INTRODUCTION

The veterinary profession has in the past centuries been most successful in for example the control and eradication of the major infectious diseases of livestock, contributed to highly improved livestock production, was responsible for introducing the concept of meat hygiene at the beginning of the 20th century and ever increasingly directed its focus on companion animal medicine in its broadest term.

Today we must take stock of our professions tremendous achievements of the past and ask ourselves, in the societal environments we live in on this globe:

Are we serving the needs of the society we live in? Are our professional services relevant in addressing today’s major fundamental issues pertaining to such societal needs as:

- food safety and public health;
- combating emerging or re-emerging diseases, especially zoonoses with the necessary disease surveillance and management of risks;
- food security and animal production to address the ever increasing states of human malnutrition and poverty;
- safeguarding biodiversity and addressing environmental management and sustainability;
- bio-security and meeting threats of bio-terrorism?

Recent data from North America indicate that in 2002 in the USA 90% of all veterinarians were in clinical practice. Based on this finding it is argued that this distortion of the veterinary profession leaves society as a whole poorly served in respect of the social issues mentioned above, warns that this situation ransoms the profession to the commercial marketplace and, undermining the capacity of the profession to serve the public good in truly essential ways, directs the veterinary profession toward social irrelevance.¹ In the time available, I will briefly look at these issues and highlight interventions needed to keep our profession firmly and committed on the path of relevance to meet the needs of society and address the challenges and opportunities in the decades ahead.

A. FOOD SAFETY AND PUBLIC HEALTH

Food- and waterborne illnesses caused by microorganisms pathogenic to humans have been estimated to affect more than 80 million Americans and cost the U.S. economy over $40 billion annually. For example, some 9,000 Americans die each year from food-borne illnesses caused by microorganisms such as *E. coli* in meat and *Salmonella* in poultry².

The shift of emphasis from production and efficiency – which was a priority until the 1990’s – to issues such as food safety and animal welfare is a fact the veterinary profession must recognize. Various food scares and disease crises e.g. BSE, dioxin etc. have resulted in a considerable distrust by the consumer of scientists, science and the food safety regulatory authorities.

The veterinarian has a most important role to play in restoring and maintaining consumer confidence in the safety of animal food products, due to the pre-graduate veterinary curriculum addressing health issues of both human and animal.

Widespread human illnesses have been associated with a variety of foodborne microorganisms and with food products contaminated with toxic chemicals. Large-scale disruptions of food supplies involving illnesses in and contamination of farm animals have occurred. These outbreaks have resulted in the straining or overwhelming of public services, intense media coverage, and adverse economic, social, and political effects. This apparently inadvertent contamination resulted in the loss of public confidence in the safety of the food supply and reorganisations by governments to improve consumer protection³.

Major outbreaks of infectious diseases through the food-chain are now well recognized in spite of the highly regulated and monitored food industry in the West. In 1997 notified cases with *Campylobacter* exceeded 50,000 and *Salmonella* cases approached 40,000. Recently the US authorities had to recall 19 million pounds of ground beef – used for preparing hamburgers – fearing contamination with the deadly *E. coli* after 19 people fell ill. It is surprising to note that a few years ago in a highly developed country like the USA, a failure in a large municipal water supply system resulted in infecting more than 400,000 people in Milwaukee with *Cryptosporidium parvum* within a few days. These examples only indicate that the experience world over, including the highly developed countries, shows that the threats posed by infectious diseases should never be lost sight of⁴.

Rapid, accurate, non-invasive tools of bio-technology can help improve the detection and control of food-borne human pathogens as well as chemical contaminants. DNA probe kits have been developed for *Salmonella*, *Listeria*, *E.coli 0157:H7*, and *Staphylococcus aureus*. Compared to traditional culture-plating methods, these new diagnostic kits offer greater precision, shorter turnaround times, and reduced need for highly trained personnel. DNA diagnostic techniques for Norwalk viruses also are commercially available. Culture techniques have not been successful in detecting these leading causes of gastroenteritis, making

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³ FAO/WHO Global Forum of Food Safety Regulators Marrakech, Morocco, 28 - 30 January 2002
⁴ Tandon, P. N.: Microbes strike again: CURRENT SCIENCE, VOL. 84, NO. 9, 10 MAY 2003 1174
the availability of genetically based techniques critical to the detection and identification of the Norwalk viruses. Mycotoxins in food are a periodic threat to food safety. DNA probes could help detect the presence of mycotoxin-producing fungi that grow under certain conditions in plant materials such as improperly dried corn and peanuts.

**B. BIO-SECURITY AND BIO-TERRORISM**

In the context of our deliberations today, Farm Bio-Security is a very relevant issue confronting the veterinary profession as key role-player.

