

FINAL REPORT



**EXPERT CONSULTATION ON COMMUNITY BASED
VETERINARY PUBLIC HEALTH (VPH) SYSTEMS**

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OPENING SPEECH

Opening address by Dr. Samuel Jutzi,
Director AGA

Mr Chairman, Ladies and Gentlemen

It is with great pleasure that I welcome you all to FAO and to the Animal Production and Health Division for the Expert Consultation on Community Based Veterinary Public Health Systems. A very special welcome to the six experts who have accepted the call to provide their advice to this important process which FAO has set up to gather the most up-to-date, advanced scientific guidance for its program of work.

FAO takes the instrument of the expert consultation very serious. You know that the advice you will be generating today and tomorrow will be taken up by the Director-General in the guidance of FAO's veterinary public health program.

Veterinary Public Health aspects have long been on the agenda of FAO's animal health program – if we think of the many activities on brucellosis control or on the internal parasite management which have been and are being carried out in many Member Countries.

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

The Task Force performs on its program of work, as is also unanimously recommended by the expert papers submitted to this consultation, using an inter-disciplinary and inter-sectoral approach. I need not dwell on this fundamental requirement which is certainly not disputed by anyone involved in VPH matters anywhere in the world.

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

To illustrate the importance of VPH incidences and thereby underscore the need for mitigating action, I could quote the example of the impact of the BSE crisis in the European Union. In a recent study prepared on this by a working group under the leadership of Patrick Cunningham and published by the European Association for Animal Production, the EAAP, the annual loss to the European livestock sector as a result of the BSE crisis is estimated at 2.75 billion USD; much of this impact is there to stay long-term as a considerable proportion of the by-products used productively before the crisis such as the Specified Risk Materials and the Meat and Bone Meal have now become a considerable cost for the industry and the society. *Nipah, Campylobacter,*

Salmonella, *E. coli*, Rabies, Rift Valley fever, SARS, *Taenia* might be other suitable examples to bring home to all concerned that very serious risks are at hand.

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

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

In many circumstances, and not only in developing countries, the raising of awareness of communities of veterinary public health risks and of ways by which to manage and mitigate them more effectively is key for the success of VPH program. This expert consultation addresses this task of community-based work head-on. Community action in veterinary health risk management is multi-faceted and multi-layered and requires careful choice of instruments. It requires, in addition to the inter-sectoral and inter-disciplinary approaches already mentioned, effective communication. If schools, i.e. administrators, teachers, pupils and parents, grass-roots organizations, cooperatives and other organizations in the areas of services, production, product processing and product retail have to play their role in managing VPH risks, communication is obviously of paramount importance. The same is true for the operation of community-based surveillance and participatory epidemiology. I am very pleased to note that significant inputs on this are available through the expert contributions to this consultation. I am therefore very confident that there will be strong and detailed advice resulting from your discussions - advice on the contents and operations, both medium- and longer term, of the FAO Veterinary Public Health Program. I would again like to thank you for your time and effort in this.

Before I turn you over to your chair, Prof. Robinson, I would like to say a few words of recognition directed at a colleague who will soon retire from FAO and to whom the FAO Animal Health Program, the Animal Production and Health Division and the Organization as a whole owes a great deal. This is Dr. Cheneau, Chief of the Animal Health Service for the last 12 years. Yves Cheneau has not only brought FAO's Animal Health Program in to the strong shape which it currently has, he is also the architect and implementer of the EMPRES-Livestock Program since it was launched by the Director-General in 1994. He also completed the Divisional Program by introducing formally the VPH program entity under his responsibility four years ago. I would simply not like to miss this good opportunity to warmly thank Dr. Cheneau very much for all his commitment and leadership.

I would also like to thank the colleagues and their supervisors who agreed to assist the expert consultation with their professional process facilitation skills. These are Marta Bruno and Jan Johnson from the Rural Development Division and Jean Pierre Ilboudo and Ester Zulberti from the Research, Extension and Training Division.

I now pass you over to your chairperson and wish you a very productive session and I am confident that all arrangements are in place to make you work as effectively as possible.

INTRODUCTION

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

A community is usually described as a group of people organized into a unit or manifesting some unifying trait or common interest; it may be a locality for which general services are provided such as a district, the most peripheral unit of local government. Community-based VPH systems therefore refer to those services such as zoonoses and food-borne illness prevention and control aimed at improving the overall health of the population.

The majority of developed countries have administrative systems in place to provide a reasonable level of VPH services at national and sub national levels, although at community levels, services may be uneven, minimal, or absent. In developing countries and those countries in transition whose infrastructures require rebuilding, VPH services are likely to be deficient at all administrative levels.

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

These include:

- Lack of any organized surveillance program
- Focus on task-oriented VPH programs unrelated to risk-based priorities
- Poorly defined epidemiological knowledge of local VPH problems
- Minimal communication and cooperation between providers of human and veterinary health services
- Lack of VPH educational materials and programs for extension
- Difficulties in electronic access to science-based current VPH information sources
- Lack of suitably trained individuals at all levels
- Lack of VPH infrastructures at the community level

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

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

The recent (2002) FAO Animal Production and Health paper 'Improved Animal Health for Poverty Reduction and Sustainable Livelihoods' offers a number of opportunities to improve animal and indirectly human health through supporting poor livestock farmers. The challenge remains as to how to develop low cost yet efficient VPH interventions at the community level.

OBJECTIVES AND PROCEDURES

The objectives of the Consultation were to consider and make specific recommendations regarding the delivery of community-based VPH systems, with special emphasis on developing countries in the following major areas:

- Surveillance methodologies for zoonotic diseases
- Significance of participatory epidemiology and rapid appraisal techniques
- Public and private VPH community delivery systems
- Monitoring and evaluation of VPH systems
- Current community-based VPH systems in sub-Saharan Africa, including examples from South Africa and Tanzania
- Training and Public Education in VPH at community levels
- Multi-disciplinary approaches to VPH delivery systems at community levels

Background papers were presented on each of the above topics by invited participants. Each Expert was asked to have a minimum of two co-authors or peer-reviewers of their paper. All papers were circulated electronically to consultants prior to the meeting. A one-page summary of each paper is included in Section D and the full papers in the appendix.

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

SUMMARIES OF PRESENTATIONS AND DISCUSSIONS

A summary of the papers presented during the plenary sessions is presented below. The full text of each paper presented appears in the Appendices.

SIGNIFICANCE OF PARTICIPATORY EPIDEMIOLOGY IN VETERINARY PUBLIC HEALTH COMMUNITY-BASED SYSTEMS

R. Ashley Robinson, Associate Dean of Pre-Clinical Programs, College of Veterinary Medicine, Western University of Health Sciences, Pomona, California, USA. Peer Reviewed by: Dr. A. Catley, Organization of African Unity/InterAfrican Bureau of Animal Resources, P.O. Box 30786, Nairobi, Kenya and Dr. David Hird, School of Veterinary Medicine, University of California, Davis, California, 95616, USA.

Participatory epidemiology (PE) is defined as “methods for the collection of action-oriented epidemiological intelligence.” PE builds on existing medical and veterinary knowledge especially in developing countries where sophisticated data gathering techniques focusing on random sampling of large populations by questionnaires/interviews are often impractical. Essentially, qualitative epidemiological techniques are adapted to gain information from a community using participatory rural appraisal techniques over limited time periods.

Developing countries and those in transition whose economies are undergoing structural adjustment face significant veterinary public health (VPH) challenges as often well established, state-funded services have been discontinued or diminished such that zoonotic disease outbreaks have increased. Community VPH services at district and lower levels are either absent or fragmented.

Zoonotic diseases exert a disproportionate effect on the poor primarily because livestock often underpin the livelihoods of the poor throughout the developing world.

PE has a wide range of applications that could be especially useful in identifying risk factors for zoonoses and other VPH problems. Community participation is now being widely- promoted as an important feature in the delivery of veterinary services in developing countries. Therefore, PE seems an essential technique if these services are to be expanded to include VPH. As Community Animal Health workers are now providing veterinary services to many underserved areas of the world, it would seem logical to involve them in PE studies and ultimately in the delivery of basic VPH services.

To gain the maximum advantage of PE for advancement of VPH, joint training of veterinarians and physicians is recommended to better identify local priorities as well as community knowledge, attitudes, and practices. ‘Pilot’ VPH programs based on the results of PE studies should be developed in selected countries representing a range of VPH problems.

SURVEILLANCE METHODOLOGIES FOR ZOOBOTIC DISEASE AT COMMUNITY LEVELS

R. Ashley Robinson, Associate Dean of Pre-Clinical Programs, College of Veterinary Medicine, Western University of Health Sciences, Pomona, California, USA. Peer Reviewed by: Dr. Hugh Mainzer, National Immunization Program Centers for Disease Controls and Prevention, Atlanta, Georgia, USA. Dr. Bruno Chomel, School of Veterinary Medicine, University of California, Davis, California, 95616, USA. Dr. Jeffrey Bender, Veterinary Public Health College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota, USA.

Ideally a community-based zoonotic disease surveillance system should be timely, representative, acceptable to the community, flexible, cost-effective, and simple. Technically, it should be sensitive (capable of detecting zoonotic disease events) and specific (capable of accurately identifying the zoonotic disease).

Community-based systems differ widely depending on the human and animal populations: unfortunately, systems are usually separate but, ideally, there should be coordination of zoonoses surveillance. Reliance on official (notifiable) reports may lead to a gross underestimation of a disease impact. In these situations, a dedicated epidemiological survey is needed drawing on a range of resources including livestock owners, community animal and human health workers, paraveterinarians, abattoirs, livestock markets, etc.

In resource-poor regions, simple systems using existing personnel can be used for both passive and active zoonoses surveillance provided adequate training is given and there is periodic feedback to participants. An initial focus should be on a few major zoonoses. Sentinel surveillance such as using free-flying or caged bird for arboviruses is a useful technique. Syndromic surveillance focusing on key signs or symptoms although non-specific may well be a useful screening mechanism (e.g., fever, neurological signs). Ideally, any surveillance system should focus on the nature and scale of the known risks for a specific disease.

Finally, at the community level, information collection systems without any actual or perceived actions are very unlikely to be sustainable.

PUBLIC AND PRIVATE ASPECTS OF VETERINARY PUBLIC HEALTH DELIVERY SYSTEMS AT COMMUNITY LEVEL AND MONITORING AND EVALUATION OF VPH SYSTEMS

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As a result of economic reforms countries throughout the world have been privatising their veterinary services whereby commercialised goods and services that benefit individual livestock owners are divested to the private veterinary sector with only the essential, non-contestable “public good” tasks such as environmental and public health provided by the public veterinary health (VPH) service. Unfortunately privatisation of VPH services in many developing countries, especially in poor, low-potential areas, has become a constraint for poverty alleviation, environmental sustainability, food safety and zoonoses prevention and control due to the lack of clarity on the appropriate roles of the public and private sectors in delivering VPH services as well as the lack of tools needed for proper evaluation and monitoring to assure quality VPH service delivery. Remote and marginalised human and livestock populations are generally underrepresented in service delivery and information systems and as a result suffer from the direct lack of services and pose epidemiologic risks to the national human and livestock populations as a whole. Public sector responsibilities in these remote, marginalised communities can be conducted effectively through the use of contracts with private veterinarians and para-professionals for their delivery under the public sector monitoring and supervision thus making essential services available while enhancing the financial viability of private practice in low-potential areas. With regard to public and private aspects of VPH service delivery and oversight of VPH systems there are several actions that countries can take to improve the efficiency, effectiveness and sustainability of VPH services including: 1) institution of legal frameworks for defining the role of VPH service providers that establishes the functions, responsibilities and control of public and private veterinarians and also para-professionals in the provision of VPH services as well as guidelines on the roles, interrelationships and regulations required to link them with the official VPH services; 2) strengthening their links with or facilitating the organisation of VPH stakeholder associations representing veterinarians, public health physicians, para-professionals, livestock producers, consumers and other relevant groups which can play a key supporting role in VPH service delivery; 3) establishing a statutory body representing the interests of all stakeholders tasked with obtaining specific commitments, financial resources and institutional and legal authority to implement VPH service delivery while securing sustainability of VPH services through the setting of regulations, monitoring the delivery and results of interventions and providing an enabling environment for the private sector; 4) implementation and enforcement of VPH programmes based on priorities established as a result of risk analysis (including participatory techniques) and socioeconomic burden assessment of VPH hazards following improvement of information and epidemiological surveillance systems through training of personnel and building of infrastructure as part of the overall decision support system.

COMMUNITY PUBLIC HEALTH EDUCATION IN TANZANIA: CHALLENGES, OPPORTUNITIES AND THE WAY FORWARD

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(A) Background information

The livestock sub-sector, contributes about 18% and 30 of the national and agricultural GDP respectively and provides food for rural and urban dwellers. Cattle, sheep and goats are kept mainly by rural communities with the objectives of animal keeping being (i) a sign of wealth and social status (ii) source of income and food

(B) Practices of public health importance to animal owners and consumers

- Improper meat inspection and close association with animals
- Collapse of veterinary services, as a result of withdraw of veterinary services.
- Presence of zoonotic diseases such as tuberculosis (Kazwala, 1996); brucellosis (Mtui-Malamsha, 2001) and cryptosporidiosis (Mtambo et al., 1997).
- Consumption of raw or undercooked meat; raw blood and milk poses health ri

(C) What type of public health education is required?

- (i) Creating public awareness on dangers/risks associated with eating habits; conservation and quality of water sources and use of latrines
- (ii) Contact with animals (shairing air space) is a risk factor
- (iii) Public awareness on risks in relation t drug residues in food
- (iv) Public awareness on the importance of quality meat inspection.

(D) The way forward

Community public health programmes require involvement of a number of players that include (i) animal owners and family members (ii) butchers (iii) food vendors (iv) consumers and (v) policy makers

The programme components will be:

- i) Sensitisation of trainers of trainees (public) on all relevant public health matters. This can be achieved by making use of members of communities such as CAHWs and field veterinary staff
- ii) Make use of other avenues for public awareness such as primary and secondary schools, religious and political fora
- iii) Creating awareness to decision makers (policy makers) especially village leaders; ward leaders and staff in local governments/councils
- iv) Complementary aspects should include retraining of meat inspectors and other service providing cadres who should be engaged to serve as meat inspectors
- v) Sensitising consumers or the general public using TV and radio programmes (the latter can be useful to reach people in the villages especially when solar powered radios are used. This will ensure maximum reach of rural communities). Other dissemination techniques such as posters and leaflets need to be used.

COMMUNITY BASED VETERINARY PUBLIC HEALTH SYSTEMS IN SOUTH AFRICA – CURRENT SITUATION, FUTURE TRENDS AND RECOMMENDATIONS

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In contrast to most other African countries the bulk of rural household income in South Africa does not derive directly from smallholder agriculture but a high percentage of rural households are net consumers of food. Almost 70% of South Africa's 122.3 million hectares land surface is not arable, but generally suitable for raising livestock. At the same time population growth, urbanization and income growth are paralleled by a rapidly increasing demand for food from animal origin. This poses a challenge on the country's agricultural sector to develop a sustainable livestock production which contributes to poverty alleviation and which ensures access to safe meat for all South Africans.

Current Situation

- The delivery of veterinary public health services in South Africa is uncoordinated and fragmented among several government agencies
- Prior to 1994 approved abattoirs with meat inspection were basically non-existent in most rural areas and as a consequence the population in those areas do not have the opportunity to buy safe, inspected and hygienically produced meat but rely on meat originating from informal slaughter.
- Since 1994 Meat Hygiene Services have transformed to include the needs of rural small abattoirs which are supported by the revised meat safety act of 2000.
- Food safety risks in rural communities are multifaceted and relate primarily to informal slaughter of livestock, socio-cultural practices and the informal marketing of foodstuffs and ready cooked foods. Close animal-human interactions and the consumption of meat and milk from animals raised without any form of veterinary intervention facilitate the transmission of diseases such as bovine tuberculosis, brucellosis, anthrax, listeriosis, leptospirosis, cysticercosis, hydatidosis, larval migrans and rabies. Among the pathogens which cause generally less severe disease but which are more frequently encountered, especially in infants and the elderly, are Salmonella, Campylobacter, E. coli and other enterobacteria.

Future Trends and Plans

- Commercialization of Livestock Production through land redistribution programs
- Planned Changes in Regulations to develop policy, norms and standards for the primary animal health care systems in the rural areas in South and Southern Africa as well as to coordinate and audit their implementation
- Urbanization

The formation of densely populated informal settlement areas on the outskirts of many towns and cities and the growing demand for affordable food prompted a sharp increase in small and large livestock being held in those areas. A lack in skills relating to animal care and a lack in grazing results in poor animal health and facilitates the circulation of pathogens between animals and humans.

- Increasing need for diagnostic support by emerging small-scale farmers and a growing export market, both field and laboratory based.

Recommendations

- Joint veterinary public health directorate with mandates from national Departments of Health and Agriculture
- Sustainable and commercialized livestock production
- Continued upgrading of unapproved slaughter facilities
- Information and skills training
- Community extension projects on food hygiene

MULTIDISCIPLINARY APPROACH TO VETERINARY PUBLIC HEALTH DELIVERY SYSTEM AT COMMUNITY LEVEL

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The past, the present and the future of multidisciplinary collaboration in veterinary public health and expected perspectives

“The sum of all contributions to physical, mental and social well-being of humans through an understanding and application of veterinary science” is the last definition of Veterinary Public Health (VPH) (WHO, 1999). The concept places strong emphasis on the need for wider links between human and animal medicine, and calls for the involvement of disciplines such as agriculture, biology, environmental research, food hygiene, and other animal health-linked skills.

The “classical” (natural) cooperation between physicians and veterinarians traces back to the remote past when no special differentiation was usually made between human and animal medical care. “One medicine” was the rule among Egyptians, Babylonians, Greeks and Romans. Except for the Middle Ages, when human medicine was kept strongly separated from the animal one on religious grounds, the concept of a unique medicine revived in the XVI and XVII centuries and continued until the present days. In establishing policies of intersectoral collaboration, great significance must be given to the “vertical” and “horizontal” approaches, the former being traditional to medical schools, tending to consider each item separately irrespective of the whole context. The latter is a global strategy considering the problem-solving process in its different aspects. Both approaches may be suitable in different situations and may be harmonised and applied together. The trend is now towards the choice of the horizontal approach as it apparently shows more practical advantages, especially in such new fields as the control of zoonoses and of the “quality” (not only “safety”) of food.

The development of VPH in international health institutions, especially in WHO along with FAO and OIE, may be divided into subsequent steps starting from the 1950’s and 1960’s. The first step (until the 1970’s) defined the public health role of zoonoses more precisely, diverted health care from the individual to the community, introduced large-scale zoonoses control programmes and surveillance on food of animal origin. Most countries, however, kept a clear distinction between human and animal health problems. The second step (until 1980’s) strengthened VPH and convened many inter-professional expert meeting on issues linked to both human and animal health such as farming intensification, animal food pollution, animal-associated problems in cities (veterinary urban hygiene), etc. Some distinction was maintained between human and veterinary

medicine, but with stronger interest in integrated VPH action. The third step from the 1980's until the current days is marked by the Primary Health Care strategy "Health for all by the year 2000" (WHO General Assembly, Alma Ata, 1978) and by the first official recognition of the necessity of intersectoral collaboration and "horizontal", multi-oriented programmes. The new conception was applied to the education and training of all categories of health operators in view of joint strategies to cope with complex problems. Nowadays, worldwide changes are in progress or expected affecting the environment (e.g. climatic modifications), human life (e.g. urbanisation and demographic increase), disease epidemiology (e.g. emergence and re-emergence of pathologies, zoonoses included). Global climatic changes (increased temperature) are most likely to favour vector-borne and other disease in humans and animals, especially in developing countries. In the event of new infections (either animal or human), inter-professional collaboration is imperative, as recently proven by the cases of Rift Valley fever and SARS.

Trade globalisation has favoured the spread of food-borne infections (e.g. BSE) and collaboration (international partnership) is needed on multidisciplinary grounds to monitor livestock feeding throughout the production cycle. The same is true for novel VPH commitments regarding laboratory research, new procedures (e.g. HACCP, HIA), GMOs, aquaculture, "veterinary disastrology".

Restraints to intersectoral co-operation, (e.g. conflicting economic and/or political interests), are discussed along with the need for coordinated communication channels able to counteract the growing influence of mass media in determining the magnitude or priority of health issues.

The following attached annexes discuss some issues more in detail: 1) Giorgio Battelli: Socio-economic impact of animal diseases and health action: some considerations, with special reference to developing countries; 2) Alfredo Caprioli: Comment on the role of laboratory in VPH; 3) Ottorino Cosivi: WHO's efforts to assist member states to prepare for the deliberate use of biological or chemical agents to cause harm; 4) Daniele De Meneghi: The importance of intersectoral collaboration for prevention and control of sylvatic tick-borne zoonoses: field experiences in ecological research on Lyme borreliosis in north-western Italy; 5) Agostino Macrì: Animal farming and prophylactic and therapeutic practices: benefits and risks; 6) Paolo Pasquali: VPH problems of immunodepressed persons; 7) Giovanni Poglayen: Urban veterinary hygiene: a topic for a multidisciplinary approach; 8) Aristarco Seimenis: The past, the present & the future of multidisciplinary collaboration in V.P.H. and expected perspectives.

TRAINING ON VETERINARY PUBLIC HEALTH ISSUES AT COMMUNITY LEVEL AND PUBLIC EDUCATION

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INTRODUCTION

In this document, we have examined issues of veterinary public health (VPH) community based systems, in relation to training and extension at community level. We have described the present situation, the desired situation and we have proposed possible ways to achieve the desired situation.

I. STATE OF THE ART

In developing countries, poverty, lack of education, low levels of hygiene, socio-cultural and religious habits, close association with various animal species and unawareness of disease transmission factors help increase the socio-economic impact of zoonotic and food-borne diseases. VPH services are generally unsatisfactory. Training at community level and public education are poor and inadequate. The absence of control programmes is mainly due to the lack of leadership and commitment of the relevant institutions, the absence of a global vision and a clear strategy at the national level, the lack of inter-sectoral collaboration, involvement of the community and resources.

II. UPCOMING TRENDS AND DESIRED SITUATION

In order to deliver more efficient VPH services, some prerequisites are necessary, at the political, technical and population levels. There is a need for a solid political decision that considers implementation of control programmes, provides the necessary funding, encourages research and provides the technical structures and infrastructures, with clear objectives and optimal conditions for the realisation of the defined VPH activities within a timely planning.

III. THE WAY FORWARD

The social marketing is the planning and implementation of programs designed to bring about social change using concepts from commercial marketing. These ensure the financial and geographical accessibility of a service or a product to a target population. The planning phase includes a description of the current and desired situations and the ways to achieve the desired situation. The implementation phase includes a study of the site, the development of tools, strategies for the product, price, promotion and public relations and finally, information, communication and education. The last phase includes monitoring, evaluation and feed-back.

CONCLUSIONS AND RECOMMENDATIONS

Training on VPH issues at community level and public education require optimal conditions and crucial prerequisites. There is a need for a political decision and commitment at the high level in order to consider the control of zoonoses as a priority. The relevant structures must define a clear control strategy within an appropriate legislation and must be committed to the programme. Control requires inter-disciplinary teams and inter-sectoral collaboration. Involvement and support of the local population and the social structures will ensure the success and sustainability of control

programmes. We recommend the social marketing approach for the organisation of VPH community based educational systems and services.

CONCLUSIONS

It was recognized that there was an urgent need to develop, introduce and evaluate low cost innovative VPH programs at community levels especially where human and livestock populations are underserved by conventional public health delivery systems. To better identify and prioritize VPH problems in these areas, improved risk-based surveillance programs will be needed that involve community participation.

Given the current limitations of the public sector to provide VPH community services, it appears that contractual services with private veterinarians can provide much-needed services. In remoter areas, the potential for community human and animal health workers to deliver simple extension VPH services, as well as collect information should be evaluated. A social marketing approach for VPH educational systems and services was also proposed.

Finally, while it was agreed that VPH community-based systems are “public good” tasks, all stakeholders and health professionals should be involved in the delivery of these services.

RECOMMENDATIONS

FAO should:

- 1) Take the lead at the international level in forming an interagency commission for support and coordination of VPH community systems development. This would include WHO and other relevant organizations such as OIE, UNEP, UNDP, UNICEF, World Bank, CGIAR which would meet on a regular basis.
- 2) Facilitate national and regional interministerial meetings, especially between the agriculture and health sectors, for the coordination of intersectoral strategies to control and prevent zoonotic and food-borne diseases.
- 3) Formalize a dedicated unit for VPH in AGAH with cooperation of other services. In addition consideration should be given to enhancing VPH capabilities at FAO Regional and Subregional Offices (for example through the placement of VPH officers). The unit would assist in VPH systems development, service delivery and coordinate VPH activities in member countries.
- 4) Assist in establishing an International Scientific Advisory Committee for VPH which should include representatives from FAO/WHO Collaborating and Reference Centers, relevant research institutes, universities, and NGO's, etc. which would advise the Interagency VPH Commission and the VPH unit at FAO.
- 5) Assist in the establishment of regional/subregional collaborating and reference centers for surveillance, diagnosis, research and training on VPH problems especially in developing countries.
- 6) Assist member countries in the establishment and/or strengthening of an official decision making body (statutory body) for VPH activities (involving all stakeholders at interministerial level) as well as developing policies and strategies including establishment of legislation necessary for effective delivery of VPH services especially at community levels.
- 7) Develop a database of all VPH activities within member countries. This will include the current status of VPH activities and specific persons involved with them at country level (including an organogram) involving all stakeholders (decision makers, technical and resource personnel, research institutes etc). This database will then provide the basis for FAO support for strengthening VPH delivery systems as well as facilitating two-way communication and networking.
- 8) Provide support to countries for identifying and solving problems especially relating to endemic, persistent zoonoses and food borne diseases with specific recommendations for prioritization of such VPH hazards based on risk analysis, burden assessment and socioeconomic factors. Zoonoses and other VPH hazards should also be considered in the context of poverty alleviation. Support should include the development of practical guidelines for the delivery of VPH services at the community level to support new or existing human and animal health services.
- 9) Include VPH control and prevention initiatives as a priority for developing countries to seek assistance through FAO's Technical Cooperation Programs (TCP's).

