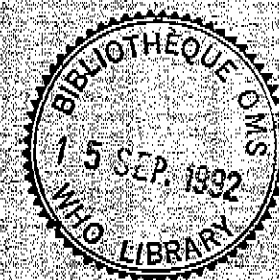


JOINT UNEP/FAO/WHO FOOD CONTAMINATION MONITORING  
AND ASSESSMENT PROGRAMME (GEMS/FOOD)

**REPORT OF THE THIRD MEETING  
OF THE GEMS/FOOD  
PROGRAMME MANAGEMENT COMMITTEE**

Geneva, Switzerland  
25-27 November 1991



Prepared under the joint sponsorship of the United Nations Environment Programme,  
the Food and Agriculture Organization of the United Nations and the World Health Organization  
in cooperation with the Global Environment Monitoring System (GEMS)

WORLD HEALTH ORGANIZATION, GENEVA, 1992

## THIRD MEETING OF THE GEMS/FOOD PROGRAMME MANAGEMENT COMMITTEE

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## 1. INTRODUCTION

The Third Meeting of the Programme Management Committee (PMC) of the Joint UNEP/FAO/WHO Food Contamination Monitoring and Assessment Programme (GEMS/Food) was held from 25 to 27 November at WHO Headquarters in Geneva. The meeting was opened by Dr Fritz Kaferstein, Chief, Food Safety Unit, Food and Nutrition Programme on behalf of WHO Director-General Dr Hiroshi Nakajima and Dr Jean Rochon, Director, Division of Health Protection and Promotion. In welcoming the participants, Dr Kaferstein expressed his optimism that GEMS/Food was entering a period of dynamic growth and progress. In this regard, he introduced Dr Gerald Moy who has been appointed GEMS/Food Coordinator for WHO.

Dr Peter Peterson, Director of UNEP GEMS/MARC, London, welcomed participants on behalf of UNEP Executive Director Dr Mostafa K. Tolba and Dr Michael D. Gwynne, Director of the UNEP Global Environment Monitoring System. He noted the revitalization of the other GEMS activities in air and water and expressed the hope that GEMS/Food could look forward to similar developments in the future. Also representing UNEP was Dr Verle Vandeweerd of the GEMS Programme Activity Centre in Nairobi who stated that GEMS/Food continued to play an important role in GEMS by providing essential data on dietary exposure to environmental contaminants and called for the broadening the scope of the programme.

On behalf of FAO Director-General Mr Eduoard Souma, Dr M. Lourdes Costarrica, Nutrition Officer, Food Quality and Standards Service, Food Policy and Nutrition Division, also welcomed the participants and noted the particular FAO interest in strengthening food control infrastructure/programmes including food contamination activities in developing countries, through technical assistance to governments and the food industry to enable better consumer protection and promotion of international food trade.

Representatives from the WHO Regional Office for Europe in Copenhagen, the WHO Centre for Environment and Health in Rome and the International Agency for Research on Cancer in Lyon attended the meeting. In addition, four representatives from GEMS/Food Collaborating Centres for Food Contamination Monitoring in China, Sweden, the United Kingdom and the United States of America served as temporary advisers. The Director of the GEMS/Food Collaborating Centre in Berlin attended as an observer. A complete list of participants is given in Annex 1.

The participants of the meeting agreed that Dr Kaferstein would serve as the Chairman and Dr Moy would serve as the Secretary assisted by Dr Verle Vandeweerd, UNEP GEMS Programme Activity Centre, Nairobi and Dr Costarrica of FAO. The participants adopted the provisional agenda as given in Annex 2 with no changes.

## 2. MATTERS ARISING FROM THE SECOND MEETING OF THE PMC

Following the Second Meeting of the GEMS/Food PMC which was held 6-7 March 1990 at FAO Headquarters in Rome, a draft report was prepared for limited distribution. In addition, a summary paper presenting the matters arising from the

meeting was prepared and is given in Annex 3. A number of these matters are discussed in relation to other agenda items which are presented in various sections of this report. Participants agreed that the summary paper should be distributed to all participating institutions.

### **3. ACTIVITIES RELATED TO GEMS/FOOD**

#### **3.1 FAO programmes and projects**

The Food and Agriculture Organization of the United Nations is greatly concerned with the problem of food contamination because of their negative effects on the health of the population, food trade and food security. FAO provides, through its Food Quality and Standards Service of the Food Policy and Nutrition Division, advice and technical assistance to its member countries in the field of food control which covers food contamination monitoring programmes. FAO's field programme includes over 40 projects which are being implemented in different parts of the world with the common objective of assisting member countries in improving one aspect or another of their food control systems. Of these, 10 are in Africa, 11 are in Asia, 5 are in Europe, 16 are in Latin America and the Caribbean and 6 are in the West Asia. In addition, FAO in collaboration with UNDP has implemented a project to establish a food control training network in Asia. Five institutions in various Asian countries have been established as training centres for various aspects of food control. A bi-annual newsletter is published in relation to the project. FAO is paying special attention to the implementation of quality assurance exercises in Asia and Latin American and the Caribbean in laboratories which participate in the monitoring of mycotoxin and pesticide residues. In addition, FAO is also providing, on request of its Member Countries, standards of both types of contaminants to support food contamination monitoring activities.

FAO has widely distributed to government agencies, laboratories, universities and GEMS/Food Participating Institutions, guidelines and manuals published by FAO, at times in cooperation with UNEP and WHO. Of particular interest to GEMS/Food, FAO published in 1991 the Food and Nutrition Paper 14/12, manual of food quality control 12, entitled "Quality assurance in food control microbiological laboratory" and a manual on quality assurance in the food chemical laboratory will be available for distribution in late 1992. These publications are available from FAO upon request.

#### **3.2 UNEP programmes and projects**

The United Nations Environment Programme, as the lead organization within the UN system with responsibility for coordination of environmental issues, promotes, through the Global Environment Monitoring System (GEMS) programmes, the generation of information and data on all aspects of the environment. UNEP, working as a catalyst in association with its partner organizations within the UN system, has sought to obtain the most accurate, precise and reliable environmental data in order to assure proper management of environmental resources. Besides GEMS/Food, UNEP supports a number of major global programmes designed to address different environmental compartments such as atmosphere, natural resources, environmental contamination, etc.

