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WORLD HEALTH ORGANIZATION/AGRICULTURE CANADA  
INTER-AGENCY CONSULTATION  
ON STRENGTHENING OF NATIONAL AND INTERNATIONAL SERVICES IN  
ANIMAL PRODUCTION HYGIENE

Ottawa, 5-7 September 1990

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## 1. INTRODUCTION

The major objective of the WHO Interagency Consultation on Strengthening of National and International Services in Animal Production Hygiene, hosted by Agriculture Canada, was to define the range of activities of each organization and to suggest cooperation and coordination.

Following decades of effective control of major zoonotic infections and intoxications, "hidden" infections in livestock which are undetectable by routine meat inspection gain significance. In line with resolution WHA42.40 of the World Health Assembly, May 1989 (Annex 3), and based on activities of the World Health Organization in animal production hygiene, the participants (see Annex 1) discussed the scope of their activities in the control of zoonoses such as salmonellosis, campylobacteriosis, and listeriosis.

Dr J. McGowan welcomed the participants in the name of the Canadian Government (Annex 2). He expressed the interest of his government in bringing human risk factors and diseases associated with animal production and products under control. Dr K. Bögel conveyed the greetings and wishes for a fruitful meeting from Dr H. Nakajima, Director-General of the World Health Organization. In his introductory presentation, Dr Bögel described the efforts presently being made by various international organizations in animal production hygiene and food safety. He referred, in particular, to the programmes of FAO, OIE, EEC, and the World Veterinary Association with its affiliated, sponsored associations.

## 2. CURRENT AND PLANNED ACTIVITIES OF INTERNATIONAL ORGANIZATIONS

### 2.1 Food and Agriculture Organization of the United Nations (FAO), Rome

In the answer dated 17 November 1989 to the letter of the Director-General, WHO transmitting resolution WHA42.40 on prevention and control of salmonellosis, FAO informed on its activities and programmes in this field.

FAO has active programmes in food quality and safety, animal health and production, and fisheries, all of which take into account the serious effects of salmonellosis and other foodborne diseases on human health. FAO works with member countries to promote the control of these diseases throughout the entire process of food production, processing and marketing. Codes of hygienic practice for many foods have been established by the FAO/WHO Codex Alimentarius Commission. Several of these Codes have been supported by microbiological specifications including those for Salmonella.

Animal production hygiene represents an important component of the protection of animal health and animal products, thus contributing to the protection of human health. Hygienic measures belong among the major preventive and control activities in fighting mass diseases. Animal production hygiene is of particular importance in controlling diseases of animals transmissible through food and other products of animal origin, as well as through a contaminated environment.

The national and international programmes in the field of animal production hygiene must be based on an adequate analysis of the existing situation and of the conditions governing the action to be taken. Sanitary, economic,

biological, ecological, social, legislative and political factors should always be taken into consideration. The resources and standards of veterinary services are of primary importance in any decision making related to this problem.

The most critical situation in the level of disease occurrence in humans caused by contaminated food and the most difficult conditions requiring action are in developing countries, particularly in the poorest ones. Usually the hygienic standard is lowest at primary production levels in the farms rather than in the food processing industry.

The FAO Animal Health Service will continue to contribute to the common international programme through the traditional forms of technical assistance to FAO member countries, first of all in the developing world by strengthening animal production hygiene activities at the animal herd/farm levels where the problems usually start.

The Animal Health Service is preparing plans of action for the 1992/93 biennium such as:

- (a) New fields of activity to be carried out by the recently recruited senior officer for production diseases, one of whose major duties will be to deal with animal hygiene.
- (b) Organization of a FAO Expert Consultation on Strengthening of the Veterinary Services in Developing Countries held in Rome from 1-5 October 1990 which will discuss the participation of these services in animal production hygiene and make recommendations to FAO member countries, as well as finalize the manual on organization, planning and management of animal health activities.
- (c) Organization of a FAO Expert Consultation on the Reduction of Food Losses due to Animal Diseases at FAO Headquarters in June 1991 to discuss measures to avoid such losses, not only in terms of quantity, but also in terms of quality and sanitary innocuity of food of animal origin.
- (d) Organization of a FAO Expert Consultation on Veterinary Helminthology to be held in Morocco during August 1991 which will deal mainly with helminthic diseases transmissible to man.
- (e) Preparation of a manual on animal production hygiene (Primary Animal Health Care) following the example of a very successful manual published by WHO entitled "Primary Health Care" destined for extension work at the grass-root level. This document will be proposed for preparation in 1991 and publication in 1992.
- (f) Consideration of the possibility to collect suitable extension material from member countries and select for dissemination information which can help in applying "good practice" in animal production hygiene measures.
- (g) Consideration of the feasibility of initiating data collection on animal production hygiene for publishing, i.e. as a component of the FAO/WHO/OIE Animal Health Yearbook.
- (h) Plan the 5th FAO/WHO Expert Consultation on Veterinary Education in 1992 or 1993 to discuss recommendations for the future development and preparation

of the new generation of veterinarians to meet the needs and conditions expected at the beginning of the next century, including subjects relating to animal production hygiene.

(i) Select and include in the FAO/WHO network of collaborating centres at least one top level institute dealing with problems of animal production hygiene which will be able to provide highly qualified advice to international organizations, member countries and relevant institutes.

(j) Consider sending to all chief veterinary officers and to all Deans of veterinary schools a letter to inform them of the cooperation of international organizations in animal production hygiene and suggest that their local programmes be reviewed further to improve their contributions in this field.

The Animal Health Service is presently preparing proposals for the Programme of Work and Budget for 1991, as well as for the forthcoming biennium - 1992-1993. This will be a good opportunity to propose some new activities concerning the field of animal production hygiene.

The initiative of WHO and the Canadian authorities in organizing this meeting was highly appreciated and provided the chance to analyze the activities of other international organizations in this field, thus facilitating harmonization and coordination of programmes as well as avoiding overlapping and gaps. FAO is prepared to contribute to this common programme in relation to resources at its disposal.

## 2.2 International Office of Epizootics (OIE), Paris in the field of health and animal production

### Public health and animal production

The primary function of the International Office of Epizootics, OIE, is the control of highly infectious diseases of serious socio-economic impact (OIE - List A).

Other diseases (OIE - List B) have historically been a source of concern, notably those with public health consequences. This concern for public health was expressed as early as 1920 when the international conference for the study of epizootics was being planned, with the creation of the OIE in mind. This concern has increased, particularly over the last decade, when the intensification of animal production and of international trade, as well as new meat or meat product processing methods may have resulted in a loss of health balance, thus producing new disease situations and public health hazards.

In the face of these new challenges, the OIE has undertaken a score of new activities either within its traditional statutory mandate (surveillance, research, coordination, regulation of international trade), or as the starting point of new strategies (creation of special working groups).

A primary example of OIE's main activities in the field of diseases arising from new animal production methods concerns the "hidden" diseases of animals which come to light as human infections. This is why certain forms of brucellosis, campylobacteriosis, listeriosis, salmonellosis, tuberculosis,

cysticercosis, toxoplasmosis, trichinosis, echinococcosis and hydatidosis have been closely surveyed, studied and regulated.

1. Surveillance

All of the above-mentioned diseases (List B) as well as other diseases, whether new or old, which are liable to represent similar "hidden" public health hazards are reported regularly by OIE Member States. These reports are collated and distributed annually by the OIE in cooperation with FAO and WHO (Animal Health Yearbook). Entirely new diseases (e.g. Bovine Spongiform Encephalopathy) must be reported for immediate publication.

