Intersectoral collaboration between the medical and veterinary professions in low-resource societies

"Where medics and vets join forces"

Report of a Symposium organised on the 5th of November 2010 in Antwerp (Belgium) jointly by be-cause health - be - troplive - network zoonoses - network neglected diseases

With the financial support of the Belgian Development Cooperation (DGD)

Where medics and vets join forces

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Touaregs (Photo: Vincent Delespaux)

Foreword

Health and food security are very important fields of action for the Belgian Development Cooperation. Both are included in the Millennium Development Goals.

The Belgian development policy supports multi-sectoral and sector wide approaches to health with the objective to improve the provision of healthcare to the populations in low resources societies.

The numerous links between human and animal health justified the organisation of a symposium on intersectoral collaboration between the medical and veterinary professions in low-resource societies on November 5th 2010, jointly by the Belgian Platform on Tropical Animal Health and Production (be-troplive), the Belgian Platform for International Health (be-cause Health), ITM's Strategic Network on Zoonoses (One Health Network), and the Strategic Network on Neglected Diseases. The symposium was financed by the Directorate of Development Cooperation (DGD) and was hosted at the Institute of Tropical Medicine in Antwerp in the framework of the ITM Colloquium on Emerging Voices and the Joint ITM & Be-cause health Seminar "*Towards Universal Health Coverage in developing countries*".

Two hundred and twenty four delegates attended the symposium on intersectoral collaboration. Apart from the Belgian delegates representing be-cause Health, be-troplive and the two ITM Strategic Networks, there were representatives of the Belgian Development Cooperation, the Belgian Development Agency, the European Commission and participants from Universities, Research Institutes, NGO's and implementing agencies from all over the world. Students from the Master course in Tropical Animal Health (Institute of Tropical Medicine Antwerp), students from the joint Master "Management of Vegetable and Animal Resources in Tropical Areas" (Gembloux Agro-Bio Tech Faculty and the Faculty of Veterinary Medicine of the University of Liège) and students from the International Master in Public Health Methodology (Free University of Brussels) were also present.

In total, people of forty-one different nationalities and with various backgrounds attended the meeting, allowing for constructive multidisciplinary and multinational discussions.

The Belgian Development Cooperation was very pleased to fund this event whose relevance was not only to address current health issues but also served as mind-opener.

These symposium proceedings include a viewpoint, abstracts of speakers' presentations, and interviews with physicians and veterinarians.

We trust the readers will appreciate the content of this booklet, which will, hopefully, incline them to rethink approaches and strategies for improved animal husbandry practices, disease prevention in humans and healthcare provision.

Mr Peter Moors
Director General
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Who we are

The Belgian platform for international health, Be-cause health, aims at strengthening the role and effectiveness of Belgian stakeholders in favouring access to quality health care worldwide, through policy dialogue, co-ordination of efforts and exchange of information and knowledge. The platform unites almost all relevant public, non-governmental and academic organisations in Belgium as well as committed individuals. The envisaged results are a more effective Belgian contribution to international health policies; a better exchange of technical and scientific knowledge; more synergy at field level; better feedback from and collaboration with partners from the South. An active steering committee takes care of planning and management. The ITM provides secretarial support. The common charter is the "Health CARE for All" declaration of 2001 (www.itg.be/hca).

Be-troplive is a Belgian informal and multidisciplinary platform financed by the Belgian Development Cooperation (DGD) in a frame agreement with the Institute of Tropical medicine Antwerp (ITM). It aims to create a network of Belgian or partner institutions and individuals involved in activities related to tropical animal health and production in order to exchange information on ongoing research, training and development projects and to attain synergy and coherence in the field. It aims also to increase the national, European and international visibility of the Belgian expertise in tropical animal health and production. An important objective is to improve the relations with the agricultural and the medical sector. This last point is considered by be-troplive as very important and was the stimulus to co-organise a symposium on intersectoral collaboration with medics in a One Health approach (www.be-troplive.be).