Within the group of environmental pollution programmes, including global urban air and water quality monitoring programmes, the Human Exposure Assessment Locations (HEALS) programme relates closely to the GEMS/Food. This joint UNEP/WHO programme, with its assessments and pilot phase results, assesses total human exposure to lead, cadmium and pesticide residues and more recently with fluoride, mercury and arsenic, and illustrates the major importance of food consumption in the exposure pathway.

Data resulting from GEMS programmes and other environmental data are periodically compiled by GEMS/MARC, London, and published as the biennial UNEP Environmental Data Reports. GEMS also cooperates with UNEP's Ocean and Coastal Areas Programme Activity Centre for the monitoring of contaminants in marine organisms which among others, assesses contaminant levels in edible marine animals. The chemical characteristics and toxicological implications of chemical substances released into the environment fall within the joint UNEP/WHO/ILO - International Programme on Chemical Safety (IPCS) and UNEP's own International Register of Potentially Toxic Chemicals (IRPTC) which includes additionally the concerns of legislation and Prior Informed Consent. UNEP's Industry and the Environment Office programme relates to contaminant release by the food industry among others.

The GEMS/HEM office in Munich supports the international harmonization of monitoring methodology. The environmental management division of UNEP has organized, with FAO, several training courses in food contamination monitoring. Increased co-operation and exchange of information between all these programmes will further strengthen the GEMS/Food programme.

### 3.3 WHO programmes and projects

#### 3.3.1 WHO Commission on Health and Environment

The WHO Commission on Health and Environment was charged with assessing the impact of environmental change on human health. The Commission consisted of four technical panels covering energy; food and agriculture; industry; and urbanization. The food and agriculture panel conducted a comprehensive review of the environmental changes to be expected as a consequence of expanding and intensifying food, agricultural and fisheries production to meet the needs of the increasing world population. The report of the Commission will be one of WHO's inputs into the UN Conference on Environment and Development, Rio de Janeiro, Brazil, June 1992.

#### 3.3.2 Rapid methods of analysis

A compendium of simple, rapid food tests which can be performed under field conditions was compiled for common food contaminants and adulterants. Many of the methods rely on immuno-reagents prepared by new biotechnology techniques and hold promise for countries where laboratory facilities are limited or transportation is difficult. Copies are being made available to all GEMS/Food participating institutions.

In China, WHO provided the services of a consultant to cooperate in the development of an immuno-based test kit for aflatoxins. In addition, the consultant

presented lectures and offered technical advice on the application of this technology for other food contaminants. This cooperation was provided within the framework of WHO's ongoing support for strengthening food safety infrastructure in China.

### 3.3.3 Food safety legislation

A regional seminar on food safety legislation was held in Kuala Lumpur in August 1990, attended by 18 participants from 16 Member States. A model food safety law was developed during the seminar for consideration by the Member States in the Region.

WHO continued its activities in regard to the compilation and dissemination of information on significant international, national, and subnational legislation dealing with aspects of food safety. The primary vehicle for the dissemination of this information is the WHO quarterly journal, the International Digest of Health Legislation (and its French-language counterpart, the Recueil International de Législation Sanitaire).

### 3.3.4 First Asian Conference on Food Safety

WHO collaborated as one of the main sponsoring agencies in convening the First Asian Conference on Food Safety, which was held in Kuala Lumpur in September 1990. It was attended by 450 participants from 33 countries and areas. The participants adopted a Regional Action Plan for promoting and improving food safety which can be the basis for regional and national initiatives undertaken by governments in cooperation with industry and consumers. One of the points of the plan called for strengthening or establishment of food contamination monitoring programmes.

### 3.3.5 Cooperation with WHO Member States in food contamination monitoring

Through the WHO Regional Offices, cooperation, including the provision of training, fellowships, consultant services and supplies and equipment, have been extended to Argentina, China, Colombia, Costa Rica, Honduras, India, Indonesia, DPR Korea, Rep. of Korea, PDR Laos, Malaysia, Mexico, Paraguay, Sri Lanka and Venezuela. Such cooperation contributes to national capacities for food contamination monitoring and promotes greater participation in GEMS/Food by developing countries.

### 3.3.6 WHO publications of interest to GEMS/Food

Since the last PMC meeting, several WHO publications of possible interest to GEMS/Food have been issued and are given in Annex 4.

## 3.4 Other programmes and projects

### 3.4.1 Joint FAO/WHO Expert Committee on Food Additives (JECFA)

Dr John Herrman of the WHO Programme on Chemical Safety reported on the recent meetings of JECFA and, in particular, on those contaminants which might be of interest to GEMS/Food. He noted that two important contaminants, benzo[a]pyrene and ochratoxin A, were evaluated. The report has been published in the WHO Technical Report Series (No. 806). The toxicological evaluations have been published in the WHO

Food Additives Series (No. 28). In addition, Dr Herrman noted that lead and cadmium would be re-evaluated by JECFA in February 1993. A compendium of JECFA specifications for identity and purity of food additives has been prepared and is available from the Joint FAO/WHO Food Standards Programme in Rome on request.

#### 3.4.2 Joint FAO/WHO Meeting on Pesticide Residues (JMPR)

Dr Herrman also reported on the JMPR which evaluates possible hazards to man arising from the occurrence of pesticide residues in food and establishes MRLs for pesticides on various food commodities. During 1990 and 1991, JMPR reviewed 8 new pesticides and 22 pesticides that had previously been considered including the GEMS/Food priority contaminant heptachlor.

#### 3.4.3 International Programme on Chemical Safety (IPCS)

The International Programme on Chemical Safety (IPCS), a collaborative activity between UNEP, the International Labour Organization (ILO) and WHO, now includes a network of 79 IPCS participating institutions in 26 countries. The environmental and health risks posed by some 130 chemicals and groups of chemicals have been evaluated and the results published as Environmental Health Criteria documents. Work has been initiated on a large number of other chemicals or groups of chemicals. Additionally, over 60 health and safety guides for decision-makers containing practical information on legislation, protection measures, as well as on first aid treatment in case of intoxication by each chemical have been published. Also, a set of approximately 370 Chemical Safety Cards for use at the shop-floor level have been issued. Of particular interest to GEMS/Food are the recent Environmental Health Criteria document on inorganic mercury (No. 118) and lindane (No. 124) which were published in 1991. In 1992, documents on cadmium and polychlorinated biphenyls are to be published. An up-date on lead is scheduled for 1993.