2. Coordination of studies and research

The impetus given by OIE to studies and research related to the above-mentioned diseases has increased over recent years as a result of:

- discussions and resolutions of OIE's International Committee (brucellosis, echinococcosis, tuberculosis, trichinosis)
- scientific papers presented at meetings of regional commissions (namely the 12th Conference of the Regional Commission for Europe devoted to health control in intensive animal production) or with reports presented to the General Session. These papers are published in the OIE Scientific and Technical Review or in minutes of regional conferences.
- the creation of working groups or special meetings devoted to these diseases (e.g. salmonellosis and BSE in 1990) or to new study methods (e.g. biotechnologies in 1989-90).
- publishing specialized documents related to diagnostic or biologic products (manufacturing and control) used in controlling these diseases (OIE "Manual"). These publications fall under the jurisdiction of the scientific advisor and of the "Standard Commission".

3. Health regulations for international trade of animals or animal products

OIE's International Animal Health Code recommends measures aimed at many of the diseases mentioned for purposes of international trade. This Code recommends a certain number of standards which should be used by both importing and exporting countries, defines health status (free or infected country), gives advice on the wording of international certificates, animal quarantines, negotiations, veterinary measures, etc.

The first edition of this Code was adopted by the committee in May 1968; subsequent editions followed in 1971, 1976, 1982 and 1989 to reflect annual updating. The preparation of these updates is the responsibility of the Code Commission in close cooperation with the Standards Commission. Certain diseases which are as yet not covered in the "Animal Health Code", have nevertheless been discussed by member countries and recommendations have been drafted for the surveillance or the prevention of such diseases (e.g. cysticercosis, listeriosis, salmonellosis). In certain cases and in the presence of a specific threat, a working group is asked to submit recommendations to the Code Commission (e.g. 14 August 1990, for avian salmonellosis).

In conclusion the current activities of the OIE in the field of health in animal production can be said to have a long history while constantly adapting to the evolution of animal production. They cover concerns of the modern hygienist, from world epidemiological surveillance to the harmonization of diagnostic methods and international trade to the study of new control methods, and finally to publication of results of scientific research. In the future, activities could be enhanced and strengthened by the OIE along these lines and within the framework of its Statute.

2.3 Inter-American Institute for Cooperation in Agriculture (IICA), Coronado, Costa Rica

It was felt by the participants that there should be an entity within the organization that would be connected to other international groups such as PAHO, OIE, FAO, etc., to facilitate export of animal products. Until such an entity is designated, Dr Fowler would be willing to assume the responsibility.

IICA arranges mainly training courses. The various international agencies should collaborate in training in diagnosis of specific diseases. IICA could include food safety aspects and surveillance management in its training programmes and suggests that more emphasis be put on training for proper specimen collection rather than laboratory procedures.

Although zoonoses is not included in IICA's mandate, intersectoral collaboration between IICA and PAHO, through the zoonotic branch of PAHO, ensures that vital information is obtained by IICA. In addition, a joint programme should be embarked upon by IICA and PAHO on Salmonella surveillance. Such programmes should include a training component of which basic epidemiological concepts should be a part, regardless of whether the disease is zoonotic or not (see recommendations).

2.4 WHO Regional Office for the Americas and Pan American Sanitary Bureau (PAHO), Washington, D.C.

Current and future activities

In existence since 1902, PAHO is the regional office of WHO for the Pan-American states. PAHO is an integral component of development especially in the area of agriculture and health. Since 1968, it has been a forum for the ministers of agriculture of 39 states to review the cooperation between animal and public health. The recommendations of these meetings must then be approved by the ministers of health of the same 39 countries.

The areas of major emphasis for the future are environmental, maternal and child health, and veterinary public health. PAHO's veterinary public health programme is coordinated in Washington, D.C., with the Pan American Foot-and-Mouth Disease Centre (PANAFTOSA) and the Pan American Zoonoses Centre (CEPANZO). There are two intra-country advisor bureaus in Central America, two in Peru and two in Columbia whose professional and support staff total 350.

Some of the activities in which PAHO is involved are:

- (a) Development of policy norms and regulations;
- (b) Mobilization of resources;

- (c) Dissemination of resources;
- (d) Training;
- (e) Research to support technical advice;
- (f) Technical support from experts to ensure that the transfer of knowledge is at a level that can be of use to those receiving it.

Food protection:

- (a) Develop comprehensive national programmes;
- (b) Technical cooperation and strengthening of inspection of residues, microbiological inspection at the consumer level;
- (c) Government surveillance of food-borne diseases - establish a Latin American network whose first meeting took place in November 1990 in Argentina and designated national coordinators in five countries to report via relevant publications/newsletters;
- (d) Consumer protection through community participation - in Peru and the Dominican Republic, primary school teachers are being instructed on personal/food hygiene so that they can pass on the information.

PAHO is implementing HACCP (Hazard Analysis Critical Control Point).

1. Foot-and-Mouth Disease - eradication in Latin America by the year 2000 using COHEFA (Comite Hemisferico Para la Erradicacion de la Fiebre Aftosa).
2. Maintenance and expansion of FMD-free areas, such as in Chile, maintain the north isthmus of Panama free-surveillance also of other vesicular diseases, such as red-disease, and hog cholera.
3. Zoonoses: viral - eliminate urban human rabies by 1992, equine encephalitis - bacterial - surveillance and control of brucellosis and tuberculosis (the hidden diseases are still important in animal production hygiene in developing countries - parasitic - control of Taenia and cysticercosis).
4. Development of biomedical models - non-human primates, their use and conservation. Advice on the replacement of laboratory animals by in vitro models for the laboratory.
5. Strengthening of veterinary public health activities by providing continuing education for veterinarians in public health and by constructing and organizing laboratory facilities RIMSA meeting planned for 30 April-2 May -international organizations and members of PAHO governments.

The major recommendation for the future is that international organizations should act as catalysts to promote technical transfer from developed to developing nations, while bearing in mind that the technology offered to the developing nations must be of use to them.

2.5 World Health Organization (WHO), Geneva

WHO/HQ will continue to promote the following areas through international working groups.

### Research

- (a) Farm management and techniques for raising microbiologically monitored animals and production of eggs.
- (b) Development and promotion of decontamination procedures.
- (c) Vaccine development.
- (d) Procedures to detect infected animals, including carriers, and to monitor hygiene status along the food chain, including slaughter lines.
- (e) Development of slaughter technologies to prevent cross-contamination.
- (f) Promotion of Codex Alimentarius activities which could contribute to the control and prevention of "enteric zoonotic infections".
- (g) Risk assessment and control of risk factors in aquaculture, fish hygiene in general, in collaboration with the Codex Alimentarius Commission.

### Management:

- (a) Systems and operations resources in the control of zoonotic foodborne infections, in particular of salmonellosis.
- (b) Cooperation with the European Parliament and German institutes in pilot schemes of Salmonella elimination in livestock and poultry.

### Education:

- (a) Development of training modules in public veterinary medicine linking epidemiology with management, economy, and social sciences.
- (b) Promotion of veterinary education (jointly with FAO and through the World Veterinary Association).

### 2.6 Commission of the European Communities (CEC), Brussels

It was determined that cooperation between the CEC needs to be developed in the field of animal production hygiene. This cooperation should be formalized and meetings planned to identify the possible areas of cooperation.

### 3. NORTH AMERICAN AND INTERNATIONAL SERVICES

#### 3.1 Agriculture Canada

The major areas of activities and scientific problems and advances of concern to the Canadian Government and technical institutions are described in annexes 4-14.

Canada and the USA feel strongly that guidelines and procedures for human risk assessment are urgently needed. Risk assessment concerning chemicals is already being taken care of by WHO, but is lacking in the area of infectious agents. This lack needs to be addressed urgently, otherwise the animal production sector will be blamed for any outbreaks (e.g. enterotoxogenic E. coli).

