



Food Chemical Surveillance
Annual Report
1999

Ministry of Agriculture, Fisheries and Food

CONTENTS

	Paras.	Page
Glossary of abbreviations and units	-	ii
Introduction	1-3	1
Information and Survey Results	4-14	1
The Programme	15-18	5
Setting Priorities in Food Surveillance	19-23	7
Publishing Survey Results	24-28	9
Progress Reports for 1999	-	12
Chemical Contaminants in Food	29-80	12
Chemical Migration from Materials and Articles in Contact with Food	81-85	31
Dietary Surveys	86-94	33
Food Additives	95-99	36
Food Authenticity	100-112	38
Nutrients in Food	113-120	42
Pesticide Residues in Food	121-144	45
Radionuclides in Food	145-158	52
Veterinary Residues in Animal Products	159-172	60
References	-	64
Appendices		
Appendix I Surveillance Work Programmes		70
Appendix II List of Food Surveillance Information Sheets		85

GLOSSARY OF ABBREVIATIONS AND UNITS

Abbreviations used in this report:

acid-HVP	Acid hydrolysed vegetable protein
ACP	Advisory Committee on Pesticides
ADI	Acceptable daily intake
AEA	Atomic Energy Authority
AGVR	Advisory Group on Veterinary Residues
ARfD	Acute reference dose
ARSVR	Annual Report on Surveillance for Veterinary Residues
AQA	Analytical quality assurance
BADGE	Bisphenol A diglycidyl ether
BFDE	Bisphenol F diglycidyl ether
BVA	British Veterinary Association
CAC	Codex Alimentarius Commission
CCPR	Codex Committee on Pesticide Residues
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
COMA	Committee on the Medical Aspects of Food and Nutrition Policy
COT	Committee on the Toxicity of Chemicals in Food, Consumer Products and the Environment
CSL	Central Science Laboratory
DANI	Department of Agriculture, Northern Ireland
DDT	The sum of <i>p,p</i> -DDT and <i>o,p</i> -DDT, the pesticide as applied, and the metabolites, <i>p,p</i> -DDE and <i>p,p</i> -TDE
DH	Department of Health
EC	European Commission
EU	European Union
ESBO	Epoxidised soya bean oil
FAC	Food Advisory Committee
FAO	Food and Agriculture Organisation
FARM	Food and Agriculture Monitoring Programme
FSA	Food Standards Agency
FRS	Fisheries Research Services

GAP	Good agricultural practice
GB	Great Britain: England, Scotland, Wales
GIS	Geographical information system
HPLC	High performance liquid chromatography
JECFA	Joint FAO/WHO Expert Committee on Food Additives and Contaminants
JFSSG	Joint Food Safety and Standards Group
JMPR	Joint Meeting of FAO and WHO Expert Groups on Pesticide Residues
LGC	Laboratory of the Government Chemist
LOQ	Limit of quantification
MAFF	Ministry of Agriculture, Fisheries and Food
MAVIS	Medicines Act Veterinary Information Service
MBT	Mercaptobenzothiazole
3-MCPD	3-monochloropropane-1,2-diol
MRC	Medical Research Council
MRL	Maximum residue level/limit
NDNS	National Diet and Nutrition Survey
NFU	National Farmers' Union
NOAH	National Office of Animal Health Limited
NRPB	National Radiological Protection Board
OBT	Organically bound tritium
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PCR	Polymerase chain reaction
PL	Permitted limit
PMTDI	Provisional maximum tolerable daily intake
PSD	Pesticides Safety Directorate
PTEs	Potentially toxic elements
R&D	Research and development
RIFE	Radioactivity in Food and the Environment
RL	Reporting limit
SCF	Scientific Committee for Food

SEPA	Scottish Environmental Protection Agency
SCOOP	Scientific co-operation
SGAM	Steering Group on Analytical Methods
SVS	State Veterinary Service
TDI	Tolerable daily intake
TDS	Total diet study
TEF	Toxic equivalency factor
TEQ	Toxic equivalent
TRAMP	Terrestrial Radioactivity Monitoring Programme
TSO	Trading Standards Officer
UHT	Ultra-high temperature
UK	United Kingdom: Great Britain & Northern Ireland
UKASTA	United Kingdom Agricultural Supply Trade Association
VMD	Veterinary Medicines Directorate
WHO	World Health Organisation
WHO-TEQ	World Health Organisation toxic equivalent
WPCC	Working Party on Chemical Contaminants in Food
WPDS	Working Party on Dietary Surveys
WPNF	Working Party on Nutrients in Food
WPPR	Working Party on Pesticide Residues

Summary of units used in this report

km	Kilometre
kg	Kilogram – one thousand grams
g	Gram
mg	Milligram - one thousandth of a gram
µg	Microgram - one thousandth of a milligram
mg/kg	Milligrams per kilogram
µg/kg	Micrograms per kilogram
mg/l	Milligrams per litre
µg/l	Micrograms per litre
µg/day	Micrograms per day
µSv	Microsievert - 1 millionth of a sievert

mSv	Millisievert -1 thousandth of a sievert
ng TEQ/kg	Nanograms of toxic equivalent per kilogram
pg WHO-TEQ/kg bodyweight/day	Picrograms of WHO toxic equivalent per kilogram of bodyweight per day
ng/kg b.w./day	Nanograms per kilogram of bodyweight per day

INTRODUCTION

1. To protect the consumer, each year the Ministry of Agriculture, Fisheries and Food (MAFF) carries out more than 190,000 food chemical analyses of almost 50,000 food samples, costing more than £10 million. This report describes the broad span of the work and guides readers to further sources of information on specific areas of the programme.

2. Each year since 1993, MAFF has published an annual report of its food chemical surveillance programme. The present series has come to an end with the publication of this the 1999 report. During 2000, the responsibility for a major part of the food chemical surveillance programme will transfer to the new Food Standards Agency (FSA). Food chemical surveillance will provide an important component of the FSA's work to improve the safety, authenticity and nutritional quality of food available to the UK consumer. The FSA is likely to continue to publish regular summaries of its food chemical surveillance programme, but the format will change to reflect new aims and policies.

3. This report describes the surveys completed in 1999, some of the uses of the survey results from the year and the issues which have been raised. The report includes a short progress update for each area of the programme and is set in context with the following background information:

- the long-term aims addressed by the surveillance;
- the plans for future work;
- the 1999 programme of work (Appendix I).

Information and survey results

4. The Government is committed to a policy of openness and transparency when reporting results of food chemical surveys. When announcing the changes to reporting procedures in July 1997, the Minister of State said 'We are committed to giving consumers the best deal. It is only right that we announce the brand names of foods that have been tested

and show the results on a product by product basis. Of course, we will make every effort to ensure our tests are scrupulously fair and do not favour one manufacturer over another'. Similar arrangements have since been announced for surveys for pesticide residues and veterinary medicines residues. During 1999, pesticides surveys have been reported with brand name information where this has been relevant.

5. Following the Minister of State's announcement, procedures for reporting surveys already in progress were drawn up and published in the MAFF/Department of Health (DH) Food Safety Information Bulletin in September 1997. At that time, a commitment was made to carry out a review in 1998 to assess the procedures which are in place to implement the government's policy of openness in relation to survey results. The policy itself was not under review. A public consultation was held during March-May 1998 and the comments received were considered by the Food Advisory Committee (FAC) and made publicly available.

The reporting arrangements

6. The procedures published in September 1997 aimed to ensure a consistent approach to publishing results from surveys which had started before the change in policy and information from these surveys would be released to the maximum extent possible. Surveys in progress would be considered on a case by case basis on completion according to the procedures. It was further stated that results of surveys starting after September 1997 would routinely include brand name information, except for survey types specifically excluded from this requirement.¹ The procedures required some amendment for new surveys and resulted in a detailed set of guidelines being produced to help officials adopt a consistent approach to the implementation of the new policy

7. Since the procedures were introduced in July 1997, 75 surveys have been reported (to December 1999). Brand names were released for fifty two percent of these. Many of the surveys were in progress in July 1997 but brand names were released, apart from those specifically excluded,¹ even though they had not been planned with the new policy in mind. In the present year (1999-2000), 89 surveys are underway or have been completed. It is

estimated that 54% (48) will be reported with brand name information. It is worth noting that 6% (5) of the 1999-2000 surveys do not involve any analysis of samples (for example literature surveys) and 19% (17) use samples composed of more than one brand.

8. In designing, conducting and reporting these surveys every effort is made:

- to ensure that surveys are conducted fairly;
- to collect samples which fairly reflect the market segment under investigation so that one manufacturer is not favoured over another (although good sources of market share data are not as readily available as anticipated and ways of obtaining better information are being investigated); and
- to ensure the quality of the analytical results.

Internal guidelines have been developed to help officials achieve a consistent approach in these and other areas of the food chemical surveillance programme. These guidelines were made freely available in 1999 (see paragraph 13). Advice is obtained from the independent expert committees on the survey results if their significance is unclear or the issue is particularly sensitive and efforts are made to present results in context, i.e. in a way which makes clear the purpose of the survey and its limitations, the extent of sampling undertaken and the significance attached to the results.

9. In 1993, a system was put into place for announcing survey results as rapidly as possible. It has since become clear that, for some surveys, it is not possible to publish results immediately after receiving the final report. The need to consult advisory committees and to follow detailed procedures which have been developed to ensure fairness have inevitably introduced delays. It takes considerable time to send out results to individual companies and for them to reply and (where necessary) to hold meetings with interested parties. However, although the reporting of results in some cases is not as rapid as originally intended in 1993, it is nevertheless a considerable improvement over the situation prior to that date.

10. The new publication procedures introduced in July 1997, particularly the more stringent requirements to ensure fairness, have increased the cost of individual surveys. The

Minister of State recognised that this may happen and that as a consequence, it was possible that fewer surveys would be carried out. The costs of some surveys are now approximately double following the new guidelines. This has led to fewer but larger, more representative and more informative surveys.

Improving availability of results

11. Efforts have been made to promote the Bulletin and the Information Sheets as sources of information on MAFF food surveys. In June 1997 there were 3,006 ‘hits’ to the area of the MAFF web site dealing with Information Sheets. This has increased greatly since then and during 1999 there have been on average approximately 20,000 hits per month.

12. Since 1997, a list of planned surveys has been made available on the Internet or on request as a hard copy from MAFF. A list of surveys planned for 1999/2000 was made available on 1 April 1999 and an amended list made available every 3 months. This allows industry, enforcement and other interested parties to become aware of surveys planned and put in place their own parallel or co-ordinated surveillance.

The Guidelines

13. For surveys starting after September 1997, a set of internal guidelines was developed which detail the procedures for undertaking surveys and reporting their results. They also aim to ensure surveys are as fair and representative as possible whilst providing the maximum information available to enable consumers to make informed choices. Key areas covered include planning the survey, purchasing samples, assessing and reporting results. During 1998, the FAC considered and commented on these guidelines in the light of the results of a consultation exercise on MAFF’s reporting procedures for survey results and recommended that the guidelines should be made publicly available. Following an announcement in January 1999², the document was made available on the Internet via the MAFF home page <http://www.maff.gov.uk> or as a hard copy from MAFF.³ Key features of the guidelines are:

- information on the Joint Food Standards and Safety Group (JFSSG) surveillance programme, which is available as below, will be updated on a quarterly basis;
- companies will be notified of any samples taken by Trading Standards Officers (TSOs). For other surveys they will not be notified but the analysts will homogenise the survey sample, if necessary, and a suitable sub-sample will be retained in case the company wants to carry out its own analysis;
- companies whose products give unusual or unexpected results, or results which cause concern, but where there is no immediate safety issue, will be sent their own result(s). They will also be sent, seven weeks in advance of the publication of an article in the Bulletin, information on the sampling regime and analytical methodology and be invited to give comments and a brief summary (max. 200 words) for inclusion in the JFSSG Information Sheet; and
- all results will be quoted as the “best estimate value” \pm 2 standard deviations.

14. The guidelines might need amending in the light of experience. Each survey has unique aspects and these may lead to changes in the way that surveys in general are carried out. However, the purpose of the guidelines is to enable surveys to be as consistent as possible across the food chemical surveillance programme and to comply with the principles of openness and transparency. It is not possible to reflect in one document all the many facets of the types of surveys carried out under the programme and keep the text clear and readable. It may therefore be necessary for individual working parties to draw up their own additional instructions to meet their individual needs so long as they meet the general principles set out in this document.

The programme

15. MAFF’s food chemical surveillance programme comprises of the following 9 discrete areas:

- Chemical contaminants in food
 - (i) Inorganic contaminants in food
 - (ii) Naturally occurring toxicants in food

(iii) Organic environmental contaminants in food

- Chemical migration from materials and articles in contact with food
- Dietary surveys
- Food additives
- Food authenticity
- Nutrients in food
- Pesticide residues
- Radionuclides in food
- Veterinary residues in animal products.

16. For each of these areas of the programme, there is a working party or advisory group whose role is to advise MAFF as required on the development and management of the specific part of the programme. Further information on the work of the individual areas of the food chemical surveillance programme, including membership lists, declarations of interests and terms of reference for the working parties, is available from each Secretariat. The contact point for each working party is given in the relevant section of this report. Some working parties already make available the papers from their meetings and the minutes or a meeting report. The movement towards increasing openness and transparency will accelerate in 2000 with the establishment of the FSA (see para. 28).

17. The responsibility for exercising an overview of MAFF's food chemical surveillance programme lies with the FAC. The Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) and associated committees advise on food safety issues. The Working Party on Pesticide Residues (WPPR) also reports to the Advisory Committee on Pesticides (ACP). These Committees have had increased roles on food surveys since the introduction of the new reporting procedures in 1997 and are consulted more frequently on the significance of results before publication. During 1999, the FAC has considered the following surveys:

- 3-MCPD in hydrolysed vegetable protein
- Ochratoxin A contamination of foods

- Epoxidised soya bean oil migration into baby foods

18. Details of these surveys and the Committees' advice were provided by articles in the Food Safety Information Bulletin and associated Information Sheets (Appendix II). These issues are described by the progress reports for the relevant area of the programme.

Setting priorities in food surveillance

19. Cost benefit analysis is recognised in JFSSG as being a useful tool in contributing to decision making. This is being increasingly applied, for example in work on chemical contaminants, chemical migration and food additives. The Working Party on Chemical Contaminants in Food (WPCC) considered a paper describing how a cost benefit analysis could be used in a new strategic initiative to set priorities in the FSA's future science spending. A mechanism which assessed the benefits of individual project proposals from each of the programmes had been tested, but was found to be of limited value for contributing to the medium to long-term design of the overall programme. The WPCC considered a proposal to assess the benefits which will arise from meeting a small number of key objectives over a projected 5-year period for each programme. The new approach has the advantage of defining what each programme is aiming to achieve, allowing the relative benefits and their related costs to be compared and also providing a means of judging the success or failure of the programme. In this process, the aim is to remove the largely artificial distinctions between Research and Development (R&D) and surveillance so that as the creation of the FSA approaches, there will simply be one overall food science programme to support the policy work. As a consequence, priorities will be set based upon this integrated R&D and surveillance programme. One further difference is that the exercise will be applied to the process at the initial stages of resource allocation rather than at the later contract commissioning stage. It will be applied when JFSSG officials are bidding for a research budget to fund proposed R&D and surveillance programmes, which will make the results more relevant to the decision making process.

