CAPACITY BUILDING FOR SURVEILLANCE AND CONTROL OF ZOONOTIC DISEASES

FAO/WHO/OIE Expert and Technical Consultation
Rome, 14 –16 June 2005
Contents

Opening address vii

Summary report 1
- Introduction 1
- Objectives and procedures 1
- Summaries of presentations and discussions 2
- General discussions and conclusions 13
- Recommendations 14

Appendix 1: Agenda 17

Appendix 2: List of participants 23

Appendix 3: Expert consultation 29
- Capacity building for veterinarians and veterinary paraprofessionals 31
- Capacity building for surveillance and control of Taenia solium/cysticercosis 37
- Capacity building for surveillance and control of bovine spongiform encephalopathy and other zoonotic diseases 47
- Capacity building for surveillance and control of tuberculosis 49
- Capacity building for surveillance and control of bovine and caprine brucellosis 55
- Capacity building for surveillance and control of zoonotic disease under emergency conditions 67

Appendix 4: Technical consultation 79
- The global framework for the progressive control of transboundary animal diseases (TADs) 81
- WHO systems for surveillance, alert and response to zoonoses outbreaks 85
- Activities of the Ad Hoc Group on antimicrobial resistance 87
- Mediterranean Zoonoses Control Programme: Activities for zoonotic disease control 91
- Veterinary Public Health activities at FAO: Current actions & what is needed 95
- Anthrax: Surveillance and control 101
- Food-borne diseases: Surveillance and control 107
- World Health Organization Global Salm-Surv: A worldwide capacity building programme for the surveillance of Salmonella and other food-borne pathogens 111
# Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AGA</td>
<td>FAO Animal Production and Health Division</td>
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<tr>
<td>AHCNENA</td>
<td>Animal Health Commission for Near East and North Africa</td>
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<td>AMU</td>
<td>Arab Maghreb Union</td>
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<td>AOAD</td>
<td>Arab Organization for Agricultural Development</td>
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<td>APHCA</td>
<td>Regional Animal Production and Health Commission for Asia and the Pacific</td>
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<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
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<td>AST</td>
<td>antimicrobial susceptibility testing</td>
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<td>AU-IBAR</td>
<td>African Union-Interafrican Bureau for Animal Resources</td>
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<td>BSE</td>
<td>bovine spongiform encephalopathy</td>
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<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<td>CFT</td>
<td>complement fixation test</td>
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<td>CBPP</td>
<td>contagious bovine pleuropneumonia</td>
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<td>ECO</td>
<td>European Cooperation Organisation</td>
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<td>EDG</td>
<td>electronic discussion group</td>
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<td>ELISA</td>
<td>Enzyme Linked ImmunoSorbent Assay</td>
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<td>EQAS</td>
<td>External Quality Assurance System</td>
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<td>ESNS</td>
<td>FAO Food Safety and Quality Service</td>
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<td>EU</td>
<td>European Union</td>
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<td>EU-FMD</td>
<td>European Commission for the Control of Foot-and-Mouth Disease</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>FMD</td>
<td>food-and-mouth disease</td>
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<td>FPA</td>
<td>fluorescence polarization assay</td>
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<td>GCC</td>
<td>Arab Gulf Cooperation Council</td>
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<td>GF-TADs</td>
<td>Global Framework for the Control of Transboundary Animal Diseases</td>
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<td>GLEWS</td>
<td>Global Early Warning System</td>
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<td>GPHIN</td>
<td>Global Public Health Information Network</td>
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<td>GOARN</td>
<td>Global Outbreak Alert and Response Network</td>
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<td>GREP</td>
<td>Global Rinderpest Eradication Programme</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<td>GSS</td>
<td>Global Salm-Surv</td>
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<tr>
<td>HACCP</td>
<td>Hazard Analysis and Critical Control Point (System)</td>
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<td>HPAI</td>
<td>highly pathogenic avian influenza</td>
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<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
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<td>IICA</td>
<td>Inter-American Institute for Cooperation on Agriculture</td>
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<td>ITFDE</td>
<td>International Task Force for Disease Eradication</td>
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<td>MDGs</td>
<td>Millennium Development Goals</td>
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<td>MERCOSUR</td>
<td>Southern Common Market</td>
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<td>MZCC</td>
<td>Mediterranean Zoonoses Control Centre</td>
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<td>MZCP</td>
<td>Mediterranean Zoonoses Control Programme</td>
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<td>OIE</td>
<td>World Organization for Animal Health</td>
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<td>OIRSA</td>
<td>Organismo Internacional Regional de Sanidad Agropecuaria</td>
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<td>PAHO</td>
<td>Pan-American Health Organization</td>
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<td>PANAFTOSA</td>
<td>Pan-American Foot and Mouth Disease Center</td>
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<td>PCR</td>
<td>polymerase chain reaction</td>
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<td>SAARC</td>
<td>South Asian Association for Regional Cooperation</td>
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<td>SADC</td>
<td>Southern African Development Community</td>
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<td>SARS</td>
<td>severe acute respiratory syndrome</td>
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<td>SPS</td>
<td>sanitary and phytosanitary</td>
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<td>STEC</td>
<td>Shiga-like toxin-producing <em>Escherichia coli</em> 0157</td>
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<td>TADs</td>
<td>transboundary animal diseases</td>
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<td>TCP</td>
<td>Technical Cooperation Programme</td>
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<td>VCIA</td>
<td>veterinary critically important antimicrobial</td>
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<td>VPH</td>
<td>veterinary public health</td>
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<td>VUH</td>
<td>veterinary urban hygiene</td>
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<td>WFS</td>
<td>World Food Summit</td>
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<td>WFS:fyI</td>
<td>World Food Summit: five years later</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WTO</td>
<td>World Trade Organization</td>
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Opening address

Mr Chairman, Ladies and Gentlemen,

It is with great pleasure that I welcome you all to FAO and to the Animal Production and Health Division for the FAO/WHO/OIE Expert and Technical Consultation on Capacity Building for Surveillance and Control of Zoonotic Diseases. A very special welcome to all the experts who have accepted the call to provide their advice to this important process which FAO has set up to gather the most up-to-date, advanced scientific guidance for its programme of work.

FAO takes the instrument of the expert and technical consultation very seriously. The advice you will be generating today and tomorrow will be taken up by the Director-General in the guidance of the FAO veterinary public health programme.

Veterinary public health aspects have long been on the agenda of the FAO animal health programme - if we think of the many activities on brucellosis, echinococcosis, trichinellosis and tuberculosis control that have been and are being carried out in many member countries.

Six years ago, however, we decided to give to these activities a more distinct platform for their further development and coordination as well as for their programmatic profile-building. This was done by creating a separate regular programme entity termed “Veterinary Public Health and Feed and Food Safety”; and we have supported the creation of a division-wide interdisciplinary task force on VPH that is very actively pursuing the entity's agenda. The VPH definition agreed in the 1999 joint FAO/WHO expert committee meeting is the relevant basis for the work of the task force; this definition reads: “Veterinary Public Health is the sum of all contributions to the physical, mental and social well-being of humans through understanding and application of veterinary science”.

The task force acts on its programme of work using an interdisciplinary and intersectoral approach, as is unanimously recommended by the expert papers submitted to this consultation. I need not dwell on this fundamental requirement, which is certainly not disputed by anyone involved in VPH matters anywhere in the world.

Veterinary public health is an international public good of paramount and increasing importance and FAO is not only well placed, but also firmly committed to strengthening this public good in collaboration with others such as with the World Health Organization, particularly but not only in the context of the Codex Alimentarius, and with the Office International des Epizooties, the OIE, in the SPS context and in collaboration with national and regional specialist organizations.

To illustrate the importance of VPH incidences and thereby underscore the need for mitigating action, I could quote the example of the impact of the BSE crisis in the European Union. In a recent study prepared on this by a working group under the leadership of Patrick Cunningham and published by the European Association for Animal Production, the annual loss to the European livestock sector as a result of the BSE crisis is estimated at 2.75 billion US$, much of this impact is there to stay long-term as a considerable proportion of the by-products used productively before the crisis, such as specified risk materials and meat-and-bone meal, have now become a considerable cost for industry and society. Cysticercosis, Nipah, salmonellosis, E. coli, rabies, Rift Valley fever, SARS, and lately avian influenza might be other suitable examples to bring home to all concerned that very serious risks are at hand.

In its VPH programme, FAO pays particular attention to animal-health-related problems and issues as they impact the human population in developing countries. This involves attention to the risks at the level of both production and consumption of food of animal origin, including risks stemming from zoonoses, related to occupational diseases and to environmental health as affected by the health condition of farm animals.

The spectrum of important veterinary public health issues is very large and careful priority-setting is required for most effective and efficient use of scarce available resources. A contribution of this expert consultation to the way in which such priority-setting might take place is expected.

In many circumstances, and not only in developing countries, the raising of awareness of commu-
nities to veterinary public health risks and of ways by which to diagnose, manage and mitigate them more effectively is key for the success of VPH programmes. This expert consultation addresses Capacity Building for Surveillance and Control of Zoonotic Diseases. If veterinary services and veterinarians in particular have to play their role in managing VPH risks, the early and correct diagnosis of zoonotic diseases is obviously of paramount importance. I am very pleased to note that significant inputs on this are available through the expert contributions to this consultation. I am therefore very confident that there will be strong and detailed advice resulting from your discussions - advice on the contents and operations, both medium and longer term, of the FAO Veterinary Public Health Programme. I would again like to thank you for your time and effort in this process.

It is a great pleasure for FAO to host this meeting with the participation of all of you and with the collaboration of colleagues from OIE and WHO and from associated collaborating centres.

I wish you a very productive session and I am confident that all arrangements are in place to make your work as effective as possible.

Samuel Jutzi
Director
FAO Animal Production and Health Division
Summary report

INTRODUCTION
Veterinary public health (VPH) was originally defined in a 1975 Joint FAO/WHO Expert Committee Report as “the component of public health activities devoted to the application of professional veterinary skills, knowledge, and resources to the protection and improvement of human health.” A more recent VPH study group report in 1999 expanded this definition to include “the sum of all contributions to the physical, mental, and social well-being of humans through an understanding and application of veterinary science”. This latter report emphasized that VPH would have to develop against a rapidly changing background of population growth, increasing urbanization, an increasing poverty and technology gap between developed and developing countries as well as changes in land use, the environment, and climate.

Capacity building is a process whereby individuals, groups, institutions, organizations and societies enhance their abilities to identify and meet development challenges in a sustainable manner. FAO proactively supports global capacity building activities and the Animal Health Service works closely with stakeholders in Member Nations and the international community in the area of surveillance, prevention and control of zoonotic diseases in support of agricultural development, food safety and food security.

The majority of developed countries have surveillance systems in place to detect and control major zoonotic diseases at national and subnational levels. In developing countries and those countries in transition whose infrastructures require rebuilding, general VPH services and surveillance systems and control programmes are likely to be deficient at all levels.

Many publications, surveys, and conclusions from a recent 2001 FAO/WHO/OIE-sponsored electronic conference on VPH and the control of zoonoses in developing countries have identified numerous difficulties relating to the effective delivery of prevention and control programmes. These include:

- lack of any organized surveillance programme;
- focus on task-oriented VPH programmes unrelated to risk-based priorities;
- poorly defined epidemiological knowledge of local VPH problems;
- minimal communication and cooperation between providers of human and veterinary health services;
- lack of VPH educational materials and programmes for extension;
- difficulties in electronic access to science-based current VPH information sources;
- lack of suitably trained individuals at all levels; and
- lack of VPH infrastructures.

The VPH priorities of developed countries in recent years have tended to focus on emerging infections albeit often of low incidence, chemical residues in foods of animal origin, antibiotic-resistant microorganisms and prevention of acts of biological terrorism. These issues are not necessarily the same priorities for developing countries. The latter are faced with long-standing and persistent zoonoses, such as rabies, anthrax, brucellosis, tuberculosis, cysticercosis, and echinococcosis. Surveillance, control and eradication procedures as used in developed countries may not be technically or economically feasible.

Poverty is now being recognized as a major risk factor for zoonoses and food-borne illness in both rural and urban consumers. Livestock offer both a major contribution to the livelihood of the poor and a pathway out of poverty, but also are a risk to their own health, well-being and performance.

OBJECTIVES AND PROCEDURES
The objectives of the consultation were to consider and make specific recommendations regarding the implementation of surveillance methodologies for zoonotic diseases, with special emphasis on developing countries in the fol-
lowing major areas:

- training programmes in surveillance methodologies at veterinary and paraveterinary levels;
- implementation of a surveillance programme in taeniases/cysticercosis;
- training programmes for the surveillance, prevention and control of BSE;
- capacity building for surveillance and control of zoonotic disease under emergency conditions;
- surveillance and control programmes in brucellosis, tuberculosis, anthrax, salmonellosis and other food-borne pathogens;
- surveillance, early warning and early reaction to zoonoses outbreaks; and
- surveillance approaches in antimicrobial resistance.

Background papers were presented on each of the above topics by invited participants. Each expert was asked to have a minimum of two coauthors or peer-reviewers of their paper. All papers were circulated electronically to consultants prior to the meeting. A one-page summary of each paper is included in the following section and the full papers in the appendices.

Following a summary presentation of each paper by the primary author, discussions were held with both other experts and FAO invited participants and staff. Finally, the experts deliberated and presented their conclusions and recommendations to a plenary session.

SUMMARIES OF PRESENTATIONS AND DISCUSSIONS
A summary of each of the papers presented during the plenary sessions is given below. The full text of each paper presented appears in the Appendices.

Capacity building for veterinarians and veterinary paraprofessionals

H. Schneider

The emergence and re-emergence of zoonoses and their potentially disastrous impact on human health have made food safety (including threats regarding the deliberate misuse of pathogenic biological agents) a priority issue for veterinary services (which includes all professional service providers and institutions) around the world. To be able to effectively and efficiently address the needed surveillance, monitoring, prevention, control and eradication of animal and zoonotic diseases, the professional capacities of all role players (including training institutions, laboratories etc.) must meet the levels of the international standards prescribed or required (e.g. by OIE, CODEX) to be able to benefit from the sanitary and phytosanitary (SPS) provisions and access regional and/or international markets for animals and animal products. Special attention should be paid to capacity building relating to:

- the professional performance and capability of veterinary services in relation to the required quality of service provision;
- pre- and postgraduate training in food safety and, specifically, zoonoses control;
- establishment, maintenance and performance of veterinary statutory bodies; and
- harmonization of registration/licensing requirements for veterinarians and veterinary paraprofessionals on a regional level;

Dr Herbert Schneider said that this was the fiftieth anniversary of collaboration between the World Veterinary Association and FAO. He noted that zoonotic diseases have been issues on the agenda of the World Veterinary Association for many years. Despite this, there had been a shift in emphasis from concern with infectious diseases and transboundary animal diseases (TADs) to emphasis on companion animals. He questioned what had happened to epidemiologists, veterinary researchers, veterinary services and their associated infrastructure. He noted particularly that the new European Union (EU) hygiene package (which would come into force in January 2006) would have a tremendous bearing on all countries wishing to export to the EU. He also noted the importance of bioterrorism. The important role players in VPH are the official veterinarian, veterinarian (licensed by the veterinary statutory body), par-veterinarians (authorised through licence by the veterinary statutory body), and the veterinary statutory bodies. Also important was the quality of veterinary services and evaluation (according to the OIE code). The principles were: professional judgement, independence, impartiality, integrity and objectivity. Financial resources were also vital. The priorities were: training, harmonization of registration/licensing, and maintenance/establishment of veterinary statutory bodies. The involvement of private veterinarians was also increasingly important given the reduction in public services.

Discussions

Dr Murrell asked about the lines of authority relating to legislation and statutory bodies (Codex, OIE). How does FAO affect that aspect in a country? Dr Schneider responded that FAO should give guidance and assistance on legal and statutory matters through workshops, etc. FAO could facilitate the implementation of regulations and guidelines. Dr Eddi noted that WHO/FAO was working closely with OIE. The Technical Cooperation Programme (TCP) is a good tool that is being used in this context all over the world. Dr Schneider added that a TCP was being used in Namibia to update legislation.

Dr Meslin said that, except in the case of avian influenza, support for action against other zoonotic diseases was limited. No resources were trickling down. He observed however that there was a lot going on and this expert con-
sultation should make a list of key activities of VPH concerns. He noted that in this area of capacity building for VPH we were not starting from scratch.

