FAO/WHO/OIE ELECTRONIC CONFERENCE ON VETERINARY PUBLIC HEALTH AND CONTROL OF ZOONOSES IN DEVELOPING COUNTRIES
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>AMESH</td>
<td>Adaptive Methodology for Ecosystem Sustainability and Health</td>
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<td>BSE</td>
<td>Bovine spongiform encephalopathy</td>
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<td>CAHW</td>
<td>Community Animal Health Worker</td>
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<td>CD</td>
<td>Compact disc</td>
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<td>CDC</td>
<td>Centers for Disease Control and Prevention (USA)</td>
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<td>CIT *</td>
<td>Countries in Transition</td>
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<td>DC *</td>
<td>Developing Countries</td>
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<td>EU</td>
<td>European Union</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>GMP</td>
<td>Good Manufacturing Procedures</td>
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<td>HACCP</td>
<td>Hazard Analysis Critical Control Point</td>
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<td>IAEA</td>
<td>International Atomic Energy Agency</td>
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<td>ICT</td>
<td>Information and Communication Technology</td>
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<td>NGO</td>
<td>Non-governmental organization</td>
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<td>PAHO</td>
<td>Pan American Health Organization</td>
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<td>PAR</td>
<td>Participatory Action Research</td>
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<td>PC</td>
<td>Personal computer</td>
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<td>PCR</td>
<td>Polymerase chain reaction</td>
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<td>OIE</td>
<td>Office international des épizooties (World Organisation for Animal Health)</td>
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<td>RADISCON</td>
<td>Regional Animal Disease Surveillance and Control Network for North Africa, the Middle East and the Arab Peninsula</td>
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<td>TCP</td>
<td>Technical cooperation project</td>
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<td>VPH</td>
<td>Veterinary Public health</td>
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<td>WHO</td>
<td>World Health Organization (UN)</td>
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The use of the terms ‘Developing Country’ and ‘Countries in transition’ can be ambiguous. Based on the World Bank glossary, a DC is defined as low (64 countries) and middle (93 countries) income countries in which most people have a lower standard of living with access to fewer goods and services than do most people in high income countries. Countries in transition refers to those countries whose economies used to be centrally planned by the government but are now changing to market-based economies.
CONFERENCE BACKGROUND

In 1999 the World Health Organization of the United Nations (WHO) convened a conference of invited experts from a total of 18 industrialized, countries in transition, and developing countries. The conference was held in Teramo, Italy in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and Office international des epizooties (World Organisation for Animal Health (OIE)). The major purpose was to consider the contributions that Veterinary Public Health (VPH) programmes could make to human health on a global basis, with a particular future emphasis on Developing Countries (DC). At the Teramo meeting, the consensus definition of VPH was:

“The contributions to the physical, mental and social well being of humans through an understanding and application of veterinary science”.

This definition therefore replaced the original defined by VPH in the 1975 joint FAO/WHO technical report (WHO, 1975) as “a component of public health activities devoted to the application of professional skills, knowledge and resources to the protection and improvement of human health.” It was believed that this new definition was more consistent with the original WHO definition of health and also with the values, goals and targets of the WHO vision ‘Health for all in the 21st century’.

The scope of VPH is clearly multidisciplinary, involving not only veterinarians in both governmental and non-governmental sectors, but also other health professionals and scientists as well as paraprofessionals who treat, control or prevent diseases of animal origin. A recurring theme of the meeting was that a team approach to problem solving, research, control programmes and communication was essential to ensure that veterinary contributions to the improvement of human health would be both significant and sustainable.

To publicize the discussions and recommendations of the Teramo meeting to a wider audience, FAO decided to sponsor the conference in collaboration with WHO and OIE, and also to focus primarily on the situation in both Countries in Transition (CIT) and DC. As a generalization, VPH activities in these two groups of countries are varied and limited in scope and delivery. Their priority areas for the betterment of human and animal health differ markedly from developed countries. Besides lack of resources, the actual problems faced were different from those in developing countries. However there are not only lessons to be learned from developed countries, but also greater opportunities for cooperation at all levels. Human and animal health problems are inextricably linked. Health problems are also not confined to specific regions, nor do they respect international borders, and they may extend across ethnic and political divides.

A background paper was prepared summarizing the deliberations and recommendations of the Teramo meeting and posted on the conference website (FAO, 2001). The Conference was announced on ProMED (International Society for Infectious Disease, 2001) and several other list servers. Potential participants were invited to sign up and forward contributions to the Moderator who edited and forwarded them to all participants. A set of rules for conduct of the conference was promulgated and participants authorized the sponsors to reference, summarize and quote all or part of a participant’s contribution for this summary. Contributions were then posted on the Conference Web site. Approximately 700 individuals signed up and contributions were received from 60. Approximately 80 countries were represented including many DC and CIT.
CONFERENCE OBJECTIVES AND DISCUSSION TOPICS

The major objective was to provide an open forum for strategy planning in the development or revival of VPH services to improve both human and animal health. These strategies need to be technically sound, cost-effective, equitably available and take advantage of the economies of scale normally associated with the public good delivery of services. Traditionally VPH activities have included (WHO, 1975; FAO, 1990) but not been limited to:

- zoonoses diagnosis, surveillance, control, prevention and eradication;
- occupational hazards and diseases associated with live animals and their products;
- biologics development and production;
- control of animal populations which may serve as reservoirs or be noxious;
- prevention and control of food-borne illness of animal origin;
- ante-mortem and post-mortem meat and poultry inspection;
- participation in outbreak investigations;
- environmental activities including vector, water, wildlife and use of animal monitors;
- biomedical research;
- emergency actions including natural and man-made disasters;
- social aspects including natural and man-made disasters;
- social aspects including service animals and human animal bonding.

A series of 19 discussion topics was developed under four general headings as follows:

- VPH in the 21st Century.
- Future Trends that will Challenge VPH in the 21st Century.
- Organization and Management of VPH Programmes.
- Education, Training and Extension in VPH.

Note: All contributions were numbered and posted on the Conference Web site (FAO, 2001), http://www.data.fao.org/waicent/FaoInfo/Agricult/AGA/AGAH/VPHconf/Home.htm
A. VETERINARY PUBLIC HEALTH IN THE 21ST CENTURY

1. Where do you recommend that VPH programmes and veterinarians in developing countries direct their efforts to attain the greatest effect?

The basic principle of VPH programmes in DC (Dr D. Allard et al., Contribution 38) should be to deliver fundamentals of public health programmes as close as possible to the individual, small group or community. These should include basic hygiene principles, quarantine and isolation, biosecurity and inexpensive vaccines, as well as more sophisticated priorities such as surveillance systems, diagnostic capability, treatment options and depopulation capability. Programmes should evolve in technical complexity and scope as they are developed over time. This implies that a coherent and coordinated approach is best. The ideal would be zoonotic disease control and food safety programmes that educate the individual in methods and practices that can be carried out at zero to low cost, with minimal equipment and materials. These programmes would ultimately require considerable human resource but little monetary investments, especially if the human resources came from the local community. Training at the top of the pyramid could be delivered by outside agencies.

In establishing objectives and priorities that will influence the development and effectiveness of VPH programmes in DC, consideration should always be given to such factors as the geographical characteristics of the country, its stage of development and the current situation with zoonoses (both impact on health and socio-economic). Consideration should also be given to the import/export trade in animals, animal products and human foods of animal origin (Dr A. Panin, Contribution 36).

The probability of success in any zoonotic disease control/eradication programme should be a major consideration (Dr R. Jackson, Contribution 40). Pre-requisites for success include:

- effective methods for stopping or reducing agent transmission;
- high socio-economic importance;
- epidemiological features that allow good case detection;
- good surveillance for measuring progress and providing information that can be used to make changes as required.

Programmes that are likely to succeed are also more likely to attract funding for the whole of their duration. A programme with these features is likely to be attractive to the public, veterinarians, health workers and policy makers alike. For most countries there will, in all probability, only be a few diseases that have these necessary prerequisites. As a result, deciding which of these should have priority is generally easier and does not necessarily require a sophisticated economic analysis. While donor funding may be helpful at the start, the aim should ultimately be to obtain sustainable funding from within the country. There is a real and urgent need to develop low cost options for control programmes in DC. These are also more likely to appeal to policy makers. While there is a tendency to choose the “latest and greatest” and most sophisticated tests and methods, often these may only be viable in countries with well-developed and often subsidized livestock industries. Pilot exercises to test the feasibility of large-scale programmes are also an essential prerequisite.

Dr Jackson also proposed that echinococcosis is an ideal candidate for a national control programme in DC. Praziquantel is a highly efficacious and cheap drug for use in the definitive hosts, and experience has shown that public awareness and involvement can be easily incorporated in control programmes. Surveillance can proceed relatively cheaply with minimal use of expensive tests. While total eradication may not be a feasible goal at this stage for some countries, reasonable control in animals and a significant reduction in new cases in humans (especially children) should be achievable in most situations. A zoonotic disease such as cystic echinococcosis (with dogs as definitive hosts), has added attractions in a control programme, as have other VPH...
issues of concern such as rabies. Maulings and human toxocariasis can be incorporated into an integrated control programme for additional benefits at marginal cost.