Testing the new mechanism

20. Details of the new mechanism used by the WPCC are provided by the working party paper WPCC/27 available from the Secretary of the WPCC (see para. 30). It remains rooted in the comparison of benefit/cost ratios as a measure of relative value for money and continues to use the EQUITY software package developed by Dr Phillips of the London School of Economics. The priority list resulting from the EQUITY analysis is based upon the size of the benefit to cost ratio for each of the objectives, which provides budget managers with important information on the relative value for money of different areas of the science programme. However, there are other factors such as statutory obligations, European Community (EC) commitments, the need for emergency action, existing contractual agreements and the size of the overall budget which also have to be taken into account in designing the food science programme for the FSA.

21. The new mechanism has now been tested using the following 5 integrated programmes:

- phytoestrogens
- mycotoxins
- food contaminants
- risk assessment
- food intolerance

The future 5-year programme for each area has been described, summarised and key objectives set in the format already welcomed by the WPCC. This assessment includes the key objectives listed in priority order, scored out of 100 with the top objective for each programme scored at 100. Details of the estimated costs of achieving each objective over the 5 years of the programme are also given and a score for benefit/cost x 100 is given for each. In order to compare the scores for each of these objectives between programmes, it is necessary to normalise them by agreeing the relative benefit scores for the top objective from each of the 5 programmes.

22. The assessments were then used as the basis of the next stage of the process in which a meeting of stakeholders was held to decide on overall priorities. This was achieved by comparing the top objectives from each programme and agreeing on the priority order by a process of debate. The stakeholders were a total of 5 officials representing each of the programmes and 2 WPCC members. The scores from this meeting were fed into the EQUITY programme which already contained the relative scores from **within** each programme. This resulted in a priority list for all 33 objectives from the 5 programmes based on a benefit/cost assessment.

23. In the next stage of the process, the programme stakeholders are being given the opportunity to modify their input data to test the robustness of the mechanism to manipulation. The computer exercise will then be rerun and the results compared to highlight any practices which need to be avoided when the mechanism is applied to the future FSA's science programme. The WPCC supported the new priority setting mechanism being developed for JFSSG's science programmes as we move towards the establishment of the FSA.

Publishing the survey results

24. If a survey identifies a potential food safety problem MAFF acts immediately, announcing the results and appropriate advice as soon as possible, usually through a News Release. Except where quarterly or annual reports are published routinely (pesticide residues, radionuclides and veterinary residues), a summary of the results are published in the Food Safety Information Bulletin as soon as possible following completion of each survey. Food Surveillance Information Sheets with further details on the survey and a more detailed consideration of the significance of the results are available on request and from MAFF's home page on the Internet. During 1999, 25 survey reports were made through the Food Safety Information Bulletin. A list of the associated Food Surveillance Information Sheets is at Appendix II.

25. The value of occasional reviews of specific areas of the programme is recognised for the important trends and priorities which can be identified. This year an independent review of MAFF-funded research and surveillance on mycotoxins has been published. It also includes an assessment of the risks from mycotoxins in food and the current regulatory situation. A copy of this MAFF report (No. PB 4045) can be obtained free of charge from MAFF Publications, ADMAIL 6000, London SW1A 2XX.

26. Survey results are now published by other more cost-effective routes than Food Surveillance Papers, e.g. Food Surveillance Information Sheets from each survey are now available through MAFF's home page on the Internet (<http://www.maff.gov.uk>) and the full survey reports can be consulted in the MAFF Library (Nobel House, 17 Smith Square, London SW1P 3JR. Tel. +44 (0) 20 7238 6575). In addition, the following information is now available:

- a full list of future surveys is provided in April of each year and is updated every 3 months;
- occasional reviews of specific surveillance areas either as a MAFF publication or in a peer-reviewed scientific journal. However, unlike Food Surveillance Papers they would not contain previously unpublished comments from expert advisory committees;
- the annual report on the food chemical surveillance programme, which summarises progress and highlights the issues;⁴ and
- contractors are encouraged to publish reports of their work in peer-reviewed scientific journals whenever possible.

27. Other publications during 1999 have included the annual report of 'Radioactivity in Food and the Environment',⁵ the 1998 Annual Report of the Working Party on Pesticide Residues,⁶ which is available free of charge and is also available on the Internet, and the Veterinary Medicines Annual Report and Accounts 1998/99.⁷

28. During 2000, the Food Standards Agency will be established. Food surveillance will continue to be the bedrock of the work on consumer safety, food authenticity and nutritional quality of the diet. In addition to the priority given to commissioning and overseeing this

work, greater efforts will be made to improving the ways in which the results from the surveys are published. The aim is to make the results more meaningful to consumers and to provide clear unambiguous advice setting any risks in context. In addition to publishing the results, we aim to provide more accessible and practical advice to improve confidence in making informed choices about our food and diet. As part of this process, during 2000, the working parties will move to more open and transparent ways of working, which will include where possible:

- advance publication of agendas, with the opportunity to comment;
- published minutes;
- published papers from each meeting (excluding any confidential material);
- reports of meetings;
- occasional open meetings; and
- published material on the Internet including information on working party members.

PROGRESS REPORTS FOR 1999

Chemical Contaminants in Food

Background

29. The WPCC was set up in 1997. Its main roles are to:

- advise the Ministry of Agriculture, Fisheries and Food (MAFF) on the results of surveys and short-term research projects on environmental organic contaminants [e.g. dioxins, polychlorinated biphenyls (PCBs), phthalates], inorganic contaminants (e.g. lead, mercury, arsenic, nitrate) and naturally occurring toxicants (mycotoxins, plant oestrogens) in food; and
- identify future requirements for surveys and research on chemical contaminants.

30. The core objective of the WPCC's work is to help protect consumers by assessing the safety of food as regards chemical contaminants. Meetings of the Working Party are reported in the MAFF/DH Food Safety Information Bulletin, and all papers and minutes of meetings are made freely available on request. Further information on the Working Party (including a list of papers) can be obtained by contacting Dr Martin Slayne, Room 207, Ergon House, c/o Nobel House, 17 Smith Square, London SW1P 3JR (Tel. + 44 (0) 20 7238 6222; Fax: + 44 (0)20 7 238 5331; e-mail m.slayne@fssg.maff.gov.uk)

Long-term aims

31. The long-term aims of the Working Party are as follows:

- to advise on the scope of future surveys and related research on chemical contaminants for funding by MAFF;
- to consider the results of surveys and relevant research on chemical contaminants⁸ and advise on the implications for JFSSG, consumers, industry and other interested parties;
- to consider and review the causes of human exposure to chemical contaminants in food in the United Kingdom (UK);
- to advise on the appropriate fora for release of survey results;
- to produce a contribution to the annual surveillance report; and

- to report to the FAC.

Progress

32. There have been five meetings of the WPCC to date. The first was held on 26 November 1997 followed by meetings on 18 March and 9 December 1998, and 10 March and 1 December 1999. Articles reporting these meetings appeared in the MAFF/DH Food Safety Information Bulletin.⁸⁻¹² The papers and minutes of all WPCC meetings are freely available by contacting Dr Martin Slayne, as above.

33. Details of the work programme are set out in Appendix I. The overall cost of the programme in 1999 was £447k (natural toxicants £117k, inorganic contaminants £229k and organic environmental contaminants £101k) and results were reported for over 13,900 analyses on over 1750 individual samples.

Economic evaluation of UK policy on chemical contaminants in food

34. The policy on chemical contaminants in food was independently reviewed by the Department of Agricultural and Food Economics of the University of Reading. The aim of the evaluation was to assess whether current controls on chemical contaminants and naturally occurring toxicants are cost effective and, taking into account the impact of the controls on consumers and the food industry, how they might be improved. The full report of this review is available on MAFF's website at: <http://www.maff.gov.uk/r&d/economic.htm>.

35. The main findings of the review were that:

- there is a strong case for Government intervention as unregulated markets were unlikely to provide an optimum level of food safety;
- MAFF's policy had produced significant net benefit for society. The main beneficiaries were identified as consumers, whilst the majority of quantifiable costs had been borne by Central Government. It was recognised that the food industry incurred considerable

cost associated with its quality assurance programmes but it was not possible to identify those associated with chemical contaminants;

- benefits to industry included greater consumer confidence, greater stability in markets and the production of information and more understanding of chemical contaminants;
- JFSSG's food surveillance programme was viewed as having the greatest impact in the decline in food contamination levels for aflatoxins, ochratoxin A, dioxins and PCBs;
- key strengths of policy related to the protection of public health, monitoring contamination levels, the UK negotiating position within the European Union (EU) (in that it highlighted issues of greatest concern to the UK) and the fact that control measures focused the food industry on the most important issues which needed to be addressed by their quality assurance programmes; and
- weaknesses highlighted by the evaluation related to the rigour of sampling and the impact of the brand naming policy. Lack of consumer awareness of the surveillance programme and the manner in which survey results were disseminated were also considered weaknesses. Ways to improve on these weaknesses will be investigated.

Ad Hoc Groups

36. Three *ad hoc* groups have been set up under the WPCC's remit to advise on individual areas or deal with specific short-term tasks. The *Ad Hoc* Group on Sewage Sludge and Related Materials set up in 1998. The purpose of this Group is to consider the implications for food safety of potentially toxic elements (PTEs) and organic chemicals in sewage sludge. No meeting were held in 1999. Further information on the *Ad Hoc* Group on Sewage Sludge and Related Materials can be obtained by contacting Dr Nigel Harrison, Room 234, Ergon House, c/o Nobel House, 17 Smith Square, London SW1P 3JR (Tel: +44 (0)20 7 238 6235; Fax: +44 (0)20 7238 5331; e-mail: n.harrison@fsci.maff.gov.uk).

37. The *Ad Hoc* Group on Mycotoxins met on 4 March 1999 to agree a strategy for mycotoxin surveillance and research for the next five years. Papers outlining this strategy were discussed at the WPCC meeting on 10 March 1999 and copies of these papers (ref:

WPCC 24 and 24a) are available from Dr Martin Slayne, as above. Further information on the *Ad Hoc* Group on Mycotoxins can also be obtained from Dr Martin Slayne.

38. The Analytical *Ad Hoc* Group met on 5 July 1998 to decide on the analytical quality assurance (AQA) requirements for surveys on chemical contaminants in food. Proposals for surveys to begin in 2000 were assessed, based on these AQA requirements, by the Group on 24 and 25 November 1999. Further information on the Analytical *Ad Hoc* Group can be obtained from Dr Roger Wood, c/o Institute of Food Research, Norwich Research Park, Colney, Norwich, NR4 7UQ (Tel: + 44 (0)1603 255000; Fax: +44 (0)1603 507723; e-mail: r.wood@fscii.maff.gov.uk).

Inorganic chemical contaminants

39. Inorganic chemical contaminants fall into two main groups: metals and other elements; and nitrate and related substances. Both these groups of chemicals can be present in food naturally, as a result of certain farming practices, and/or from environmental contamination. Inorganic chemical contaminants in food are of interest because of their possible health effects. Long-term exposure to elements such as arsenic, mercury and lead may be harmful to human health. For example, organic mercury compounds are neurotoxins, exposure to lead can be harmful to neuropsychological development, and inorganic arsenic is a human carcinogen.^{13,14} Other elements, such as tin, can cause short-term health effects such as stomach upsets at high concentrations.¹³ Some elements such as zinc, iron and copper are essential to health but can be toxic at high levels of exposure.¹³⁻¹⁵ The presence of nitrate in food is of interest because it can be metabolised in the gut to compounds with both potentially harmful and beneficial health effects.¹⁶ To help protect consumers, maximum exposure levels for a number of these contaminants have been recommended by international organisations such as the Joint Expert Committee on Food Additives of the Food and Agriculture Organization of the United Nations and the World Health Organization International Programme on Chemical Safety (JECFA), the World Health Organization (WHO), and the EC's Scientific Committee for Food (SCF). To control the levels in food of certain inorganic chemical contaminants, maximum limits have been set by the UK and EC. The JFSSG carries out surveys of inorganic

chemical contaminants in food to help ensure that dietary exposures of UK consumers are below the relevant recommended maximum exposure levels and are not risks to health, and that concentrations in food are below the relevant limits.

Nitrate

40. Most foods contain low concentrations of nitrate with higher levels present in green leafy vegetables and beetroot.^{17,18} Nitrate is present in foods naturally, or may be present as a result of the use of fertilisers on crops, or from its use as a preservative. A number of surveys and research projects on nitrate have been carried out in 1999 with the aims of assessing the risks to health from dietary nitrate and obtaining data on nitrate concentrations in vegetables to inform EC negotiations on a review of EC Regulation No. 194/97 as amended by EC Regulation No. 864/1999 which set maximum levels (limits) for nitrate in lettuce and spinach.^{19,20}

41. The UK Monitoring Programme for Nitrate in Lettuce and Spinach has been carried out since 1996 to comply with EC requirements. A paper reporting the results obtained from 1996 to 1998, and correlating nitrate concentrations in these crops with weather conditions was published in 1999.²¹ The Monitoring Programme re-commenced in 1999 with samples being taken by TSOs in England, Northern Ireland and Scotland and analysed for nitrate by Public Analysts' Laboratories, and is being co-ordinated by Norfolk County Council Trading Standards Department. The sampling plan for the 1999 to 2001 Monitoring Programme was submitted to the EC in June. Results will be reported to the EC annually as part of the review of the EC Regulations due before the end of 2001.

42. The results of a survey of nitrate concentrations in lettuce and spinach on retail sale in the UK were reported to the EC in February and published in Food Surveillance information Sheet No. 177.²² This survey was carried out by ADAS Laboratories to provide up-to-date information to support the UK's position in negotiations on the review of EC Regulation No. 194/97 as amended by EC Regulation No. 864/99.^{19,20} Most samples of lettuce and spinach contained nitrate concentrations below the EC's maximum limits, but 13% were above.^{19,20,22}

43. Research projects on nitrate have also been in progress in 1999. A study to determine the effectiveness of the National Farmers' Union (NFU) Codes of Good Agricultural Practice (GAP) for minimising nitrate concentrations in spinach was carried out by Horticulture Research International. The results of a previous project carried out by Horticulture Research International was used to revise the Codes of GAP for outdoor-grown and protected (glasshouse) lettuce. These revised Codes of GAP were sent to the EC in June and the one for spinach will also be submitted to the EC with any revisions needed in light of the results of the above study. A project began in September to characterise the potential benefits versus toxicity to humans from nitrate in the diet. This work is being carried out by Guy's, King's and St. Thomas' School of Biomedical Sciences, and will be used to inform the review of the EC Regulations on nitrate in lettuce and spinach.

