, and in two measures of the nature of the material upon which the birds sit, namely hock and pad burn. In each case, the birds from the farm which almost always produces *Campylobacter*-negative birds, had better production scores. One interpretation of these data is that birds in which health, performance or welfare are poor are compromised in their ability to withstand challenge from *Campylobacter*.

Figure 1: A comparison of low and high *Campylobacter* farms in relation to certain health/quality indicators



Farm A has consistently fewer *Campylobacter*-positive chickens.
 Farm B has consistently greater numbers of *Campylobacter*.
 NB: The vertical axis uses an arbitrary scale to compare birds from the two farms. In essence, the data on mortality and rejects at the processing plant are recorded figures whereas those for hock and pad burn are the recorded figures divided by 10. This was done to allow an easier comparison between farms.
Source: Unpublished data from the University of Bristol.

37. One factor that might differ between the two farms is dryness of the litter, and this is known to be an important factor in the epidemiology of *Salmonella* infection. Data from Sweden suggest that *Campylobacter* spp. in dry litter may be less infectious than bacteria in wet litter. This was addressed in a recent study in Sweden, which saw a reduction in flock infection with *Campylobacter* spp. following the introduction of nipple drinkers, which led to an increase in litter dryness. Further improvements were seen when Swedish farmers started to use scoring of foot pads as a parameter for adjusting the density of birds in a shed.

38. The aetiology of hock and pad burn is not yet fully understood but essentially they are manifestations of physical damage to the birds' feet and legs as a consequence of contact with litter of poor quality. The cause of these lesions is multi-factorial, and industry sources suggest that they come about as a combination of poor diet, poor ventilation and over-supply of drinking water leading to wet litter. Evidence currently available indicates that there is little relationship between the incidences of the two lesions. These problems are not confined to housed birds and are seen with free-range birds also.

39. There are welfare and public health needs to identify the key differences between "good" and "bad" farmers with respect to *Campylobacter* status. If it is true that healthier chickens are better able to resist *Campylobacter*, then there are two potential benefits for the poultry industry. Productivity and profitability will be improved, and contamination levels with *Campylobacter* will be reduced.

Vaccinations and other treatments as anti-*Campylobacter* measures

40. Surveillance of *Campylobacter* isolates from human cases and chickens has shown that strains present in the latter are not always found in the former. This raises the intriguing prospect that some chicken-associated *Campylobacter* strains are non-pathogenic for humans. Given that the poultry gut flora usually contain a dominant *Campylobacter* type, the non-pathogenic strains may have a role as agents to exclude potential human pathogens. Recently published work has shown that, under laboratory conditions, birds colonised with one *Campylobacter* isolate were able to resist challenge with another. Caution may be needed with this approach. The genome of *C. jejuni* contains many repeat sequences and these allow a high degree of genetic adaptability. Given that passage through the chicken gut increases the ability of *C. jejuni* to colonise other chickens, it must be established beyond all reasonable doubt that the strains used as exclusion agents do not change to become human pathogens.

41. The use of mixed bacterial cultures as an anti-*Salmonella* measure in broiler production is well established in the international poultry industry, and this approach is usually referred to as 'competitive exclusion'. Some work has been undertaken to try to develop preparations with efficacy against *Campylobacter* spp. Results have been mixed so far. Another approach may be possible. Young, *Campylobacter*-negative, broiler chickens have been shown to have a gut flora which is naturally antagonistic to *C. jejuni*. Experimental data indicate that these gut bacteria, under laboratory conditions, are able to protect against challenge with broth cultures of *C. jejuni*. This may provide an explanation for why chickens do not usually become *Campylobacter*-positive until the third week of life. More work is needed on this approach, but it has the advantage of being a 'natural' phenomenon.

42. In common with all other bacteria, *Campylobacter* spp. can be attacked by viruses which are known as phages. These viruses generally have a limited host range, a fact which allows them to be used as typing agents for both *Campylobacter* and *Salmonella* spp. Phages are found naturally in the chicken gut and offer another potential control measure. Research on this approach continues but it may one day be possible to treat a *Campylobacter*-positive flock a few days before slaughter to either reduce or eliminate carriage of the bacteria. A possible danger with this approach is that it might lead to an increase in the prevalence of phage-resistant *Campylobacter* strains.