#### 3.4.4 GEMS/Water, GEMS/Air and HEALs

In collaboration among UNEP, WHO, the US Environmental Protection Agency, the Canadian Centre for Inland Waters and other participating organizations, these programmes are part of the United Nations system-wide effort to monitor the contamination of the world's water and air and, in the case of HEALs, to assess the impact of contamination from all sources on human health through analysis of human excreta, secreta and tissues. Further information on these programmes is available from WHO.

#### 3.4.5 Food safety concern as a result of environmental pollution in Kuwait

In a collaboration between WHO, UNEP and other international organizations, Dr Moy visited Kuwait from 30 July to 4 August 1991 to assess possible impact of the Iraq/Kuwait conflict on the safety of the food supply. One of the recommendation was the strengthening of food analytical capabilities to effectively monitor the food supply for residues of petroleum as well as pesticide residues. Subsequently, a WHO consultant provided technical cooperation in sampling and analytical methodology.

## 4. STATUS REPORT ON GEMS/FOOD ACTIVITIES

### 4.1 GEMS/Food institutions

The list of GEMS/Food participating institutions, including about forty countries, was reviewed and the PMC agreed that, in the future, telephone and facsimile numbers should be provided whenever possible. An up-dated list is given Annex 5.

In noting the wide differences in capabilities and responsibilities for food contamination monitoring among countries and participating institutions, the PMC agreed that, in the future, three different levels of participation in GEMS/Food should be defined, namely, National Participating Institutions, National Focal Points and Collaborating Centres.

### 4.2 Implementation of 1991 workplan

The PMC reviewed the implementation of the 1991 workplan which had proceeded smoothly with only minor revisions. All funds in the 1991 budget had been disbursed or obligated. One difficulty encountered was the identification of a sponsor to conduct the Analytical Quality Assurance studies for heavy metals which was under-funded in the budget. This was resolved with the agreement of the GEMS/Food Collaborating Centre in United Kingdom to again undertake this study on behalf of GEMS/Food and to absorb some of the overhead cost. However, there is a need to identify other sources of funds for the future.

### 4.3 Feasibility study of microbiological monitoring

The PMC reviewed the report prepared by Dr J.H.B. Christian entitled, "Monitoring of microbiological contaminants in the GEMS/Food programme" which was funded by WHO which concluded that, for the moment, such monitoring should not be formally included in GEMS/Food (see Annex 6). However, the PMC agreed with the report's further conclusion that microbiological monitoring be conducted on a trial basis until more experience can be obtained. Participating institutions will be provided with copies of the report and invited to submit appropriate data on their microbiological monitoring efforts.

### 4.4 Assessment reports

#### 4.4.1 Pesticide residues and heavy metals

The PMC was provided with copies of the report prepared by Dr C. Jelinek entitled, "Assessments of dietary intakes of chemical contaminants" and was requested to provide comments. The report would include assessments of heavy metals, organochlorine and organophosphorus pesticides and polychlorinated biphenyls. The report would be published by UNEP during 1992 with Dr Jelinek listed as the author.

#### 4.4.2 Aflatoxins

A progress report on the preparation of the assessment document on aflatoxins was

provided by Dr Peterson of MARC. The report would be the most comprehensive assessment of available data from GEMS/Food, published literature and, in some cases, unpublished studies. The report would be published by Blackwells on behalf of GEMS/Food during 1992.

#### 4.5 Assessment of Analytical Quality Assurance (AQA) studies

##### 4.5.1 Pesticide residues

Based on an analysis of the AQA studies conducted by GEMS/Food for five organochlorine pesticide, it is estimated that greater than 98% of the pesticide data submitted to the programme during the 1986-1990 period was likely to be of acceptable quality. However, it should be noted that while data were submitted by 15 countries, about 80% of the data on pesticides is from a single country, the United States.

##### 4.5.2 Heavy metals

Based on an analysis of the AQA studies conducted between 1986 and 1989, it is estimated that 20% of the lead data, 60% of the cadmium data and 80% of the mercury data submitted by participating institutions were unreliable.

#### 4.6 Technical Cooperation

From 14 October to 8 November 1990, a consultant supported by GEMS/Food and WHO visited Beijing and Chengde, China in cooperation with the Institute for Nutrition and Food Hygiene, Chinese Academy of Preventive Medicine to review the overall structure of the total diet study programme and to make recommendations that would result in more accurate estimates of the population's exposure to foodborne chemical contaminants as well as nutrients.

From 1-6 September 1991, a consultant supported by GEMS/Food visited the National Institute of Food Hygiene and Nutrition in Budapest, Hungary to cooperate in the residue analysis of organochlorine contaminants, with special emphasis on the determination of polychlorinated biphenyls.

#### 4.7 Reports and publications

The PMC reviewed the current list of GEMS/Food reports and publications which now includes 54 documents, 5 of which are in press and will be published in 1992 (see Annex 7). In this regard, it was noted that two GEMS/Food publications were issued in 1991, namely the summary of data received by GEMS/Food for the period 1986-1988 and a report of the analytical quality assurance studies carried out in 1989 and 1990.

### 5. DEVELOPMENT OF GEMS/FOOD PROGRAMME

#### 5.1 GEMS/Food priority contaminants

The PMC agreed that drinking water should be included in GEMS/Food as it can result in a significant contribution to dietary intake of certain contaminants, such as lead.

## 5.2 Database considerations

Mr Larry Grant, who is responsible for the GEMS/Food database within WHO Headquarters, presented an overview of the current capabilities and limitations of the data processing system. Mr Grant referred to the enormous decrease in recent years in the cost of storage capacity and recommended that considerable savings could be realized if the database were transferred to a microcomputer. The PMC agreed that this should be developed as a proposal with costing for various options.

## 5.3 Data collection considerations

The collection of monitoring data is currently accomplished by the completion of GEMS/Food data reporting forms. For countries which acquire and store their analytical data on computer, the completion of such forms has proved to be an obstacle to reporting. Consequently, much information is not being submitted to the GEMS/Food database. Therefore, the PMC agreed that electronic reporting of data should be an option in the future. As such data handling can also improve the accuracy of the data and promote quality assurance, a proposal for the diffusion of computer reporting to developing countries would be prepared for the next PMC.