In this connection the participants were informed by the WHO Secretariat that there is a good chance that the German Government will fund a meeting on risk assessment for E. coli in 1991.

3.2 United States Department of Agriculture (USDA), Washington

The fish industry is a growing area of interest to the USDA.

The Food Safety and Inspection Service (FSIS) is responsible for ensuring the safety of meat and poultry. The better the job of preventing unseen hazards at the production level, the better the product presented to the consumer. Irradiation is looking like an option. The FDA has already approved irradiation for poultry, and regulations will be issued by the end of 1990. The public must be educated on the merits of irradiation and efforts should be made to dispel cancer fears. In a recent survey of consumers, 67% stated that they would be willing to buy irradiated products. A food irradiation meeting is scheduled for early 1991 in Mexico.

Assay methodology needs to be improved in terms of cost and rapidity.

The study on The Hazard Analysis and Critical Control Point-System (HACCP) is into the sixth month of its two year duration. Five public hearings and over 100 meetings have been held with interested organizations. FSIS is working with the industry to develop model HACCP plans for raw and processed foods.

FSIS will consider co-sponsorship of the next WHO consultation on slaughter technology which may be held in 1991 in the USA.

The Animal and Plant Health Inspection Service (APHIS) has become deeply involved in the surveillance and control of zoonotic foodborne infections at the farm level. Efforts are being made by regulatory and non-regulatory mechanisms to control such infections and emphasis is being placed on holistic strategies from "farm to table". Integrating approaches appear necessary for the international standardization of diagnostic reagents and procedures (see recommendation No. 5) and this should be seen in connection with a need to harmonize relevant policies, activities and standards for both animals and plants (see recommendation No. 12). APHIS has become one of the forces promoting the education and professional coherence concerning veterinary activities in various sectors engaged in public practice (animal and veterinary public health).

3.3 FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Institute of Veterinary Medicine, D-W-Berlin, FRG

The Centre plays an important role in foodborne diseases surveillance in Europe. Through the WHO Surveillance Programme for the Control of Foodborne Infectious and Intoxications in Europe, countries transfer information on foodborne diseases. Problems have arisen in the past because of the various information systems used by the different countries.

A pilot project has been launched in food hygiene education. Ten individuals are presently being trained. The programme is basically geared for developing nations. The training lasts from 3-8 months. The courses are offered in Germany as well as other countries. The teaching of the implementation methods is emphasized since they are essential for success in the food hygiene area.

The Centre would welcome sharing information with any interested US agency. This information exchange need not be computer based, at least not until a uniform system is made available to all countries. The information should not be just numerical data, but also epidemiological information, including discussions of the contributing factors of an outbreak.

Three departments (food hygiene, animal health, residues) deal with foodborne diseases, zoonoses, and animal production hygiene, covering all areas of the food chain. East Germany has many large institutes which are overstaffed and large overproducing farms. With the reunification of Germany, many institutes will be closed but some, such as the Research Institute for Bacterial Animal Diseases will most probably remain.

### 3.4 Strategic planning for veterinary education (Example from the Ontario Veterinary College)

#### (a) The PEW initiative:

The PEW National Veterinary Education Programme (PNVEP) was developed as a result of the creation of a programme initiative by PEW Charitable Trusts of Philadelphia that recognized the need to restructure the health professions to meet the changing environmental forces. The development of the PNVEP involved four phases, of which the last remains incomplete.

The first stage was a situation analysis conducted by a committee chaired by William Pritchard. Thirty-one veterinary colleges in North America took part in this process, which established the changes that needed to be addressed. These ranged from structural changes within the farm industry, such as the increasing percentage of large farms that need veterinarians who can handle large populations, to the rising importance of food safety. The resulting recommendations included the need to change the focus of veterinary education from animal disease to animal health, to make research more important (significantly less research is being done in veterinary medicine than in other health professions), and to give veterinary students a solid footing in the biomedical sciences since it is totally unrealistic to teach all the information that is presently available to each student. The age of the universal veterinarian is over and the programmes must reflect this by offering highly specialized areas of instruction.

The second phase concentrated on training the academic staff of the veterinary colleges at the Adult Centre of North Carolina. The goal was to try to understand the new orientation of veterinary education, to define responsibilities and to implement a strategic plan.

This strategic plan became the third phase of the initiative. At the Ontario Veterinary College, five major recommendations were made, namely: (i) a Veterinary Medicine curriculum stressing career emphasis and not the broad scope of the veterinary profession; (ii) a 12-month final year possibly outside the college; (iii) mandatory undergraduate externships (in clinical and public sector); (iv) need for in-house continuing education; and (v) encouragement of flexibility in the curriculum to allow for leave during the course of the degree.

In the final stage of implementation, several ideas, such as "National Animal Health and Food Safety Network", are being investigated.

(b) Education emphasizing epidemiology and international veterinary medicine

The Ontario Veterinary College was founded in 1862 and is the oldest existing veterinary college in Canada. The University of Guelph, of which the College is now a part, was founded 26 years ago.

The graduate programme offers four degrees: Graduate Diploma, Master of Science, Doctor of Veterinary Science, and Doctor of Philosophy. Of the 129 students, 36 are from 19 different countries.

The Graduate Diploma is a new diploma with major emphasis on epidemiology. It encourages admission of foreign veterinarians and provides a means for them to upgrade their skills and at the same time receive hands-on experience with Canadian veterinary operations. The programme also gives Canadian veterinarians the knowledge and experience necessary for careers in international veterinary medical development.

The programme lasts a minimum of three semesters or one year, during which a minimum of four courses and a semester spent on a disease investigation project in another country (or in the case of foreign students, one semester spent analyzing data from their country) must be completed.

This programme has been approved as of 1990 and four students are currently enrolled.

4. MAJOR CONCLUSIONS AND RECOMMENDATIONS

1. Strengthening of cooperation between international organizations

The Consultation recognized the need to strengthen the activities of the international organizations (WHO, FAO, OIE), especially in promoting technical cooperation among countries in animal production hygiene, and the transfer of technology for strategic use, particularly in the surveillance and control of salmonellosis and other enteric zoonoses.

The international organizations should strengthen their role as catalyzing agents in mobilizing resources from developed to developing countries, particularly for training, research, direct technical advice and for the development of programme policy and guidelines in animal production hygiene and food-borne diseases.

WHO should increase its operational activities, particularly in the regions of Africa, Eastern Mediterranean, South East Asian, and Western Pacific, by providing direct technical assistance to Member States in the development and strengthening of veterinary public health activities, and in mobilizing resources for project development in enteric zoonoses.

2. Surveillance: PAHO and FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Berlin, FRG.

Functional links should be strengthened between the Latin American network for surveillance of foodborne diseases and the WHO Surveillance Programme for the Control of Foodborne Infections and Intoxications in Europe which has global implications, with respect to the information disseminated. The FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Institute of Veterinary Medicine, Berlin, Federal Republic of Germany, may also include the collection of information on the application of the HACCP concept in the animal production sector in Latin American countries.

3. Surveillance: EEC/EURO/WHO cooperation

The cooperation between WHO headquarters, the WHO Regional Office for Europe and the EEC should be strengthened in the field of animal production hygiene and human health related problems, including surveillance of foodborne diseases, preferably in close collaboration with the FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Berlin.

4. Surveillance: IICA and PAHO

A joint IICA and PAHO project should be formulated and agreed upon for surveillance of Salmonella in poultry in Latin America and the Caribbean.