43. The genome of a strain of *C. jejuni* has been sequenced, which has made it possible to better understand the behaviour of this bacterium. Work is in progress to establish a library of *Campylobacter* strains with mutations in different single genes. By using these bacteria in chicken colonisation studies, it should be possible to identify the genes which enable *Campylobacter* to establish in the chicken intestine. A medium to long term aim of this work is that, by better understanding the genetics of gut colonisation, it may be possible to produce component vaccines against particular cell targets.

44. Another long-term anti-*Campylobacter* measure is to develop breeds of chickens which cannot be colonised with these bacteria. It has already been established that genetic lines of chickens differ in susceptibility to *Salmonella* spp., and work is in progress to examine whether similar differences will be seen with *Campylobacter* spp.

Conclusions

45. It is becoming clear that control of *Campylobacter* on-farm is now a practical proposition, at least with birds that are housed. The first commitment must be to rigorous biosecurity, combined with high standards of stockmanship and attention to good flock health and stress control. This will involve such measures as restricting farm visits to essential personnel; ensuring visits are undertaken as hygienically as possible; and appropriate staff training on flock infection. The control of *Campylobacter* on-farm presents a greater challenge than that associated with the control of *Salmonella*.

46. In addition, it is clear that a well-run broiler farm can reduce the incidence of *Campylobacter* through adherence to a number of key principles. It should:

- be species mono-specific (i.e. farm only chickens);
- supply the birds with water of potable quality;
- properly clean and disinfect houses after flock removal, which should include disinfection of the water supply system;
- protect the house from entry by wild birds and rodents;
- supply feed which has received treatment sufficient to have eradicated *Salmonella* (and, hence, *Campylobacter*), and protect it from re-contamination;
- only carry out thinning if done in association with proper crate washing (so that crates are not contaminated with *Campylobacter* spp. or other pathogenic microorganisms) and proper biosecurity measures covering eg., clothing and footwear;
- ensure that transport crates and vehicles are cleaned and disinfected properly on every occasion; and
- maintain general biosecurity and hygiene barriers at a high level, to prevent infection from the farm environment.

47. In our view, the reduction of *Campylobacter* would be greatly assisted if the practice of thinning were to be discontinued. However, as we have noted, there are important economic reasons why the industry wishes to persist with this practice.

48. In risk assessment terms, a lower incidence of *Campylobacter* in broiler flocks is also likely to be reflected in lower numbers of organism in individual birds in the flock, and on finished carcasses. An important factor in consumer exposure to *Campylobacter* is the frequency and level of contamination of the chicken brought into the home or into catering kitchens.

49. We accept the advice we have received from various parts of the poultry industry that broiler chicken production is extremely price competitive and that the UK industry is faced with continuing threats of import penetration.

50. We do recognise that many of the measures for controlling *Campylobacter* in chicken imply additional production costs. However, there is increasing evidence that there are direct links between the general health status of birds and their susceptibility to *Campylobacter* infection. In addition, the maintenance of good flock health conveys economic benefits. Measures put in place for the control of *Campylobacter* might also help reduce the risk of introducing other infections into the flock.

51. We assume that the Food Standards Agency will continue to use routine surveillance of retail chicken for *Campylobacter* to assess the effectiveness of *Campylobacter* reduction programmes. The potential value of industry data as an output measure should not be overlooked even if, for reasons of commercial sensitivity, such information cannot be made publicly-available outside the FSA.

Recommendations

52. We recommend that the Food Standards Agency utilises the conclusions we have drawn to intensify its work with the poultry industry and other stakeholders to achieve wider acceptance that *Campylobacter* control of housed birds is now possible. A primary aim should be to develop an industry-wide programme to spread the “good farming” practices and biosecurity measures which lie at the heart of the matter.

53. In an ideal world, the practice of thinning would be discontinued. However, we recognise that the economic pressures on the industry make this impossible at the present time. We therefore recommend that the Food Standards Agency, in collaboration with the Department for Environment, Food and Rural Affairs, as appropriate, should explore with the industry the conditions which might allow the ending of the practice of thinning in the longer-term. Alternatively, the possibility should be examined of modifying thinning procedures so as to reduce the threat to the biosecurity of broiler houses.

54. Given that thinning will continue, then the hygiene conditions involved, such as crate washing and other biosecurity measures (including clothing and footwear), would need urgent improvement. Again, this is a matter to be taken up with stakeholders.