Dr Jackson also argued that other high profile zoonotic disease control programmes in DC, such as those for brucellosis (especially due to *B. melitensis*) have had variable success. There probably has been an overemphasis on development of improved vaccines and tests rather than on the basic epidemiology as an essential means of control. More attention should be given to monitoring key indicators of disease status and on factors that influence disease transmission, as well as on the collection of information to determine the effectiveness of specific interventions. Analysis of local surveillance data gives valuable insights into the epidemiology of the disease within the country.

Finally Dr Jackson suggested that the time is opportune for DC to gradually move away from heavy reliance on regulatory and task-oriented disease control programmes and to move towards a more responsive approach based on risk analysis and management (Murray, 2002; Hathaway, 1991). Unfortunately these approaches have been used for many years and are firmly entrenched within the veterinary profession. As an example he cited the surveillance of chemical residues popularly used in DC, yet these are likely to be associated with very low levels of risk compared with other VPH concerns.

Dr H. Mainzer (Contribution 22) made the point that if VPH programmes focus only on zoonoses, there is the risk that this will be the only contribution that veterinarians can make to improve human health. Dr Mainzer made the point that zoonoses outbreaks keep occurring and we keep making the same recommendations. Surveillance and diagnostics do not stop disease - they only identify it. These public health emergencies are failures of prevention. Veterinarians need to become involved in all aspects of the agent/host/environment causation triad. Only in this way can they help to identify and develop logical evaluations, design sound intervention systems and ultimately effective prevention strategies. In the United States veterinarians are involved in environmental health, vaccine preventable disease programmes, disaster response/assessments, chronic disease and nutrition aspects, occupational health, injury control, food, drug, water and waste issues, pet-facilitated therapy, HIV/AIDS awareness, teaching and the management of public health programmes and organizations. Veterinarians should focus not only on veterinary related diseases/injuries, but on their occurrence within the ‘bigger picture’ of public health systems and processes.

Dr P. Schantz (Contribution 45) presented a succinct history of VPH in the United States. The Center for Disease Control (CDC) has, over the last 50 years, established itself as the United States’ premier public health agency for epidemiology and disease prevention. Veterinarians have been an integral part of the programme since its inception and CDC was an active partner in defining the field of VPH and in developing programmes and policy. A separate VPH Division was created at CDC in 1947 and over the next 28 years made major contributions in the areas of food-borne diseases, and zoonotic infections such as rabies, psittacosis, trichinosis, cysterccercosis, anthrax and leptospirosis, to name but a few. The Division also conducted field investigations, assisted States in inaugurating new programmes and provided laboratory support for all aspects of animal diseases transmissible to humans. The Division also provided support to foreign countries and to WHO for assistance in scanning VPH programmes. In 1975 all discipline-oriented groups at CDC were abolished and the personnel were moved to multidisciplinary groups dealing with related groups of diseases. While some perceived this as a setback and threat to VPH, in practice it freed up veterinarians to consider a broader range of career possibilities at CDC. Now veterinarians are eligible and selected for whatever positions they can successfully compete, on the basis of their qualifications and interests. Currently there are 70 veterinarians at CDC assigned to ten different Centres, Institutes or programme offices. Besides being active in zoonoses
research and control, they are working in HIV/AIDS, the national immunization programme and in environmental, occupational and international health. Many former CDC veterinarians are now employed as State Public Health veterinarians and maintain a functional liaison with CDC through the National Association of State Public Health Veterinarians. Even when the current responsibilities of veterinarians at CDC do not involve issues of animal health or veterinary medicine, they often affirm that their educational experiences were very appropriate in preparing them for their current tasks. The veterinary orientation to “herd health” is a metaphor for community health.

CDC has also formed close links with the United States Department of Agriculture and the Food and Drug Administration. This has proved of great value in the investigation of food-borne disease, by for example, traceability of meat incriminated in outbreaks, investigation of other endemic and emerging zoonotic diseases and coordination of national surveillance for food and water-borne diseases.

Looking to the future, it is certain that the challenges of public health in the next 50 years will be different from those of the past. It is clear that veterinarians are prepared and willing to work with colleagues from other disciplines to respond to these challenges and to develop effective programmes to continue to improve the public’s health.

Moderator’s comments: It is to be hoped that these multidisciplinary approaches will in the future expand in developed countries. However, in most DC the pressing need is for veterinary expertise to control zoonoses such as rabies, brucellosis and echinococcosis, to recognize that animal disease outbreaks may be sentinels for emerging environmental health risks (Stephen and Ribble, 2001) and to improve the safety of food of animal origin. VPH programmes as a whole will be more likely to succeed if tangible successes are demonstrated in sustainable initial component projects.

2. Should countries or regions set targets for the reduction of specific zoonotic infections in relation to their burden of disease?

The ‘burden’ of disease as measured by WHO uses mathematical models and analyses to arrive at outcome measurements for mortality and disability for a specific disease (Murray and Lopez, 1996). While this technique has certain limitations, approximately 90 percent of the worldwide burden of all causes of death and disability occur in developing regions of the world. However only 10 percent of all health care funds are spent in these regions. Communicable diseases, with the exception of HIV/AIDS and tuberculosis, are expected to decrease by 2020. Six disease categories (pneumonia and influenza, AIDS, diarrhoeal disease, tuberculosis, malaria and measles) are responsible for 90 percent of the estimated 13.3 million deaths in children and young adults due to major infectious and parasitic diseases (Meslin et al., 2000). Zoonotic agents contribute in several of these categories. Rabies is the leading cause of zoonotic deaths and accounts for 40 000-60 000 deaths per year, while other zoonotic agents such as monkeypox occur at very low levels, e.g. 500 reported cases since 1992. Clearly surveillance for many zoonoses in DC is subject to numerous biases, especially under-reporting of endemic infections.

There appeared to be general support among conference contributors for the development of specific zoonotic disease population-based targets for reduction of incidence/prevalence, but with the caveat that these should be of real public health importance within that country. For example, it was stated (Dr D. Allard et al., Contribution 38) that it would probably be best to word the targets as a percentage reduction from currently reported rates of various zoonoses in the country, with priority setting of targets influenced by level of risk (probability x severity) to human health, animal health and economic impact. Although risk and to a certain extent prevalence are very important, ease of implementation and sustainability of the
programmes over time must be considered. Programmes which rely heavily on external input and funding in the long term or indefinitely, are less likely to be maintained.

**Moderator’s comments:** Where budgets for health care in DC are very small, it is critical that available funds are used where they will do the most good. A recent example from the United Republic of Tanzania (The Economist, 2002) showed that instead of collecting health data from clinics, door to door surveys were carried out to determine deaths and disability, and their symptomatology. A ‘burden of disease’ profile was developed and using this information, health spending was redirected to the actual burden that the communities were experiencing.

3. What types of assistance do developing countries need from international agencies such as who, fao and oie and from bilateral donors to improve/expand their VPH programmes?

A number of contributors addressed this topic and mentioned the need for:

- Assistance in the prioritization, support and implementation of control and eradication programmes for zoonoses of major public health importance.
- Organization of regional meetings and workshops on zoonotic diseases.
- Support for applied research by way of technical cooperation projects (TCP) to provide training and other expertise.
- Assistance in the design and implementation of health information systems.

Dr A. El Idrissi (Contribution 44) observed that public health authorities in most DC were interested in zoonotic disease only when the incidence/prevalence was high or during epidemics. It was also noted that while FAO/OIE/WHO frequently organized groups of experts to make recommendations on strategies and guidelines to control zoonotic diseases, there were few joint or common initiatives between these organizations to develop cohesive VPH programmes in developing countries. Joint inter-regional scientific programmes including both medical and veterinary professionals from relevant institutions in clusters of countries with similar epidemiological problems should be developed. Priority should be given to integrated control programmes for rabies, brucellosis, tuberculosis and major food-borne diseases for example. Another area where international organizations can play an active role is to ensure education and technology transfer for VPH programmes and in the support of their adaptation to meet local and regional needs in DC.

It was also noted with concern that apart from the Pan American Health Organization (PAHO) in the Americas, WHO currently has no veterinary public health experts in their regional offices.