Single zoonotic/food-borne disease risk analysis and burden assessment can be used as a catalyst for strengthening VPH structures and functions in general. Participatory epidemiological and economic techniques to assist in defining risk and disease burden assessments should also be supported.

10) Support the formulation of multilingual/multimedia VPH materials for extension at the community level, continuing education for technical staff such as community human and animal health workers ('train the trainers') and tertiary education for health professionals, including veterinarians.

11) Encourage the development of a range of extension, training and education programs including distance (internet) learning related to zoonoses and food borne diseases. Integrated education of veterinary and medical students on zoonoses and food-borne diseases should be incorporated in their curricula.

12) Support the formation of new or utilize existing regional networks for information exchange, standardization, and integration of VPH research and control activities.

APPENDICES

Agenda
Papers Presented
List of Participants

AGENDA

**Expert Consultation on Community Based
Veterinary Public Health (VPH) Systems
Chairman: Prof. Ashley Robinson
Secretary: Dr. Lee Willingham
27-28 October, 2003**

Monday 27 October

09.00 - 09.10	Official Opening Statement and Introductory note	Prof S. Jutzi, Director of AGA.
09.10 - 09.30	Objectives, procedures and the agenda	Dr C. Eddi, Senior Officer
09.30 - 10.00	Surveillance methodologies for zoonotic diseases at community level. Significance of participatory epidemiology in VPH community based systems	Prof A. Robinson,
10.00 - 10.30	Public and private aspects of VPH delivery systems at community level and Monitoring and Evaluation of VPH delivery systems	Dr L. Willingham
10.30 - 10.40	Questions	
10.40 - 11.00	Break	
11.00 - 11.30	Community public health education in Tanzania: challenges, opportunities and the way forward	Prof D.Kambarage
11:30 - 12:00	Community based Veterinary Public Health Systems in South Africa: Current Situation, Future Trends and Recommendations	Dr A. Michel
12.00 - 12.10	Questions	
12.10 - 14.30	Lunch Break	
14.30 - 15.00	Multidisciplinary approach to veterinary public health delivery system at community level	Prof A. Mantovani
15:00 - 15:30	Training on VPH issues at community level and public education	Prof M. Kachani
15.30 - 15.40	Questions	
15.40 - 16.00	Break	

16.00 - 17.00 General discussion – Preliminary conclusions
and recommendations of day 1.

17:00 – 18:30 Cocktail Indonesia Room Building C, 8th floor

Tuesday 28 October, 2003

09.00 - 10.30 Working groups Invited
participants

10.30 - 10.50 Coffee Break

10.50 - 12.00 Working groups – Consolidated outcome Invited participants

12.00 - 14.00 Lunch Break

15.00 - 16.00 Plenary – Conclusions and Recommendations Experts and
invited participants

PAPER PRESENTED

SIGNIFICANCE OF PARTICIPATORY EPIDEMIOLOGY IN VETERINARY PUBLIC HEALTH COMMUNITY-BASED

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INTRODUCTION

Veterinary Public Health (VPH) was originally defined 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” (1). However, a Joint FAO/WHO Expert Committee in 1999 (2) on VPH expanded this concept to “the sum of all contribution to the physical, mental, and social well-being of humans through an understanding and application of veterinary science.” In effect, this expansion recognized that veterinary medicine has the potential to make an enormous contribution to the improvement and maintenance of human health.

Participatory epidemiology (PE), surprisingly, is not defined in a recent Dictionary of Veterinary Epidemiology (3). But a recent FAO publication manual on PE (4) is subtitled “methods for the collection of action-oriented epidemiological intelligence.” PE builds on existing medical and veterinary knowledge especially in developing countries where sophisticated data gathering techniques focusing on random sampling of large populations by questionnaires/interviews are often impractical. Essentially, qualitative epidemiological techniques are adapted to gain information from a community using participatory rural appraisal techniques over limited time periods.

STATE OF THE ART

Traditionally, VPH activities and services have included but are not 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 disease reservoirs or be noxious
- Prevention and control of food- and water-borne illness of animal origin
- Ante-mortem and post-mortem meat and poultry inspection
- Participation in outbreak investigations of suspected zoonotic origin
- Environmental activities including vector, water, wildlife, and use of animal monitors
- Biomedical research
- Emergency actions including natural and man-made disasters
- Issues relating use of service animals and human-animal bonding

There is very considerable diversity and variation in the effectiveness of how VPH services are delivered to communities both between and within countries. Even in developed countries, while there may be good VPH programs at national and state-provided levels, often at the local levels, services are uneven or less well-organized.

Taking the USA as an example, most States have a designated VPH component usually within their Department of Health staffed by one or more veterinarians with post-graduate training in public health. Larger States, such as California, have county and even city level services also, where zoonotic (especially food, water, vector, and rodent-borne) diseases are a primary focus. Usually, these groups have access to sophisticated medical and veterinary diagnostic laboratories ensuring rapid and accurate diagnoses and thus facilitating epidemiological investigations of both epidemic and endemic problems. However, even with these services there still may be variable medical/veterinary liaison.

Developing countries and those in transition whose economies are undergoing structural adjustment as well as increasing privatization of state veterinary services face significant VPH challenges as often well established, state-funded services have been discontinued or diminished such that zoonotic disease outbreaks have increased. Community VPH services at district and below levels are either absent or fragmented. Reactive responses to epidemic or disaster situations are more likely than any proactive preventive programs.

Zoonotic diseases exert a disproportionate effect on the poor primarily because livestock underpin the livelihoods of the poor throughout the developing world (5). Deaths and disabling disease are characteristic of most zoonoses. The poor, especially women, and their livestock are usually in very close contact, increasing the risk of pathogen exposure through direct or vector-borne routes of transmission. Unsanitary living conditions in both rural and large urban areas increase the risk of multiple exposures to zoonoses, especially where water supplies and sewage disposal methods are suspect.

John Snow's original investigation of the role of water and sewage in the transmission of cholera in 19th Century London was an example of participatory epidemiology; Snow relied on oral histories plus careful observations to draw his clearly enunciated conclusions and recommendations.

Participatory epidemiology is an emerging field that is based on the use of participatory techniques for the harvesting of qualitative epidemiological intelligence contained within communication observations, existing veterinary knowledge and traditional oral history. It relies on the widely accepted techniques of participatory rural appraisal, ethno-veterinary surveys and qualitative epidemiology. This information can be used to design better animal health project and delivery system, more successful surveillance and control strategies or as new perspectives for innovative research hypotheses in ecological epidemiology (4).

The many techniques of PE are well described in the FAO manual including how to identify and prioritize animal health issues, general disease surveillance, and participatory disease investigations.

The key features for successful PE (6), include:

- Attitudes and behavior. Epidemiologists should be willing to learn from local people, not lecture but listen and respect local knowledge and culture;
- Combined methods and triangulation. Use a variety of techniques including interviews, visualization, and scoring methods and integrate with conventional investigative techniques;
- Identify key informants wherever possible to assist;

- Be action-oriented; and
- Be flexible in methodology selection.

Some recent examples of PE include an analysis of seasonal incidence of diseases of cattle disease vectors and rainfall in southern Sudan (7), persistence of Rinderpest Virus in East Africa (8), Bovine Trypanosomiasis in Kenya (9), and Chronic Wasting Disease in cattle in the Sudan (10).

The use of participating appraisal techniques in Africa by veterinarians were surveyed recently (11). The authors found that government veterinarians were much less likely to use these techniques compared to veterinarians working with non-governmental organizations. While these techniques were shown to be useful in working with communities to analyze and solve local health problems, there were some constraints. These included lack of financial resources, low availability of relevant training courses and material, as well as time constraints and negative attitudes among colleagues. The authors concluded by advocating a much wider adoption of participatory epidemiological techniques by veterinarians in Africa, when attempting to develop services according to the priorities and community capacity.

The recent FAO-EMPRES Expert Consultation paper (6) describes how PE can be used to strengthen public sector veterinary services with particular reference to community-based animal health programs, epidemic disease control and research needs. A wide range of applications of PE were identified including:

- Participatory disease searching
- Disease modeling
- Reliability and validity when used by trained workers
- Research on emerging diseases
- Basic research on epidemiology of endemic and epidemic disease

Examples of community participation in the delivery of veterinary services in Africa (12) and Indonesia (13) have been recently described in some detail.

Rapid appraisal (RA) has been developed as an effective technique to collect human health data at the community level. Rapid appraisal is defined as a method of getting information about a set of problems in a short period and without a large expenditure of professional time and finance. It is also a method of needs-based assessment and involves the community. The focus has been primarily on urban areas. A 1988 WHO report (14), "Improving Urban Health: Guidelines for Rapid Appraisal to Assess Community Health Needs," describes the methodologies that have been used with some success. It is based on 'information pyramids,' which are defined a description of the health situation of people living in a defined geographic area. Pyramids have several characteristics:

- They are based on needs identified by the community;
- They are built on information gathered from documents, dialogues with community members and from observations;
- They are constructed with the recognition that urban, and to a lesser extent rural, communities often experience rapid change;
- They are built from data gathered by rapid appraisals; and
- The quality of information generated is more crucial than the quantity of information.

It should be emphasized that rapid appraisals tells what these problems are and not necessarily how many people are affected by the problem.

RA was initially developed as a method to quickly supply resources to alleviate problems of the rural poor. While early studies were subject to investigator biases, ignoring seasonality effects and non-representative sampling, later effects were more successful if carefully planned and used with common sense. The three principles fundamental for RA are:

- Do not collect too much or irrelevant data
- Adjustment investigations to reflect local conditions and specific situations
- Involve community people in both defining community needs and identifying possible solutions.

Data from RA methods is collected from three main sources:

- Existing records
- Interviews with a range of informants
- Observations

RA for identifying human health problems in low income urban and rural areas is best done by a multidisciplinary team. Detailed suggestions for carrying out RA for health needs are described in the WHO report. Generally, they should be completed promptly, usually within ten days. RA clearly has some limitations and should be used as a basis for planning to improve human health. Follow-up epidemiological investigations may be needed especially to identify individual or community risk factors.

Two examples of recent participatory research in human health which may have implications for veterinary public health includes:

- Community health among indigenous populations in rural Ecuador was assessed using a participatory approach in 26 communities (16). From this, a number of health reform strategies arose including the development of a comprehensive plan for health improvement in conjunction with all stakeholders in the general population. In addition, the needs for intersectoral collaboration among both governmental and non-governmental organizations as well as the private sector were stressed.
- A recent Ugandan study (17) compared community-identified health problems with the more formal WHO Global Burden of Disease assessed health priorities. Using nominal group techniques, interviews, and group discussions with both community members and leaders were carried out in a district. It was found that the community-perceived health problems were similar to those identified by the global burden of the disease study. Prevalence, mortality, social and cultural stigma were included in the ranking. Poverty and lack of knowledge were the perceived major causes of ill health in the community.

The burden of disease is estimated by a combination of time lost due to premature mortality and time lived with disability calculated as "Disability Adjusted Life Years" (DALYs). Knowing the cause of DALYs, global and regional ranking lists can be calculated to identify both national and district health problems. For example, of the top 27 infectious diseases based upon the Global DALYs burden, seven were diseases where there was a significant zoonotic component (i.e., the animal transmission cycle is important and that veterinary interventions could reduce the burden of disease. These seven diseases were trypanosomiasis, schistosomiasis, leishmaniasis, Chaga's disease, Japanese B encephalitis, hookworm, and hepatitis E virus (5).

Unfortunately, basic information on zoonotic diseases is lacking such that quantitative assessments of many zoonoses is difficult. Take rabies, for example, for which WHO data is available. A total of 1.1 million DALYs can be calculated adding this disease to the above list of seven diseases. Rabies is a preventable disease in humans and domestic dogs so, theoretically, a very high proportion could be prevented through veterinary interventions. The major advantage of DALYs is their regional or national ranking, as obviously, there is very considerable variation. It should be kept in mind that the relative importance of zoonoses will differ among the population and generally be higher for livestock keepers, agricultural wage laborers and consumers of livestock products than the general population.

UPCOMING TRENDS AND DESIRED SOLUTIONS

The WHO study group (2) in their recommendations stressed that community participation should play an integral role in the implementation of VPH programs and that local communities should be empowered to take ownership of, and manage their VPH activities. The following findings were considered important:

- Encourage participation by all stakeholders including minority groups, women and children in decision-making at the local level;
- Ensure that social and gender analyses are incorporated into VPH programs;
- Involve both the private sector and local non-governmental organizations;
- Establish multi-sectoral and interdisciplinary committees at local level for sustainability;
- Build on indigenous knowledge by involving and training where necessary local influential people;
- Extend and incorporate VPH activities into existing primary human and animal health care services.

The 2002 WHO/FAO/OIE Electronic Conference on VPH (18) received a number of recommendations relating to community effectiveness of VPH. Examples were cited where attempts had been made to reduce meat-borne zoonoses, such as cysticercosis by proper cooking and use of toilets (latrines). Later revisits showed no significant changes suggesting extension methods were failing because of cultural and other factors. Unless people truly wanted change no improvement is likely to occur. The need for careful evaluation of pilot studies before embarking on a major community effort was also mentioned. Recognition of general differences between men's' and women's' roles in livestock production is also critical in many societies.

Many changes are foreseen in the next century, which will present new challenges for VPH (2). These include:

- Changes in farming methods. These included changes in the intensity of livestock production, expansion of industries, such as aquaculture and game farming, use of new biotechnologies, and larger volume high density livestock operations. The latter were likely to result in environmental hazards especially for workers.
- Change in food production, such as newer technologies and more emphasis on biosecurity and also food safety guarantees.
- Movement of animals and trade in animal products as well as human travel will increase. Notwithstanding that this can result in zoonotic disease problems, overall the results have been beneficial to importing and exporting countries.
- Interactions between humans and animals will change especially with increasing urban and peri-urban animal populations.

- Natural and man-made disasters, often weather-related, may involved both livestock and companion animals.
- Privatization of veterinary services, especially in developing countries together with reduced governmental funding will threaten many traditional VPH services. At the community level, how to balance VPH, which is essentially a “public good” activity poses a challenge in terms of funding an appropriate balance.
- Population increases continue to result in increasing organization such that by 2020, over 50% if the world’s people will be living in urban areas. As rural people migrate to cities, they often bring their animals with them.
- Climatic changes, such as increasing temperatures, affect vector-borne disease agents which result in increasing human health risks in the long term.
- HIV/AIDS although probably of zoonotic origin affects VPH in several ways including increased risk of secondary zoonotic infections and its indirect effect on lowering agricultural productivity especially in rural areas, due to premature morbidity, and mortality.
- VPH research is often handicapped by a lack of basic knowledge of host-parasite interactions and even for many zoonotic diseases, the route(s) of transmission to humans are unclear. While a plethora of new laboratory techniques are now available for diagnosis and surveillance, these techniques are of limited use unless prior epidemiologic research has been undertaken to identify the important questions to be answered.
- Curricula of many veterinary schools have not kept current with the need of society and communities for a scientific evidence-based approach to VPH.
- While primary and public health services are continually changing, in many instances, the changes have not always been for the better. Laurie Garrett’s writing in the “Betrayal of Trust—The Collapse of Global Public Health” (19) describes through a series of examples an alarming deterioration of public health services especially in a developing countries and those in transition. While VPH may only be a relatively small component of overall human health maintenance and promotion, it is still critical in less fortunate countries especially at local levels.

A joint WHO/FAO publication, “Guiding Principles of Planning, Organization, and Management of VPH Programs” (20), describes in detail the overall scope and administrative design of an idealized system with special reference to technical strategies in specific areas. In 1995, PAHO published a useful guide on the development and strengthening of local health systems specifically in relation to VPH (21). Some key points from this report were that there is no standard formula for the size and scope of local community health systems. Both depend on the political and administrative contexts in each country and on other factors such as geography, communications, transport, population density, etc., political and administrative decisions also constitute a basis for a local health system. Decentralization was seen as a prerequisite for community participation since without this the power relationships and space for decision-making among users and providers of health services cannot exist. Community participation in local health system as a social process seeks to make individuals and groups the architect of their own prospects for health. The downside of decentralization is that a national disease control program for example, may be adversely affected if central control is lost.

The degree of VPH community participation varies and is strongly influenced by social and cultural factors. In general, community participations can be reconciled more easily with health needs in urban and peri-urban areas than in rural areas. In part, this is the

result of better communications and greater access to local health services but given the special position that domestic animals occupy in the social and economic structure of rural areas, VPH is integral to the overall well-being of rural families and agricultural communities.

Community participation is now being widely promoted as an important feature in the delivery of veterinary services, especially in developing countries (12). There are differing types of community participation ranging from so-called 'manipulative' participation through to true 'collective' actions, and this variation may have hindered the effectiveness of how community participation should be used and what it might deliver. A comparison of community-based animal health projects that encourage interactive participation and self-mobilization were most likely to result in sustained benefits for livestock owners.

Integral to the success of community participation has been the increasing use of Community Animal Health Workers (CAHWs) in developing countries. Two recent publications describe in detail how they can be used to improve veterinary services (22) and also how concerns relating to perceived threats to veterinary services, drug issues, economic, and related legal issues are being resolved (23). Overall, it is fair to state that CAHWs have the potential to make very significant contributions to both small holders and governments alike but to realize their full potential a sound regulatory and enabling environment will be needed. Policy and legislative reform to support veterinarian-supervised CAHWs is underway in a number of African countries and, at international level, an ad hoc committee of the OIE is reviewing the role of para-veterinary professionals (including CAHWs) in veterinary service delivery (24). Guidelines for the control and regulation of CAHWs according to the principles of the OIE Code are also available (25).

Community Health Workers (CHWs) in various forms have long been used and valued in the human health in both developed and developing countries. In the former, they are well recognized as having an important and successful role in primary health care. But in developing countries, problems have arisen especially in translating the gains of local projects into nationwide programs. It appears that administrative aspects, rather than medical or technical aspects have been limiting factors (26). CHWs generally function as part of the district health management team but they may be employed by religious and other non-governmental organizations. How effectively CHWs are involved in VPH programs is poorly documented as is cooperation between CHWs and CAHWs.

In isolated communities, there have been innovative initiatives to combine both human and animal services. An example from Chad (27) showed that human and animal health status of nomads and their livestock (camels) could be assessed simultaneously using a cross-sectional study design. Perceptions of disease priorities were also carried. The results showed potential synergies between veterinary and public health services and confirmed that relationships between people and their animals is highly complex and reflects deep-seated cultural values. Other anecdotal evidence suggests that improving the knowledge and practices of women regarding health care of newborn livestock can translate into improved health care of their own infants.

THE WAY FORWARD

If VPH community-based systems are to be effective, especially in countries in transition and developing, better epidemiological information is a prerequisite. For example, the

clinical and epidemiological features of human campylobacteriosis in developing countries especially where there is a high prevalence of HIV/AIDS appear to differ from developed countries (28). Ideally, qualitative data is needed for priority setting and at least semi-quantitative data for risk factor identification and assessment. Although PE has not been widely-used, especially by veterinarians and physicians in the public sector, there are many opportunities to promote its wider development and application. When combined with conventional medical and veterinary diagnoses, participatory approaches can assist both professionals to gain a better understanding of VPH issues and dynamics. This will necessitate training in PE at the community level. Given the variation in degree of communication and cooperation between physicians and veterinarians even in the public sector, joint training should be an advantage if a participatory epidemiological approach is to be successful.

CHWs and CAHWs have similar missions except the species of interest differed. Given the need for interdisciplinary collaboration, it would seem important to determine by way of pilot studies if some VPH cross-training could be developed and its application evaluated in selected countries and districts. CHWs and CAHWs should also be included in pilot PE/VPH studies to provide guidance on local attitudes and behavior, interview techniques selection of key informants, background information as well as any disease/problem specific information. Therefore, it is proposed that several PE initiatives in countries with differing VPH problems be developed to determine local priorities as well as local knowledge, attitudes and practices.

Each country initiative would be developed by a team of physicians, veterinarians, and other health professionals from both the public and private/non-governmental sectors. This group would be responsible for selection of community/districts (both urban and rural) to be included. Specific PE projects would be developed and field-tested. The role of poverty as a risk factor for zoonotic diseases should be explored in depth. All local resources in the community should be well-identified such as laboratories, clinics, abattoirs, etc. Geographical mapping techniques would be an integral component of these studies.

Once the local priorities have been established, the potential to focus on groups of zoonoses where there is a common host or transmission link(s) could be explored. For example:

- dogs in rabies and hydatidosis
- cattle in brucellosis, tuberculosis, and leptospirosis
- vector borne zoonotic diseases
- food borne pathogens of animal origin, such as cryptosporidiosis, salmonellosis, and campylobacteriosis

Once the local epidemiological situation with regard to animal husbandry practices, social customs, and beliefs are better understood, specific control/prevention programs at the local level can be developed in conjunction with CHWs and CAHWs. Test projects should then be developed using these workers to determine how best such programs can be introduced into test areas. Control areas where no program is present should be used for comparative purposes.

The costs of such PE initiatives are indeterminable at this stage. Local political support would also be important for their success. The economic costs and benefits of these 'pilot' programs should be carefully monitored in relation to their long-term sustainability.

CONCLUSIONS AND RECOMMENDATIONS

There is general agreement that community-based VPH programs are urgently needed especially in developing countries, not only to protect and improve human health but also to ensure that livestock production is healthy and economically viable. PE can play a major role in determining disease priorities, decision-making and control/prevention/eradication options. This will also require that interventions to reduce the risk from zoonotic or other animal-related problems are compatible with sustainable livestock enterprises. The critical elements needed for a successful VPH program will depend on a careful multidisciplinary review and ranking of the human health and veterinary resources. Individual owner and community responsibilities should be clearly identified.

Well-designed participatory epidemiological studies should be used to accomplish this objective. PE is designed to rapidly and reliably generate epidemiological intelligence on complex issues. In developing countries especially, we do not always have the luxury of access to sophisticated laboratory based technology. Therefore, clinical signs both human and animal together with simple field tests can provide a preliminary basis for PE studies.

Results will need to be evaluated and validated by professional medical and veterinary investigations. Preferably, these 'pilot' VPH program developments should be carried out in a number of communities in several countries representing a range of zoonotic disease and related-VPH problems.

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SURVEILLANCE METHODOLOGIES FOR ZONOTIC DISEASE AT COMMUNITY LEVELS

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INTRODUCTION

For the purpose of this paper, surveillance is defined as the 'systematic' collection, analysis, interpretation, and timely dissemination of health data for the planning, implementation, and evaluation of health programs. It is essentially descriptive in nature, requires standardization of data recording, and case definitions of the event(s) for surveillance, and has multiple uses. Distinctions between 'active' and 'passive' (monitoring) surveillance are often made. Recent texts on Public Health Surveillance (1) and animal disease surveillance (2) have been published. Methods for the evaluation of epidemiological surveillance systems are also available (3). Some of the special issues relating to surveillance in developing countries have also been described (4).

Surveillance is an essential function of Veterinary Public Health (VPH). Zoonoses are the primary concern; although, increasingly animals are being utilized as sentinels for both communicable and non-communicable human disease. There are significant deficiencies and disparities among national surveillance systems for zoonotic disease (5). Several efforts have been made to coordinate surveillance activities at the international level through WHO, such as the rabies network, Rabnet (6), Salmonella Surveillance Network (7); and also through OIE List A and B animal diseases (8), some of which are zoonoses. Other informal sources of zoonotic disease information have been developed such as ProMED-AHEAD (9), which permit veterinary public health professionals around the world to communicate rapidly and search archives of selected zoonotic diseases.

STATE OF THE ART

While zoonotic agents includes a multitude of pathogens and display a wide range of diseases with varying clinical and epidemiological features, there is a strong argument for grouping these diseases together. For successful control, both veterinary and medical input is required.

The key technical requirements of an effective community based zoonotic disease surveillance system are:

- Sensitive: capable of detecting zoonotic disease events.
- Specific: capable of identifying the zoonotic disease

In addition, systems should be timely, representative, acceptable, flexible, cost-effective and simple.

Zoonotic diseases can be detected at community levels from both human and animal information sources. Usually, these are independent although there are some examples of coordinated surveillance programs (see later).

The district is the most peripheral unit of local government and administration and is often referred to as the 'community' (10). The actual names used to describe the district vary by country but, typically, a district has a population of 100,000 to 300,000 persons. At the district level, surveillance of human zoonoses is usually focused on two situations: epidemic and endemic disease.

The population of animals obviously will vary depending on whether it is a rural or urban district and may include livestock, recreational, companion, and feral animals as well as wildlife including avian species. Within districts, there usually will be a number of physicians and veterinarians together with community health and animal health workers. In most districts, there will be separate governmental human health and veterinary health (usually within an Agricultural Ministry) district offices. In developing countries, there may also be cooperatives, religious, and other non-governmental organizations involved in providing human and animal health services.

Both Human and Animal District health management services would be expected to have fairly detailed information on the district's history, physical and climatic characteristics, community organizations, people's occupations, and organization of the local government. The geographical distribution of towns, villages, roads, and topography should also be known but actual details will vary. It would also be expected that the Human Health Administration should have a reasonably accurate knowledge of the population size, age, and sex structure; but, in isolated areas or where there are nomadic/transhumant populations, this is unlikely. The Veterinary Administration should have knowledge of the number and location of livestock owners but, especially in developing countries, the animal population may be poorly enumerated. In the case of dogs, for example, apart for owned animals, total numbers may be unknown. Similarly with livestock, numbers are often only vaguely known; especially if there is a tax on animals. In many developing countries, herds and flocks are often commingled making the concept of a single herd or flock arbitrary.

Both Human Health and Veterinary Services should have reasonable knowledge of the common causes of mortality, morbidity, and epidemic diseases as well as the important underlying health problems, such as food/feed availability, housing, water supply, excreta disposal, and the presence of hospitals (with or without laboratories) as well as outpatient clinics, private practitioners, universities or other sources of information. Finally, some knowledge of overall health status indicators, such as nutritional status, morbidity, and mortality, would be expected.