55. We recommend that the Food Standards Agency acts to achieve a high degree of cohesion between the various research groups involved with *Campylobacter*, so that effort is not duplicated, and to ensure that research is focussed on the most appropriate aspects of the problem.

56. Indications of some of the more important research topics are shown in Annex C.

Annex A

ACMSF *CAMPYLOBACTER* WORKING GROUP

Terms of reference and membership

Annex B

ACMSF involvement with *Campylobacter*

- **Interim report in 1993 by ACMSF identifies poultry as an important cause of human campylobacteriosis, makes various research recommendations, and also advises the food industry on necessary hygiene measures and HACCP.**
- In 2000 the Committee decides to revisit the problem, and to establish a Working Group specifically to do this, reflecting the fact that *Campylobacter* has become far and away the biggest cause of foodborne bacterial infectious intestinal disease in the UK.
- Primary aim is to develop advice which will assist FSA in evolving its strategy for reducing the incidence of foodborne *Campylobacter* infection in humans.
- Working Group set up with members drawn from veterinary, epidemiological, public health, and microbiological sciences, and also with two lay members and industry technologists (including one from Sweden).
- With FSA support, ACMSF holds workshop in February 2002 of invited outside specialists and industry experts.
- Working Group concentrates early attention on the role of poultry, and receives input from a variety of sources, and prepares early advice for FSA.
- A second focus concerns disputes about preferred laboratory methodology, which emerged strongly at the workshop mentioned above.
- Plans for the near future include sending some of the Working Group to visit Norway and Denmark, where progress is reported in reducing *Campylobacter* in poultry. Information from this visit will supplement input from the Swedish member of the Working Group.

Annex C

POSSIBLE RESEARCH AREAS (see paragraph 56)

We would support research funding in the following areas:

- a detailed examination of the relationship between broiler flock health and husbandry, and *Campylobacter* colonisation. This should include an examination of litter quality and feed composition;
- an examination to determine whether vaccines received by broiler chickens in the second and third weeks of life compromise the ability of the chickens to exclude *Campylobacter* spp;
- the impact of feed withdrawal on *Campylobacter* levels in chicken intestines and on carcasses;
- the impact of thinning, using crates with or without *Campylobacter* spp. as contaminants, on flock colonisation levels;
- the effect of thinning on stress levels in the birds remaining in the poultry house, and their subsequent behaviour and susceptibility to infection with *Campylobacter* spp;
- the use of naturally-occurring and introduced competitive bacteria as agents to prevent flock infection with *Campylobacter* spp;
- the use of phage, to prevent flock infection or to remove a pre-existing infection before slaughter;
- determination of which aspects of enhanced biosecurity (and these include hygiene barriers, water treatment and visitor reduction) are the most important in preventing flock infection with *Campylobacter* spp.

(cm 7049)

Annex VI

Advisory Committee on the Microbiological Safety of Food

Administrative Secretary, Room 813C, Aviation House
125 Kingsway, London WC2B 6NH
Telephone : 0207-276-8951 Fax : 0207-276-8907
E. mail : colin.mylchreest@foodstandards.gsi.gov.uk

Sir John Krebs FRS
Chairman
Food Standards Agency
Aviation House
125 Kingsway
London
WC2B 6NH

26 September 2002

ACMSF CAMPYLOBACTER WORKING GROUP

1. I thought I should write formally to you, in your capacity as Chairman of the Food Standards Agency, the Government Department to which the ACMSF reports, to let you know that we are currently submitting advice to the Agency, via Jon Bell in the first instance, on reducing the burden of human infectious intestinal disease associated with *Campylobacter*. I am currently chairing an in-depth Working Group review of *Campylobacter*, and we believe that this early advice from the Group is appropriate, rather than waiting for our full report which may take a year or so to complete. The background to our interest in *Campylobacter* is summarised in the Annex to this letter.

2. **The subject of our first tranche of advice to the FSA is on-farm control measures against *Campylobacter* spp. in broiler chickens.** We are not 100% certain of the extent of the association of poultry with human illness. **The ACMSF is nevertheless satisfied that poultry plays a significant role in the causal chain of events leading to human foodborne illness.** Something said by one of those who recently gave oral evidence to the ACMSF Working Group struck a particular chord with me. He said that a single live chicken could potentially carry millions of human infectious doses of *Campylobacter* (the human infectious dose is thought to be quite low). Of course, much of this will be removed during slaughter and

gutting, but the figure does illustrate the heavy challenge posed to hygienic measures along the supply chain, right into kitchens both in the home and in catering establishments. Given the organism's prevalence in poultry, and knowing how easily pathogens can persist and spread in the domestic and catering environment, we believe that reducing the level of *Campylobacter* in retail poultry is likely to make a significant contribution to the battle against human foodborne illness. Any reduction in the number of *Campylobacter* cells reaching the kitchen would enhance the effectiveness of normal hygiene measures.