## 5.4 GEMS/Food Regional Coordinating Centres

The possible expansion of GEMS/Food within the WHO European Region was presented by Dr Kello, who highlighted several related activities being undertaken, especially in regard to the European Community (EC) and the formation of the single European market under various EC directives. One of the recommendations of the consultation on food safety in Europe in the 1990s (Brussels, November 1989) was that a broad European food contamination monitoring programme should be established and linked to the global GEMS/Food network. With the availability of resources, the rapid expansion of the GEMS/Food in Europe was anticipated.

To give greater emphasis to food safety, Dr Peter Weigert, formerly the Director of the GEMS/Food Collaborating Centre in Berlin, discussed his current activities at the WHO European Centre for the Environment and Health located in Rome. Dr Weigert noted that food contamination was a component of European environmental assessment projects, namely "Concern for Europe's tomorrow" and "State of the environment in Europe". He also noted that planning was underway for holding a meeting of national focal points for GEMS/Food Europe in November 1992. He envisioned a considerable increase in monitoring data submitted by European countries in the future.

Dr Arnold, recently appointed Director of the German Centre for Surveillance and Health Evaluation of Environmental Chemicals (ZEBS), Berlin discussed the role of a possible GEMS/Food Regional Coordinating Centre in Europe to provide cooperation to European countries in technical areas of food contamination monitoring as well as to serve as a regional focal point for the international GEMS/Food network. The PMC endorsed the concept of the regional coordinating centres, but recognized that responsibilities of such centres would have to be negotiated individually based on the needs and resources available.

## 5.5 Analytical Quality Assurance (AQA) activities

Because of the problem of reliability of data being submitted to GEMS/Food, the PMC agreed that AQA studies, by themselves, were unable to assure that data were reliable and comparable. In particular, data from different monitoring programmes were not distinguished in terms of its reliability and comparability after it was entered into the database. As a consequence, the use of the GEMS/Food database, especially for regulatory decision-making, should be approached with caution. The PMC agreed that a system of identifying the reliability and comparability of data based on continuous AQA monitoring should be considered.

To promote awareness of the need to maintain adequate quality assurance in the laboratory to foster inter-laboratory collaboration, the analysis of the results of AQA studies will be sent to GEMS/Food Collaborating Centres or National Focal Points providing information on all AQA-participating laboratories in their countries, but avoiding precise identification. Participants in future AQA studies will be advised of this reporting. In a related matter, guidelines for the implementation of national AQA exercises for laboratories monitoring chemical contaminants in food being prepared by FAO will be sent to the three AQA coordinators for their comment prior to its publication.

In regard to future AQA studies, it was agreed that aflatoxin check samples should be restricted to aflatoxin B<sub>1</sub> and M<sub>1</sub>. In addition, heavy metal check samples would contain background levels similar to typical limits established for the contaminant. In the case of mercury, levels similar to the limits being considered by Codex should be approximated. These levels are 1.0 ppm and 0.5 ppm of total mercury for predatory and non-predatory fish, respectively. Because of the increasing cost of conducting the heavy metal AQA studies, the latest round of these studies had to be delayed into 1992. In the future, addition funds will have to be identified to maintain participation at current levels.

In this regard, GEMS/Food will approach other Collaborating Institutions for possible cooperation in implementation of AQA studies. It was recommended that regional AQA exercises be implemented to increase the frequency of studies. FAO will contact the Central Bureau of Nuclear Measurement of the CEE regarding its interest in collaborating with GEMS/Food in the conduct of AQA studies, particularly for European countries.

## 5.6 Dietary intake studies

A comprehensive food contamination monitoring and assessment programme was based on both an analysis of individual food items and information on dietary intake which together provide an estimate of dietary exposure to contaminants. However, it was recognized that the resources necessary to undertake such a programme were considerable. In fact, many countries did not have any information on dietary exposure to contaminants. From a review of the GEMS/Food database, it was apparent that little or no valid and comparable data on levels of contaminants in food and dietary intake exposure were available for many developing countries which represented a significant portion of the world's population. Consequently, the PMC recommended that, under such conditions, the conduct of total diet studies could serve to (a) generate basic

information on dietary intake of contaminants and identify potential hazards and (b) establish the technical capability for the implementation of on-going food contamination monitoring programmes in these countries. The PMC recommended that extrabudgetary resources be identified to promote such studies.

#### 5.7 Technical cooperation

The Committee agreed that the provision of technical cooperation is a priority for the programme and that efforts should be made to identify extrabudgetary resources for this purpose. Possible areas of technical cooperation include management of food contamination monitoring and assessment programmes, designing monitoring/sampling plans, data handling and analysis, dietary intake studies, laboratory analyses and their respective quality assurance, and preparation of national/regional food contamination assessment documents. Training in such areas should be complemented by the provision of relevant manuals and publications, reference materials, database systems (softwares), and selected priority reagents and laboratory materials, as resources permit.

Dr Costarrica reported that FAO on behalf of GEMS/Food would conduct two training course in pesticide residue analysis, including AQA techniques. The first one will be held in Guatemala in March 1992 for such countries as Cuba, Costa Rica, Dominican Republic, El Salvador and Mexico. The second will be held in Brazil in April 1992 for participants from Argentina, Brazil, Chile, Peru and Uruguay.

#### 5.8 Reports and publications

As mentioned under Section 4.6, five GEMS/Food publications are scheduled to be issued during 1992, including assessment documents based on 1986-1988 monitoring data.

### **6. GEMS/FOOD BUDGET AND WORKPLAN FOR 1992**

Because of the need to reconsider the basic strategy of GEMS/Food, the PMC agreed that preparation of the 1992 budget and workplan should be delayed until a new strategy was formulated.