While it has been shown that some zoonotic diseases (e.g. brucellosis, hydatidosis) are eradicable in developed countries, where there is strong public support and an efficient administrative infrastructure, this is usually not possible in DC. Dr M. Lightowlers (Contribution 1) makes a strong case for international organizations such as FAO and WHO, as well as bilateral donors, to identify and promote scientific advances, which clearly have the potential to achieve genuine improvements in zoonotic disease control and prevention. He cited the example of cystic hydatid disease (*Echinococcus granulosis*) and bovine cystercosis (*Taenia saginata*) where highly effective and practical vaccines have been developed based on the identification of host-protective recombinant antigens (Lightowlers, 2002). The challenge will be not only to establish ‘good manufacturing practices’ (GMP) for the production of these vaccines but to establish a best use practice that will reduce the burden of human illness in DC. Ultimately commercialization of production will be required. The test will be whether these products can give long-term protection at a reasonable cost.

The actual type of assistance needed by each DC may be similar in some areas and quite different in others (Dr J. Calder, Contribution 19). To take a ‘one size fits all’ approach could be counterproductive. Often there is a need for both technical and professional support. However the needs of each country and/or region have
to be developed at the country and regional level with local input. There is clearly a temptation for a person who has worked in a developed country to take back all the technology available, but unfortunately in most cases the infrastructure to maintain it may be lacking. Therefore before assistance is given to a DC, an assessment should be made to see whether the infrastructure is there to support the type of aid that is to be given. Other contributors also gave examples of national zoonoses laboratories built with international assistance but never completed, furnished or equipped adequately, nor staffed with trained individuals.

Networks are an example of both developed and DC countries joining to focus on a particular VPH problem. The Informal Working Group on Echinococcosis (P. Schantz, Contribution 23) was created in 1985 under the auspices of WHO, specifically to promote scientific exchange and cooperation in research of this parasitic zoonosis. Currently this group consists of a variety of networks of individuals from many countries dedicated to areas of research and intervention selected according to the needs and interests of participants; they also represent the priority areas for research in those countries most affected by the disease. Current network subject areas include development, evaluation and standardization of methods for diagnosis in animal and human hosts, treatment options, evaluation of vaccines in intermediate hosts and measurement of economic costs. Although network activities and research are not directly funded by WHO, the group does play an important role in defining priorities, coordinating activities and promoting communication.

Dr. S. Sandor (Contribution 13) described how both WHO and the European Union (EU) support a comprehensive programme to control and prevent both cystic and alveolar echinococcosis in Romania. Future plans are to include other South East European and Balkan countries. Dr. M. Kachani (Contribution 37) indicated that a similar approach was started some years ago in Morocco and it was hoped to include other Mahgreb countries in the future. Other areas where international organizations can assist, is in developing, translating and distributing educational material on VPH issues. For example educational materials written in both Arabic and French, and developed in Morocco for Echinococcosis (Hydatidosis), can be used in all North African (Mahgreb) countries where the disease situation is similar.

All international agencies have a variety of publications available that may be of use to those in DC responsible for VPH and zoonoses control. Unfortunately these may be unavailable, out of print or in some cases cost prohibitive. Making these publications available via the Internet or through compact discs (CD) is one solution. International agencies might also give consideration to making generic computer simulation models and epidemiological/geographic information systems more readily available for those working in VPH issues in DC (Centers for Disease Control and Prevention, 2001; Computer-aided Learning In Veterinary Education, 2001). This would include within-country demonstrations and courses designed to encourage use of computer databases for routine reporting of disease, analysis of disease patterns, and economic analyses of costs and benefits.

B. FUTURE TRENDS THAT WILL CHALLENGE VETERINARY PUBLIC HEALTH IN THE 21ST CENTURY

Identify methods that would improve the delivery of VPH programmes in developing countries in the following general areas

4. Access to and rapid transfer of science-based information especially to those with a 'need to know'

Dr. D. Allard et al. (Contribution 38) emphasized the need for electronic tools that do not require high computing power or rapid Internet lines, such as:
• e-mail list-based discussion groups or conferences;
• electronic bulletin boards with maintenance of discussion threads;
• on-line reading access to VPH discussion documents (often unpublished);
• Power Point presentations suitable for lectures, etc.

Good examples of distance learning sites include the multilingual Supercourse – “Epidemiology, the Internet and Global Health” (Pitt.edu, 2001) and "Emerging Infections of International Public Health Importance" (University of Washington, 2001).

Dr E. Jette (Contribution 3) stated that the focus for both DC and CIT should be on electronic access and networking and training by developing and strengthening access to information. This would strengthen not only the technical veterinary expertise in these countries but also their administrative infrastructure – the former cannot function in a vacuum. A suggestion was made that the Animal Health Service staff of FAO could maintain an interactive Internet site where VPH related questions could be asked and answered, say with a 48 hour turnaround. There was also an urgent need for electronic training packages on zoonoses, food inspection, etc. However there was concern expressed (Dr B. Gummow, Contribution 4) that at present, especially for many African countries, access to the Internet was both frustrating in terms of delays and also very costly. These problems are unlikely to be solved in the short term and thus reliance will remain on paper-based continuing education material supplemented by CD’s. It is now possible to place whole or parts of Web sites on a stand alone PC or on CD’s.

How to make important and up-to-date information more readily available to those in VPH with a ‘need to know’ was raised by several contributors. For example Dr R. Jackson (Contribution 40) cited the example of the recently published WHO/OIE Manual on Echinococciosis in Humans and Animals (Eckert et al., 2001). This is a unique and current compilation of just about everything known about these diseases. While it is available for purchase, given the difficulties for those working in DC to obtain overseas currency, should it not (as with all OIE publications) be available online at the OIE Web site.

Dr A. El Idrissi (Contribution 44) noted that scientific and technical libraries in DC are unable to afford subscriptions to many journals, which may run as high as US$1500 per year. While some VPH related journals are now available online free (Free Medical Journals.com, 2001) others limit current issues to subscribers, while other journals are unavailable electronically.

Several contributors raised the issue of how up to date and accurate was the information on specific zoonotic disease websites. This problem is not just confined to these sites. Often information is required promptly, and there is little time to review the original literature. In general, University or Government Web sites tend to be more reliable than others. Hopefully in the future, the scientific peer review process, as used for journals, will eventually be used to categorize Web sites. Original publications are usually neither available nor immediately useful for practical application.

There are now a number of list servers that provide current and valuable VPH and zoonoses information. Some have restricted membership while others are open to all. Probably the most widely recognized is multilingual ProMED mail (International Society for Infectious Disease, 2001) established to provide an early warning of emerging diseases of humans, animals and plants, as well as disease activities signalling biological warfare and bio-terrorist activities. ProMED has a number of specific categories of lists including ProMED-Ahead which focuses on animal health and emerging animal diseases. ProMED has the distinct advantage of immediacy, which print media lack. A number of links to other list servers and Web sites reporting current outbreak reports are also listed on this conference Web site.

In summary, information management skills must replace memorization and intuition in VPH decision-making.
5. Coordinated and sustainable human and veterinary surveillance programmes for zoonoses and animal related hazards

Clearly epidemiology must be used as the primary guide for veterinary public health policies based on prevention. Surveillance is one of the key issues and is defined as the ‘ongoing scrutiny of all aspects of occurrence and spread of a disease that are pertinent to effective control, prevention and eradication’. Unfortunately in many countries, collection of the animal and human data relating to zoonoses are carried out quite independently and with predictably unsatisfactory outcomes.

Surveillance systems in many DC are characterized by the following:
- Attempting to collect too much information about too many diseases and conditions.
- Lack of uniformity and too much complexity in forms.
- Local staff have little or no idea how surveillance data are used because they are not provided with feedback.
- Local staff are also likely to accept endemic diseases as “the status quo” and not report them. Nevertheless they must report promptly any change from this status.
- Data are aggregated and tabulated but seldom analysed or interpreted for the specific information needed for VPH practice.

The difficulties in obtaining accurate and current information and reports on disease situations (both transboundary and zoonotic) in regions of Africa were well described by Dr S. Hailemariam (Contribution 6). Two issues of particular concern were:
1. Obtaining information from the grass routes level.
2. Poor communication between Ministries of Health and Agriculture.

Information on zoonotic diseases needs to be given higher priority at all levels of the administrative chain, and consistent training and standardization of reporting established. Another barrier which discourages transparency is the perception that reporting potential zoonoses outbreaks may result in livestock trading bans and affect tourism.

The gathering of epidemiological data can be a frustrating task in DC, especially if a real information network does not exist. It may be better to limit investigations to areas where teams exist and can operate efficiently. Trying to expand them beyond their efficient reach could jeopardize the accuracy of observations (Dr E. Rapoport, Contribution 12).

Dr J. Crowther (Contribution 8) described a Technical Cooperation project that the International Atomic Energy Agency (IAEA) has developed for rinderpest surveillance in Africa. This project involves all aspects of Information and Communication Technology (ICT) starting with training of trainers through specific packages developed for the world wide web and in CD format. This project has fostered good information collection, encouraged teamwork, identified the exact geographical location where people are and provided a real time value on data. It is also supported by extensive electronic hardware as well as telecentres where the focus is on teaching, development, and information dissemination. This model could obviously be developed/modified for zoonotic disease surveillance.