**Capacity building for surveillance and control of *Taenia solium*/cysticercosis**

K.D. Murrell and Z. Pawlowski

Control of neurocysticercosis from *Taenia solium* infections will require a multidisciplinary and multilevel approach because of the complex nature of their epidemiology. A control programme will necessitate establishing a national organization that helps and guides local efforts. The control programme will also demand cooperation and participation by the veterinary, medical and public health sectors. In addition to resources, this complex organization of experts and stakeholders must be provided with a solid understanding of the epidemiology and biology of the zoonosis and the rationale for control strategies that are to be pursued. In addition to basic parasitology of *T. solium*, a good understanding of the risks associated with animal husbandry and human behavioural practices, and the economics of pig production and marketing is essential. Important to the success of a programme is attention to management and coordination of the various components of the control organization. Therefore, a good deal of effort and investment in training and indoctrination of all participants in the overall control programme will be required up front. Even pilot or demonstration control projects will require substantial capacity building. Without this level of preparation, controlling this zoonosis, which is so dependent upon long-established risky animal rearing and cultural traits, will remain nearly intractable. Dr Murrell showed the incidence of taeniasis in developing and developed countries (USA). The disease was potentially eradicable, given that the human is the only definitive host for the parasite. Therefore, the human is the target for mass treatment with drugs. However, this was not to preclude improved meat inspection, improved pig rearing and sanitation practices. Education and training were required. Clandestine marketing was also a problem. There was a need to strengthen the laboratory diagnostic base. He also stressed the importance of management, supervisory and organizational skills. He highlighted the need for intersectoral cooperation (medical, veterinary and non-medical). There was a need to revise legislation, to create awareness, to train the trainers, and for community-level education.

**Discussions**

Professor Mantovani stated that there was a need for professional training for all zoonoses. He considered that the group should not limit itself to communicable diseases only but include chemical contaminants, etc. Dr Nari noted that in developing countries there was no real connection between veterinary services and veterinary faculties of universities. Dr Eddi commented that cysticercosis has been eradicated in Europe without sophisticated scientific techniques such as DNA probes, GIS mapping and molecular vaccines, but with improvement in livestock production techniques, awareness creation and mainly with improvement in lifestyles. Continuing education was needed to improve on capacity for zoonotic disease surveillance and control. At this point, Dr Jutzi (Director of AGA) welcomed participants to the consultations and noted the concurrence of this event with the steering committee meeting of the Pro Poor Livestock Policy Initiative, with whom the experts would meet at a social event at 17.00 hours the same day.

**Capacity building for surveillance and control of bovine spongiform encephalopathy and other zoonotic diseases**

U. Kihm, E. Mumford, A. Speedy

The project utilizes Swiss expertise and FAO infrastructure to assist the governments of selected partner countries in building capacity, establishing preventive measures, and analysing risks for bovine spongiform encephalopathy (BSE). The project aims to improve or build technical capacity along the entire food production chain (including governmental and private veterinary services, diagnostic laboratories, livestock, animal-feed, and meat industries) in partner countries so that all components required for an effective and sustainable BSE control programme are available. The ultimate goal of the project is that the partner countries either are able to prove themselves to be BSE-free, or are able to decrease their BSE risks to acceptable levels. Although the focus of this project is to lessen the negative impacts of BSE on public health, animal health, and trade in partner countries, the capacity developed will promote implementation of similar control programmes for other emerging zoonotic food-borne pathogens. This project is concerned with public health, animal health and trade and with the whole food chain, and not only veterinary services. Economics and trade are the driving forces and BSE is the model. The process involved risk assessment, risk-based (targeted) surveillance, disease awareness, and control measures. He outlined the project organization and explained the four courses in diagnostics, surveillance, feed industry and meat industry and subsequent in-country activities.

**Discussions**

Dr Aidara-Kane thought that, in the context of risk assessment, the chain should extend to the hospital and epidemiological data from the public health domain. Projects should include participants from the public health domain. The integrated approach should not end at the table. She referred to *Salmonella* as an example where risk assessment
included quantitative (numbers) and qualitative aspects (serotypes).

**Capacity building for surveillance and control of tuberculosis**

Dr. J. Berrada

Through a well-designed project, a developing country, the Kingdom of Morocco, built and strengthened organizational and technical capacities for surveillance and control of bovine tuberculosis. In this regard TCP/MOR/2904 (Stratégie nationale de lutte contre la tuberculose bovine) could serve as a model for other capacity building programmes in developing countries with similar levels of development.

At the regional level, it was recommended to establish collaborating and reference centres for training, surveillance, diagnosis and research on bovine tuberculosis. At the international level, it was recommended to assist developing countries in developing and financing participatory approaches to define country needs and priorities and in so doing, strengthen human resource and institutional capabilities. Dr. Berrada provided a definition of surveillance: surveillance is defined as the “systematic” collection, analysis, interpretation, and timely dissemination of health data for the planning, implementation, and evaluation of health programmes. Surveillance could be active, passive or a combination of both. Bovine tuberculosis was the model. It was a serious public health (hygienic) as well as an economic problem. The only successful control method was the test and slaughter method. It depended on the capacity of professionals and paraprofessionals.

He reported on the TCP project in the Kingdom of Morocco. The project included a survey, capacity building, surveillance and testing, training of meat inspectors and stakeholder workshops. There was also provision of laboratory equipment and reagent supplies for bovine tuberculosis diagnosis. The final stage was building farmer awareness, trust and advocacy: this was a key element of project objectives. It involved extension, video shows and radio presentations on laboratory diagnosis and field recognition of the disease in cattle. He noted the trend of increase in problems with tuberculosis prevalence from population pressure, trade and intensification of cattle production as well as HIV/AIDS in Africa. Regional and international assistance was therefore needed to control bovine tuberculosis. He noted that before the project started the expected incidence (infected herds) was 2 percent; the actual incidence was found to be 32 percent during the implementation of the project.

**Discussions**

Dr. Pasquali noted that brucellosis has been eradicated or controlled by developed and rich countries and that the same situation was also true of bovine tuberculosis. What was needed was basic financial support. Dr. Berrada further contributed that developing countries need to prioritize their problems, because there were several zoonotic diseases with different impacts. In the Kingdom of Morocco, rabies has a low cost to the livestock sector but has a disastrous impact on public health and the authorities are prepared to act to control the disease. In the case of brucellosis, tuberculosis and hydatid cysts, the political will is not so strong. These diseases have a common background and similarities therefore capacity built for one will support the control of the other. Dr. Amanfu questioned the sustainability of these activities? It was good to provide training but could we sustain this capacity?

**Capacity building for surveillance and control of bovine and caprine brucellosis**

L.E. Sammartino, A. Gil and P. Elzer

Brucellosis is still a major disease of worldwide distribution. There are many factors involved in both human and animal brucellosis that are important challenges in the control and eradication of this disease. Today, we have very powerful tools available: excellent serological methods, very effective immunogens and an overall knowledge of the pathogenesis of the disease. Efforts should be made by authorities responsible to devise feasible control plans. The development of these plans should involve all participants working together. Support for control programmes will require strong economic structure. One of the most important aspects to be considered is education, which must be targeted to all susceptible populations and be adjustable for each region and its cultural peculiarities.

Dr. Sammartino noted that the disease was still important. He described the aetiology and epidemiology, both as an occupational disease and as a food-borne disease. In animals, the disease is often asymptomatic. Many serological tests are currently available. Vaccines are likewise available. All materials for control of brucellosis have been available for many years. New diagnostic tests are also available. He outlined the guidelines, strategies and control methods that need resources and laboratory facilities. Agglutination tests can be used anywhere for screening. It was recommended to adopt ELISA and FPA technology. PCR should be considered where technically feasible. He also recommended surveillance methods including the milk ring test and market cattle testing. Education is linked with all phases of the control programme. Collaboration between veterinary services and public health services is essential.

**Discussions**

William Amanfu asked if Dr. Sammartino could give his perception of the distribution of different species of Brucella. Dr. Sammartino replied that B. abortus is worldwide in dis-
an emergency task force. He suggested the establishment of surveillance and control of zoonoses in non-epidemic emergencies, and the communication in zoonotic emergency, surveillance and restoration phase. He also covered risk management needs interprofessional cooperation and all the available human and technological resources. Dr Pasquali considered different kinds of disasters, the operational systems to monitor and control communicable diseases suddenly stop and the best conditions to spread infectious diseases arise. Even if culling is the most common and successful approach used to control and eradicate epidemic outbreaks in developed countries, it requires considerable technologies for animal carcass disposal. Moreover, the growing tendency in managing the waste of animal products and the negative environmental impact of technologies utilized for animal carcasses disposal must be considered. Before deciding on measures to avoid spread of epizootics and on methods of carcass disposal, a well-balanced risk analysis must be done. This is especially important in developing countries where food supplies and disposal plants are both very limited. Management plans for carcass disposal are essential tools both in epidemic and in non-epidemic veterinary emergencies. Plans must be established well in advance taking into consideration all possible risks, the epidemiological situation, the geographical and geological characteristic of the area, the social situation and all the available human and technological resources. Efficient management plans need interprofessional cooperation and extensive consultation among concerned people. Dr Pasquali considered different kinds of disasters, natural and man-made. Following an incident, he listed the recognition phase; emergency phase; secondary action; and restoration phase. He also covered risk management and communication in zoonotic emergency, surveillance and control of zoonoses in non-epidemic emergencies, and capacity building for surveillance and control of zoonotic diseases in urban areas. He suggested the establishment of an emergency task force.

Discussions
Dr Murrell said that if he were to propose an emergency task force he would be told that agencies already existed. He was not sure what such a task force would do. Were there examples? Dr Pasquali responded that it was difficult to achieve this and that it was a very broad area. It is an important issue to develop a training system for people interested in these issues and this should focus on priorities such as VPH.

Professor Mantovani said that all activities in non-epidemic emergencies are typically horizontal (cross-disciplinary). There have been two stages; in the 1980s, the Italian earthquake involved improvised task forces, whereas later the civil defence system was developed. The aim was to give general guidelines and to have local services able to respond. Emergencies involving animals may also be small-scale in extent and must be dealt with by local veterinary services. Dr Schneider thought that Dr Pasquali had summarized the current situation well. In emergencies, there was a lack of practical advice. A database of people and resources is needed. Carlos Eddi said that FAO is prepared to assist but needed specific information of veterinary services that are capable of providing such support in emergencies. Andrew Speedy said that all facilities and expertise exist in FAO but departments are vertically structured and we need horizontal (cross-disciplinary) organization in emergencies. A recommendation by the experts in this regard, would be welcome.

Professor Mantovani referred to the European Centre for Disaster Medicine in San Marino. This institute gives training courses but they are still fairly general. Dr Meslin said that WHO had a task force for the tsunami and this had been well coordinated. He noted however that following the tsunami in the Democratic Socialist Republic of Sri Lanka, it was found that there had been little destruction of animals. He called for further examples. Dr Pasquali said there were few good examples but disease outbreaks can occur at any time. In any change of environment, relationship between humans, animals and pathogens could change. Dr Meslin was not sure if we should put funds into hypothetical situations. Dr Pasquali said that this was a risk analysis situation. In planning for emergencies, we should take account of the risk of zoonoses. Dr Eddi thought that a minimum database was needed. This would include guidelines on how to handle food safety, water quality, etc. He said there was a need to evaluate economic costs and benefits. This was needed to convince stakeholders.

Dr Kihm noted that, in public health incidents (fact or perception), people are scared and there is often a ban on trade. The question is, “What is an acceptable risk?” BSE has had a major effect because now everyone is talking of food safety. A small risk is a big hurdle. There are much bigger numerical risks, e.g. brucellosis, salmonellosis, etc.
Dr Murrell cited the prevalence of E. coli in the USA. Dr Kihm suggested further that non-epidemic emergencies are a low priority. Dead bodies do not spread zoonotic diseases. But water supplies are a problem. Dr Murrell recalled that, in the former Yugoslavia, trichinellosis had been largely eradicated but there was a reservoir in wild pigs. During the war, animals were turned loose, and some of highest rates of trichinellosis occurred in that area. Dr Kihm agreed that war is another problem because infrastructure is destroyed. However, he reiterated that VPH emergencies were often not a priority. Dr Pasquali agreed.

The global framework for the progressive control of transboundary animal diseases (TADs)

J. Domenech

The Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) is a joint FAO/OIE initiative, which combines the strength of both organizations to achieve agreed common objectives. It is a facilitating mechanism that endeavours to empower regional alliances in the fight against transboundary animal diseases (TADs), to provide for capacity building and to assist in establishing programmes for the specific control of TADs based on regional priorities. Outbreaks of foot-and-mouth disease (FMD) from 1997 to 2003, classical swine fever in Europe and the Caribbean, rinderpest within the Somali ecosystem, peste des petits ruminants outbreaks in the Republic of India and in the People's Republic of Bangladesh, contagious bovine pleuropneumonia (CBPP) in Angola, Zambia and Namibia, and Rift Valley fever outbreaks in 2000, provided the main stimulus for the creation of the GF-TADs initiative. The spread of TADs will increase unless international concerted efforts are put in place for effective prevention and progressive control, as currently shown by the avian influenza epidemic in parts of Asia, in which FAO, WHO and OIE have collaborated at various levels in order to bring the outbreaks under control. Prior to the avian influenza crisis, FAO and OIE had examined the problem of TADs from the standpoint of complexity of the environment, market access, food chain and international public good goals of social equity. Thus, the GF-TADs proposes control of major TADs as an effective contribution to the achievement of the Millennium Development Goals (MDGs) by providing assistance and guidance to member countries through the existing regional specialized organizations such as the African Union-Interafrican Bureau for Animal Resources (AU-IBAR) in Africa, the Pan-American Health Organization (PAHO) in South America, the South Asian Association for Regional Cooperation (SAARC) in Asia, and others. A major component of TADs is the Global Early Warning System (GLEWS), which will be a joint FAO/OIE/WHO initiative. GLEWS is a joint system that builds on the added value of combining and coordinating the alert and response mechanisms of the three organizations for the international community and stakeholders and so assists in prediction, prevention and control of animal disease threats, including zoonoses. The GF-TADs programme will be developed along four main thrusts namely:

1. regionally led mechanisms to implement action against priority animal diseases as agreed by relevant stakeholders;
2. development of regional and Global Early Warning Systems for major animal diseases;
3. application of research on TADs-causing agents at the molecular and ecological levels for more effective strategic disease management and control; and
4. the completion of the Global Rinderpest Eradication Programme (GREP) set for achieving global declaration of freedom from the disease by year 2010.

Discussions

Lessons learnt from GREP, the control of FMD in Africa, South America, Asia and Europe and the current FAO/WHO/OIE joint control actions in managing the avian influenza outbreaks in parts of Asia, offered critical ideas and focus for implementing the GF-TADs concept. Specifically, conclusions from the avian influenza epidemic management, including capacity building for improved surveillance, will be analysed and developed within the context of GF-TADs. The successful implementation of GF-TADs requires that FAO and OIE work in synergy, and not in competition, to achieve set goals and objectives. Budgetary support is expected from the donor community and roughly 100 million dollars expected through parallel initiatives. Seventy per cent of funds are expected to be committed at the regional level. Dr Murrell wanted to know what potential difficulties were to be foreseen in the implementation of the programme. Dr Domenech responded by stating weak epidemiological analysis, lack of disease reporting, lack of political will in animal disease control, and poor recognition of the role of livestock in improving peoples' livelihoods, have been identified as challenges facing the GF-TADs concept.

WHO systems for surveillance, alert and response to zoonoses

F.X. Meslin

Communicable disease outbreaks threaten the health of the world's population and as such require regional/global alert and response mechanisms to ensure rapid access to technical advice and resources to support national public health capacity. No single institution or country has all the necessary capacities to respond to international public health emergencies caused by epidemics and by new and emerging infectious diseases. WHO collects both official and unofficial information on outbreaks of communicable diseases including zoonoses and other events of potential
international public health significance. The organization uses different networks and news/rumours scanning systems including the Global Public Health Information System (GPHIN). When an event requires international assistance WHO ensures that countries have rapid access to the most appropriate experts and resources through the Global Outbreak Alert and Response Network (GOARN). GOARN was created in April 2000 to improve the coordination of international outbreak responses and to provide an operational framework to focus the delivery of support to countries. Since 2000, WHO and GOARN have responded to over 50 events worldwide with over 400 experts providing field support and capacity building in disease management to some 40 countries.

GOARN acts in the following ways:
1. It assists countries with disease control efforts by ensuring appropriate technical support to affected populations rapidly.
2. It investigates and characterizes events and assesses risks of rapidly emerging epidemic disease threats.
3. It sustains national outbreak preparedness by ensuring that responses contribute to sustained containment of epidemic threats. Major constraints have been local beliefs, security and accessibility in outbreak investigations, and verification of rumours of disease.

Many of the most recent outbreaks of international public health concern have been of animal origin with, for example, severe acute respiratory syndrome (SARS) in 2003 and avian influenza in 2004 and 2005. In addition to these new emerging infections which have mobilized worldwide attention, a number of epidemic-prone and endemic zoonotic agents have emerged or re-emerged in various parts of the world such as Nipah and West Nile viruses, anthrax, leptospirosis and rabies. For zoonoses detection, verification and response, sharing of official and unofficial information with other organizations specializing in animal diseases, such as FAO and OIE, is particularly important. To this goal, OIE, FAO and WHO have developed a common platform named Global Early Warning System (GLEWS). GLEWS covers a number of animal diseases such as FMD, Rinderpest, CBPP and a number of zoonotic diseases as well as any emerging or re-emerging infections that represent or could become animal and human health emergencies. Essential elements of GLEWS are forecasting, epidemic intelligence, disease tracking, alert, verification, assessment, response and dissemination of information.