3. We do recognise that there are other routes of infection, and that both food and non-food exposure pathways are important. There is also the association between travel and human *campylobacteriosis* in the UK. We believe however that this should not distract from the need to reduce levels of carriage in a popular food item such as broiler chickens.

4. We are also giving poultry early attention because it appears that reducing *Campylobacter* carriage by broilers is now a practical proposition, where previously many thought it impossible. We do not minimise the difficulties involved, nor the serious pressures in this competitive and price-sensitive industry where increased import penetration is a continuing threat; but the evidence we have taken suggests that, on some farms, the problem is already being successfully addressed. I should also stress that this success has not been dependent on great scientific innovation but has come about by rigorous attention to detail, particularly in relation to robust biosecurity, and through high standards of stockmanship. Moreover, we believe that these measures not only produce benefits in relation to *Campylobacter*, but are also reflected in overall improvements in poultry health. As such, they could be self rewarding.

5. Despite evidence that practical measures are available for tackling *Campylobacter* on-farm, I still detect the attitude that action at primary production is all too difficult, and that the problem is more appropriately addressed further along the supply chain, perhaps even by consumers. We strongly believe, for the reasons given above, that it is not reasonable to expect consumers to protect themselves fully against foodborne *Campylobacter*. The FSA may wish to use our provisional advice to intensify its work with stakeholders. We believe that action is becoming possible now, and that it is not advisable to depend on the outcome of further research, which might take years to yield useful results.

6. I realize that the primary role of our Committee is to provide risk assessment, but in a complex chain such as poultry production, we believe that commenting on possible risk management options is appropriate.

7. To return to my original theme, there is still a degree of scientific uncertainty about the origins of *Campylobacter* infection and the routes of transmission. However, the ACMSF believes that there is sufficient evidence of an important association between poultry and some human foodborne campylobacteriosis. Given the FSA's foodborne disease and poultry strategies and targets, we have therefore concluded that we should offer early advice to the Agency based on the progress the Working Group has made to date. Our advice will be refined and supplemented, as necessary, as the Group's work progresses.

8. There are other issues which we shall be examining with a view to submitting early advice to the Agency. One of these is laboratory detection and typing methods, where the absence of a common approach across human, animal and food isolates is hindering epidemiological investigation. We hope to submit advice in this area in the not too distant future.

PROFESSOR DOUGLAS L GEORGALA

Chairman

Advisory Committee on the Microbiological Safety of Food

Annex

ACMSF involvement with *Campylobacter*

- **Interim report in 1993 by ACMSF identifies poultry as an important cause of human campylobacteriosis, makes various research recommendations, and also advises the food industry on necessary hygiene measures and HACCP.**
- In 2000 the Committee decides to revisit the problem, and to establish a Working Group specifically to do this, reflecting the fact that *Campylobacter* has become far and away the biggest cause of foodborne bacterial infectious intestinal disease in the UK.
- Primary aim is to develop advice which will assist FSA in evolving its strategy for reducing the incidence of foodborne *Campylobacter* infection in humans.
- Working Group set up with members drawn from veterinary, epidemiological, public health, and microbiological sciences, and also with two lay members and industry technologists (including one from Sweden).
- With FSA support, ACMSF holds workshop in February 2002 of invited outside specialists and industry experts.
- Working Group concentrates early attention on the role of poultry, and receives input from a variety of sources, and prepares early advice for FSA.
- A second focus concerns disputes about preferred laboratory methodology, which emerged strongly at the workshop mentioned above.
- Plans for the near future include sending some of the Working Group to visit Norway and Denmark, where progress is reported in reducing *Campylobacter* in poultry. Information from this visit will supplement input from the Swedish member of the Working Group.