Information on human zoonoses is usually based on official (i.e., notifiable) reports as seen in outpatients in clinics, hospitals, or by physicians. The potential for under-recognition or under-reporting is high. If more accurate information is required, especially on zoonoses of high-frequency or severity, it may be necessary to expand the sources to include in-patient hospital records, laboratory records, and death certificates. Ultimately, a dedicated epidemiological investigation may be required to measure morbidity and mortality impacts of specific zoonotic diseases at community levels, together with their seasonality and geographical location, and other risk factors.

For animal zoonotic information, an initial question is whether the pathogen results in the death of the host, e.g., rabies, or is present in a subclinical form, such as echinococcosis, recognizable only at necropsy or slaughter or *Salmonella* infection, only identified by bacteriological culture. Other zoonotic pathogens, such as *Brucella sp.*, *Leptospira sp.*, and *Listeria sp.* may cause abortion but this is a non-specific sign and requires bacteriological/serological identification and confirmation.

There are many potential sources of animal zoonotic surveillance information in a community. Experienced livestock owners are often good at describing signs of specific diseases and should not be overlooked. Paraveterinarians, and community animal health workers all have varying local knowledge of zoonotic disease but unfortunately their information especially in developing countries may not be well integrated with that of the government services. Also laboratory confirmation may be lacking.

Regional or local diagnostic laboratories and local meat slaughter/abattoirs are also a useful source of information, especially if the zoonotic disease is manifested by gross lesions, e.g., *Mycobacterium bovis*. Finally, universities and research institutions may have on-going or prior investigations.

The USA has an extensive network of veterinarians involved in zoonotic disease surveillance and control at the central (Federal), state, and, in some cases, local (county and city) levels. The majority of states have a designated Public Health Veterinarian, who has a primary role in surveillance. Astute medical and veterinary clinicians are the first line of defense for the identification of zoonoses. Infection control professionals also play an important role in emergency departments of hospitals, especially in detecting unusual disease clusters. Recent examples include Lyme disease, hantavirus pulmonary syndrome, anthrax, and West Nile Virus Infections. A National Notifiable Disease Surveillance System is based on all states reporting infectious diseases, including zoonoses, to the Center for Disease Control (CDC). In 1998, the CDC implemented an Emerging Infections Program designed to collect population-based surveillance data from nine specific sites. One of these initiatives, FoodNet, conducts surveillance on *E.coli* OIS:H7, *Salmonella*, *Campylobacter*, *Listeria*, and other zoonotic pathogens. This program has been successful in tracking trends and defining risks factors for food-borne illnesses (11).

The following are two current examples of VPH surveillance at Community levels in the USA:

1. West Nile Virus (WNV) Surveillance in California (12).
This is part of a wider California Vector-Borne Disease Surveillance System, which includes plague (rodents and carnivores), hantaviruses (rodents), Lyme disease, and arboviral diseases. The WNV surveillance program is a sequential system involving sentinel chicken flocks, mosquito trapping, dead bird collection (especially crows), and suspected human and equine meningitis/encephalitis cases. Since its first detection in 1999 in the New York region, WNV has spread across the United States to reach California this month (October 2003) with the first confirmed case in Riverside county. At the local level, weekly surveillance reports have been publicized in the media as the level of viral activity increased in the southern counties.
2. Multi-State Outbreak of Monkey pox in the USA (2003) (13).
This outbreak occurred in six states and involved over 80 human cases acquired from prairie dogs purchased as pets. The prairie dogs were infected from

imported African rodents including Gambian rats. This was the first recorded outbreak of monkey pox in the Western Hemisphere. The epidemic was brought under control promptly through good local surveillance and epidemiological investigations, including tracing suspected animal movements forward and backward. A feature was the excellent communication between local, state, and Federal health authorities including the National Association of State and Public Health Veterinarians.

For further examples of local and regional zoonotic disease surveillance in the United States including BSE, avian influenza, see reference #14. Current U.S. surveillance systems include active surveillance to detect known pathogens and passive systems for more generalized monitoring. One of the lessons learned has been the need for better communication and collaboration among veterinary, human, and wildlife health professionals. Additionally, vertical collaboration between local, state, and federal staff is critical, especially preparedness to recognize the unexpected.

The recent FAO/WHO/OIE-sponsored electronic conference on VPH and the Control of Zoonoses in Developing Countries (15) included a section on the status of human/animal health surveillance for zoonoses. The conclusions from contributors indicated the following:

- In many countries, human and animal health data on zoonoses was collected independently
- Too much information about too many diseases and conditions was collected under the category 'nice to know'
- Reports were based on numerators only.
- There was a lack of uniformity and complexity of forms
- Local staff had little or no idea how surveillance data was used and were not provided with feedback
- Endemic diseases tended to be regarded as "status quo" and not reported
- Data were aggregated and tabulated but seldom analyzed or interpreted (so called "data morgues")
- Reports of zoonotic disease were not given priority accorded to other human diseases
- There was a disincentive to report incidents if it resulted in livestock trading bans
- Lack of a local information network
- Lack of trained epidemiologists
- Internet communication was often unreliable and expensive
- Failure to utilize public domain software, such as Epi-Info and Epi-Map.

While it is recognized that it is hazardous to generalize the above problems to all countries, clearly there is an unmet need for improved zoonotic surveillance, especially at community levels.

UPCOMING TRENDS AND DESIRED SOLUTIONS

Surveillance systems for the zoonoses have had to adapt dramatically during the last 10 years as new syndromes and agents are recognized and older agents that were thought to be controlled have re-emerged (5, 14). Many of these examples have been associated with:

- changing farming practices
- increased international trade and consumer habits (e.g., enteric E.coli 0157:H7 and BSE)

- changing environmental conditions (e.g., Rift Valley Fever) from the development of dams as a source of vectors
- pathogens acquiring new properties (e.g., influenza A viruses).

SURVEILLANCE IN RESOURCE-POOR REGIONS

Expense can be a major limiting factor in developing countries as well as deficiencies in laboratory confirmation and modern electronic reporting systems. One solution is to identify critical points where information on either humans or animals can be readily obtained. Resources will then need to be deployed strategically rather than equally in a community. The frequency of surveillance activities will involve a trade-off between field realities and budgeting limitations. Community Human Health and Animal Health Workers can play a major role in these situations. Mariner(31) describes in detail how Community Animal health workers can function in both traditional passive disease surveillance and also in active surveillance and participatory disease searching.

Most developed countries where rabies is endemic have well-defined reporting requirements for rabies and fairly accurate databases on rabies occurrences in humans, and domestic animals are available. Such systems are often impractical in developing countries, however, and the result is a large under-reporting bias.

A method of community-based surveillance for rabies in Kenya was recently described (16). Traditionally official reports of rabies in developing countries have been grossly underestimated compared to the true incidence. This study was carried out in a district in East Kenya. Local residents were trained as rabies workers to monitor randomly selected households. All animal-bites and suspected rabies cases were followed for a year. Primary suspects were animals showing signs of rabies but for which the exposing animal was unknown, while secondary suspects were animals exposed to primary suspects.

Intact canine heads were submitted to a laboratory. In addition, a door-to-door dog census was carried out showing that virtually all dogs were owned. Approximately 860 rabid dogs per 100,000 were confirmed, compared to approximately 12 per 100,000 by the previous passive system of reporting. The annual incidence of animal bites (97% of canine origin) was 234 per 100,000 people and the human rabies death rate was 25 per million people/year. It was concluded that community based surveillance was a cost-effective strategy for estimating rabies incidence and epidemiology to inform veterinary and policy decision makers.

COORDINATED SURVEILLANCE OF ZONOOSES

Coordinated surveillance refers to the concept of integrating data from several sources to improve the overall accuracy and usefulness of a database. When dealing with zoonotic diseases, human and animal data on specific diseases will be collected in order to improve investigation of outbreaks, evaluate sector trends and guide decision making in control efforts.

One early example of coordinated surveillance was the integration of echinococcosis (hydatidosis) in Australia. Human data was obtained from field tests. When human notifications were converted to an annual rate per 100,000 for each local government area and compared with dog prevalence, there was a statistical correlation of 0.8 (17). One important measure of the success of the eradication program of echinococcosis in New Zealand was the gradual reduction of new cases in children under five years of age.

Unfortunately, for a disease such as hydatidosis, human data has often been less accurate and harder to collect than animal data in developing countries.

Brucellosis (18), plague (19) and anthrax (20) are three zoonotic diseases where coordinated surveillance can be vital to prompt investigations and control. Local level health care centers, clinics, physicians, etc. will be the first point of contact with an infected patient where data is collected. Even suspect cases may be reported from this level to higher levels such as the district or county. Routine cross-notification between the veterinary and human health sectors should lead to case collaboration during epidemiological investigations.

Zoonotic agents are a major contributor to human food borne illness in both developed and developing countries (21). In the latter, malnutrition is a highly significant risk factor. At community levels there tends to be a high degree of under reporting especially of sporadic cases. Laboratory facilities for accurate diagnosis are also often a limiting factor.

The USA established the FoodNet program in 1997 to develop active surveillance of laboratory confirmed food-borne illness. This collaborative project determines the epidemiology of bacterial, parasitic and viral food borne diseases, as well as investigating links between certain foods and the proportion of food borne diseases caused by their ingestion. Food-borne illness data of zoonotic origin obviously needs to be linked with data on food contamination throughout the food chain. Ultimately this will require a risk assessment process as previous FAO/WHO consultations have stressed (22).

At community levels, surveillance of food borne illness poses considerable challenges especially if epidemiological expertise and laboratory facilities are limited or absent. Unfortunately, many veterinary surveillance activities are based on only clinical disease in animals and are not prioritized relative to risks to human health. Ultimately, surveillance activities at the level of livestock production will need to be redesigned if they are to properly contribute to achieving contemporary food safety goals.

SENTINEL SURVEILLANCE

Sentinel surveillance is used to identify potential epidemics early, investigate changes in the prevalence of endemic diseases or evaluate control programs. An example is the use of selected physicians to report on weekly cases of patients seen with influenza-like symptoms. Free-flying birds or caged chickens have long been used to identify arbovirus activity by periodic serological examinations. A case of human brucellosis occurring in a brucella-free district may also be a sentinel for persisting or re-introduced ruminant or porcine brucellosis. Selection of sites, frequency of sampling, and types of tests need to be determined in relation to any sentinel zoonotic surveillance program.

INTEGRATED (RISK-BASED) SURVEILLANCE

Morris, et al. (23) have recently proposed a new approach to surveillance designed to take advantage of geographical information systems for spatial data and incorporate them with temporal data to develop a structured and targeted system. It is proposed that surveillance strategies should be classified as follows:

- Scanning surveillance to provide an overview of the national disease situation and of regional variation within a country, with an emphasis on patterns of overall disease

occurrence and detection of morbid changes in disease patterns within particular animal populations.

- Targeted surveillance to answer specific questions of importance on diseases determined to be of special interest.
- Food Safety surveillance targeted at issues related to safety such as zoonotic pathogens which do not usually cause animal disease.
- Surveillance as a component of disease control activities, including both epidemic or endemic situations.

These elements would then be combined in various ways to form an integrated surveillance strategy. Ultimately this approach will relate surveillance to the nature and scale of particular risks.

A somewhat similar Canadian initiative is in progress (24) based on surveillance of risk factors that may precede public health events referred to as “surveillance of exposures”. This approach has been justified on the basis of public health, bioterrorism prevention and safe food production. Health Canada developed the Canadian Integrated Public Health Surveillance (CIPHS) project. Pilot studies are underway to evaluate the use of human, animal, food and environmental data including various agencies such as the Laboratory for Food Borne Zoonoses. Eventually “on-farm food safety” program data and Animal Health Laboratories data will also be included to form a national network for veterinary public health.

SYNDROMIC SURVEILLANCE

This is a relatively recent development defined as the surveillance of disease syndromes (groups of signs and symptoms) rather than specific clinical or laboratory defined diseases (25). A major impetus for syndromic surveillance has been the threat of agents of bioterrorism surveillance of presenting symptoms of illness in emergency departments or clinics could be used to detect a mass release of a biological agent earlier than would be possible through more traditional methods. Syndromic surveillance has been used extensively in major eradication programs (e.g., smallpox and rash with fever, poliomyelitis and acute flaccid paralysis, Rinderpest, and Stomatitis-Enteritis). These systems are also being evaluated to detect epidemics of influenza and some gastrointestinal illnesses earlier than would otherwise be possible. A key issue will be how sensitive and specific this system is without resulting in too many false alarms. Clearly, accurate electronic and geospatial coding will be critical if this system is to be useful as an early warning surveillance program.

In summary, a range of newer techniques and ideas that may be adapted to improve community level, surveillance of zoonoses have been presented. The challenge is to evaluate how these may be incorporated into new or existing systems, especially in developing countries.

THE WAY FORWARD

Infectious disease surveillance in the USA was described about 10 years ago as a “crumbling foundation” (26). Since then as a result of recognition of emerging and re-emerging zoonoses together with the actual (e.g., anthrax) and perceived threats of bio and agroterrorism, considerable improvements have been made. However, zoonoses surveillance systems are still dangerously deficient in many regions and especially at local/community levels.

For example, investigations into the recent Severe Acute Respiratory Syndrome (SARS) in humans have shown that early cases were associated with animal markets in China. Similar corona viruses were detected in at least two wild animal species in a market, and antibody studies in people working in markets showed a higher prevalence than the general population, clearly suggest an animal source (27).

As indicated earlier, collaboration between physicians and veterinarians in the surveillance, investigation and control of zoonoses has been problematical in many countries. To correct this situation, especially at community/distinct levels joint service-oriented field epidemiology training programs should be developed. A useful WHO model for training at the health district level in Africa is available (28) but a specific zoonoses training module is needed for joint medical/veterinary epidemiological investigations.

In developing new surveillance programs for zoonotic disease at community levels, the model of using participatory epidemiological techniques in all components of Rinderpest surveillance may be very useful (29). Although Rinderpest is not a zoonosis, communities have knowledge, concern and specific terminology for zoonoses such as rabies or anthrax. Knowledge, Attitudes and Practices (KAP) studies of zoonoses should be carried out prior to developing surveillance programs to ensure that it is designed to be compatible with local needs.

Given the critical need for developing better models of community level surveillance of zoonoses especially in developing countries, a joint working group of WHO, FAO and OIE experts together with suitably qualified additional experts should be convened for this purpose. The charge would be to design systems based on local input and knowledge that could be evaluated on a pilot basis in regions where zoonotic diseases are a significant burden and where there is a political, professional, and technical support for such initiatives.

CONCLUSIONS AND RECOMMENDATIONS

From the discussion so far, it is fair to conclude that there is no single best model of surveillance of zoonoses at community levels that can be recommended. Nor is it likely, given the great differences in resources available and the priority ranking of diseases, that one or should be developed. However; given the experiences of developed countries and some of the problems facing developing countries and those in transition, the elements of an idealized community surveillance program should include the following:

- Only those zoonoses that are of major importance to the community in terms of mortality, morbidity and long-term disability should be included.
- Both epidemic and endemic zoonotic diseases should be included based on their actual or perceived burden of disease impact.
- A prerequisite should be to develop a framework for the collaboration between human health providers at all levels in the community. This would include both governmental and non-governmental representatives. The potential to include both community human health and animal health workers should be tested.
- Clear objectives should be developed for the program so that it is understood how the data is to be used, how privacy will be maintained and what are the expected results.
- Both urban and rural areas should be included.

- Criteria for case definitions (e.g., clinical, suspected, probable and confirmed) should be developed based on local resources.
- What if any laboratory resources are available in the community for both human and animal confirmation? Can field screening tests be used?
- A thorough evaluation of all community resources to support any surveillance program including slaughter houses, milk collection system, livestock markets etc. must be carried out.
- If specific risk factors for zoonoses are known with some degree of certainty, based on historical, enthoveterinary knowledge or recent epidemics, these factors should be included when designing a program.
- Can sentinel populations be included?
- Develop a simple flow chart for the surveillance program to ensure that errors are minimized and quality control maintained.
- Develop a method for regular summarization and interpretation of data and ensure that this is promptly disseminated to all participants especially those with a “need to know.”
- Pilot test the surveillance system in several areas.
- Periodic surveys may be useful to complement a surveillance program for zoonoses.
- Periodically evaluate the surveillance program to ensure that it is delivering reliable and timely information.

It is recommended that pilot programs be developed for community based coordinated surveillance programs for rabies, brucellosis, anthrax, cysticercosis and hydatidosis in selected countries. These zoonoses are suggested on the basis of their priority ranking from OIE reports and a perception based questionnaire of participants in the recent FAO/WHO/OIE electronic conference on VPH and the Control of zoonoses in Developing Countries (30).

There is no perfect surveillance system and trade-offs between sensitivity, specificity and simplicity must be made. Each system is unique and requires a balancing of the efforts and resources put into the system. At the community level one should always keep in mind that information collection systems without any actual or perceived actions are very unlikely to be sustainable.

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Public and private aspects of Veterinary Public Health delivery systems at community level and monitoring and evaluation of VPH systems

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Introduction

Veterinary Public Health (VPH) is an essential component of public health and incorporates various types of cooperation between the many relevant disciplines involved in the interaction between people, animals and the environment they share. VPH programmes should not be viewed as operating in isolation, but as making an important contribution, as part of an intersectoral collaborative approach, to the improvement of a country's infrastructure, economy and rural development. Delivery of VPH services at the community level must take into account the needs and desires of the communities being served as well as the increasing privatization of veterinary services. Although VPH should be considered as a "public good", in many countries financial constraints and increased awareness of inefficient government activities have led to the privatisation of veterinary services and thus the transferal of resources and responsibilities for provision of VPH and other veterinary services from the public to the private sector. Privatisation of VPH services in many developing countries has become a constraint for poverty alleviation, environmental sustainability, food safety and zoonoses prevention and control due to the lack of clarity on the appropriate roles of the public and private sectors in delivering VPH services as well as the lack of tools needed for proper evaluation and monitoring to assure quality VPH service delivery. Ways must be found to assist countries by strengthening their capacity to promote changes resulting in policies and legislation that would address the functions, responsibilities and interrelationships of the public and private sectors in VPH activities as well as the establishment of national and local bodies and guidelines for overseeing and evaluating the organisation and provision of VPH services. Development of such capacity would enable the delivery of more efficient, effective and sustainable VPH services for addressing local needs and priorities.

Current situation

Privatisation of VPH and other Veterinary Services

As a result of economic reforms countries throughout the world have been implementing structural adjustment programmes to refocus government services. The objectives of privatisation may include 1) the relief of the financial and administrative burdens of government, 2) improvement in efficiency and productivity, 3) facilitating economic growth, 4) reduction in the size and presence of the public sector in the economy; and 5) helping to meet national economic productivity targets (Babjee, 1996). A major basis for

divestment of veterinary services is improving a government's operational capacity and effectiveness by rationalizing the delivery of "public good" veterinary services such as environmental and public health while divesting those services that can be commercialized and that benefit individual livestock owners. Only the essential, non-contestable tasks remain with the public veterinary service. The overall objective of restructuring veterinary services should be to increase the efficiency and effectiveness of animal health care delivery and as a consequence livestock production, safeguard public health and contribute to national development with the end result being a public veterinary service better able to carry out its redefined responsibilities, a functioning private sector and the necessary supporting personnel and infrastructure able to contribute to the overall objective (FAO, 1997).

Rational delivery of veterinary services usually includes 5 essential components (FAO, 1997):

- Livestock producers and their organisations
- National public veterinary service
- A private veterinary service
- A statutory regulatory body
- A veterinary professional association

with each component having different responsibilities and representing different stakeholders. Indirect involvement of consumers should also be considered.

Under privatisation commercialised goods and services are delivered by the private veterinary sector. This means that a private practice veterinarian should debit livestock owners' the full cost of examination and diagnosis, medicines, economically motivated preventative vaccinations, surgery, husbandry advice, and other services provided, together with his or her time, transportation costs and other service delivery expenses. The criteria for assigning functions to the responsibility of the public or private sector include 1) economic theory, 2) technical judgement by national veterinary authorities, 3) tradition and 4) prevailing sociocultural conditions (FAO, 1997). The public character of goods and services does not imply that the body providing these good or services should be public. Tasks identified as public or shared responsibility can be contracted out to the private sector (private practitioners, NGOs and membership organisations, acting with registered veterinarians and other animal health care providers) under public sector monitoring and supervision. Public contracts may also be used to expand the extension role played by private practitioners beyond their normal provision of husbandry advice. Awarding government contracts by tender to private practitioners to undertake public or shared responsibilities serves as an inducement to leave government service and offers a potential remuneration, while assuring that essential services are performed (Fassi-Fehri & Bakkoury, 1995).

Zoonoses and the Poor

The burden of zoonoses falls disproportionately on poor people with poverty, and unsanitary living conditions associated with poverty, being considered potential risk factors for zoonotic and food- and water-borne diseases in many areas of the developing world (Perry et al., 2002). The low standards of education and veterinary public health services commonly associated with poverty increases the risk of transmission of zoonoses and food-borne diseases. There are many features of zoonotic diseases that render them particularly important to the poor, be they livestock keepers, labourers

working with livestock or engaged in agricultural production, traders of livestock products, livestock owners consuming products from their animals or non-livestock owners consuming the livestock products of their neighbour or of other poor communities. The close association between poor people and animals in large areas of the developing world has been recognised as promoting the opportunity for multiple zoonotic infections (Coleman, 2002). This close contact between domestic livestock and people is particularly noticeable in rural settings associated with traditional production systems though the problems of zoonoses in peri-urban settings is increasing due to the popularity of peri-urban livestock keeping. Domestic animals (including cattle, goats, sheep, pigs, poultry, and dogs) of poor people can be important reservoirs of zoonotic diseases that impact on their health, either through direct or vector-borne transmission routes. Moreover, in certain settings, the contact with potential zoonotic reservoirs includes wildlife as well as domesticated animals. The shift of VPH services to private-sector delivery in these resource-poor farming communities may have important consequences for the transmission of zoonoses as the interventions may not be affordable for the population being served (Belino, 1992).

Delivery of VPH Services in Remote, Marginalised Communities

Remote and marginalised livestock populations are generally underrepresented in service delivery and information systems. As a result, these populations suffer from the direct lack of services and pose epidemiologic risks to the national human and livestock populations as a whole. The absence of current surveillance information on the human and animal health status of remote populations may also adversely affect export trade. Effective delivery of goods and services in low potential areas presents managerial and public relations challenges requiring continued experimentation and evaluation of delivery schemes, infrastructure development and in-service training (FAO, 1997). Since the profitability and therefore the supply of private veterinary services is governed by several factors arising from economies of scale, such as the size of the livestock enterprises in the locality, the nature of potential or actual diseases, and the types of animals raised in the production systems, in areas where private veterinary work is unprofitable or where other types of market failure occur, economic or social concern usually makes some type of public intervention necessary. In such areas, purely commercial private goods and services are often not readily accessible and both private and public sector services have to be subsidized by the government if they are to be made available, thus transfer of VPH services from the public to private sector is done selectively in these areas. Public sector responsibilities in these remote, marginalised communities can be conducted effectively through the use of contracts with private veterinarians and para-professionals (e.g. community-based animal health workers, paravets, animal health technicians, animal health assistants and auxiliaries) for their delivery thus making essential services available while enhancing the financial viability of private practice in low-potential areas (Umali et al., 1994).

Oversight of VPH Services

Statutory bodies established for examining, certifying, registering and disciplining those providing VPH services oversee quality assurance for the delivery of VPH services in many developed countries and as such are responsible for identifying strengths, weaknesses, opportunities and constraints of the VPH delivery system. These government bodies usually obtain input from the private sector (e.g. producers, processor, consumers and veterinarians) for formulating policy and drafting regulations aimed at quality control which must be continually reviewed and revised as needs arise. Such councils are usually composed of representatives from various stakeholder groups

including the public veterinary service, public health service, livestock producer groups, private veterinary practitioners, consumer groups, pharmaceutical industry associations, etc. Their activities are supported by associations of the various stakeholder groups and enforced through legislation. Unfortunately many countries, especially developing countries, lack VPH oversight bodies making evaluation and monitoring of their VPH delivery systems very difficult due to the lack of established principles and guidelines and their enforcement (Correa Melo & Gerster, 2003). This often leads to confusion concerning the roles of the public and private sectors in providing VPH services often leading to ineffective and inefficient delivery. In order for privatisation to work the VPH services must recognize the need to shift to a regulatory and monitoring role to ensure the provision of an enabling environment for strengthening the structure and functions of the VPH system.

Future trends and desired situation

The World Bank anticipates that the major forces driving global livestock sector during the next 20 years will include the growing demand for milk and meat especially in developing countries, changing functions of livestock, changing international and national socioeconomic policy frameworks and changing consumer perspectives (de Haan et al., 2001). Zoonotic and foodborne diseases are also expected to increase during the coming years, especially in developing countries, mostly due to the increasing industrialisation of livestock production and processing as well as environmental (both natural and anthropogenic) and demographic changes that promote epidemic expansion of hosts and geographic range (de Haan et al., 2001; Kaferstein & Adbussalam, 1999; Childs et al., 1998). As awareness of zoonotic pathogens grows there is an increasing demand among producers and consumers for VPH services to protect animal and public health and the safety of products of animal origin for both domestic and international markets. The marketplace is thus driving change along the entire “farm-to-table” chain such that VPH services must show that their structure, organisation, resources and scientific and technical capabilities are in line with the needs of their own countries, and those of countries or groups of countries with which they trade in order to assure both their own people and their trading partners that the animals and animal products that they produce and market do not constitute a risk to human or animal health, or to the environment (Correa Melo & Gerster, 2003)

The roles of the public and private sectors in VPH service delivery are dictated by the choice of hazard management which is usually based on research and analysis to provide evidence (valid data) for decision-making and evaluation in relation to other priorities. Novel quantitative and qualitative methods are being used to identify, monitor and assess zoonotic and foodborne hazards to determine whether and what interventions are needed. Thus VPH programmes should involve a partnership between government, industry and consumers with the roles of each in situation analysis and intervention clearly defined to enable effective communication, collaboration and coordination.