The zoonoses network of the Institute of Tropical Medicine, Antwerp (ITM) aimed at strengthening the collaboration between the medical and the veterinary sectors in low-resource countries. The network mostly dealt with improved disease impact assessment in humans and animals, surveillance and control of zoonoses in developing countries. The network involved a few departments of the ITM (Veterinary, Parasitology, Clinical Sciences and Public Health departments) and various ITM institutional partners in South-Africa, Morocco, Ecuador, Vietnam and Cambodia. The main activities of the network included the organization of workshops on intersectoral collaboration and zoonosis burden assessment, regular review of literature and the organization of surveys to evaluate people's perception of zoonoses and control of zoonoses in developing countries.

The Strategic Network on Neglected Diseases (SNND) is one of the strategic networks which are part of the 3rd Framework Agreement Programme (FA3) between the Belgian Directorate-General for Development Cooperation (DGDC) and the Institute of Tropical Medicine in Antwerp, Belgium (ITM). The overall goal of the FA3 strategic networks is to optimise synergies and cooperation between ITM's Southern partners. In this frame, the SNND aims to bring together available expertise on neglected infectious diseases within the network of ITM's institutional partners and, where relevant, additional network partners, for improved control and evidence based priority setting (www.snndz.net).

Damien Foundation (Action Damien, Damiaanactie, Mit Damian) is a Belgian nongovernmental organization working on Leprosy, tuberculosis and leishmaniasis, three poverty-related diseases. The Damien Foundation has been in Africa, Asia and Latin America for more than forty years. Today, the Foundation is active in 15 countries in all three continents. The Damien Foundation actions are long-term, never emergency actions, and mainly carried out by local personnel. The Damien Foundation always acts upon request by the local Ministry of Health. Why and how is Damien foundation related to the topic of this symposium? Because leishmaniasis and some types of tuberculosis (*M. bovis*) are zoonotic diseases. For leprosy, the role of animals, if any, is still unknown (www.damienfoundation.org).

Created in 1971, Médecins Sans Frontières (Doctors Without Borders; MSF) is an international nongovernmental organization with humanitarian purpose. It offers emergency medical care in case of armed conflicts, natural disasters, epidemics and famines. MSF also had longer term interventions during prolonged conflicts or during chronic instability. MSF received the Nobel Peace Prize in 1999. The Charter of Médecins Sans Frontières articulates around a central idea: the right of every individual to benefit from a humanitarian aid. MSF thus considers it is its duty to support victims of wars and crises. The Charter of Médecins Sans Frontières underlines, the neutral, impartial and independent character of the organization. In certain emergency situations, there is a strong relation between human and animal health, and, typically, MSF and vets can join forces in such instances (www.msf.org).

Over one billion people who live in chronic hunger and poverty depend on cows, buffalo, camels, sheep, goats, pigs and poultry to provide essential nutrition and livelihoods. That's why Vétérinaires Sans Frontières Belgium chose to work with families and communities depending at least partially on smallholder livestock systems in fragile areas of developing countries. Its mission is to improve animal health and livestock production in disadvantaged regions of the world in order to have an optimised human nutrition and health. Its vision states: "Healthy Animals, Healthy People". Vétérinaires Sans Frontières Belgium works in an environmentally, economically, and socio-culturally sensitive and appropriate way - through partnerships - with (wo)men and their communities. In support of this, Vétérinaires Sans Frontières Belgium communicates and builds awareness about the importance of these "livestock focused, people centered" processes and shares its lessons learned, in the North as much as in the South, in view to promote an international solidarity.

The Institute of Tropical Medicine in Antwerp, Belgium (ITM) is one of the world's leading institutes for training, research and assistance in tropical human and veterinary medicine and health care in developing countries. ITM's overall goals are to strengthen evidence-based medical and veterinary health care in developing countries and to provide specialist referral clinical services for the management of tropical diseases, import pathology and AIDS in Belgium. ITM has a high profile of international expertise in public health, epidemiology and medical and veterinary services delivery.

Symposium participants (Photo: Mike Claes)

Introduction

The "One Health" concept refers to the notion that human and animal health are closely related (Schwabe 1984). It is generally well acknowledged that human and animal functioning are based on roughly the same biological template. As such, animal models have extensively been used in medical and pharmaceutical research. Humans and animals also share a number of pathogens, referred to as zoonotic infections.

"One Health" by Professor Pat Conrad (UC Davis)

In tropical countries, endemic zoonoses, which use animals as a reservoir, continue to significantly affect human health (WHO 2006). This is often due to the close contact with animals, the lack of recognition when zoonoses occur in humans and the lack of resources to control them.