Contribution 38 from Dr D. Allard et al. stressed that an important point in exchanging information on surveillance of diseases is to ensure that similar criteria are used to collect and count the data. This is best established by agreement on, and application of standardized definitions of cases, outbreaks, incursions, etc. and similar ways for descriptive statistics such as rates, proportions, ratios etc. This harmonization is best achieved by adherence to standards developed by international organizations such as OIE and WHO. Capacity development for coordinated surveillance such as staff recruitment, training, equipment, networks and coordination is also critical and international/bilateral donor funding will usually be needed.

The primary objective in DC surveillance should be to detect significant increases in disease incidence/prevalence and to detect emerging/re-emerging disease. Information
from a few reliable sources rather than a broad coverage by less reliable contributors will generally enable surveillance to achieve these objectives. Therefore, resources and training should be concentrated in a few strategically located areas and these centres should then try and build their networks based on local conditions.

Several contributors identified a lack of trained epidemiologists who are critical for the functioning of any joint surveillance systems. Service-oriented, ministry-based field epidemiology training programmes are one solution.

Dr Joshi (Contribution 2) advocated the greater use of computer software programs such as Epi-Info and Epi Map which are available without charge and are also available in several languages (Centers for Disease Control and Prevention, 2001). These programs can be adapted readily for local, national and regional surveillance.

Examples of zoonotic diseases cited where coordinated surveillance would be valuable include, hydatidosis, Japanese B encephalitis and other arboviral infections, leishmaniasis, brucellosis and tuberculosis. Also, attempts should continue to link food safety and animal health data (Dr Joshi, Contribution 2).

**Moderator’s comment:** A good example of community based surveillance for district rabies in Kenya (Kitala et al., 2000) demonstrated that the traditional passive surveillance system underestimated rabies prevalence in dogs by a factor of 72. After consultation with local leaders, a resident rabies worker was recruited to publicize the system. A post-exposure rabies treatment supply network was organized and this encouraged the continual participation of the public in reporting rabies suspects cases. Schoolboys were also recruited to conduct a dog census.

6. Research topics (and potential funding sources) where knowledge of the biology and epidemiology of zoonoses (especially emerging and re-emerging) and other related vph problems are inadequate

Research into the impacts of the interactions of human/animal/environment and the better understanding of the multiple interfaces between these three areas was advocated by several contributors. The concept of ‘ecosystem health’, its relationship to VPH and Zoonoses and ongoing needs for research was the subject presented by Dr Waltner-Toews (Contribution 20). This adaptive methodology for ecosystem sustainability and health (AMESH) involves working with local communities to define the interacting sets of issues such as livelihoods, environment, public health and general economic development (Waltner-Toews, 2001)

The merits of a ‘vertical’ over a ‘horizontal’ approach to the control of zoonotic diseases was the subject of considerable discussion, using cystic echinococcosis (CE) as an example. The vertical approach is defined as considering CE as a specific parasitic infestation with a causative agent (*Echinococcus granulosus*), final host (dog) and intermediate hosts (usually sheep but also other grazing animals). The horizontal approach as defined by Dr A. Mantovani (Contribution 32) considers CE as a complex in which there are many components besides the agent and hosts, including all of the suitable environmental and social conditions necessary for perpetuation of the life cycle. Thus a horizontal approach tends to be very long term, including health education, diagnosis, control, improved sanitation, meat inspection and long term primary health care. Dr P. Schantz (Contribution 41) stated that while horizontal approaches to the control of zoonotic diseases are always beneficial and do reduce transmission, they have not been effective in permanently reducing infection in animal and human hosts. He argues that vertical approaches directly targeted at the parasite, using dog population control and treatments supported by health education and community involvement, have been successful in some situations. For example CE has essentially been eliminated from New Zealand and Tasmania, and significantly reduced in Cyprus, Uruguay and parts of Chile and Argentina (Eckert et al., 2001).

Research since the above programmes were started, although under funded, has vastly improved the technology to control this zoonosis. There are effective drugs to
treat adult-stage infections in dogs as well as cost-effective treatments for human cases. A vaccine effective for the prevention of larval stages of infection in the intermediate hosts for animals and humans has also been developed (Dr M. Lightowlers, Contribution 1).

Major credit for research progress has to be given to an informal working group on Echinococcosis created in 1985 under the auspices of WHO, with the aim of promoting scientific exchange and cooperation in research and control methods. Although not directly funded by WHO, at least this concept provides individuals from many countries with an ongoing focus for discussion and coordination of research. It is surely a model that could be used in other globally important zoonoses.

Some contributors indicated that DC should not be unduly influenced by current problems of developed countries, but rather focus research on practical problems in their own country or region.

It was suggested (Dr D. Joshi, Contribution 2) that Participatory Action Research (PAR) methodology be applied wherever possible. PAR aims to break out from the relations of dependency and restore to people their ability to transform their own worlds. It involves collective research, recovery of history, valuing ‘folk culture’ and diffusion of new knowledge through written, oral and visual forms. It is but one of several participatory processes used in agricultural research and extension in DC (Scoones and Thompson, 1994).

7. Realistic and practical field programmes to improve the safety of food and water from contamination by zoonotic pathogens

While some developed countries have reasonably accurate data on the impact of food-borne disease, it is rarely possible at the moment to derive similar statistics for DC because of the lack of surveillance systems collecting reliable data. However as DC begin to participate in international trade in food, they must develop science-based food safety systems, which will ultimately benefit their own population.

The World Veterinary Association has recently adopted the following policy (Dr H. Scheneider, Contribution 14): “Projects or actions aimed at restructuring of public health services should consider that veterinarians with expertise in veterinary public health and hygiene are able to fulfil important services in areas of food hygiene and safety”.

One suggestion was that both regional and in-country workshops should be organized with only local participants and for their essential needs and priorities to be identified. Projects should be developed from these workshops with specific responsibilities fixed for individual stakeholders (Dr Joshi, Contribution 2). Workshops are also needed for decision-makers in order to put VPH on the veterinary/public health ‘map’. An example was cited of a successful “farm to fork” concept currently being used for export meat in Namibia.

A problem identified by one contributor was that in many DC, responsibility for meat and food inspection is a function of the Ministry of Health. The training of health inspectors, especially those employed by local or municipal authorities, is often minimal or absent in general areas of VPH food safety.

Codes of good manufacturing practices, Hazard Analysis Critical Control Point (HACCP) and other similar auditing systems are being introduced widely in developed countries and also for the export sectors in some DC. Their primary aim is to reduce the risk of contamination of meat borne pathogens such as Salmonella and E. coli O157: H7. The development and implementation of HACCP systems are costly and require skills, training and organization. Where slaughter, inspection and processing systems in some developed countries are poorly organized and managed, HACCP programmes at the processing level are difficult to develop. If this were the case, Dr J. Butterweck suggested that implementing these systems at the farm level in DC would be even more
difficult, especially if there are insufficient incentives. Nevertheless several contributors indicated that in DC, greater efforts should be made to educate farmers on codes of “Best Practices” on the farm and in marketing channels for livestock, poultry and fish.

Dr C. McCrindle (Contribution 17), clearly outlined the difficulties experienced in improving food safety in rural, peri-urban and settlement areas of South Africa. Diarrhoeal diseases are generally more prevalent in children from rural and developing areas. Here it is difficult to estimate how much can be ascribed to eating contaminated meat or milk because most cases go to local clinics where treatment is given by nurses and few records are kept. The cause of death in rural humans is seldom investigated, as post-mortems are not culturally acceptable and also there is a high level of HIV/AIDS.

Generally less than 50 percent of livestock are slaughtered in abattoirs and this meat is sold through the retail sector or exported. For these markets, HACCP standards may be appropriate, but in the informal sector where animals (especially small ruminants) are slaughtered, either at home or in local butchers, the carcasses are not generally inspected and animals may even be consumed after they have died from other causes. Farmers have few incentives to join the formal sector for marketing meat, as expenses may run as high as 22 percent of the selling price. Dr McCrindle advocates that the major focus should be on anthrax vaccination, preventing the consumption of animals that have died from other causes, and cooking meat very well. The latter is generally adhered to.

Dr D. Waltner-Toews (Contribution 20) believes that there are theoretical and practical reasons for focussing on systems other than HACCP etc. in the informal food sector in DC. He has developed an adaptive methodology for ecosystem sustainability and health (AMESH) in which local communities are assisted to define interacting sets of issues such as environment, public health and economic development.

In DC, zoonotic illness contracted from eating meat derived from animals that have died from Anthrax is recognizable, but increasingly zoonotic agents such as E. coli O157: H7 or Campylobacter sp. which are not necessarily pathogenic to animals, are not recognized because the “link” to humans is unclear. Currently the actual status of these pathogens in most DC is poorly documented. For example a recent study of Campylobacteriosis in DC (Coker et al., 2002) showed that the infection was primarily confined to children less than 2 years old, it was often accompanied by other enteric pathogens and was not seasonal. Exposure, poor hygiene and close proximity to animals appear to be risk factors in the very young. The burden of Campylobacteriosis in older HIV positive individuals is predicted to rise in DC.