Risk analysis

The discipline of risk analysis has emerged in recent years in response to an increased need to deal systematically and openly with risk issues using scientific evidence and socioeconomic analysis to select optimal points of intervention for disease control and determine the cost-effectiveness of various risk management options (WHO Study Group on Future Trends in Veterinary Public Health, 2002). VPH systems should be risk-based (i.e. consisting of risk assessment, risk management and risk communication) so

that the measures enforced to reduce zoonotic and foodborne illnesses are justified by the actual risks involved, ensuring that resources are directed to hazards posing the most serious threats to public health and where potential gains from risk reduction are greatest. Risk analysis depends on sound scientific knowledge and effective reporting systems requiring the involvement of various sectors to share responsibilities for reducing zoonotic and foodborne hazards. Risk assessment is based on independent scientific research and should be a separate function from risk management, which is based on government regulation and control of hazards and thus political in nature. Risk analysis is necessary to identify data gaps and research needs and focus practical risk management and communication strategies that best address important country-specific veterinary public health problems

Appropriate surveillance and monitoring of zoonotic agents in the environment and along the food chain are critical elements to support risk assessment and identify, prioritize and monitor risk management actions (WHO, 2002). The implementation of sampling schemes at key points in the community, e.g. slaughterhouse and hospitals, is indispensable to receive valid information. An infrastructure has to be developed for reliable and standardised epidemiological data collection and their evaluation, which includes all stakeholders. Where surveillance systems are lacking, targeted surveys on human and animal health may be required. The lack of basic information on zoonotic diseases is a major constraint to making quantitative assessments of the relative importance of these diseases. There is often a lack of detailed country-level data resulting in under-reporting of these diseases making an assessment of the true scale of zoonotic diseases difficult. The problem of under-reporting is most serious in rural areas where the levels of poverty restrict treatment-seeking options, and the health facility infrastructure tends to be grossly under-funded. For these reasons, it is believed that the number of the zoonotic cases recorded at formal health facilities is only a fraction of the true number of cases (Coleman, 2002).

All measures available and their relative contribution to reducing risks to human and animal health should be taken into account when considering the different risk management options for zoonotic and foodborne pathogens (WHO, 2002). Also important is an understanding of the underlying epidemiology of zoonotic diseases when determining the practical and effective intervention strategies that should be implemented. Knowledge of the extrahuman reservoirs of these pathogens is essential for understanding the epidemiology and potential control of human disease. For practical reasons, surveillance of zoonotic agents too often relies on the identification of human cases. Understanding extrahuman life cycles and predicting zoonotic disease outbreaks may permit control activities targeted at several points in the cycle of pathogen maintenance before human infection actually begins (Childs et al., 1998).

In addition to specific control actions, good farming practices are critical for reducing the prevalence of a number of zoonotic agents. Effective risk communication to all stakeholders in the risk analysis is essential to the success of implementing risk management strategies. The distribution of the results should ensure close cooperation of all parties involved. Risk communication poses a unique challenge, particularly in developing countries, because an effective infrastructure is needed to enable VPH strategies to be developed, communicated to, and implemented by producers (WHO, 2002).

Burden assessment

The allocation of limited resources for disease control should be guided by an understanding not only of the cost-effectiveness of interventions but also the magnitude of the burden imposed by the disease that is to be controlled so that the relative importance of the hazard can be assessed in comparison to other issues (Coleman, 2002). The impact of zoonotic diseases extends beyond human public health to include economic losses associated with the infections in both the human and animal hosts. The economic issues associated with zoonotic infections in human hosts include direct costs spent on seeking diagnosis and treatment, the cost of treatment, and indirect costs in terms of time away from work activities and the opportunity costs of caregivers. The livestock productivity effects include direct production losses as well as the cost of limitations to market access of agricultural products due to trade restrictions or prohibitive costs in meeting production guidelines. In addition farmers can incur control costs and livestock infections may also impact on other agricultural production such as crop production that depends on manure and/or animal traction for cultivation (Coleman, 2002). These economic aspects must be considered when assessing disease burdens and designing control measures. The magnitude of economic impact depends on the pathogen and the severity of the disease caused in its respective hosts. The pathogenicity of zoonotic pathogens should be clarified by monitoring host populations and comparing pathogens from human and livestock clinical zoonotic illnesses with the other pathogens in the area (WHO, 2002). The relative importance of the different economic impacts will depend on the nature of the production system, the livestock breeds involved, and other developmental issues, such as the level of access to markets (Perry et al., 2001). Unfortunately the livestock productivity effects of zoonotic infections have in most cases not been properly quantified because many zoonotic infections in animals have been considered to be unapparent or mild, causing little or no animal health or economic concern (Palmer et al., 1998).

Participatory appraisal for needs assessment

Participatory appraisal techniques are increasingly being used to conduct community-based needs assessments on various veterinary public health and other animal health issues especially in rural areas. The participatory appraisal approach makes use of existing quantitative analytical information and uses qualitative participatory intelligence to fill the gaps between available data. Participatory appraisal methods involve understanding how target populations characterise and prioritise veterinary public health issues, enabling local people to play an active role in defining, analysing and collectively solving their own problems. This process allows the beneficiaries to provide direction to the information gathering process empowering them to identify, prioritise and overcome the challenges they are facing resulting in more sustainable development (Catley, A., 2000; Mariner, J. C., 2001). The use of participatory appraisal needs assessments can focus on the following areas (Mariner et al., 2001):

- Veterinary public health related problems and priorities
- Local veterinary knowledge and concepts
- Traditional knowledge systems (ethnoveterinary knowledge)
- Disease vectors and reservoirs, epidemiological understanding
- Treatment
- Appropriate interventions
- Community structure, decision making and entry points

Participatory appraisal methods have been found to be useful for developing good relationships with communities, understanding local knowledge and priorities, encouraging community-level problem solving and in general are relatively inexpensive and flexible (OAU/IBAR, 2001). These approaches and methods have an important role in defining the perceptions and needs of communities resulting in more effective delivery of public and private VPH services.

Community-Based Animal Health Workers

The changing structure of the VPH and animal health service in many countries has resulted in the emergence of another group of players in the delivery of services – the Community-Based Animal Health Workers (CBAHW). CBAHWs are non-veterinary auxiliaries (or para-professionals) informally trained in animal health and VPH to complement official veterinary services. They may be allowed to administer specified remedies and vaccines and conduct certain tests and procedures as well as other services, receiving fees from both public service contracts or on a private basis. CBAHWs have an important niche in the delivery of services in developing countries filling the gap in remote marginalised low-potential areas where conditions are not conducive for private veterinary practitioners though the public veterinary services still have responsibilities for implementing public service mandates in these areas. The effectiveness of the CBAHWs is enhanced and their acceptance by professional service providers increased if they are incorporated within structures that provide technical advice, training, support, supervision and guidance from veterinarians who themselves come under the authority of the official public veterinary services though they may also be linked with private practitioners (OIE, 2003). CBAHWs must survive in the private sector subject to market forces and facing serious constraints such as long-distance travel and low-density livestock populations (McCorkle & Mathias, 1996). The concept of using primarily livestock owners or farmers as CBAHWs who only provide animal health or husbandry services on a part-time basis has proven successful in many countries (FAO, 1997). CBAHWs play an important role in community-based VPH networks (and thus national disease surveillance networks) as a source of information about major disease outbreaks and trends in endemic diseases including zoonoses.

Needs and Recommendations

Many countries, in particular developing countries, are currently unable to effectively deliver VPH services in the face of privatisation due to the lack of: 1) clarity on the roles of public and private VPH sectors, 2) technical and financial resources, 3) an effective institutional framework, 4) trained manpower and 5) sufficient information about the hazards, risks and impacts involved with regard to existing and emerging zoonotic pathogens and food safety problems. In order to strengthen their VPH programmes they will need to concentrate principally on three important areas: legislative frameworks, policies and institutions, and infrastructure and human and institutional capacity building (de Haan et al., 2001). With regard to public and private aspects of VPH delivery and oversight of VPH systems there are several actions that countries can take to improve the situation.

Defining the role of VPH Service Providers

There is a need for a legal framework that establishes the functions, responsibilities and control of public and private veterinarians as well as para-professionals in the provision of VPH services as well as guidelines on the roles, interrelationships and regulations required to link them with the official VPH services. Linkages between VPH administrations and private veterinarians and para-professionals should take the form of

contracts for the provision of specific services such as zoonotic and foodborne disease monitoring and surveillance, animal vaccination (for diseases of public health significance), food inspection and disease prevention and control.

In particular the competition and sharing of resources between private service providers, government paid veterinarians and para-professionals must be addressed through legislation and regulations. Removal of unfair contribution by the public sector is crucial for creating an enabling environment for the private sector thus public VPH service staff must be adequately compensated with a non-competition policy with the private sector enforced (i.e. they are not allowed to administer or sell veterinary products for profit). On the contrary, the establishment and maintenance of private veterinarians as VPH service providers in rural areas should be promoted by remunerating such veterinarians from public funds while they are also allowed to supplement their income through commercial activities.

Countries must recognise that VPH services can be strengthened through involvement of para-professionals (e.g. CBAHWs) as part of the VPH delivery team, especially in marginalised areas. The role of para-professionals should be defined through a legal framework producing regulations concerning the tasks they are allowed to conduct, their licensure and veterinary supervision. Such regulations should help promote interaction between public and private veterinarians with the para-professionals thus facilitating their involvement with national VPH systems.

Organisation of Stakeholder Associations

National associations representing veterinarians, public health physicians, para-professionals, livestock producers, consumers and other VPH stakeholder groups can play a key supporting role in VPH service delivery. Such associations can contribute to the national dialog on policies and regulations concerning VPH programmes and also support unpopular VPH programmes that are ultimately in the public interest or necessary for national development thus helping to ensure public acceptance. They may also play a role in the informal national VPH surveillance network providing early warning about outbreaks of zoonotic or foodborne diseases. In addition, professional and para-professional associations play a critical role in providing a forum for communication between those working in public VPH service and their peers in the private sector, maintaining and upgrading technical competence of their members through continuing education and promoting codes of ethics. Governments should strengthen their links with such stakeholder associations and facilitate their organisation where they do not already exist.

Establishment of a Statutory Body for Overseeing VPH Service Delivery

Establishment of a statutory body, such as a national VPH Board or Council, that fairly represents the interests of all stakeholders (e.g. public veterinary and health services, producer associations, private veterinary and medical practitioners, consumer groups, pharmaceutical industry associations, etc.) is essential for ensuring the organisation, delivery and oversight of VPH services. Such a body could be tasked with obtaining specific commitments, financial resources and institutional and legal authority to implement VPH service delivery while securing sustainability of VPH services through the setting of regulations, monitoring the delivery and results of interventions and providing an enabling environment for the private sector. The VPH Board would need to continually review and revise gaps and needs of the VPH delivery service to ensure that the activities are appropriate and addressing priority issues. It can also obtain input of

the private sector and local affected communities to help devise policy and draft quality control regulations. A VPH Board would also be in the position to bring together VPH field workers, researchers and policymakers to share and discuss experiences and concerns so that there could be close integration of research and control efforts on zoonotic and foodborne pathogens. The formation of local VPH committees to improve sanitary conditions and boost livestock production should also be promoted to facilitate community participation in the design and implementation of VPH projects thus ensuring that local practices and trends are considered resulting in more effective delivery and greater sustainability of VPH programmes.

Prioritisation of VPH Hazards Based on Risk and Impact

Implementation and enforcement of VPH programmes must be based on priorities established as a result of risk analysis and burden assessment of VPH hazards. Improved capacity for surveying and monitoring is essential in enabling individual countries to assess risks associated with zoonoses and food hazards and to set priorities and manage those risks more effectively. Thus much attention should be given to improving the information and epidemiological surveillance systems through training of personnel and building of infrastructure as part of the overall decision support system. The use of participatory techniques and inclusion of socioeconomic analysis are important mechanisms to help reveal information to facilitate improved planning for livestock extension, public health education and other VPH interventions. Estimates of public health burden should be considered in addition to other conventional economic methods of determining potential productivity gains when prioritising zoonotic and foodborne disease control programmes. This will lead to a more coherent and comprehensive assessment of the full impact of zoonotic diseases which can be relayed to policy makers who may be more accustomed to considering animal diseases of economic impact or human diseases of public health impact but not a combination of both the agricultural and public health impacts. The establishment of national (or regional) centers for both risk assessment (diagnosis, epidemiology, impact assessment) and risk management (prevention and control) would be of great help in strengthening capacity for risk analysis and burden assessment.

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COMMUNITY PUBLIC HEALTH EDUCATION IN TANZANIA: CHALLENGES, OPPORTUNITIES AND THE WAY FORWARD

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BACKGROUND INFORMATION

More than 85% of the Tanzanians live in rural areas and depend on agriculture for their livelihood. The sector is the backbone of the Tanzania economy; accounting for an average of 50% of GDP and 50% of the export earnings. Crop and animals play a crucial role in people's livelihood and poverty eradication/alleviation. In particular, the livestock sub-sector, according to 1994/95 Agriculture Census results, contributes about 18% of the national GDP. The sub-sector, as a whole, contributes about 30% to the agricultural GDP and provides food which is consumed in form of meat, milk and other products.

Tanzania has cattle, goat and sheep populations estimated at 15,644,800, 10,682,400 and 3,493,000, respectively (Melewas and Rwezaula, 1999). Other livestock include chicken (27,065,382), geese (1,200,000), pigs (201,789), rabbits (47,851) and water buffaloes (4,807)(Bahari et al., 1999). Cattle, sheep and goats are kept mainly by rural communities with, for instance, about 90% of the national cattle herd comprising mainly of the Tanzania Short-Horn Zebus being owned by traditional herders. Very few cattle (303,704) are of improved dairy type (URT, 2003) that plays a tangible role in urban and peri-urban livelihood and survival.

Although, the objectives of animal keeping in rural areas vary to some degree with communities, they generally include

- i) a sign of wealth and hence social status in communities
- ii) source of income whereby animals are sold in order to generate income for needs such as paying for school and medical fees, purchase of food and other family needs
- iii) source of food where animals serve as a dependable source of meat, milk etc

Practices/Issues that may be of public health importance to animal owners and consumers

- Although, it is expected that meat must be inspected before being turned into the market, in the rural areas, proper meat inspection is not adequately carried out and this is aggravated by the collapse of the veterinary service sector following the withdrawal of public veterinary services. Although meat inspection is carried out in urban areas, this mainly involve cattle as small ruminants and pigs are slaughtered in the backyards without or with minimal inspection.
- Animal keepers in many rural communities have maintained a close association with animals and in some communities, people share houses with their animals (living in the same house). This is applicable with small ruminants, calves and even adult cattle where one has very few animals and is scared of theft.
- Veterinary services especially in rural areas have collapsed as a result of withdraw of veterinary services. Most animal keepers have been left to fill in the vacuum by employing a do it yourself scheme. In many situations, farmers treat their animals themselves or the services are offered by ill-trained people,

- There are a number of zoonotic diseases that have been reported in Tanzania. These include bovine tuberculosis (Kazwala, 1996; Shirima, 2000); and brucellosis (Mahlau and Hammond, 1962; Kitaly, 1984; Minga and Balemba, 1990; Swai, 1997; Weinhaupl et al., 1998 and 2000 and Mtui-Malamsha, 2001) and it affects mainly people of low socio-economic status and those working in high risk occupations or who consume raw milk, raw blood (Figure 1) or raw or undercooked meat. Other diseases include cryptosporidiosis in animals (Mtambo et al., 1997; Mpelumbe-Ngeleja, 1997, Manjurano 2001) and humans (Tarimo, 1995; Mpelumbe-Ngeleja, 2000), porcine (Kassuku et al., 1999) and bovine cysticercosis.

- Eating habits with special reference to preference for consumption of raw or undercooked meat; raw blood and milk poses health risks for consumers if foodborne zoonotic infection exist in animals

Given, the multiplicity of public health issues that animal owners and consumers face in Tanzania, this paper therefore discusses if there are any needs for creating public awareness in relation to association with animals and consumption of animal products for the purpose of in ensuring optimal health of people and sustainable use of animal products.

IS PUBLIC HEALTH EDUCATION OF IMPORTANCE AND PRIORITY IN TANZANIA?

Yes, public health education in Tanzania is important because of

i) Inadequate knowledge and inappropriate perceptions and practices: Most of the producers or animal keepers are rural based and lack formal education and, although have some valuable indigenous knowledge, they possess inadequate knowledge about the whole range of diseases and their treatment and control strategies. For instance; most farmers would cull the animals when the cases become hopeless and even where such cases should be destroyed, owners are often reluctant to destroy them and such animals often are slaughtered for human consumption. Much too often, such animals are those which would have been under treatment up until just prior to the slaughter time. A practice of this kind not only does it allow the availability of poor quality meat in the market, but also poses dangers related to drug residues and zoonotic diseases. Such practices are not uncommon in both the traditional and dairy sectors in Tanzania.

ii) Intimate or close contact with animals: In some communities, people share houses with animals, thereby risking contracting zoonotic infections. For instance, it is not uncommon in some households to find people staying together with small ruminants, chickens, calves and even adult cattle. Sharing common air space with animals and direct contact with animals and faecal materials pose health dangers to people i.e. contracting diseases such as mycobacteriosis

iii) Poor animal health delivery systems: The animal health service delivery system has become rudimentary mainly in rural areas to the extent that farmers treat cases themselves or have to depend on ill-trained people such as Community-based Animal Health Workers (CAHWs) and other cadres who are filling the gap created following withdrawal of veterinary services. This implies that sick animals do not get proper treatment; misdiagnosis is not uncommon and disease control programmes are either lacking or deficient. The lack of and/or the informal delivery of services has often led to increased morbidities and mortalities with consequential over-use of drugs as well as possibly increased levels of drug residues, and sell of poor quality meat from sick animals to consumers.

iv) High prevalence of zoonotic diseases in the country:

Zoonotic infections/diseases are common in Tanzania. Such diseases include anthrax, rabies, brucellosis, tuberculosis etc (Table 1).

- In particular, tuberculosis has been shown to be highly prevalent in Tanzania and recently the disease has been shown to be contributing to human infections. This is based on the results of isolation of *M.bovis* from adenitis cases of humans in Tanzania (Kazwala, 1996). In addition, records seem to suggest that although tuberculosis appears to be associated with greater numbers of deaths each year in sub-Saharan Africa, the problem has been receiving less press coverage in comparison to HIV/AIDs. However, on the other hand, the association of the disease with HIV/AIDs, especially after the press coverage of the link between TB and HIV/AIDS has played a key role in people recognising its importance. For instance, recently with the study conducted in the small holder dairy sector in Dodoma and Coastal regions, we have found out that more people were aware of tuberculosis (*) as a zoonotic disease than it applied with brucellosis (*) (unpublished data).

- Brucellosis has been shown to be present in both traditional and dairy animals (*) but more prevalent in traditional cattle than in the dairy sector. The disease seems to be responsible for some of the malaria-like cases that are not uncommon in some areas. For instance, a malaria-like syndrome that is unresponsive to anti-malarials has been reported amongst pastoral communities in the Usangu plains in the southern highlands in Tanzania (Kazwala, personal observation). Although, this condition has never been investigated, it remains highly suggestive that the syndrome is brucellosis which is commonly acquired through consumption of raw or sour milk, fresh meat and raw blood as well as contacts with aborted materials .

- Another infection that has been associated with HIV/AIDS is cryptosporidiosis. This infection which is often a water-borne disease, is acquired through drinking of water contaminated by effluents from animal houses and contact with animal faeces during the cleaning process of houses or during per rectal manipulation of animals. Sharing of water sources between people and cattle in some areas in Tanzania (which is not uncommon) provides increased opportunities for transmission of infection to humans. Prevention of contamination of water sources and avoiding sharing water with animals are thus of paramount importance and this requires public awareness which does not only prevent human infections but also leads into sustainable use of water sources.

- Diseases such as anthrax and tuberculosis also have been reported in wildlife so is *Cyclospora cayetenensis* infection in primates in Gombe national park. These observations suggest that there is every possibility for occupational hazards that may involve park workers, tourists and neighbouring communities.

v) Poor meat inspection systems especially in rural areas: In Tanzania, there is organised meat inspection at the level of the region and district where the activity is carried out by trained meat inspectors (trained to the level of Diploma and Certificate qualification)

- However, these are meat inspectors who have never received further training or refresher courses in order to improve their knowledge and abilities to detect conditions of public health importance. Indeed, of recent there has been complaints regarding their ability to ensure good quality and safe meat going into the human food chain.

- In addition, most district and regional abattoirs are in a very poor state. Most of them lack or have inadequate water supplies and lack of railage systems (with animals being slaughtered on the floor) and are not fenced off to prevent access by members of the public as well as dogs and cats. For instance, it is not uncommon to find animal owners or butchers standing by the carcass when a meat inspector is doing his job. This

automatically constrains free and fair meat inspection, thereby leading to meat inspectors often approving meat which otherwise would have been condemned. Therefore, the risks to this effect are immense and these can be minimised through retraining of meat inspectors; improving facilities and prohibiting butchers from free access to the facilities.

- The situation is worse in rural areas because of the inadequacy of meat inspectors. Their numbers have tremendously gone down following the retrenchment of staff when public services were withdrawn. There are also no proper facilities for meat inspection and often animals are slaughtered in the backyards. In some places, meat inspection is not done at all or is carried out by ill-trained people

vi) Lack or inadequate knowledge on risks involved through consumption of animal products:

- In rural areas, it appears that people have not parted away with the habit of consuming meat from animals which have not been inspected. Some people consume meat even from animals which have died naturally. As a result, there have been many reports in the press which have indicated incidences of people who have consumed meat from for instance suspected anthrax cases. A number of people have died from such cases. More recently, a number of hippos in Mtera dam died of anthrax (Nsengwa and Matandala, 2000) and there were reports of people who consumed hippos meat and developed diarrhoeas but it was not established whether this was associated with fatalities. Likewise, it is known that 80% of the milk in Tanzania is consumed raw and since diseases such as tuberculosis and brucellosis are present in our animals, it is very likely that consumers of raw milk face a great danger of contracting these diseases. Of recent, there have been many cases of tuberculosis amongst the Masai communities and there is some inclination to believe that bovine tuberculosis is contributing to some of these cases

- The control of taeniasis in humans can be better achieved by increased public awareness on risks involved and avoiding consumption of infected meat; use of proper meat inspection and reducing chances of animals being infected through use of latrines. The use of latrines by rural people requires community initiatives.

vii) Inappropriate eating habits; Most of the milk consumed in rural areas is consumed raw and even in towns, despite the fact that most people use milk for tea or coffee or feeding children (for which the milk is boiled), there are a lot of people who prefer drinking sour milk prepared without boiling. In our recent study, we have observed that most people prefer consumption of raw to boiled milk (unpublished data) and they associate their preference with the good taste of raw milk in comparison to that of the boiled form. This tradition therefore poses a lot of dangers to all consumers in relation to milk-borne diseases. In addition, in some rural communities, people prefer eating fresh or undercooked meat (common practice in animal auction places/facilities) and drinking raw blood. Such habits are likely to increase chances of consumers contracting diseases such as tuberculosis, brucellosis, taeniasis and other zoonotic infections.

What type of public health education is required?

In Tanzania just like in any other developing country there is an urgent need to provide public education in the following areas:

(i) Creating public awareness on dangers/risks associated with eating habits that influence zoonotic disease dynamics in humans. We need to improve consumers' knowledge that is useful in initiating changes in eating/drinking practices and preferences. For instance, there is an urgent need to get people to avoid consumption

of raw meat, blood and milk as well as undercooked meat products as these practices often lead to food-borne zoonotic diseases ie tuberculosis and brucellosis

(ii) Creation of awareness is also needed in respect of waterborne diseases such as cryptosporidiosis etc and this can be prevented through avoiding sharing of water sources with animals. Once knowledgeable, communities may wish to establish programmes that assist in creating and separating water sources for humans from those for animals so as to reduce conflicts that have not been uncommon between animal owners and other members of communities; improve sustainable use of water sources and to reduce transmission of water-borne diseases to humans

(iii) There is an urgent need to sensitise communities on the use of latrines in order to reduce chances for animals to contract parasitic infections such as *Cysticercus cellulose* and *C. bovis* in pigs and cattle respectively which result in taeniasis in humans following consumption of infected meat. Use of latrines will also reduce risk of contamination of water sources

(iv) There is a need to improve animal keepers' knowledge in regard to risks involved through the close contact with animals. For instance, sharing air and ground space with animals may result into humans contracting infections such as mange, flea infestations (which along with lice may cause annoyance), tuberculosis and brucellosis; the latter through contamination of food by splashes of urine and faecal materials etc. The idea would be to provide separate houses thereby reducing chances of people contracting various zoonotic diseases.

(v) Public awareness is also crucial on the part of the producers in an attempt to minimise drug residues in meat, milk and eggs. The problem of drug residues applies more for cattle, as these are the animals, which are often treated against various diseases by owners or ill-trained people such as CAHWS. As indicated above, most owners would turn the animals for slaughter once they become hopeless or do not recover (other animals in the traditional sector, with the exception of goats when they have contracted CCPP, generally pose no dangers related to drug residues; as often are not treated). Drug residues is also a problem in urban animals because much too often animals are treated and milk is not discarded as required and those animals which turn hopeless through treatment are never destroyed. Such animals are slaughtered through informal ways and eventually meat finds its way into the human food chain despite animal owners being aware of the risks involved. As for the commercial poultry sector, the situation is even worse because there is a lot of drug usage as most farmers have resorted to the use of drugs instead of adopting integrated disease control strategies. Although, the problem has never been evaluated, the current trend of relying on use of drugs for combating infections creates possibilities for poultry meat and eggs containing dangerous levels of residues. Unfortunately consumers are not in the position of detecting and rejecting meat especially that with high levels of drugs and primarily the producers can only protect them through fare play. Animal owners need to be sensitised on their responsibility to protect consumers by observing drug withdrawal periods. This thus demands good treatment schedules which should be done by trained staff who understand the implications of treatments on human health

(vi) Public awareness is also required in the area of meat inspection. Consumers need to realise the importance of meat inspection. The quality of meat inspection needs also to be improved and this requires refresher courses as part of continuing education programmes as well as training others who should be given the responsibility of carrying out meat inspection

The way forward

Community public health programmes requires involvement of a number of players that include

- (i) animal owners and family members,
- (ii) butchers,
- (iii) food vendors,
- (iv) consumers and
- (v) policy makers who are also important as they can mobilise people and resources as well as devising appropriate policies for implementation.