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## AGENDA

THIRD MEETING OF THE GEMS/FOOD  
PROGRAMME MANAGEMENT COMMITTEEGeneva, Switzerland  
25-27 November 1991

1. Opening of Meeting
2. Adoption of Agenda
3. Matters arising from the Second Meeting of the GEMS/Food Programme Management Committee
4. Activities related to GEMS/Food
  - 4.1 FAO programmes and projects
  - 4.2 UNEP programmes and projects
  - 4.3 WHO programmes and projects
  - 4.4 Others
5. Status report on GEMS/Food Activities
  - 5.1 GEMS/Food Institutions
  - 5.2 Implementation of 1991 Workplan
  - 5.3 Feasibility study of microbiological monitoring
  - 5.4 Assessment reports
    - 5.4.1 Pesticides residues and heavy metals
    - 5.4.2 Aflatoxins
  - 5.5 Assessment of Analytical Quality Assurance studies
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    - 5.5.2 Heavy metals
    - 5.5.3 Aflatoxins
  - 5.6 Reports and publications
6. Development of GEMS/Food Programme
  - 6.1 GEMS/Food priority contaminants
  - 6.2 Database considerations
  - 6.3 Data collection considerations
  - 6.4 GEMS/Food Coordinating Centres
  - 6.5 Analytical Quality Assurance activities
  - 6.6 Dietary intake studies
  - 6.7 Technical cooperation
  - 6.8 Reports and publications
7. GEMS/Food Budget and Detailed Workplan for 1992-1993
8. Formulation and Adoption of Report

## MATTERS ARISING FROM THE SECOND MEETING OF THE GEMS/FOOD PROGRAMME MANAGEMENT COMMITTEE

The second meeting of the GEMS/Food Programme Management Committee of the Joint UNEP/FAO/WHO Food Contamination Monitoring Programme was held 6-7 March 1990 at FAO Headquarters in Rome resulting in the following conclusions and recommendations:

### **Report of the Previous Meeting of the GEMS/Food Programme Management Committee, Challes-les Eaux, France, 20-22 July 1989**

The report of the first meeting of the GEMS/Food Programme Management Committee held in 1989 in Challes-les-Eaux was approved for distribution to all GEMS/Food institutions.

### **Selection of GEMS/Food Contaminants and Foods**

A survey of all GEMS/Food institutions would be undertaken to identify priority contaminants and foods of national/regional concern for possible inclusion in GEMS/Food. This information will be considered by the GEMS/Food Programme Management Committee with their inputs.

A review of the possibility of including microbiological contaminants in the Programme would be postponed until the results of a feasibility study, carried out by WHO, were available.

### **Data Reporting, Handling and Publications**

Following the recommendations made in Challes-les-Eaux, all GEMS/Food participating institutions would be contacted to determine their agreement to release their computer processed data.

WHO would continue to explore the feasibility of using microcomputers in the Programme.

Any substantive assessment documents would be circulated to UNEP, WHO and FAO prior to publication and distribution.

An assessment of mycotoxins would be prepared by GEMS MARC based on information available from WHO, FAO and the open literature and would include a comparison of human exposure assessment data with contamination data.

An assessment of heavy metals and pesticide residues would be carried out by WHO.

A brochure on GEMS/Food would be prepared by UNEP.

#### **Mobilization of Extrabudgetary Resources**

Extrabudgetary resources would be sought to support the Programme.

#### **Establishment of Regional Centres**

A review of progress in establishing the GEMS/Food Regional Coordinating Centre for Europe would be undertaken at the next meeting.

#### **Data Quality Assurance**

An assessment of the acceptability of data submitted to the Programme would be carried out by WHO to include a review of the sampling, analytical and reporting procedures used by institutions that submitted data during the 1986-1988 reporting period. The assessment will be discussed by the GEMS/Food Programme Management Committee and the three AQA coordinators.

#### **Management of GEMS/Food Programme**

WHO would continue to manage the Programme with FAO serving as the technical lead for analytical quality assurance activities and with MARC playing a greater role in assessment of GEMS/Food data.

The 1991 GEMS/Food workplan was approved and the budget was recommended for submission to UNEP pending final revisions.

## WHO PUBLICATIONS OF INTEREST TO GEMS/FOOD

Diet, nutrition, and the prevention of chronic diseases. WHO Technical Report Series No 797, 1990.

Public health impact of pesticides used in agriculture. WHO, Geneva 1990.

Principles for the toxicological assessment of pesticide residues in food. Environmental Health Criteria, No. 104, WHO, Geneva 1990.

Methylmercury. Environmental Health Criteria, No. 101, WHO, Geneva 1990.

Inorganic mercury. Environmental Health Criteria, No. 118, WHO, Geneva 1991.

Lindane. Environmental Health Criteria, No. 124, WHO, Geneva 1991.

Strategies for assessing the safety of foods by biotechnology. Report of a joint FAO/WHO consultation, WHO, Geneva 1991.

Hazard Analysis Critical Control Point Evaluations - A guide to identifying hazards and assessing risks associated with food preparation. WHO, Geneva 1992.

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## MONITORING OF MICROBIOLOGICAL CONTAMINANTS\*

### INTRODUCTION

The major objective of GEMS/Food, as revised at a GEMS/Food Review and Planning Meeting (1) in 1989 "is to inform Governments, The Codex Alimentarius Commission, other relevant institutions and the public on levels and trends of contaminants in food, their contribution to the total human exposure and significance with regard to public health. This is to be done globally, regionally and locally, as well as in geographical areas of special concern, as a basis - where appropriate - for remedial actions, for food control and for resource management. Components supporting the Programme involve technical co-operation, analytical quality assurance programmes and information exchange."

To date the Programme has been concerned only with chemical contaminants in food. The same meeting resolved that a consultant be engaged to consider the inclusion of microbiological contaminants in the GEMS/Food Programme. Subsequently the consultant was asked

- (a) to consider the benefits that would accrue from the inclusion of microbial contaminants in GEMS/Food,
- (b) to recommend the microorganisms and the foods that should be included in the programme, and
- (c) to develop a data collection system to cover methods of analysis, sampling plans and reporting procedures.

This is the report of that consultation. It draws upon "Guidelines for Establishing or Strengthening National Food Contamination Monitoring Programmes" (2) which should be consulted for detail.

### BASIS OF THE EXISTING GEMS/FOOD MONITORING PROGRAMME

The objectives and benefits of an internationally co-ordinated food contamination monitoring programme are described in detail in the report of an Expert Consultation in 1974 (3). While most emphasis was given to chemical contaminants, the Consultation dealt also with three groups of biological contaminants, bacteria, viruses and parasites.

In the first group, it considered Clostridium perfringens, Clostridium botulinum, Vibrio parahaemolyticus, Salmonella spp. and indicator organisms. It concluded that there was little to be gained by monitoring for any bacteria except Salmonella. The foods suggested for monitoring for presence of Salmonella were

\* This report was prepared by Dr J.H.B. Christian, CSIRO Division of Food Processing, North Ryde, NSW, Australia on behalf of WHO for GEMS/Food.