Metals and other elements

44. To assess dietary exposures to metals and other elements of UK consumers, the JFSSG carries out a programme of surveys of the foods consumed by either the general UK population or specific groups of consumers. The dietary exposures estimated from the results of these surveys are compared with the recommended maximum levels of exposure and/or considered by the COT to assess the risks to health. Results and dietary exposures to aluminium, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, tin and zinc from the 1997 Total Diet Study were reported in Food Surveillance Information Sheet No. 191.²³ In all cases, dietary exposures were below the recommended maximum levels of exposure and were similar to those from the 1994 Total Diet Study (TDS).^{24,25} The TDS provides information on dietary exposures of individuals in the general UK population but not those groups of consumers with different dietary habits (e.g. infants, vegetarians).

45. A multi-element survey of infant foods was reported in Food Surveillance Information Sheet No. 190.²⁶ Concentrations of the 13 metals and other elements analysed in this survey were similar to those found in other studies of infant foods and within the relevant legal limits. Dietary exposures of infants estimated from the results of this survey were considered by the COT which concluded that they raised no health concerns for infants fed these foods.²⁶ A further multi-element survey of infant foods is being carried out by the Central Science

Laboratory (CSL). Dietary exposures of vegetarians to 12 metals and other elements will be reported in a Food Surveillance Information Sheet in 2000. Vegetarians' dietary exposures to aluminium, cadmium, chromium, cobalt, copper, lead, nickel, tin and zinc were found to be similar to those of the general population but those for arsenic, mercury and selenium were lower.

46. A survey of lead and cadmium in raw (unprocessed) foodstuffs (e.g. cereals, raw milk) was carried out by CSL to provide information to support the UK negotiating position in discussions on a draft EC Regulation on lead and cadmium in food . The results will be reported in a Food Surveillance Information Sheet in 2000. They show that unprocessed foodstuffs in the UK would meet the limits proposed by the EC.²⁷ A research project, being carried out by AEA Technology Environment and the University of Reading, on the effects of processing on lead and cadmium concentrations in food complements this survey. Preliminary results from this project were presented at a Royal Society of Chemistry symposium in September. A survey of lead and cadmium in foods not included in the proposed EC Regulation (e.g. eggs, nuts, honey, herbs and spices, etc.) is being carried out by Campden and Chorleywood Food Research Association. The results of this survey will be reported in a Food Surveillance Information Sheet in 2000 and will be used to help develop future UK controls on the lead and cadmium contents of these foods.

47. Following the discovery of elevated concentrations of iodine in milk, the COT recommended that monitoring of iodine in cows' milk should continue and that an investigation should be made of the different forms of iodine in milk and infant formulae.²⁸ A survey of iodine in cows' milk has recently been completed by the Laboratory of the Government Chemist (LGC) and will be reported in a Food Surveillance Information Sheet once the results have been considered by the COT. A research project on the different forms of iodine in milk and infant formulae is currently being carried out by CSL. Iodine, bromine and fluorine analyses are being carried out by CSL on samples from the 1997 TDS. The results will be used to estimate dietary exposures to these elements which will be considered by the COT.

48. Mercury is present in food in organic and inorganic forms. It is the organic forms which are the most toxic. To assess the risks to health from mercury in food it is important to be able to analyse the different forms present. A project is being carried out by the University of Plymouth to develop a method to differentiate organic and total mercury in food for routine use and validate it by inter-laboratory trial. Fish is the main contributor to dietary exposure to mercury. A survey is being carried out by University of Bristol of total mercury concentrations in fish, shellfish and their products on sale in the UK. The results will be used to estimate dietary exposures for consumers of fish and to check that mercury concentrations in fish are below EC limits.²⁹

49. Multi-element surveys of foods collected from the wild (so called 'free foods') and allotment produce have recently been completed by the University of Bristol. The results of these surveys will be reported in Food Surveillance Information Sheets in 2000 once they have been considered by the COT.

50. Following the discovery in a JFSSG-funded research project of elevated tin concentrations in some canned tomato products, a survey was carried out by Campden and Chorleywood Food Research Association to investigate the extent of this problem and was reported in Food Surveillance Information Sheet No. 179.³⁰ Four of the 185 products tested were found to exceed the UK statutory limit for tin in food of 200 mg/kg.³¹ At JFSSG's request these four products were immediately withdrawn from sale and consumers warned to return any unused cans to retailers. A survey of tin in canned pineapples on sale in the UK was reported in Food Surveillance Information Sheet No. 182.³² This survey was carried out by Campden and Chorleywood Food Research Association after reports from the EC of high levels of tin in some batches of canned pineapples imported into Finland. All the products tested were below the UK statutory limit.³³

51. The JFSSG surveys of arsenic in food usually measure total concentrations of arsenic. However, arsenic is present in different forms in food which vary in toxicity with the inorganic forms being the most toxic. To assess the risks to health from arsenic in food, it is important to measure accurately inorganic arsenic. A new method to determine the different arsenic

species in food was tested by inter-laboratory trial by CSL in 1997 and 1998. Unfortunately, it was found that the method was not suitable for routine use. The project at CSL has therefore been extended to develop a routine method and test it by inter-laboratory trial. This project will be completed in 2000.

Organic environmental chemical contaminants

52. Industrial organic chemicals, such as polychlorinated biphenyls (PCBs) and phthalates, may be present in the environment as a result of their current or historical use, manufacture and disposal. Some other organic chemicals, like dioxins, may be released into the environment as unwanted by-products of industrial processes, domestic activity or by natural formation. These environmental contaminants may then enter the food chain through direct deposition onto crops or through uptake by plants and animals (including fish) from soil, herbage and feed materials, and water.

Dioxins and PCBs

53. Dioxins and PCBs have been the focus of much of the work on organic environmental contaminants. Surveys for dioxins and PCBs have been targeted on those commodities which may be important sources of these compounds in the diet, either because they are frequently consumed foods and or because they are more likely to accumulate dioxins and PCBs, i.e. fat-containing commodities such as fish and cows' milk.

54. Dioxins and PCBs are two groups of closely related compounds called congeners. Certain PCB congeners exhibit a mechanism of toxicity similar to that shown by dioxins. As individual dioxins and 'dioxin-like' PCBs congeners differ in their degree of toxicity, concentrations of individual congeners of dioxins and PCBs are multiplied by weighting factors known as Toxic Equivalency Factors (TEFs) reflecting their individual toxicities. These weighted concentrations are then added together to give combined concentrations expressed as Toxic Equivalents (TEQs). The WHO has now proposed revised TEFs for certain congeners of dioxins and PCB,³³ and these have been adopted by the COT.³⁴

Accordingly, JFSSG now expresses the concentrations of dioxins and PCBs in food as World Health Organization Toxic Equivalents (WHO-TEQs).

55. The WHO has also recommended a revised Tolerable Daily Intake (TDI) range of 1-4 pg WHO-TEQ/kg body weight/day for dioxins and PCBs.³⁵ The COT will carry out a review of the data on which this proposed TDI range is based when the full WHO consultation is published. In the meantime JFSSG continues to assess dietary exposures to dioxins and PCBs against the previously recommended WHO TDI of 10 pg WHO-TEQ/kg body weight/day,³⁶ which was endorsed by the COT in 1997.³⁷

56. The Central Science Laboratory has analysed dioxins and PCBs in samples of certain marine fish species landed at various locations in the UK, in salmon and in retail samples of fish fingers. The results were published in Food Surveillance Information Sheet No. 184³⁸ and they show that dietary exposure to dioxins and PCBs by the majority of UK consumers of marine fish in combination with the rest of the diet are within the UK TDI for these chemicals.³⁶ The COT advised that people should continue to follow the independent expert Committee on the Medical Aspects of Food Policy (COMA) advice to eat an average of two portions of fish a week, of which at least one should be oily fish, each week. This recommendation was made on the basis of evidence that increasing the intake of certain long chain polyunsaturated fatty acids (for which oily fish are a rich source) reduces the risk of cardiovascular disease.³⁹ Following this advice is likely to provide health benefits for most adults without exceeding the recently recommended WHO TDI and therefore the COT does not discourage the consumption of oily fish because of their content of dioxins and PCBs.

57. A number of other surveys for dioxins and PCBs are approaching completion and are expected to be published in 2000. These aim to determine concentrations of dioxins and PCBs in milk samples from farms in the Rotherham area (an area where elevated levels of dioxins and PCBs were found in cows' milk from one farm in 1996),⁴⁰ 1997 TDS samples, infant formulae, free range duck and hens' eggs, shellfish, and fats and oils for food production. The results of all these surveys will be published in the usual way after consultation with the COT where appropriate.

58. A number of short-term research projects are in progress, including:

- Further work on improving the analysis of foodstuffs for PCBs using perfluorocarbon fluids to extract selectively individual PCBs from both aqueous and oleaginous (fatty) foodstuffs. This project aims to provide a rapid, cost-effective method with a view to speeding up analysis;
- a study of the transfer of dioxins from pasture subject to flooding by contaminated river sediments to the milk of animals grazing on the land. It has been suggested that elevated concentrations of dioxins could be found in milk from cattle grazing pasture which has been flooded by rivers with dioxin-containing sediment; and
- a study of the bioavailability of dioxins and related compounds in humans. The extent of absorption of different congeners of dioxins and PCBs is likely to vary, and this project will assist in assessing whether levels of dioxins and PCBs in foodstuffs pose any risk to human health.

The final reports of all these projects will be made available to the public in the library on completion.

Other organic chemical contaminants

59. Surveys of TDS and/or retail food samples are currently in progress for phthalates, chlorinated solvents, chlorinated paraffins and synthetic nitromusks. The results of these surveys will all be published in the usual way.

60. Three short-term research projects are in progress. These are:

- An investigation into the sources of polynuclear aromatic hydrocarbons (PAHs) in infant formulae. It is intended that this project will provide JFSSG with up-to-date information on the levels of PAHs in infant formulae on sale in the UK. Breast milk samples are being analysed to put the results in context; and
- rapid and automated methods for the screening of foods for the presence of a wide range of organic contaminants. Two separate projects are investigating if foods could be screened for multiple organic contaminants resulting from, for example, chemical spills or factory fires. These have the potential to improve JFSSG's ability to provide advice on the

safety of foods produced in the locality following such contamination incidents by targeting analysis on specific contaminants.

The final reports of all these projects will be made available to the public in the library on completion.

Mycotoxins

61. Mycotoxins are toxic substances produced naturally by fungi. Fungal growth and the possible mycotoxin contamination of crops is generally favoured by humid conditions at warm or ambient temperatures. The most important mycotoxins in terms of food safety are aflatoxins, ochratoxin A, patulin, trichothecenes, sterigmatocystin, fumonisins, zearalenone, ergot alkaloids and moniliformin.

62. The results of a survey of ochratoxin A in 300 samples of grain traded by central depots from the 1997 UK cereal harvest was reported in Food Surveillance Information Sheet No. 171.⁴¹ Ochratoxin A is a mycotoxin, which is produced by a number of fungal species in the genera *Aspergillus* and *Penicillium*. The growth of the mould and subsequent production of ochratoxin A depends on a number of factors, which include the temperature and humidity during the harvesting and subsequent drying and the storage of the crop.⁴² Ochratoxin A is moderately stable to heat and may occur in food products made from contaminated grain.⁴³ The SCF agreed that ochratoxin A is a potential genotoxic carcinogen which is possesses nephrotoxic, teratogenic, immunotoxic and possibly neurotoxic properties.⁴⁴ The COT considers that ochratoxin A is a human genotoxic carcinogen.⁴⁵ At present, there are no statutory limits for ochratoxin A in the UK but both the COT and FAC have recommended that the concentrations of ochratoxin A in food should be reduced to the lowest technically achievable level.⁴⁶ Barley was more frequently contaminated than wheat and contained the highest mean concentration of ochratoxin A. Oats contained the lowest mean concentration of ochratoxin A. The highest concentration detected was 17.8 µg/kg in feed barley. The analytical methodology used to detect ochratoxin A in grain had a limit of detection of 0.1 µg/kg and the limit of quantification was 0.2 µg/kg. Grain stored in the East of England was less frequently contaminated by ochratoxin A than that stored in the North or West.

Comparison with previous surveys in 1994 and 1996 indicates that in spite of the worse weather conditions prior to harvest, concentrations of ochratoxin A were not significantly higher.

63. A survey for patulin in apple juice was reported in Food Surveillance Information Sheet No. 173.⁴⁷ Patulin is a mycotoxin, which is produced by certain strains of the mould *Penicillium expansum*.⁴⁸ Surveys of patulin in apple juice have been carried out since 1992, when the problem of contamination by patulin at concentrations above 50µg/l was first identified. The COT reviewed the available toxicity data on patulin in 1992 and recommended that patulin concentrations in food should be reduced to the lowest technologically achievable level. The FAC subsequently set an advisory level of 50µg/l in apple juice.⁴⁹ This survey of apple juices monitored the extent of patulin contamination in directly produced juices and also checked the situation for apple juices made from concentrate as these had not been sampled for four years. In apple juice samples produced from concentrate, patulin was not detected above the advisory level of 50µg/l. Patulin was determined in 55 (28 per cent) samples of directly produced apple juice at a concentration of >15µg/l (the limit of quantification). Of these, 4 (2.5%) samples contained patulin at concentrations which exceeded 50µg/l. The highest patulin concentration found in the survey was 171µg/l. The percentage of samples found to contain patulin above the advisory limit of 50µg/l is similar to those from recent years and the satisfactory situation for patulin contamination of apple juice compared with previous years remains.

64. A survey of human exposure to ochratoxin A is also being conducted and the initial phase was published in Food Surveillance Information Sheet No. 172.⁵⁰ Samples of duplicate diets, plasma and urine were collected from 50 volunteers and aliquots were taken from these samples to provide monthly composite samples for analysis. The samples were analysed using suitably sensitive methods to investigate a quantitative relationship between either plasma or urine ochratoxin A levels with dietary exposure to the mycotoxin. All diets and plasma samples and 92 per cent of the urine samples contained ochratoxin A. It is not surprising that ochratoxin A exposure is so widely found in the population since the toxin is frequently found, at low levels in a number of commonly consumed foods. However, it is reassuring that the

exposure calculated from the ochratoxin A levels in the diet were below the tolerable intake of less than 5 ng/kg b.w./day recently recommended by the SCF.⁴⁴ Statistical analysis of the results indicated a higher correlation between urinary ochratoxin A levels and ochratoxin A consumption than between plasma levels and ochratoxin A consumption suggesting that urine provides a more useful biomarker of intake than plasma. This finding is subject to further investigation.

65. A follow up survey of ochratoxin A in dried vine fruits and other retail food commodities was also reported in Food Surveillance Information Sheet No. 172.⁵¹ The previous survey carried out in 1997 showed that, in particular, dried vine fruits contained higher than expected levels of ochratoxin A. The survey analysed ochratoxin A levels in 501 samples of the following retail products: currants, raisins, sultanas, figs, kidney beans, butter beans, cocoa powder, chocolate bars, red wine and grape juice. In general low levels of ochratoxin A were detected in figs, chocolate, cocoa, red wine and grape juice, and was not detected in any samples of pulses analysed. The highest levels of ochratoxin A contamination were in dried vine fruits and the highest level detected was 41 µg/kg, 9% of dried vine fruit samples contained ochratoxin A. Although the present survey confirmed that dried vine fruits are frequently contaminated with ochratoxin A, there appear to have been small improvements to the situation reported in 1997.