5. Standardization of laboratory work

The consultation recognized that there are a number of international organizations and institutions concerned with the technical transfer of laboratory procedures and tests for the detection of microbial infections and/or chemical contamination in animals.

A joint WHO/FAO/OIE strategy and plan should be developed for the international standardization of diagnostic reagents and procedures in support of the transfer of technology for laboratory detection of microbiological infections and/or chemical contamination in animals. It was recommended that the organizations work with the Codex Alimentarius to develop standards for the determination of chemical contaminants in food.

6. WHO/FAO slaughter technology research

The Consultation recognized that significant research activities are under way in the area of the hygienic slaughter and further processing of food animals.

An international consultation should be organized in North America in 1991. This meeting should deal with achievements and further plans for research in the area of hygienic slaughter and further processing of food animals.

7. Proposed working groups on human health risk assessment and consumer information on enteric bacterial zoonoses

The Consultation recognized that guidelines for global use on the human health risk assessment of salmonellosis, and other foodborne pathogens do not currently exist.

A WHO working team of experts should be convened to establish guidelines for the human health risk assessment of foodborne enteric zoonoses. This should also address proper risk communication, e.g. consumer information, and thus supplement global guidelines regarding salmonellosis and other foodborne pathogens. It is recommended that this working team includes in its considerations the emerging risk for human health of haemorrhagic E. coli.

8. Training

The cooperation between AMRO/PAHO and the FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Institute of Veterinary Medicine, Berlin, should be strengthened with respect to the development of training modules in animal production hygiene.

9. IICA and PAHO training courses

It was recommended that IICA and AMRO/PAHO should include animal production hygiene in their animal health training courses.

10. FAO/WHO veterinary education

The Consultation welcomed the convening in 1992 of an FAO Expert Consultation in Veterinary Education (in collaboration with WHO) to elaborate recommendations for the future development of veterinary manpower. It is hoped that emphasis will be placed on the role of veterinarians in animal production hygiene and food safety.

11. Coordination of regulatory issues

The Consultation recognized that there are a number of international organizations and institutions concerned with regulatory issues of hygiene and disease control in warm blooded animals, fish and plants. National strategies should be developed for the harmonization of policies, activities and standards regarding hygiene and disease control related to warm blooded animals, fish and plants. FAO, in collaboration with OIE and WHO, should communicate with relevant national agencies on the possibility of organizing a consultation on strategy development and the establishment of working groups.

12. OIE - codes for animal trade

The initiative of the OIE to develop codes for the control of Salmonella infections in the international trade of poultry for breeding purposes and fertilized eggs is appreciated.

Whereas certification of Salmonella free status would be most useful, consideration should also be given to a definition and formal recognition of good manufacturing practice including Salmonella free feed supply to breeding flocks. This would appear an essential part for the control of the infection at the farm level and in the trade of animals and eggs for breeding purposes. Such OIE activities may be extended to other species and to all the production sectors, at the farm level.

13. Partnership programme development towards food quality assurance

A partnership programme should be promoted between all organizations and institutions able to contribute to the production and distribution of animal products free of invasive Salmonella and other foodborne pathogens. The experience of such a programme for the control of salmonella infection in poultry in Canada should be made widely available by the international organizations. A European initiative between the European Parliament, Federations engaged in animal productions, health food quality assessment and WHO may become an example for the development of similar international and national partnership programmes in other parts of the world.

14. Other coordinating functions of FAO, WHO, and Collaborating Centres

In addition to tasks recommended above, FAO's role as coordinator of international and national activities in fish hygiene should be strengthened.

15. Circulation of this report

Through a joint FAO/WHO/OIE letter invite chief veterinary officers and Deans of veterinary schools to strengthen programmes related to food hygiene and technology.

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Dr J. B. Morrissey, Assistant Deputy Minister, Science, Fisheries and Oceans Canada, 200 Kent Street, Suite 1500, Ottawa, Ontario K1A 0E6

Secretariat

Dr K. Bögel, (Secretary), Chief, Veterinary Public Health, Division of Communicable Diseases, WHO, Geneva

Ms Y. Rodriguez, (Rapporteur), Staff Officer, Animal Health Division, Food Production and Inspection Branch, Agriculture Canada, 2255 Carling Avenue, Hallidon Square, Ottawa, Ontario K1A 0Y9

ANNEX 2

Dr J. E. McGowan, Senior Assistant Deputy Minister, Agriculture Canada, Ottawa

GENERAL CONSIDERATIONS

Since the beginning of the history of farming, a practice which began because man valued animal protein and recognized that animals could convert inedible plants to meat, man has been aware of the risks associated with the consumption of meat.

The two constants throughout history have been the measured risks and the approach taken in addressing those risks. Originally, the risks associated with meat were attributed to the old age of the meat. Over the years meat risks have become more associated with sanitary practices rather than with age, and yet sanitary practices still only address the processing and not the production phase of the animal protein industry.

Due to media attention, the industry could lose much if it does not take measures to protect itself. Improved hygienic prevention approaches as well as common sense biosecurity measures must be stressed upon the industry if they are to meet the challenges.

FORTY-SECOND WORLD HEALTH ASSEMBLY

WHA42.40

Agenda item 18.2

19 May 1989

PREVENTION AND CONTROL OF SALMONELLOSIS

The Forty-second World Health Assembly,

Acknowledging the work of the Organization in the prevention and control of food-borne diseases, including those of zoonotic origin;

Concerned at the marked increase in food-borne infections in many countries, particularly the incidence of human salmonellosis and other zoonotic enteric infections due to the presence of causative agents in livestock and poultry;

Conscious of the need to protect human health from harmful agents in food products obtained from infected animals;

Noting that international trade in infected feedstuffs, animals and their products poses worldwide problems for human health;

Affirming that the control of these diseases depends on good hygienic practices in breeding, feeding, slaughtering and marketing animals, poultry and animal products for human consumption; in the preparation, processing, distribution and storage of food; and in the catering trades and in the home;

Taking into account the recommendations of the Codex Alimentarius Commission, various WHO meetings and expert committees on the subject;

1. URGES Member States:

(1) to intensify their epidemiological surveillance services in monitoring critical points of production, processing, and marketing of animals and their products with regard to salmonellosis and other zoonotic infections;

(2) to strengthen efforts to control food-borne zoonoses through the application of effective measures to ensure the quality of feedstuffs, animals, and their products;

(3) to take into account the relevant Codex standards and international codes of hygiene practices in the development and implementation of the food safety programmes;

(4) to foster intersectoral and community-based applied research projects with a view to reducing health risks from animals and their products;

2. REQUESTS the Director-General:

(1) to develop further, in collaboration with FAO and other organizations, WHO's activities on the promotion of hygiene in the production and marketing of animals and their products;

- (2) to continue to assist Member States in particular through the work of the Codex Alimentarius Commission in the development of optimum microbiological and hygiene standards for products of animal origin;
- (3) to continue to cooperate with Member States in the development and dissemination of information on the most effective practical veterinary and public health measures for preventing and controlling salmonellosis and other zoonotic infections;
- (4) to report to the Executive Board and the Health Assembly on future activities of the Organization in the area of prevention and control of salmonellosis and other zoonotic enteric infections.

Thirteenth plenary meeting, 19 May 1989  
A42/VR/13

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ANNEX 4

ANIMAL PRODUCTION HYGIENE

Dr M. Morissette, Director General, Food Inspection Directorate, Agriculture  
Canada

Presented by Dr R. Reid, Senior Advisor to the Assistant Deputy Minister

Both known and emerging food borne pathogens are attracting media attention because of the cost to humans in terms of lost productivity, lost work days and increased burden of the health care system. The media's portrayal of the threats, or perceived threats, can often also have detrimental effects on the affected food industry.