- (a) meat and meat products, excluding shelf stable cured or uncured meats; perishable cured canned meats; sausages cooked, uncooked or fermented, dried or semi-dried,
- (b) poultry and poultry products, excluding canned products,
- (c) liquid eggs and dried egg products
- (d) dried milks and dried whey
- (e) shellfish.

It was not recommended that tests for viruses be included in the Programme, but it was agreed that the incidence of Trichinella spiralis, Cysticercus bovis and Echinococcus granulosus was sufficiently important and widespread to warrant their inclusion.

#### THE PRESENT POSITION - BACTERIA

The recommendations regarding Salmonella and the three parasites have not been implemented in the GEMS/Food Monitoring Programme. In reconsidering the introduction of biological agents into the Programme it is appropriate to review briefly developments of the last fifteen years to help determine what are now the agents most appropriate for monitoring in foods.

For the bacteria considered in 1974, the arguments advanced for inclusion or exclusion have not changed markedly. Salmonella remains the most important foodborne pathogen in countries where epidemiological data are published, commonly with an increasing incidence of salmonellosis reported. There are, however, other bacterial pathogens that have assumed major importance in foods in the intervening years. Probably the greatest concern has been expressed over Campylobacter jejuni, Listeria monocytogenes and enterovirulent Escherichia coli. The difficulties in routine identification of the latter in populations of non-pathogenic E. coli make it unsuitable for a monitoring programme. L. monocytogenes is a ubiquitous organism in many environments and such organisms, it was suggested in the 1974 report (3), are inappropriate to general monitoring programmes. The frequent presence of Campylobacter in the intestinal tract of warm-blooded animals, and especially poultry, gives it a status that is in many ways similar to that of Salmonella. Although in recent years isolations of Campylobacter from humans have exceeded isolations of Salmonella, it is not yet clear to what extent campylobacteriosis is a foodborne disease.

The situation regarding viruses has changed since 1974 and monitoring for a limited range of viruses is now practicable, particularly in shellfish. However, the viruses that can be so monitored are not those commonly associated with foodborne infections. The arguments for including parasites in a monitoring programme remain as they were in 1974 (3).

BENEFITS AND DETRIMENTS ACCRUING FROM INCLUSION OF  
MICROBIAL CONTAMINANTS IN GEMS/FOOD

The major benefits from monitoring biological agents in foods (modified from (1)) would be

- (a) provision of reliable information on the safety of foods world wide,
- (b) warning of actual and potential food poisoning problems,
- (c) indication of the effectiveness of established regulatory mechanisms and of processing and hygienic factors,
- (d) improvement of the economic prospects for developing countries to export quality-controlled food,
- (e) development of microbiological expertise in monitoring and survey methodology, especially in developing countries.

There appear to be few detriments to such a programme. A reluctance of some countries with the greater microbiological problems to contribute data might result in a biased picture of the global situation. A more important problem may be the cost of some more complex and time consuming microbiological analytical procedures.

THE PRESENT POSITION - FOODS

All of the microbial contaminants that have been suggested here for inclusion in a monitoring programme (Salmonella, Campylobacter, Trichonella, Cysticercus and Echinococcus) are associated with warm blooded food-animals. Examination for Trichinella spiralis is confined to pigs and for Cysticercus bovis to cattle. Various slaughtered animals are examined for Echinococcus granulosus.

Salmonella, as noted earlier, commonly causes problems when contaminating meat, poultry, milk, eggs and shellfish. Acceptable and reliable methods exist for destroying Salmonella in milk and eggs by pasteurization and for removing Salmonella from shellfish by depuration. However, no such methods (with the exception of irradiation, which is not yet widely accepted) have been developed for ridding raw meat or raw poultry from contaminating Salmonella that are brought into the abattoirs with the live animal and are subsequently transferred to the edible tissues.

The distribution of Salmonella on a meat or poultry carcass may be highly heterogeneous, so that obtaining a representative sample of the food for analysis is very difficult. However, with poultry (but obviously not with quadrupeds) this problem can be overcome by using a whole carcass rinse to recover the bacteria.

The cost per sample of poultry (about 1.5kg) with this technique is much greater than the cost of a 25g sample of red meat, but much greater sensitivity and accuracy results.

Campylobacter also appears to be more common on poultry carcasses than on red meat. Thus if poultry is monitored for Salmonella it may be appropriate to test for Campylobacter also. (Notes on the sampling and analysis for these bacteria and reporting area included in Annex I).

Having said this, it must be noted that the incidence of Salmonella on poultry is so high in almost all countries from which data are available that monitoring for this bacterium would provide little useful information. The United States Department of Agriculture in 1990 reported 100 percent contamination of processed birds tested after chilling. In respect of Campylobacter contamination, the only country where incidence of Salmonella in poultry is low, Sweden, has reported some fifty percent of carcasses carry Campylobacter.

One may therefore conclude that, until significantly better control of these bacteria in such foods has been achieved, a formal monitoring scheme will provide little useful data. Unfortunately, in respect of both of these bacteria, there is in most countries a serious paucity of data on the extent of food-borne disease for which they are responsible. Improved epidemiological studies and data collection would seem to offer much greater benefits than routine monitoring foods for their presence.

#### A PRELIMINARY ALTERNATIVE

If it is accepted that the introduction into GEMS/Food of a formal monitoring system for Salmonella and Campylobacter is premature, it is suggested that it be preceded by the accumulation of existing information. Many countries collect microbiological data on foods in statistical surveys and in import and export surveillance, and these could be made available to GEMS/Food. As suggested above, the data should be confined to Salmonella and Campylobacter in poultry, Trichinella in pork, Cysticercus in beef and Echinococcus in meat from animals appropriate to each country.

Reports containing these data would require more details concerning sampling and methodology than the standard form suggested in Annex 2, because the procedures would not themselves be standardized. However, the reports would give an indication of how many countries have such information, the general extent of contamination and the variation in the extent of contamination between countries. Annex 3 gives a possible reporting pro forma.

#### CONCLUSIONS

Although the spectrum of pathogens known to contaminate foods has broadened since GEMS/Food was initiated, the genera

appropriate to a monitoring programme remain Salmonella, Trichinella, Cysticercus and Echinococcus with the addition now of Campylobacter. The foods most appropriate for monitoring are poultry in the case of the bacteria and meat of the relevant animals for the parasites. However, the incidence of the bacterial pathogens in poultry in most countries is so high that a formal monitoring programme is unlikely to yield useful, cost-effective data at this time. It is concluded that the collection of existing data on contamination of the foods by these organisms would be a more practical approach. It is also concluded that a programme to encourage governments to establish epidemiological programmes that record accurately and exhaustively the incidence of foodborne disease would give greater information on existing food contamination and would establish a better framework for a future programme to monitor microbial contamination.