66. A survey for aflatoxins, ochratoxin A, fumonisins and zearalenone in raw maize was reported in Food Surveillance Information Sheet No. 192.⁵² One hundred and thirty nine samples were taken at UK ports or on entry to large maize mills, a further 11 samples were taken from consignments following an industrial physical cleaning procedure. Over 92 per cent of samples were below the levels of 4 and 2 µg/kg for total aflatoxins and aflatoxin B₁ respectively which are the limits set by EC legislation for cereals and cereal products intended for direct human consumption or use as an ingredient in foodstuffs. However, 1 sample was found to be highly contaminated at 29.1 microgram/kg total aflatoxins. The importer was informed and has taken appropriate action. The maximum concentration of ochratoxin A found was 1.5 µg/kg. Fumonisins and zearalenone were detected in almost every sample with 48 per cent of samples containing more than 1000 µg/kg total fumonisins (B₁, B₂ and B₃) and

42 per cent of samples containing more than 100 µg/kg of zearalenone. Physical cleaning of raw maize reduced aflatoxin concentrations by about 40 per cent and total fumonisins by 32 per cent, however, the results for zearalenone were inconclusive. Imported raw maize undergoes cleaning and further processing before use for direct consumption or as an ingredient in foodstuffs and, therefore, the amounts of mycotoxins in raw maize are unlikely to reflect the concentrations in the finished products for human consumption.

67. Effective sampling of food is essential to check whether it is contaminated by unacceptable levels of mycotoxins. An easy to use computer programme has been developed by RHM Technology Limited to generate sampling plans for mycotoxins in cereals and cereal products.⁵³ Three choices of sampling plan are made available, namely pragmatic (e.g. for sampling at delivery to storage silos), routine and enforcement. Pragmatic plans always require 6 incremental samples, which together must not exceed a total aggregate of 10 kg. Routine plans allow the user to select between 4 and 100 incremental samples. The number of incremental samples in the enforcement plan is determined by the size of the lot, and a larger aggregate sample is required although the actual weight is dependent upon the particle size of the commodity. In addition, a further study to develop sampling plans for ochratoxin A in cereals and similar particulate commodities has been completed and the results will be published in February 2000. Results from these surveys will be used to support the negotiations in the forthcoming EC discussions on proposed limits for ochratoxin A in food.

68. An independent review of MAFF funded applied research and surveillance on mycotoxins carried out between 1993-1996 has been published.⁵⁴ The review provides a summary of the key findings, discusses their significance for food safety and recommends areas for future work.

Inherent Natural Toxicants

69. A duplicate diet study is being conducted to assess dietary exposure of vegetarians to certain inherent natural toxicant such as glycoalkaloids, glucosinolates, furocoumarins and

phytoestrogens. The dietary exposures of participants in this study will be compared with those estimated for the general population. The results of this study will be published in 2000.

70. A survey to measure ethyl carbamate, a known carcinogen which is formed as a by-product of fermentation, in whisky will be reported in early 2000. Previous surveys were performed in 1988 and 1990 and the present survey will assess the effectiveness of the industry in reducing levels of ethyl carbamate in whisky.

Future Work

Inorganic chemical contaminants

71. Four new surveys are planned to begin in 2000. Nitrate and nitrite analyses will be carried out on TDS samples collected in 1999 to provide up-to-date information on dietary exposures of UK consumers to these contaminants. A further survey of tin in canned fruit and vegetable products will be carried out to check that these comply with *The Tin in Food Regulations 1992* and to help identify any further problems. Inorganic and total arsenic concentrations will be determined in 1999 TDS samples and fish and shellfish to assess the risks to health by comparing dietary exposure estimates for the general population and fish consumers with the JECFA Provisional Maximum Tolerable Daily Intake (PMTDI) for inorganic arsenic.

72. A short-term research project will begin in 2000 to investigate the problems with accurate analysis of arsenic in food.

73. The banning of leaded petrol in 2000 has led to increasing interest in the environmental fate of fuel additives used in lead replacement petrol and the platinum group elements which may be released by their use in catalytic converters. A research project is planned to model the transfer into the food chain of lead and its replacement anti-knock agents (e.g. manganese-based additives) as well as the platinum group elements used in catalytic converters.

74. Two duplicate diet studies are planned. The first will assess dietary exposures to dioxins and PCBs, methyl mercury and inorganic arsenic of above-average consumers of seafood. A duplicate diet study of infants aged 4 to 12 months is planned to provide accurate information on dietary exposures of this critical group of consumers to metals and other elements.

Organic environmental chemical contaminants

75. Three new surveys are about to start. A survey of dioxins and PCBs in milk from rural and from urban/industrial areas of the UK will provide up-to-date background ranges of these contaminants in cows' milk and will provide a yardstick to identify areas of possible localised contamination in the UK. A 'follow up' survey of dioxins and PCBs in fish oils will determine the levels of dioxins and PCBs in fish oil dietary supplements and medicinal products; the results of the previous survey were published in 1997.⁵⁵ A third new survey will investigate levels of dioxins and PCBs in fruit and vegetables. Although most fruit and vegetables contain very little fat, dioxins and/or PCBs have been found in vegetables with a waxy skin such as cucumbers, and could also be present on the surfaces from aerial deposition or adhering soil. A further survey of dioxins and PCBs in milk products is planned to begin in April 2000. Since dioxins and PCBs tend to be found in the fat component of foods, foodstuffs such as butter and cheese have the potential to contain dioxins and PCBs.

76. One short-term research project is planned to begin in April 2000. At present there is considerable knowledge about the transfer of compounds such as dioxins and PCBs to cows' milk and to beef, but very little information regarding their transfer from soil, grass and other feedingstuffs to the eggs and meat of chickens, pigs and sheep. It is likely that species differences in feeding habits and habitat affect the accumulation of these compounds in animal tissues, but even less is known about the transfer of dioxins and related compounds to the meat and eggs of wild fowl, game and other poultry. This project will investigate this area.

77. One survey is planned to begin in April 2000. Several surveys have in the past been carried out by MAFF on volatile *N*-nitroso compounds, especially *N*-nitrosodimethylamine in foods, and some foodstuffs have also been analysed for Apparent Total *N*-nitroso Compounds,

a method of analysis that gives the total content of both volatile and non-volatile compounds.⁵⁶ However, very little is known about levels of individual non-volatile *N*-nitrosamines on foodstuffs. Such compounds will be the subject of the planned survey.

78. Two short term research and development projects are planned to begin in April 2000. There is increasing interest in persistent organic pollutants (POPs) other than dioxins and PCBs, but there is relative little information in the literature about their occurrence in food. The first project will be a review of such literature which will help in assessing the need for future surveys for POPs. JFSSG currently uses a number of computer models of the transmission of environmental contaminants through the food chain, and work is currently underway to review these models with a view to incorporating them into a robust, integrated suite. The second project will consist of supporting studies to generate data with which to validate more fully the algorithms used in the suite's models.

Mycotoxins

79. Surveys of rice, dried figs and fig paste, spices, milk and nuts/nut products for mycotoxins (principally aflatoxins and ochratoxin A, but for some commodities zearalenone, tricothecenes, fumonisins and sterigmatocystin) will start in April 2000. The proposed studies will provide new information on mycotoxins in certain food commodities to identify further the extent to which consumers are exposed to mycotoxins in food. The data will be used to aid negotiations on possible EC Regulations on these contaminants.

Inherent Natural Toxicants

80. Two surveys are proposed to start in April 2000 for the Phytoestrogens in the Diet Programme. As industry is becoming increasingly active in developing and marketing phytoestrogen rich dietary supplements a survey to measure concentrations of isoflavones and lignans in dietary supplements will be carried out. The data will be important in assisting the COT Working Group on Phytoestrogens and FAC to consider the findings of the phytoestrogens in the diet R&D programme in relation to likely intakes of particular vulnerable groups in society. In addition, to support the programme a quality assurance scheme will be commissioned. It is important to ensure that all phytoestrogen assays carried

out by contractors in the Phytoestrogens in the Diet Programme are efficient, effective, comparable and traceable.

Chemical Migration from Materials and Articles in Contact with Food

Background

81. The Government carries out surveillance on chemical migration, from materials and articles in contact with food, to ensure that this does not pose a risk to health. The Working Party on Chemical Contaminants from Food Contact Materials and Articles advises on possible areas of surveillance work.

82. Further information on the Working Party can be obtained by contacting Mr Patrice Mongelard, Room 213, Ergon House, c/o Nobel House, 17 Smith Square, London SW1P 3JR (Tel. + 44 (0) 20 7238 6225; e-mail p.mongelard@fssg.maff.gsi.gov.uk). Their advice is taken into account by Government in deciding which surveys to commission in the Government's Requirements Document on food research. Details of the surveillance programme for 1999 are set out in Appendix I. The overall cost of the programme in 1999/2000 will be £126,699. For the three surveys which were completed during the year 401 samples were collected and subjected to 5,836 analyses. The Government also carries out research on chemical migration from materials and articles in contact with food which is reviewed and reported⁵⁷ annually.

Long-term aims

83. The aims of the surveillance programme on chemical migration from materials and articles in contact with food remain the protection of public health, specifically the maintenance of a safe food supply. Surveys will continue to be reported in full, as soon as possible after their completion and where necessary with advice from independent expert committees on the significance of the results.

Progress

84. The Working Party met twice during 1999. Three surveys were completed and reported in 1999. These were: a survey of retail paper and board food packaging for PCBs,^{58,59} a survey of epoxidised soya bean oil (ESBO) migration from plasticised gaskets^{60,61}

and a survey of styrene in UK TDS samples.^{62,63} Work continued on four surveys which started in previous years (areas one to four in Appendix I). Work began on a major new survey (area 5 in Appendix I), on packaging materials used for dietary staples. This is primarily an intelligence-gathering exercise, on the nature and conditions of use of packaging systems used for the most important food commodities in the diet. The information obtained will inform sampling strategies for future surveillance or research and should help with assessments of the risk to health of chemical migration from food contact materials.

Future work

85. Two new surveys will start in 2000. The first of these is on possible migration of acrylamide monomer from paper and board in contact with food, that might arise from the use of this substance as an additive to impart wet-strength properties to paper and board. There will also be a survey of mineral hydrocarbons in food contact materials and any migration of these substances into food or drink (for comparison with Acceptable Daily Intakes set by the SCF). The first step in both surveys will be the development and validation of methods of analysis.

Dietary Surveys

Background

86. The Working Party on Dietary Surveys (WPDS) was first convened in 1991 to address issues arising from the increasing complexity and volume of work on dietary surveys. The core objective of its work is to ensure that accurate, up-to-date and representative data are available on the food consumption of the UK population, from which any emerging nutritional or health problems can be identified, and which provide the basis for risk assessment for food chemicals. Further information regarding the WPDS can be obtained by contacting Miss Gillian Smithers, Room 429D, Ergon House, c/o Nobel House, 17 Smith Square, London SW1P 3JR (Tel. +44 (0) 20 7238 5738; e-mail g.smithers@fscii.maff.gov.uk).

Long-term aims

87. The constitution, terms of reference and future priorities of Working Party are currently under review, along with those of the Working Party on Nutrients in Food. The long term aim of the Working Party will continue to be the provision of reliable and up to date quantitative information on food consumption of individuals and households. This information is needed by Government for a number of reasons:

- (i) To investigate the nutritional adequacy of the diet, both of the nation as a whole and particular sections of the population. The food consumption data are linked to the nutrient composition data to estimate the prevalence of nutrient deficiencies and excesses. Although deficiencies due to food shortages rarely present a public health problem in Britain today, concern is growing at the risk of deficiency of some vitamins and minerals in certain populations (for example pre-school children; low income households) as a result of restricted or poor choice of foods consumed;
- (ii) To monitor the extent of the deviation of the diet of groups of the population from that recommended by experts as optimal for health and identify dietary habits which may contribute to the risk of developing chronic disease such as heart disease and cancer;

- (iii) To provide information on the distribution of nutrient intakes in different age groups and to describe the characteristics of individuals with intakes above and below the average;
- (iv) To identify foods that are the main contributors of nutrients in the diet of particular population groups, for example elderly people; and
- (v) To provide a database to enable the estimation of likely dietary exposure to non-nutrient constituents of foods, for example natural toxicants, contaminants and additives, for risk assessment.

Progress

88. The Working Party did not meet this year as there was insufficient business to warrant a meeting. Details of the work programme for 1999 are set out in Appendix I. The total cost of the surveillance programme in 1999/2000 will be £407,000, all of which relates to the National Diet and Nutrition Survey (NDNS), a programme of approximately three-yearly surveys of different population age groups funded jointly with the Department of Health.

89. Preparation of the report of the NDNS of young people aged 4-18 years has continued. A number of factors have slowed progress and a report of the findings is now expected in Spring 2000.

90. Fieldwork for the feasibility study for the NDNS of adults aged 19-64 years began at the end of September 1999, after a six month delay due to difficulties in obtaining ethical approval, and will continue until the end of the year. Fieldwork for the main survey is scheduled to begin in July 2000 and will run for a year. A report of the findings is expected at the end of 2002.

91. The first of the projects on further analysis of the data from the NDNS of children aged 1½-4½ years⁶⁴ has been completed and has shown important interactions among indices of micronutrient status and markers of iron status, emphasising the need to consider these as well as dietary iron intake. For example, dietary iron intake from food sources was only

related to iron status in those children with the lowest iron status. Haemoglobin was positively associated with vitamin C intake, body weight and plasma measures of retinol, vitamin D and zinc, and negatively associated with intake of n-6 polyunsaturated fatty acids.

92. In order to provide robust, quantitative data on food consumption, from which intakes of nutrients and exposure to food chemicals can be derived, it is necessary to develop, evaluate and validate improved methods of dietary assessment. Work on research projects in this area continued during 1999. A project aiming to produce a predictive model and derive correction factors for mis-reporting of food consumption continues and is due to report in 2000.

93. The Working Party continues to be responsible for the TDS which supplies composite food samples representative of average consumption for analysis of any food constituent. The samples thus collected are used by other working parties to estimate intakes in Great Britain (GB) of those food constituents (nutrient and non-nutrient) of interest or concern for which there are no other current data.

Future Work

94. The future work of the Working Party is currently under review. However the focus will continue to be on the following areas:

- the development of methods for collecting reliable, quantitative data on habitual food consumption, and the validation of such methods; and
- advising on the design, methodology and reporting of NDNS, in particular the collection and reporting of food consumption data.

Food Additives

Background

95. The core objective of this surveillance work is to ensure that the use of food additives and processing aids does not prejudice food safety. The data obtained are used to inform work on the estimation of the intake of food additives and to develop a strategic approach to this task. The Working Party on Food Additives meets twice a year and advises on possible areas of future surveillance work. This advice is considered by Government in reviewing which new surveys might be included in the Requirements Documents. Government research on food additives is reviewed annually⁶⁵. Further information regarding the Working Party can be obtained by contacting Dr Wendy Matthews, Room 228, Ergon House, 17 Smith Square, London SW1P 3JR (Tel. +44 (0) 20 7238 6229).