Farm Bio-security refers to those on-farm measures taken to keep diseases out of populations, herds, or groups of animals where they do not currently exist or to limit the spread of disease within the herd. Any disease that could jeopardize the health of these animals represents a threat to the economic viability of the farm and the welfare of the herd. Taking common sense precautions to prevent disease from coming on to the farm is the best investment one can make.

**On-farm aspects relating to bio-security are:**

The responsibility for farm-level bio-security belongs to the producer or herd owner, working in close co-operation with the farm veterinarian to develop a health programme. A successful bio-security plan must address –

- Purchasing of livestock from herds with a known and proven clean health status
- Isolation of new animals brought to the farm: *Bringing new animals onto the farm poses the risk of spreading disease between the introduced and the resident farm animals. Buying e. g. a bull, ram, weaned heifers or game are common practices that can potentially compromise the biosecurity of a farm. The isolation of newly introduced animals e. g. in a separate camp, for at least 5 days is deemed to be essential*
- Isolation of sick animals and treatment under veterinary supervision (or at least based on veterinary professional advice).
- Regulation of the movement of people, animals, and equipment: *This is crucial in circumstances of disease outbreaks such as Foot-and-mouth disease.*
- Procedures and Equipment for cleaning and disinfecting facilities. *Transport vehicles are becoming recognized as a major threat to successful biosecurity. Trucks should be properly cleaned and inspected before they are allowed back on the premises. (This is also the reason for the EU Requirement re cleansing and disinfection of vehicles used for the transportation of slaughter animals)*

Countries with a relative high animal disease free status and dependant on the export of animals and animal products, should be conscious of the very real threat of importing highly infectious diseases through the ease and speed of global movements of people and animal products. Veterinary administrations are in the forefront of applying the necessary bio-security measures to prevent or minimize such occurrence.

The spectre of terrorism gives yet more scope for fears over food safety. Bio-terrorism - the act of introducing a disease or contaminating the food supply - is a worst-case scenario that

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authorities have been aware of for a long time, but recent events have inevitably increased their fears of vulnerability (e.g. the anthrax letters in the USA).

The deliberate sabotage of civilian food supplies has occurred throughout recorded history associated with military campaigns and more recently to terrorise or otherwise intimidate civilian populations and their governments. Terrorists can have a variety of motives, from settling grudges to political destabilisation. It is not necessary to inflict mass casualties to cause widespread panic and disruption, particularly economic. Extortion threats directed at specific organizations, particularly those in the commercial sector, are far more common than generally recognized. All populations are vulnerable to such actions. While contamination of entire food supplies in most areas is unlikely, pre-existing food shortages could be considerably worsened by deliberate contamination. FAO and WHO are strengthening their disease surveillance and response operations to include food sabotage and to provide guidance to Member States in the development of their programmes for prevention, detection, and response to terrorist threats to food.

Appropriate consideration must be given to the possibility that information on threat agents and system vulnerability could be used by terrorists.

Many foods, such as fish, meat, poultry, fruit, and vegetables, are consumed with minimal processing. In these systems, there may be a limited number of points at which contamination can be detected before the food is consumed.

The potential for contamination and interruption of food supplies as acts of terrorism should be considered in the assessment of food safety assurance systems, such as Hazard Analysis and Critical Control Point (HACCP). All operations involved in the production of food should monitor for contamination as part of their quality control systems. Monitoring programmes can include a range of approaches, from careful visual examination to high technology in-line detection systems. Such rapid detection procedures include employment of DNA Probe kits as mentioned above.

The involvement of the veterinarian at all the various stages in the “stable-to-table” food production concept will clearly be needed for surveillance, detection and response actions.

Again law makers and government agencies must be made aware of the very important role veterinarians can and must play in preventing and combating bio-terrorism and ensuring bio-security of man and animal. It is of particular importance for veterinary schools to revise their curricula to provide students with a sound knowledge in respect of epidemiology, microbiology, regulatory medicine and public health. Urgent attention must be given to the reality that inspection systems for imported food worldwide move to a cohesive and co-ordinated control mechanism based on risk analysis and veterinarians must be able to apply the tools of risk assessment, risk management and risk communication competently.