Salmonella, E. coli and Listeria are the pathogens of concern to the food industry, the former two being familiar ones which have somehow become altered in the way they affect human and animal populations and the latter being a truly new pathogen.

With regard to Salmonella in egg or poultry products, Canada does not have the same problem as the USA and UK. However, Salmonella in general has been identified in Canadian poultry especially. Three years ago, a study to identify and institute proper measures to reduce the presence of the organism was undertaken. The Salmonella Control Programme led to the implementation of many new procedures such as slaughter techniques, hygiene, etc., within the poultry plants. The programme was recently expanded and is now being applied to all sectors of the industry. A significant reduction in the prevalence of Salmonella is anticipated within five to ten years.

Verotoxigenic E. coli is receiving much attention for its implication in human cases of haemorrhagic colitis and kidney disease, especially insofar as it can cause irreversible kidney damage to young children. Agriculture Canada and Health and Welfare Canada (H&WC) are involved in a joint survey, which began in August and is expected to be completed by November, of all registered meat establishments that produce ground beef and beef patties. Further work is being conducted by H&WC at the retail level to determine if any particular slaughter house or area or herd is the problem.

Listeria monocytogenes causes a 30% mortality rate in humans and is extremely difficult to control since it can survive and multiply at low temperatures. Environmental swabbing of meat establishments is being jointly conducted with H&WC and once we have an overview of the prevalence of the organism, the programme will be altered respectively. In the meantime, if any organisms are found, measures are taken to reduce the prevalence in the establishments.

Other organisms that deserve our attention, insofar as the significance of their effect on humans is unknown are Campylobacter, Bacillus cereus and Shigella.

Finally, an area on which one definitely needs to focus is foodborne viruses in the etiology of disease outbreaks. No active role has been taken due to lack of current epidemiological data.

Agriculture Canada intends to increase its programmes in foodborne diseases and the collaboration of Health and Welfare Canada and other agencies will help promote a national food safety programme.

ANNEX 5

EMERGING PROBLEMS IN FISH AND FISH PRODUCTS

Dr A. Gervais, Inspection Services Directorate, Fisheries and Oceans Canada

Fishing is an important economic activity in Canada, resulting in a \$ 2.7 billion trade in 1988. Consequently, the health of the Canadian consumers and the international reputation of our products are major concerns.

The Inspection Services Directorate is responsible for a comprehensive fish inspection programme that concentrates on both domestic products as well as imports. Recently, the Department, in conjunction with the fishing industry, developed an In-Plant Quality Management Programme Control Points, an approach which is used by other countries' inspection agencies. Inspection of imports is also of major concern: the Department must ensure that fish products sold in Canada are in accordance with the Food and Drug Act and the Consumer Packaging and Labelling Act.

The report of the Consultation on Public Health Aspects of Seafood borne Zoonotic Diseases hosted by WHO in Hanover, FRG in 1989, is a valuable tool and should be made readily available to all those involved in the fish industry.

Areas of major concern:

1. Parasitic agents

Some roundworms and nematodes can cause human illness only if consumed live in raw tissue. The recent increase in human illness, although still low, is undoubtedly due to increasing popularity of raw or slightly marinated fish dishes. Control measures include cooking to core temperature of at least 60°C for 1 min, or freezing to a core temperature of -20°C to -23°C for 24 hours, or salting with a 20 to 30% brine solution for 10 to 28 days.

There is a need to reconsider present regulations, which vary among countries, with the objective of defining economical and effective methods of processing for safety. Better consumer education or information on fish parasites and their health significance is needed.

2. Marine toxins

Diarrhetic Shellfish Poisons (DSP), Paralytic Shellfish Poisons (PSP), Amnesic Shellfish Poison (ASP) and Neurotoxic Shellfish Poison (NSP) are associated with oysters, mussels and clams. Because the phytoplankton producing these toxins occurs naturally in the marine environment, one is limited to trying to prevent the potentially toxic shellfish from reaching the consumer through monitoring such as water sampling for phytoplankton, testing shellfish prior to harvesting for toxins, and the closing of harvesting area when the level of phytoplankton is high.

Research is required to develop more rapid and accurate analytical techniques, standard reference materials, toxicology of the toxins, and to establish international tolerances based on proper health risk assessment.

3. Human pathogenic bacteria and viruses

(a) bacteria naturally present in aquatic environments: Listeria monocytogenes is attracting attention although no human case has been attributed to it. Some regulatory agencies are enforcing zero tolerance. Vibrio vulnificus has resulted in death in people who were predisposed, either through cirrhosis of the liver or who were immuno-compromised.

(b) bacteria from human or animal sources: Salmonella, Shigella, Campylobacter are examples of pathogens which could contaminate either through unsanitary sewage and agricultural waste disposal or from unsanitary processing and handling.

(c) viruses from human sources: lack of virological techniques make it difficult to identify the presence of viruses, but heat treatment at temperatures of 85-90°C for 1.5 minutes will inactivate viruses.

Enhanced surveillance and reporting are needed worldwide to better assess the incidence and underlying causes of illness associated with the consumption of fish and shellfish. There should also be wider application of HACCP or similar systems in the fish and shellfish processing industries.

4. Drugs in aquaculture

Aquaculture has prompted the use of drugs to fight disease in the fish populations. However licensing is not readily accessible, thus veterinarians are using drugs that were approved for animal use. Zero level of residues is unrealistic and so specified safe limits must be defined. There is a danger that the low levels of drug residues in the marine environment will lead to human pathogens developing a resistance to their respective drugs.

ANNEX 6

GENERIC MODEL FOR VETERINARY INTERVENTIONS

Dr J. Kellar, Animal Health Division, Agriculture Canada

Epidemiology is the leverage for human disease problems derived from animal disease problems. Although diseases are complex biological issues, they can be analyzed in a mechanical way. The focus of a veterinarian's investigation should be on a production site, the metaphoric link within the production chain.

Once the field of investigation has been narrowed, the veterinarian can concentrate on isolating the different factors that could contribute to the pathogenic problem. The problem could be a result of the potential bacterial burden of the incoming raw material, as well as the external and internal pressures that influence the production of the product. The important significance of such an approach is that each of these factors can be measured qualitatively and quantitatively in an almost mathematical manner for their relative importance. Such a system can allow one to measure the potential impact of any decision before taking any large risks. Of the barriers that must be overcome, industry reluctance is the greatest impediment. Other barriers, such as the inadequate knowledge of the process and of the problem, could be overcome by employing people of different backgrounds.

In conclusion, the veterinary profession is changing in such a way that veterinarians who concentrated on animal diseases in and of themselves will now have to view them in terms of the possible human health risks they pose.

ANNEX 7

THE CANADIAN SALMONELLA CONTROL PROGRAMME IN POULTRY AS AN EXAMPLE

Dr J. Kellar, Food Production and Inspection Branch, Agriculture Canada

The initial step was to broaden the perspective of the poultry industry and recognize it as a finely tuned operation. It was also important to realize that salmonella could be caused by approximately two thousand serotypes, any of which could be transmitted to man. The next step was to look at each of the 17 production sites in the poultry production operation as individual entities that have the same set of circumstances which can be monitored by epidemiologists.

The establishment of such a programme required overcoming the problem of limited resources. This was solved by unifying all past efforts into a corporate approach, raising the profile to a departmental layer, and sharing resources amongst all those concerned despite historical barriers. Multi-disciplinary teams made up of epidemiologists, bacteriologists, operations people, etc., were established and a formal problem solving approach was adopted. Industry reluctance was countered by a series of commitments which included assurances that nothing would be imposed on the industry that could have harmful effects or place them at an economic disadvantage from their trading partners. Industry members also form part of the consultative committee.