(cm 6994)

Annex VII

Advisory Committee on the Microbiological Safety of Food

**Administrative Secretary, Room 813C, Aviation House
125 Kingsway, London WC2B 6NH
Telephone : 0207-276-8951 Fax : 0207-276-8907
E. mail : colin.mylchreest@foodstandards.gsi.gov.uk**

Dr Roger Skinner
Head of Microbiological Safety Division
Food Standards Agency
125 Kingsway
London
WC2B 6NH

2 May 2002

CHIEF MEDICAL OFFICER'S STRATEGY : GETTING AHEAD OF THE CURVE

1. At the ACMSF's meeting on 21 March, Members expressed concern about how the Public Health Laboratory Service (PHLS)'s microbiological food safety functions will be accommodated within the structure of the new Health Protection Agency (HPA). I thought I should draw these concerns to your attention so that they can be reflected, as appropriate, in whatever representations the Food Standards Agency (FSA) is making to the Department of Health (DH) about the CMO's strategy.

2. As you know, the PHLS plays a vitally important role in monitoring foodborne disease and in carrying out epidemiological investigation of the origins and spread of such disease. This becomes more and more important with wider sourcing of foods, changes in eating habits, and developments in food preparation methods. The evidential and trend data generated by the PHLS often form an essential component of the risk assessments which the ACMSF carries out. If these monitoring and epidemiological functions are not to be transferred to the HPA, or if they are transferred but there is a significant diminution in the level of activity, this could have a very serious impact on the ability to tackle foodborne gastrointestinal illness effectively.

3. There is also the contribution made by reference laboratories to combating foodborne disease. As you know, the ACMSF has consistently supported the establishment and maintenance of reference laboratory facilities. The investigation of foodborne illness would be greatly enhanced if detection and typing methods were available across clinical, veterinary and food isolates. The PHLS has been a leading player in the search for common methodologies and this capability must be transferred to the HPA.

4. ACMSF members were also concerned about the potential loss of the services provided by PHLS laboratories in respect of sample testing in support of local authority food surveillance programmes. The laboratories are also an integral part of the food law enforcement process and in helping handle the central and local response to food hazards. We cannot afford for these functions to disappear with the setting up of the HPA.

5. It is the full integration of PHLS microbiological and epidemiological functions into a cohesive whole which offers a unique service to the FSA and DH. This clearly needs to be enshrined in any new arrangements. Anything you can do to register our concerns with DH and help ensure that these vital services are transferred to the HPA will be greatly appreciated.

Professor Douglas L Georgala
Chairman
Advisory Committee on the Microbiological Safety of Food
(cm 6847)

Annex VIII

References

1. Advisory Committee on the Microbiological Safety of Food (1993). Report of Progress 1990-92. HMSO, London. ISBN 0-11-321664-5.
2. Advisory Committee on the Microbiological Safety of Food (1994). Annual Report 1993. HMSO, London. ISBN 0-11-321816-8.
3. Advisory Committee on the Microbiological Safety of Food (1995). Annual Report 1994. HMSO, London. ISBN 0-11-321921-0.
4. Advisory Committee on the Microbiological Safety of Food. Annual Report 1995. Department of Health, Wetherby. ISBN 1 85839 5763.
5. Advisory Committee on the Microbiological Safety of Food (1997). Annual Report 1996. Department of Health. ISBN 85839 7243.
6. Advisory Committee on the Microbiological Safety of Food (1998). Annual Report 1997. Department of Health.
7. Advisory Committee on the Microbiological Safety of Food (1999). Annual Report 1998. Department of Health.
8. Advisory Committee on the Microbiological Safety of Food (2000). Annual Report 1999. Department of Health.
9. Advisory Committee on the Microbiological Safety of Food (2001). Annual Report 2000. Food Standards Agency. FSA/0012/0401.
10. Advisory Committee on the Microbiological Safety of Food (2002). Annual Report 2001. Food Standards Agency. FSA/0577/0502.
11. Advisory Committee on the Microbiological Safety of Food (1992). Report on Vacuum Packaging and Associated Processes. HMSO, London. ISBN 0-11-321558-4.
12. Advisory Committee on the Microbiological Safety of Food (1993). Report on *Salmonella* in Eggs. HMSO, London. ISBN 0-11-321568-1.