Discussions
This presentation generated a lot of discussions. A question was asked by Dr Nari on the apparent lesser degree of involvement of WHO in South America. Dr Meslin responded that the probable reason could be fewer requests from member countries of WHO in South America, or that countries in that continent may have the capacity for dealing with outbreaks. The presence of PAHO is essential and it may have the capacity to respond to outbreaks and other disease emergencies. However, there were more WHO interventions in Central America than in South America. The response of WHO to a suspect Rift Valley fever outbreak in the Federal Democratic Republic of Ethiopia due to climatic changes characterized by floods was questioned. Dr Meslin responded by stating that in some instances WHO was not made aware of the potential outbreak of Rift Valley fever or other potential zoonotic diseases and it was essential that veterinary authorities flagged zoonotic disease suspicions for the attention of WHO so that it could play the necessary role in supporting control efforts.

Dr Kihm raised the issue that that there was the impression that WHO was interested only in stopping outbreaks once they occurred, but there were not enough guidelines to prevent the outbreaks in the first place. In the control of the avian influenza outbreak there was no provision of safer food, chickens were destroyed, compensation was delayed and no alternative safe food was provided. Problems with difficulties in access to WHO data were raised and the need for more transparency of data for risk analysis was emphasized.

On intersectoral collaboration, Dr Seimenis pointed out that there could be positive changes in attitude if the highest political leadership are involved. Dr Meslin supported this view and informed the group that in the Kingdom of Thailand the Prime Minister became involved and WHO, with a lot of pressure, managed to get Agriculture and Health to cooperate. The Ministry of Health of Thailand acknowledged the first case of avian influenza in humans. An official statement made by the Minister of Health was posted on the OIE website. Sometimes there are conflicts within public health departments in the name of protection of “turf” and these are always detrimental. Sometimes responsibilities are not carried out. In the Rift Valley fever outbreak in the Arab Republic of Egypt, the Ministry of Health confirmed the disease, but the Ministry of Agriculture denied the outbreak. Difficulties accessing RABNET were pointed out and it was suggested that the same software available for other zoonoses could be used. Dr Berrada further elaborated on intersectoral collaboration - there should be more emphasis on communication between the two ministries. For example a case of infectious bronchitis was referred to as avian influenza and this nearly collapsed the poultry industry in the Kingdom of Morocco. Also BSE was reported by the Ministry of Health without proof in the Kingdom of Morocco but denied by the Ministry of Agriculture. Information accuracy was deemed very important for the avoidance of confusion between the two ministries. It was also felt that intrasectoral collaboration and information sharing could help avoid some of the confusion men-
tioned above. In PAHO, the Ministries of Agriculture and Health have regular meetings for information sharing.

Activities of the Ad Hoc Group on antimicrobial resistance

C. Bruschke

Following a request of the OIE Regional Commission for Europe in 1997, OIE considered the use of veterinary antimicrobial substances as a key issue in animal and human health. A debate on this issue followed at the General Assembly in 1998 and an International Ad Hoc Group on Antimicrobial Resistance was created in 1999. The objectives of the Ad Hoc Group were to address the human and animal health risks associated with antimicrobial resistance and to address the contribution of antimicrobial use in veterinary medicine.

The Ad Hoc Group for Antimicrobial Resistance adopted the following terms of reference:

1. To develop an appropriate risk assessment methodology for the potential impact on public health of antimicrobial resistant bacteria of animal origin.
2. To develop technical guidelines on prudent use of antimicrobials in animal husbandry.
3. To develop technical guidelines on monitoring the quantities of antibiotics used in animal husbandry.
4. To harmonize national antimicrobial resistance monitoring programmes in animals and food of animal origin. To elaborate a priority list of relevant bacteria and antimicrobial substances to be included in resistance monitoring programmes.
5. To standardize and harmonize laboratory methodologies used for the detection and quantification of antimicrobial resistance.
6. To collect information on the procedures used in veterinary laboratories and in clinical biological laboratories in different countries for quantitative and qualitative analysis of bacterial resistance to antibiotics.
7. To propose standardized protocols for analysing the antibiotic resistance of bacteria isolated from animals or products of animal origin, and notably specific procedures for different bacterial groups.
8. To propose to the OIE Standards Commission on harmonization of assays on antibiotics in the veterinary laboratories of OIE member countries.
9. To formulate recommendations to the OIE Standards Commission on the preparation and distribution of resistant bacterial strains taking account of international reference strains and the requirement for biosecurity.

Guidelines were developed following OIE procedures and during the General Assembly of 2003, four guidelines concerning antimicrobial resistance were accepted. Three guidelines are now part of the Terrestrial Animal Health Code (Section 3.9) and the fourth guideline is part of the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.

1. Surveillance of bacterial resistance (Appendix 3.9.1)
2. Monitoring the quantities of antimicrobials used in animal husbandry (Appendix 3.9.2)
3. Responsible and prudent use of antimicrobial agents in veterinary medicine (Appendix 3.9.3)
4. Laboratory methodologies for antimicrobial susceptibility testing (AST) (Chapter 1.1.10).

A fifth guideline (Terrestrial Animal Health Code, Section 3.9) was accepted during the General Assembly of 2004 - Risk analysis methodology (Appendix 3.9.4).

OIE, FAO and WHO organized two joint Expert Workshops on Non-Human Antimicrobial Usage and Antimicrobial Resistance in Geneva, Switzerland, in December 2003, (Scientific Assessment) and in Oslo, Norway, in March 2004 (Management Options). It was recommended that OIE should develop a list of critically important antimicrobials in veterinary medicine and that WHO should also develop such a list for critically important antimicrobials in human medicine. OIE also suggested the creation of a joint OIE/Codex Alimentarius task force on antimicrobial resistance in order to work towards a common scientific position and to avoid gaps and/or duplications in OIE and Codex Alimentarius standards. This proposal is yet to be adopted by the Codex Alimentarius member countries.

Discussions

Dr Schneider pointed out that antimicrobial resistance and the misuse of antibiotics are worldwide problems affecting both developed and developing countries. Developing countries needed to be assisted most in setting up structures for surveillance of antimicrobial resistance. Most private veterinarians in developing countries sell antimicrobials as a major component of services rendered to the livestock community and the problem of antibiotic residues in meat and eggs poses problems in the development of antimicrobial resistance. Dr Meslin informed the group that the Republic of Uganda requested assistance from WHO for the destruction of tonnes of expired antibiotics. Awareness campaigns are of particular importance in limiting the indiscriminate use of antibiotics. WHO was willing to cooperate with FAO/OIE in the use of antimicrobials. A WHO scientific assessment is that non-human use is essential. There was the need to monitor antimicrobial resistance from the animal side so as to use the necessary data for risk management of antimicrobial use.

Mediterranean Zoonoses Control Programme: Activities for zoonotic disease control

A. Seimenis

Zoonoses and food-borne infections cannot be controlled effectively by countries acting alone. The situation of zoon-
Summary Report

Oases and food-borne infections in the Mediterranean countries was first addressed by member states of WHO at the 31st World Health Assembly held in 1978, which endorsed a resolution on the “Prevention and Control of Zoonoses and Food-borne Diseases due to Animal Products”. Following the adoption of this resolution, WHO created the Mediterranean Zoonoses Control Programme (MZCP). To coordinate and manage its activities the Mediterranean Zoonoses Control Centre was established in 1979 in Athens, Greece. The MZCP collaborates closely with the Department of Communicable Diseases Control Prevention and Eradication at WHO headquarters, Geneva, as well as with the WHO Regional Office for the Eastern Mediterranean, EMRO, in Cairo, Egypt, specialized WHO collaborating centres and the MZCP network of national participating institutions. It maintains close relationships with OIE and the Animal Health and Production Division of FAO.

The main objectives of the programme are to:

• foster, at national and interregional levels, programmes for the prevention, surveillance and control of zoonoses and food-borne diseases as an integral part of national health programmes;

• and to strengthen the cooperation between veterinary and public health services, and to foster collaboration between the MZCP member states.

The MZCP is a self-financed activity that depends on the annual contributions of its member countries and on the support of its collaborating institutions for the implementation of its activities. The participating countries are Bulgaria, Cyprus, Egypt, Greece, Lebanon, Kuwait, Portugal, Saudi Arabia, Spain, the Syrian Arab Republic and Turkey. Countries associated with the programme are Algeria, Italy, Jordan, Malta, Morocco, Tunisia and Yemen. Countries wishing to join should accept the statutes and pay an annual contribution of 20 000 US$. During 26 years of operation, WHO/MZCP activities have focused on the concept of intercountry cooperation. Workshops and consultancies have been recognized as effective tools in developing common approaches to zoonoses and food-borne diseases in their prevention, surveillance and control. Over the past five years, the programme has been focusing on activities in capacity building in human resource development. Attention has been paid to the training of physicians, veterinarians, health inspectors and laboratory technicians in areas related to prevention, surveillance and control of major zoonoses and related food-borne diseases. A pilot brucellosis surveillance programme in the Syrian Arab Republic, with a computerized system linking public health and veterinary laboratory data, has recently been completed.

Discussions

Asked on avenues for communication in the project in the Syrian Arab Republic, participants were informed by Dr Seimenis that public education was often through publications, presentations and indirectly through radio and television. These were the common avenues utilized in public education on the transmission of brucellosis from animals to humans. There was the possibility of connecting member countries of the MZCP to the VPH network. Dr Eddi wanted to know whether MZCP was concerned with the control of echinococcosis. Dr Seimenis responded that, at present, there were no activities geared towards the control of echinococcosis in the region. Many sectors needed assistance in the control of zoonoses, but these have been cancelled owing to lack of funds. The activities of MZCP are limited by its self-financing arrangements. He further explained that annual dues are paid to WHO in Geneva and WHO deducts 13 percent. Thus 18 700 US$ are received by MZCP. However, the contributions from member countries and payments are irregular and the financial situation is difficult. FAO has supported the activities of MZCP three times during the past five years in organizing workshops and supporting participants to some of the workshops. Dr Speedy pointed out that risk analysis and risk management are very important issues in VPH. There was the need to look at management systems on farms that do not rely on the extensive use of antimicrobials. Dr Seimenis responded that good agricultural practices are required to reduce the burden of zoonoses and these are actively promoted by the MZCP. According to Dr Seimenis, the establishment of a VPH coordinating unit in the Syrian Arab Republic was found to be extremely useful. A new technical environment and new professional mentality is needed to enhance the control of zoonoses in many countries. Tuberculosis centres where data are collected could serve as a focal point for the analysis and evaluation of brucellosis data.

Veterinary public health activities at FAO: current actions & what is needed

C. Eddi, K. de Balogh, J. Lubroth, W. Amanfu, A. Speedy, D. Battaglia, A.C. Bertrand and J. Domenech

This was a joint presentation by Carlos Eddi and Katinka de Balogh. The development of the VPH group in the Animal Health Service of FAO started in 2001 with members from the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases/Infectious Diseases Group, the Parasitic Diseases Group, the Feed Resources Group of the Animal Production Service, and the Pro Poor Livestock project supported by the Department for International Development-UK. Activities of the Veterinary Public Health Group over the past four years were highlighted to include:

• publications;

• an expert consultation on community-based veterinary public health systems;
• the establishment of a database of world veterinary schools;
• a database of VPH professionals; and
• the establishment of regional networks in Africa, Asia, Europe and South America.

An electronic exchange with these centres is co-ordinated from FAO headquarters. The VPH activities (213) in FAO is to have three major outputs in 2006, namely:

• 001 - integrated control of major zoonotic diseases;
• 002 - inputs to, and implementation of, Codex Alimentarius and SPS agreements; and
• 003 - good practices for reduction of food-borne human health risks.

Specific TCP projects that have direct relevance to the major outputs of the VPH programme were also highlighted. The key elements of these projects were:

• TCP/ARG/3003 - Inputs to Codex, SPS agreements and harmonization of training programmes, with due recognition of regional specificities based on sociocultural factors. In-service training and continuing educational programmes could be facilitated to improve capacity in VPH activities.

Discussions
The possibility of having a joint FAO/WHO division on VPH (on a similar basis as the joint FAO/International Atomic Energy Agency (IAEA) division in Vienna) was raised by Dr Speedy. There was a general consensus that this idea could be further pursued in view of the rapidly evolving changes in VPH issues on the global front. Concern was raised by Dr Meslin on the scientific basis for administering the questionnaire and it was stated that this was just a snapshot of people’s ideas on the control of zoonotic diseases. Food safety is now in the forefront of VPH concerns and this should be addressed by the international organizations. Dr Katinka de Balogh further stated that the current rejuvenation of VPH is refreshing, and the years of equating VPH with meat inspection are now over. In some areas of zoonoses, the role of FAO was found to be nebulous. The function of FAO in setting standards and guidelines in fish zoonoses was raised. Dr Amanfu pointed out that there was widespread use of antibiotics in aquaculture with potential for the development of antibiotic resistant strains of bacteria that could affect human populations. The need for a formal structure for VPH in FAO to meet the ever expanding VPH issues at both normative and field levels was stressed by participants.

Anthrax in animals: surveillance and control
William Amanfu
Anthrax is primarily a disease of herbivores caused by a bacteria, Bacillus anthracis. The disease has been one of the most important causes of uncontrolled mortality in cattle, sheep, goats, horses, pigs and wildlife worldwide. Humans contract anthrax directly or indirectly from animals. Anthrax is still enzootic in many countries of Africa, Asia, a number of European countries, parts of the American continent and parts of Australia. Human case rates for anthrax are highest...
in Africa, the Middle East, and central and southern Asia. Where the disease is infrequent or rare in livestock, it is rarely seen in humans. Consumption of meat from animals that have died suddenly, or the skinning of these animals, have been the principal causes of anthrax outbreaks in humans. The report of the deliberate release of anthrax in 2001 in Florida, USA, rekindled the use of B. anthracis as an instrument of biological weapon/warfare and created a lot of panic throughout the international community.

Factors that favour the use of anthrax as a biological warfare agent are:
- the low cost of culturing the anthrax organism;
- no high-tech production - knowledge is widely available, it is easy to produce in large quantities; and
- it is easy to weaponize - extremely stable and can be stored almost indefinitely as a dry powder.

The Malilangwe Wildlife Reserve in Zimbabwe experienced massive outbreaks of anthrax that affected wildlife species, in 2004. Epizootics of anthrax were experienced in wildlife in Botswana, Namibia and Uganda involving hippos, kudu, elephants, buffaloes and other wildlife. Diagnosis of the disease is made through the characteristic staining, the MacFaydean reaction, of the encapsulated bacilli in blood smears stained with polychrome methylene blue. There is little use of serological/immunological tests in anthrax diagnosis. Biosurveillance is very important in providing the basis for control. Anthrax control measures are aimed principally at breaking the cycle of transmission. Control methods used either singly or in combination can be employed to control anthrax. The following are the key elements of anthrax control:
- correct disposal of anthrax carcasses;
- disinfection, decontamination and proper disposal of contaminated materials;
- vaccination of exposed susceptible animals and humans at risk;
- adoption of quarantine and animal movement management controls; and
- an important adjunct to control of anthrax is public awareness creation and intersectoral collaboration between the Ministry of Health and Veterinary Departments of the Ministry of Agriculture - farmer education and general public awareness on the dangers of consuming animals that die suddenly are very important in this regard.

Discussions

Although anthrax is relatively simple to diagnose, many veterinary laboratories in developing countries lacked the necessary infrastructure for a rapid diagnosis of anthrax that could underpin control of the disease. This was regarded as one of the reasons for the low and inconsistent reporting of outbreaks of the disease. Professor Mantovani wanted to know about data on anthrax prevalence in humans. Dr Amanfu responded that such data were often lacking in official reports to OIE. Reports of anthrax outbreaks were frequently made through the press when there were human deaths caused by consumption of anthrax-infected carcasses, or skinning of animals that had died of the disease. Dr Meslin asked a question on the prevalence of anthrax in humans. Again the paucity of data in this area was pointed out. An example of the anthrax outbreak in Guinea-Bissau was given in which eighty people were affected, thirteen were hospitalised, and four died from the disease. The importance of proper disposal of anthrax-infected carcasses was stressed. The logistics of doing this in the field for the death of large domestic ruminants and wildlife due to anthrax should never be underestimated.

Food-borne diseases: Surveillance and control

A. Caprioli, L. Busani

Food-borne infections are an important public health concern worldwide. WHO and the US Centers for Disease Control and Prevention (CDC) report annually on the large number of people affected by the consumption of contaminated food and drinking water. The epidemiology of food-borne infections has profoundly changed during the past 20 years. Classical food-borne pathogens such as Mycobacterium bovis and Trichinella spp have been controlled or eliminated in industrialized countries. However, many other zoonotic pathogens have been newly described or newly associated with food transmission within the past 25 years such as E. coli 0157 in cattle and Salmonella Enteritidis in layer hens. The animal reservoirs are usually not affected by these pathogens. The trade of infected healthy animals has facilitated the global spread of many zoonotic agents. Therefore, surveillance must consider the monitoring of healthy animal populations and public health concerns must include events happening around the world.

Another important issue common to many emerging zoonotic pathogens is antimicrobial resistance, largely because of the widespread use of antibiotics in animal production. Campylobacter strains isolated either from human patients or from poultry are increasingly resistant to fluoroquinolones, after these agents were introduced for use in animals. Multiresistance has become a feature of some Salmonella serotypes such as S. Typhimurium, S. Blockley and S. Hadar. Therefore, public health concerns must include the improvement of prudent use of antimicrobials in husbandry productions.