The consulting body is composed of several levels of grass-root teams (e.g. hatcheries at the bottom) which report to a management committee headed by Dr Ditberner, Inspector General of the Operations Directorate of Agriculture Canada, who in turn report to the steering committee. However, the information does not simply flow vertically upwards; the industry has an outlet in the form of the review board so that it can sidestep the management committee and go directly to the steering committee to ensure that the information reaching the top is not filtered.

The Canadian Salmonella Programme has designed a formal type approach that must be followed by each team. It is estimated that by the year 2000, the prevalence of Salmonella in our poultry will have significantly been reduced to the level where consumers will no longer refrain from, or have doubts about, buying chicken or chicken products. This will be accomplished by applying pressures to reduce the level of contamination in the end-product and to the communication of kitchen hygiene to the public.

In dealing with the industry, the steering committee will only apply sufficient regulatory pressure to ensure that the industry goes in the right direction. It is up to the clients in the production chain to apply back pressure on the producers. Finally, there exist some outside pressures, "wild-cards", that can be used to the committee's advantage. Such an example would be using the negative media attention given to Salmonella in the UK and USA as an incentive to counter the industry's reluctance to accept the programme. On a recent trip to Sweden to examine their Salmonella project, members of the industry formed part of the delegation.

The participants asked to what extent the programme would involve certification and/or monitoring. The response was that, in Canada, there were

two classes of producers divided by the number of hens in the operation, i.e., those in National Marketing Agencies and smaller ones who are not so controlled. The monitoring effort is now directed at the larger operations, but it is known that the programme procedures and measures will trickle down secondarily to the smaller operations. Certification level will start at the breeding layer.

The participants proposed the need to harmonize both the agricultural and public health agencies in particular on this Salmonella issue. A need was also shown for more veterinary services and more communications people.

The participants asked if any results of the effects of the salmonella project existed. The response was that the programme was still in its first year and that it had mostly concentrated on defining the problem. The programme is not making use of human cases because the health services do not have statistical data on the source of infection, i.e. cheese or dairy products as opposed to eggs etc. nor on the country where the infection may have taken place. There are preliminary results from broiler sampling which are presently at the publishers.

The participants asked at what interval the results would be published, the answer to which was that they would be reported as soon as there was any additional information. The participants also asked about the type and degree of research being conducted. There are six laboratories across the country which are investigating salmonellosis, but the efforts are being coordinated, even with those investigating food safety aspects, so as to not duplicate the work. The scientists develop a programme based on the client needs that have been identified. There is a review board meeting scheduled for 8 November 1990, which will review research delivery. Dr Lonnie King, Deputy Administrator, Veterinary Services, APHIS, USDA, has been invited to send a delegate.

The participants also questioned the type of sampling system used, the answer to which was that the common bacterial approach was being used. Experience in Sweden and Finland has shown that new sampling techniques must be used in conjunction with the common approach. The testing method now being used in surveys detects with 95% efficacy those flocks that have more than a 5% incidence of Salmonella.

The participants also raised the need to establish priorities and to determine an acceptable level of risk that the public would tolerate and that would still be accomplished within the available resources. During the ensuing discussion, the role of national departments of health and welfare in setting the list of priorities and acceptable risks was questioned. National health and welfare departments play important roles in fisheries, yet have limited involvement in agriculture. In Canada, however, there are cooperative working arrangements in place between the various agencies.

Also discussed was the apparent international reduction of professional and/or technical staff. It was established that in Canada, not all food hygienists need to be veterinarians, although a certain percentage is required within each team.

The question of whether or not the regulatory agencies could be held accountable legally for an outbreak of salmonellosis in humans was also discussed. The question of what measures were being used to determine the

percentage of salmonella cases in humans referable to poultry was also discussed. Furthermore, it was also noted that IICA has a role in assisting the dissemination of the latest available information to the developing countries which need to export their products to the developed countries.

ANNEX 8

ANIMAL DISEASE RESEARCH INSTITUTE (ADRI), AGRICULTURE CANADA  
Nepean, Ontario, Canada

Introduction - Dr B. Stemshorn

ADRI, Nepean, is 1 of 6 laboratories of the Health of Animals Directorate of Agriculture Canada. It is the largest and accounts for approximately 30% of all the Health of Animals' laboratory effort. There are nine sections within the laboratory: laboratory operations, immunology, microbiology research, microbiology services, pathology, reproduction, serology, biologics evaluation, virology, and administration and resources.

The laboratory has been providing both diagnostic and research services since the early 1990's. There are 5 major areas on which it focuses:

Foreign animal disease

The virology section in Hull will be undergoing a \$3 million renovation early in 1991. There are also plans for a new facility in Winnipeg that should be completed by the mid 1990's. The Hull laboratory is responsible for the first front detection of vesicular diseases, African swine fever, hog cholera, exotic Newcastle, bluetongue, pseudorabies, in short, the foreign animal diseases. It also maintains diagnostic systems. The focus in recent years has been on research on immunoassays and molecular genetic methods of detection.

Meat hygiene

Until recently, this had not been an area of major focus. Some work had been done in the mid 1970's on competitive exclusion methods for Salmonella. However, with the shift of resources away from brucellosis and para-tuberculosis, there has been an increased interest in the field. There is a move towards rapid detection methods especially where Salmonella is concerned. Dr Ann Fraser spoke on this topic. Other initiatives include programmes in Listeria and E. coli whose programmes are still to be announced and a multifactorial approach (genetics, flora, management) to Salmonella carriers.

Zoonotic diseases

1. Rabies: presentations were made by Drs Charlton and Wandeler. Resource investments over the past few years are paying off and there is a prospect that ADRI will be designated a WHO collaborating centre in the near future.
2. Brucellosis: There is a full range of serological and culture diagnostic methods available. There is both B. abortus and ovis antigen production and research with the National Research Council has defined the "O" chain chemistry of the antigen. Research has also developed enzyme-immunoassays, identified causes of false positives in agglutination test reactions and identified the value of the EDTA test in reducing the amount

of false positives. Work is currently underway with WHO and IAEA to standardize the ELISA test for brucellosis and other cattle diseases worldwide.

3. Tuberculosis: ADRI is the tuberculosis diagnostic centre for Canada. It also produces both bovine and avian tuberculin. Research on the diagnosis of para-tuberculosis focuses on antigen chemistry, immunoassays, and molecular biology.

#### Import/export certification

The laboratory conducts diagnostic testing, a scope of which can be found on pages 50-53 in the Health of Animals 1988 Overview. Elizabeth Singh heads the research team that conducts research on the risks of disease transmission by semen and embryos. The results of the Embryo Transfer studies presented at the OIE by Dr Hare have had important impact in revising criteria and setting standards for certification of embryos for international movement.

#### Biologics evaluation

This is a recent initiative for the Institution, having only begun in 1987. The laboratory has been focusing on establishing assays for standard and new products, exploring new approaches to ensure product efficacy and preparing for the wave of products coming from investments in biotechnology. The section is headed by Dr Ted Thomas. The result of this new initiative is the fact that the links between commercial industries and universities have improved.

#### New directions

Plant health laboratories are being integrated and exist on the premises. The concept behind this move is that plant and animal medicine is one medicine. Many laboratories that are common to both will be shared.