In fact, domestic and wild animals harbour a huge pool of micro-organisms that are potentially pathogenic to humans. Some authors estimated that more than 60% of human pathogens originate from animals (Taylor et al. 2001). Furthermore, most human emerging diseases, including haemorrhagic fevers, H5N1 influenza, SARS and HIV/AIDS, have a zoonotic origin.

This advocates for the need of the medical, veterinary and wildlife professions to collaborate closely in order to improve the surveillance and the control of pathogens. Yet, intersectoral collaboration should only be advocated if it has an added value (Zinsstag et al. 2005).
The benefit of collaboration should be greater than the sum of individual initiatives:

1+1>2

Do not be scared: vets will not take over medics' jobs and vice-versa! (drawing by Hamissou Daouda, Niger)

It is therefore of paramount importance to be able to quantify the impact of diseases on both human and animal health on the one hand, and the cost of surveillance and control interventions on the other. Finally, animals can contribute positively to human health, not only as a source of food and income. It has, for instance, been demonstrated that living in close contact with a cow in Asia protects people from malaria because the local *Anopheles* mosquitoes are zoophilic (Hewitt et al. 1994). This characteristic could also be used to control malaria vectors through the application of insecticide on cattle (Hewitt & Rowland 1999).

Whereas the emotional role played by pets in Northern societies and the psychological impact of the destruction of infected herds on their owners have been increasingly recognised (Zinsstag & Weiss 2001), the importance of animal health on human wellbeing should not be ignored. These indirect effects are even more difficult to measure than direct effects of zoonotic pathogens.

Thus, a symposium was organised in Antwerp on 5 November 2010 to evaluate the needs and relevance of intersectoral collaboration in low-resource societies and to make recommendations in regard to the way forward. The aim of the symposium was to present the "One Health" concept as an opportunity to improve human health and well-being through an integrated management of health in humans, domestic and wild animals. The issue of disease prioritisation and impact quantification, the difficulty to reconcile impact on human and animal health and the need to provide decision makers with disease impact evidence were discussed. Finally, examples of intersectoral collaboration successes and failures were presented and analysed, and ways to improve intersectoral collaboration were suggested.

Professor Pat Conrad (UC Davis) insisted on the fact that intersectoral collaboration using the "One Health" concept is more relevant than ever in today's world characterised by major ecological changes (Conrad et al. 2009). Human population development, growth and movement have a tremendous impact on the likelihood of inter- and intra-species transmission of diseases, including wildlife. At the same time, technological tools have never been as efficient in terms of diagnoses, communication and control of diseases. Integrated solutions need to be developed to meet the challenge in an integrated and holistic way. To this effect, all competences from the medical, veterinary and wildlife sectors must join forces. Transdisciplinarity should be the goal. The focus should therefore not be on debating whether and why one discipline prevails over another, but on collaboration and on finding ways to combine each discipline's strengths.

Introduction to the One Health concept: an approach to global health challenges

Patricia A. Conrad[1,2], Woutrina Miller[1,2], Anil Deolalikar[1,3] and Jonna K. Mazet[1,2]

The concept of 'One Medicine' has evolved over the past decade into a more holistic, inclusive understanding of a 'One Health' approach to research and training that considers the interdependency of human, animal and ecosystem health. In recent years concern about emerging infectious diseases has increased appreciation for One Health as an integrated global approach to improve human health.

This talk will describe the evolution of the One Health approach and its application to research, education and service that focuses on health at the individual, population, and ecosystem levels. Projects involving University of California faculty that apply and teach an integrated One Health approach to global health challenges will be described, including the:

1) SMART (Strategic, Measurable, Adaptive, Responsive, and Targeted) surveillance program currently being established under the USAID-funded PREDICT program (http://www.vetmed.ucdavis.edu/ohi/predict/index.cfm) to improve global capacity to detect novel diseases with pandemic potential early so as to give health professionals the best opportunity to prevent emergence or control epidemics at the source of spill-over from wildlife to humans (http://www.vetmed.ucdavis.edu/ohi/predict/index.cfm);

2) Health for Animals and Livelihood Improvement (HALI) Project (http://haliproject.wordpress.com) in the Ruaha Ecosystem in Tanzania which is a research and capacity building program exploring the impacts of zoonotic disease caused by restricted water flow, degraded water quality, and increased interactions between livestock and wildlife;

3) One Health Center of Expertise in the newly launched University of California Global Health Institute (http://www.ucghi.universityofcalifornia.edu) whose mission is to train and empower future global health leaders from different disciplines to work effectively in action-oriented trans-disciplinary teams committed to developing innovative, practical solutions to problems that threaten the health of vulnerable populations worldwide.