The programme components will be:

- i) Sensitisation of trainers of trainees (public) on all relevant public health matters. This can be achieved by making use of CAHWs (animal owners and food vendors) and field staff (veterinary and health staff)
- ii) Make use of other avenues for public awareness such as primary and secondary schools, religious and political fora
- iii) Creating awareness to decision makers (policy makers) especially village leaders; ward leaders and staff in local governments/councils
- iv) Complementary aspects should include retraining of meat inspectors and other service providing cadres who should be engaged to serve as meat inspectors
- v) Sensitising consumers or the general public using TV and radio programmes (the latter can be useful to reach people in the villages especially when solar powered radios are used. This will ensure maximum reach of rural communities). Other dissemination techniques such as posters and leaflets need to be used.

Table 1: SUMMARY OF ZONOTIC CONDITIONS REPORTED IN TANZANIA

DISEASE	SPECIES, PREVALENCE & OTHER INFORMATION
Tuberculosis	1. Cattle: Prevalence (based on tuberculin test) (9-15%) 2. Isolation of Mycobacteria: 4.5% and 4.2% of cultured milk and lymph nodes, respectively
Rabies	1. Estimated human deaths due to rabies=1,499 deaths/year 2. Official records=10.8 deaths/year
Brucellosis	1. Small ruminants (goats & Sheep), prevalence=0.8% 2. Indigenous cattle, prevalence=3.2%
<i>Taenia solium</i> infestation	1. Porcine cysticercosis prevalence=2.9-6.7% 2. Human taeniasis, based on faecal examination=1.7%

Table 2: Annual Disease Status in Animals, Tanzania (1999-2001)

YEAR	DISEASE	SPECIES	NO. OUTBREAKS	NO. CASES	DEATHS
1999	Anthrax	Cattle	22	49	46
		Goats	7	55	54
	Rabies	Dogs	118	419	265
	Brucellosis	Cattle	3	41	-
	Tuberculosis	Cattle	4	5	-
2000	Anthrax	Cattle	14	78	48
		Goats	3	13	13
	Rabies	Cattle	11	32	32
		Dogs	88	295	160
2001	Anthrax	Cattle	8	13	13
		Goats	3	63	63
	Rabies	Cattle	2	6	5
		Dogs	188	566	392
	Brucellosis	Cattle	3	5	0
Tuberculosis	Cattle	4	10	2	

Source: The OIE Handistatus II database

Table 3: Annual zoonotic diseases reported in humans, Tanzania (1997-1999)

Disease	Human cases reported during		
	1997	1998	1999
Anthrax	No	Yes	Yes
Bovine tuberculosis	Yes	No	Yes
Brucellosis	Yes	Yes	Yes
Echinococcosis/hydatidosis	No	Yes	Yes
Rabies	No	Yes	Yes
Salmonellosis	No	Yes	Yes

Source: The OIE Handistatus II database

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Community based Veterinary Public Health Systems in South Africa – Current Situation, Future Trends and Recommendations

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Introduction

Food security and socio-economic development in resource poor areas/countries is largely governed by the successes of agriculture. Both, non-disease associated aspects relating to improved animal husbandry and resource utilization as well as veterinary public health related problems play a key role in improving food supply and human health. In contrast to most other African countries the bulk of rural household income in South Africa does not derive directly from smallholder agriculture but a high percentage of rural households are net consumers of food (4). Almost 70% of South Africa's 122.3 million hectares land surface is not arable, but generally suitable for raising livestock (5). At the same time population growth, urbanization and income growth are paralleled by a rapidly increasing demand for food from animal origin. This poses a challenge on the country's agricultural sector to develop a sustainable livestock production which contributes to poverty alleviation and which ensures access to safe meat for all South Africans.

Current Situation

1. Veterinary Public Health and Small Scale Farming

Animal products make up a large proportion of South Africa's exports. Within the boundaries of South Africa locally produced poultry, eggs, dairy products, red meat and pork contribute to food security. However, many of these outputs previously depended on the commercial farmer and veterinary public health practices and regulations to ensure the production of safe food from animal origin focused almost exclusively on the commercial, large scale farming sector and would, in general, be inadequate and incompatible with communal farming and cultural practices. Testing of communal cattle for bovine tuberculosis and brucellosis, for example, has been widely neglected in South Africa, because government compensation schemes applied to the commercial sector are culturally unacceptable to rural communities. A workable solution in the form of exchange of infected animals against disease free animals cannot be implemented due to a shortage of funds.

Despite ongoing efforts to combine all food control functions within a single government department the delivery of veterinary public health services is still divided among a "fragmented and uncoordinated multitude of government agencies". While slaughter animals and meat produced from them falls under the responsibility of the National

Department of Agriculture the food produced from animal origin such as meat, milk, eggs, fish and honey are classified as foodstuffs and their processing and distribution is regulated by the National Department of Health with executive powers delegated to the corresponding provincial and local authorities. The informal sale of meat and milk is, however, not subject to any form of control and local authorities are unable to ascertain the extent of this activity. For example, it is possible for small-scale dairy farmers, to apply for permission from their local municipality to sell raw milk directly to the public without consultation of the relevant state veterinary office. Strictly speaking, even pasteurized milk is not without risk because it cannot be completely protected from failures in the pasteurisation system and post-pasteurisation contamination if hygiene standards are not adhered to in a holistic approach throughout the production and distribution of milk.

1.1. Meat Hygiene Services

Prior to 1994 approved abattoirs with meat inspection were basically non-existent in most rural areas and as a consequence the population in those areas do not have the opportunity to buy safe, inspected and hygienically produced meat but rely on meat supplied by family members working in larger cities or from informal slaughter. Following the deregulation process in the abattoir industry the number of abattoirs registered with the Red Meat Abattoir Association of South Africa rapidly increased to 530 (www.rmaa.co.za/congresses). Membership in this independent organization is subject to compliance with national hygiene standards and defined training requirements for all levels of abattoir personnel which has posed a number of challenges to government and industry. The tendency to increase production in small abattoirs for example, the involvement of new, inexperienced abattoir owners and a high turnover rate of workers may occur to the expense of hygiene standards. The Ministry of Agriculture of South Africa has recently drafted revised red meat regulations under the Meat Safety Act of 2000, which, for the first time, include and specify requirements for rural red meat abattoirs with a low throughput including on-site cutting plants in South Africa. Today not only the high throughput (A grade) abattoirs, but also B and C grade abattoirs contribute significantly to slaughtering in South Africa.

1.2. Lack of infrastructure

In South Africa, there is good infrastructure in the main centers and people in the higher income bracket have good access due to off road vehicles, cellular networks and a sophisticated private medical system. In low-income communities (rural, peri-urban and urban), there is still an inadequate transport network, poor roads and lack of access. Fuel is expensive and the main form of transport is minibus taxis, buses or trains. However these generally run on the more popular routes and some areas may have little access to transport. This has the effect of preventing access to formal marketing channels (which are more easily monitored and controlled by the state veterinary services). In addition, medical services are provided by community clinics with medical doctors not available at all times. This means that the effects of food-associated and zoonotic diseases may not readily be diagnosed.

2. Food safety risks in rural communities

2.1. Food safety risks relating to the informal production of food from animal origin

It is assumed that many areas in South Africa do not have equal access to safe, inspected and hygienically produced meat. Understanding of food safety concepts in general is lacking. Due to a lack of control over informal slaughterers where no meat inspection is performed, informal slaughtering has a negative impact on human health, exposing the community to a wide spectrum of meat related hazards and food borne diseases. From an economic point of view informal slaughterers can undercut prices and put formal traders who offer inspected meat out of business or at a disadvantage. On the positive side, discussions between Veterinary Services officials and small communities on the issue of informal slaughtering have initiated counseling activities and a growing interest by informal slaughterers provide safe meat.

2. 2. Socio-cultural practices

Ritual practices in Africa include the slaughter and consumption of livestock (particularly goats and cattle) for weddings, funerals and other ceremonies. The slaughter usually takes place near to the household. In addition to the high possibility of meat being consumed that has not been inspected, there is also the possibility of transmission of disease to the person slaughtering the animal and to the general public when there is no hygienic disposal of offal. Diseases of particular significance in this regard include *Taenia saginata*, *Taenia solium*, brucellosis, bovine tuberculosis, salmonellosis, *Staphylococcus aureus* and anthrax. Fortunately the culturally acceptable way of preparing meat for the ceremonies involves cooking it in a metal pot for several hours. The meat is consumed immediately and not reheated. However, there is some documentation on outbreaks in traditional communities. Apart from meat, milk can be a potential disease 'vector' since it is cultural practice to consume unpasteurised but soured milk and certain pathogens can withstand acid conditions for prolonged periods of time, especially when present in abundance. Disease outbreaks relating to the consumption of carcasses from animals which died from infectious diseases such as anthrax have also been reported.

2.3. Informal marketing

There is a high level of unemployment in South Africa and therefore the possibility exists of informal marketing of animal products. These products may arise for the commercial (formal) sector as well as the informal sector. At most railway, bus and taxi stations, a myriad of hawkers sell food to the commuters. Research done in conjunction with the University of the Witwatersrand has shown that the food sold by these hawkers is reasonably safe from a microbiological point of view as little prepared at a time, it is well cooked and it is not used. Unpasteurised milk sold to the public is, however, not as safe. *Staphylococcus aureus* and high coliform counts have been found in milk samples bought from so-called "milk shops" as well as in milk sold informally by small scale dairy farmers. In general, street food vending might help solve the need to supply food to large masses of the population in urban areas. It plays an important role in the economy of the country as it incorporates many people in the labour force and offers low priced food to the urban consumer, whose preferences hinge on the ease of finding food that satisfies their taste and in economics rather than safety.

2.4. Veterinary public health risks through zoonoses in the human – livestock interface

The type and level of human-animal interaction is a function of the socio-economic and environmental situation in which it occurs and therefore zoonoses attribute for a significant percentage of human health problems in rural areas of developing countries. Zoonoses, or diseases which can be transmitted between animals and humans, pose a serious human health risk on rural communities in Southern Africa and at the same time they impact negatively on the economic sustainability of livestock farming. Close animal-human interactions and the consumption of meat and milk from animals raised without any form of veterinary intervention facilitate the transmission of diseases such as bovine tuberculosis, brucellosis, anthrax, listeriosis, leptospirosis, cysticercosis, hydatidosis, larval migrans and rabies. Among the pathogens which cause generally less severe disease but which are more frequently encountered, especially in infants and the elderly, are *Salmonella*, *Campylobacter*, *E. coli* and other enterobacteria.

Brucellosis, zoonotic (bovine) tuberculosis and anthrax rank among the most important zoonoses in Southern Africa. Only limited testing of cattle herds in the commercial sector and selective testing of communal cattle is currently performed which means that the disease status regarding brucellosis and tuberculosis is unknown for certain areas. The major route of transmission is through consumption of unpasteurised milk, which is common practice in rural communities. Zoonotic tuberculosis can be transmitted even more effectively by aerosol during close physical contact with animals shedding bacilli from open lung lesions. In the absence of regular tuberculosis testing infected cattle are likely to develop these advanced stages of disease.

This risk of contracting zoonotic tuberculosis (and other zoonoses) is increased considerably if exposed individuals are immuno-suppressed by HIV infection. A report published recently in South Africa stated the current overall HIV prevalence in this country at between 15% (total prevalence) and 30% (age group 30 – 34 years) (2). Against this background the risk of zoonotic tuberculosis occurring in close proximity to the livestock – human and the wildlife - livestock - human interface must not be underestimated.

Future Trends and Plans

Commercialization of Livestock Production

Previously, animal disease control was rigid and based on state-subsidized quarantine, vaccination and slaughter-out policies to control epidemic diseases and food safety. Partially because of this, the least understood veterinary needs identified during the previous decade were at the level of small scale and subsistence farmers where there is a lack of capital to buy land and communal grazing is a possible alternative. The sub-program Land Redistribution for Agricultural Development (LRAD), initiated by the State, is bringing previously disadvantaged farmers into commercial agriculture through redistribution of land and financial assistance from the Land Bank. As a result an increased number of farmers move from subsistence to small scale commercial farming and urgently require training in a range of disciplines including animal health and animal care programs.

In the short term, the land redistribution process could increase the risk of transmission of food borne diseases as the newly settled farmers do not necessarily have the level of experience and expertise nor the financial resources to participate in livestock health monitoring programs.

Planned Changes in Regulations

As part of the restructuring plans for the Directorate Animal Health of the National Department of Agriculture a sub-directorate for Veterinary Hygiene will be responsible for animal health development in rural areas with the following functions:

- To develop policy, norms and standards for the primary animal health care systems in the rural areas in South and Southern Africa
- To audit the implementation of primary animal health care and community veterinary services in the provinces
- To coordinate the community veterinary services program in the communities through the provinces
- To develop and organize veterinary health awareness programs, including zoonoses in the communities

Urbanization

Since 1994, there has been a rapid urbanization as people previously confined to the homelands moved to the cities in search of jobs. This has resulted in densely populated informal settlement areas on the outskirts of many towns and cities. The growing demand for affordable food prompted a sharp increase in small and large livestock being held in those areas. A lack in skills relating to animal care and a lack in grazing results in poor animal health and facilitates the circulation of pathogens between animals and humans. Informal slaughter may also occur in these settlements. Ablution facilities and facilities for sewage and solid waste disposal are minimal. Rivers may become severely polluted through uncontrolled discharge of human waste and high levels of potential human disease pathogens can be found in run-off water to the extent that such water constitutes a grave danger for human and animal health (1). Apart from direct human exposure to waterborne infection, the health hazard is worsened through the use of such water for irrigation of edible crops and livestock watering further downstream.

2. Diagnostic Support

In the EU, surveillance has been proceeding over the last 20 years and there is a statistical information on the incidence of animal diseases and food-borne pathogens. In South Africa, there has been adequate diseases and hygiene surveillance of the formal sector including commercial farmers, abattoirs, dairies and food processing factories. With the rapidly growing export opportunities for South African foodstuffs the efforts are presently geared up to link data collection for disease surveillance with quality requirements such as traceability, hygiene and pathogen monitoring to accomplish a comprehensive farm-to-fork approach. Trained field personnel and a sophisticated laboratory support system are essential cornerstones in this development, which stakeholders have not addressed sufficiently to date. Regional veterinary laboratories are increasingly suffering under declining budgets and a shortage in personnel. This has a particularly strong negative impact on the emerging small-scale farming sector which has a growing need for veterinary extension work. Efforts are currently underway to assess the current capacity of regional veterinary laboratories and match them with a needs appraisal in terms of infrastructure and professional skills.

Recommendations

Information Systems and Skills Training

The problem of agricultural information in South Africa is twofold, namely, the unavailability of relevant and dependable data and actual dissemination or communication of information. Communicating with the emerging sector in especially the rural areas is more difficult owing to the absence of effective communication media, a relatively low degree of literacy and various languages. To overcome these obstacles it is important to

- Implement improved human and animal health surveillance and investigation systems to quantify risk data for food-borne and animal diseases
- To undertake a study to ascertain optimum communication with target audiences to establish their prime needs and the correct media to reach them.

Preliminary results from work done in South Africa suggest that skills training works better than just information to empower emerging farmers to improve their livestock management and disease control. Participatory action research enables small scale farmers to become actively involved in the assessment of their own veterinary needs. Using participatory methods, objectives can be selected, evaluated and ranked. The emphasis is that the veterinary services are structured in terms of the target audience, rather than the animals. This approach is in contrast to one that is paternalistic, prescriptive and animal centered and where the owner's interests are disregarded (3)

Meat Hygiene Services

A recent survey conducted by the Directorate Food Safety and Veterinary Public Health confirmed that all communities do not have equal access to inspected meat, although the situation differs significantly between provinces. As a result the following recommendations were released:

- The informal slaughtering and meat-trading sector should become the focus of human capacity building to expedite progress to uniform hygiene practices.
- Despite projects by the Directorate of Veterinary Services to inform communities on the risks associated with informally slaughtered meat there is little awareness present at the moment and language differences make effective communication difficult. Future education and extension projects in a multi-disciplinary team approach to address this particular problem are urgently needed, followed by surveys to monitor the success thereof.
- A program for upgrading existing unapproved facilities over a period of time in areas where no abattoirs exist is necessary and should be included in a revised policy.
- Local community extension projects on food hygiene could enhance a culture of using safe meat and increase consumer demand for safe meat.
- The possible establishment of a para-statal meat inspection service in cooperation with provincial veterinary services, local authorities and accredited agencies is advocated
- Free market principles should be stimulated in cooperation with the meat industry to encourage commercial ventures, especially in developing rural areas.

- There is a need to align production methods and initiatives with marketing/trade opportunities. It is proposed that the National Red Meat Producers Organization and other relevant organizations play an active role in such developmental programs in the production areas. Ownership by black entrepreneurs, at each link of production, harvesting, processing and relating chain will be the goal of such a livestock development program.

Sustainable Livestock Production and Food Safety

Sustainable and moreover commercialized livestock production is the key to poverty alleviation as well as to the growing demand for food from animal origin by an increasingly urbanized population. Sustainable and possibly intensified livestock production not only relies on the successful prevention and control of animal diseases but also on the correct selection of livestock to be produced. Especially if resources are limited, it is important to select for animal species which are non-competitive in terms of food requirements such as ruminants rather than poultry or pigs. The next step involves the implementation of an animal care program which deals with three major components:

- a) Genetic selection of breeding stock
- b) Animal management (nutrition and animal welfare)
- c) Preventive veterinary activity (vaccination, animal first aid etc)

The production of safe meat requires the production of healthy slaughter animals and is concluded with the prevention of contamination during harvesting, processing and distribution through the implementation of adequate hygiene measures according to GMP and HACCP guidelines. This can only be achieved through an integrated network of veterinary services and extension officers reaching from national to community level as outlined in figure 1.

Equally important is the access to adequate laboratory services to diagnose animal diseases and food borne pathogens both on farm and abattoir level.

Figure 1. Proposed structure of veterinary services including extension officers

National:	National Department of Agriculture
Provincial:	Provincial Veterinary Services supported by sub-contracted private veterinarians in 9 provinces
District:	State veterinarians
	District/local authority: Animal health technicians supported by veterinary nurses and veterinary laboratories
Community:	Village veterinary workers

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MULTIDISCIPLINARY APPROACH TO VETERINARY PUBLIC HEALTH DELIVERY SYSTEM AT COMMUNITY LEVEL

The past, the present and the future of multidisciplinary collaboration in veterinary public health and expected perspectives

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Foreword

The last updated definition of Veterinary Public Health (VPH) given by the World Health Organisation (WHO) in 1999 published in Future Trends in Veterinary Public Health (Technical Report Series 907) (2002) reads as follows: "the sum of all contributions to the physical, mental and social well-being of humans through an understanding and application of veterinary science". Compared to the previous official definition of 1975 (i. e. "a component of public health activities devoted to the application of professional veterinary skills, knowledge and resources to the protection and improvement of human health"), the new concept places stronger emphasis on the need to expand the link between human and animal medicine. The growing trend to 'multidisciplinarity' of VPH is also underlined as it involves not only public and private veterinarians but also other professionals such as agricultural scientists, biologists, environmental researchers, food experts, microbiologists, nurses, paraveterinary workers, physicians and other concerned categories who contribute to the prevention, control and therapy of diseases of animal origin.

The approach to co-operation between physicians and veterinarians and with any other health-related skills shall be addressed to the identification and attainment of the goals that require collaboration meant both as a joint action and a division of responsibility. Collaboration must be achieved both when Medical and Veterinary Services belong to the same Administration and when they belong to different ones. In most countries Veterinary Services depend on the Agricultural Administration, and this constitutes the most common model. In some other countries Veterinary Services are split and pertain to both Agricultural and Health Administrations. In Austria, Italy and few other nations Veterinary Services belong to the Health Administration. The fields of action of VPH (hence of Veterinary Services) in this model involve all aspects of public veterinary activity including such issues as animal diseases and zoonoses control, food safety, animal-linked environmental problems. Accordingly, the sectors and disciplines covered by Veterinary Services will include infectiology, toxicology, food science, environmental and biological pollutants, and others. This model implies per se a high degree of multidisciplinary collaboration and will be prevalently used in this paper.

A problem which has found a solution in the Italian model (see Marabelli and Mantovani, 1997) but not in the WHO and international models is the fact that zoonoses sensu lato (and consequently VPH) are often split between different administrative sections (e.g. communicable and non-communicable diseases).

VPH (Veterinary Services) perform their activity according to a “crossroad” pattern, where agricultural activities, public health, environment protection merge, encounter and (should) collaborate. In such a crossroad situation, the existing divergences become evident and may either turn into agreements (as desirable) or evolve into conflicts justified by differences of interests (economic, political, etc.), cultures, social status, etc. Sometimes conflicts are part of professional or political strategies aiming at maintaining distances, differences and supremacies, or at defending economic positions.

The special issues connected with the collaboration between public health and animal health sectors, especially in the Mediterranean Region, are discussed in Annex 8 by A. Seimenis.

The academic teaching tradition in our Schools, both medical and veterinary, tends to a “vertical” approach, according to which each item is considered per se and is usually studied irrespective of the whole context and of its practical (and practicable) application. VPH and Veterinary Services, instead, are confronted with problems which require a “horizontal” approach, i. e. a strategy that takes into consideration all the aspects involved in the problem-solving process, including legal, administrative, epidemiological, aetiological, economic, public health, social factors and many others. No problem associated with public health (e. g. zoonoses control, food hygiene, veterinary urban hygiene, action in emergencies, etc.) can be faced without a horizontal approach. All too often an obvious discrepancy is seen between the available models of strategy and the actual necessities.

The vertical trend may be visualised as a forest of independent trees, whereas the practical needs of public health command a horizontal policy comparable to a mycelial network of interconnected hyphae. Of course, close links are essential between the two approaches enabling a co-ordination of the basic vertical inputs with the subsequent horizontal ones.

The horizontal approach has the disadvantage of being scarcely suitable for fund raising. As a matter of fact, scientists generally can make their applications for funds only on vertical programs. This is sometimes a source of misunderstanding between academic and field operators. However, some initial change towards horizontal approach is present in the current European programmes for funding research.

A classical horizontal approach is the one connected with the control of the “quality” (not only the “safety”) of foods and other animal products. Indeed, in many countries VPH services are requested by law to perform also activities concerning food provision, i. e. to control also the quality of the products (e. g. the animal species of the marketed meat; whether fish is really fresh or had previously been frozen) which must actually comply with their guarantee labels.

The past

As previously stated, the concept itself of VPH as expressed by its new definition implies and highlights the need for joint action of both medical and veterinary sciences (and allied ones). There is no reasonable doubt that both disciplines (or, better still, practices) were born together and share common roots. To our knowledge, no special differentiation was made in the past between healers of humans and healers of animals. Both mythology and history provide various examples of ‘one medicine’ in different parts of the ancient world.

The legendary figure of the centaur Chiron may be taken as the symbol of a unique medicine because, besides his physically being half-man and half-animal, he is depicted as a master practising and teaching veterinary and human medicines at the same time. He is reported to have lived during the period from 1250 to 1220 B.C. and to have left a number of disciples. The most famous of these, Asclepius, is considered one of the 'fathers of medicine', and both humans and animals received medical care in his temples. The ancient Egyptians are known to practice one (or general) medicine. Among the many examples provided by Schwabe, we read that "the Egyptian priesthood was hereditary. The priests and priestesses... also (i. e. besides humans - authors' note) cared for the individual animal or animals maintained in the temples". The Babylonian Hammurabi's law code was found among the ruins of Susa. The inscriptions date back to the 2nd millennium B.C. and, among other items, probably contain the first "institutional" regulations of veterinary activity along with topics of human medicine and principles of food hygiene. Hippocrates (460 B.C., i. e. about 100 human generations ago), the 'father of human medicine', underlines the usefulness of comparative pathology and its application to human medicine. He was also the first to refer to an occupational zoonosis when he mentioned that the Libyan shepherds in continuous contact with goats were the healthiest of men without any symptoms of epilepsy. Galen, another 'father of medicine', maintained that veterinary observations and practices are useful to human medicine. At the height of the Roman Empire, Cicero (1st century B.C.) reports that the birth of human medicine was believed to have first derived from the observation of diseases of animals and of the natural remedies they instinctively sought and applied. It may be remembered that the Romans worshipped a (minor) god, Verminus, committed to epidemic infectious diseases of humans and animals.

The merging of healing practices into a unique, comprehensive medical science was also due to the recognition of diseases shared by animals and man and of 'plagues' which affected humans and animals contemporaneously. A typical example of the common interest of health scholars in veterinary and human medicine is rabies, 'the mother of all zoonoses', a disease known to and feared by man from time immemorial and for which the concept was developed of 'transmission' (from dog to dog and, later, from dog to man).

Occupational zoonoses had soon been recognised as being transmitted from animals to humans ever since the Roman times.

The 'natural', both practical and theoretical viewing of 'one medicine' (including comparative studies of anatomy and pathology) was strongly discouraged throughout the Middle Ages. During such a period the prevailing concern was to stress the different nature of man modelled in the likeness of God rather than recognise (admit) that man and animals were so similar as to share the same diseases. An initial reaction, albeit rather a philosophical than a scientific one, came from alchemy: Paracelsus (1493-1541) supported a close correspondence between man ("microcosm") and his environment ("macrocosm").