ANNEX 9

RABIES LABORATORY

Drs K. Charlton and A. Wandeler, Animal Diseases Research Institute  
(ADRI), Agriculture Canada, Nepean, Ontario, Canada

Two laboratories (one in Lethbridge, one in Nepean) employ ten professional staff, five of which are employed part-time and two of which are graduate students. They receive external grants and funding. As far as diagnosis is concerned, the Nepean laboratory is responsible for half of the country's rabies diagnosis, from the Manitoba/Ontario border to the east coast. There is a network which provides for a uniformity of tests. The amount of false-negatives has been reduced to 0%. Tissue culture tests are used as a secondary test and these have obviated the need for 30 000 mice a year.

The laboratories are also involved in research on the morphological and immunocytochemical aspects of the pathogenesis of rabies, concentrating mainly in skunks. Emphasis is also placed on epizootology. Much effort has been made to characterize the major strains of rabies across Canada. Dr Wandeler has also brought several different monoclonal antibodies from Switzerland.

Attenuated live virus (both SAD and ARE) was the first to be used for the oral immunization to control wildlife rabies. In Switzerland, oral vaccination using SAD has ceased since the country is ???? rabies-free. Only the border is still an immunization zone. Other countries have experienced more difficulty with the programme because of the different species of wildlife that may be harbouring the disease. Foxes were the only species to respond well to SAD. In addition, the live attenuated virus vaccine may be pathogenic to other non-target species.

Recombinant vaccinia using a rabies glycoprotein has worked quite well in a variety of species in field trials in Virginia and Europe. It is expected that better monitoring of these field studies in North America will provide better results of the efficacy of the recombinant vaccinia. This vaccine, however, is still not widely used for skunks.

Research on the efficacy of the recombinant vaccine using the human adeno 5 virus so far looks promising. Research is being conducted in conjunction with WHO on the effect on target and non-target groups of the virus that is excreted by the ingesting animal.

In the ensuing discussion, the participants were informed that of all the rabies cases, only half resulted in human exposures, and that in Canada, rabies control came under Agriculture Canada and not Health and Welfare Canada.

### THE SALMONELLA PROJECT

Dr A. Fraser, Animal Disease Research Institute (ADRI), Agriculture Canada  
Nepean, Ontario, Canada

The food safety research section is concerned with Salmonella, Campylobacter, Listeria, and enterotoxigenic E. coli. The major emphasis of the food safety research division is on development of tests for the rapid detection, identification, characterization, and epidemiological evaluation of foodborne pathogens. The section is also involved in the development of strategies for the control of foodborne pathogens.

Two and a half years ago, the research team was given the mandate to develop a 30 to 120 minute test for the antemortem detection of Salmonella in broiler chickens arriving at poultry processing plants. The course of action the research team decided to opt for was to try to develop a method of recovering Salmonella from faecal material so that it would not interfere with DNA probing or ELISA test. The approaches looked at were mainly filtration followed by centrifugation. The objective was to filter out a high enough number of Salmonella cells to allow for proper detection from the faecal material.

The approach was indeed successful. The laboratory has in fact applied for a patent for the filter system. However, the combination of filtering and centrifugation yielded only 10 Salmonella cells, an insufficient number to conduct the CSA dot test. Therefore media enrichment had to be adopted. All commercially available tests for Salmonella detection use a time-consuming process of overnight selective media enrichment in peptone water followed by overnight selective media enrichment. The research team has opted for media and culture conditions that support the fastest growth of Salmonella with minimal inhibition from competing microorganisms. The incubation time using this procedure could drop from over 48 hours to about 6 hours. Furthermore, it could be used to reduce the number of false positives since it is possible that the sample may be interfering with the detection method.

As far as the detection is concerned, the Salmonella cells are broken to allow better sensitivity of monoclonal M105 to the core LPs of Salmonella (CSA). The Dot blot test, including the comparative one, uses a nitrocellulose membrane. The membrane is then cut into strips of three dots, each with different dilutions and then allowed to interact with the reagents for two hours. Reading the results involves colour comparison with both negative and positive control samples.

There are presently 127 field studies underway. The preliminary results indicate that the specificity and sensitivity of the overall procedure, which takes 19 hours, is 83.7%. Using the comparative CSA Dot test, the efficacy can be raised to 92.7%.

ANNEX 11

RESEARCH AND DEVELOPMENT

Dr R. Clarke, Health of Animals Laboratory, Agriculture Canada,  
Guelph, Ontario, Canada

Control of foodborne pathogens will require research programmes that provide the best possible data for decision making. Scientists must also learn to communicate these findings in a language that the public can understand.

A recent review of the research programme of the Health of Animals Laboratory has resulted in some major changes, notably improved methods to define client problems, a "fund by project" system and the establishment of a National Food Safety Research Network.

A major focus of the research programme has been to investigate technology that can be used in the plant environment to assess the bacterial contamination of meat products. Currently a hydrophobic grid membrane filter (HGMF) interpreter system that is on trial at one of the poultry plants can enumerate the bacterial load of a carcass rinse solution. This equipment has proven to give repeatable reliable results and hopefully will provide a mechanism and enhance the traditional types of inspection currently in use today.

Research on rapid detection of pathogens continues to be a major component of our research programme. Oligonucleotide primers/probes have been developed for Verocytotoxin-producing E. coli (VTEC), Salmonella and Listeria. At the present time a PCR system for VTEC is being evaluated as part of a national VTEC survey of meats at the processing level.

New and emerging pathogens such as VTEC continue to present a challenge to research on food safety. In Canada as many as 70 serotypes of VTEC have been found in humans and at least 50 serotypes in cattle. To date 15 serotypes have been found in both cattle and humans. Studies on stool samples for human patients with diarrhoea indicate that VTEC are isolated at a similar rate as Salmonella and Campylobacter. In one recent study Pai et al. (1988) examined over 5 000 stool samples and found VTEC in 3.1%, Salmonella in 2.7%, and Campylobacter in 2%.

Studies have confirmed epidemiological suspicions that cattle are an important reservoir of VTEC. A study of meat samples collected at slaughter isolated VTEC from 19.5% of dairy cattle, 10.5% of beef cattle and 3.5% of veal calves. Studies of ground beef confirmed that these organisms are present in as many as 30% of samples tested. The significance of these data are not completely understood since we do not know if all of the serotypes of VTEC found in cattle are pathogenic for man. Studies on the colonization factors and virulence determinants of these organisms will hopefully clarify the situation.

In summary, I would like to make the following recommendations:

- (1) Investigate the possibility of establishing an International Food Safety Research Network.

- (3) Develop international surveillance systems to monitor new or emerging pathogens.

#### FUTURE CHALLENGES FOR FOOD SAFETY RESEARCH

- International food safety research network
- International standards oligonucleotide probes sampling
- Reduce duplication of research projects
- International surveillance of emerging pathogens
- Technology should not become an end in itself, i.e. technology transfer

ANNEX 12

RESEARCH AND DEVELOPMENT

Dr J. B. Morrissey, Assistant Deputy Minister, Science,  
Fisheries and Oceans Canada

There has been a growing concern about the health of fish in the past couple of years. Ten years ago, the fishing industry was at the hunting and gathering stage. Within the last dozen years, aquaculture has gained significance. Because of the cultured stocks and intensive husbandry associated with aquaculture, the risk of disease is higher. Cultured stocks create a situation where disease occurrence is exponential to the number of fish per space (3-6 units of fish/unit of space results in 3-9 units of disease/unit of space).

The aquaculture industry has experienced a five-fold increase in production between 1982 and 1989. By the year 2000, production is expected to double to reach a high of 60 900 tonnes. Most of aquaculture's future expansion is expected to take place in coastal waters rather than in fresh water. It is anticipated that by the year 2000, the supply of fish will be meeting the public's demand. As aquaculture starts meeting the demand for high priced species, the prices may come down.