Long-term aims

96. The long-term aims of this surveillance and related work are as follows:

- to develop methods for the accurate and meaningful estimation of food additive dietary intakes;
- to develop techniques to identify which food additives should be considered in detail;
- to carry out specific evaluations of the dietary intakes of those food additives which might exceed acceptable levels; and
- to formulate an inventory of processing aids used in UK food manufacture which identifies their function and intended purpose in each type of food product.

Progress

97. Four surveys were completed in 1999. These were on annatto in retail foods, red and yellow colours in sauces for meat and ethnic foods, and 3-monochloropropane-1,2-diol in acid hydrolysed vegetable protein and soy sauces. Seven other surveys started in 1999 as set out in Appendix I. The overall cost of the programme, in which 610 samples were analysed and 2243 analyses performed, was £144,000.

98. Details of the surveillance work programme for 1999 are set out in Appendix I. An additives database developed to assist with intake assessments has been expanded and work is being carried out to incorporate this facility into an additives information system. This will provide valuable data to aid the estimation of intakes. JFSSG continues to take an active role in developing intake assessment methodology for additives. This is being done both in the context of an EU Additives Monitoring Exercise and the Codex General Standard on Food Additives. Several further reports have been delivered to the European Commission and collaboration has increased with other organisations to assist this work. Developments in the markets for additives are monitored to help maintain a sharp focus to the surveillance work.

Future work

99. The following work will be carried out in 2000:

- A new survey of caramels in foodstuffs will start.
- A new survey of intense sweeteners in beverages consumed by young children will begin.
- Dietary intakes of additives will continue to be estimated.

Food Authenticity

Background

100. The Working Party on Food Authenticity was established in October 1992 to co-ordinate work on food authenticity surveillance and authenticity method development. Membership of the Working Party comprises representatives from industry, retail, catering, enforcement bodies, consumer groups and Government officials. The core objective of its work, is to identify and report on current or potential food authenticity issues, and develop methods capable of determining them. Further information regarding the Working Party can be obtained by contacting Dr Michelle McQuillan, Room 323, Ergon House, c/o Nobel House, 17 Smith Square, London SW1 3JR (Tel. + 44 (0) 20 7238 6168).

Long-term aims

- 101.** The Working Party has agreed the following long-term aims for its work programme:
- to form, to the extent resources permit, an overview of the general level of compliance with labelling and compositional legislation and authenticity standards of foods marketed in the UK;
 - to identify, assess and prioritise the food authenticity issues and foods or sectors of the market where surveillance is needed;
 - to assess and evaluate analytical methods to determine food authenticity, advise on the significance of the results they give, and recommend further development or research where methodology is lacking.
 - to co-ordinate authenticity surveys by agreeing protocols and procedures.

Progress

102. The Working Party met twice during 1999. Mr Paul Raynor joined the Working Party replacing Mr Nigel Garbutt as the representative from the British Retail Consortium. Details of the work programme for 1999 are set out in Appendix I. The overall cost of the

programme was approximately £372,500 and entailed approximately 4165 analyses on 1787 individual samples.

103. Work on developing appropriate analytical methodology has continued under the direction of the Working Party's Methodology Sub-Group. The group have finalised the protocol for detecting added water in poultry meat. They also discussed methods for the detection GM soya in processed foods and agreed to focus their consideration on methods such as real time polymerase chain reaction (PCR) which would allow more accurate quantitative determination. Method development work in this area will continue in 2000. Consideration has also been given to the methods for detecting adulteration of white spirits, basmati rice and spreadable fats.

104. The Working Party considered the issues of openness at its April meeting. It concluded that in the spirit of greater openness it would publish a summary of the issues discussed at each meeting in the Food Safety Information Bulletin. Protocols would also be made available once surveys had commenced.

105. The Working Party suggested it would be useful to explore whether other European countries carry out any food authenticity work and consider the possibility of tapping into such information. Under Scientific Co-operation (SCOOP), the UK have put forward a proposal to conduct a SCOOP task involving a co-ordinated exchange of information on food authenticity work taking place in other Member States. The initial concept was favourably received and a more detailed proposal is currently under consideration by the SCOOP management committee.

106. During 1999 the results from three surveys were reported in the Food Safety Information Bulletin with detailed results provided in an accompanying information sheet. The April edition reported the results of two authenticity surveys, on undeclared meat species in meat products and orange juice.

107. The results of the orange juice survey demonstrated the success of the food authenticity surveillance programme of improving the quality of the product offered for sale to consumers. The survey found none of the 186 samples analysed to be adulterated either with added sugar, malic acid or enzymically degraded peel or pulp extracts.⁶⁶ This showed a considerable improvement from previous surveys which had found a number of oranges juice samples to be adulterated.

108. The meat speciation survey found 83 of the 570 samples analysed to have labels which did not declare a species of meat detected within them.⁶⁷ Limitations to the methodology did not, however, offer enough quantitative precision for it to be possible to say whether the non-declared species were present as a result of deliberate substitution or accidental cross contamination.

109. A survey on the authenticity of olive oil was reported in the June Bulletin which showed the majority of the 125 oils analysed to be correctly described.⁶⁸ Four samples were found to exceed European Commission limits for one or more chemical criteria used to distinguish and authenticate the different grades of olives oil. In all of the authenticity surveys retailers and the relevant Trading Standards/Home Authorities were made aware of the findings and appropriate action has been taken.

110. Two other surveys were also completed in the latter part of 1999 and the results will be published early in 2000 *via* the Food Safety Information Bulletin. These are:

- the authenticity of apple juice
- the authenticity of speciality oils

111. A further two surveys which started in 1999 will be completed in 2000. These will be investigating the misdescription of tuna products and the presence of added water in whole chickens and chicken parts. The results of these will be published in the relevant edition of the Food Safety Information Bulletin as soon as possible after completion.

Future Work

112. In 2000 the Working Party intends to focus its efforts to:

- identify and prioritise food authenticity issues with a view to carrying out surveillance as deemed appropriate. The following topics are currently under consideration:
 - GMO labelling;
 - description of fresh potato varieties;
 - glycerol in wine;
 - vegetarian foods;
 - geographical origin wine;
 - authenticity of vinegar;
 - premium long grain rice;
 - white spirits (gin, vodka, white rum);
 - nutritional labelling of fat spreads; and
 - labelling of fish products (total fish content; fish mince content; added water).

- report the findings of individual surveillance exercises, method development and validation work and advise where further research or development work is required to improve or validate existing methods, and advise on the significance of results by giving an overview of completed surveys;

- continuously review its own procedures for identifying, undertaking and publishing surveys by taking into account any revisions to the general procedures and guidelines adopted within JFSSG;

- examine ways of having a better exchange of information of its work with that of local government enforcement authorities; and

- consider development and application of novel analytical approaches.

Nutrients in Food

Background

113. The Working Party on Nutrients in Food (WPNF) was first convened in 1991. This Working Party, along with the Working Party on Dietary Surveys, replaced the Working Party on Nutrients and provides an expertise predominantly in the area of food composition. The core objective of the Working Party is to ensure that the Government possesses sound and extensive data on the nutrient content of foods consumed in the UK, in order to support government policy on the balance of nutrients in the nation's diet. The Sub-Group on Preparation of Data was set up to oversee the preparation of data from the Ministry's surveillance programme and elsewhere for publication in the *McCance and Widdowson's The Composition of Foods* series. Further information regarding the WPNF can be obtained by contacting Miss Victoria Grace, Room 429D, Ergon House, c/o Nobel House, 17 Smith Square, London SW1P 3JR (Tel. +44 (0) 20 7238 5500; e-mail v.grace@jfssg.maff.gov.uk).

Long-term aims

114. The constitution, terms of reference and future priorities of the Working Party are currently under review, along with the Working Party on Dietary Surveys. The long term aims of the Working Party will continue to include:

- the investigation and monitoring of the nutritional adequacy of the diet, both of the nation as a whole and particular sections of the population;
- the monitoring of the extent to which the quantitative dietary targets set by the Government are being met;
- being able to identify the size and characteristics of any population that may be at risk because of an inadequate or excessive intake of a nutrient;
- identifying foods that are the main contributors of nutrients in the diet of specific groups of people;

- measuring both the effect and effectiveness of food, agricultural, social and health policies on the nutrient intake of the population; and
- assisting with the planning of diets for closed communities.

115. Historically, the nutritional data were used to estimate the risk of deficiencies arising as a result of food shortages and to help to plan the allocation of available food supplies. Although food shortages are no longer a problem, concern is growing at the increased risk of deficiency of some vitamins and minerals in certain population groups, as a result of restricted or poor choice or availability of foods. Evidence is also growing of the links between foods or individual nutrients and the risk of developing chronic diseases, such as heart disease and cancer. Information on the nutrient content of food is vital if the relevance of this evidence base is to be assessed.

Progress

116. Neither the Working Party, nor the Sub-Group on Publication of Data, met during this year as there was insufficient business to discuss. However, both provided advice by correspondence. Details of the work programme for 1999 are set out in Appendix I. The total cost of the surveillance programme in 1999 was £88,000 and involved approximately 8,500 analyses.

117. The results of a survey to determine the nutrient composition of ‘other’ milks and creams (including UHT and sterilised milks, dairy and non-dairy creams and butter) were reported in Food Surveillance Information Sheet No. 178.⁶⁹ Surveys to determine the nutrient composition of bread and morning goods, cheeses and ice creams and desserts have been completed and will be announced early in 2000.

118. A survey of the products available in the breakfast cereal market was carried out, as background research for a nutrient surveillance project on this area that will commence in 2000. The results from all these projects will be evaluated for inclusion, where appropriate, in the Ministry’s nutrient databanks for the NDNS and the National Food Survey. A research

project to develop and validate a routine high performance liquid chromatography (HPLC) method for the determination of folates and folic acid in foods was commissioned during 1999.

119. 'Fatty acids', the latest supplement to *McCance and Widdowson's The Composition of Foods*, was published in electronic format in March 1999. The Working Party provided advice on the scope and format and foods and nutrients to be included in the sixth edition of *The Composition of Foods* which is in preparation, and advised on the formation of a Composition of Foods User Group.

Future Work

120. The future work of the Working Party is currently under review. However, the Working Party intends to continue to focus its efforts on the following areas:

- Providing advice on sampling protocols;
- Continuing to identify the individual foods that make up the UK diet and, where appropriate, prioritising projects;
- Continuing to identify the need for, and provide advice on priorities for associated research on methodological studies for improved methods of analysis, and particularly the separation and measurement of different forms of nutrients in foods; and
- Continuing to advise on the content and format of *McCance and Widdowson's The Composition of Foods*.

Pesticide Residues in Food

Background

121. The WPPR reports to both the FAC and the ACP. It was set up in 1977 to survey both home-produced and imported food and feedingstuffs, human tissues, wildlife and the

environment for residues of pesticides, their metabolites and other degradation products. The core objectives of its work are to:

- (i) Ensure compliance with maximum residue levels (MRL) and to alert the FAC, the ACP and Departments, at the earliest opportunity, to any pesticide/commodity areas where pesticide residues are being found that are above the MRLs or higher than expected; and
- (ii) Provide information on the incidence and levels of pesticide residues in both UK-produced and imported produce so that areas requiring further investigation can be highlighted and consumers' exposure can be estimated.

122. The EC has a strong influence on the work of the WPPR. In 1988 there were 1000 UK MRLs, today there are over 10,500 - the vast majority of which have been set under an EC harmonisation programme. The Commission's intention is that this process should continue until there are MRLs for all pesticide/commodity combinations in the EU. The introduction of Directive 97/41/EC is intended to speed up this process as powers for setting MRLs have now transferred from the Council to the Commission.

123. There is also a requirement for all member states to submit their monitoring results for the previous year and forward programmes for the coming year to the Commission.

Long-term aims

124. The Working Party has agreed the following long-term aims for its work programme:

- (i) To carry out annual monitoring of the dietary staples (bread, milk and potatoes), which form a large part of the average national UK diet and from which exposure to pesticide residues needs to be regularly assessed;
- (ii) To carry out regular monitoring programmes covering the main food groups (fruit and vegetables, cereals and cereals products, products of animal and fish origin) and feeding stuffs for selected pesticides. This will include participating in future EU harmonised monitoring programmes;

- (iii) To carry out *ad hoc* surveys of produce which intelligence or previous surveillance has suggested may contain unacceptable residues of a particular pesticide;
- (iv) To estimate average and the upper limit of normal intakes of pesticides from individual foods using food consumption data from dietary surveys and the mean residue levels found in samples analysed in the surveillance programmes, supplemented by TDSs carried out at appropriate intervals;
- (v) To carry out surveys of pesticide residues in human fat and breastmilk to provide further information on the persistence of longer lived pesticides in the UK population;
- (vi) To encourage the development of new methods such as multi-residue techniques, and the extension of existing methods to ensure that pesticides and commodities can be analysed rapidly, economically and with sufficient accuracy and specificity.

Progress

125. A new lay representative was appointed to the Working Party in 1999. There will be a further review of membership of the Working Party in 2000.

126. The Working Party held three meetings during 1999 one of which dealt exclusively with the preparation of the annual report of the WPPR for 1998 which was published in September 1999.⁶ During the last meeting of the year, the Working Party agreed the numbers and types of samples for the 2000 programme which had been proposed by the Sub-group on Future Priorities. The sub-groups on Fruit and Vegetables, Cereals and Cereal Products and Products of Animal/Fish Origin also met on a number of occasions during the year.

127. The 1998 annual report was the tenth to be published by the Working Party. The report was again made available free of charge and has been placed on the Internet. The report contains the results of regular monitoring of dietary staples, the rolling programmes for the different commodity sectors, miscellaneous surveys, enforcement monitoring and some monitoring undertaken by industry in 1998. As in previous years, the report contains all residue results in tabular form with a brief summary of the results and subsequent action. The

report also contains a section on 'trends and developments' which featured residues in a range of citrus fruits. For the first time the report included full brand name information on the commodities analysed, published as a separate annex. This increases the amount of information available to consumers about the products they buy. Also it brings pesticides in line with other chemical contaminant surveys run by JFSSG where brand names are already published.

128. EU Member States take part in a voluntary EU monitoring programme involving the analysis of a small number of samples for an agreed list of pesticides. Surveys of carrots, oranges, spinach, peaches and nectarines carried out under the EC programme are included in the 1998 Annual Report. The aim of these surveys differed from the WPPR's usual objective (to target resources where intelligence/previous monitoring suggests that residues are likely) in that they concentrated particularly on those pesticides for which EC MRLs have been set.

129. In total over 2,200 samples were analysed by the Working Party and results for over 90,000 pesticide/commodity combinations were reported. The total expenditure was £1.7M of which approximately 60% was funded by the agrochemical industry to reflect the relative proportions of UK and imported produce on the market.