13. Advisory Committee on the Microbiological Safety of Food (1993). Interim Report on *Campylobacter*. HMSO, London. ISBN 0-11-321662-9.
14. Advisory Committee on the Microbiological Safety of Food (1995). Report on Verocytotoxin-Producing *Escherichia coli*. HMSO, London. ISBN 0-11-321909-1.
15. Advisory Committee on the Microbiological Safety of Food (1996). Report on Poultry Meat. HMSO, London. ISBN 0-11-321969-5.
16. Advisory Committee on the Microbiological Safety of Food (1998). Report on Foodborne Viral Infections. The Stationery Office, London. ISBN 0-11-322254-8.
17. Advisory Committee on the Microbiological Safety of Food (1999). Report on Microbial Antibiotic Resistance in Relation to Food Safety. The Stationery Office, London. ISBN 0-11-322283-1.
18. Advisory Committee on the Microbiological Safety of Food (1999). Report on Microbial Antibiotic Resistance in Relation to Food Safety. Synopsis. The Stationery Office, London. ISBN 0-11-322295-5.
19. Advisory Committee on the Microbiological Safety of Food (2001). Second Report on *Salmonella* in Eggs. The Stationery Office, London. ISBN 0-11-322466-4.
20. Advisory Committee on the Microbiological Safety of Food (2001). Report on *Mycobacterium bovis*. A review of the possible health risks to consumers of meat from cattle with evidence of *Mycobacterium bovis* infection. Food Standards Agency; January 2002. FSA/0400/2002.
21. British Retail Consortium. Water UK. The Safe Sludge Matrix. ADAS 2001.
22. Food Standards Agency (2002). Report on the Review of Scientific Committees. FSA/0567/0402.
23. Committee on Standards in Public Life (Nolan : First Report). May 1995.
24. The Commissioner for Public Appointments. Office of the Commissioner for Public Appointments. Code of Practice for Ministerial Appointments to Public Bodies. July 2001.

25. WRc plc. Review of the scientific evidence relating to the controls on the agricultural use of sewage sludge. Part 1 – the evidence underlying the 1989 Department of the Environment Code of Practice for Agricultural Use of Sewage Sludge and the Sludge (Use in Agriculture) Regulations. Final report to the Department of the Environment, Transport and the Regions, Department of Health, Ministry of Agriculture, Fisheries and Food and UK Water Industry Research Ltd. DETR 4415/3. June 1998.
26. WRc plc. Review of the scientific evidence relating to the controls on the agricultural use of sewage sludge. Part 2 – evidence since 1989 relevant to controls on the agricultural use of sewage sludge. Final report to the Department of the Environment, Transport and the Regions, Department of Health, Ministry of Agriculture, Fisheries and Food and UK Water Industry Research Ltd. DETR 4455/4. June 1998.
27. The Sludge (Use in Agriculture) Regulations 1989. SI 1989 No. 1263.
28. Department of Trade and Industry (2000). Review of risk procedures used by the Government's advisory committees dealing with food safety. Report of the Group led by Sir Robert May, Chief Scientific Adviser. July 2000. DTI, UK.
29. Little C L, Gillespie I A, Mitchell R T. Microbiological examination of ready-to-eat burgers sampled anonymously at the point of sale in the United Kingdom. *Comm Dis Pub Health*, 2001; **4(4)** : 293-299.
30. Food Standards Agency. Research Programme Annual Report 2001. FSA/0490/1201.
31. Food Standards Agency press release 2002/0190 of 28 February 2002. Independent experts to guide Food Standards Agency's £30.8m research programme.
32. Adak G K, Long S M, O'Brien S J. Trends in indigenous foodborne disease and deaths, England and Wales : 1992 to 2000. *Gut* 2002; **51**: 832-841.
33. Grant I R, Hitchings E I, McCartney A, Ferguson F, Rowe M T. Effect of commercial-scale high temperature short-time pasteurization on the viability of *Mycobacterium paratuberculosis* in naturally infected cows' milk. *App Environ Microbiol* 2002; **68(2)** : 602-607.
34. Veterinary Medicines Directorate (2002). Sales of antimicrobial products used as veterinary medicines, growth promoters and coccidiostats in the UK in 2000.

35. Department for Environment, Food and Rural Affairs. Developing a draft strategy for surveillance of antimicrobial resistance in animals. Action plan for England and Wales.
36. Food Standards Agency (2002). Science and Innovation Strategy. FSA/0492/0102.
37. European Commission (2002). Risk profile on the microbiological contamination of fruits and vegetables eaten raw. Report of the Scientific Committee on Food.
38. Department of Health (2002). Health effects of climate change in the UK.

(cmar 0224-0234)