The Bay of Fundy seems to be the ideal area for aquaculture to expand because of the large flushing tides. The Western Coast, stretching from the most southern tip almost as far as Alaska, also seems promising. Finfish lend themselves well to commercial and genetic breeding facilities. The most important species cultured are the salmonids, as well as mussels and oysters. Scallops are already being farmed in the east, and lobsters are being farmed at the Maurice Lamontaigne Institute in Québec. The largest Farming of Irish Moss in North America occurs on the Atlantic coast.

Whereas 70% of diseases in warm blooded animals are transmissible to man, it is estimated that in fish a much lower percentage are transmissible. The major concern with the pathogens that affect fish is that they are responsible for significant economic losses. Some of these pathogens include the viruses, viral haemorrhagic septicemia (VHS), infectious haematopoietic necrosis (IHN), and infectious pancreatic necrosis (IPN), which are the hardest to treat, the bacteria, Aeromonas salmonicida and Yersinia ruckeri, and the parasites, Myxobolus cerebratis and Ceratomyxa shasta. There are also ubiquitous diseases such as motile Aeromonas spp., Pseudomonas spp., and Vibrio spp. that can be avoided through good husbandry.

There are, however, some pathogens which pose a risk to human health. These bacteria are Staphylococcus, Salmonella, faecal coliform, and Listeria, which also are of concern in animal products. The risk to humans by parasites, such as Pseudoterranova decipiens and Anisakis, can easily be reduced by proper treatment. Other risks to humans include the accumulation of toxic algae in molluscs and residues of environmental contaminants, therapeutic drugs and pesticides.

applies to wild and farmed fish. It concentrates mainly on viral, bacterial and parasitic agents of finfish and molluscs.

The Department of Fisheries and Oceans coordinates other federal and provincial agencies work in related areas such as regulatory work in the importation and production of biologics by Agriculture Canada. Regulations are needed to control and prevent the introduction and dissemination of fish disease agents. Present regulations apply only to salmonids, but consideration is being given to include other finfish species and invertebrates.

As in other areas of non-human medicine, the trend towards placing a higher importance on human health rather than animal health is also likely to occur in fish. International trade will require that countries harmonize their regulations and seek international consensus on the standards required by each country that minimize risks to human and fish health and which do not create barriers to trade. In the future, more research money should be spent on bacterial zoonotic diseases such as Listeria monocytogenes which cannot be controlled through proper treatment prior to consumption. Research into vaccines for viral fish diseases should also be encouraged. Present areas of research into diagnostic techniques include use of DNA probes and ELISA tests.

International cooperation in research and exchange of information on drugs used to control the spread of disease in fish would facilitate the registration of drugs, thus increasing the number available to fish farmers. National surveillance programmes need to be standardized internationally. Regulations protecting the health of fish need to be developed in all countries before fish transplanted from the wild to farms spread diseases uncontrollably. Finally, international collaboration in rapid diagnostic procedures to detect pathogens in fish flesh need to be developed as the public's demand for disease-free fish products increases.

It is also important to consider the lessons learned in the wild fish resource industry and apply them to the emerging aquaculture industry. In the future, it will be important not to continue artificially separating fish from plants and animals.

In the ensuing discussions, the American participants expressed the need for a total linkage and networking of all groups (fish, plant and animal) involved in food safety if the WHO is to become a leader in food safety. The participants also concurred that there was a need for more professional staff. There is a need to determine if the OIE, which has shown leadership in forming a Fish Centre, can work as an international umbrella agency coordinating the standardization and transfer of information. In the US, the USDA's Office of Aquaculture provides the leadership for the coordination of all Federal government aquaculture programmes. In 1989, the office received \$3.75 million in congressional appropriations.

The participants also raised the need to have acts and regulations dealing with animals and plants closely parallel (i.e. word for word) to those that will be drawn up for fish. This is particularly important in the event of an outbreak where the expertise of a group having previously dealt with a similar situation would be of great value.

ANNEX 13

SUPPORTIVE AREAS OF TRAINING

Dr G. Dittberner, Inspector General, Operations Directorate,  
Food Production and Inspection Branch, Agriculture Canada

Overview:

The Operations Directorate is responsible for the delivery of all the programmes of the Food Production and Inspection Branch (Animal Health, Plant Health and Food Inspection). In order to avoid duplication, the organization was unified. There are 7 regions, roughly representing the provinces, with 3 300 inspectors, one third of whom are in Quebec and another third are in Ontario.

The inspectors are "Primary Product Inspectors". There is flexibility within the division such that on a slow day, an inspector working in the slaughter plant could offer services at a potato plant.

The directorate and its programmes will develop gradually because of resource restraints. Due to the fact that approximately 20% of the veterinarians are due to retire over the next five years, there will be a turnover rate of new staff of 100-150 people/year. Newly recruited staff will have to be better skilled in technological and administrative areas. As well, all staff need to be equipped with state of the art tools, tests and laboratories.

Training:

The goal of our training programmes is to support our division's multidisciplinary programme delivery. All veterinarians, technicians, and agrologists of the division must undergo testing that would certify them to do their jobs. There is at the present time mixed opinions on this requirement.

Some of the training mechanisms include training modules, national courses and schools, regional workshops and seminars, officer exchange programmes and university programmes.

The training modules are not specific to only one profession. For example, training modules are not just for inspectors, but are also for the industry sector. The training modules, such as the Salmonella one, have also been sent to other countries. Manuals for both Meat Hygiene and Animal Health Programmes are available to private veterinarians who are accredited by Agriculture Canada. Fisheries and Oceans has a food inspection training programme that is combined with Health and Welfare, Agriculture Canada and Consumer Affairs. Fisheries enforcement training is similar to Agriculture Canada's.

Beagle Brigade Video:

The video describes the unique approach to import control by employing beagles at our three major airports. The training module is a pilot project that is based on a US model. The module is designed to train those technical

stopping the illegal importation of prohibited products, not to mention that they are a tremendous public relations asset.

Salmonella video-clip:

This video has received awards for creative training. It was designed to be used by a broad target audience, from inspection staff to industry and plant employees. It has reduced unnecessary travel between countries since prior to these training videos, those involved in industry had to come to Canada for training.

In conclusion, Agriculture Canada favours international sharing of information in the area of training. Agriculture Canada conducts training courses in Plum Island and welcomes input of international agencies to facilitate the upgrading and updating process of its training.

ANNEX 14

FIELD TRIP TO THE INTERNATIONAL LIVESTOCK MANAGEMENT SCHOOL

Mr Lang and Dr Watson

The International Livestock Management School was established by SEMEX CANADA, a cooperative of eight cattle and one swine production cooperatives across Canada. It is a not-for-profit institute that was established to help successfully complete the process of artificial insemination and embryo transfer that begins with the exporting of reproductive material. It was determined that a country, who imported genetic material in hopes of attaining the same performance that Canada was enjoying (i.e. in dairy cattle, a 160 kg of milk/day), was incapable of reproducing the desired results. This was due to the fact that 38% of the input necessary to attain the high performance was genetic improvement, while 62% lay in the management of the genetics to make them perform.

Those interested in the programme have usually been independent businessmen and government agencies. The programme operates on a cost-recovery basis and presently offers no fellowships. However, fellowships are available from other funds such as CIDA, etc.

The programme had originally been limited to artificial insemination, but it has been steadily expanding to include embryo transfer. Trainees are expected to have a solid background in agriculture and have strong leadership abilities as they are meant to pass on their acquired knowledge upon their return to their country. The courses stress hands-on experience and one-on-one training rather than classroom-style lectures. IIMS is affiliated with several agricultural colleges and dairy farms to further provide demonstrations of proper herd management techniques to the trainees.