The epidemiology of food-borne infections in industrialized countries has remarkably changed during the past ten years. An increasing number of unusual food vehicles have been associated with human infections. Many of these foods were previously considered safe from a microbiological standpoint. Dry-fermented sausages, considered safe...
because of their low pH and water activity, have now been associated with outbreaks of E. coli 0157 and Salmonella infections. The marked acidic and environmental resistance of E. coli 0157 also allows the organism to survive in apple cider and dried venison jerky. The internal contamination of intact eggs with Salmonella enteritidis is a consequence of the peculiar biological niche of this Salmonella serotype in egg-laying flocks. The dispersion of untreated animal excrements in the environment can cause the contamination of different items, which can then act as secondary vehicles of human infections. An increasing spectrum of fruits and vegetables fertilized with animal faeces or contaminated during harvesting or processing have been involved in food-borne outbreaks. Contaminated sprouts have caused episodes of salmonellosis and represent an emerging source of food-borne infections. Preventing food-borne infections is a multifactorial process.

Understanding the mechanisms by which contamination can occur along the chains of production and infections can be transmitted to human beings should be the basis for any prevention strategy. Prevention can be achieved by identifying and controlling the key points, from the farm to fork, at which contamination can either occur or be eliminated. The general strategy known as the Hazard Analysis and Critical Control Points System (HACCP) has replaced the strategy of final product inspection. Moreover, traditional food inspection, which mainly relies on visual identification of hazards, is often not adequate to detect contamination with the new food-borne zoonotic agents, which requires new control strategies. Prevention of food-borne zoonoses must begin at the farm level. Therefore, understanding how pathogens arrive at and persist in animal herds is a crucial step in prevention strategies. Controlling contamination of feed and water consumed by animals is an important part of such strategies. Consumer education about basic principles of food safety remains an important component of prevention. The main clinical manifestation of food-borne infections is diarrhoea, and the clinical syndromes caused by different food-borne pathogens are usually not distinguishable. As a consequence, reporting of disease episodes without indication of the aetiological agent will not distinguish between infections caused by agents (bacteria, protozoa, viruses) with different epidemiological cycles, including different animal reservoirs and different routes of transmission. National control programmes for food-borne zoonoses should therefore be laboratory-based, and networks of designated national reference laboratories capable of a full characterization of the food-borne agents should be implemented.

Discussions
Tourism was important for both developed and developing countries and it was essential that developed countries and the international organizations helped developing countries improve capacity for surveillance activities in food safety. It was suggested that the EU should be interested in supporting developing countries to improve food safety standards because many of the tourists are from developed countries. There was the need for an advocate for good public health infrastructure for food safety standards and quality assurance as a means of ensuring food safety for nationals and for tourists as well. Food safety is a strategic priority, which requires definition of responsibility for both the producer and public health authorities in control and surveillance.

World health organization global salm-surv: A worldwide capacity building programme for the surveillance of salmonella and other food-borne pathogens
A. Aidara-Kane

The WHO Global Salmonella-Survey (GSS) was initiated in 2000 as a global network of national and regional public health, veterinary and food laboratories involved in isolation, identification and antimicrobial resistance testing of Salmonella and surveillance of salmonellosis. From 2001, Campylobacter was included in GSS and more recently E. coli and V. cholera were introduced. The mission of GSS is to reduce the global burden of food-borne illness by strengthening laboratory-based surveillance and outbreak detection and response. GSS is a collaborative effort between WHO, the Danish Institute for Food and Veterinary Research, the US Centers for Disease Control and Prevention, Institut Pasteur, the Public Health Agency of Canada, the US Food and Drug Administration, the EU EnterNet, the Australian OzFoodNet, and the Dutch Animal Sciences Group. As of April 2005, WHO Global Salm-Surv had 862 general members from 140 countries. The mission of GSS is achieved through five project components that promote capacity building, collaboration, and communication. These components include international training courses, an External Quality Assurance System (EQAS), focused regional and national projects, an electronic discussion group (EDG), and a Country Data Bank.

International training courses - Since GSS began in year 2000, training courses have been conducted for over 300 microbiologists and epidemiologists from 91 countries in English, Spanish, French, Chinese, Russian, and Arabic. There are currently four training sites (Trinidad, Cameroon, the Russian Federation and China) and four Regional Centres (Mexico, Argentina, Poland and Thailand).

External Quality Assurance System - The system encourages laboratories to achieve the highest quality isolation, identification, serotyping and antimicrobial susceptibility testing results in collaboration with the Danish Institute for Food and Veterinary Research.

Focused regional and national projects - One other mechanism for encouraging collaboration between coun-
tries and different scientists is through focused regional and national projects. These were created to promote the continued development and application of skills or concepts introduced or learned at GSS training courses. Focused regional projects were developed between training course participants and GSS steering committee partners focusing on regional food-borne pathogens, serotypes, or public health practices of interest.

Electronic discussion group - The EDG links GSS members through a listserv. Messages from the EDG range from programmatic issues, through solicitations for information on outbreaks or rare serotypes, to training materials and recent publications on food-borne diseases. Messages are provided in English, Spanish, and French. An Arabic translation is posted on the web.

GSS Web-based Country Data Bank - The WHO Global Salm-Surv Country Data Bank reports annual surveillance summary results of the fifteen most frequently isolated Salmonella serotypes by member institutions. It is the only publicly available database of Salmonella serotypes isolated globally. Data may be from human, animal, food, feed, or environmental sources. Members are then able to trace sources and follow patterns of food-borne disease by comparing serotypes from human and non-human sources in different countries.

Discussions
The international training courses served as excellent platforms for international and intersectoral cooperation in Salmonella and other food-borne pathogens (microbial) surveillance. The regional centres of excellence also offered training courses in surveillance capacity improvements on a regional basis and sharing of relevant surveillance data. Current trends indicate that surveillance and reporting systems in participating countries are gradually improving and therefore offer a basis for development of strategies to control food-borne pathogens. Surveillance for Salmonella enteritidis shows a gradual decline of pathogens in eggs and other poultry products. This suggests that control of Salmonella enteritidis at farm level is improving. Sharing of information and data on the GSS survey is critical to the future performance of GSS in food-borne pathogen control.

GENERAL DISCUSSIONS AND CONCLUSIONS
Dr Seimenis said that brucellosis can be readily controlled but it required a good state structure with well-trained people who were motivated to implement animal disease control rules and regulations. It required sufficient funds. It also needed intersectoral collaboration. Collaboration between veterinary services and public health departments is generally poor. Without this collaboration, eradication cannot be achieved. We need reliable serological diagnostic tests that can reach the efficiency of ELISA. He referred to a brucellosis control project in the Syrian Arab Republic. The cost of diagnostic tests should be taken into account. Public perception (or ignorance) is a major problem. Brucellosis has been eradicated or controlled by developed and rich countries.

Dr Speedy thought that the issue of priorities should be extended. He requested that the experts consider making a recommendation about the priority of VPH in the whole FAO livestock and agriculture programme. Dr Meslin said that whilst visiting the Ministry of Health in the Kingdom of Morocco in 2000, three diseases, i.e. rabies, leishmaniasis and echinococcosis, were the priorities set by public health authorities. He asked how the TCP objectives were set by FAO without Ministry of Health involvement. Dr Schneider noted that priorities for VPH change with time and economic circumstances. In Namibia, brucellosis had been effectively dealt with in the past. Now ovine and caprine brucellosis had become a priority because of EU requirements for export. They urgently need capacity to address EU requirements.

Dr El-Idrissi agreed that trade and economics are important issues. Avian influenza and BSE have a high impact on trade. The lack of intersectoral coordination is a problem of developing countries. Zoonotic diseases can only be eradicated in developing countries. Control of zoonotic diseases is not a problem of tests and strategies, but how capacity can be sustained. These are long-term disease eradication and control problems and they cannot be donor funded alone. There needs to be budget allocation by the national governments. Donor support could be expected for a maximum of five years. Recommendation should be made for governments to give financial support to animal disease control in general and zoonotic diseases in particular. Dr Sammartino agreed that long-term programmes were needed.

Dr Eddi agreed that political will was needed. Intersectoral collaboration is a human problem. He noted the difference of opinion on collaborating and reference centres; one view was that they should be based in developed countries; the other was that they should be in developing countries. We need to have a common FAO/WHO/OIE position on this issue. Dr Sammartino noted that the Pan American centre for cysticercosis had now been closed down.

Dr Kihm wanted to know whether there was a minimum standard that has to be complied with in order to control a disease? Disease awareness, diagnostic tools, etc. were required. Dr Nari informed the participants that, in parasitology, there used to be a centre on tick resistance in Germany. The cost was 3 million US$ per year and it was impossible to keep going. In South America, they had established different levels of laboratories. They found three types of laboratory: basic diagnostics, intermediate,
and a few at a higher level. On the issue of sustainability, he noted that brucellosis vaccination had been carried out in the Eastern Republic of Uruguay for many years. Now the FMD crisis had diverted attention.

Lee Willingham raised the issue of cysticercosis. There had been a meeting in the United Republic of Tanzania. A report had been submitted to WHO in December but no reply had been received. Of all the countries considered, there were only three countries where there was enough quality of information. It was found that this was a serious problem in these countries. Health and trade were affected. There was a need for a practical test for surveillance in endemic countries. The availability and costs of tests needs to be considered, including those for tapeworms. Oxendazole is used for control. There is a need to consider the safety of its use in pigs at an increased dose rate when compared to ruminants. A meeting on diagnostics, surveillance and control would be very helpful. On health information systems: it would be helpful if zoonotic diseases were included.

Dr Eddi asked when Europe had been made free of cysticercosis. It was agreed that the only way to eradicate the disease was through socio-economic development. Dr Mantovani pointed out that cysticercosis was a disease of poor people in developing countries. In rich countries, BSE received a lot of attention. We should develop different strategies because they required very different approaches. There was a necessity for funds not only to eliminate infections but also to keep an area clean. Dr Schneider noted that the term cysticercosis was used here exclusively for porcine disease. There was the problem of bovine cysticercosis in Namibia. Although less serious, it caused zoonoses and economic losses. Dr Meslin observed that, for human parasitic diseases, WHO brainstorming sessions had decided on the most effective single intervention - usually mass drug treatment. There were a limited number of approaches for groups of diseases. Can this be done for zoonoses?

Dr Berrada supported the point made by Dr Amanfu. There was limited use in building capacity if it was subsequently lost. One of recommendations should be to sustain capacity for effective surveillance and control of zoonoses. Dr Kihm asked if something had been achieved with the WHO campaign for smallpox or the FAO campaign against rinderpest. Did we achieve something that was sustainable? Dr Eddi asked when Europe had been made free of cysticercosis. It was agreed that the only way to eradicate the disease was through socio-economic development.

From the general discussions throughout the meeting the following conclusions were recognized:

That VPH has an important contribution to make to the achievement of the Millennium Development Goals (MDGs) by directly enhancing human health and well-being through the prevention and control of zoonotic and food-borne diseases.

In addition, VPH programmes are able to reduce poverty and hunger through the provision of safe food and income-generation by increasing access to local, regional and international markets for animal products. Veterinary public health, and particularly capacity building activities in this area, should be assigned a higher priority in the livestock programme of FAO.

The complementary roles, experience and responsibilities of FAO, OIE and WHO suggest close collaboration within the Regular Programme and the TCPS.

Finally, activities within the FAO VPH programme of the Animal Production and Health Division (AGA) and FAO Food Quality and Standards Service (ESNS), and WHO Zoonotic Disease and Food Safety programmes need to be coordinated.

**Recommendations of the FAO Expert Consultation On Capacity Building for Surveillance and Control of Zoonotic Disease.**

**General considerations**
Veterinary public health has an important contribution to make to the achievement of the MDGs of directly enhancing human health and well-being by preventing and controlling zoonotic and food-borne diseases. In addition, VPH programmes are able to reduce poverty and hunger through the provision of safe food and income-generation by increasing access to local, regional and international markets for animal products. Veterinary public health, and particularly capacity building activities in this area, should be assigned a higher priority in the FAO livestock programme.

The complementary roles, experience and responsibilities of FAO, OIE and WHO suggest close collaboration within the Regular Programme and TCPS. Activities within the FAO VPH and ESNS, and WHO Zoonotic Disease and Food Safety programmes need to be coordinated.

**RECOMMENDATIONS**

**A. FAO organizational effectiveness:**
1. Formalize a dedicated unit for VPH in AGA, with the direct cooperation of other services. In addition, consideration should be given to enhancing VPH capabilities at FAO regional and subregional offices (for example through the placement of VPH officers). The unit should assist with VPH systems development, service delivery and coordinate VPH activities in member countries.

**B. FAO should maximize its resources by promoting regional approaches to VPH by:**
2. Expanding at regional levels its networks of collaborating and reference centres for training, surveillance, diagnosis and research on zoonoses and VPH issues. These new and existing centres should be located
mainly in developing countries, in order to promote knowledge, techniques, and control programmes on zoonotic and food-borne diseases. These centres should also provide regional training on internationally standardized laboratory diagnostic techniques and research. Professional expertise and support should be made available for the regional harmonization of training for veterinary and public health personnel and for veterinary paraprofessionals.

3. Strengthening human resource and institutional capabilities at the regional level in developing countries by designing participatory, intersectoral multidisciplinary approaches to defining VPH priorities, by conducting surveillance, risk and disease burden assessments using appropriate techniques such as risk analysis, and by initiating control activities. This should include training and support on more effective advocacy for VPH at the national and regional decision-making and standard-setting levels.

4. Promoting the organization of electronic conferences at the regional level. It is strongly recommended that these conferences be conducted in the major regional languages. The topics should be selected after consultation with the relevant professional groups in the regions.

5. Assisting in the establishment by regional organizations and academic institutions of educational programmes at regional level, including continuous professional development and extension programmes on VPH for veterinary and medical public health personnel. These should include paramedical and paraveterinary staff, as well as farmers and other professional groups at risk. Also develop educational/awareness programmes for the general population at risk. Assist and provide guidance for pre- and postgraduate training in epidemiology, disease prevention, food safety, and zoonosis control. These programmes should include HACCP implementation, the risk of antimicrobial resistance due to the non-human use of antimicrobials, and pesticides and veterinary drug residue issues.

6. Supporting the development, among the national and regional VPH staff, of improved management, organizational and communication skills to organize and manage large-scale control programmes, especially regional programmes, with emphasis on supervisory and evaluation training.

7. Assisting and encouraging the joint participation and collaboration of the animal and public health sectors on significant zoonoses and in new areas of common concern relating to VPH such as environmental degradation, prevention of antimicrobial resistance due to non-human use of antimicrobials, food safety (microbiological and chemical hazards) and natural and man-made disasters.

8. Facilitating and encouraging national and regional intra- and intersectoral collaboration in developing and implementing VPH and zoonoses control programmes. This should include high level decisions made at ministerial levels as well as educational efforts directed in particular at veterinary and medical public health sectors and organizations, and other sectors such as finance, planning and trade. Government should enable combined action (political, legislative and administrative) by their Ministries of Agriculture, Health and Trade.

9. Providing information related to VPH issues in emergency conditions by creating a database of experts, developing guidelines for relief actions in emergency situations, and developing a strategic training system dealing with VPH in emergency situations.