This attitude continued until the transition period from the 'darkness' of the Middle Ages to the revival of rationalism during the Enlightenment and Renaissance (XVI-XVII centuries). In those times, outstanding scientists and physicians in Europe were treating medical and veterinary issues and were committed to the solving of animal health problems, especially epidemics in livestock. In this same period evolutionistic theories were developed and novel attention was again paid to comparative pathology. Great physicians such as G. Fracastorus (1478?-1553), M. Malpighi (1628-1694) and F. Redi (1626-1698) had studied animal diseases and parasites, and the concept of a unique medicine was again prevailing. B. Ramazzini (1623-1714), professor at the University of

Padua, wrote a dissertation on a cattle plague outbreak in Venice and Padua and may be considered the 'resuscitator' of comparative veterinary and human pathology as well as the founder (or inventor) of occupational medicine. The archiatre F.M. Lancisi (1654-1720) was charged by the Pope with the control of a cattle plague in the State of Church and enforced a number of measures, the most important of which is 'stamping out', still used in fighting some of the most serious infectious animal diseases.

A relevant example of interdisciplinary commitment is given by the work of L.A. Muratori (1672-1750), librarian and political adviser of the Duke of Modena, who published a large amount of contributions to public health based on his experience in the control of both human and animal plagues, with numerous recommendations and comments on the religious, political, social and economic aspects of the issue.

Fundamental from our present interest and for the history of human kind was the contribution by E. Jenner (1749-1823) who immunised humans against smallpox by the use of cowpox; the procedure was later denominated 'vaccination' by L. Pasteur.

In the period from Renaissance to the foundation of Veterinary Schools, a significant number of doctors were practising both for humans and animals. Especially in England, some doctors left human medicine and passed to the more economically appealing veterinary care of horses and dogs.

The first veterinary schools were being founded in France in the XVIII century. Yet, the concept of one medicine and the close links and similarities between veterinary and human medicines continued to be stressed by a number of authors. As an example, A. Zanon (1696-1770), in his first Italian History of Veterinary Medicine, wrote that veterinary medicine shares the same dignity with human medicine '...since veterinary doctrine does not differ in many respects from the Medical Art, but these two Arts coincide in several cases'. The same concept is expressed until the past century, e. g. by R. Virchow (1821-1902) who first used the term 'zoonosis'.

The present

Many examples of collaboration have persisted along the years. For instance, many city health boards and/or committees for the control of rabies and food hygiene continued to be formed by both physicians and veterinarians (and often included allied health personnel). Under certain circumstances (e. g. at village level), where veterinary and medical doctors were scarce, physicians were sometimes asked to take care of animals and to perform food inspection and veterinarians to assist humans (as an early example of primary health care).

It must be also remembered that an important role in fostering interdisciplinary co-operation was and is still being played by institutions investigating on biological sciences (anatomy, infectious diseases, microbiology, mycology, parasitology, physiology, toxicology, virology, etc.) in which the borderline between the two medicines was never fully recognised but the need was increasingly felt for a more integrated approach to research as a whole. This has become even truer when such new and emerging items appeared as laboratory animal medicine, ecotoxicology, food science, analytical epidemiology. Similarly, in environmental sciences and in pollution control, as well as in disease surveillance systems, animals and animal models proved once more to be indispensable substitute for humans (e. g. as indicators of human health risks). Accordingly, major European Agencies, such as EMEA and EFSA (dealing with drugs and foods, respectively), include both medical and veterinary expertises. The development of VPH has always played an important role within the activities of national and international health bodies and especially the WHO with the collaboration of FAO and OIE. The advancement of VPH has been analysed by Cosivi and Mantovani, and may be described as subsequent steps starting from the 1950s and 1960s, when

the importance of zoonoses in public health was being defined more and more precisely, although most countries still kept a clear distinction between human health problems and veterinary issues. The provision of health care was gradually diverted from individuals to the community, large-scale planning techniques were devised and evaluation techniques were introduced. During such a period programmes were formulated to control individual zoonoses and exert surveillance over foods of animal origin.

A second step in the 1970s was devoted to strengthening the foundations of VPH. A great number of inter-professional expert meetings were convened during this period and many issues were examined concerning both animal and human health problems such as farming intensification, noxious residues in foods of animal origin, problems associated with the presence of animals in cities (veterinary urban hygiene). A distinction was still maintained between problems of human and animal health, but again the need was strongly felt for integrated programmes to control zoonoses and animal diseases. Special emphasis was placed on the need to develop systems of monitoring and evaluation of environment-related health risks by using animals and animal models. The necessity was also recognised of interdisciplinary professional training in VPH.

The third step in the 1980s (until the present days) was marked by the WHO General Assembly in Alma Ata in 1978, where the foundations were laid of Primary Health Care launching the strategy "Health for all by the year 2000". Here the need was first officially and universally recognised for intersectoral collaboration and for the development of "horizontal" programmes covering a multiplicity of health problems seen in the light of their interconnections and relationships. Health education was enforced involving different skills in health-related professions. Training and refresher courses were extended to all categories of health operators, mainly physicians and veterinarians, to enable co-ordinated strategies and policies to be adopted in order to manage and solve multifaceted public health problems.

The field of classical zoonoses (communicable from animals to humans) progressively proved too narrow for VPH. The public health and social importance of animal diseases (including such conditions non-communicable to humans as foot-and-mouth disease and rinderpest) did receive more and more VPH attention. The contamination of the environment and animal products by substances used in animal farming (feeding and disease control) and in animal industry was being given increasing importance.

A prevailing aspect (trend) of the health policy of this period is the involvement of the whole social body in health and economy. Indeed, social and economic indexes were established to evaluate the "quality of life" and social welfare associated with the development and advancement of health services (including Veterinary Services). The socio-economic impact of animal diseases and health action is discussed by G. Battelli in Annex 1.

From the international to the local level, the organisation of intersectoral links and functions in the operational structure of VPH activities proved to require fundamental steps which include the following:

- agreement on political and legal means for establishing intersectoral co-ordination
- identification of common problems
- programme planning and definition of responsibilities
- identification of those areas requiring interdisciplinary collaboration
- planning of joint programmes
- establishment of communication channels in the administrative structure of the concerned institutions
- establishment of information systems, especially on items concerning both animal and human health

- establishment of mechanisms of operational co-ordination and evaluation of results at the different levels.

Primary health care had been the main mover towards 'health for all' strategy. Despite some improvements, however, advancements have been hampered by a number of adverse factors, including poor political interest in adopting the necessary measures and establishing intersectoral action for health.

The present task of VPH within the overall framework of public health is still to promote activities enabling the achievement of health for all and assist in reaching its objectives.

The future

Other changes are in progress or expected which are likely to heavily affect VPH activities. The major predictable ones will include the following:

- Dramatic increase of world human population
- Growing urbanisation especially in developing countries; in developed countries an "urbanisation" is expected of areas previously classified as rural
- Increasing environmental problems due to pollution
- Changes (increase) in the global temperature of the planet
- Emergence of or increase in VPH duties in the fields of animal welfare and animal populations management;
- Changes (generally an increase) in the kinds of animal species requiring VPH action. The VPH activities in the field of wild animals are discussed by D. De Meneghi in Annex 4.
- Appearance of new and re-emerging zoonoses with changed or changing epidemiologic features
- Global trends in the organisation of national health services, with contextual recognition of the many functions of VPH in improving public health and well-being
- International movement of animals and of products of animal origin, exotic ones included
- Invasion of ecological niches by humans, animals and disease vectors, and by chemical and/or genetic contaminants
- Changed susceptibility of groups within the human population as a consequence of immunodepressing conditions and of changed living habits. The VPH problems of immunodepressed persons are discussed by P. Pasquali in Annex 6
- Emerging of usually non-pathogenic (or rarely pathogenic) organisms as agents of co-infections
- Crossing of the species barrier by pathogens
- Emergence of new pathogens (e.g. prions, endocrine disruptors)
- Increasing expectations about health (human and animal), food, quality of life, and decreased tolerance of inconveniences
- Increased needs for specialised education at all levels
- Relevance of international collaboration in exchange of information
- Improvement and/or development of collaboration with international, national and local agencies devoted to human and animal health, commerce, economy, animal welfare and related fields, acceptance of VPH as a goal and term of reference for the action of the agencies
- Development of operative and cultural systems to face globalisation of pathologies and problems of food safety connected with mass movements of persons, animals and animal products and with ecological changes
- Adjustment to the changes and to the growing power of the market; necessity for greater consideration of health problems (compared to economical interests) and for the respect of local traditional ways of life (including food habits).

Of these modifications, world-wide climatic changes are expected to increase the risk of vector-borne and other diseases in humans and animals. Much of the impact of changed climate will affect developing countries with poor monitoring capabilities, so that close collaboration will be needed between developed and developing countries. In case of a new infection (of humans or animals) inter-professional collaboration will prove necessary, as it has been recently showed by the cases of Rift Valley fever and SARS. The elimination of some classical zoonoses (e.g. rabies, glanders, American myiasis) has been followed by the emergence of other zoonoses as a consequence of ecological changes, industrial and commercial practices, changes of habits, climatic changes, increased interests (sometimes fashion) in new issues, appearance of economic and/or political priorities, development of diagnostic capabilities, and others.

Globalisation of trade has favoured the diffusion of food-borne infections and diseases such as BSE. As a consequence, close collaboration is needed to monitor livestock feed during production, handling, processing and marketing. Under such circumstances, any transmissible (in the broadest sense) disease represents a global problem so that no country is isolated or protected enough to guarantee the safety of its human and animal populations. This commands an international partnership able to grant international food safety programmes based upon multidisciplinary grounds and integrated with strategies for public health and sanitary control.

Industrialised animal production has experienced a continuing dramatic evolution of farming and marketing techniques, nutrition, therapy etc., requiring the involvement of VPH and collaboration combining health, the environment, economy and technologies. This item is discussed by A. Macrì in Annex 5.

A field calling for specialisation, multidisciplinary and collaboration is laboratory research which commands that VPH services should be appropriately equipped with facilities and personnel. Many VPH activities are laboratory-dependant, such as diagnosis, epidemiological surveys, food safety, environmental sanitation, etc. This issue is commented by A. Caprioli in Annex 2.

The evolution of food safety and the application of the concept 'from the stable to the table' (or 'from the farm to the fork') has imposed standardised rules at national and international levels, the most common of which are those connected with the application of HACCP. It is likely that the large-scale application of rules for food safety will complement (integrate) VPH contributions with the "health impact assessment (HIA)", an emerging activity which aims at establishing the influence of different policies on health. The need for such an approach was obvious for BSE, where the connections between policies and VPH were most evident (exploded).

Another field in which such an approach should find application is genetically modified organisms (GMOs) about which there are conspicuous doubts and conflicts among health, the environment, politics and economic interests. The role of VPH in making sure that animal productions (local or imported) are GMO-free in countries that have banned or limited GMOs requires organisation, adequate structures and collaboration with technical and administrative structures.

An emerging field which requires the adaptation of the policy "from farm to fork" is aquaculture, which is growing in importance as a consequence of the increased demand for aquatic food in a situation in which fishing practices have reached the maximum acceptable level. VPH activities connected with organic aquaculture imply the protection of health and production of the cultivated animals, the safeguard of consumers against biological and chemical pollutants, the control over the proper application of the required sanitation and preservation practices and over the imported and/or exported aquatic products.

The first perception that an illness might be transmitted from animals to humans (an observation which has later developed into the concept of “zoonosis”) stemmed in the Roman times from occupational diseases of slaves and herders in contact with animals. These diseases, associated with both animal farming and care and related industries, are growing in importance and command close collaboration between VPH and occupational medicine, meant in the broadest sense. Such a collaboration will enable all the aspects of a more and more serious problem to be completely identified, and promote an ad-hoc legislation involving responsibilities of both medical (occupational medicine) and veterinary services. The activities connected with the full application of the concept “from the farm to the fork” require an interpretation based also on the prevention of occupational diseases. An example of the continuing expansion of the problem is the fact that recent knowledge has shown that the extensive use of feed additives and their abundant elimination in the environment result in the contamination of workers.

Mass transfer of persons and animals for occupation, tourism, commerce, military and other reasons are creating situations of uniformity which had never been experienced in the past (at least to such an extent), even in an area, such as the Mediterranean, which during centuries had experienced impressive movements and commerce. Huge movements of populations for religious events (Pilgrimages, Councils, etc.), sports (Olympics, etc.) and other events pose problems for VPH regarding food protection, general hygiene, animal movements, etc.

Mass migrations and tourism are also posing problems to VPH associated with ritual slaughtering, food habits, social customs and other factors.

Someone had been expecting that the control of urban rabies, which has been eliminated from some Mediterranean and other countries a few years ago, would have terminated the veterinary activities of control of animal (especially dog) populations. Indeed, the management (control) of animal (mainly urban) populations has been transferred from “rabies control” to “animal welfare”. The animal species which in the Mediterranean call for some responsibility of VPH services include farm animals and domestic, synanthropic and feral (wild) dogs (and other canids), cats, rodents, pigeons, starlings, etc. Veterinary services are responsible for population control (including sterilisation), welfare and other activities, often performed in collaboration with animal protection associations. Veterinary urban hygiene is becoming one of the most significant (and visible) activities of veterinary services.

New activities connected with animal welfare (as the management of dogs, cats and urban birds populations) and the social role of animals (as in animal assisted activities and pet therapy) are entering the field of VPH and command close collaboration. In Annex 7, G. Poglayen submits some comments on veterinary urban hygiene.

Another emerging and important series of activities of VPH is connected with disasters. Traditionally, these activities were focused on epidemic emergencies. In the last quarter of century, the demand for VPH action has been extended to non-epidemic emergencies, which may be classified as natural (e. g. earthquakes, floods, hurricanes, volcanic eruptions, etc) and due to human activities (e. g. industrial disasters, traffic accidents, fires). Each geographic area has its own specific risks and VPH must be prepared to face them. An emerging activity in this field is VPH action (especially, but not exclusively, food control) in refugee camps and other mass events. ‘Veterinary disastrology’ is a growing field of VPH activities, which implies preventive action (study of the territory, cultural promotion, logistic preparation), permanent capability of intervention and co-ordination with all sectors involved.

Political events have required VPH to pay attention also to biological warfare. The item is discussed by O. Cosivi in Annex 3. It is hoped that the knowledge so far acquired will

serve only for a better protection against common present problems. This hope seems to be justified by the current evolution of events.

In specific cases VPH has to act in situations in which the responsibilities of public health are in conflict with the interests of economy, trade, consumer policy, political leadership. Examples may be the control of epidemic diseases of animals (including some zoonoses), the use of illicit drugs (e.g. hormone-like anabolics), the control of food derived from biotechnology, the direct or indirect contamination with GMOs and/or pollutants (e. g. endocrine disrupters). In some cases these problems become a limiting factor for the development of VPH services which are allowed to act only within strict boundaries (e. g. the control of some zoonoses) whereas are not allowed to interfere with other interests which could be considered priorities. In such cases, an agreement on the importance of the problem examined jointly with the Public Health administration (and the medical management) may provide strong support. Indeed, the magnitude of some VPH problems is sometimes determined on the basis of interests not directly connected with public health.

In some cases, inter professional collaboration is not provided for by legislation. The lack of good will may be an obstacle. Interests (economic factors, career, social prestige, etc.) are often responsible for not establishing co-operation. In all these circumstances, the personal collaboration between individual (generally the most influential, cultured and progressive) professionals is extremely useful and may start the officialisation of a routine.

Considering the increased and widespread influence (power) of mass media, the necessity emerges that VPH should establish channels of co-operation in order to provide correct public information and avoid the spread of unjustified alarms by emphasising negligible issues while overlooking real problems.

New items are continuously emerging and are becoming priorities (sometimes temporary) of VPH. These include zoonoses (new, emerging or re-emerging) and such problems as those involving food safety (new knowledge, mass movement of people, trade, industrial procedures, etc) and the environment. VPH is more and more requested to manage all animal-connected problems, especially in urban areas (development of veterinary urban hygiene), and to assist in fostering the social use of animals.

To conclude, the steady widening of fields of activity of VPH is now causing both the general public and public administrators to expect that VPH should cover and take care of all animal-connected problems which may be encountered by our society, in close collaboration with all agencies and professionals involved in public health, food safety, animal management, and environmental protection.

ANNEX 1

SOCIO-ECONOMIC IMPACT OF ANIMAL DISEASES AND HEALTH ACTION: SOME CONSIDERATIONS, WITH SPECIAL REFERENCE TO DEVELOPING COUNTRIES

Giorgio Battelli

1. Animal diseases and their socio-economic impact

Animal diseases, owing to both direct and indirect damage, may negatively affect the “quality” of life and human “health”, the latter being meant not only as the mere absence of pathologies but as a state of complete physical, psychological and social well-being. The evaluation of these consequences and of the interventions capable of preventing or minimising them are therefore exceedingly important for Veterinary Public Health (VPH). For example, diseases of farm animals may reduce their productive and reproductive capabilities, shorten their lives, and decrease the availability of food for human

consumption. They may also impede trade exchanges and movements of animals, and prevent non-disease-free countries from exporting live animals and their products. It should be remembered that the illegal use of certain drugs (e. g. antibiotics, hormones) for preventive, therapeutic or growth-promoting purposes or of chemicals as food preservatives may inhibit the marketing and sale of living animals and their products, and represent a hazard to public health, with negative consequences for both producers and consumers.

Diseases and related problems may therefore exert a negative, sometimes very heavy impact on the social status of individual families and communities and on the economy of entire regions. This is especially true for those countries where technical assistance to farmers and stockholders, veterinary Services and prophylactic plans are insufficient or even absent, and where natural calamities (e. g. floods, earthquakes, drought) or man-made ones (e. g. wars, industrial disasters) create periodic or permanent emergency situations.

Among the diseases of farm animals with strong socio-economic impact, special mention must be made of those included in "list A" of the World Organisation for Animal Health (OIE), such as rinderpest, foot-and-mouth disease, and classical and African swine fevers.

As for zoonoses, negative consequences include also cases of human infections, more or less justified distrust of consumers in some foods of animal origin or in animals in general, fear of possible use of zoonotic agents for war purposes or in terrorist actions. Examples are bovine tuberculosis, brucellosis, trichinellosis, BSE and anthrax.

Sometimes, human cases of zoonoses reported by mass media (often with wrong information and comments) may negatively affect the economy of areas of very high tourist value. Furthermore, some zoonoses represent occupational hazards for certain categories of workers, especially in areas where they are highly endemic in animals and where the prevention of occupational risks is underestimated or completely ignored. Accordingly, damage caused by animal diseases may be either of strictly economic or social nature. The absence or inefficiency of multidisciplinary collaboration between Institutions and people charged with the surveillance and prevention of such diseases and with the information and health education of the general public or of the most concerned categories are themselves responsible for negative socio-economic consequences.

The evaluation of damage is sometimes difficult and, for certain pathologies, the data obtained from literature must be interpreted with caution. Indeed, both quantity and type of damage depend upon such different factors as farming systems; breed of raised animals and their productive features; the market or "social" value of the living animals and/or their products; the possible concomitant presence of different pathologies; the quantity and quality of feeds; and others. The degree of difficulty is also depending on the availability (or the lack of availability) of basic (e. g. epidemiological) information necessary for evaluation. Also, regarding human infections it proves hard or even impossible to attribute a monetary value to some consequences such as death, abandon of work or loss of working days on the part of the diseased persons; the consequences for their families; the fear of contagion.

In spite of these obvious difficulties, the evaluation of the socio-economic impact of animal diseases, even if not sophisticated, proves indispensable for identifying major health problems, deciding the kind of actions to perform and the kind of resources to employ for their control or elimination.

It should be remembered that even the diseases of "pets" (a term especially appropriate in industrialised countries), especially dogs and cats, and of wild and synanthropic animals do have in many instances a significant socio-economic impact. Some of them

(not only zoonoses but also infections not transmissible to man such as distemper) may pose serious public health problems. Examples are - in the Mediterranean region – rabies and visceral leishmaniosis. Other health problems and economic losses are associated with dog straying, which is on the increase in industrialised countries and is chiefly linked to the abandonment of animals and to the low level of collaboration and information among health services, public administrations and citizens.

2. Evaluation of health action

For many years, also in the animal health sector, a development has occurred of methodologies applicable to the evaluation of health interventions, especially of the prophylactic ones. The reasons for such a development chiefly came from the need to optimise the exploitation of available resources (monetary, human, structural) and to provide decisional tools.

Evaluation types and techniques are numerous. There are, for example, evaluations that take into consideration how profits and losses associated with an intervention are shared among the single individuals; others consider how they influence economy and society as a whole. An intervention (or more alternative interventions) may be evaluated through various parameters and for different purposes, for instance to verify its/their degree of effectiveness and/or efficiency, the advancement level, the acceptance level, the social effects. Among the economic procedures frequently applied in the veterinary field, mention should be made of partial budgeting, cost-benefit analysis, decision tree analysis. Recently, the use of mathematical models has been introduced to compare different intervention strategies aiming at controlling a specific health problem. These models, however, are hardly applicable due either to the lack of accurate qualitative (epidemiologic and economic) data or to their insufficient number. In some cases, therefore, such models must be evaluated with due caution.

Regarding the evaluation of costs and benefits of an intervention, e. g. a programme of control of a disease, their identification and quantification may sometimes prove complex and/or “twisted” when one intends to estimate all costs and benefits, especially the secondary ones, when the intervention itself is complex and associated with a high degree of uncertainty, or when benefits are essentially social or hard to calculate/predict. In addition, there are different decisional criteria for the evaluation of the results of a cost-benefit analysis, such as the net present value of the benefits, the benefit/cost ratio, the internal rate of return.

It is therefore desirable that, whatever the type and technique of evaluation of a health (or other kind of) intervention may be adopted, the parameters involved and the information sources should be always detailedly indicated and the limits of the evaluation itself clearly stressed.

3. Remarks

The evaluations of the socio-economic impact of animal diseases and of health actions put into effect to control or eliminate them often prove difficult. Their validity strongly depends, besides on the specialised skills of those performing them, also on an efficient information system (not only sanitary) capable of providing reliable, real data and minimising exclusively personal evaluations. Sophisticated analyses not based upon qualitatively and quantitatively sufficient data may prove useless and give a false impression of precision. Multidisciplinary collaboration is therefore prerequisite to activate adequate information systems, to follow them up and possibly modify them. In spite of restraints, the socio-economical evaluation of the consequences of a health problem and of the interventions under way or still to be made to solve it proves indispensable to optimise the use of available resources and to possibly modify the

strategies. Evaluations taking into account only few but sufficiently accurate and time-verifiable parameters and data, and based on correct methodologies, may assist in reaching the objective.

Many countries, especially the developing ones and those with unstable socio-political situations, generally do not have technicians and financial means (and health organisation) enabling them to perform the collection and analysis of extremely detailed (e. g. epidemiological) information. As a consequence, they must (should) work out socio-economic and health indicators based on rather easily obtainable data. This is also the reason why the international standardisation, once personally recommended, of the methods for evaluating disease-associated damage, interventions, and the type and number of data to be analysed is now seen with scepticism about its feasibility and usefulness.

In addition, evaluations should always allow for the socio-economic and political situation of the country or reference area. The “weight” and value of the different parameters and data and of the results of the analyses (e. g. costs, economic benefits, social benefits, interest rate of investments) must be evaluated by people who do know the situation itself and can more precisely assess the impact of diseases and programmes of intervention on the agricultural-zootechnical activities, on the economy of the concerned area, and on the society as a whole.

If necessary, a technical-scientific support to evaluations might be offered by experts working for International Agencies such as FAO, WHO and OIE, or on behalf of non-governmental Organisations acting in the field of international co-operation.

ANNEX 2

COMMENT ON THE ROLE OF LABORATORY IN VPH

Alfredo Caprioli

At the level of the European Union, the revised Zoonoses Directive and Regulation are intended to encourage the development of monitoring activities and the establishment of national control programmes for zoonotic agents, especially foodborne pathogens. These activities should be laboratory-based, and networks of designated National Reference Laboratories capable of a full characterisation of the agents are under construction. Characterisation of the isolates is essential for epidemiologic purposes and molecular typing methods have largely increased the capability of tracing back zoonotic infections from the episodes of human disease to the animal or food sources. Routine surveillance should include all isolates of specified agents from human cases, isolates from selected foodstuffs (ready-to-eat foods or those likely to be consumed without being subjected to a further risk reduction process), and selected isolates from potential animal reservoirs and animal feed.

It is plain that such an integrated surveillance will require a strong multidisciplinary approach, for it will involve medical, veterinary, and food microbiologist as well as medical and veterinary epidemiologists. Medical, veterinary, and food reference laboratories will have to compare and harmonise their methods and possibly to share their databases. In some countries this integration is made difficult by the belonging to different administration branches (e.g. public health versus agriculture). In Italy, the inclusion of the territorial veterinary services into the public health system has greatly facilitated the harmonisation of the activities for surveillance of foodborne zoonoses like salmonella or verocytotoxin-producing *Escherichia coli*. Joint report comparing serotype, phagetype and antibiotic resistance profile of the isolates from human infections with

those from animals, food and the environment are available and contribute to the understanding of the mechanisms of transmission of such infections to humans.

ANNEX 3

WHO's efforts to assist Member States to prepare for the deliberate use of biological or chemical agents to cause harm

Dr Ottorino Cosivi

The World Health Organization, the United Nations specialised agency for health, was established in 1948. WHO's objective is the attainment by all peoples of the highest possible level of health. WHO is governed by 192 Member States through the World Health Assembly, which is composed of representatives of WHO's Member States. The work of this assembly is facilitated by an Executive Board made up of 32 members technically qualified in the field of health.

In 1970, WHO made technical guidance on the Health aspects of biological and chemical weapons available to its Member States in a publication bearing this title. This WHO report made a significant contribution to the achieving of international consensus on the Biological and Toxin Weapons Convention and the Chemical Weapons Convention. The events of 11 September 2001 in the United States of America, and the subsequent dissemination of anthrax spores through the United States Postal Service in the autumn of 2001, highlighted the need for public health preparedness against the deliberate use of biological or chemical agents to cause harm. Health organisations in developing and developed countries were overwhelmed by requests for information and guidance on various aspects of deliberate use of biological or chemical agents to cause harm. Through World Health Assembly resolution WHA55.16 of 18 May 2002, WHO Member States requested their Director General to strengthen activities on global public health preparedness and response to the deliberate use of biological and chemical agents or radionuclear material that affect health. It is noteworthy that WHO focuses exclusively on the public health aspects of preparedness for, and response to such threats. WHO actions on health preparedness for the deliberate use of biological and chemical agents are implemented through the existing framework provided by the Global Health Security epidemic alert and response strategy, in accordance with resolution WHA54.14 of 21 May 2001.