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6 FAO/WHO Global Forum of Food Safety Regulators Marrakech, Morocco, 28 - 30 January 2002
7 26th CODEX Commission: Rome and Brisbane 2003: Guidelines for Food Import and Export Inspection and Certification Systems
C. EMERGING AND RE-EMERGING ANIMAL DISEASES AND ZOONOSES

Ingenuity, knowledge, and organization alter but cannot cancel humanity’s vulnerability to invasion by parasite forms of life. Infectious disease which antedated the emergence of humankind will last as long as humanity itself, and will surely remain, as it has been hitherto, one of the fundamental parameters and determinants of human history. William H. Mc Neill, Plague and Peoples (1976)

Until the end Eighties and before the HIV/AIDS pandemic, a feeling of having won the fight against infectious diseases was evident. So much so that already in 1969 the US Surgeon General William H. Stewart declared that it was ‘time to close the book on infectious disease’8. However, the ever-growing human population, natural disasters like droughts and floods etc. resulted in drastically increasing levels of poverty and malnutrition, combined with poor public health systems, specifically in developing countries of Africa, Asia and Latin America. Decreased governmental spending on primary health care in humans, neglected animal disease surveillance, monitoring and control and reduced funding for staff employment by veterinary administrations resulted in the re-emergence of previously eradicated diseases. The advent of globalization, combined with the ease and tremendous increase in volume of passengers of air-travel and hence the international movement of peoples, animals and animal products, greatly contributes to the emergence of diseases.

In the past 30 years previously unknown infectious diseases such as HIV/AIDS; Ebola virus infection; Hendra and Nipah virus disease; Hanta virus, E. coli O157:H7; BSE; nvCreutzfeld-Jacob disease; SARS (Severe Acute Respiratory Syndrome) were discovered and cause high mortalities and severe economic disruptions.

“Old” diseases like tuberculosis and malaria re-emerged even in the developed world, often in drug-resistant forms. For instance, a new strain of tuberculosis (strain W), which is multidrug resistant and occurs more frequently in HIV-infected people, has now been reported in the USA9.

Animal disease outbreaks are likely to reduce world trade by as much as $10 billion in 2004, according to a report released on March 2 by the United Nations Food and Agriculture Organization, making this year the worst year for meat and live animal trade since 2000, the height of the mad cow problems in Europe. According to FAO10, around one third of the global meat trade—around 6 million metric tons—are affected by animal disease outbreaks, most significantly the avian influenza in Asia and bovine spongiform encephalopathy (BSE). Most of the losses are concentrated in 11 countries, most notably in the United States, where if bans are maintained until the end of the year beef exports are expected to drop to 100,000 tons in 2004 from 1.2 million tons a year earlier, due to concerns related to BSE. Neighbouring Canada, with a beef export market about one-third the size of the U.S. market, is expected to see a similar drop in beef exports. Additionally, the U.S., Canada, and nine Asian countries have reported outbreaks of avian influenza, resulting in a dramatic drop in poultry exports from those countries. More than 100 million birds were killed in Asia in January and February 2004 as a precaution against the spread of the disease.

8 Tandon, P. N.: Microbes strike again: CURRENT SCIENCE, VOL. 84, NO. 9, 10 MAY 2003 1174
Another, direct, negative impact by BSE in Canada has been large-animal veterinary practices, with a high number of them going out of business due to drastically reduced income from livestock owners (farmers).

Apart from the disastrous impact on the livestock industry through e.g. the killing of millions of animals for disease control purposes (FMD in the UK 2001; Avian Influenza in Asia 2004), outbreaks cause severe trade disruptions through embargos on the export/import of animals and animal products (Rift Valley Fever in Kenya/Somalia 1997-98) and directly impact on tourism (Nipah virus in Malaysia 1999).

Factors which drive the emergence and re-emergence of microbial threats are complex and a convergence of any number of these factors can create an environment for disease emergence and maintenance in society. The such critical factors are: microbial adaptation and change (e.g. antimicrobial resistant pathogens); host susceptibility (e.g. due to being immunocompromised due to HIV/AIDS, malnutrition); climate and weather (global warming expanding the distribution of vector- and water-borne diseases – yellow fever, Hanta virus pulmonary syndrome); changing ecosystems; economic development and land use; international trade and travel; reduction in animal health and public services or infrastructure etc.\(^\text{11}\)

The following are a few examples of infectious diseases, illustrating some of the factors mentioned, which have been in the public focus in recent years:

### 1. HIV/AIDS

Although a disease of humans, this disease dramatically illustrates the speed and ease of transmission of an infective agent in a population and also the great difficulties, even in high-technology age, of developing an effective vaccine. Scientific evidence shows that the HI Virus has jumped from primates to people on at least seven occasions – thus being a zoonosis - and people in Cameroon are showing symptoms of HIV infection, but are testing negative to both the virus and its primate equivalent, SIV, the virus from which HIV is thought to have evolved. This suggests that new strains of a HIV-like virus are circulating in wild animals and infecting people who eat them\(^\text{12}\).