Dr I. Klinger addressed the issue of illegal or non-inspected slaughtering of animals in DC. The reasons for this are several and include the eating habits of a population – people are used to eating meat only from their own animals and trust no one else to slaughter them. Another reason is that both Jewish and Islamic religious laws require for example, that animals be slaughtered according to a prescribed method. If this demand is fulfilled, the common rural citizen is satisfied about the safety of the meat and the lack of any veterinary inspection is less appreciated. Lastly, illegally slaughtered meat is usually cheaper than inspected meat. The solutions to these problems are not easy but must include:

- the enforcement of veterinary law;
- enforcing the population to purchase inspected and identified meat only from authorized establishments;
- public health education regarding common infectious agents, drug residues, heavy metals and other environmental pollutants.
8. How can decision-making in VPH programmes be made more transparent and consistent with societal values in the face of complexity, uncertainty and varying scientific opinion?

There were several suggestions made that both non-governmental organizations (NGOs) and Universities should be asked to play a greater role in decision-making. It was observed that they were often more knowledgeable about what would work at the local level and what would be likely to fail. Decision-making should always involve community representatives; they should be invited to scientific events where the importance of the disease and its consequences are shown, and the need for control justified. To aid this process in rural areas, communication networks are clearly needed.

Dr D. Allard et al. (Contribution 38) cited a Canadian report (Science Advice for Government Effectiveness, 1999) which defined several principles that can improve science-based decision-making. ‘Science advice’ is defined as value-added guidance derived from scientific theories, data, findings and conclusions provided to inform policy and regulatory decision making. The following summarizes these six principles:

1. **Identification**: Early identification of a situation where science advice will be required.
2. **Inclusiveness**: Science advice from external and international sources needs to be sought from a wide range of sources, including ‘traditional knowledge’ of local people. If necessary, independent agencies or advisory panels should be used especially where there is significant uncertainty, a range of opinions or there are sensitive areas of public policy where public confidence is important.
3. **Sound Science and Science Advice**: Quality, reliability and scientific peer review need to be built into the science advisory process. Science advisors should contribute sound scientific information unfiltered by other policy considerations.
4. **Uncertainty and Risk**: Science public policy always contains some uncertainty and often a high degree of risk, which must be assessed, communicated and managed. As such it is important to adopt a risk management approach.
5. **Openness**: Democratic governments are expected to employ decision-making processes that are transparent and open to stakeholders. This implies a clear articulation of how decisions are reached, policies are presented in open fora, and the public has access to the findings and advice of scientists as early as possible.
6. **Review**: This should include two elements: a) subsequent review of science-based decisions to determine whether recent advances in knowledge impact the science and science advice used to inform the decision, and b) evaluation of the decision making process.

Once the decisions have been made and adopted, their adherence and accountability should be monitored as well as their effectiveness.

It may prove challenging to adopt these principles in toto in VPH decision-making in DC, where a central and hierarchical decision-making process is common. However, veterinarians should ensure that their advice is offered, listened to and hopefully acted upon.

9. The perceived need for sound economic justification for zoonotic disease control and eradication programmes

Livestock disease control programmes in DC and CIT are often established, albeit not very critically, on their economic importance. As a result zoonotic control programmes may not be seriously considered, especially if they do not apparently impact animal health and production. Clearly there is a need to better define the economic impact of zoonoses and other VPH problems with ‘burden of disease’ analyses, as used by WHO and the World Bank (See Question 2).
Dr G. Sharma (Contribution 24) suggested that there is a very real need for DC to develop economic justifications for their zoonoses control programmes. Where there are limited financial resources available, flexible computer-based models should be used to estimate the direct and indirect economic losses and should include the effect on animal and human populations. These models should also estimate ‘cost-benefit ratios’ and ‘internal rate of return’. Models should also be flexible enough to incorporate varying animal husbandry practices and other similar parameters. Decision-makers, stakeholders, and the population at risk must always be made aware of the actual losses caused by zoonotic diseases, especially if their cooperation is to be long term.

Dr J. Zinsstag (Contribution 28) stated that livestock production is far more than an economic issue; it requires attention to a much broader range of ecological, ethological, social, psychological and ethical considerations (Zinsstag, 2001). If VPH veterinarians are to avoid BSE-like incidents in the future, they will have to play a significant role in formulating new concepts of livestock production.

10. Given the integral role that community participation has in determining the success or failure of VPH activities, how can these programmes be effective at the local level?

Dr J. Boomker (Contribution 26) used the example of human cysticercoses (T. solium and T. saginata) as examples of zoonoses where the basic problems are mindsets, cultural and other factors rather than technical issues. Examples were cited where despite giving demonstrations on cooking of meat and lectures on the use of toilets (however primitive), nothing was found to have changed when visiting again 6 months later. No doubt other examples of failed health education programmes could also be described. Obviously these failures are indicative that extension methodologies need to be reappraised. Without a thorough understanding of the knowledge, attitudes and practices of any community towards say a zoonotic disease, an intuitive approach is likely to fail. Participatory Action Research or similar techniques, as described under Question 6 are needed to correct these deficiencies. Unless people want change and intend to make it happen, no improvement will occur.

Several attempts have been made to provide human and animal health services simultaneously to nomadic people because often animal health services, such as vaccination campaigns, appear to have a better coverage. At the same time coordinated surveys of zoonotic infections can be undertaken in isolated populations (Zinsstag et al., 2000; Schelling et al., 2002).

Initiation of pilot projects using community involvement was recommended as well as their careful review, evaluation and revision before their implementation on a broader scale (Dr D. Allard et al., Contribution 38).

Several contributors advocated that children and young people especially should be informed of VPH activities and trained where appropriate to participate. Awareness of men’s and women’s different roles in livestock production and food handling can increase the effectiveness of VPH programmes at the local level. This issue is discussed in greater detail in the contribution from Dr B. Miller (Contribution 37) under Question 18.

Moderator’s comment: Communities should be regularly informed about the progress and achievements of VPH programmes using the local media information sources. If they know they are part of the action and contributing to it, the controls are much more likely to succeed. While community participation is widely promoted as an important feature of aid projects in DC, the results have not all been successful. Projects that encourage interactive participation and self-mobilization are most likely to result in sustained benefits (Catley and Leyland, 2001).
11. How can collaborating centres, consortia of universities and research institutions better serve the needs of VPH in developing countries?

Dr Joshi (Contribution 2) recommended that specific VPH problems requiring research be developed by Universities (both within country and foreign) in conjunction with NGOs in DC. Application could then be made to potential donors for funding. Once a project is funded, faculty and students from the University can work together with local peoples. He cited the example of his own country (Nepal) where projects involving Tufts, Washington State, Colorado State and Guelph Universities from North America have been undertaken.

Dr J. Zinsstag (Contribution 28) suggested that developing close North-South research partnerships, where researchers from the South work with research groups in the North for short periods without disrupting social and institutional ties in their own country, is probably optimum. In this way researchers in remote places with poor infrastructure, foster their own work for their own country.

Dr M. Kachani (Contribution 41) identified the following areas where collaborating centres or consortia of educational or research institutions could be more effective:

- Conducting appropriate applied research to answer practical questions to serve the needs of the DC.
- Developing project proposals on control/eradication programmes to be submitted to donors and international organizations.
- By providing experts to solve particular technical field problems.
- By organizing extension programmes in conjunction with local extension services.
- Training local NGO members and community health workers on relevant activities and practices needed by local populations at risk.
- By organizing conferences and workshops to update the knowledge of scientists involved in VPH programmes.

C. ORGANIZATION AND MANAGEMENT OF VETERINARY PUBLIC HEALTH PROGRAMMES

Given that VPH is essentially a “public good” activity defined as “the contributions to the physical, mental and social well-being of humans through an understanding and application of veterinary science”

12. How can governments that are actively privatizing their veterinary services be persuaded to retain a basic service to ensure that communities are protected from zoonotic disease, food and water-borne infections and other environmental problems that may be associated with animals or livestock production?

Public goods are those from which everyone stands to benefit and from which no one can be denied access. These would include activities such as quarantine, disease surveillance and meat and food inspection that are best provided by the State. Private goods on the other hand are those for which benefits only accrue to individuals or groups and are not experienced by the wider community. Clinical services are an example because the only beneficiary is the owner of the animal receiving attention. Not all services to society can be clearly categorized as exclusively public or private goods. For example vaccination of dogs against rabies not only protects the dog, but also other animals and humans. Therefore this spillover effect is described as public good with externalities (Sherman, 2002).