WHO activities relevant to resolution WHA55.16, as summarised below, include the following three main areas of work: (a) global outbreak alert and response; (b) support to Member States for national health preparedness in the event of the deliberate use of biological or chemical agents; (c) technical guidance and information on diseases associated with biological warfare.

(a) Global outbreak alert and response. The objective of this work is to provide the global public health community with timely information on public health emergencies of international concern, and to provide Member States with support in their response activities, should this be required. Alert and response operations include disease intelligence, verification, response and follow up. The Global Outbreak Alert and Response Network includes some 110 partners, and has proven its capacity to provide Member States with technical assistance in cases of outbreaks of epidemic origin and intoxication. This mechanism is now being strengthened to address the challenge posed

by the deliberate use of biological or chemical agents. The International Health Regulations (IHR) of 1969 are being revised to provide an up-to-date legal context for WHO alert and response operations. The revised IHR will require Member States to report to the WHO all public health emergencies of international concern, and will also provide Member States with assistance in the making of such responses, with the option of confidential/provisional notification. Public health emergencies of international concern may include events related to the possible or threatened use of biological or chemical agents to cause harm. However, some key issues merit careful consideration in this regard: (a) the need for WHO to maintain neutrality and to focus its involvement solely on the public health component of any such response; and (b) WHO has no mandate to assess the deliberate nature of any threatened or actual use of biological or chemical agents to cause harm. Should such agents be involved in such events, the responsibility for any related investigation is vested in the United Nations and the Organisation for the Prohibition of Chemical Weapons (OPCW) respectively. However, the UN may request WHO technical assistance in the case of such investigations.

(b) Support to Member States on national health preparedness for the deliberate use of biological or chemical agents to cause harm. The objective of this work is to respond to the increased number of requests for technical assistance from Member States to strengthen their health preparedness and response activities. Activities in this area include the second edition of Public health response to biological and chemical weapons: WHO guidance, and the publication of further technical guidance in the form of supplements to this second edition. A WHO Scientific Advisory Group is being established as a permanent technical and specialist resource for WHO and its Member States. WHO has continued to monitor international developments on various aspects of biological weapons, including the Biological Weapons Convention follow up process agreed to at its Fifth Review Conference, in November 2002. WHO is also working with the United Nations Disaster Management Programme (UNDP) on the development of a training module for policy-makers on the management of preparedness and response programmes for chemical, biological and radionuclear incidents.

With regard to direct technical support to Member States, field missions to advise Ministries of Health on preparedness for the deliberate use of biological or chemical agents to cause harm were conducted in 2002, and are continuing into 2003. However, only some of these requests could be fulfilled, due to limited resources. In this regard, WHO is developing guidelines to assess national health preparedness and response programmes for the deliberate use of biological or chemical agents and is establishing a network of experts to technically support this project. The first draft of these guidelines will be field tested in Thailand in September of this year.

Other relevant WHO ongoing efforts include the following: the Biosafety Programme, which provides information, training, and advocacy for laboratory biosafety procedures and practices; and a programme aiming at strengthening laboratory and epidemiology country capacities for epidemic prone diseases, by targeting microbiologists and epidemiologists from several Member States in the African, Eastern Mediterranean and European regions. This includes an in-depth review of epidemic disease surveillance and early warning systems .

Efforts have been also devoted to strengthening regional cooperation. An Inter-Country Meeting on Emergency Preparedness Strategies held in Bangkok, Thailand, from 17–20 March 2003, involved Member States of the WHO Regional Office for South-East Asia.

(c) Technical guidance and information on diseases associated with biological warfare
The objective of this work is to contribute to international preparedness for diseases associated with biological warfare, by (a) establishing global networks of experts and laboratories; (b) establishing standards and procedures, and disseminating information; and (c) setting up and implementing training. WHO is also strengthening selected disease specific networks on anthrax, plague and smallpox. Other priority diseases — identified by a WHO risk assessment — include tularaemia, brucellosis, glanders, melioidosis, Q fever, typhus fever, coccidioidomycosis, and Venezuelan equine encephalomyelitis.

To prepare for a deliberately caused outbreak of smallpox — where a single confirmed case would trigger an immediate global emergency — WHO has reissued training materials for smallpox recognition, vaccination, and outbreak management. Previously published resources on the disease and on containment operations for it have already been made available. WHO has conducted a global survey of smallpox vaccine stocks and, in October 2001, issued advice on vaccination policy. Guidelines are now being prepared for the surveillance of and response to smallpox in the post eradication era, in addition to training materials.

Work is ongoing for the setting up of a global database of anthrax experts and laboratory capabilities. The priorities of this project include the establishment of quality control mechanisms for the laboratories of the anthrax laboratory network and the development of training materials, as well as the publication of the fourth edition of Guidelines for the surveillance and control of anthrax in humans and animals. Furthermore, consideration is being given to the development of a plan of work for tularaemia — similar to that developed for anthrax — for implementation beginning in late 2003.

ANNEX 4

The importance of intersectoral collaboration for prevention and control of sylvatic tick-borne zoonoses: field experiences in ecological research on Lyme borreliosis in North-western Italy

Daniele DE MENEGHI

In 18th and 19 centuries, the ecologic conditions necessary for developing and maintaining foci of sylvatic tick-borne zoonoses disappeared from many areas of North America and north-western Europe, due to man-made habitat alterations, e.g. vast woodland areas were cleared for agriculture, settlements, firewood/charcoal collection, etc. Then, most of this agriculture land was abandoned and it returned from open fields to fallow land and to deciduous forests, and the so-called “woodburbs” -suburban residential communities- started developing. These “new ecosystems” include high densities of both humans and deer, abundant populations of competent vector ticks and reservoir hosts, thus making the ideal ecological conditions for maintenance of endemic foci of sylvatic zoonoses. Over the last decades, tick-borne zoonoses like Lyme borreliosis, Human Granulocytic ehrlichiosis, European tick-borne encephalitis -as well as other emerging sylvatic zoonoses e.g. Babesia microti and acute pathogenic hantavirus infections- are being increasingly reported from many regions of the temperate World. Also in Italy, like other industrialised European countries, the incidence of sylvatic tick-borne zoonoses has been increasing over the last years. Land use changes –

abandonment of areas that were once dedicated to traditional agriculture and their colonisation by woodlands, in conjunction with the rapid increase of wildlife population-created favourable conditions for ixodid ticks, namely *Ixodes ricinus*; this tick species is the western European vector of *Borrelia burgdorferi sensu lato* (s.l.), agent of Lyme borreliosis (LB). LB is considered the most frequent vector-borne zoonosis in the northern hemisphere, and it is endemic in many areas of northern Italy. Recent increase of recreational activities in wildlife/woodland areas greatly augmented the incidence of tick bites in man, hence the risk of infection by tick-borne pathogens. Within the vector geographic range, intensity of *B. burgdorferi* s.l. transmission is highly heterogeneous. In Italy, the reported prevalence of infection in host seeking ticks varies greatly, and consequently the risk of infection for man and for susceptible animal hosts. In assessing risk of LB, the reported clinical cases are often considered by many authors of scarce utility, mainly due to uneven criteria of case detection. Sero-epidemiological surveys (in exposed human categories and sentinel animals) could be used as an indicator to classify geographic locations for the risk of infection, although difficulties for the interpretation of some serological tests (false positive results) have been reported. As the different stages of *I. ricinus* feed on different wild animals species -characterised by different level of competence as reservoirs for *B. burgdorferi*- the intensity of LB transmission is conditioned by the role played by micro-mammals and/or birds (competent reservoirs), and by wild ungulates -mainly deer (non competent reservoirs) as host for immature ticks. For the above reasons, ecological research plays an important role in the evaluation of LB transmission risk, and a multidisciplinary approach is needed to get an insight of the ecological dynamics of sylvatic tick-borne zoonoses. Therefore a collaborative effort by veterinarians, physicians, epidemiologists, ecopathologists, microbiologists, parasitologists, wildlife managers, etc. is extremely important in order to assess the real risk of exposure at both small and large geographical scale .

As an example of this kind of interdisciplinary approach, we can quote the intersectoral research activities which have been carried out by a multi-disciplinary team -coordinated by researchers of Dept. Animal Production, Epidemiology and Ecology- in two study areas located, respectively in Liguria (Borzonasca and Chiavari, Genoa province) and in Piedmont (Squaneto, Alessandria Province). These study areas are markedly different as regards land use and wildlife population: the former being characterised by a quite high human density, with no wild ungulates except wild boar; the latter characterised by scarce human settings, with a high density of roe deer.

To assess the acarological risk of exposure to agents of sylvatic tick-borne zoonoses in these study areas, a research protocol including the following was designed: i) monthly collection of host-seeking ticks; ii) studying the intensity of infestation by ixodid ticks in wild hosts; iii) collecting data on the incidence of ticks infesting humans; iv) performing laboratory analysis to identify pathogens in vector ticks. Finally, data on abundance/seasonal patterns of ticks, prevalence of infection in ticks were then integrated to generate estimated index of the acarological risk.

It should be noted that the first Italian case of LB was reported in 1984 from the study area in Liguria, and in the same area, LB annual incidence has been estimated at 17 cases/100000 inhabitants. In this study area, ticks were present throughout the year, with significant nymphs and adult peaks, respectively in spring and autumn. About 18.2% of the ticks submitted to PCR (31/170) were positive for *B. burgdorferi* s.l. In particular, *B. garinii* -which causes neuroborreliosis- was the most common genospecies found; *B. afzelii* -causing cutaneous lesions- and *B. valaisiana* -a non-pathogenic genospecies- were also detected from this area. Prevalence of infection in

ticks was significantly lower than in other LB endemic areas in North-eastern Italy (e.g. Friuli-Venezia Giulia region; about 70% infection prevalence in nymphs).

Also in Squaneto study area, *I. ricinus* ticks were found all year round, even in coldest months. Host-seeking ticks were more abundant than in Liguria. High intensity of *I. ricinus* infestation was reported in roe deer (up to 1137 immature ticks per metacarpi from hunted deer). *B. burgdorferi sensu stricto* -the genospecies causing arthritis- was identified by DNA sequence analysis from one out of 3 adults and 132 *I. ricinus* nymphs which were tested by PCR.

Results from this intersectoral research in the two study areas showed the presence of an abundant *I. ricinus* population that is active throughout the year. Prevalence of infection with *B. burgdorferi* sl. in vector ticks, and number of cases reported are markedly different in the two areas, confirming the mosaic-like pattern of LB distribution.

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- “ATC Ge-2 Levante” and “ATC Ge-3 Genova” hunting districts
- “Squaneto” game reserve, Pareto (Alessandria)
- “Assessorato Tutela Ambientale, Amministrazione Provinciale di Alessandria”, Alessandria (Wildlife & Environment Conservation Office)

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ANNEX 5

Animal farming and prophylactic and therapeutic practices: benefits and risks.

Agostino Macri

The ever-growing demand for food of animal origin has stimulated important research activities in the field of animal husbandry which, in turn, have led to a substantial modification of the farming systems. Probably, the most significant changes are the "isolation" of animals from the surrounding environment and their feeding with balanced feeds produced in specialised structures using first matters (corn, soybean, etc.) coming from other geographic areas or even from other continents. In addition, the animals on the farms originate from highly selective procedures exalting their productive performances by promoting such particular productive capabilities as the maintenance of the monogastric condition in calves by keeping them on a milk diet far beyond the weaning period. Also aquaculture has had a noticeable development both in fresh and sea waters through the introduction of fish farming systems allowing animals to be constantly kept under control.

Also, the present farming systems are based upon the most advanced techniques of artificial insemination enabling a conspicuous reduction of the costs for the maintenance of breeder males and contemporaneously securing the availability of animals with optimum reproductive profiles.

In such a situation, it is therefore possible to use the animals' physiological resources to the utmost, so as to obtain productive levels unthinkable in the past. This has permitted to meet the nutritional needs of those countries that have adopted the above techniques. In some species, especially sheep, traditional farming is prevailing with the introduction of the animals into the environment from which they derive feeding and form an agro-pastoral "ecosystem" of noticeable economic and social significance; also this type of farming has introduced technological innovations which have resulted in conspicuous quantitative and qualitative improvements of meat and milk production.

Another relevant aspect is that the production of meats of all species comes from young animals in their full developmental stage, when the index of transformation of feed in meat is favourable.

The concentration of animals significantly increases the risk of spreading infectious diseases, this being the greatest concern of farmers. To solve the problem, important prevention and therapy techniques have been introduced allowing the control of the most serious and devastating ones.

In the sector of veterinary immunology, scientific research has permitted the obtainment of highly advanced products which in many cases preceded similar human vaccines. Indeed, live, genetically modified vaccines have been developed that have assisted in controlling, if not eliminating, some infectious diseases. There are also vaccines intended for breeding females that secure the offspring's immunization through milk, or also vaccines for hens that transfer antibodies into the eggs with resulting passive immunisation of chicks.

The launching of very effective prophylactic campaigns has led to the disappearance of some infectious diseases and to the classification of the corresponding geographic areas as "disease-free". In such cases, vaccination has therefore been discontinued against individual specific diseases and, should they (re)appear, stamping-out will be enforced as the most classical measure.

In comparatively recent periods, techniques have also been introduced based on the administration to animals of saprophytic bacteria capable of competing with the pathogenic flora and thus significantly reducing its infecting capabilities.

Also in the field of pharmacological products important drugs have been developed that have allowed both the prevention and the treatment of many, mainly infectious conditions.

Prevention, called also chemoprophylaxis, consists of a low-dosage administration of antibacterial drugs through feeds or drinking water; an “inhibiting” action is thus exerted on the growth of pathogenic agents by favouring the development of the saprophytic flora. Beneficial effects are so obtained on the health status of animals and, as a result, an improvement of the animal production.

However, the low-dosage antibiotics favour the appearance of drug-resistant bacterial strains and this occurrence was the cause for the gradual discontinuation of antibiotics as feed additives.

At the moment, only coccidiostatics are still in use as feed additives since they are difficult to replace, especially in poultry and rabbits.

As already said, the major infectious diseases virtually affect all the subjects on a farm and must necessarily be treated by a group therapy. Accordingly, should a diffusive disease appear, mass therapeutic measures must be adopted consisting of the administration of drugs through feeds or drinking water at dosages capable of preventing pathogenic agents from spreading. New therapeutic techniques have also been developed for individual treatment such as boluses in the form of containers to be inserted into the rumen where they release the drugs gradually.

An individual treatment gaining great importance against some parasitic diseases is “pour in”, consisting of the percutaneous administration of drug solutions so as to secure their gradual, constant adsorption.

In addition, important innovations were introduced in the therapy of udder conditions both through new drugs and in preventive treatments during the dry period.

Conversely, less important are those drugs employed in the treatment of diseases which are either not transmissible or which may affect only a limited number of animals; should a low-incidence disease appear, it may be appropriate to directly eliminate the animals on the farm.

The current situation of the production of foods of animal origin offers sure economic and sanitary advantages.

The economic advantages are the possibility to obtain very good foods at comparatively low costs (suffice it to say that one litre of milk costs as much as one litre of mineral water and that meat may cost less than salad), with undoubted advantage for consumers.

Foods of animal origin obtained on intensive farms are safer than those provided by traditional farms. Indeed, the isolation allows chemical and microbiological risks to be avoided that are inevitably present in the environment; this same applies to animal living on free range that drink and feed directly on surface waters and hard-to-control pastures. In addition, contacts with wild animals, which are often carriers of infectious diseases including zoonoses, are difficult to avoid.

As already mentioned, industrial animal husbandry largely employs therapeutic means and also chemicals. Furthermore, the high heterogeneity of the first matters used in manufacturing feeds implies the risk of the presence of both environmental and natural pollutants.

The first risk is the presence of residues of different drugs and biotic or xenobiotic chemical substances in foods of animal origin.

To avoid such a risk, the European Union (EU) has worked out very strict regulations and defined positive lists of the different usable products; the inclusion of a determined substance in these lists implies very strict evaluations (definition of Maximum Residue Levels, treatment discontinuation times, use allowed only in certain species, etc.) that practically make its use absolutely safe.

Regarding feed pollutants, allowance limits have been established, the respect of which will avoid any significant risks for animals and especially for human consumers.

The other risk is the development of drug-resistance in the bacteria present in the tissues and excreta of animals treated with antibiotics. This is a very important phenomenon whose associated risks for consumers of food of animal origin are not fully predictable, and which is presently being monitored. The existing concern, as previously said, led to the exclusion of some antibiotics from zootechnical use, and further restrictive measures are likely to be taken in the future.

Finally, the problem exists of the environmental contamination by zootechnical wastes and also the obnoxious odours associated with farming. These are very serious problems that in some geographical areas with a high density of farms are strongly felt by the populations and are still to be fully solved.

To conclude, it may be stated that the evolution of animal husbandry has brought forth undoubted benefits and that risks have largely been provided for by the extant legislation. Accordingly, the respect of law will enable industrial animal production to be considered with confidence.

ANNEX 6

VPH PROBLEMS OF IMMUNODEPRESSED PERSONS

Paolo Pasquali

A particular area in which Veterinary Public Health could play a crucial role is that connected to the zoonoses in immunodepressed human beings, with particular emphasis for patients with Human Immunodeficiency Virus (HIV) infected or Acquired-Immuno-Deficiency-Syndrome (AIDS) affected patients.

An estimated 42 million individuals are currently infected worldwide, with the vast majority of those in Sub Saharan Africa. Spread of HIV infection continued at an alarming rate in 2002, with over 5 million new infections and 3 million deaths (UNAIDS, 2002).

AIDS can be considered a disease of immune system that is not able to work, properly. HIV can weaken the immune system to the point that the infected host is not able to control certain organisms that are usually controlled by a healthy immune system. On that account, these types of pathogens are known as "opportunistic" because they are able to express their pathogenic effect only in association with predisposing factors that weaken the immune system.

Some of these infections are well-recognised zoonoses that are naturally transmitted between animals and humans. Others are associated with, but not directly transmitted by, animals.

In this second case, the transmission usually involves complicated patterns that have to be known to better understand the epidemiology of HIV-related infections and to provide medical support to infected patients.

In order to deal correctly with opportunistic infectious diseases which can easily occur in HIV patients, it is extremely important to discriminate between developing/under-developed and developed Countries because they represent a complete different setting in which discrete scenarios can be drawn, in relation to human habits, epidemiological patterns and interplay between human beings and animals. In developed Countries, in fact, the most frequent patterns through which HIV or AIDS patients contract a zoonosis is by means of direct contact with pets or of the consumption of contaminated food of animal origin. In developing/under-developed Countries, on the other hand, the most frequent route of infection is characterised by direct contact with farm or wild animals. It means that different risks and mechanisms of spreading of zoonotic agents exist, according to the considered geographical areas and those differences have to be taken into account in order to organize an effective control strategy.

It comes out that interactions between animals and humans are truly complex and health care providers should be aware of the potential role of animals in infectious diseases of HIV or AIDS infected patients. HIV or AIDS patients are not obliged to get rid of their pets, to avoid any contact with animals, or to eliminate the consumption of food of animal origin, but they have to be informed about the risks connected to their actions and if there is a way to reduce the potential hazards connected with animals.

Overall, we can define two different critical points, which have to be considered to reduce the risks of infections due to opportunistic pathogens for HIV or AIDS patients: food of animal origin and direct contact with animals, either pets or farm animals.

Food safety is a complicated issue which involves many professionals, but the basic rules to follow, in order to minimize the risk of consumption of infecting food, are based on the concept that most of zoonotic foodborne opportunistic pathogens are temperature-sensitive and are contaminating, not infecting, agents, implying that foodstuff is contaminated along the production chain between the slaughter and the table of the consumer. Among opportunistic pathogens, of particular concern for immunocompromised humans are *Salmonella* spp., *Campylobacter jejuni*, *Listeria monocytogenes* as bacteria and *Toxoplasma gondii* as protozoan. Here we will focus on particular aspects that have to be followed by immunocompromised consumers.

- * Avoid to eat raw or undercooked meat, poultry, fish, and eggs. It preserves to the risk of ingestion of bacteria that are normally present on the surface of meat or of those that cause opportunistic infections.

- * Avoid as much as possible food cooked without evidence of high hygienic standards. It means that it is strongly advised to avoid restaurants, take-out, or deli-prepared food. In case it would be necessary it could be useful to order simple foodstuff, which does not need manipulations, such well done grilled meat.

- * Food must be handled properly and safely from purchase to consumption. The basic rule to consider is that the risk of contamination is correlated to the handling. It means that the more food is handled, prepared or seasoned, the more it is at risk for contamination.

- * Consider raw meat a potential contaminating agent. Put it in a separate bag and take home immediately. Avoid storing meat for period longer than 3 days in refrigerator.

- * Wash carefully hands and utensils before starting cooking. Glass or dedicated wooden cutting boards have to be used when preparing meat. It avoids that bacteria present in meat could contaminated other food that will not be cooked for consumption.

- * Refrigerate leftovers immediately after meal, dividing into shallow containers and cover with plastic wraps or aluminium foils. Do not storage leftovers for more than 3 or 4 days and re-heat them before consumption.

* Other source of infections could be water, vegetables and fruits. In order to minimize risks connected to that food, drink only canned or bottled water or drinks. Use ice made of boiled water. Avoid uncooked vegetables and salads or unpeeled fruit. Direct contact with pets or farm animals is a source of infections for immunocompromised humans. In order to minimize those risks the following recommendations are strongly advised:

- Avoid direct contact with animal faeces;
- Remove daily faeces from litter box asking to someone else to do it for you;
- Wash hands after touching objects that may be contaminated with faeces of animal origin;
- Vaccinate pets against common animal diseases and treat periodically pets to control parasite infections, in order to reduce the risks and to protect pets against pathogens which could debilitate them and predispose to contract infectious transmissible also to humans.
- Use vaccine BCG (in humans) to prevent risks to contract bovine tuberculosis in endemic areas
- Spay pets (especially cats) to reduce movements and to minimize risks to contract sexual transmitted diseases.

The necessary expertise could be easily provided by veterinarians, who represent the natural interface between animal and human health. In collaboration with physicians, they could create a comprehensive information system, which represent the starting point for preventing and controlling opportunistic infections in HIV or AIDS patients. Every opportunistic pathogen has peculiar patterns of transmission from animals to humans and addressing these aspects could contribute to fill a gap left in the multidisciplinary approach of the control of opportunistic infections.

UNAIDS/WHO Joint United Nations Programme on HIV/AIDS. AIDS Epidemic Update: December 2002. United Nations, Geneva, Switzerland, www.unaids.org

ANNEX 7

URBAN VETERINARY HYGIENE: A TOPIC FOR A MULTIDISCIPLINARY APPROACH

Giovanni Poglayen

Urban Veterinary Hygiene (UVH) is the discipline committed to the activities and organisation of veterinary services in urban areas. It is a very old practice, associated with the administrators' concern about the presence of animals in cities, traces of which are found in edicts and documents issued especially on the occasion of rabies control and of great pestilences when animals were suspected to be plague-spreaders. UVH was born in 1977 at the meeting of the WHO/FSAO Expert Committee on "Some veterinary public health problems associated with intensive large-scale animal production, animals in urban areas and chemical residues in food of animal origin". Later on, in Italy a specific functional area of public Veterinary Services has been developed. It is important to stress that UVH, as a multisectoral practice requiring the collaboration of different technical-professional skills, has been given poor attention by the academic field where the vertical approach is still prevailing with a marked trend to privilege (small) animal practice. However, this has not prevented the recognition and the practical application of this new way of thinking. The initial goal was the control of zoonoses, chiefly the elimination of urban rabies. In industrialised countries, the changed attitude of the population towards animals (as a consequence of rabies elimination) has widened

veterinary competencies. In some countries, urban animals, either domestic, synanthropic or wild, have now become “citizens” with recognised rights (and “duties”). The establishment of “Offices for Animal Rights” in some cities (e. g. Rome) is an example of the results of this novel attitude. In 1995, VUH has become “a complex of health activities associated with man-animal-environment relationships in urban areas”. This may represent a revolution in veterinary activities, competencies and responsibilities not only in cities but also wherever the urban living way has superseded rural habits. Along with the closer and closer proximity with classical pets, at least two of the “new attitudes” are posing problems to the veterinary profession, i. e. the habit (“fashion”) of keeping exotic or unusual animals and of owning dogs with a strong tendency to aggressiveness (viciousness). Another major problem is pet abandonment which results in the involvement of veterinary services in this sort of new emergencies.

A present major challenge is the relationships with other professional categories that, besides the culturally closest medical one, include architects, city planners, computer scientists, ecologists, economists, engineers, psychologists, school teachers, sociologists and others which are today necessary for managing animal-related problems in urban areas. The co-operation with each of such skills is a further challenge to a permanently developing profession.

Psychologists and teachers, together with psychiatrists and physiatrists, are the interface of veterinary medicine with pet therapy and with a new activity which may be defined as “animal education”. The former is a proper support therapy for different disabled persons where the veterinarian should secure the optimum health status of the animal in view of its use and of the kind of patient’s disability. The veterinarian should also exert control over the psychological/behavioural attitude of the animal throughout the entire period of the therapy. This should not be a mere initial assistance but a continuing inter-professional practical collaboration.

Also the “institutionalised” introduction of animals in schools as an educational tool is gaining ground along with the “controlled” introduction of animals into old people’s homes, hospitals and prisons. In these situations the veterinarian may also assist by providing education and information through audio-visual teaching material.

Architects, city planners and engineers are seldom prepared to help limit the number of synanthropic animals while they are more willing to assist in building housing structures and man-pet cohabitation places. The importance of these professional categories is best understood when one realises that the excessive number of pigeons in our cities is due to the fact that they were intentionally planned so as to host these animals as a precious protein reserve in view of sieges and famine. A direct intervention on the structures would therefore be necessary to curb the populations of these birds.