130. Levels of pesticide residues in bread and potatoes were generally low and all were below their respective MRLs, where these have been set. Residue levels in samples of cereals and cereal products, animal products and fruit and vegetables were also generally low, with 3% of fruit and vegetables containing residues in excess of their respective MRLs. No MRLs were exceeded in animal products. In the cereals programme for 1998, MRLs exist only for the grain but none of these were exceeded. Overall, the proportions of samples containing residues were very similar to those of previous years with 1.3% of samples containing residues above the MRL, 26% containing detectable residues (above the limit of determination but below the MRL) and 73% containing no detectable residues.

131. Increased monitoring of milk continued for lindane residues with analyses being carried out on receipt as a follow-up to the unexpected elevation in residues found in 1995 monitoring. No residues were detected in any of the samples.

132. Misuse of various fungicides and insecticides on UK-produced winter lettuce by a minority of growers has been of continuing concern. In 1998 monitoring was carried out on retail samples in addition to the enforcement campaign directed at growers. Some improvements were seen compared to monitoring carried out in previous years, particularly in terms of the absence of residues of non-approved pesticides in growers' lettuce samples. However results from the analysis of the samples from retailers in particular indicated use of non-approved pesticides and MRL exceedances. Based on enforcement monitoring carried out since 1994/5, five growers have been successfully prosecuted and several others issued with warning letters. The Government is determined to maintain this pressure for improvement and a further enforcement programme is in operation for 1999/2000.

133. A survey on pears was initially carried out in 1995 following intelligence that chlormequat, a growth regulator that is not approved for use on fruiting pears in the UK, was being used by some UK growers. Residues were found and a wider survey in 1997 showed that 30% of UK samples contained chlormequat. In the 1998 survey, chlormequat residues were determined in 4 of the 5 UK samples and one of these exceeded the MRL. In addition 5 of the 36 imported pears contained residues in excess of the MRL, together with another of unknown origin. A consumer risk assessment for the most vulnerable population group (toddlers in this case), assuming residues at the highest level detected and a high consumption figure for toddlers, indicated that safety margins could be eroded. Whilst there is not a risk of serious health effects, these levels are clearly unacceptable.

134. The 1998 pear monitoring results were published in June in advance of the Annual Report in line with the Government's commitment to openness. The results were published in the form of a Pesticide Residues Information sheet which was announced via the July Food Safety Information Bulletin and the results were made available on the Pesticides Safety Directorate (PSD) Web site.

135. Many of the pears exceeding the MRL were imported from the Netherlands and Belgium. The issue has been raised with the Dutch and Belgian authorities. Belgium has suspended the use of chlormequat on pears and other countries have undertaken to screen exports to the UK.

136. The WPPR are continuing to monitor the situation in 1999. Pears are being analysed on a monthly basis. The results of the first six months of the 1999 pear survey were published in October this year in a further Residues Information Sheet showing a similar situation. Enforcement monitoring of UK and imported pears commenced in October 1999.

137. A large proportion of yams were found to contain residues of carbendazim and/or imazalil in excess of the MRL. These particular MRLs were set at the limit of determination. This is because the crop is not grown in Europe and there was no request for an 'import tolerance' from the exporting countries. The countries concerned have been notified of the results and invited to apply for an import tolerance. The residues do not present a risk to the health of consumers. Yams will be included in the 2000 monitoring programme.

138. Carrots have been monitored extensively by the Working Party since 1990. This was increased from 1994 following the discovery of the unexpectedly wide variation of residues between individual carrot roots. Restrictions on the number of organophosphorus applications were introduced in 1995. Carrot fly pressure has been low since 1996 and there was a reduced level and incidence of residues in 1996 and 1997 which has also continued in 1998. Organophosphorus residues were found in 13 of the 66 samples analysed in 1998 but no multiple organophosphorus residues were detected. These findings appear to reflect a continued move by UK growers away from the use of organophosphorus insecticides towards pyrethroid pesticides to control carrot fly since 1995.

139. Data supplied by industry are again included in the 1998 annual report. These data include results from approximately 700 samples which represents a significant reduction in contribution compared to previous years (*ca* 2000 samples). It should be recognised that

industry monitoring is largely carried out to ensure compliance with MRLs, not to assess consumer exposure and in that respect differs to the objectives of the WPPR.

140. A large proportion of the work programme comprises the continuous monitoring of the dietary staples of bread, milk and potatoes and the rolling programmes for the main food groups of fruit and vegetables, cereals and cereal products, products of animal and fish origin. In addition to these projects, the work programme includes *ad hoc* surveys of produce which intelligence or previous surveillance suggests merit further work. Research and development projects carried out in support of surveillance are also described.

141. Method development provides essential support to the work programme. Research is also being undertaken to improve existing methods in terms of accuracy and efficiency by, for example, investigating sources of interference in residue analysis and incorporating and/or developing new hardware and software technology. In addition, existing methods are being extended to enable new pesticide residues and/or commodities to be analysed.

Future Work

142. In 2000 the WPPR will focus its efforts on the following areas:

- (i) Analysis of around 2,500 samples comprising the dietary staples (bread, milk and potatoes) and the main food groups (fruit and vegetables, cereals and cereal products, animal products, and fish and fish products) covered by the rolling programmes.
- (ii) Production of programmes for the sampling and analysis of the dietary staples and main food groups in 2001.
- (iii) Publication of an annual report of the Working Party's activities in 1999
- (iv) Contribution to the European Union harmonised monitoring programme

143. For the 2000 programme the Working Party will be analysing a selection of fruit and vegetables sampled from the 'back of the store' in order to ensure greater reliability of the

information on the origin of loose produce in particular. The Working Party will also be moving towards more frequent publication of survey results.

144. There will also be a full review of the membership of the Working Party with the aim of reconstituting the committee with an entirely independent membership.

Radionuclides in Food

Background

145. The Working Party on Radionuclides in Food was first convened in 1988. Its roles are to:

- continually assess the development of a national strategy for the surveillance of radioactivity in foodstuffs;
- assist in the development of a programme of externally commissioned research to maximise the efficiency of current surveillance; and,
- identify where further monitoring may be required.

146. The core objective of its work is to ensure and demonstrate that the radionuclide content of foods consumed in the UK is acceptable and that radiation dose via the ingestion pathway meets national standards and dose limits. Further information can be obtained by contacting Mrs Caroline Morris, Room 530, Ergon House, c/o Nobel House, 17 Smith Square, London, SW1P 3JR. (Tel. + 44 (0) 20 7238 6209). E-mail c.morris@fsci.maff.gov.uk

Long-term aims

147. The Working Party has agreed the following long-term aims for its work programme:

- to develop and maintain comprehensive, continuous environmental surveillance programmes to ensure that radioactive discharges from licensed nuclear sites and other industries do not result in unacceptable levels of radionuclides in foods;
- to quantify more accurately the actual or potential doses to humans from radionuclides in foods and to ensure that these are within acceptable limits;

- to carry out *ad hoc* surveys to investigate the impact of changes to the operation of nuclear plants or commencement of new processes and to ensure that surveillance programmes adapt where necessary to maintain comprehensive coverage;
- to investigate the geographical and temporal variation of naturally occurring radionuclides in food and agriculture, and their pathways to the consumer;
- to develop and maintain environmental surveillance programmes around non-nuclear industrial sites where enhanced levels of natural and anthropogenic radioactivity may be found;
- to develop appropriate survey design, analytical methodology and quality assurance in support of surveillance programmes for radioactivity in foodstuffs;
- to provide the necessary scientific and technical information to official bodies and the public sector to demonstrate that food and agriculture are being adequately safeguarded in the context of radioactive substances; and
- to establish baseline data on radionuclide levels in food and agricultural produce around nuclear sites and nation-wide against which any subsequent contamination by accidental release of radioactivity can be compared.

Progress

148. There have been two meetings of the Working Party during 1999. The major task of work involved reporting the results from monitoring of aquatic and terrestrial foodstuffs around nuclear establishments and sites remote from nuclear sites, undertaken in 1998.

149. The 1998 Radioactivity in Food and the Environment (RIFE) report⁵ was published jointly by MAFF and the Scottish Environment Protection Agency (SEPA) on 21st September and gave details of 1998 radioactivity levels and potential doses to the public for the entire UK.

150. The report concluded that estimated doses to individuals living near nuclear sites and consuming locally produced and caught terrestrial and aquatic foodstuffs during 1998 were well within UK and EU limits. Doses from natural radionuclides in foods dominated those from artificial sources.

151. As part of the Ministry's initiative to increase openness and transparency of its Advisory and Working Parties dealing with food safety issues, the WPRF agreed to make the agendas, completed papers, minutes of meetings and the Register of Members' Interests publicly available. These would be available on request and also put onto the MAFF Internet site with a summary of the meeting reported in the Food Safety Information Bulletin. The same Bulletin would also continue to report the results of all surveys with further details available as Food Surveillance Information Sheets. The Working Party also gave consideration to having open public meetings.

152. The Working Party's programme for 1999 is presented in the Appendix I. The terrestrial surveillance programme (work areas 1, 3, 5-9, 11-14 and 16) involved the collection of approximately 5794 samples that were subjected to 7035 analyses. The cost of this portion of the surveillance programme was approximately £1.30 M. Comparable figures for the aquatic surveillance programme (work areas 2, 4, 10-12 and 15-16) are 891 samples subjected to 7,961 analyses at a cost of £0.89 M. The major area of work undertaken was reporting the results from the environmental surveillance programmes as detailed in work areas 1 to 5 and 7 in the Appendix. Eight new projects were commissioned and nine projects (including those below) were completed during the year:

- A computer-based decision-aiding tool to assist MAFF in prioritising the monitoring programme requirements has been developed. The model built, called Optimon-T, takes into account factors covering practical, financial and public perception aspects. This model enables the user to compare different monitoring strategies and, for existing strategies, to determine whether and how improvements could be introduced.

- A more sensitive methodology for the analysis of cerium-144 has been devised. A method for analysis of strontium-90, using a semi-automated Dionex chelation ion-chromatography system was modified. Cerium-144 concentrates onto a resin and is then separated from other retained metals by anion exchange using a mixture of oxalate and diglycolate eluents. The cerium-144 levels in the eluent are evaluated by liquid scintillation counting of the ingrowth of praseodymium-144.
- A simple, quantitative integrating sampler for radionuclides in freshwater systems has been developed. It is based on diffusive gradients in thin-film and consists of an absorbent gel matrix that accumulates radionuclide ions diffusing through a diffusive gel, at a controlled rate determined by the gel thickness, the diffusion coefficient and radionuclide solution concentration. The absorbent can then be analysed to allow determination of the concentration. Trials have proved robust results for caesium-134, caesium-137, cobalt-60, zinc-65 and strontium-90. Initial trials on technetium-99, americium-241 and plutonium-242 provided encouraging results.
- A survey of the transfer of radioactivity from fishmeal, used in animal feeding-stuffs, has been completed. Sources of UK production and import were investigated, samples were collected and were analysed for a range of radionuclides. Estimates were determined for likely human uptake of these radionuclides from the consumption of animal products derived from animals fed on fishmeal-based feeding-stuffs. Even at pessimistic levels of activity and consumption it is not expected that the dose from man-made radionuclides would exceed 9 μ Sv/year (below 0.1% of the legal limit).
- A study on local food production around major UK nuclear sites has completed its development stage and is undergoing an evaluation stage. Field-by-field analysis was conducted to a radius of 2 km; on a farm-by-farm basis up to 8 km; and up to 15 km the analysis was parish-by-parish. Data has been entered onto a Geographical Information System (GIS) to aid routine and ad-hoc surveys of radioactivity in foods from close to nuclear establishments.

153. Ongoing work includes:

- Environmental measurements of radioactivity often fail to establish the presence of contamination in samples since the levels are so low. In this respect the true levels are hidden or 'censored'. A study will review and investigate the mathematical techniques available to provide more realistic, but still conservative, estimates of 'censored' data values consistent with the available data.
- Continuation of a quality control programme for the measurement of radioactivity in foodstuffs. In general, the overall performance of UK radioanalytical labs in this proficiency testing scheme could be described as good for caesium-137 and plutonium-239+240, fair to good for uranium-238 and thorium-232, variable for strontium-90 and poor for sulphur-35 and radium-226.
- A study to assess the potential levels of radioactive contamination of foodstuffs grown on land that has been used for sewage sludge spreading. Preliminary findings indicate that the Thames would potentially receive a large load of tritium if all non-licensed nuclear sites discharged at 100% of their authorised limits. Extra routine surveillance for tritium has been put in place.

154. Some non-nuclear industrial sites discharge enhanced levels of natural radioactivity to the environment. A small rolling programme of monitoring has continued in order to assess the impact of radioactivity on the food-chain via these routes and the 1999 sampling results will be reported in the RIFE report published in 2000. In 1999 the landfill site work previously conducted by MAFF passed to the Environment Agency with the number of industrial sites studied increasing from four to six.

155. Other ongoing work includes the 5-year programme of Duplicate Diet studies around nuclear sites. These surveys determine the actual dietary intake of local people living near to

nuclear sites who regularly eat locally produced food. In 1999 duplicate diets from around Hinkley Point and Sellafield were sampled.

156. Eight new projects have been commissioned this year:

- Seasonal variation in body-burden of significant radionuclides in crabs and lobsters will be assessed. This information will allow optimisation of sampling for these species. The study is aimed at variation due to species physiology and behaviour more than environmental variation.
- An intercomparison exercise of UK laboratories for the analysis of organically bound tritium (OBT) in milk and fish.
- A survey is underway to look at the radionuclide content of the 19 food groups that together with beverages make up the TDS. The results will show which radionuclides in which food groups are the major contributors to the dose received by members of the UK public.
- A habit survey has begun to determine the usage of 'free foods' at two areas of England remote from any major nuclear installation. Free foods are non-cultivated foods collected from the wild. Results from this survey will dictate what samples are to be collected for analysis from these locations. Dose estimates will be calculated from these analytical results.
- A study to assess the level and variability of naturally occurring radionuclides in seafood, and the implications of this in estimating doses to consumers. The paucity of data relevant to UK coastal waters has been confirmed by a literature search. Suitable sample sites, not influenced by sources of man-made enhancement, have been selected in three sea regions. Target species have been identified and sampling and analyses will continue throughout a three-year project.
- Trends in activities and doses at nuclear sites in England and Wales are being investigated. A report of the findings will be made widely available in a format designed for easy reading by the public.

- A survey of samples not routinely collected as part of MAFF's Terrestrial Radioactivity Monitoring Programme (TRAMP) is being carried out around the Cardiff area. Radioanalysis will be made for tritium, radiocarbon and radiosulphur (S-35). The results will help answer some anomalous features of the environmental fate of radionuclides discharged under licence from the Nycomed Amersham plant. Problems in obtaining suitable samples are being addressed.
- A survey of levels of uranium in a variety of samples from the TRAMP and Food and Agriculture Radioactivity Monitoring (FARM) programmes, including milk, grass, faeces, total diet, etc.