In 2003, it was estimated that 840,000 people in China and 3.8–4.6 million in India were infected with HIV/AIDS. Countries in eastern Europe and central Asia are experiencing growing epidemics, driven mainly by injecting drug use and to a lesser extent by unsafe sex among young people. The global impact is clearly indicated in the following graph.\(^\text{13}\).

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\(^{11}\) King L. J. May 2004 OIE : Emerging and re-emerging zoonotic diseases: Challenges and Opportunities

\(^{12}\) New Scientist : 9 Aug 2004 : Bush meat trade and risk of transmission of novel pathogens

\(^{13}\) WHO World Health Report 2004
2. AVIAN INFLUENZA

Avian Influenza (AI) is a very serious disease of poultry and it appears more and more frequently all over the world. The recent spread in the bird population in Asia is unprecedented. Two groups of viruses are recognised on the basis of their ability to cause disease in poultry: Highly Pathogenic Avian Influenza (HPAI) and Low Pathogenic Avian Influenza (LPAI).

Influenza A viruses have a segmented genome. Because of this segmentation, genetic re-assortment can occur in mixed infections of the same host with different strains of influenza A viruses. This means that a ‘new’ virus may appear with features inherited from the original viruses. As a result of this re-assortment, influenza viruses that circulate in nature show a high level of genetic variations and may develop the capability of crossing the species barrier. AI viruses able to infect humans and to spread easily from person to person may cause an ‘influenza pandemic’. Animal husbandry systems where humans live in close cohabitation with poultry and pigs are considered potential sources of new strains capable to cross the species barrier from animal to man.

Humans are not commonly affected by AI. However, the large epidemics of highly pathogenic avian influenza currently seen in poultry in Asia, and possible widespread presence of the virus in the environment, increase opportunities for human exposure and infection. Usually the human infections caused by AI are not serious (conjunctivitis with some respiratory symptoms). However severe cases of AI in humans have been reported in the past and during the current epidemics in Asia.

14 EU : Public Health : Fact Sheet : Threats to Health
The analysis and the evidences of the past outbreaks suggests that: 1) the majority of human infections have been caused by HPAI viruses following direct exposure to infected birds; 2) the direct contact with infected poultry seems the only way of transmission from poultry to humans; 3) human to human transmission has been very limited; 4) Only HPAI viruses were fatal to humans.

3. SEVERE ACUTE RESPIRATORY SYNDROME (SARS)\textsuperscript{15}

The Severe Acute Respiratory Syndrome (SARS) is a respiratory illness. It usually begins with fever that might be associated with other symptoms (chills, headache, body aches). Supportive care is the only treatment shown to improve the conditions in persons with SARS. The causative agent of the disease is a previously un-recognised coronavirus, named SARS coronavirus (SARS CoV).

Recent virological studies, from China and abroad, support a working hypothesis that the SARS virus is closely related to coronaviruses found in the masked palm civet \textit{(Paguma larvata)} thus implying that this species may be amongst the original source of the SARS virus\textsuperscript{16}.

A recent (April 2004) outbreak of SARS in the Peoples Republic of China could apparently be traced back to an infection from a laboratory source.\textsuperscript{17} This incident highlights the importance of the application of high bio-safety standards.

4. BSE

The following is a summary of confirmed cases up to August 2004:\textsuperscript{18}

<table>
<thead>
<tr>
<th>Country</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004 (up to 23 Aug)</th>
<th>TOTAL Since 1987</th>
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<td>612</td>
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<td>183 978</td>
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<td>2</td>
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\textsuperscript{15} \url{http://europa.eu.int/comm/health/ph_threats/com/sars/sars_en.htm}
\textsuperscript{16} OIE Working Group on Wildlife Diseases Report Feb. 2004
\textsuperscript{17} PROMED Mail 3 Jul 04 : \url{www.promedmail.org}
\textsuperscript{18} PROMED Mail 24 AUG 2004
The following is a summary of the Report No. 108 (2003) by the European Association of Animal Production (PROMED Mail BSE Update : 24 August 2004) The economic losses of BSE to EU countries, as calculated in this report, have been tremendous; the lesson, and conclusions, are valuable to countries around the globe and most informative in the context of this paper:

- The BSE epidemic, which began in 1986, is now gradually coming to an end. Though knowledge is incomplete, enough is known about the disease to be reasonably confident that such an epidemic will not recur.
- 3 principal questions remain unresolved: the origin of the BSE epidemic; the future of vCJD; and what to do with the 16 million tonnes of animal by-products produced annually by the slaughter industry.
- Loss of value and cost of disposal of meat and bone meal (MBM) exceed 1.5 billion Euro [USD 1.8 billion] per year. Though new EU legislation could permit over 80 percent of this material to be used again in livestock feeds, the best option is to continue the ban on its use.
- The cost of the epidemic has been enormous, and is estimated here at about 10 percent of the annual output value of the European beef sector. The discounted present value of these costs is estimated at 92 billion [US$ 111 billion].
- The progress of the epidemic was marked by many deficiencies and failures, of which 2 are particularly noted:
  - The inadequacies of public information, particularly in the UK
  - Failure to prevent international spread through contaminated meat and bone meal.
- Ongoing changes in the industry are documented: changing consumer requirements; concentration of processing and retailing power; declining producer prices, and reduction in numbers of full-time producers. These changes represent both the causes and effects of a continuing shift in the terms of trade to the disadvantage of producers. To ensure fair trading, increased controls to prevent abuse of economic power may be necessary.
- In the present context it is ironic to note that the situation on animal disease in Europe has never been better. All major diseases are eradicated or under control. For the future the emphasis will be on the control of enzootic diseases, largely through husbandry practices; reduction, and eventual elimination of routine use of antibiotics in feeds; and intensive research to cope with emerging diseases.
- Scientists have lost credibility as a result of the BSE crisis. While it is more critical than ever that public policy be informed by the best scientific advice, those involved in providing such advice must more carefully identify and distinguish the factual basis from the value judgements involved.
- Scientific innovation has also lost favour with the public, particularly where it affects food and health. The livestock sector will need to weigh carefully the technical benefits against the risks and public acceptability of technologies such as GMOs, BST in milk production, growth promoters in meat production.
- Given that over 95 percent of European livestock production is destined for European consumers, the production industry must concentrate on securing their loyalty by fulfilling their expectations on:
  - food safety;
  - transparency and accountability;
  - quality and variety, including response to the demand for regional and organic products.
- New ways need to be found to build the community of interest of producers, processors, and retailers in meeting these goals.

5. **WEST NILE VIRUS (WNV)**\(^{19,20}\)

West Nile virus (WNV) has been recognized since 1937 when it was first isolated in Uganda. It is primarily transmitted in birds through mosquito bites while humans are incidental hosts. Incidental infection may also occur in other mammals including horses, cats, and domestic mammals.

WNV has emerged in recent years in temperate regions of Europe and North America, presenting a threat to public and animal health. It has also been described from the Middle East, west and central Asia and Oceania (subtype Kunjin). In the U.S. since 1999, WNV human, bird, veterinary or mosquito activity have been reported from all states except Hawaii, Alaska, and Oregon.

The most serious manifestation of WNV infection is fatal encephalitis in humans and horses, as well as mortality in certain domestic and wild birds.

This disease presents a *good example of a disease emerging in previously uninfected regions and the inability, given today’s regulatory and financial abilities, to contain its rapid spread* – since 1999 throughout the USA.

6. **HENDRA AND NIPAH VIRUSES**\(^{21}\)

Hendra virus, formerly called equine morbillivirus, and Nipah virus are *newly recognised zoonoses* belonging to the Paramyxoviridae family. Hendra was isolated in Australia in 1994, Nipah in Malaysia in 1999. The viruses cause disease in animals including horses and pigs. Fruit bats have very high infection rates and are believed to be the natural hosts. Experimental studies have shown that Hendra and Nipah viruses can occasionally be passed to humans by close contact with infected body fluids. In mid-March 2004 an outbreak of Nipah virus encephalitis occurred in Bangladesh. His disease, being a zoonosis, had a *very negative impact on the Malaysian tourism industry*, due to warnings to travellers issued to avoid contact with wild or domestic animals in the region.


\(^{20}\) [http://www.cdc.gov/ncidod/dvbid/westnile/background.htm](http://www.cdc.gov/ncidod/dvbid/westnile/background.htm)

\(^{21}\) [www.dh.gov.uk](http://www.dh.gov.uk)
7. HANTA VIRUS PULMONARY SYNDROME

Hantavirus pulmonary syndrome (HPS) has been recognized as a disease only recently in North America. So far, it's also fairly uncommon and the chances of becoming infected are low. However, HPS is potentially deadly and immediate intensive care is essential once symptoms appear.

Hantaviruses that cause HPS are carried by rodents, especially the deer mouse. You can become infected by exposure to their droppings, and the first signs of sickness (especially fever and muscle aches) appear 1 to 5 weeks later, followed by shortness of breath and coughing. Once this phase begins, the disease progresses rapidly, necessitating hospitalisation and often ventilation within 24 hours. Prevention is the best strategy, and it simply means taking some very practical steps to minimize contact with rodents. HPS is not contagious from person to person in the United States.

It is suggested that outbreaks of HPS have been exacerbated by climatic changes (EL Nino/Southern Oscillation), to which small rodent and tick populations are sensitive.