10. Working closely with private industry in order to mobilize resources and share knowledge and experience for the implementation of mutually beneficial activities in the field of zoonoses and food-borne diseases.
APPENDIX 1:

Agenda
FAO Expert Consultation on Capacity Building for Surveillance and Control of Zoonotic Diseases

Chairman: Dr Darwin Murrell  
Secretary: Dr Herbert Schneider

TUESDAY 14 JUNE 2005

09.00 - 09.10 Official opening statement and introductory note  
Dr S. Jutzi, Director of AGA

09.10 - 09.30 Objectives, procedures and the agenda  
Dr C. Eddi

09.30 - 10.00 Capacity building for veterinarians and veterinary paraprofessionals  
Dr H. Schneider

10.00 - 10.30 Capacity building for surveillance and control of Taenia solium/ cysticercosis  
Dr K.D. Murrell

10.30 - 10.40 Questions

10.40 - 11.00 Break

11.00 - 11.30 Capacity building for surveillance and control of bovine spongiform encephalopathy and other zoonotic diseases  
Dr U. Kihm

11:30 - 12:00 Capacity building for surveillance and control of tuberculosis  
Professor Dr J. Berrada

12.00 - 12.10 Questions

12.10 - 14.30 Lunch Break

14.30 - 15.00 Capacity building for surveillance and control of bovine and caprine brucellosis  
Professor Dr L. Sammartino

15.00 - 15.30 Capacity building for surveillance and control of zoonotic disease under emergency conditions  
Dr P. Pasquali

15.30 - 16.00 Questions

17:00 - 18:30 Cocktail  
Indonesia Room Building C, 8th floor
# FAO/WHO/OIE Technical Consultation on Capacity Building for Surveillance and Control of Zoonotic Diseases

**Chairman:** Dr Francois Meslin  
**Secretary:** Dr Christianne Bruschke

## WEDNESDAY 15 JUNE 2005

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenters</th>
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<tbody>
<tr>
<td>09.00 - 09.30</td>
<td>The global framework for the progressive control of transboundary animal diseases (TADs)</td>
<td>Dr Domenech</td>
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<td>09.30 - 10.00</td>
<td>WHO systems for surveillance, alert and response to zoonoses outbreaks</td>
<td>Dr Francois Meslin, WHO</td>
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<td>10.00 - 10.30</td>
<td>Questions</td>
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<td>10.30 - 11.00</td>
<td>Coffee break</td>
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<td>11.00 - 11.30</td>
<td>Activities of the Ad Hoc Group on antimicrobial resistance</td>
<td>Dr C. Bruschke, OIE</td>
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<td>11.30 - 12.00</td>
<td>Mediterranean Zoonoses Control Programme: Activities for zoonotic disease control</td>
<td>Dr A. Seimenis</td>
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<td>12.00 - 12.30</td>
<td>Questions</td>
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<td>12.30 - 14.00</td>
<td>Lunch</td>
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<tr>
<td>14.00 - 14.30</td>
<td>Veterinary Public Health activities at FAO: Current actions &amp; what is needed</td>
<td>Dr C. Eddi &amp; K. De Balogh</td>
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<td>14.30 - 15.00</td>
<td>Anthrax: surveillance and control</td>
<td>Dr W. Amanfu</td>
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<td>15.00 - 15.30</td>
<td>Questions</td>
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<td>15.30 - 16.00</td>
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<td>16.00 - 16.30</td>
<td>Food-borne diseases: Surveillance and control</td>
<td>Dr A. Caprioli</td>
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<td>16.30 - 17.00</td>
<td>World Health Organization Global Salm-Surv: A worldwide capacity building programme for the surveillance of <em>Salmonella</em> and other food-borne pathogens</td>
<td>Dr A. Aidara-Kane</td>
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<td>17.00 - 17.30</td>
<td>Questions</td>
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Expert and Technical Consultation

Chairmen: Dr Darwin Murrell and Dr Francois Meslin
Secretary: Dr Ueli Kihm

THURSDAY 16 JUNE 2005

09.00 - 10.30 Discussions among Expert Consultation Participants: Final conclusions and recommendations prepared by the Experts of the FAO Consultation

09.00 - 10.30 Discussions among the Technical Consultation Participants: Final conclusions and recommendations prepared by the Participants in the Technical FAO/WHO/OIE Technical Consultation

10.30 - 11.00 Coffee break

11.00 - 11.30 Presentation of the final conclusions of the FAO Experts Consultation

11.30 - 12.00 Presentation of the final conclusions of the FAO/WHO/OIE Technical Consultation
APPENDIX 2:

List of participants
Appendix 2: List of participants

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APPENDIX 3:

Expert consultation

PRESENTATIONS

These papers have been reproduced as submitted by the participants.
Appendix 3: Expert consultation

Capacity building for veterinarians and veterinary paraprofessionals

H. Schneider
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INTRODUCTION
The emergence and re-emergence of zoonoses and their potentially disastrous impact on human health is a growing concern around the globe. The ease and speed of international travel, the rapid growth of international trade in animals and animal products due to globalization, urbanization of populations, and dramatic changes in livestock production systems and patterns are important factors in the spread of animal diseases and zoonoses. Surveillance and the early diagnosis and detection of pathogens are crucial components of disease control, eradication and prevention strategies.

Factors that drive the emergence and re-emergence of microbial threats are complex and a convergence of any number of these factors can create a suitable environment for disease emergence and maintenance in society. Such critical factors are: microbial adaptation and change (e.g. antimicrobial resistant pathogens); host susceptibility (e.g. due to being immunocompromised owing to HIV/AIDS, malnutrition); climate and weather (global warming expanding the distribution of vector-borne and water-borne diseases such as yellow fever or Hantavirus pulmonary syndrome); changing ecosystems; economic development and land use; international trade and travel; and reduction in animal health services, public services or infrastructure etc. (King, L. J., 2004). Public demands and societal needs in respect of public health and food safety place increasingly higher demands on the delivery of veterinary services. Compliance with international standards for veterinary services, such as those contained in the OIE Terrestrial Animal Health Code, and their evaluation for quality and equivalence, will increasingly be public demands at national, regional and international level on all bodies charged with veterinary service delivery.

The involvement of the private veterinary sector, as well as an increased role for veterinary paraprofessionals in surveillance, early disease detection and monitoring, and rapid response actions require capacity building activities on all levels. The same, however, also applies to official veterinary services and infrastructure, veterinary diagnostic and research laboratories as well as to veterinary training institutions and statutory bodies. The latter, especially as they are charged with the registration or licensing of veterinarians and veterinary paraprofessionals, require assistance and support to be able to fulfil their functions of legal control and maintenance of standards.

DEMANDS AND ACTIONS
In addressing the need for capacity building for veterinarians and veterinary paraprofessionals, it is necessary to take note of international developments in this respect. A number of international bodies and organizations have, in recent years, recognized the need for assistance and capacity building, specifically in developing countries, to facilitate and improve the international trade in animals and animal products.

Widespread human illnesses have been associated with a variety of food-borne microorganisms and with food products contaminated with toxic chemicals. Large-scale disruptions of food supplies involving illnesses in and contamination of farm animals have occurred. These outbreaks have resulted in the straining or overwhelming of public services, intense media coverage, and adverse economic, social, and political effects. These apparently inadvertent contaminations resulted in loss of public confidence in the safety of the food supply and regulations by governments to improve consumer protection (FAO/WHO, 2002). Adherence to dosages and withdrawal period instructions are very important elements of on-farm food safety management for animals and humans because the emergence of antimicrobial resistance in bacteria may be directly related to the use or misuse of antimicrobials in food-producing animals. The veterinarian has a most important role to play in restoring and maintaining consumer confidence in the safety of.
animal food products, based on knowledge obtained in the pregraduate veterinary curriculum addressing health issues of both human and animal.

Increased demands for food safety require an analysis of all potential risks present at the various stages of the “stable-to-table” food chain. Food-borne risks to human health can be reduced and minimized by the prevention, elimination and control of hazards arising at the preharvest stages of food of animal origin. At present, there is room for a significant improvement in many aspects of food-safety control in terms of cost and efficacy, especially during ante-mortem and post-mortem abattoir inspections and microbiological control processes. Measures should be tailor-made for the range and prevalence of hazards in a particular animal population. Management of all these hazards by the veterinary services needs to be carried out in a way that optimizes the use of available resources in both the public health and the animal health sector (OIE, 2003).

As part of a collaborative effort and resulting from a declaration made in Doha, the OIE, WHO, FAO, WTO and the World Bank have joined forces and developed the Standards and Trade Developments Facility. This aims to facilitate collaboration in enhancing the capacity of developing countries to meet the SPS standards. In the context of improving their trade prospects, the Facility will support information exchange and development of databases, toolkits and learning materials on trade-related SPS issues to better coordinate capacity-building projects. The Facility will also provide funding of seed capital for pilot projects on capacity building in individual countries or through regional initiatives in direct support of the Doha declaration, including, when appropriate, development activities involving both public and private sectors. The Facility will only address projects related to standards in food safety, plant, and animal health within the scope of SPS measures. These efforts are in direct support of the strengthening of veterinary infrastructures and thereby enhance the ability to detect and respond to disease incursions, while also enhancing the ability to trade internationally (OIE, 2005).

The implementation of the EU Hygiene Package of legislation as from 1 January 2006 will lead to a shift of the responsibility for safe food from the authorities to the producer, while the role of the official veterinarian will change from inspecting to auditing and the transfer of information (food chain information, feedback to producers etc.). Hence this demands integrated professional involvement at all stages, with a greater emphasis on the building of the required capacities for implementation in the official and private veterinary sector (especially veterinarians active in veterinary public health and food safety) and veterinary paraprofessionals (such as veterinary public health personnel, meat/food inspectors) involved in the food sector.

Recognizing this need, the Council of the EU, in responding to a conference on European Response to Public Health Risks from Emerging Zoonotic Diseases (Sept 2004, the Hague) called on all “Member States and the Commission to intensify the cooperation with the relevant international and intergovernmental organizations, in particular the WHO, the OIE, the FAO and the Codex Alimentarius, to ensure effective international coordination of activities in the area of zoonotic diseases, including, where appropriate, in the framework of the International Health Regulations”. To this aim there should be more focus on technical and financial support for capacity building in developing countries for the control and eradication of zoonoses in animals (Council of the EU, 2004).

In the Evaluation of the Joint FAO/WHO Food Standards Programme by Codex (Codex, 2002) it is stated “Capacity building in developing countries was found to be essential for countries to protect their own citizens, to benefit from a globalizing market in food and to represent their interests effectively in Codex and WTO negotiations. Codex and FAO and WHO capacity building were found to be continuing to make a substantial contribution internationally and to individual countries”, and “Capacity building for food safety and health systems for domestic consumers and for trade is a major priority of developing countries. In many of these countries, domestic food safety surveillance and controls tend to be very weak”.

Public demands in respect of zoonoses are increasingly levelled on official veterinary services, nationally and internationally, placing additional financial and administrative burdens on already underfunded public services. A recent meeting of the World Bank (April 2005) acknowledged that emerging zoonoses and pathogens are a global public-good concern and that capacity building and strengthening of veterinary services in terms of surveillance, the development of rural networks of veterinarians and rapid response capabilities will provide a basis for improved crisis prevention. Increasingly the veterinary profession is becoming involved in creating awareness of the danger of the spread of zoonotic diseases from pet animals. Such public awareness campaigns address preventive as well as control measures through close liaison between the pet owner and veterinarian.

In recent years the threat regarding the deliberate misuse of pathogenic biological agents (bioterrorism) that could affect public health, and food and animal production has become a growing concern. Specific measures to counter such occurrences have to be developed by adapting existing methods of disease prevention and control and establishing rapid response mechanisms to manage and contain incidents of natural, accidental or deliberate disease introduction, whether animal diseases or zoonoses. The need for capacity building in this specific area is a particularly high priority.
THE ROLE PLAYERS

1. Official veterinarians
Official veterinarians at veterinary administrations are responsible for the implementation of sanitary standards related to animal health, veterinary public health and zoonoses and animal welfare.

The OIE Code (OIE, 2004a) definition of an official veterinarian is “a veterinarian authorised by the Veterinary Administration of the country to perform certain official tasks associated with animal health and/or public health and inspections of commodities and, when appropriate, to certify in conformity with the provisions of Section 1.2. of this Terrestrial Code”, and veterinary administration “means the governmental Veterinary Service having authority in the whole country for implementing the animal health measures and international veterinary certification process which the OIE recommends, and supervising or auditing their application”.

The standards of quality of veterinary services must be adhered to and maintained in order to enable their countries to benefit more fully from the WTO Agreement on the Application of the Sanitary and Phytosanitary Measures (SPS Agreement) while at the same time providing greater protection for animal health, animal welfare and public health. In all these sectors of animal health service delivery, particularly in terms of the ability of surveillance, monitoring, control, eradication and prevention of animal diseases and zoonoses, support and capacity building is of a high priority to enable developing countries to access international and national animal/animal-product markets and make a meaningful contribution to poverty reduction and the improvement of living quality of rural communities.

2. Veterinarians in the private sector
The OIE was requested by its members to address the issue of the use of private veterinarians and veterinary paraprofessionals by national veterinary services and the conditions under which they may be used in order to comply with the OIE international standards on the quality of veterinary services and international certification of animals and their products. In response to these requests, an Ad Hoc Group was formed with the following terms of reference:

- to define the functions and responsibilities of private veterinarians and paraprofessionals in the provision of animal health services; and
- to provide guidelines on the roles, interrelationships and regulations required to link them with the relevant fields of activities of the veterinary services.

This work is also relevant to the commitment made by the major relevant international organizations at the Doha ministerial meeting regarding capacity building in developing countries, where veterinary services may be under organizational or financial pressure, to enhance their participation in regional or international trade in animals and their products (OIE, 2004d).

In terms of the OIE Code a veterinarian “means a person registered or licensed by the relevant Veterinary statutory body of a country to practise veterinary medicine/science in that country”.

3. Veterinary paraprofessionals
The OIE Ad Hoc Group referred to above defined a veterinary paraprofessional as a person who is authorized to carry out certain veterinary tasks with authorization from a Veterinary Statutory Body, under the responsibility and direction of a registered or licensed veterinarian.

In the OIE Code a veterinary paraprofessional means a person who, for the purposes of the Code, is authorized to carry out certain tasks (dependent upon the category of veterinary paraprofessional) in a country through a licence from the veterinary statutory body, and delegated to them under the responsibility and direction of a registered or licensed veterinarian. The tasks authorized for each category of veterinary paraprofessional should be defined by the veterinary statutory body depending on qualifications and training, and according to need.

Examples of veterinary paraprofessionals would include veterinary nurses, veterinary technicians, community-based animal health workers, food inspectors, livestock inspectors etc. The modified definition of veterinary services emphasizes the important role of the private sector in the provision of these services, especially regarding animal disease surveillance and reporting, and the implementation of animal disease control measures.

4. Veterinary statutory body
To ensure adherence to ethical codes and standards by veterinarians and veterinary paraprofessionals, the Ad Hoc Group has recommended that a veterinary statutory body be established in each OIE member country. This body will be responsible for the licensing/registration of private veterinarians and veterinary paraprofessionals, the setting and monitoring of professional standards, and for discipline. Such a body will play a vital role in maintaining public and international confidence in veterinary services.

The Code definition of a veterinary statutory body is “an autonomous national authority regulating veterinarians and veterinary paraprofessionals”.

All these professionals are part of the veterinary services of a country, which is defined by the OIE Code to mean the veterinary administration, all the veterinary authorities and all persons registered or licensed by the veterinary statutory body.
CAPACITY NEEDED FOR QUALITY VETERINARY SERVICES IN ACCORDANCE WITH THE PROVISION OF THE OIE CODE (OIE, 2004B)

The capacity for surveillance and the control of zoonoses by veterinarians and veterinary paraprofessionals is an integral part of the quality of veterinary services of a country. Hence it is prudent to note the requirements as specified in the OIE Code to assess and maintain quality veterinary services in a country. Competency in and capability to fulfil the provisions of the fundamental principles (see below) for assessing quality are thus equally applicable for successful control of zoonotic diseases.

The quality of the veterinary services of a country depends on a range of factors, which include fundamental principles of an ethical, organizational and technical nature, and veterinary services should conform to these fundamental principles, regardless of the political, economic or social situation in the country. Compliance with these fundamental principles by the veterinary services of a member country is important for the establishment and maintenance of confidence in its international veterinary certificates.

The Code definition of an international veterinary certificate is “a certificate, issued in conformity with the provisions of Chapter 1.2.2., describing the animal health and/or public health requirements which are fulfilled by the exported commodities”.

The quality of veterinary services can be measured through an evaluation, the general principles of which are described in the Code. The following is a summary of the Code recommendations with which veterinary services should comply to ensure the quality of their activities.

Professional judgement - The personnel of veterinary services should have the relevant qualifications, scientific expertise and experience to give them the competence to make sound professional judgements.

Independence - Care shall be taken to ensure that veterinary services personnel are free from any commercial, financial, hierarchical, political or other pressures that might affect their judgement or decisions.

Impartiality - The veterinary services shall be impartial. All parties affected by their activities have a right to expect their services to be delivered under reasonable and non-discriminatory conditions.

Integrity - The veterinary services shall guarantee the integrity of the work of each of their personnel. Any fraud, corruption or falsification should be identified and corrected.

Objectivity - The veterinary services shall act at all times in an objective, transparent and non-discriminatory manner.

General organization - The veterinary services must be able to demonstrate by means of appropriate legislation, sufficient financial resources and effective organization that they are in a position to have control of the establishment and application of animal health measures, and of international veterinary certification activities. Legislation should be suitably flexible to allow changing situations to be addressed efficiently, including the incorporation of animal welfare and food safety measures. In particular, they shall define and document the responsibilities and structure of the organizations in charge of the animal identification system, control of animal movements, animal disease control and reporting systems, epidemiological surveillance and communication of epidemiological information.

A similar demonstration should be made by veterinary services when they are in charge of veterinary public health activities.

The veterinary services shall have at their disposal effective systems for animal disease surveillance and for notification of disease problems wherever they occur, in accordance with the provisions of the Terrestrial Code. Adequate coverage of animal populations should also be demonstrated. They shall at all times endeavour to improve their performance in terms of animal health information systems and animal disease control.

The veterinary services shall define and document the responsibilities and structure of the organization (in particular the chain of command) in charge of issuing international veterinary certificates.

Each position within the veterinary services, which has an impact on their quality, shall be described. These job descriptions shall include the requirements for education, training, technical knowledge and experience.

Quality policy - The veterinary services shall define and document their policy and objectives for, and commitment to, quality, and shall ensure that this policy is understood, implemented and maintained at all levels in the organization. The guidelines for the quality and evaluation of veterinary services propose a suitable reference system, which should be used if a member country chooses to adopt a quality system.

Procedures and standards - The veterinary services shall have appropriate procedures and standards for all their activities, including those for the registration of slaughter establishments.