Functions which provide the necessary tools and means for the protection of the health of a country people and domestic and wild animal herds should not be privatized. (Dr D. Allard et al., Contribution 38). However there seemed to be general agreement that veterinary clinical services, especially for livestock in DC, will continue
to be either privatized or be provided by farmer-owned cooperatives. The savings in financial and human resources should be used to strengthen the regulatory and service delivery infrastructure (i.e. public good activities). These would include programmes for disease control, epidemiological and surveillance services, quality control and registration of biologics etc. There were also opinions expressed that extension and research services should be carried by government institutions, preferably in collaboration with Universities (especially those with Veterinary Schools) and also NGOs.

The World Veterinary Association (Contributions 21 and #25) has adopted a policy on veterinary involvement in the restructuring of public health services. This policy recognizes the vital contribution that veterinarians can make to public health especially in the whole area of food safety. It also recognizes that the control of transboundary diseases and food safety are public “goods”, because they are multidimensional in scope and in DC, cannot be delegated to the private sector for profit. Nevertheless private veterinarians and also veterinary associations can play very important roles in transboundary disease control programmes especially in coordinated disease reporting, information distribution and continuing professional development.

Basic services such as tuberculosis and brucellosis testing, meat inspection and quarantine should not be privatized (Dr. J. Calder, Contribution 19).

Dr H. Schneider (Contribution 14) emphasized that because many African countries shift non-core government functions to private veterinarians, there is the opportunity to employ these individuals on a part time basis in food/meat inspection or other VPH activities and thus broaden their income base.

For governments in DC, the publication “Guiding Principles for Planning, Organization and Management of VPH Programmes” was recommended (FAO, 1990).

13. How can active collaboration at national, provincial and local levels between ministries of health and agriculture, including physicians and veterinarians, become more proactive and beneficial?

There was general support for the proposal that zoonotic disease control committees should be formed at all levels and be multidisciplinary to include physicians, veterinarians, epidemiologists, social scientists and other professionals as required from both government as well as NGOs. Community representation is also very desirable. The importance of Health Systems Research and inter-sectoral collaboration in VPH is stressed in a WHO Consultation report (WHO, 1989).

By introducing legislation or regulation for the control of zoonotic diseases, animal owners, animal product manufacturers, veterinarians and medical practitioners could be made more responsible and accountable in DC. By creating task forces and working groups with representatives from central, provincial and local governments who have a stake in VPH and zoonoses, the expectation would be that they all work in a productive and collaborative manner (Dr G.K. Sharma, Contribution 24). Where difficulties are encountered in setting up VPH programmes either within a Ministry of Health or Agriculture, the suggestion was made to conduct a ‘pilot experiment’ with technical cooperation from an international organization such as WHO or FAO. (Dr G. Togo, Contribution 27).

Dr B. Gummow (Contribution 4) drew attention to the situation in South Africa where the Departments of Health and Agriculture rarely appear to work together. He also cites the example of a recent Medical Research Council report showing that an estimated 40 percent of reproductively active persons are HIV positive. Yet there does not appear to be any clear plan to ensure that VPH policies are incorporated into HIV control and prevention programmes. There is also minimal training of medical students to recognize common zoonoses such as brucellosis, Q fever, tick-bite fever, leptospirosis and psittacosis, all of which can be misdiagnosed as malaria. To
compound the situation, autopsies are rarely carried out. It is also likely that there will be many more zoonotic infections in the future. This is because almost 50 percent of populations in DC live in rural areas, where they can be expected to come in contact with animals on a regular basis, they live under poor socio-economic conditions and are immunocompromised from HIV infections.

Another example of failure of the Departments of Health and Agriculture to communicate is the not infrequent situation where persons receive the full schedule of post-exposure rabies prophylaxis, despite quarantined dogs remaining healthy after 10 days of observation. These are just two examples of the urgent need for greater cooperation between the medical and veterinary professions.

Ministries of Health in DC tend to focus on disease prevention and care, for example, childhood vaccinations and HIV/AIDS. Zoonoses often do not warrant attention unless there is a major epidemic. Building effective partnerships with individuals in different ministries and disciplines that can address specific diseases (such as plague, rabies or hydatidosis) is recommended as an excellent start (Dr D. Waltner-Toews, Contribution 31). Later these initiatives can be expanded and built upon to ensure that effort is not restricted to a specific disease and that they are used to leverage broader support for VPH. Effective use of the media by professionals working in VPH is also strongly recommended.

Dr A. Benkirane (Contribution 34) suggested that the most immediate action to be developed in DC (where the priorities tend to prevent both physicians and veterinarians from concentrating their efforts on VPH issues) is to create a synergy among all concerned. A well-identified interface ought to be established in each DC to deal specifically with these problems within its particular administrative infrastructure. Such an interface should also exist physically, and either be hosted by the Ministry of Health or Agriculture, or exist as an independent entity. Other Ministries such as Education may also be involved if school children were a group targeted for a VPH programme. Both FAO and WHO, as well as other international organizations involved in VPH, should work in close collaboration to assist DC governments. They should help them set up relevant VPH units and possibly network these units on a sub-regional or regional basis. The Regional Animal Disease Surveillance and Control Network for North Africa and the Near East (RADISCON) was cited as a fairly successful example of an organization for surveillance in the area. Pilot diseases may be investigated at the launching of national VPH units, using say rabies and hydatidosis as representative models. These diseases are also more likely to motivate physicians. To reach a fully operational VPH unit, funds will have to be raised and these will only be released if decision-makers respond at the highest levels.

A suggestion was made that communication and information sharing between human and veterinary medicine would be encouraged by having a focal zoonotic disease information centre, as well as a file server and a web page (Dr K. Sato, Contribution 10). Dr D. Allard et al., (Contribution 38) suggested that courses on zoonoses and food-borne illness be taught jointly by physicians and veterinarians, and lectures attended by both medical and veterinary students together. The expectation would be a strengthening of working relationships between the two professional groups. In DC, it was also suggested that cooperation between the two groups could be encouraged in rural areas by having joint veterinary and human vaccination campaigns.

The current controversy regarding the prudent use of antibiotics by both professions was cited as another example of where more active collaboration is urgently needed. While the evidence in developed countries for antibiotic resistance of micro-organisms of animal origin infecting humans is becoming clearer, the situation in most DC is unknown. The World Veterinary Association (WVA) has taken a lead in this area (Dr J. Edwards, Contribution 21) by advocating that therapeutic antibiotics should be used under supervision of a veterinarian, and only in those situations where an infectious agent susceptible to therapy is likely to be present.
14. Identify resources in industrialized countries that might be able to better assist VPH capacity and institution building in developing countries

An innovative example of bilateral governmental and non-governmental cooperation was described in Contribution 29 from Dr N. Neils-Ole Bjerregaard. The Danish Veterinary Association assisted the veterinary profession in Latvia, following their regaining of independence in 1991, by support and contributions for a Latvian Veterinary Journal, an annual veterinary conference and training of Latvian veterinarians in Denmark. The latter included training in VPH. In virtually all developed countries there are well organized veterinary associations and they have the resources to cooperate with colleagues in developing countries by helping to structure the profession and improve it where necessary. This is especially critical in countries where food safety is often problematical, yet it is a precondition for international trade in both food and feed.

It was also suggested several times that companies producing vaccines, pharmaceuticals and diagnostics for use in zoonotic disease control programmes should be approached to determine whether they would be able to develop a VPH capacity in DC where they can also market their products. These companies have already played a major role, especially in sponsoring extension campaigns. Organizations with expertise in communication and the production of educational materials are also potential resources.

D. EDUCATION, TRAINING AND EXTENSION IN VETERINARY PUBLIC HEALTH

Given that many veterinary schools in developing countries are inadequately funded, staffed and equipped to teach VPH at both undergraduate and graduate levels and also participate in community extension programmes

15. Suggest how this situation could be improved especially to include the basic principles of food safety, zoonoses control and environmental/community health

While the curriculum of veterinary schools is increasingly under pressure to include more material, concern was expressed that VPH was not being given a high enough priority, especially in DC. Guest lectureships by experienced veterinarians in the various fields of VPH should be encouraged to assist in broadening the professional perspective of students. There is increasing acceptance that not all veterinary students need identical education. ‘Tracking’ of students into health disciplines of particular interest to them helps to solve the problem of information overload. It allows students to tailor their education to their career aspirations and the expectations of the communities in which they work.

A number of contributors indicated that faculty exchange programmes between Universities of developed and DC countries should be started, or existing programmes expanded. Programmes like these have been undertaken informally over many years using a variety of funding sources such as Fulbright grants to and from the USA.

It was suggested that curricula for VPH education at the undergraduate level be reviewed and developed on a regional basis because it is recognized that emphasis may vary depending on the geographical region (Dr G. Nasinyama, Contribution 18).