8. MONKEYPOX

An outbreak of human monkeypox occurred in the United States in 2003. The sources of infection for humans were native North American rodents (prairie dogs - Cynomys sp.) sold in the pet trade. These animals themselves had become infected through contact with rodent species imported from western Africa where infection in those species is common.

9. ANTHRAX

Anthrax, a very old infectious disease known to man, was during 2001 in the limelight because of being used in acts of bio-terrorism in the USA.

To illustrate the importance of this disease not only in bio-terrorism, but also in wildlife conservation, I wish to refer to annual high mortalities amongst elephant and zebra in the Etosha National Park (Namibia), as well as to estimated mortalities of over 4,000 hippopotamus in the South Luangwa National Park (Zambia) in 1987. Anthrax is suspected to be the cause of death in these animals in Uganda during August 2004.

10. EBOLA HAEMORRAGIC FEVER

Ebola hemorrhagic fever, which in its worst form causes massive internal bleeding and is one of the most deadly diseases in the world, was first identified in the Sudan in 1976, but has claimed most victims in the Democratic Republic of Congo and Uganda. Although largely confined to tropical regions of Africa, it has also been reported in rain forest areas in the Western Pacific. The most virulent of its 4 known [genotypes] occurs in the Congo where, in the first known outbreak in 1976, 88 percent of the 318 reported victims died, and in 1995 it killed 81 percent of 315 infected people. Over the last 2 years in the Congo, it killed between 75 percent and 89 percent of all victims, a total of 199, in 3 separate outbreaks. The incubation

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22 http://www.responsiblewildlifemanagement.org/hanta_virus.htm
23 King L. J., May 2004 OIE : Emerging and re-emerging zoonotic diseases: Challenges and Opportunities
period for the disease, whose origin is still unknown despite years of research, is 21 days, and the United Nations agency says an outbreak can be considered over when no new cases have been reported for twice that length of time.

Although investigations have been unsuccessful in establishing a vector or reservoir for the virus, an animal reservoir like monkeys is suspected.

**D. ANIMAL WELFARE**

Animal welfare is an area subject to an increasing social concern in the developed world, particularly in Europe. Urbanisation has removed the majority of their citizens from the realities of the agricultural world. Since in urban society animals are mostly considered as pets, the conception of animals as sentient beings has become more obvious. Therefore the suffering of animals for the production of food has become much less acceptable. Animal welfare is becoming an increasing ethical concern corresponding to this social change. Industrialisation of animal production is not perceived as an absolute necessity and the consumer is ready to pay more for better food. Environment concerns have grown and intensive farm productions also generate legitimate questions on this aspect. In recent years the control of animal diseases like Avian Influenza, Classical Swine Fever, BSE and FMD resulted in the slaughter of millions of animals, which led to very intensive debates, both political and professional, on the scientific basis and ethics for such action.

It must be clearly understood, that there is a critical relationship between animal health and animal welfare and that the provision of animal health care, the prevention (through immunisation, quarantine etc.) and treatment of diseases, as well as the culling (killing) of animals for disease control purposes, all have serious and direct welfare implications.

Animal welfare standards are not defined at an international level except in Conventions by the Council of Europe and some multilateral agreements. Current WTO provisions take little account of animal welfare, with the prevailing view being, that non-health measures involving animal welfare are not permitted. However, this is yet to be tested under the WTO dispute settlement procedures. Nevertheless the conclusions of the WTO Ministerial meeting in Doha 2001 placed non-trade concerns, including animal welfare, firmly on the agenda for future WTO agricultural negotiations.

Today it is recognized that that certain provisions of care are essential to welfare, encompassed in the “Five freedoms and Provisions” and every practical effort should be made to achieve them. They are:

- **Freedom from thirst, hunger and malnutrition** – by ready access to fresh water and a diet to maintain full health and vigour,
- **Freedom from discomfort** – by providing a suitable environment including shelter and comfortable resting area,
- **Freedom from pain, injury and disease** – by prevention or rapid diagnosis and treatment,

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• Freedom to express normal behaviour – by providing sufficient space, proper facilities and company of the animal's own kind.
• Freedom from fear and distress – by ensuring conditions that avoid mental suffering.

Implementation of animal welfare standards will require the traditional involvement of the veterinary community, and of other key stakeholders in industry and non-governmental organisations (NGOs) who may have little knowledge of animal welfare science, but who are keenly interested in being actively involved on the subject. Veterinarians have a special and legitimate role to play in animal welfare because this involves the relation between animals and human beings. Veterinarians are in the best position to offer a balanced view between ethical social demands and scientific knowledge.