Information, complaints and appeals - The veterinary services shall have effective internal and external systems of communication, ensuring that any requests for information, complaints or appeals are dealt with in a timely manner.

Documentation - The veterinary services shall have a reliable and up-to-date documentation system.

Self-evaluation - The veterinary services should undertake periodical self-evaluation especially by documenting achievements against goals, and demonstrating the efficiency of their organizational components and resource adequacy. The OIE can assist in the process.

Communication - The veterinary services should have effective internal and external systems of communication.
Human and financial resources - Responsible authorities should ensure that adequate resources are made available to implement effectively the above activities.

CAPACITY NEEDED FOR THE EVALUATION OF VETERINARY SERVICES IN ACCORDANCE WITH THE PROVISION OF THE OIE CODE (OIE, 2004C)

To be able to assess the quality of veterinary services of a country, it is necessary to evaluate such veterinary service provision, which includes the whole spectrum of animal diseases and zoonoses control.

The OIE recommends that any evaluation of veterinary services be based on the OIE Guidelines for the Evaluation of Veterinary Services contained in the Code. The Guidelines, which were adopted by all member countries in May 2002, are applicable to the evaluation of the veterinary services of another country and to the evaluation of a country’s own veterinary services.

The purpose of evaluation may be:
- to assist a national authority in the decision-making process regarding resources and priorities to be given to its own veterinary services (self evaluation); or
- a part of a risk analysis process to determine the health measures which an importing country will use to protect human (in the case of zoonoses) or animal life or health from disease threats posed by imports.

Although quantitative data can be provided on veterinary services, the ultimate evaluation will be essentially qualitative. While it is appropriate to evaluate resources and infrastructure (organizational, administrative and legislative), emphasis should be placed on the evaluation of the quality of outputs and performance of veterinary services, thus the capacity for service delivery.

In an evaluation of veterinary services, the following criteria may be considered, depending on the purpose of the evaluation:
- organizational structure of the veterinary services;
- human resources;
- material (including financial) resources;
- functional capabilities and legislative support; and
- animal health and veterinary public health controls.

As regards veterinary public health controls, the national veterinary services should be able to demonstrate effective responsibility or controls, such as surveillance and monitoring programmes, concerning food hygiene, zoonoses, chemical residue testing programmes, veterinary medicines and the integration between animal health controls and veterinary public health.

These may include:
- formal quality systems, including quality policy;
- performance assessment and audit programmes; and
- participation in OIE activities and compliance with OIE member countries’ obligations.

To complement the evaluation of veterinary services, it is necessary to also consider the organization structure and functioning of the veterinary statutory body.

CAPACITY NEEDED TO MEET SPECIFIC DEMANDS OF VETERINARIANS AND VETERINARY PARAPROFESSIONALS

Urgent attention must be given to the training of future veterinarians, measured against the needs of the twenty-first-century society. This will necessitate examining entry requirements into veterinary schools, course contents and curricula, with attention to those fields of knowledge and expertise the veterinarian of the future will need. Veterinary pregraduate curricula, as well as postgraduate continuous professional development courses need to be assessed and, where necessary adapted, to be able to meet the demands for the control of TADs and zoonoses, the safeguarding of public health and food safety, application of animal welfare standards and sustainable and sound environmental practices in livestock-production systems (intensive or freerange). The next veterinary generation needs to be scientifically equipped to face up to these challenges brought about by habitat destruction, overpopulation and intensive agricultural and marine farming systems.

There exists a general need to address the harmonization of registration/licensing requirements of veterinarians and veterinary paraprofessionals on a regional basis. This will also facilitate cross-border professional activities needed in the control, prevention and eradication of TADs and zoonoses. Such regional activities have been very successfully implemented in e.g. Australia and New Zealand, or within the EU. Many regional political groupings such as the Southern Africa Development Commission (SADC) would greatly benefit from such harmonization protocols, however there is an urgent need for capacity building in this respect.

The maintenance or establishment of veterinary statutory bodies is a prerequisite for the licensing/registration of veterinarians and veterinary paraprofessionals. Expertise and support is needed for the establishment of legal frameworks and administrative structures for these bodies.

The involvement of private veterinarians and veterinary paraprofessionals will greatly contribute to increased efficacy and service delivery of official veterinary services. Such improved quality of veterinary activities will enhance the animal health situation, improve control of zoonoses and contribute to the safety of international trade in animals and animal products and the access and opening up of regional and global markets.

New developments in intensive farming practices, be they on land or in the ocean, demand the veterinary profession’s participation and active engagement in issues relating to e.g. environmental (land, sea and air) pollution, science-based
welfare practices, and prevention of antimicrobial resistance caused by use of antimicrobials in non-human species.

SUMMARY AND RECOMMENDATIONS
The emergence and re-emergence of zoonoses and their potentially disastrous impact on human health has made food safety (including threats regarding the deliberate misuse of pathogenic biological agents) a priority issue for veterinary services, which includes all professional service providers and institutions, around the world. To be able to address effectively and efficiently the needed surveillance, monitoring, prevention, control and eradication of animal and zoonotic diseases, the professional capacities of all role players, including training institutions, laboratories etc., must meet the levels of the international standards prescribed or required (e.g. by OIE, CODEX) to be able to benefit from the SPS provisions and to access regional and international markets for animals and animal products.

Special attention should be paid to capacity building relating to:

- the professional performance and capability of veterinary services in relation to the required quality of service provision;
- pre- and postgraduate training in food safety and specifically control of zoonoses;
- establishment, maintenance and performance of veterinary statutory bodies; and
- harmonization of registration/licensing requirements for veterinarians and veterinary paraprofessionals on a regional level.

REFERENCES
Appendix 3: Expert consultation

Capacity building for surveillance and control of Taenia solium/cysticercosis

K.D. Murrell¹ and Z. Pawlowski²

INTRODUCTION
The terms cysticercosis and taeniasis refer to food-borne zoonotic infections with larval and adult tapeworms, respectively. The important features of these zoonoses are that the larvae are meatborne (generally beef or pork) and the adult stage develops only in the intestine of the human host (obligate). Taenia saginata (the beef tapeworm), T. saginata asiatica (Taiwan Taenia) and T. solium (the pork tapeworm) are the most important causes of taeniasis in humans. Cysticercosis is a tissue infection with the larval cysticercus or metacestode stage, and occurs most commonly in pigs and cattle; Taenia saginata occurs only in beef, T. saginata asiatica in pig organs, and T. solium primarily in pork. Humans acquire the adult stage through eating improperly cooked infected meat.

Taenia solium is unique because the larval or cysticercus stage can also infect humans and cause cysticercosis/neurocysticercosis (man acts as an intermediate host in this case) (Pawlowski & Murrell, 2000). Infection with the cysticercus stage is responsible for almost all serious human disease caused by these taeniid tapeworms (Nash, 2003). These cestodes are cosmopolitan in distribution, and are highly endemic in Latin America, Africa and Asia where poverty conditions such as poor sanitation, and intimate contact between humans and their livestock are commonplace (Murrell, 2005; Pawlowski, Allan & Meinardi, 2005). It has been estimated that millions of people worldwide are infected with T. solium. For example, more attention to this zoonosis is occurring in sub-Saharan Africa because of the growing recognition of the importance of neurocysticercosis (larval infection of the central nervous system) in epilepsy, a disease that is now the subject of a global public health campaign, Out of the Shadows (Diop et al., 2003).

Although the life cycle cannot be maintained in regions that have adequate sanitation and good animal husbandry practices, these regions are still vulnerable, owing to immigration of people from highly endemic regions carrying infections of the adult stage (taeniasis). Such introduced infections account for an increased global distribution to non-endemic regions such as in the United States and Europe. These human carriers can contaminate the environment of others, leading to secondary infections (Murrell, 2005; Pawlowski, Allan & Meinardi, 2005).

In addition to the importance of this relatively neglected food-borne zoonosis as a cause of morbidity and mortality in many non-developed regions, it is also being recognized as a cause of loss of income for farmers with marginal subsistence. The rapid expansion of smallholder pig production in Africa has led to a significant increase in cysticercosis in pigs and humans, an important problem for governments seeking to increase livestock production and rural incomes. These events are not unique to Africa, however, and are the impetus for international concern and actions, such as the recent recognition of the importance of neurocysticercosis by the 56th World Health Assembly (WHO, 2002), which issued a report on control of neurocysticercosis. This report highlights important issues and actions that need to be taken to control neurocysticercosis:

• Recognition that cysticercosis of the central nervous system is the most important neurological disease of parasitic origin in humans. It causes serious morbidity in areas where T. solium is endemic, and is known to be a leading cause of epilepsy, which has profound social, physical and psychological consequences.
• Because neurocysticercosis is an important cause of epilepsy, it places particular demands on health services; the burden of disease will dramatically increase as result of social stigmatization and discrimination.

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• Human cysticercosis is a disease associated with poverty in areas where people eat pork and traditional pig husbandry is practiced. The spread of this disease is facilitated by poor hygiene, inadequate sanitation and the use of untreated or partially treated wastewater in agriculture. However, cysticercosis can also occur in individuals who do not raise pigs or consume pork.

The report points out that more than a decade ago (1993) the International Task Force for Disease Eradication (ITFDE) declared T. solium “a potentially eradicable parasite” (Schantz & Tsang, 2003). More recently, ITFDE called for a large demonstration project on effective control to be carried out; such a “proof of concept” would probably be the greatest single stimulus to further action against this potentially eradicable disease. However, there is as yet no truly successful intervention programmes instituted anywhere at a national level to achieve this goal. Until then, both the WHO and ITFDE urge medical and veterinary sectors to cooperate in establishing national prevalence, economic impact studies, and to establish surveillance reporting programmes. These efforts should adopt up-to-date diagnostic tools and clinical management procedures, employ anthelmintic for the treatment of humans and pigs, ensure high standards of meat hygiene and greater veterinary control over pig husbandry and slaughter practices, and give wider health education on the risks and prevention of cysticercosis. Constraints on resources and expertise needed to implement control programmes are significant to severe in most endemic countries; these countries are resource-poor.

CURRENT SITUATION

Prevalence and distribution

Global distribution of Taenia solium taeniasis/ cysticercosis

Taenia solium is an important zoonosis in many pork-eating countries and is usually associated with low social and economic development. The prevalence of T. solium infection varies greatly according to the regional level of sanitation, pig husbandry practices and eating habits. It is very difficult to evaluate the prevalence of T. solium taeniasis because the coproscopical methods used for survey are not completely adequate and usually cannot differentiate between T. solium and T. saginata infections (Dorny et al., 2003). Therefore data on prevalence of adult worm infections are generally considered very conservative. Similarly, prevalence data based on serological methods may overestimate infection rates because presence of antibody may be the result of exposure to eggs and early but unsuccessful infection (Dorny et al., 2003).

Africa

Taenia solium is an emerging and expanding zoonosis in Africa (Zoli et al., 2003). Data from West and Central Africa suggest that investigations of human cysticercosis based on the prevalence observed in the pig population often underestimate true transmission rates but that there are regions of hyperendemicity (hyperendemic prevalence indicates a constant occurrence of the disease at a high transmission level). The high prevalence of pig cysticercosis should be expected to be accompanied by obvious and frequent T. solium tapeworm infections in man. A similar pattern is seen in eastern and southern Africa, where the prevalence in pigs is reported to range from 20 to 40 percent (Mafojane et al., 2003). Because of the growing interest among veterinarians and agriculturists in porcine cysticercosis, the information on pig infection is in many instances more extensive than that for human infections.

The incidence data in humans are very limited owing to a lack of adequate surveillance, monitoring and reporting systems, although the recognition of its status as a serious and emerging threat to public health is increasing. Concern is growing in eastern and southern Africa that the rapid expansion of pig farming and pork consumption will exacerbate the problems with T. solium cysticercosis; since 1961 the pig population in the countries of Uganda, Tanzania, Kenya, Zambia, Zimbabwe, and Mozambique has increased nearly threefold (in Uganda over sixfold) (Phiri et al., 2003).

Latin America

Due to the very active research efforts in this region a large amount of data has accumulated that clearly demonstrate that there is a very substantial risk of infection with T. solium for residents of many Latin American countries, although the prevalence rates vary from country to country (Flisser et al., 2003). Concerning cysticercosis in the human population, the frequent finding of neurocysticercosis in autopsy cases from general hospitals, its notable presence (4 to 6 percent) among the patients of specialized neurological institutions and the overall serological reactivity to cysticercus antigens found in the general population (e.g. the United Mexican States) indicate an active transmission of cysticercosis in the region.

Porcine cysticercosis is also frequently found at meat inspection in the abattoirs of Latin America but again these data are thought to be conservative indicators since ostensibly infected pigs (often identified by simple lingual palpation) are usually not taken to the slaughterhouse, but slaughtered elsewhere (clandestine marketing) (Gonzales et al., 2003). In the Republic of Peru, where infection rates in pigs vary from 14 to 25 percent, virtually no recognized infected pigs are processed at local slaughterhouses.
Europe
Neurocysticercosis is infrequently encountered in most of Europe. However, owing to increased immigration and travel, T. solium cysticercosis is likely to be diagnosed with increasing frequency and there is evidence that in some regions in Europe T. solium infection can be acquired locally; a recent survey revealed that out of a total of 45 cases of neurocysticercosis diagnosed between 1996 and 2000, 11 were autochthonous cases (Overbosch et al., 2002).

Asia
In Asia this zoonosis has been known to occur for several hundred years, but until recently, it has not received much attention; consequently, epidemiological information for the region is not extensive (Rajeshkar et al., 2003). T. solium taeniasis and cysticercosis is common in the Republic of Indonesia (Simanjuntak & Widarso, 2004). Very high prevalences in the Wissel lakes area in western Irian Jaya have been associated with an “epidemic” of epilepsy and burns. The prevalence of T. solium infections is also high in Bali. Serosurveys in Irian Jaya using immunoblots revealed an eight to ten percent prevalence rate; approximately two percent of 548 examined persons had demonstrable taeniasis, half of which were diagnosed as T. solium, studies in Irian Jaya indicate that the majority of people with epilepsy harboured T. solium cysticercosis.

Cysticercosis is prevalent in nearly all of the Republic of India, particularly in the north (Rajeshkar, 2004). Significantly, neurocysticercosis accounts for 8.7 to 50 percent of patients with recent onset of seizures. The peculiarity of the disease in the Republic of India is the high incidence of patients with the solitary form of the disease, the solitary cysticercosis granuloma; 60 to 70 percent of Indian patients with neurocysticercosis have a solitary cysticercosis granuloma. The prevalence of taeniasis is reported to be between 0.5 to 2 percent, although surveys in Uttar Pradesh found 38.7 percent of people in a pig rearing community had taeniasis.

T. solium infections have also been reported from the Kingdom of Thailand, the Republic of Korea and are sporadically reported in the Taiwan Province of China. A recent assessment of the cysticercosis situation in the People’s Republic of China revealed that human cases of taeniasis and cysticercosis were found in 29 provinces, municipalities and autonomous regions, with five particularly endemic zones (Chen & Zhou, 2004). The average incidence of T. solium taeniasis in the regions surveyed range from 0.05 to 15 percent, while the number of people with cysticercosis was estimated at 3 to 7 million. In the endemic areas, pig cysticercosis varied from 0.4 to 15 percent, and occasionally up to 40 percent.

USA: The impact of immigration and travel
As in Europe, most cases of T. solium taeniasis/cysticercosis in the USA are attributed to immigration and travel. However, it has been reported recently that among the rising number of cases being seen in the country’s western states, a proportion appears to be locally acquired. A retrospective analysis of hospital records (1995-2000) in Oregon revealed 89 hospitalizations due to cysticercosis, five of which occurred in people who had not travelled or lived outside the United States (Engels, 2003). In California, over a 12-year period (1989-2000) a total of 124 cysticercosis deaths were identified, representing a death rate of 3.9 per million population; the large majority were foreign born, predominantly in the United Mexican States (Dorny, Brandt, & Geerts, 2005). However, nearly 14 percent of deaths were among people born in the United States, some of whom may have had autochthonous infections, although travel-related exposure cannot be ruled out as a source of infection.

Important risk factors in the epidemiology of T. solium cysticercosis
(Murrell, 2005; Pawlowski, Allan & Meinardi, 2005; Kyvsgaard & Murrell, 2005)
The major risk factors related to transmission of T. solium eggs to pigs can be summarized as follows:

- Extensive or free-range pig rearing in households lacking latrines, and outdoor human defecation near or in pig-rearing areas.
- Allowing pigs to scavenge and eat human faeces (sanitary policeman).
- Deliberate use of human faeces as pig feed.
- Connecting pigpens to human latrines (pigsty privies).
- Use of sewage effluent, sludge or “night soil” to irrigate and/or fertilize pig pastures and food crops.
- Human carriers involved in pig rearing and care.

The risk factors important to the transmission of cysticerci to humans are:

- Lack of comprehensive and satisfactory meat inspection at pig slaughter.
- Clandestine marketing of pigs to avoid inspection.
- Cultural preferences for eating raw or improperly cooked pork. Studies have shown that the problems of illegal slaughter and marketing are widespread and their solution will require substantial efforts in veterinary control. The habit of eating raw or improperly cooked pork is also a very intractable trait, but hopefully, this can change through education.