#### RECOMMENDATIONS

It is recommended that

- (1) the monitoring of microbiological contaminants in food not be introduced formally into the GEMS/Food programme at this time;
- (2) governments involved in the GEMS/Food programme be invited to contribute to that programme data on the incidence of Salmonella and Campylobacter in poultry and of Trichonella, Cysticercus and Echinococcus in the appropriate meats;
- (3) governments be encouraged to establish effective epidemiological reporting programmes for foodborne disease where these are not already in existence.

#### REFERENCES

- (1) Joint UNEP/FAO/WHO Food Contamination Monitoring Programme. GEMS/Food Review and Planning Meeting, 1988. WHO, Geneva. WHO/EHE/FOS/89.4.
- (2) Guidelines for Establishing or Strengthening National Food Contamination Monitoring Programmes, 1979, WHO, Geneva. WHO/NCS/FCM/78.1.
- (3) Report of an Expert Consultation on Identification of Contaminants to be Monitored and Recommendations on Sampling Plans and Methodology, 1974, Rome. FAO-ESN:MON/74.21.

## ANNEX I

### SAMPLING AND SAMPLING PLANS FOR BACTERIAL CONTAMINANTS

It is important that samples be taken at random and are not taken from food that is suspect in any respect (e.g. in relation to known or suspected unhygienic handling). Poultry carcasses may be taken as samples at any stage after chilling or freezing. Five samples (carcasses) should be taken from one lot and subjected individually to the whole-bird rinse technique.

### METHODS OF ANALYSIS

Salmonella spp. The ISO method for isolation of Salmonella from meat is appropriate, modified to accept the rinse medium as the pre-enrichment. Unfortunately this method has not been revised in recent years. Expert advice should be sought as to whether substitution of the Rappaport-Vassiliadis medium for tetrathionate medium would be acceptable. Results are expressed as positive or negative for each carcass - samples are not composited. The serotypes of at least three colonies per isolation should be determined.

Campylobacter jejuni. The isolation of this organism from poultry or meats has not yet been standardized. It usually involves enrichment, selective enrichment, selective isolation and growth on blood agar prior to confirmation. Results are expressed as positive or negative. Note that Campylobacter is quite sensitive to freezing, and frozen carcasses may yield many less positive results than chilled carcasses.

### REPORTING PROCEDURES

The data should be entered by the Collaborating Centres on the reporting sheet (Annex 2) and submitted annually on a date to be fixed by the co-ordinating office.





## LIST OF GEMS/FOOD PUBLICATIONS AND REPORTS

1. Identification of Contaminants to be Monitored and Recommendations on Sampling Plans and Methodology. Report on an Expert Consultation on the Joint FAO/WHO Food Contamination Monitoring Programme, Rome, 7-11 October 1974 (Document FAO-ESN:MON/74.21; WHO-FAD/FCM/74.21)
2. Development of System for Processing, Appraisal and Storage of Data. Report of an Expert Consultation on the Joint FAO/WHO Food Contamination Monitoring Programme, Geneva, 17-21 March 1975 (Document WHO-FAD/FCM/75.1; FAO-ESN:MON/75.1)
3. Cadmium, Lead, Mercury and Methylmercury Compounds. A Review of Methods of Trace Analysis and Sampling with Special Reference to Food. FAO, Rome 1976. (Document M-84 ISBN 92-5-100094-8).
4. Methods of Sampling and Analysis of Contaminants in Food. Report of a Joint FAO/WHO Expert Consultation in Collaboration with UNEP, Rome, 12-16 January 1976 (Document FAO Food Control Series No. 3; WHO Food Control No. 3)
5. Report of Meeting to Plan Phase II of the Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme, Geneva, 13-16 December 1976 (Document WHO-FAD/FCM/77.2; FAO-ESM:MON/77.2)
6. Report of the Consultation on the Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme - Phase II, Geneva, 14-18 June 1977. (Document WHO-FAD/FCM/77.9; FAO-ESM:MON/77.9)
7. Draft Food Classification System for Food Contamination Monitoring Programme (Document WHO-FAD/FCM/77.10; FAO-ESN:MON/77.10)
8. Report of the First Session of the Technical Advisory Committee, Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme, Rome, 13-17 March 1978 (Document FAO-ESN/MON/TAC.1/78.1; WHO-FAO/FCM/TAC-1/78.1)
9. Guidelines for Establishing or Strengthening National Food Contamination Monitoring Programmes (Document FAO Food Control Series No 5; WHO/HCS/FCM/78.1 (E,F,S))
10. Summary Report of Data Received from Collaborating Centres for Food Contamination Monitoring, Stage 1 - 1977, under the Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme Phase II (Document WHO:HCS/FCM/78.2; FAO-ESN/MON/78.2)

11. Analytical Quality Assurance, Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme. Report of a Consultation, Geneva, 27-29 February 1980 (Document WHO:HCS/FCM/80.1)
12. Report of the Second Session of the Technical Advisory Committee, Geneva, 27 April - 1 May 1981, Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme (Document FAO-ESN/MON/TAC-2/81/5; WHO-EFP/81.15)
13. Analytical Quality Assurance of Monitoring Data, Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme (Document FAO-ESN/MON/AQA/81/8; WHO-EFP/81.17)
14. Summary of Data Received from Collaborating Centres - 1977 to 1980, Part A - Countries, Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme (Document FAO-ESN/MON/DCC/81/9-A; WHO-EFP/81.19A)
15. Summary of Data Received from Collaborating Centres - 1977 to 1980, Part B - Contaminants, Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme (Document FAO-ESN/MON/DCC/81/9-B; WHO-EFP/81-19B)
16. Summary and Assessment of Data Received from the FAO/WHO Collaborating Centres for Food Contamination Monitoring (Document Swedish National Food Administration, Uppsala, 1982)
17. Guidelines for the Study of Dietary Intakes of Chemical Contaminants. Report of a Joint FAO/WHO Meeting, Rome, December 1982 (Document FAO-ESN-FAO-MISC/83/1; WHO-EFP/83.44)
18. Summary of 1980-1981 Monitoring Data received from the Collaborating Centres, Joint FAO/WHO Food Contamination Monitoring Programme (Document WHO-EFP/83.57; FAO-ESN/MISC/83/4)
19. Analytical Quality Assurance - II, Joint FAO/WHO Food Contamination Monitoring Programme (Document FAO-ESN/MISC/83.3; WHO-EFP/83.54)
20. Information on Pesticides to Assist in Establishing Priorities for Food Contamination Monitoring. Joint FAO/WHO Food Contamination Monitoring Programme - Third Session of the Technical Advisory Committee, Rome, 28 November - 2 December 1983 (Document EFP/TAC.3/WP/83.4)
21. Technical Cooperation Under the Joint FAO/WHO Food Contamination Monitoring Programme. Third Session of the Technical Advisory Committee, Rome, 28 November - 2 December 1983 (Document EFP/TAC.3/WP/83.5)
22. Report of the Third Session of the Technical Advisory Committee, Rome, 28 November - 2 December 1983 (Document WHO-EFP/83.60; FAO-ESN/MISC/83.5)