Only with optimum management and care (animal welfare) can the animal live and produce to its potential. This is also an ethical approach. Clearly, man is the species responsible for the environment and for all other species. The veterinary profession is pre-eminent in this work and believes that animals can benefit most from the point of view that man is responsible for the provision of animal welfare and well-being²⁶.

It needs to be stressed that in the mean time, with policy debates on animal welfare in international trade not having been concluded, some food producers, wholesalers and retailers have established food quality assurance programmes, with animal welfare aspects being an important part thereof. This relates directly to the concerns of consumers of animal products to welfare aspects in respect to the production of these products. These industry-led quality assurance schemes to promote animal welfare (on- and off-farm) have had a major impact on animal welfare awareness and the introduction of minimum welfare standards.

Again, the broadest possible involvement of the veterinary profession in the development, application, monitoring and certification of compliance with such standards is essential.

In this context I would like to quote from a speech made by Mr. David Byrne, Commissioner for Health and Consumer protection at the OIE Global Conference on Animal Welfare (Paris, France February 2004):

"I should mention the main criticism often voiced by producers and certain sections of the food industry is that higher welfare standards lead to higher production and supply costs. The experience within Europe has shown that in many cases there are no significant additional costs in improving animal protection. Indeed if such costs are experienced, they can be more than recovered by the price differential of superior more 'animal welfare friendly' products, provided that these are effectively marketed and consumers properly informed. It is of obvious importance that markets evolve and adapt in response to consumer demands²⁷."

Many valuable research findings on animal welfare science are available and need to be translated into action on international level. Decision- and law makers need to understand the implications and requirements, even more so in countries where due to cultural, religious or social beliefs and traditions the present-day animal welfare ethic and science may not be well understood. During the recent OIE Global Conference on Animal Welfare (Paris, Feb. 2004),

²⁶ World Veterinary Association : Policy on Animal Welfare Manual Chapter 16 T-3.1
²⁷ EU Commissioner D. Byrne : 23 Feb. 04 : OIE, Paris
developing countries indicated their willingness in developing animal welfare concepts in their own countries.

It was, however, also made clear that those countries need time and an understanding of their particular situation, which sometimes leads to some constraints. In order to allow them to endorse the animal welfare standards that will be applied by the international community, it is important to provide them with technical and financial assistance\(^{28}\). **Again an important area for veterinary professional involvement.**

Although veterinary pre-graduate training touches aspects of animal welfare, a higher profile for animal welfare matters needs to be given in veterinary curricula. International veterinary certification in the trade of animals and animal products increasingly includes elements of animal welfare. Veterinarians need to be sufficiently qualified in the fields of animal welfare science and ethics, complemented by post-graduate continuous professional development (CPD) courses, to be able to meet the demands of compliance with animal welfare during the “stable-to-table” process for products of animal origin and to ensure effective enforcement of the laid-down standards.

The OIE’s initiative to organize the First Global Conference on Animal Welfare (February 2004), involving all stakeholders, proved to be very successful and placed animal welfare firmly on the agenda of the veterinary profession. The key role of the veterinary profession – government veterinary services, private veterinarians, para-veterinary professionals) in animal welfare was clearly identified and the need stressed to provide and strengthen the support and resources needed to accomplish the tasks and challenges.

### E. BIODIVERSITY AND SUSTAINABLE ENVIRONMENT

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Time does not allow me to go into great detail. The Key Facts and the following data refer to ASIA. (UNEP, 2003). Asia has a great diversity of birds. Its 2,700 species represent over 27 per cent of all bird species described. However, one in eight (12.5 per cent) of all bird species in the Asia region is globally threatened. The two primary threats are habitat destruction and human overexploitation. A total of 323 bird species are at risk of extinction over the next 100 years (Birdlife International 2003). Of this number, 41 are listed as “critical” and a further 65 are “endangered,” meaning that these species face a high risk of extinction over the next 10 years. The declining populations of birds such as the hornbill in Nepal.

reflect the general deterioration of biodiversity and the environment in the region (BirdLife International 2003).

Current estimates are, that Orangutans' days in the wild – only still to be found on the islands of Borneo and Sumatra - may be numbered due to the current rate of habitat destruction by logging unless something drastic occurs to halt the pace of illegal logging29.

**Air Pollution**: Air quality, especially the concentrations of particulate matter in major Asian cities, is of serious concern. More than 500 000 people die every year from diseases related to air pollution (WHO 2003). In the next few years, governments in the majority of countries in the region intend to address air pollution as their top priority. Trans-boundary air pollution is a concern in Asia, affecting many countries in the region30.

The number of threatened species serves as an indicator of overall threats to biodiversity. Of all the animal groups, **mammals and birds** have both the highest proportion and the highest number of threatened species. Altogether, more than 5 000 animal species are now threatened with extinction. At the same time, almost 6 800 plant species are endangered or vulnerable31.