THE MOST IMPORTANT RISK FACTORS INVOLVED IN HUMAN-TO-HUMAN TRANSMISSION ARE:

Low economic status, low level of household sanitation and low personal hygiene standards.

History of passing proglottids by a member of a household or a member of the community in frequent contact
with household. Household or community food handlers and childcare givers (carriers) are potentially very high risk factors. Frequent pork consumption.

**THE WAY FORWARD: SPECIFIC CAPACITIES NEEDED TO IMPLEMENT CONTROL ACTIVITIES.**

There is a consensus that from the standpoint of disease transmission to humans and maintenance of the parasite’s life cycle, the adult tapeworm is of primary importance (Pawlowski, Allan & Meinardi, 2005; Pawlowski, 2002). The expertise needed to implement a control programme (detailed below) is diverse and must be provided through multidisciplinary cooperation between the medical, veterinary and public health sectors (and, perhaps, the education sector).

**Strategy for T. solium infection control**

**1. Prevention of taeniasis in humans**

The prevention of environmental contamination with *Taenia* eggs is of paramount importance in both prevention and control schemes. The development of improved sanitation and hygiene practices have had a major impact on the occurrence of cysticercosis in developed countries, and also among urban dwellers in the developing countries, because of their effect on the transmission of *Taenia* eggs (Pawlowski, Allan & Meinardi, 2005; WHO, 1983). The installation of adequate sanitation and the adoption of safe animal husbandry practices, however, are very problematical in these resource-poor areas, and therefore, prevention strategies must rely on multiple approaches, tailoring each to the special features of the particular endemic area (Kyvsgaard & Murrell, 2005).

In general, these strategies are:

- meat inspection to prevent human infection;
- improved farm management to ensure that pigs and cattle are protected from ingesting feed or water contaminated with human faeces to prevent cysticercosis in animals;
- screening of farm workers for taeniasis, and treatment if warranted;
- proper treatment of sewage effluent and sludge to kill *Taenia* eggs, and regulation of the use of effluent and sludge for agricultural purposes;
- control of pig and cattle marketing systems, including the provision of incentives to ensure owner compliance; and
- health education of both farmer and consumer.

**2. Prevention of cysticercosis infections in people**

**Focus of Control Effort**

A control programme can be based on the maximal use of existing medical and veterinary services to control specific foci of *T. solium* infection (Pawlowski, Allan & Meinardi, 2005), therefore capacity building should emphasize:

- education and training of the medical and veterinary staff;
- ensuring their mutual cooperation; and
- establishment of a national/regional management structure.

Specifically, standardized protocols on how to define the potential foci of *T. solium* infection (a case, a family, a locality) and on how to treat human tapeworm carriers in a foci have to be developed and communicated to all the levels of medical services, especially those in endemic areas that deal with peripheral health units assigned primary health care. Importantly, the terms of local cooperation between local medical and veterinary services in defining *T. solium* foci, and the exchange of available information, must be developed and promoted. Of critical importance, a system of supervision to ensure that the programme is implemented and managed correctly has to be established, and any identified obstacles removed.

**Logistics and management of control programmes**

Establish a committee or a single person to be responsible for the implementation of preventive and control measures at various organizational levels (regional, national, district or community). The international agencies should also designate an officer responsible for coordination of various control approaches and activities.

Create a reporting system - as simple as possible - at all levels of existing medical (taeniasis, cysticercosis) and veterinary (cysticercosis) services. Produce and distribute a protocol for active surveillance activities in endemic areas, commensurate with the local human and technical resources. Ensure regular analysis of the incoming data and use the analysis for further decision-making at the national and/or local levels.

Institute a training programme for medical, public health and veterinary services personnel who will be involved in carrying out the control programme. They must be trained in the implementation of the preventive and control measures relevant to the local human and financial resources, as well as to the local cultural, environmental and economic conditions. This can be accomplished through government-supported training at academic institutions, or in special courses conducted by government agencies (e.g. public health or veterinary public health).

Create at the national or local levels groups of people involved in development and implementation of the prevention and control programmes in the highly endemic areas. Support those groups with the necessary scientific, logistic and financial assistance required to carryout the plan.

Revise existing legislation, which may be related to prevention or control of taeniasis/cysticercosis, i.e. animal production and meat distribution as well as sanitation, and
diagnosis and treatment of human tapeworm carriers. Promote and justify the control programme at the district, national and international levels using valid estimates of the health and economic burden of human taeniasis/cysticercosis.

**Major control elements dependent upon capacity building**

*Improvements in meat inspection*  
(Kyvsgaard, & Murrell, 2005)  
Various studies have shown that improvement of the effectiveness of inspection staff depends upon such factors as training, rewards, motivation, psychological disposition, adequate lighting and improving methods of processing carcasses. These are important, but they do not overcome the problem that there is no specific site for examination that can be relied upon to detect all infected carcasses.

Failures in the detection of cysticercosis during post-mortem inspection may be reduced if meat inspection is practiced by experienced and conscientious inspectors under optimal conditions; these should include adequate rest periods. These conditions also include good lighting, a low noise level and a system of inspection integrated with slaughtering procedures. Meat inspection manuals should be explicit in their directions for the examination of carcasses and organs for cysticerci. Meat inspection should be well planned, organized and managed at every slaughterhouse. It has been observed that the efficiency of meat inspection diminishes after two hours of routine work in a given position.

*Health education and training of professionals - “training of trainers”*

Education is crucial to any control effort, and must be given at all levels of a programme. All health education effort has to be planned and conducted through a net of professionals who are working in the field or who have contacts with the public (Pawlowski, Allan & Meinardi, 2005; Kyvsgaard & Murrell, 2005).

*Meat inspectors*

Meat inspection in larger slaughterhouses is in most countries under the veterinary authority of the Agricultural Ministry. The authority and obligation to carry out meat inspection in the smaller towns and communities may vary between countries, belonging either to local municipal government, the Agricultural Ministry or to the Ministry of Health. Local police may even be involved when meat is condemned. The meat inspectors may have other duties and will often have very different educational backgrounds. Proper training is therefore crucial.

*The role of health workers*

The primary health worker plays a central role both in the identification of human carriers and in the promotion of better hygienic practices in the community.

*The role of schools*

Taeniasis/cysticercosis is an appropriate subject to be introduced into schools along with discussions on food hygiene, food habits, environmental sanitation, man/animal relationships, life cycles of the organisms and their zoonotic importance. In many endemic areas this is an important opportunity for education to reach isolated farms. The preparation of teachers to become active health educators should be encouraged.

*Training of health workers and schoolteachers*

As far as possible, health educators should be drawn from the community in which they will be working. Everyone involved directly or indirectly in preventing taeniasis/cysticercosis must participate in carrying out public health education. It is, therefore, essential that this subject should have an important place in staff training. Such training should be planned and preferably imparted by a specialist, who should also advise on the selection of appropriate educational methods and the preparation of educational material suited to local conditions and to the various phases of the programme. The general training that health workers may have received in schools of public health also needs to be supplemented with briefings on the various aspects of the local situation. It is useful to prepare and distribute a poster, booklet or manual dealing with the technical, administrative and educational aspects of the programme. This can then be used by all persons involved in the project, including lay members of committees or other groups set up to obtain public cooperation and support. A manual helps to avoid confusion caused by different answers to the same questions given by different people.

*The role of pharmacists*

Pharmacists play an important role locally, because they sell taenicides, often without medical prescription, and are asked to diagnose taeniasis. They can be actively involved in health education particularly in the supply of educational materials. The educational curriculum of pharmacists should include a course of lectures on diagnosis, treatment, prevention and control of taeniasis/cysticercosis.

*Training of the public*

Farmers  
Farmers should be informed of the risks associated with allowing pigs to have access to human faeces, and the use of human sewage for fertilization and/or irrigation of
pasture, and they should be instructed on the benefits of providing effective toilet facilities for their own and worker’s families. Therefore, they should be convinced of the importance of: (i) having all cases of taeniasis reported and properly treated; and (ii) using effective toilets when available or, if not available, avoiding defecation in places either directly accessible to susceptible animals or with potential for contaminating their feed.

Pig owners should be informed of the life cycle and the health risks to their families and to the consumers of the meat they produce. They should also be informed of the economic implications (possible closure of their small business by the health authorities and the loss of customers). Sometimes the best way to involve these animal owners is through their children, who can be taught the life cycle of these parasites and the means to prevent infection at school.

These animal owners should also be advised to have their animals inspected at slaughter, but if this is not possible, to learn how to detect cysticerci in the meat and to use the infected meat only if properly treated by cooking or freezing. They also must learn to clean all tools used to cut the meat, in order to prevent the transfer of cysticerci. They should also be persuaded to report and have treated all cases of taeniasis occurring to themselves or to their families.

**Butchers**

Butchers should be: (i) required to cooperate in the veterinary inspection to detect cysticerci; (ii) trained to detect cysticerci, and properly treat the infected meat, if veterinary inspection is not available; and (iii) required to avoid tasting, eating or selling suspect, untreated raw meat.

**Food handlers and consumers**

Food handlers should be educated: (i) look for cysticerci and use infected meat only if it has been previously treated by freezing or cooking; (ii) use suspect (uninspected) meat only if it has been previously treated by freezing or thorough cooking; (iii) thoroughly clean hands, and all kitchen tools (e.g. knives, chopping-boards, etc.) which have been used in preparation of meat; and (iv) avoid tasting raw or insufficiently cooked, infected or suspect meat.

**Persons involved in home slaughtering**

Some people raise pigs for home slaughter and distribute meat to their families or to local consumers. This may create urban foci as well as act to disseminate infection to rural areas. This is one of the activities where education is most needed in the village situation, as it is probable, currently, that the carcasses have not been inspected.

**Community education or prevention**

All members of the community should be informed of the life cycles and of the public health and economic impacts of these parasites. They should be encouraged to: (i) report and have treated all cases of taeniasis; (ii) insist that proper public and private toilets with effective sewage disposal are made available and are used; (iii) keep pigs in pens or behind fences; and (iv) insist on the adequate meat inspection services.

**Campers and tourists**

These groups are often exposed to taeniasis because they may eat raw or improperly cooked meat. Because they frequently defecate in the fields or by the roadside they are an important group that should be informed about the life cycle of the parasite; and advised to: (i) refrain from eating unsafe, raw beef or pork in countries where cysticercosis is endemic; (ii) inspect their faeces for tapeworm proglottids and report for treatment; and (iii) use toilets when available; if these are not available, then they should avoid defecating in places accessible to cattle and pigs, or bury their faeces.

**Hunters**

They have responsibilities similar to campers and tourists in general, particularly in the use of uninspected meat from the killed animals (pigs) as food for their families or for local consumers. Hunters should be advised: (i) to have wild pig meat properly inspected and, if it is found to be infected, to have this meat properly treated by cooking or freezing; (ii) to learn how to detect cysticerci, if inspection is not feasible; and (iii) to cook the meat thoroughly and avoid tasting before it is cooked.

**Exploiting media for local education programmes**

The educational material used should take into full consideration the beliefs, perceptions, behaviour, expectations and needs of the people (felt and unfelt). This highlights the need to carry out preliminary cultural and socio-economic studies to ensure that the information imparted will be accepted by each target group (Sanchez & Fairfield, 2003). There is a need to measure the impact of each educational programme to ensure that it does meet the needs and cooperation capabilities of the target group.

A potentially powerful use of the electronic media for prevention and control education efforts is in training the educators in the project with interactive media presentations or tutorials. The use of such new technologies can greatly extend and enhance education materials traditionally employed in health education programmes. A recent project on porcine cysticercosis in The United Republic of Tanzania expanded the use of electronic media options by introducing an educational video to inform the rural communities of the health risks and prevention of *T. solium* infections (Rimm, 2003). The product of this research was a video that could be taken to even very remote locations and presented to community members either as a VHS vide-
otape (with television screen) or with a DVD player and an LCD projector.

**TASKS FOR CONTROL PROGRAMME STAFF, COOPERATORS AND STAKEHOLDERS WHICH REFLECT THE SKILLS AND KNOWLEDGE NEEDED (PAWLOWSKI, ALLAN & MEINARDI, 2005)**

**Health policy-makers**
Collect all possible information on medical and economic importance of taeniasis/cysticercosis in a country and consider a need, priority and feasibility of undertaking control measures.

Create a positive atmosphere from all interested bodies, including mass media, about the necessity of implementation of control measures against *Taenia solium* taeniasis and cysticercosis.

Select the optimal ways of implementation of the control measures in a country and designate person(s) responsible for its coordination and implementation.

Regularly examine and evaluate the progress in control activities.

**Public health officers**
Establish person(s) responsible for implementation of control measures and the mechanisms of periodical evaluation of control activities.

Collect hard data on taeniasis/cysticercosis from medical, veterinary and research institutions and create or strengthen existing information system.

Define endemic areas or foci of taeniasis/cysticercosis as well as local resources (personnel and funds) necessary for successful control.

Train medical, laboratory and veterinary services in implementation of the control measures.

Promote a cooperation of the medical, veterinary and non-medical institutions in implementation of control measures.

Strengthen laboratory diagnostic base for identifying *Taenia* proglottids and/or finding specific coproantigens or *Taenia* eggs.

Ensure the availability of effective and cheap taenicides listed in the essential drugs list and decide what to do if the drugs are not available, when needed.

**Primary health workers**
Get the support of the local community leaders for implementation of taeniasis/cysticercosis control measures.

Collect information on cysticercosis in humans and pigs and cases of epilepsy in the area and pass the information to the appropriate health authorities and control programme leaders.

Identify, in cooperation with veterinary services, the local foci of *Taenia solium* infection.

Educate farmers how to prevent cysticercosis in humans and pigs, emphasizing the risk of epilepsy and economic losses.
CONCLUSIONS
Control of neurocysticercosis from T. solium infections will require a multidisciplinary and multilevel approach because of the complex nature of it epidemiology. A control programme will necessitate establishing a national organization that helps and guides the local effort. The control programme will also demand cooperation and participation by the veterinary, medical and public health sectors. This complex organization of experts and stakeholders must be provided with, in addition to resources, a solid understanding of the epidemiology and biology of the zoonosis, and the rationale for the control strategy that is to be pursued. In addition to basic parasitology of T. solium, a good understanding of the risks associated animal husbandry and human behavioural practices, and the economics of pig production and marketing is essential. Important to the success of a programme is attention to management and coordination of the various components of the control organization. Therefore, a good deal of effort and investment in training and indoctrination of all participants in the overall control programme will be required upfront. Even pilot or demonstration control projects will require substantial capacity building. Without this level of preparation, controlling this zoonosis, which is so dependent upon long-established risky animal rearing and cultural traits, will remain nearly intractable.

REFERENCES


Capacity building for surveillance and control of bovine spongiform encephalopathy and other zoonotic diseases

Ulrich Kihm¹, Elizabeth Mumford¹, Andrew Speedy²

Over the past decade, bovine spongiform encephalopathy (BSE) has emerged as a disease with effects on animal health, public health, and trade. Many countries concerned about BSE need help in assessing and managing their BSE risk. The project utilizes Swiss expertise and Food and Agriculture Organization (FAO) infrastructure to assist the governments of selected partner countries in building capacity, establishing preventive measures, and analysing risks for BSE. The project aims to improve or build technical capacity along the entire food production chain (including governmental and private veterinary services, diagnostic laboratories, and the livestock, animal-feed, and meat industries) in partner countries so that all components required for an effective and sustainable BSE control programme are available. The ultimate goal of the project is that the partner countries either are able to prove themselves to be BSE-free, or are able to decrease their BSE risk to an acceptable level. Although the focus of this project is to lessen the negative impacts of BSE on public health, animal health, and trade in the partner countries, the capacity developed will promote implementation of similar control programmes for other emerging zoonotic food-borne pathogens.

The specific objectives for the project in each partner country are:

• that the overall technical understanding and capabilities for BSE control are improved;
• that the national veterinary service is able to design and implement an effective BSE surveillance and prevention programme, and to develop strategies to cope with similar zoonotic diseases; and
• that a national comprehensive BSE risk assessment is prepared and submitted to the OIE.

Initially, the strengths and needs of each partner country are assessed so that the implementation of the project can be focused according to the specific needs of the country. Then, a comprehensive programme of courses to “train the trainers” is offered to qualified individuals working in the relevant veterinary and food industries in the partner countries. Courses are given by experts on BSE and other related topics from throughout the world. Course topics include diagnostic techniques, epidemiology, surveillance and risk assessment, risk management in the meat industry, and risk management in the feed industry. The curricula focus on improving overall understanding of BSE epidemiology and relevant risk factors, and on building specific practical knowledge and skills for developing and implementing appropriate BSE risk management measures.

The same training in the native language is then offered to a broader range of participants in the partner countries. These in-country courses are organized through the national veterinary office by the previously trained individuals, with support, technical assistance, and materials (translated into the native language) from the project. At least one expert trainer assists in presenting these courses, and FAO provides infrastructure support in the countries.