23. Dietary Intakes of Chemical Contaminants - A Review of Data from FAO/WHO Collaborating Centres for Food Contamination Monitoring. WHO, Geneva, 1984 (Document EFP/84/61)
24. Guidelines for the Study of Dietary Intakes of Chemical Contaminants. Summary. WHO, Geneva 1984 (Document EFP/84.62)
25. Galal-Gorchev, H and C.F. Jelinek. "A review of the dietary intakes of chemical contaminants", Bulletin of the World Health Organization, 63(5): 945-962 (1985)
26. Assessment of Human Exposure to Environmental Pollutants. WHO, Geneva, 1983 (Document EFP/83.52)
27. Guidelines for the Study of Dietary Intakes of Chemical Contaminants. WHO Offset Publication No. 87, ISBN 92 4 170087 4, 1985 (Ar, E, F, S)
28. Programme Report 1984-1985, Joint FAO/WHO Food Contamination Monitoring Programme (Document FOS/85.7)
29. Analytical Quality Assurance - III, Joint FAO/WHO Food Contamination Monitoring Programme (Document WHO/EHE/FOS/85.20)
30. Summary of 1980-1983 Monitoring Data, Joint FAO/WHO Food Contamination Monitoring Programme (Document WHO/EHE/FOS/86.2)
31. Mercury in Fish - A Special Study Prepared for the Codex Committee on Food Additives (Document WHO/EHE/FOS/86.3)
32. Report of the Fourth Session of the Technical Advisory Committee, Joint FAO/WHO Food Contamination Monitoring Programme, Geneva, 9-13 September 1985 (Document WHO/EHE/FOS/86.4)
33. Chemical Contaminants in Foods: 1980-1983. Joint FAO/WHO Food Contamination Monitoring Programme (Document WHO/EHE/FOS/86.5 (unedited/ limited distribution))
34. Mercury in Fish and Fishery Products. Codex Committee on Food Additives, Nineteenth Session, The Hague, March 1987 (Document CX/FA 87/18-Add.2)
35. Programme Report 1986-1987, Joint FAO/WHO Food Contamination Monitoring Programme (Document WHO/EHE/FOS/87.3)
36. Food Additives. In Point of Fact, No. 51/1987, WHO, Geneva, 1987
37. Guidelines for Predicting Dietary Intake of Pesticide Residues. Report of a Joint FAO/WHO Consultation, Geneva, October 1987 (Document WHO/EHE/FOS/88.3)

38. Summary of 1984-1985 Monitoring Data, Joint FAO/WHO Food Contamination Monitoring Programme (Document WHO/EHE/FOS/88.4)
39. Analytical Quality Assurance Studies 1985-1987, Joint FAO/WHO Food Contamination Monitoring Programme (Document WHO/EHE/FOS/88.10)
40. The Quality of the Environment: A health-based global assessment. Report of a Meeting of UNEP/WHO Government-designated Experts, WHO, Geneva, September 1988 (Document WHO/PEP/88.15)
41. Assessment of Chemical Contaminants in Food. Report on the results of the UNEP/FAO/WHO programme on health-related environmental monitoring (prepared in cooperation with MARC, London) 1988
42. Dietary Intake of Hg, Cd and Pb, WHO, Geneva, 1989
43. Guidelines for Predicting Dietary Intake of Pesticide Residues. Joint UNEP/FAO/WHO Food Contamination Monitoring Programme in collaboration with the Codex Committee on Pesticide Residues, WHO, Geneva, 1989 (E,F,S)
44. GEMS/Food Review and Planning Meeting, Challes-les-Eaux, France, 20-22 July 1989 (Document WHO/EHE/FOS/89.4)
45. Dietary Intake, Levels in Food and Estimated Intake of Cadmium, Lead and Mercury, Joint FAO/WHO Food Standards Programme - Codex Committee on Food Additives and Contaminants, 22nd Session, The Hague, March 1990 (Document CX/FAC 90/5-Add.1)
46. Summary of GEMS/Food Activities, Joint UNEP/FAO/WHO Food Contamination Monitoring Programme (Document WHO/EHE/FOS/90.2)
47. Analytical Quality Assurance Studies 1989-1990, Joint FAO/UNEP/WHO Food Contamination Monitoring Programme (Document WHO/HPP/FOS/91.2)
48. Summary of 1986-1988 Monitoring Data, Joint FAO/UNEP/WHO Food Contamination Monitoring Programme (Document WHO/HPP/FOS/91.4)
49. Report of the Second Meeting of GEMS/Food Programme Management Committee, Rome, 6-7 March 1990 (Restricted Document)
50. Review of Dietary Intake of Chemical Contaminants by Dr C. Jelinek. Joint FAO/WHO/UNEP Food Monitoring Programme (in press)
51. The Contamination of Food. UNEP/GEMS Environmental Library No. 5 (in press)
52. The GEMS Food Contamination Monitoring and Assessment Programme. UNEP/GEMS brochure (in press)

53. Total Diet Study Programme for Food Contaminants and Nutrients in China. Report of the Mission of Dr J. Jones to the People's Republic of China, 14 October - 8 November 1990 (in press)
54. Monitoring and Assessment of Human Exposure to Aflatoxin. UNEP MARC, London (in press)

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