The veterinary profession must be relevant to society where the responsible use of our natural resources and the maintenance and protection our earth’s biodiversity is at stake. Taking note of the stated data, it is evident that veterinarians in this Region have a great responsibility to ensure that their voice is heard loud and clear on environmental issues affecting nature and all its living creatures.

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

As mentioned before, our profession needs to re-focus its future veterinary training to empower the next veterinary generation to be scientifically equipped to face up to these challenges brought about by habit destruction, over-population and intensive agricultural and marine farming systems.

**F. EMBRACING BIOTECHNOLOGY**

Exiting new developments are seen in the field of **Biotechnology**, making it the most challenging science in the years ahead and the veterinary profession must take note of and be an active participant in this mega-trend, which already plays a major role in medical and agricultural research.

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30 GEO Yearbook 2003: UNEP, p. 14
31 GEO Yearbook 2003: UNEP:Biodiversity
It has the potential to increase food production, reduce the dependency of agriculture on chemicals, lower the cost of raw materials, and reduce the negative environmental impacts associated with traditional production methods.

In addition, the new knowledge gained through basic research into the nature of life and ecosystems at the molecular level can lead to improved farming practices and diagnostic tools for use in veterinary medicine.

With improved technology and knowledge about agricultural organisms, processes, and ecosystems, opportunities will emerge to produce new and improved agricultural products in an environmentally sound manner.

The following are just a few examples of biotechnological processes already applied in practice or opportunities that are being explored:

- **Technologies** have been developed for gene cloning, gene transfer, *in vitro* culturing, and sex determination of embryos, and these approaches are being refined for use with animals. Transgenic embryos or offspring have been produced from rabbits, chicken, fish, sheep, swine, and cattle.

- There are opportunities to boost the immune competency of animal hosts by genetic manipulation, develop biotechnology-derived regulators of immune function, and identify ways to prevent attachment of disease agents to host cells. Factors affecting the disease-producing capacity of a bacterium or virus can be identified, and strategies can be devised to help the host withstand these pathogens. Through the use of techniques such as enzyme-linked immunosorbent assays, polymerase chain reaction (PCR), and monoclonal antibody-based systems, biotechnology contributes to major advances in diagnostics.

- Work is underway to introduce new genes into animals in order to impart resistance to disease and to identify host cell traits that can be used to enhance resistance to disease agents.

- **The development of biosensors** offers great promise for improving food processing, analysis, and safety assurance. The highly specific actions of biological molecules can be exploited for use in biosensors that can measure the concentration of specific components in complex mixtures. **Miniature biosensors** also could be incorporated into food packages to monitor temperature stress, microbial contamination, or remaining shelf life, and to provide a visual indicator to consumers of product state at the time of purchase.

- **Aquaculture** will be benefiting by such new advances in biotechnology developed for e.g. improved survival and reproduction of cultivated fish stocks and endangered species, reduction in the transfer of disease between cultivated and wild fish stocks and improved techniques for the detection of pathogens and diseases

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33 Biotechnology for the 21st Century: New Horizons: Part 5 Opportunities in Marine Biotechnology and Aquaculture, USDA
Again we must ask ourselves:

“Is the veterinary profession prepared to participate in these developments as a key stake holder?”

“Is our profession expanding its capacity to provide the services needed from an animal health, welfare and ethical point and are we being perceived by society as being a relevant in serving society’s needs?”

**CONCLUSION**

To prevent, control and eradicate infectious diseases in the 21st Century, international cooperation is needed. Here veterinarians have a most essential and important role to fulfil – thus they – our profession – must be relevant by rendering a service to society in all fields of animal disease control, surveillance, epidemiology, food safety and public health, veterinary health certification and animal welfare.

Urgent attention must be given to the training of future veterinarians, measured against the needs of the 21st Century society. This will necessitate examining entry requirements into veterinary schools, course content and curriculum with attention to those fields of knowledge and expertise the veterinarian of the future will need.

In addition it is equally important to make governments and public institutions aware of the important and vital role the veterinary profession can play in meeting societal needs and in addressing threats of bio-security, food safety etc. and ensure adequate public funding of veterinary administrations and institutions.

Above all, it is fundamentally important that we measure our professional actions not only against the demands of society but also within the context of a firm commitment to the conservation and responsible and sustainable use of our environment.

Only if we recognize and respect the importance of a sound relationship between man, animal and the environment will we be able to successfully address the manifold challenges and opportunities facing our profession in the decades ahead. It is thus NOW the time to pause and re-orientate our profession to a bright and exiting future.

**WE OWE IT OUR CHILDREN AND FUTURE GENERATIONS!**