Again, the problem of synanthropic animals calls now for the collaboration with ecologists with the computer scientists’ support. Actually, the present understanding of the ecology of animal populations allows measures to be taken which are reliable, efficient and durable.

Also, when planning and implementing UVH programmes, the support of economists and sociologists is needed to evaluate losses and socio-economic benefits and to protect citizens, city administrations, the veterinary profession and animal welfare.

ANNEX 8

Problems in Multidisciplinary (intersectoral) Collaboration: the Public and Animal Health Sectors' Issue

A. Seimenis, DVM

All public health and animal health professionals, even most of the decision-makers, recognise that zoonotic disease control cannot be achieved without concerted actions of all sectors by all means involved. Regrettably, this is the theory. The practice in most of the countries is completely different. Experience has shown that many control programmes failed because it was felt that a liaison office or a veterinary public health project at the national level alone would solve the problem. In the absence of a national programme (i.e. commitment to a comprehensive national plan), such liaison offices often had difficulty in functioning usefully. Similarly, the establishment of intersectoral committees, including directors of services, usually do not lead to successful programme implementation because budgeting, staff supervision, and information exchange still remain strictly vertically oriented within the various sections, without making practice of the horizontal communication and co-ordination.

In spite of progress in technology, several zoonotic diseases have not yet been brought under control in many countries. The measures taken have remained inadequate because existing resources were not fully utilised or included in an inappropriate, therefore, inefficient way, or had not even been identified due to lack of horizontal communication and co-ordination. Another example refers to foodborne diseases. Co-operation for the control of these diseases at national level is often hampered by the diversity of technical specialisation required. Thus, it is not surprising to see, in some countries, up to six Ministries maintaining services, including laboratories, dealing with the control of a distinct zoonosis or foodborne infection. Such services may be found under the Ministries of Agriculture, Municipality, Education, Trade and Environment Protection. There is no sign that this is going to change in the near future. Unfortunately, such multifocal services very often have no working contacts among them at national or even local levels because integrated systems are largely missing.

In many countries of the Mediterranean and Middle East (MME) regions, disease prevention and control activities are managed through vertical programmes using dedicated staff to provide specific services. These programmes are so well established that their managers and senior personnel in Ministries of Health and/or Agriculture may resist any move for change towards co-ordination/integration, fearing erosion of authority and resources with subsequent negative effects on the programmes.

Several vertical disease control and prevention programmes are donor-driven. Donors may be reluctant to support a change towards integration as this policy might prolong their commitment and lead to loose in their effectiveness and accountability.

Several countries suffer from a poor public health and/or animal health systems infrastructure, particularly the peripheral (district) services. There is concern that integration will put more pressure on an already overloaded health system. Overload of the multipurpose health worker is already well documented in several countries in the MME regions, particularly those in a situation of complex emergency.

The Declaration of Alma-Ata states in Article VII, 4, that «primary health care involves, in addition to the health sector, all related sectors and aspects of national and community development, in particular agriculture, animal husbandry, food industry, education, housing, public works, communications and other sectors», and demands the co-ordinated efforts of all those sectors. Such a concerted action is particularly critical in the developing countries with extremely fragile infrastructures and limited resources, to

ensure the optimum utilization of available resources and minimize duplication of efforts. However, such action should not be restricted to those countries only.

In response, the World Health Organization (WHO) and a number of Member States decided to develop more integrated health policies and programmes-incorporated in the Primary Health Care approach-and to design institutional mechanisms and administrative structures better able to promote intersectoral action for health.

These efforts point to the potential resources that are available for health promotion through intersectoral action. But it cannot be said that they have as yet led to a comprehensive intersectoral approach that would enable the health sector to collaborate with other sectors to shape and influence their health-related components towards a positive outcome in health.

There are several reasons why health strategies have not advanced far in this direction. Despite the new strategy for health, health planning has remained a more or less self-contained exercise within public the health or animal health sectors, carried out principally by professionals in relative isolation from other development processes. This isolation is reinforced by the tendency of most sectors to perceive health as comprising mainly medical or veterinary services respectively and their output. This pushes the health strategy back to a curative approach. In this context, other development sectors tend to regard intersectoral collaboration (IC) for health as a diversion of time and resources for their own sectoral priorities.

In zoonotic diseases, there is an intimate relationship between animals and humans and their environment and continuous interaction between their respective cycles. Obviously people responsible for their respective welfare should share this intimacy as well. The lack of co-operation, co-ordination and understanding between the services dealing with human and animal health has been responsible for the failure in many countries of the prevention and control of zoonotic diseases programmes, including foodborne diseases. The close ties of animal activities to rural communities provide an added advantage in promoting intersectoral co-operation. Case studies have shown that agricultural people tend to view the world in non-sectoral terms, unlike in urban societies, which have been accustomed to think in terms of division of labor and government fragmentation. They are not inclined to split problems into self-contained compartments, such as «health», or «agriculture», or «education», etc. Such sectoral distinctions are necessary for government administration, as they allow different agencies to be in charge of various parts of rural reality, but they tend to obscure inter-connections between different problems. In other words, effective communication for health promotion carried to the agricultural people through veterinary public health (V.P.H.) activities may have a more significant impact.

Tackling the Problem

Conventional responses to communicable diseases cannot break the stalemate particularly in the countries hard-hit with such diseases. Intervention tools should be used for a more effective response that makes the best use of available resources to improve the outcome of programmes and activities.

Integrated communicable diseases prevention and control under the V.P.H. concept means diversion of policy from the «vertical» approach to the «horizontal» one. It includes common planning and implementation of programmes and activities where appropriate, providing merging of resources, services and intervention at various levels inside and between sectors.

To achieve such a challenging target political will and motivation to change to a new concept is essential. Strong support should also be assured by all sectors to be involved, particularly the major ones: public health and animal health.

Feasible and well established planning can become the platform for the advocacy needed at all levels and directions, particularly state infrastructures and donor agencies. Intersectoral collaboration under the V.P.H. concept, is not being promoted as a panacea for all public health problems. There are many other important programmes and activities in health (public and animal), as in other sectors, that can be implemented with well defined sectoral boundaries with the minimum of interaction between sectors. The intersectoral/integrated collaboration approach, as envisaged by the V.P.H., is related to those factors that have a major impact on public health, and by so doing, the best possible outcome for health is produced at the lowest cost and higher possible effectiveness.

Conclusions

Zoonoses control programmes which in their implementation overlook the importance of the multi-disciplinary approach, as well as, of the human and animal health services and professions active involvement, are condemned to fail or to reach only partial results. Duplication of manpower, facilities, and activities occurring independently could be minimised, or cut-down entirely, if active efforts for co-ordination were put forth by the members of the animal health and public health communities.

Inter-agency zoonoses committees, formed to co-ordinate efforts of the animal and human health sectors, are a useful device. Where "territoriality" between the above-mentioned sectors exists, such attitudes do not serve the needs and priorities of public health and result in needless duplication of efforts and increased expenses. In the best interest of the society, such communication and interaction obstacles should be dispelled.

The present scarcity of examples of successful co-operation between public health and animal health services and professions, as well as with other inter-related sectors, should alarm the competent authorities in all countries. IC should not rely upon the good will or the by chance presence of some "key persons" who support and promote this policy. It should become the ideology and strategy of every country needing to be alleviated in a first stage and there after possibly released by the heavy socio-economic impacts that zoonotic and foodborne diseases are creating. International organizations are there to contribute with their experience and knowledge. Seeking and implementing their suggestions and contribution would be a major benefit.

Human and animal health authorities and institutions by accepting that public health is their first target, face a great challenge. Not only do they have a great deal to contribute but they also have a great deal to gain. The effective and honest collaboration of these two more important sectors in all possible branches of common activities will multiply their opportunities and achieve goals that would have been impossible to be reached otherwise. In this regard integrated public health programmes are the best systems, as they can serve as focal points to channel independent efforts and resources in various sectors and disciplines involved in animal health and production towards safeguard and improvement of human health.

In conclusion, we have to accept that zoonoses and foodborne diseases prevention, surveillance and control is not only a matter of scientific up-dating, it is not only a matter of sufficient financial recourses, political commitment and appropriate management. It resides mostly on the principle to getting rid from the «territoriality» concept of each responsible sector.

We have to bear in mind that public services and agencies are there to serve the population of their country to afford public health problems. They are there to safeguard and promote public health and animal health and production and not at all to compete among them or, even worse, to ignore each other.

When we all are working together to solve major problems, we can be then sure that we have possibilities for success and this way, we can consider our mission as services, institutions, academic communities and individuals to be fully justified.

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TRAINING ON VPH ISSUES AT COMMUNITY LEVEL AND PUBLIC EDUCATION

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INTRODUCTION

The special umbrella term VPH originated within the Centres for Disease Control (CDC) Atlanta, in the late 1940s and was adopted soon after by the newly formed World Health Organisation (WHO). Veterinary Services gradually began to integrate the new dimension of VPH in their activities. The VPH activities of the Veterinary Services were oriented towards the protection of human health. However, the prominent functions remained the control and eradication of zoonoses and food protection.

In the course of the 20th century, the importance of VPH has increased, due to the evolution of animal health problems, the human population growth, the acceleration of international trade, the growing force of information media, the emergence of biotechnology and the new concerns of contemporary societies (food safety, care of the environment, respect of animal welfare, etc...). Veterinarians had to adapt to this new situation in order to respond more adequately to the new requirements of public health.

The concern of VPH has shifted over the years from animal epidemics to problems in public health. In 2002, VPH was defined by a joint FAO/WHO study group as “the sum of all contributions to the physical, mental and social well-being of humans through an understanding and application of veterinary science” (WHO, 2002).

The usual veterinary police action of the veterinary profession gradually shifted to community participation, which will eventually dominate official functions. Control of zoonoses, which is a major VPH activity, must be based on public cooperation. It is in this context that the present paper examines issues of VPH community based systems, in relation to training and extension at community level. The present situation of the VPH community based systems and the desired situation are described. Possible ways to achieve the desired situation are proposed.

In this document, the hydatid disease pilot control programme was used when necessary as an example of control programme, where health education is a major component.

I. STATE OF THE ART

Present situation of VPH community based services

The protection of animal health and the control of animal disease is an essential component of livestock husbandry. Despite remarkable technical advances in the diagnosis, prevention and control of animal diseases, the poor animal health situation throughout the developing world causes large economic losses and remains a major

obstacle to improvement in world-wide livestock production. Farmers must be advised in order to achieve the greatest value from their animals. The overall objective of animal health programmes is to contribute in a cost-effective way to the improvement of food production and the protection of human health against animal diseases and to minimise the negative impact of animal disease as a trade barrier.

Poor human health and low levels of hygiene help increase the socio-economical impact of zoonoses. Improving health risks and food production techniques, especially in developing countries is an essential element in the general improvement of the standard of living of humanity. The zoonoses causing the greatest problems for human health and greatest economic losses are brucellosis, rabies, salmonellosis and hydatidosis.

In developing countries, particularly in North Africa and the Middle East, efforts have been made to reduce the prevalence of some major zoonoses. Programmes to control zoonoses have been implemented in several areas, either by the appropriate institutions or by NGOs or small groups. They have shown that control is possible. However, these have mainly been short term operations due to the lack of resources. Support has been provided from the appropriate institutions, when necessary. Although control of zoonoses is not a priority in the relevant ministries, some programmes have been conducted in pilot areas and have underlined the importance of inter-sectoral collaboration.

As an example, the hydatid disease pilot control programme in Morocco have been based on a solid collaboration between IAV Hassan II, the Central Veterinary Service in the Ministry of Agriculture and the relevant services in the ministries of Health, Education and Interior. In spite of the scarce human and material resources, the programme has been very useful in identifying the necessary methods and tools and has emphasized the need for control at the national level.

Despite all efforts, parasitic and infectious zoonoses continue to cause considerable economical losses both in humans and in domestic animals. Zoonoses such as rabies, tuberculosis, brucellosis, hydatid disease, leishmaniasis, etc... are still highly prevalent in developing countries. Knowledge of their frequency and territorial distribution in human and animal populations is very limited. Although major zoonoses are still highly prevalent in developing countries, control is rarely performed.

The scarcity of programmes to control zoonotic and animal diseases is mainly due to the absence of a global vision and a clear strategy for control at the national level. Other limiting factors such as the lack of resources, the absence of collaboration between the various sectors and actors and the lack of involvement of the community, must also be considered. Consequently, VPH services are either inexistent or under-used, in many developing countries. This explains why in most cases, training at community level and public education are precarious.

Diseases continue to spread, due to an environment that allows transmission of pathogens, namely low levels of hygiene, unawareness of transmission routes and prevention measures in at risk populations, abundance of pathogens, poverty, lack of water, etc....

Integrated control programmes must be implemented in order to reduce losses, morbidity, mortality, improve human wellbeing and strengthen animal health services.

Programmes to control zoonoses are usually based on several measures among which public health education is a major component. The transmission routes of zoonoses and animal diseases and the control measures must be clearly understood by the various categories of the population. Control can only be successful and sustainable if the communities are fully involved and play an active role in the various control activities.

II. UPCOMING TRENDS AND DESIRED SITUATION

It is evident that some prerequisites are necessary in order to achieve a more efficient control of zoonoses. These lie at 3 levels: political, technical and population levels. These levels are closely interdependent. The following figure represents these interactions.

Political level

The lack of programmes to control major zoonoses is usually due to the fact that these diseases are not considered a priority among the national development programmes. The reason for this is the lack of a political decision and the lack of commitment, at the high level, to control animal diseases and zoonoses.

Technical level

Structures

In some countries, the Ministry of Health that takes care of human and animal diseases. These do not experience problems resulting from divergence between the structures in charge of human diseases and those in charge of animal diseases in the case of zoonoses.

In countries where the Ministries dealing with human and animal health are separate, there is a need for the creation of a VPH structure that represents a link between the Ministry of Agriculture (if so called) and the Ministry of health. This structure will be responsible for all programmes to control zoonoses and food-borne diseases and will ensure an adequate inter-sectoral collaboration.

Where this structure is lacking, inter-sectoral collaboration is difficult, if not impossible. This results in a divergence in priorities between the Ministry of Agriculture and the Ministry of Health in zoonotic disease control programmes.

There are cases where the relevant ministries are not convinced of the public health importance of zoonotic diseases. Changing the situation usually requires lobbying and public relations at the decision making level.

In Morocco, for example, it has taken many years to make the Ministries of Agriculture and Health aware of the public health importance of some major zoonotic diseases. Today, some control measures are being conducted.

Technical structures with adequate resources are also necessary in the field, in order to conduct control activities. For example, extension programmes require central and local extension units that are responsible for the types of messages to transmit to the various target audiences and the appropriate educational materials to reach the communities.

Strategy

A global vision for VPH services in the country will enable to define a clear strategy for the control of zoonoses at the national level, with a timely programme of actions. Control activities must be coordinated and the agenda elaborated during regularly scheduled concerted actions at the central and regional levels. Any control programme to be implemented must have a defined and timely planning of activities within a defined timeframe. These will then be monitored and evaluated.

Control of zoonoses require long term and repeated actions. (Ex: the hydatidosis control programme in Cyprus: the first phase of the programme, called the attack phase took 10 years).

Periodic and formal extension programmes must be implemented to prevent parasitic and infectious diseases. It is very important that programmes differentiate between the various categories of at risk populations (segmentation of the population). Activities must be gender sensitive. When all target populations are exposed to the same extension programmes, some target audiences may be excluded or forgotten. Women, for example, do not usually take part in extension programmes, due to socio-cultural habits. However, they are the most exposed to some zoonoses, due to their specific rural activities. Therefore, special extension programmes must be specifically designed for rural women and addressed when their timetable permits.

The community and the local authorities must be involved in the elaboration of the programme and in all activities in order to feel concerned and play an active role in the control.

Control programmes must target animal and human health issues, but also problems resulting from the interactions between animals, humans and the environment.

Communication

The results of the control operations must be disseminated and published in order to inform the populations about the advancement of the control activities and ensure their continuous involvement. This must be performed through formal communication systems. In addition, powerful communication means such as the radio and television must be appropriately used to support extension programmes.

Research

It is very important to encourage research in general and particularly in the field of VPH. Research institutions have a key role to play in VPH control programmes. Funding must be provided in order to develop tools for epidemiology, diagnosis and monitoring and find solutions to various issues. The development of a national data base is crucial for recording and monitoring. Investigations must be conducted in the field of education, information and communication. This field, very useful for the development of VPH programmes, is usually neglected. In addition, socio-economical and human aspects of diseases are often forgotten. Sociologists or socio-economists must be involved in research and must be regular member of the control teams. Guidelines should be developed for epidemiology, diagnosis, prevention and épidémio-surveillance of zoonoses and food-borne diseases.

Experiences and actions implemented in various regions must be documented and valorised. The tools developed and the conclusions, recommendations and lessons learned must be taken into consideration when implementing new programmes.

Resources

Control programmes in general and development of VPH services at the national, regional and local level are not possible without financial resources. Funding must be secured long before the preparation of the programme, in order to provide the necessary human and material resources, purchase drugs and vaccines, train personnel in communication and extension, develop appropriate and professional educational materials, provide necessary expertise, etc... National and regional funds must be primarily solicited from the various sectors involved. Government Institutions may also seek assistance from International Organisations and NGOs for various development activities.

Ex: Technical cooperation programmes from FAO, development programmes from various UN organisations, UNDP, UNICEF, etc...health programmes through WHO, etc...

Population level

Structures

Rural populations need to communicate with public institutions in the same way that the later needs to interact with farmers and livestock producers. There is a need for an active structure that bridges between the local communities and the government institutions. This structure will be responsible for the delivery of appropriate VPH services, public education and training at the community level.

Infrastructure

The delivery of VPH services and particularly public information are best performed in appropriate learning places and infrastructures for health education and extension. There is a need for gathering laces, in the villages, in order to provide extension programmes for farmers, livestock producers, rural women, health authority representatives, and training for extension workers and NGO representatives. In the case of children, primary rural schools have proved the best places to dispense health educational programmes.

In the hydatidosis control programme in Morocco, primary schools have been used for educational programmes addressed to schoolchildren and their teachers, but also for rural women, and for population in general during the ultrasound surveys. Pictures.

Strategy

It is well established that VPH services have to be delivered at the community level. A global strategy for the country must define clear and comprehensive VPH programmes at the low level. The components of the VPH training and extension programmes must match the current situation in the field and need to be formal and periodically updated. In many developing countries the same extension programmes have been dispensed for

many decades. Regular training should be provided to trainers and extension workers in all sectors. Public education must be repetitive and continuous process. Programmes must be adapted to the various rural activities of the population categories. In the case of rural women and children, domestic activities are time consuming and do not leave free time or provide conditions for them to attend extension or health educational programmes. Women represent a key target because they are more exposed to some zoonoses due to their contact with animals. The population must be concerted in the preparation of the control programmes, informed about the activities of the programme and must play an active role in the various actions. The participatory approach must be adopted wherever possible in order to give an active role to the communities in the programmes: they will be responsible for their own development. In addition, there should always be a feed back on the community regarding the advancement and the results of the control activities. Local NGOs must also take an active role in control programmes. Incentives must be used in order to encourage the local populations to contribute. Involvement of the exposed populations will insure the viability and sustainability of the implemented VPH control programmes.

Research

There are always gaps between research and the real situation in the field. Applied research must be encouraged and planned. The results must be applied at the local level, through training and extension programmes for the benefit of the communities.

Resources

Functioning resources must be mobilised at the local level. In many developing countries, local structures in various sectors usually have a budget for rural operations. This must be explored before seeking national funds. Usually, international organisations and NGOs are encouraged and convinced to provide assistance when they see a contribution from the local, regional and national structures, showing the interest and the concern of the relevant authority for a particular VPH issue.

In conclusion, there is a need for a solid political decision that considers implementation of control programmes, provides the necessary funding, encourages research and provides the technical structures and infrastructures, with clear objectives and conditions for the realisation of the defined VPH activities within a timely planning.

III. THE WAY FORWARD

The methodology undertaken in the development of this document is integrated in an operational concept named the social marketing.

The social marketing (SM) was developed by P. Kotler and G. Zaltman (1971). It is an organised and structured process aiming at the behavioural change of exposed low income and other vulnerable people. It combines the best elements of the traditional approaches targeting the social progress in a structured and planned manner. It uses the marketing techniques, applied to health, in order to generate discussions and promote dissemination of the information and adoption of new practices. It contributes to the creation of optimal conditions for the social progress and changes of behaviour.

The objective of the SM is to insure the financial and geographical accessibility of a service or a product to a target population. Here the product can be a social product, for instance the change of behaviour in order to eliminate a zoonosis, or a market product such as a vaccine or a drug.

The SM approach includes 3 distinct phases: the planning phase, the execution phase and the evaluation phase.

- Clear strategy
- Work plan, timeframe
- Monitoring
- Evaluation

Phase 1. Planning

Public education at the community level aims at changing the behaviour, attitudes and practices of at-risk communities. To address this complex issue, we need to ask some crucial questions:

- Where are-we now? we have described the current situation of the VPH community based services (part I of this document).
- Where do-we want to go? we have described the desired situation (part II).
- How can-we do it? This question will be developed in the third part of this document (the way forward).

Phase 2. Execution

Study of “the market” and data base

- Literature review

There is generally a limited knowledge of the frequency and territorial distribution of zoonoses in human and animal populations. All available data must be compiled in the focal point (VPH structure). Information on the subject will be collected at the national and international levels. Experiences of other countries in control will be reviewed. More surveys and research will be needed to complete the information (ex: prevalence of diseases in various species, cost and KAP studies, levels of knowledge of the various sectors and actors, etc...). All available and newly obtained data will be incorporated in a national data base.

- Geographic study
- Network for exchange of information within and outside the country.

Strategy for the development of tools

Gaps in applied research must be filled in. The control programmes will require some crucial tools, indicators and studies. This will be the responsibility of research institutions. These are:

- diagnosis tools
- epidemiological and epidemio-surveillance tools
- evaluation tools

- criteria for measuring results of veterinary programmes: indicators of productivity and reproduction, indicators of animal health
- criteria for measuring prevalence, incidence and focality of disease
- Indicators of morbidity and mortality among human populations
- Socio-economic studies: economical and sociological impact of diseases

Product strategy (services)

Here the products might be market products or social products such as the services provided.

The products in VPH services may be either the change of behaviour, through public education, or the use of drugs or vaccine to treat or prevent diseases, etc... This phase consists in making the service or the product financially and geographically accessible to the exposed and vulnerable populations.

In the case of hydatid disease:

- An example of "social product" is the change of behaviour and practices. It is acquired through health education, training and extension. The main messages are:
 - o do not give hydatid cysts to dogs
 - o wash your hands with soap before eating
 - o wash fruits and vegetables before using them

Another example of social product is the surgical operation provided for patient with hydatid cysts.

- An example of market product is the medical treatment used for positive patients: albendazole, or the anti-parasitic treatment used for dogs: praziquantel.

Price strategy

Rural populations are poor and vulnerable and cannot afford to cover the cost of expensive medicine or surgical operations, or vaccines. This strategy consists in making the products accessible to the population, geographically and financially (solubilisation). Example: in the case of the hydatid disease control programme:

- The medical treatment has been provided by WHO: it costs USD 2 per tablet, and the treatment require 2 tablets a day, for 3 months to many years...
- The surgical operation for positive patients was performed at no cost by the regional public hospital in Khénifra or the Ibn Sina Hospital in Rabat. Travel costs were provided by the BAFI/IAV project.
- All drugs needed for the operation were provided by IAV, under the BAFI/IAV project.
- Treatment for dogs and anti-rabies vaccine was provided by the Ministry of Agriculture.

Strategy for the promotion and communication

- o Information, education and communication (IEC)
- o Promotion

Strategy for public relations

The objective of this strategy is to convince the stakeholders to consider VPH services and to secure funds for the zoonoses control programmes to be implemented.

Actions must be conducted at the institution level in order to sensitise all sectors and actors.

Secure funds

- Creation of a VPH structure, common between the Ministry of Agriculture and the Ministry of Health, with leadership in the control of zoonoses and defined programmes
- Sensitisation of decision makers and politicians in order to have their political support, ensure their commitment and secure funding for control activities, educational programmes and materials, applied research, etc
- Sensitisation of stakeholders and technical institutions in order to ensure and their involvement and commitment in VPH programmes, to ensure inter-sectoral collaboration and secure funding
- Sensitisation of local authorities in order to mobilise local funds and ensure their commitment
- Sensitisation of opinion leaders (newspapers, parliament), in order to disseminate the information and ensure that the relevant decisions concerning control are taken.
- Sensitisation of research institutions in order to produce relevant tools and criteria
- Sensitisation of the civil society (local NGOs and local communities)
- Sensitisation of industrials and producers in order to involve them in the programme and hence ensure the accessibility of the exposed populations to their products and services.
- Sensitisation of relevant International Organisations to have their support and secure funding

Strategy for public information

Health education and extension programmes must be planned and implemented accordingly.

The following target audiences must be exposed to extension programmes:

- Decision makers
- Local authority representatives
- Religious leaders
- Opinion leaders
- Rural women
- Schoolchildren
- Dog owners
- Abattoir personnel

Strategy for training

Training programmes must be prepared and the following audiences targeted:

- All medical and veterinary professionals
- Medical and veterinary auxiliaries
- Technicians
- Extension workers
- Meat inspectors
- Rural school teachers
- Local NGO personnel
- Social science experts

- Professionals in communication

Phase 3. Evaluation and feed-back

Case of the pilot programme to control hydatid disease in Morocco:

- It is a model of control programme, it shows the real situation in the field, difficulties, assets, methodology, commitment, inter-sectoral collaboration, role of local populations, etc...

The example of rabies control and dog population management based on responsible dog ownership and public cooperation in dog rabies control. Measures taken in the past in many parts of the world to control stray dogs had no or in some cases only a partial effect on the density of the dog population and proved counterproductive in the social context.

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