To improve sustainability, the project strongly promotes the application in the partner countries of technical knowledge gained through training, and contact and follow-up is ongoing. Technical support and assistance in the development and implementation of a national BSE control programme is given. Information campaigns and public awareness programmes on BSE issues, including animal feed and food safety, are developed. These programmes target farmers, private veterinarians, government workers, laboratory personnel, consumers and the livestock, animal-feed and meat industries, in the partner countries. Ultimately, the countries are supported in the preparation and submission of a comprehensive national BSE risk assessment to the World Organization for Animal Health (OIE), as a step in to establishing their BSE status within the international community.

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Once a national BSE programme is effectively implemented in each partner country, both small and large producers as well as the livestock and meat industries will benefit from a decrease in the deleterious effects of having BSE in their country, including improved animal health, better product marketability, and enhanced international and regional trade opportunities. All citizens of that country will benefit from a safer food supply. As well, given global movements and trade in cattle and bovine products, every country that successfully controls the further distribution of BSE contributes to reducing risk for BSE in the animal and human populations, and thereby contributes to improved animal and public health worldwide. See Figure 1.
Capacity building for surveillance and control of tuberculosis

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INTRODUCTION
Limited capacity to design and implement programmes of surveillance, and control of animal diseases such as bovine tuberculosis, is one of the constraints restricting the ability of developing countries to promote livestock industry and to alleviate poverty. The present paper describes the contribution of an FAO Technical Cooperation Project (TCP/MOR/2904) to building and improving the capacity for surveillance and control of bovine tuberculosis in the Kingdom of Morocco. For the purpose of this paper, capacity building is defined as the building of organizational and technical abilities, behaviours, relationships and values that enable individuals, groups and organizations to enhance their performance effectively and to achieve their objectives over time. Surveillance is defined as the “systematic” collection, analysis, interpretation, and timely dissemination of health data for the planning, implementation, and evaluation of health programmes (Robinson et al., 2003). Animal disease control refers to policies and procedures aimed at preventing and minimizing the risk of spreading disease in animals in order to reduce its occurrence to an acceptable level or to eradicate it from the population.

1. STATE OF THE ART
Bovine tuberculosis is an enzootic disease caused by Mycobacterium bovis. The disease affects primarily cattle but also other domestic and wild mammals and is transmissible to humans. In developed countries, the public health significance and economic importance of this infection has resulted in the design and implementation of successful long-term programmes for control and/or eradication of tuberculosis in cattle. These are based on the “test and slaughter” method (Frye, 1995; Thoen, Karlson and Himes, 1981).

The success of these programmes is largely due to the capacity of professionals to:
- design control programme with clear objectives;
- promulgate and enforce appropriate regulations;
- implement sequentially, as planned, the components of the programme;
- allocate appropriate and durable resources; and
- evaluate and adjust (if necessary) the programme continuously.

Surveillance of bovine tuberculosis in cattle is an essential component of disease control programmes in developed countries. Periodic tuberculin testing of cattle is traditionally used as a tool for active surveillance and control of the disease. These control programmes have allowed for a dramatic decrease in the prevalence of bovine tuberculosis in developed nations (Frye, 1995). Consequently, a novel approach, based on passive slaughterhouse surveillance of bovine tuberculosis combined to tracing lesioned animals to their herds of origin with subsequent epidemiological investigation to locate herds that had been exposed to infection, has been developed (Frye, 1995). The success of this cost-effective approach depends highly on:
- the capacity of meat inspectors to recognize and submit potential tuberculous lesions for laboratory examination;
- the capacity of veterinary diagnostic laboratories to diagnose bovine tuberculosis by histopathology, culture and identification of tubercle bacilli;
- the existence of an efficient cattle identification system that allows for effective trace-back (Frye, 1995).

During the past two decades, tremendous progress, based on molecular biology techniques, has been achieved in laboratory diagnosis and molecular epidemiology of tuberculosis (Van Embden, Schouls and Van Soolingen, 1995). These techniques are costly and require specialized laboratories and competencies. As a consequence, they are presently used for research and molecular epidemiology purposes. In developing countries, especially in Africa, bovine tuberculosis is thought to be widespread among humans. Poverty, sociocultural habits, close association between humans and
animals and the HIV/AIDS epidemic are important factors in the dissemination of *M. bovis* infection (O’Reilly and Daborn, 1995). Despite the importance of human tuberculosis in these countries, little information is available on the epidemiology, and zoonotic implication of bovine tuberculosis (Berrada and Barajas-Rojas, 1995; Cosivi, 1997). Among the reasons that account for this situation are:

- the chronic nature of the disease and the simultaneous existence of other diseases that have immediate devastating effects (i.e. FMD, PPR, CBPP, parasitic diseases, etc.) - this leads to bovine tuberculosis being considered a minor problem (Chillaud, 1992);
- the insidious nature of tuberculosis - losses due to infection with tubercle bacilli are often overlooked by farmers and governments;
- the lack of close cooperation between medical and veterinary professionals to address the public health significance of bovine tuberculosis; and
- the limited capacity (in terms of infrastructure, human and financial resources) of developing countries to design and implement programmes of surveillance and control for bovine tuberculosis.

Developing countries, such as the Kingdom of Morocco, whose economies underwent structural adjustment and the privatization of public veterinary services during the 1980s and the 1990s, faced significant challenges in tackling zoonotic diseases such as bovine tuberculosis (Robinson, 2003; Tber, Fikri and Laghzaoui, 1995). As a consequence, in the Kingdom of Morocco, prevalence of bovine tuberculosis in dairy cattle (based on tuberculin testing) increased from an average of 1.78 percent in 1988 (4) to an average of 17.8 percent in 2004, coinciding with the interruption, in 1989, of a public-funded control programme initiated in 1976 (Fikri, 1997). Realizing the magnitude of the problem, the Moroccan Government requested FAO assistance in 2001 to design a strategy for control of bovine tuberculosis. In August 2002, FAO and the Moroccan Government signed a 302 000 US$ Technical Cooperation Project (TCP/MOR/2904). The aims of the project were to:

- assess the epidemiological situation of bovine tuberculosis in the Kingdom of Morocco;
- strengthen the data-analysis capacity of the Moroccan veterinary authority through the use of a Java version of TADInfo developed by FAO;
- build and strengthen existing capacities for laboratory diagnosis of animal tuberculosis;
- improve the capacity of slaughterers and abattoir veterinarians to recognize and to report tuberculosis in carcasses;
- create public and farmer awareness of dangers/risks associated with bovine tuberculosis, ways to prevent exposure to infection and measures to control the disease in cattle; and
- design a pilot plan for control of bovine tuberculosis in cattle at a regional level within the Kingdom of Morocco.

As will be shown below, capacity-building through trainings, skills development and raising awareness was the cornerstone of TCP/MOR/2904.

### 1.1. Building capacity for surveillance of bovine tuberculosis in the Kingdom of Morocco

#### 1.1.1. Building technical capacity for tuberculin testing and designing epidemiological surveys

A control programme for bovine tuberculosis is based on accurate information on the prevalence and epidemiology of the disease. Surveillance of tuberculosis can be achieved either passively by monitoring tuberculosis in slaughterhouses or actively by cattle tuberculin-testing campaigns. In the Kingdom of Morocco, official reports, based on slaughterhouse monitoring, grossly underestimated the incidence of the disease compared to the true prevalence in the field. Thus, it was necessary to design and carry out a national survey on a statistically representative sample of herds. The objectives of this survey were to:

- assess the herd prevalence at regional and national levels with regard to bovine tuberculosis by tuberculin testing sampled cattle herds; and
- assess the prevalence of bovine tuberculosis in cattle within sampled herds.

The expertise needed to design a national survey on bovine tuberculosis was provided by international and national expert consultants recruited under TCP/MOR/2904 with specific qualifications and terms of reference. The survey was designed with the cooperation of the Moroccan veterinary authority. As designed, the survey was conducted nationwide according to a standardized and uniform method of tuberculin testing and result reporting. For this purpose, two workshop/training sessions were organized for 30 field state veterinarians practicing in different regions, under the supervision of international and national consultants. Each training session included a theoretical presentation on methods for screening, reporting and controlling bovine tuberculosis, as well as a practical workshop on tuberculin testing of cattle in selected herds. Appropriate documentation and audiovisual aids were provided to participants. Participants in the workshop were expected to extend the acquired knowledge to their peers in the veterinary services. Treatment and analysis of survey results were conducted by a national consultant with the collaboration of trained senior veterinarians.
1.1.2. Building capacity for quality control of tuberculin

Surveillance and control of bovine tuberculosis in cattle depends on tuberculin testing of animals. To ensure reliability and allow significant comparison of tuberculin test results over time it is essential to use high quality tuberculins with precise potencies. Thus, quality control of tuberculin is an important component of tuberculosis surveillance and control programmes.

In the perspective of implementing a bovine tuberculosis control programme in the Kingdom of Morocco, a senior veterinarian from the national laboratory of veterinary drug and vaccine control benefited from specialized training in a French reference laboratory for Mycobacterium spp. The training was financially supported by TCP/MOR/2904.

1.1.3. Strengthening capacity for epidemiological data analysis

Strengthening Moroccan veterinary capacity for epidemiological data analysis was the focus of a one-week mission conducted by an FAO expert in the Kingdom of Morocco. During her mission, the FAO expert trained several Moroccan senior veterinarians on the use of the Java version of TADInfo, newly developed by FAO.

1.1.4. Improving the capacity of meat inspectors to recognize and to report tuberculosis on carcasses

A uniform method for recognizing tuberculous lesions at meat inspection is an important component of disease surveillance and control programmes. It also provides solid support for the credibility of the tuberculin test and slaughter of reactors programme. For this reason, two workshop/training sessions were organized for 30 field state meat-inspector veterinarians practicing in different slaughterhouses, under the supervision of a national consultant. Each training session included a theoretical presentation on a uniform and efficient method for recognizing and reporting tuberculous lesions, as well as a practical workshop on tuberculous carcasses conducted in a selected slaughterhouse. Condemnation of carcasses due to tuberculosis was also reviewed with regard to disease forms and national regulation. Appropriate documentation and audiovisual aids were provided to participants who were expected to extend the acquired knowledge to their technicians and peers. Furthermore, the workshop represented an excellent opportunity to design a national form for uniform reporting of tuberculosis in the slaughterhouse to the central veterinary authority in charge of disease surveillance. The activities outlined above undoubtedly enhanced veterinary institutional and technical capacities, in terms of disease surveillance and control. They also helped the Kingdom of Morocco to define the magnitude of bovine tuberculosis in its cattle sector at the regional and national level.

1.2. Building and strengthening existing capacities of laboratory diagnosis of animal tuberculosis

As mentioned earlier, laboratory diagnosis of bovine tuberculosis is an important component of disease control and research programmes. Furthermore, it plays a critical role in settling disputes that may arise between farmers and veterinarians in the course of a control programme over the slaughter of reactor cattle not harbouring visible tuberculous lesions. Laboratory diagnosis of tuberculosis requires appropriate facilities, safety procedures, special skills and appropriate laboratory procedures. In the Kingdom of Morocco, there are six regional state veterinary laboratories. However, none of them had the required capacity for isolating and identifying tubercle bacilli. To build and strengthen existing capacity of these laboratories to diagnose animal tuberculosis, it was necessary to:

- train personnel of these laboratories according to a set of uniform safety and laboratory procedures; and
- complement the equipment of laboratories with necessary material, reagents, chemical and culture media.

For this purpose, two training sessions were organized for 14 participants practicing in the above-mentioned laboratories. Supervision was provided by an international and a national expert-consultant recruited under TCP/MOR/2904 with specific qualifications and terms of reference. Each training session included a theoretical presentation on safety procedures and laboratory methods for diagnosing animal tuberculosis, as well as a relevant practical workshop. Appropriate documentation and audiovisual aids were provided to participants. In the perspective of establishing a Mycobacterium spp reference laboratory in the Kingdom of Morocco, a senior laboratory veterinarian benefited from four weeks training in a French reference laboratory. The workshop sessions organized in the Kingdom of Morocco as well as the training provided in France were financially supported by TCP/MOR/2904. They allowed the Kingdom of Morocco to built and strengthen its capacity for laboratory diagnosis and research of animal mycobacterial diseases, including tuberculosis. Such capacity will be required while implementing a bovine tuberculosis control programme.

1.3. Building leadership

Vision and respectability are necessary components of leadership. The experiences of developed countries in the successful control of animal tuberculosis may aid in building vision to design and implement the disease control programme in the Kingdom of Morocco. For this purpose, a high-ranking Moroccan senior veterinarian made a study tour in France to exchange experiences on the possible ways to tackle animal tuberculosis.

1.4. Building farmer awareness, trust and
advocacy

Public relations and educational aspects of tuberculosis control in developing countries such as the Kingdom of Morocco are critical points to consider in the course of a control programme. The intent is to increase the level of understanding of tuberculosis problems and solutions, to have a positive feedback and to build trust and support from the public as well as from the professionals involved (Berrada and Barajas-Rojas, 1995). In addition, organizing farmers into professional organizations for the control of bovine tuberculosis was encouraged. For these purposes, several actions were undertaken in the course of TCP/MOR/2904. These included:

- organizing five regional workshops for the benefit of 448 farmers;
- the design and wide distribution of a poster on bovine tuberculosis;
- the production and wide circulation of an extension booklet on bovine tuberculosis;
- making a video on bovine tuberculosis; and
- the broadcasting over several weeks of a radio programmes devoted to bovine tuberculosis.

Positive ideas and feedback from farmers were recorded following the achievement of the above listed activities.

1.5. Designing a bovine tuberculosis pilot control programme

A pilot programme for the control of bovine tuberculosis was designed by the project’s consultants with the active collaboration of a panel of professionals. The programme aims at:

- controlling bovine tuberculosis at a regional level within the Kingdom of Morocco and its progressive extension to other regions whenever it is possible and feasible; and
- promoting healthier herds and products.

In developing this pilot control programme, several points were considered. These include:

- prerequisite conditions to implement control programme (regulation, funding, cattle identification system, eligible regions, etc.);
- the results of a national survey to assess herd and population prevalence of cattle tuberculosis at national and regional levels;
- the estimation of annual cost to implement the pilot control programme in a specific region;
- the feasibility of the programme in terms of delivery logistics and qualified human resources; and
- the contribution of each professional category to the delivery of the programme.

2. UP-AND-COMING TRENDS AND DESIRED SOLUTIONS

The livestock sector plays an important role in the economy of several developing countries and contributes to alleviating poverty and malnutrition in rural communities. The human population in these countries is constantly increasing and the demand for food of animal origin will consequently follow. As a result, many changes are foreseen in coming decades. These include intensification of animal production with the subsequent risk of serious zoonotic disease problems (e.g. bovine tuberculosis) in human and animal populations to be addressed. National mechanisms and international cooperation for capacity-building in developing countries are the focuses of chapter 37 of Agenda 21 (Commission on Sustainable Development at its fourth (1996), fifth (1997) and sixth (1998) sessions) and by the United Nations general Assembly at its Special Session to review the implementation of Agenda 21. On the other hand, the FAO expert consultation on community-based public health (VPH) systems held in 2003 recommended providing support to countries for identifying and solving problems especially related to endemic and persistent zoonoses (http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter37.htm). Thus, regional or international assistance may be needed for some developing countries to trigger mechanisms by which the magnitude of bovine tuberculosis in animal and human populations could be addressed and to consequently build progressive capacity for surveillance and control of the disease.

3. THE WAY FORWARD

Recognizing the importance of a zoonotic disease such as bovine tuberculosis in the animal and human populations of a given country is a necessary step before decision-makers list it as a priority problem and raise national or international interest to the level that will result in building the necessary capacities for initiating an appropriate control programme. Assessing the importance of bovine tuberculosis in cattle implies the existence of an effective surveillance programme based on screening and/or slaughterhouse monitoring. Systematic tuberculin testing of cattle to determine the prevalence of bovine tuberculosis is costly and may not be feasible in many developing countries. Thus, well-designed surveys based on testing a representative sample may constitute a reliable and cost-effective alternative.

Survey results, cost estimation and technical feasibility are some of the elements to consider in designing a control programme and in outlining institutional and technical capacities to be developed. As indicated earlier, institutional and technical capacity building and strengthening helped The Kingdom of Morocco to address bovine tuberculosis as a priority problem and to design a pilot programme for sur-
veillance and control. In this regard, FAO assistance through TCP/MOR/2904 played a critical role in this capacity building effort and in establishing farmer awareness, trust and advocacy to adhere to the proposed control plan. Moreover, it triggered a dynamic process within government agencies, professional organizations and farmers that will allow for implementation of a pilot control programme soon. The success of such a pilot programme will depend on:

- the commitment of farmers, agencies and organizations involved;
- the input and close cooperation of veterinary and medical agencies; and
- the availability of appropriate funds.

CONCLUSION AND RECOMMENDATIONS

Through a well-designed project, a developing country such as The Kingdom of Morocco built and strengthened organizational and technical capacities for surveillance and control of bovine tuberculosis. In this regard TCP/MOR/2904 can serve as a model for other capacity building programmes in developing countries with similar levels of development. At the regional level, it is recommended that collaborating and reference centres for training, surveillance, diagnosis and research on bovine tuberculosis be established. At the international level, it is recommended that developing countries be assisted in developing and financing participatory approaches to define country needs and priorities and in so doing to strengthen human resource and institutional capabilities.

REFERENCES