Future Work

157. In 2000, the Working Party on Radionuclides in Food will focus its efforts on the following areas:

- the annual report for surveillance of radionuclides in foods for 1999;
- review the content of the monitoring programmes and their modification in the light of surveillance results or other information to ensure the programmes remain comprehensive and address all food-chain pathways to man;
- the optimisation and rationalisation of the monitoring programmes to take account of limiting factors such as sample size, cost and the need for statistically robust data;

158. Other future work is likely to include,

- Development of a database to hold all of MAFF's terrestrial radiological monitoring data since 1986 and the development of a custom-designed GIS front-end to display the data.
- Development of a method for chlorine-36 determination in foods using accelerator mass spectrometry.

- A survey to identify the less common marine biota potentially usable as food or in healthcare products and to collect samples for radioanalysis.
- A survey to assess trends in tritium and carbon-14 in aquatic foods
- design of a new database and data transfer of the Centre for Environment, Fisheries and Aquaculture Science's (CEFAS's) radiological surveillance results
- the computerisation of historic environmental radioactivity surveillance records held by CEFAS

Veterinary Residues in Animal Products

Background

159. The Advisory Group on Veterinary Residues (AGVR) was first convened in 1995. Its main role is to:

- advise on all aspects of the incidence and concentration of residues of veterinary medicines in food of animal origin sampled under EC Directive 96/23/EC.⁷⁰

The core objective of its work is to ensure that residues of veterinary medicines in food producing animals do not enter the food chain in unacceptable concentrations. The AGVR meets three times a year, and includes independent members with expertise in consumer and analytical matters as well as members from representative organizations such as the United Kingdom Agricultural Supply Trade Association (UKASTA), the National Office of Animal Health Limited (NOAH), the British Veterinary Association (BVA) and the National Farmers' Union (NFU). Its work ensures that the residues surveillance programmes of the Veterinary Medicines Directorate (VMD) are subject to independent expert scrutiny and advice. Further information regarding the AGVR can be obtained from Mr C Penny, VMD, Woodham Lane, New Haw, Addlestone, Surrey KT15 3LS (Tel. +44 (0) 1932 338322) (c.penny@vmd.maff.gov.uk)

160. The Steering Group on Analytical Methods (SGAM), an expert group set up by the AGVR to advise it on the analytical methods used in the VMD residues programmes and the future R&D needs in this area, held its final meeting in January 1999.

Long Term Aims

161. The AGVR has agreed that the aim for the surveillance work programme is:

- to protect the consumer by ensuring that residues of veterinary medicines in food producing animals do not enter the human food chain in unacceptable concentrations.

Progress

162. The AGVR met in March, June and October 1999 and details of its work programme for 1999 are set out in Appendix I. The results of the VMD's statutory and non-statutory residues surveillance schemes are published in the Annual Report on Surveillance for Veterinary Residues (ARSVR),⁷¹ which was again well received by both industry and consumers. This publication provides the background to, and the content of, the surveillance programmes along with detailed results and supporting commentaries. The summary results are outlined quarterly in the Medicines Act Veterinary Information Service (MAVIS) and in the VMD Annual Report and Accounts.⁷

Statutory Programme

163. The 1999 National Plan for statutory surveillance is set out in Appendix VIII of the fourth ARSVR.⁷¹ Statutory surveillance has continued in accordance with the provisions set out in Council Directive 96/23/EC.⁷⁰ Under this Directive eggs, wild and farmed game, milk and honey became fully part of the statutory scheme from 1 January 1999.

164. During 1998 a competitive tender was carried out for the analytical work of the National Surveillance Scheme with a view to awarding a five-year contract to begin on 1 January 1999. The LGC was awarded the contract early in December 1998.

165. Under the 1999 National Plan, some 34,800 samples were collected and subjected to approximately 41,400 analyses. The cost of the programme, £3.9 million, was met entirely from charges on industry.

166. The results of statutory surveillance carried out in GB between January and December 1999 continue to be encouraging. Of approximately 34,539 samples, 99.8 per cent were found to contain no residues above the MRL. Details of these results are given in recent editions of MAVIS.⁷²⁻⁷⁴

167. All positive findings in red meat, game, poultry, milk and egg samples are followed up by the State Veterinary Service (SVS). Follow-up investigations on fish samples are undertaken by CEFAS (for England and Wales) and the Fisheries Research Services (FRS) (for Scotland). Farmers and veterinary surgeons are advised how to avoid residues in the

future. Where these follow-up visits indicate serious shortcomings, or illegal substances are involved, consideration is given to prosecution.

Non-statutory Programme

168. The 1999 sampling for non-statutory surveillance is set out in Appendix IX of the fourth ARSVR.⁷¹ Since the publication of the 1999 plan, the AGVR at its meeting in June 1999 agreed further minor amendments on the basis of contemporary expert advice (details in MAVIS).⁷³

169. If any results are in excess of the 'Action Level' (concentration equal to the MRL where this has been set, or the limit of quantification (LOQ) where no MRL has been set), the VMD advises producers, retailers and food importers at the same time as the results are published in MAVIS. Where the food is imported, the producer country is notified so that they can take appropriate action to prevent the same residues being found in the future. Under the 1999 programme, some 1,600 samples were collected and subjected to approximately 8,995 analyses. The cost of approximately £700,000 was met entirely by MAFF.

170. The results available from June 1999 to December 1999 continue to be generally reassuring. Details of these results can be found in recent additions of MAVIS.⁷²⁻⁷⁴

Future work

171. Further details of the 1999 statutory and non-statutory surveillance programmes, including concentrations of positive residues, will be found in the fifth ARSVR to be published in July 2000.

172. The AGVR will hold two meetings in March and June 2000 before being reconstituted under the Nolan principles as the Veterinary Residues Committee (VRC). The VRC is expected to hold its first meeting in the second half of 2000. It will provide the Chief Executives of the VMD and the FSA with independent expert scrutiny and advice on the content of the Agencies' veterinary residues surveillance programmes and on the significance of the results in terms of consumer safety. It will also focus its work in the following areas:

- for the **VMD's statutory scheme**, from 1 January 2000, it is forecast that approximately 35,000 samples will be collected as in 1999. The programme will cover residues of a large range of veterinary medicines in red meat, poultry, milk, eggs, fish, wild and farmed game and honey; and
- for the **2000 non-statutory plan**, approximately 1,400 samples will be collected and 7,500 analyses undertaken. The programme includes matrices that are based on the most popular preparations of meat and animal products, according to the national average consumption figures. To reflect consumer purchasing habits, the 2000 plan includes imported meat, organic produce and a range of processed foods.

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APPENDIX I

WORK PROGRAMMES

Chemical Contaminants in Food

Area of Work	Objectives	Duration	Contractor
<i>Inorganic Contaminants - metals and other elements</i>			
1. Lead and cadmium in raw (unprocessed) foodstuffs.	To determine the concentrations of lead and cadmium in raw commodities to inform negotiations on the proposed EC Regulation setting maximum limits for lead and cadmium in food.	April 1998 – October 1999	Central Science Laboratory
2. Lead and cadmium in foods not included in the draft EC Regulation on lead and cadmium.	To provide data on those minor components of the diet which are not included in the draft EC Regulation. This information will aid discussions on the development of controls for these foods.	August 1999 – March 2000	Campden and Chorleywood Food Research Association
3. Iodine levels in milk.	To determine the concentrations of iodine in cows' milk on sale in the UK.	June 1998 – August 1999	Laboratory of the Government Chemist
4. Mercury in fish and shellfish and their products.	To provide data on total mercury concentrations in imported fish, shellfish and their products to assess dietary exposures of consumers.	September 1999 – October 2000	University of Bristol
5. Tin in canned tomato products.	To determine the concentrations of tin in canned tomato products for comparison with the UK statutory limit for tin in food.	December 1988 – February 1999	Campden and Chorleywood Food Research Association
6. Tin in canned pineapples.	To determine the concentrations of tin in canned pineapples for comparison with the UK statutory limit for tin in food.	January 1999 – March 1999	Campden and Chorleywood Food Research Association
7. Multi-element analysis of 1997 Total Diet Study samples.	To determine the concentrations of 14 elements including, for the first time, bromine, iodine and fluorine, and estimate dietary exposures of consumers.	April 1998 – December 1999	Central Science Laboratory

Chemical Contaminants in Food (cont.)

Area of Work	Objectives	Duration	Contractor
8. Multi-element survey of allotment produce.	To provide data on the normal ranges of arsenic, cadmium, chromium, copper, lead, mercury, nickel, tin and zinc in soils and crops from typical allotments in the UK.	July 1998 – November 1999	University of Bristol
9. Multi-element survey of free foods.	To provide a snapshot of the concentrations of arsenic, cadmium, chromium, copper, lead, mercury, nickel, tin and zinc in free foods (e.g. berries, fungi) to assess dietary exposures of consumers of these foods and to detect environmental contamination. Platinum analyses are also included to determine the extent of contamination of foods grown near roadsides from traffic using catalytic converters.	July 1998 - July 1999	University of Bristol
<i>Inorganic Contaminants – nitrate</i>			
10. UK Monitoring Programme for Nitrate in Lettuce and Spinach.	To meet requirements of EC Regulation No. 194/97 as amended by EC Regulation No. 964/99.	January 1999 – December 2001	Norfolk County Council Trading Standards Department
11. Nitrate in lettuce and spinach.	To provide information on nitrate levels in lettuce and spinach for negotiations of a review of EC Regulation No. 194/97 as amended by EC Regulation No. 964/99.	August 1998 - January 1999	ADAS Laboratories
<i>Organic Environmental Contaminants – dioxins and PCBs</i>			
12. Survey of dioxins and PCBs in cows' milk from the Rotherham area.	To provide information on the concentrations of dioxins and PCBs in samples of cows' milk taken in 1998 only from the Rotherham area as follow-up to earlier work.		Central Science Laboratory

Chemical Contaminants in Food (cont.)

Area of Work	Objectives	Duration	Contractor
13. Survey of dioxins and PCBs in chicken and duck eggs.	To provide information on the concentrations of dioxins and PCBs in chicken and duck eggs to identify the potential for use in assessing specific localised contamination.	April 1994 - April 2000	Central Science Laboratory
14. Survey of dioxins and PCBs in shellfish.	To provide information on the concentrations of dioxins and PCBs in shellfish to allow estimates to be made of dietary exposures via this source.	April 1997 - April 2000	Central Science Laboratory
15. Survey of dioxins and PCBs in fats and oils for food production.	To provide information on the concentrations of dioxins and PCBs in fats and oils used in the production of cereal products, confectionery and snack foods.	April 1997 - September 2000	Central Science Laboratory
16. Survey of dioxins and PCBs in Total Diet Study samples.	To determine dietary exposures to dioxins and PCBs via the typical diet and to provide time trend data.	April 1997 - April 2000	Central Science Laboratory
17. Survey of dioxins and PCBs in infant formulae.	To provide information on the concentrations of dioxins and PCBs in infant formulae. To allow comparison of the dietary exposures of dioxins and PCBs by breast fed and formula fed infants.	May 1997 - April 2000	Central Science Laboratory
<i>Organic Environmental Contaminants - other environmental contaminants</i>			
18. Residues in food of non-active ingredients of pesticide formulations.	To analyse samples of wheat of known treatment history and samples of wholemeal bread produced from such wheat. To determine the residues of organic solvents and wetting agents present as non-active ingredients in pesticide formulations used on such wheat.	May 1995 - November 1999	RHM Technology Ltd.

Chemical Contaminants in Food (cont.)

Area of Work	Objectives	Duration	Contractor
19. Synthetic musks in foods.	To determine the concentrations of nitromusks in composite Total Diet Study samples and selected retail foods and provide data to allow estimates to be made of UK dietary exposures to these compounds.	June 1995 - December 1999	Leatherhead Food Research Association
20. Chlorinated paraffins and chlorinated solvents in foods.	To determine the concentrations of chlorinated paraffins and chlorinated solvents in composite Total Diet Study samples and selected retail foods and provide data to allow estimates to be made of UK dietary exposures to these compounds.	September 1995 - December 1999	Leatherhead Food Research Association
21. Determination of individual phthalate esters in retail samples of fatty foods.	To procure retail samples of fatty foods from across the UK and analyse them for residues of specific phthalate esters, providing data to allow estimates to be made of UK dietary exposures of these compounds. To investigate the concentrations of monoester phthalate metabolites in poultry and eggs.	June 1996 - June 2000	Central Science Laboratory
22. An investigation into the identity and levels of phthalate esters present in food at stages in the production of milk products.	To take and analyse samples of milk and dairy products at various stages of production to assess whether there is any significant change in concentrations of specific phthalate esters during food production.	July 1996 - March 2000	Leatherhead Food Research Association
<i>Mycotoxins</i>			
23. Human exposure to ochratoxin A.	To examine the correlation between plasma/urine concentrations of ochratoxin A and dietary intake.	December 1995 - February 1999	Central Science Laboratory

24. Surveillance of grain for ochratoxin A at intake to cereal stores 1997-1998.	To determine ochratoxin A in stored wheat, barley and oats from the 1997 harvest.	October 1997 - September 1998	KAS Mycotoxins and RHM Technology Ltd.
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Chemical Contaminants in Food (cont.)