A difficulty cited by one Contributor (Dr B. Gummow, Contribution 4) was that veterinary students often fail to grasp the importance of their role in controlling zoonotic diseases. While they see clinical animal disease, they do not routinely see the associated human cases. Perhaps therefore when opportunities arise, students should be exposed to say a child with rabies or an adult with tuberculosis. Medical and veterinary infectious disease faculties should consider giving lectures in each other’s disciplines.

Dr C. Wilks (Contribution 22) described an innovative approach being used in the teaching of VPH in Australia. On the assumption that VPH was “the application of
veterinary science to the protection and promotion of human health and well being”, the decision was made to present an expanded VPH course over the whole four-year curriculum. Traditionally the VPH course was primarily focussed on meat inspection, but now it has been expanded to include:

- quality assurance of animal-based products to meet consumer expectations;
- knowledge of the causes, epidemiology and control of food borne zoonotic and emerging diseases;
- adverse effects of agricultural and other human activities on food quality, animal welfare, human health and the environment.

The mode of delivery has shifted to a small number of formal lectures, tutorials and field visits, which are used to guide the students rather than instruct them. Specific learning objectives are set for each year and links into other courses that are already providing core material are identified. Students are also encouraged to use identified Web sites. Under this new approach, students are required to assemble an electronic portfolio that draws together, analyses and discusses the information needed to meet the annual learning objectives. At a set time these portfolios are accessed and assessed by the responsible faculty member. The portfolios are developed and enlarged over the four years and on graduation, provide a dynamic document that can continue to be updated and expanded according to the student’s/veterinarian’s interests and professional needs. In summary, VPH should be seen by students as an integral part of every veterinarian’s responsibility and education. It is also considered vital that students develop skills in locating, identifying, assessing and collating information.

Dr B. Miller (Contribution 37) made the point that a critical component of VPH is interacting and understanding human populations and their relationships with animals. A frequently overlooked part of this population is women, as livestock producers, as mothers and as professionals, i.e. veterinarians. It is well established that educational messages given to men regarding women’s work are rarely successful, so VPH personnel need policies, strategies and training to help reach both rural and urban women in DC. In DC over 40 percent of the agricultural work force is female. This means a VPH educational programme that includes an understanding of the social context and an examination of “gender neutral” thinking, in which the farmer is assumed to be male, literate and has the authority to make decisions. VPH is the branch of veterinary medicine most related to sociology, yet veterinary graduates, both those with and without explicit VPH training, often shy away from thinking about the internal dynamics within the family and community, fearing to incite controversy. Yet clearly VPH personnel are agents for change in DC, and must act responsibly in that role.

Awareness of men and women’s different roles in livestock production and food handling can increase the effectiveness of VPH educational campaigns. For example, the echinococcosis campaign in Morocco targeted existing women’s groups for training in offal handling and sanitation. Heifer Project’s technical training in dairy production in Uganda is designed for whole families, so that women as well as men can attend. Messages on sanitation and pasteurization can be directly transmitted to women who can implement them.

Worldwide the percentage of women entering the veterinary profession has been increasing over the last decade. Women professionals have a great deal to contribute to VPH not only as veterinarians, but also as researchers, paravets, and technicians. They can provide new perspectives and increase outreach to women farmers. However many women find it difficult to work in institutions designed for men, so policies regarding dependent care, flexible hours, security and harassment can help VPH institutions and organizations find and retain women professionals. In summary, although the challenge of VPH in DC is great, inclusion, awareness and outreach to women is a ‘low tech’ and affordable way to increase the effectiveness of programmes.

An example of a VPH course entitled “Introduction to Community Health” used in Nigeria was described by Dr B. Olugasa in Contribution 30. This was given in the
fourth year of a six-year programme and placed emphasis on the VPH systems of that country. Topics included definition of VPH and discussions on zoonoses, the role of the abattoir, small clinics, livestock and poultry farms and of human households for data collection and epidemiological studies, etc.

**Moderator’s comments:** A successful exercise that has been used for many years in the VPH clinical rotation at the College of Veterinary Medicine, University of Minnesota in the United States is for all studies to be presented with a ‘real’ problem. These are based on circumstances where a faculty has been asked to provide advice on a situation involving human health or exposure from an animal source. Students are expected to prepare a written response in the form of a letter, and defend their advice in an oral presentation to faculty and their peers. These case-based exercises tend to engender more interest and participation by students than is customary with formal lectures.

A model of a VPH/Preventive Medicine curriculum for United States’ Colleges of Veterinary Medicine based on a 1974 PAHO publication “A Competency Based Curriculum for VPH and Preventive Medicine” has recently been developed (Association of Teachers of Veterinary Public Health and Preventive Medicine, 1999). However Veterinary Schools in DC are encouraged to develop the VPH curriculum for their students that reflects the current and future needs in their own countries.

16. How can veterinarians, either wishing to be or currently employed in VPH programmes, expand their knowledge and skills by formal graduate or continuing education?

Whatever type of course is developed, it is critical that it is not only well planned, but also designed with a set of learning objectives that are appropriate to the needs of the individual as well as those of his/her current or future employer. Other principles needed to maximize the effectiveness of any education/training should include:

- Provision of adequate financial assistance based on ability, commitment and financial need.
- A commitment to continuous learning by the candidate, educational institution and supporting institution.
- A requirement to demonstrate a focused need and a plan to address it at a basic level before advancing to a more technical level.
- An obligation for the candidate to be a catalyst for community change and improvement from the perspective of VPH.
- An outcomes assessment to measure performance of the individual.
- That participants should critique any courses or programmes to ensure their ongoing relevance.
- Wherever possible online/Internet based programmes should be developed to ensure the widest coverage.

Traditionally veterinarians with an interest in VPH and Zoonoses have gone to North America, Europe or Australasia for either Diploma or graduate level education. A list of educational institutions offering these educational opportunities will be posted on the conference Web site (FAO, 2001).

One example is a three-month course on Animal Production and Veterinary Public Health offered by the Faculty of Veterinary Medicine of Utrecht University in the Netherlands (Utrecht University, 2001) as described by Dr K. Balogh (Contribution 33).

Participants have come from DC and also Europe. The emphasis is on providing a broad and intensive overview of many different aspects of VPH, primarily by way of problem solving case studies, presentation of group assignments and round-table discussions. In addition, and to encourage greater harmonization of veterinary curricula, a number of case studies compiled in a European Module on VPH has been developed with six other European faculties using EU funding. These cases follow
a specific format and include both a student and teachers guide. A complete two week course on VPH has also been developed jointly by three European and three East African faculties primarily in a ‘train the trainers’ format. Curricula on VPH should ideally have the flexibility to make use of material/modules already available and introduce new topics as they arise. The WebCT programme (WebCT.com, 2001) enables the creation of a virtual classroom. Following the 2000 outbreak of West Nile virus (WNV) infection in the United States, a group of Dutch students were put in touch with the Veterinary faculty at the University of Florida to develop a Web site for WNV in Northern Europe. Other contacts have been made with Faculties in South Africa, Brazil, Italy and Portugal by e-mail and WebCT. Even live chat sessions via WebCT have been organized. These types of cross-border educational experiences can be developed without large resources and depend on cooperation between the various institutions.

While there are numerous excellent publications in the general areas of VPH and zoonoses, many are inaccessible to veterinarians in DC, primarily because of cost. Comments were made that in the past FAO, WHO and OIE publications were readily available to Universities in DC gratis, but this appears to have lapsed. A bibliography of current publications, sources and availability will be appended to the conference Web site (FAO, 2001).

Dr M. Abo-Shehada (Contribution 15) described how a successful one-week course was held in Jordan training veterinarians and biomedical scientists on the use of polymerase chain reaction (PCR) techniques in diagnosis. This is a very useful low cost technique for diagnosing zoonoses in DC with modest laboratory equipment.

The development of a National Zoonosis Centre with associated laboratories, besides acting as a valuable country resource, could also serve as a learning and skills development centre for veterinarians in VPH programmes (Dr B. Olugasa, Contribution 30). Regular seminars and workshops focussing on epidemiological findings and control measures in both rural and urban situations could be organized.

17. How can distance learning or similar techniques be applied in developing countries?

Many contributors commented that electronic teaching aids are very useful and versatile and providing that needs are clearly defined, can be matched by even the most modest of facilities. A wide range of software and online resources in VPH is now available. Examples include the epidemiology “Supercourse” (Computer-aided Learning In Veterinary Education, 2001) and “Emerging Infections of International Public Health Importance” (Pitt.edu, 2001) described earlier. The United States’ based Association of Teachers of VPH and Preventive Medicine (ATVPHPM) also list many educational resources on their Web site (ATVPHPM, 2001).

Where Internet connections are uneven or absent, scarce materials can be stored on moveable discs such as CD’s and can be distributed or exchanged.

Dr M. Abo-Shehada in Contribution 15 suggested that the means of producing VPH course materials on CD’s should be made available to educational institutions in DC with the assistance of international organizations. Some institutions already use such interactive teaching aids as a complete course. Students or veterinarians are asked to access the materials for set hours and only see the tutors for evaluation. This methodology would allow participation of experts worldwide in the production of accredited courses in VPH and zoonoses. Such courses could be stored on an Internet site such as FAO or WHO as a public domain to be downloaded as required. Translation versions would also be needed in the long term.

Other suggestions included setting up focal Internet sites where VPH related questions could be directed and using the Internet to hold conferences, continuing education programmes etc.
18. Given that the primary need in most developing countries is for village level basic human and animal health care, how can trained lay persons be better utilized to provide these services?

In many DC, NGO’s and cooperative organizations have established good infrastructures and have also won the confidence of poor and illiterate animal owners in their areas. Involvement of these organizations in VPH programmes is likely to include many extension and education initiatives to create awareness at grass roots level. Ultimately this would facilitate the participation of farmers in these programmes. These organizations have developed a new class of paraprofessional; the community-based animal health worker (Sherman, 2002). These individuals, with appropriate training, could play a significant role in VPH extension at the local level. The emphasis should be on a ‘train the trainers’ approach, taking into account the socio-cultural habits and customs of the area.

Dr G. Sharma (Contribution 24) suggested that the services of lay workers could be better utilized for providing village level basic human and animal care. This could be done through their education and training in vaccination, presumptive diagnosis and subsequent reporting to veterinary or medical officers. Data collection could also be achieved and above all, educating animal owners about the importance of VPH, the risks involved and what steps can be taken to avoid them. Education of animal owners and animal product producers is of critical importance, because without a change in their attitude and practices, nothing substantial can be attained.

Dr D. Allard et al. (Contribution 38) suggested village ‘health workers’ could be given additional knowledge and skills for basic diagnosis and control of the most prevalent zoonoses in DC. These workers would already have the biological knowledge necessary to grasp such information, and their access to village populations could be an asset in the early identification and control of zoonoses, not just in humans but also in domestic animals.

Dr E. Rapoport (Contribution 43) recommended that farmer community training in DC would be better if it were carried out slowly in order that recipients can more easily assimilate the principles and other concepts of modern management. Often the changes needed are relatively simple and do not need sophisticated electronic equipment or techniques. They are better carried out by watching the instructor at model sites such as farms, abattoirs, dairies, butcheries, homes etc. Generally at least one whole breeding season (more or less a full year) is necessary before new methods are well assimilated on livestock farms.

19. Give examples of innovative community based VPH programmes, especially those involving grass roots approaches

Dr B. Olugasa (Contribution 30) described a VPH programme developed specifically to identify zoonotic infections and risks for children (9-16 years of age) working as apprentices in abattoirs in Nigeria. They may constitute up to 12 percent of the total workforce. Abattoir waste water quality assessment was also included as a measure of environmental pollution.

Moderator’s comment: Dr David Sherman in his recently published book “Tending Animals in the Global Village – A guide to International Veterinary Medicine” (Sherman, 2002) describes the critical elements of community-based animal health programmes. The importance of ethnoveterinary medicine, defined as ‘local people’s knowledge pertaining to animal health and production’, derived over long periods of time from the close association of people and their animals, is emphasized. Human health knowledge and attitudes regarding zoonoses and other animal-related risks should be included in these types of programmes.
E. OTHER TOPICS FOR DISCUSSION

20. If you wish to raise other topics or issues related to VPH and zoonoses control in developing countries that are not covered in the above topics, please do so under this item.

Contribution 39 from Drs A. Mantovani and R. Borrini raised the issue of VPH preparedness for disaster situations. The major disasters which can and have occurred in DC countries include: war and civil instability, epidemics and natural disasters such as droughts, floods and earthquakes. All may result in massive loss of livestock and other animals with resulting famine. In some instances the risks of zoonotic disease, for example rift valley fever, are exacerbated by a geophysical event such as flooding. DC are especially at risk because livestock are essential for both human and economic survival. The involvement of the veterinary profession in preparing for such events is emphasized and details exemplified through the planning measures undertaken by the Italian official veterinary services.

For a review and recommendations see the OIE publication: "Emergency management of disasters involving livestock in developing countries" (Heath et al., 1999).

Dr G.K. Sharma (Contribution 24) suggested that certain VPH problems present in developed countries, including zoonoses, may not be present in DC. The vast majority of DC are ill equipped to diagnose and prevent the entry of such VPH problems. Developed countries, as a social obligation, should not knowingly supply items that could introduce new VPH problems to DC. International agencies like FAO/WHO/OIE could play a very important role in preventing the spread of VPH problems between countries.
CONCLUSIONS

There appeared to be general agreement that the current needs and future challenges for the delivery of effective VPH programmes in developing countries will be very different from those in developed countries. The latter generally have public infrastructures in place, which will be better able to cope with challenges faced from emerging or re-emerging zoonotic infections and also bioterrorist threats from zoonotic agents.

VPH initiatives in DC should focus at community levels and also choose programmes prioritized on the basis of disease burdens; they should also be epidemiologically defensible, risk based and have a reasonable probability of success and sustainability. Success is more likely if veterinarians take their place as a member of the health team rather than try and go it alone.

While international assistance was available and examples of cooperative projects were described by several contributors, there were obviously many unmet needs for technical help as well as financial assistance. International agencies need to make their numerous publications more readily available and also consider expanding their staff, particularly at regional level so that more support can be provided. Electronic access to information for those with a ‘need to know’ can and should be greatly expanded.

A number of deficiencies in surveillance programmes in DC was noted, and coordinated human/animal health databases for zoonotic infections were supported. Again these would require extensive training and commitment, especially at local level if they were to be successful.

While there was a wealth of knowledge and experience on how to control and prevent zoonotic diseases in developed countries, it was hazardous to transfer this directly to DC unless participatory field research had identified local knowledge and attitudes which might present major barriers for implementation. Food safety in DC is a good example. New quality control systems being adopted in meat hygiene in developed countries, where virtually all animals are slaughtered and inspected at abattoirs, are of very limited value where the majority of meat is derived from animals killed at a local butcher or at home. As globalization of trade in products of animal origin increases, DC should benefit from a need to meet export standards.

While there was a perceived need for DC to develop sound risk-based economic justification for zoonoses control programmes, it was also noted by several contributors that attention should be paid to ecological, ethological, social, ethical and psychological issues.

A number of examples of community based involvement in VPH programmes were presented. These ranged from improving surveillance, delivery of a combined animal and human health programme, especially to isolated communities, and the involvement of women and young people in prevention based education. In DC, human and animal health are interrelated especially as the majority of food is still produced and consumed locally.

A number of suggestions were made to ensure that ‘public good’ VPH services were not eliminated as more DC veterinary administrations transfer clinical services to the private sector. While in some cases NGO’s and farmer cooperatives could provide some VPH services, ultimately the State must retain responsibility for disease surveillance, control of transboundary and zoonotic diseases and meat and other food safety.

Several contributors gave examples of very limited collaboration between Ministries of Health and Agriculture at all administrative levels. Unfortunately this problem is not only confined to DC. One solution favoured was that a well identified interface should
be established in all DC either within an existing Ministry or as an independent entity. The problems facing DC were too important to be hampered by interprofessional rivalry or non-communication.

A number of innovative trends to improve both instruction in teaching VPH in veterinary schools and the ‘student friendliness’ of the subject were reported. These included reducing the number of formal lectures and increasing tutorials and field visits. More use of real life problems for teaching was also advocated. Specific learning issues were identified for each year and students were encouraged to use identified Web sites and to develop their own electronic portfolios.

The increase in women veterinary students presents many opportunities in DC, as women are still the major caregivers for livestock in many rural areas. Education on basic hygiene and other preventive measures can often be more effective if given by women to women directly rather than via men.

Opportunities for graduate and continuing education in VPH in DC are limited unless funding is available from North America, Europe or Australasia. However, several initiatives were described involving both inter-University linkages and distance learning via the Internet. Given the difficulties and also cost of access to the Internet in DC, a greater use of multilingual CD’s was recommended, but unfortunately there is only limited material available at present.

If preventive VPH information especially on zoonoses was to be delivered at village level, greater use of community based animal and human health workers was advocated. These individuals could be taught the basic skills needed to advise on the common zoonoses. This material should be seen as a supplement to local people’s knowledge relating to animal health and production rather than as a replacement.

Finally the importance of dealing with livestock emergencies following natural disasters was advocated and based on experiences, specific recommendations were made.
ACKNOWLEDGMENTS

The assistance of staff in the Animal Health Service of the Animal Production and Health Division of FAO, Drs C. Eddi, W. Amanfu and D. Ward is acknowledged. Also Dr Scott McEwen, University of Guelph, Ontario, Canada, Dr David Hird, University of California, Davis, California, United States and Dr D. Cordes, New Zealand, for kindly reviewing the summary document.
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