Area of Work	Objectives	Duration	Contractor
25. Survey of directly produced apple juice and apple juice produced from concentrate for patulin.	To determine the patulin concentration in directly pressed apple juice and apple juice produced from concentrate.	April 1998 - September 1998	Central Science Laboratory
26. A critical study to develop sampling plans for mycotoxins.	To write a computer program that will make information on mycotoxin sampling schemes accessible to operators in the field.	May 1997 – December 1998	RHM Technology Ltd.
27. Survey of levels of ochratoxin A in retail commodities.	To measure the contamination of ochratoxin A in retail commodities e.g. dried fruit, red wine, chocolate, grape juice and pulses.	May 1998 - April 1999	RHM Technology Ltd.
28. Survey for aflatoxins, ochratoxin A, zearalenone and fumonisins in maize.	To assess the degree to which aflatoxins, ochratoxin A, zearalenone and fumonisins occur in raw whole maize imported into the UK for human consumption.	June 1996 - May 1999	KAS Mycotoxins and RHM Technology Ltd.
29. Report on mycotoxin surveillance 1993-1996.	To present MAFF – funded work on mycotoxins carried out since the publication of Food Surveillance Paper No 36 in a concise and 'consumer friendly manner'.	July 1997 – March 1998	KAS Mycotoxins
<i>Inherent Natural Toxicants</i>			
30. Duplicate diet study of vegetarians.	To measure the concentration of several naturally occurring toxicants in vegetarian diets in order to establish dietary intakes of these compounds for vegetarians in the UK.	May 1997 – February 1999	BMRB International and the Central Science Laboratory

Chemical Migration from Materials and Articles in Contact with Food

Area of Work	Objectives	Duration	Contractor
1. Survey of migration of benzophenone from paper and board packaging materials into food.	To determine whether benzophenone is present in retail foods, as a result of migration from packaging, at levels which could pose a risk to health.	April 1998 – December 1999	Central Science Laboratory
2. Survey of packaging used for take away food.	To analyse the range of packaging materials used for take away foods, for potential migrants and their levels in food.	June 1997 – January 2000	Central Science Laboratory
3. Survey of chemical migration from can coatings into food & beverages.	To determine the migration of selected substances from internal coatings on cans:	January 1998 – May 2000	Pira International
	1. Formaldehyde	Work on this substance completed and reported in FSIS No. 157.	
	2. Epichlorohydrin	Work on this substance completed and reported in FSIS No. 170.	
	3. isophthalic acid & terephthalic acid)	
	4. BADGE, BFDGE & related compounds) - in progress	
5. bisphenol A & bisphenol F)		
4. Survey of aqueous food and drink for migration of mercaptobenzo-thiazole and related vulcanisation residues.	To test samples of food and drink for residues of vulcanisation accelerators used to make natural rubber and nitrile rubber.	June 1998 - April 2000	Central Science Laboratory
5. Survey of packaging materials used for dietary staples.	To examine the market share held by each type of packaging, distinguishing between virgin and recycled materials, for about 100 different food commodities and to investigate the conditions of use of the packaging that might affect chemical migration.	July 1999 - August 2000	Pira International

Dietary Surveys

Area of Work	Objectives	Duration	Contractor
1. National Diet and Nutrition Survey: young people aged 4-18 years.	To provide detailed, quantitative information on the food and nutrient intakes, sources of nutrients and nutritional status of young people.	February 1996 - April 2000	Office of National Statistics and MRC Resource Centre for Human Nutrition Research
2. National Diet and Nutrition Survey: adults aged 19-64 years.	To provide detailed, quantitative information on the food and nutrient intakes, sources of nutrients and nutritional status of adults.	October 1999 - December 2002	Office of National Statistics and MRC Resource Centre for Human Nutrition Research

Food Additives

Area of Work	Objectives	Duration	Contractor
1. Survey of the extent of use of food additives.	To develop and maintain an extensive database on which additives are present in which foods.	Continuing	Additives and Novel Foods Division, JFSSG
2. Survey of additive markets.	To maintain a watching brief on developments in the markets for individual and/or particular groups of food additives.	Continuing	Additives and Novel Foods Division, JFSSG
3. Survey of annatto in foodstuffs.	To provide information on the level of use of annatto in a range of permitted foods and thus facilitate the more accurate calculation of dietary intakes.	April 1997 - March 1999	Central Science Laboratory
4. Survey of red and yellow colours in sauces for meat and ethnic foods.	To provide information on the levels of colourings used in these foods and to allow dietary intakes to be calculated more accurately.	September 1998 - March 1999	Reading Scientific Services Ltd.
5. Survey of 3-monochloropropene-1,2-diol (3-MCPD) in acid hydrolysed vegetable protein (acid-HVP).	To assess the 3-MCPD content of acid-HVP used in food to check for compliance with the Food Advisory Committee's guideline limit of 10 µg/kg.	November 1998 - March 1999	Central Science Laboratory
6. Survey of the levels of caramels in soft drinks.	To provide information on the levels of caramel colour present in soft drinks from both retail and catering outlets and to allow dietary intakes to be calculated more accurately.	November 1999 - October 2000	Reading University
7. Survey of the levels of carotenes in soft drinks.	To provide information on the levels of carotenes used in foods permitted to contain this colour and to allow dietary intakes to be calculated more accurately.	June 1999 - December 2000	Central Science Laboratory
8. Survey of 3-MCPD in foods.	Carry out a survey of 3-MCPD in foods to check for compliance with the Food Advisory Committee's guideline limit of 10 µg/kg.	October 1999 - May 2000	Central Science Laboratory

Food Additives (cont.)

Area of Work	Objectives	Duration	Contractor
9. Survey of 3-MCPD in food ingredients.	Carry out a survey of 3-MCPD in food ingredients to check for compliance with the Food Advisory Committee's recommendations.	October 1999 - March 2000	RHM Technology Ltd.
10. Development of surveillance methods for class III caramels.	To provide methods for future surveillance work.	November 1999 - March 2000	Reading University
11. Survey of artificial colours in children's sweets.	To provide information on the levels of these colourings used in children's sweets, in particular the unwrapped "pick-n-mix" selections.	November 1999 - March 2000	Reading Scientific Services Ltd.
12. Survey of 3-MCPD in soy sauce.	Carry out a survey of 3-MCPD in soy sauce samples on sale in the UK to check for compliance with the Food Advisory Committee's guideline of 10 µg/kg and in response to the recent findings of other member states.	September 1999	Central Science Laboratory

Food Authenticity

Area of Work	Objectives	Duration	Contractor
1. Survey on undeclared species in meat products.	To investigate whether the meat species or meat type named on a label of a product sold in the UK is correct; and if not to identify where possible, the substituting species.	December 1997 – January 1999	Greater Manchester Scientific Services Ltd. and Rowett Research Institute
2. Survey on olive oil authenticity.	To determine by chemical analysis whether olive oils sold in the UK are being substituted or adulterated with lower grades of olive oil or other cheaper vegetable oils.	December 1997 – February 1999	Central Science Laboratory and ADAS, Wolverhampton.
3. Survey of apple juice authenticity.	To apply methods of analysis to ascertain whether apple juice sold in the UK is being adulterated, and if so, to identify the adulterating material.	January 1999 - March 1999	Reading Scientific Services Ltd. and Eurofins Scientific, Analytical Services (South Wales)
4. Survey to determine the misdescription of tuna products.	To investigate the mislabelling or misdescription of tuna products containing bonito or species of tuna other than indicated on the label.	October 1998 – February 2000	Central Science Laboratory, Rowett Research Institute and Laboratory of the Government Chemist
5. Survey of speciality oil authenticity.	To investigate whether speciality oils (walnut, sesame, grapeseed and hazelnut) sold in the UK are being substituted or adulterated with cheaper vegetable oils.	April 1998 - January 1999	Central Science Laboratory, Kent Scientific Services, Leatherhead Food Research Association , Mylnefield Research Services and Reading Scientific Services Ltd.
6. Survey of added water in poultry.	To investigate the addition of excess or undeclared extraneous water in whole chicken and chicken parts sold in the UK.	October 1999- July 2000	Eurofins Scientific and Public Analyst laboratories
7. Development of methodology for the quantitative detection of GM material in food.	To evaluate use of real-time PCR methodology for the accurate determination and quantification of the presence of GM soya in processed foods containing soya. This is to enable investigation of the validity of GM-free labelling claims in such products.	June 1999- February 2000	Central Science Laboratory, Eurofins Scientific, Leatherhead Food Research Association and Laboratory of the Government Chemist

Nutrients in Food

Area of Work	Objectives	Duration	Contractor
1. Survey of dietary supplements for essential fatty acids.	To determine the fatty acid content of a range of dietary supplements.	July 1996 to Autumn 2000	Laboratory of the Government Chemist
2. Nutrient analysis of cheese.	To provide up to date and reliable information on the nutrient content of cheese.	May 1998 to May 1999	Laboratory of the Government Chemist
3. Nutrient analysis of bread and morning goods.	To provide up to date and reliable information on the nutrient content of bread and morning goods.	August 1998 to June 1999	Laboratory of the Government Chemist
4. Nutrient analysis of ice cream and desserts.	To provide up to date and reliable information on the nutrient content of ice cream and desserts.	August 1998 to March 1999	ADAS
5. A market survey of the breakfast cereal products available in the UK	To provide up to date and reliable information on the breakfast cereal products available in the UK	October to November 1999	IIS

Pesticide Residues in Food

Area of Work	Objectives	Duration	Contractor
1. Pesticides in the UK food supply.	To monitor the levels of the active ingredients of pesticides and biocides and their metabolites of toxicological significance to man, domestic animals and the environment and advise the ACP, IDS, FAC or the Departments as appropriate.	January to December 1998	Purchasing contract - Research Services Ltd. Analytical contracts: Laboratory of the Government Chemist, Central Science Laboratory, Department of Agriculture for Northern Ireland, Scottish Agricultural Science Agency and RESTEC Laboratories

Radionuclides in Food

Area of Work	Objectives	Duration	Contractor
1. Terrestrial Radioactivity Monitoring Programme (TRAMP).	To monitor milk, crop and animal produce in the vicinity of licensed nuclear sites, and estimate exposure resulting from discharges to the atmosphere.	Continuous	Veterinary Laboratories Agency
2. Aquatic Radioactivity Monitoring Programme.	To monitor fish, shellfish, aquatic plants and assess additive exposure pathways from liquid discharges around licensed nuclear sites.	Continuous	Centre for Environment, Fisheries and Aquaculture Science
3. Food and Agriculture Monitoring Programme (FARM): National Dairy and Crop Programmes and Isle of Man.	To monitor the radiological quality of the national food supply, to generate representative data not affected by the proximity of nuclear establishments, to generate data useful for the identification of temporal trends.	Continuous	Veterinary Laboratories Agency
4. Analysis of aquatic materials at locations near non-nuclear sites, at former nuclear sites and remote from nuclear sites.	To calculate individual exposure from industrial sites, to provide information on background and post-operational radioactivity in the aquatic environment, and to determine UK population exposure.	Continuous	Centre for Environment, Fisheries and Aquaculture Science
5. Determination of total uranium in samples from MAFF's TRAMP and FARM modules.	To analyse milk, crops, TDS, grass, soil and animal faecal samples for total uranium content, by delayed neutron counting.	Annual	Imperial College
6. Dietary study to assess intake of radionuclides of people living close to nuclear installations.	To assess the intake of radionuclides, via food ingestion, of members of the public consuming food most likely to be contaminated as a result of discharges of waste.	April 1995 - July 2000	British Market Research Bureau International
7. Radioactivity analysis for FARM: industrials and total diet survey.	To monitor the radiological quality of the national food supply. To generate representative data not affected by the proximity of nuclear establishments and for use in the identification of temporal trends.	June 1997 - March 2000	National Radiological Protection Board

Radionuclides in Food (cont.)

Area of Work	Objectives	Duration	Contractor
8. Continuation of a quality control programme for the measurement of radioactivity in foodstuffs.	Intercomparison exercise between UK laboratories for the analysis of various radionuclides in foodstuffs.	March 1998 - March 2000	Atomic Energy Authority Technology plc
9. Investigation of the methods available for the practical utilisation of left-censored environmental measurement data.	To establish a hierarchy of approaches which may be applied in an analysis of left-censored data.	June 1998 - December 1999	National Radiological Protection Board
10. Natural radionuclides in seafood.	To assess the level and variability of naturally occurring radionuclides in seafoods.	April 1999 - March 2002	Centre for Environment, Fisheries and Aquaculture Science
11. Five year trend report for site-specific data reported in RIFE.	To investigate potential trends in activities and doses at nuclear sites in England and Wales.	April 1999 - March 2000	Centre for Environment, Fisheries and Aquaculture Science
12. Cardiff radiological survey of selected foods.	To survey samples not taken routinely as part of projects 1 & 2 from the Cardiff area to investigate the anomalous tritium results obtained.	August 1999 - December 1999	Centre for Environment, Fisheries and Aquaculture Science
13. The radiological impact of naturally-occurring radionuclides in foods from the wild.	To determine the usage of free foods and resultant doses from consumption of free foods to members of the public at two locations remote from nuclear sites.	August 1999 - July 2002	National Radiological Protection Board
14. Analysis of the food groups in the total diet study.	A survey of activity levels and resulting doses to members of the public for 19 food groups that, together with beverages, make the TDS.	April 1999 - March 2000	Institute of Terrestrial Ecology
15. Seasonal variation in radionuclide concentrations in crabs and lobsters.	Seasonal variation in body-burden of radionuclides in crabs and lobsters due to species physiology and behaviour.	June 1999 - May 2001	Centre for Environment, Fisheries and Aquaculture Science
16. Assessment of UK laboratory performance: tritium in fish and milk.	An intercomparison of UK laboratories analysing for OBT in milk and fish.	May 1999 - January 2000	Atomic Energy Authority Technology plc

Veterinary Residues in Animal Products

Area of Work	Objectives	Duration	Contractor
1. Statutory surveillance for veterinary medicine residues in red meat, poultry, fish, eggs, milk, wild and farmed game and honey.	To assess the incidence and concentrations of veterinary medicine residues in the UK in red meat (cattle, pigs, sheep and goats), poultry, fish, eggs, milk, wild and farmed game and honey.	January 1999 – December 1999	Meat Hygiene Service, State Veterinary Service, Centre for Environment, Fisheries and Aquaculture Science, Fisheries Research Services, Egg Marketing Inspectorate, Laboratory of the Government Chemist, Veterinary Science Division and Food Science Division DANI
2. Non-statutory surveillance for veterinary medicine residues in food of animal origin.	To assess the incidence and concentrations of veterinary medicine residues in the UK in food preparations and imported foods of animal origin.	June 1999 – January 2000	British Market Research Bureau International and Central Science Laboratory

APPENDIX II

Food Surveillance Information Sheets

list compiled and maintained by:

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<u>No</u>	<u>Title/Subject Area</u>	<u>Date</u>	<u>Bulletin</u>
169	Diisopropylnaphthalenes in Food Packaging Made from Recycled Paper and Board	Jan 1999	104
170	Survey of Chemical Migration from Can Coatings into Food and Beverages -2. Epichlorohydrin	Jan 1999	104
171	Survey of Ochratoxin A in Grain Traded by Central Depots 1997-1998	Feb 1999	105
172	A Survey of Human Exposure to Ochratoxin A	Apr 1999	107
173	1998 Survey of Apple Juice for Patulin	Apr 1999	107
174	Survey of Retail Paper and Board Food Packaging Materials for Polychlorinated Biphenyls (PCB's)	Apr 1999	107
175	MAFF Orange Juice Authenticity Surveillance Exercise	Apr 1999	107
176	Meat Speciation Survey	Apr 1999	107
177	Nitrate in Lettuce and Spinach	May 1999	108
178	Nutrient Analysis of Other Milks and Creams	May 1999	108
179	Tin in Canned Tomato Products	June 1999	109
180	Authenticity of Olive Oils	June 1999	109
181	Survey of 3-Monochloropropane-1,2-diol (3-MCPD) in Acid-hydrolysed Vegetable Protein	June 1999	109
182	Tin in Canned Pineapples	July 1999	110
183	Evaluation of the Radiological Impact of Free Foods Found in the Vicinity of Nuclear Sites	July 1999	110
184	Dioxins and PCBs in UK and Imported Marine Fish	Aug 1999	111
185	1998 Survey of Retail Products for Ochratoxin A	Aug 1999	111

<u>No</u>	<u>Title/Subject Area</u>	<u>Date</u>	<u>Bulletin</u>
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186	Epoxidised Soya Bean Oil Migration from Plastic Gaskets	Sept 1999	112
187	Survey of 3-Monochloropropane-1,2-diol (3-MCPD) in Soya Sauce and Similar Products	Sept 1999	112
188	Transfer of Radioactivity from Fishmeal in Animal Feedingstuffs to Man	Oct 1999	113
189	Total Diet Study: Styrene	Nov 1999	114
190	Metals and Other Elements in Infant Foods	Nov 1999	114
191	1997 Total Diet Study - Aluminium, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Tin and Zinc	Nov 1999	114
192	Survey for Aflatoxins, Ochratoxin A, Fumonisin and Zearalenone in Raw Maize	Dec 1999	115