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Parasitic zoonoses: the example of echinococcosis and hydatidosis

Philip S. Craig

Echinococcosis, caused by *Echinococcus granulosus*, is a geographically wide-spread non-vector-borne neglected zoonotic disease (NZD) that globally causes >1 million lost DALYs, for which effective epidemiology, surveillance and control actions require a strong veterinary public health context and significant intersectoral collaboration. However, high endemicity occurs in scattered, sometimes semi-nomadic, populations in pastoral areas which are often further marginalised within resource-poor countries/regions and figure low within already stretched public health priorities.

Lack of recognition by livestock owners and of demonstrable economic impacts of cystic echinococcosis/hydatidosis (CE) on livestock production, together with occurrence of asymptomatic infection in dogs causes further neglect by government or NGO animal health sectors.

The Turkana tribe in the semi-arid Rift Valley of northern Kenya and Tibetans on the frigid high plateau of western China show very similar human disease and canid infection profiles for echinococcosis. In these communities combined medical and veterinary investigation teams have used conventional methods (hospital surgical records, livestock slaughter data, dog necropsy, dog purgation) and more modern approaches (portable ultrasound, human serology, albendazole chemotherapy, coproELISA/PCR for dogs, praziquantel dosing, livestock anti-*Echinococcus* vaccine, intervention modelling) to quantify parasite frequency/disease prevalence, measure burden, reduce transmission and zoonotic risk, and treat/manage existing cases.

For echinococcosis, human case data (surgical and/or ultrasound data) provides justification for implementation of epidemiological studies and importantly for intervention programs; while dog and livestock veterinary data provide the key control attack phase and shorter term surveillance indicators.

In both Turkana (Kenya) and Shiqu (China), livestock CE data was most unreliable and difficult to collect, while dog coproELISA especially but also human ultrasound data were most effective in establishing baseline and surveillance follow-up. In both pastoral communities medical clinics and veterinary focussed dog dosing were positively accepted and allowed more effective potential for implementation of vertical control programs. `Med-vet` combination/packaging of disease/infection focus in humans (eg. CE and TB treatment), in dogs (eg. *Echinococcus* dosing and rabies vaccination), and in livestock (eg. CE and brucellosis vaccination) should also be investigated.

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Theme 1 - The Role of animals as reservoirs for human diseases

Professor Jacques Godfroid (Veterinary School of Norway) and Professor Philip Craig (University of Salford, UK) were both invited to give keynote presentations on the role played by domestic and wild animals as reservoirs of neglected zoonoses. They used brucellosis (a bacterial zoonosis) and hydatidosis (a helminthic zoonosis), respectively, as models for their lectures.

Both zoonoses are known to have a severe impact on human health, most particularly in pastoral and livestock breeding communities, and both zoonoses use animals as only source of human infections (Acha & Szyfres 2003a; Acha & Szyfres 2003b).

Among the numerous species of the *Brucella* genus, only a few are zoonotic: *Brucella abortus*, *Brucella melitensis* and some *Brucella suis* biovars (Godfroid et al. 2005). These *Brucella* species are mainly found in cattle, sheep and pigs respectively, where they cause abortion and reduced fertility. Hygromas are observed in chronic cases. Brucellosis is transmitted through direct contact with infected animals (especially during abortion or delivery) or animal products (raw milk). In humans, brucellosis causes a flu-like syndrome called undulant fever.

Brucellosis has been controlled in most industrialized countries through vaccination, testing and destruction of positive animals. In developing countries, this eradication method has often proved too expensive and too difficult to implement (Marcotty et al. 2009). Vaccination is used in some places, but usually too erratically to have any significant impact. Most developing countries are therefore assumed to be endemic for brucellosis, which has been confirmed by numerous serological surveys. Yet, brucellosis serology presents serious deficiencies in terms of diagnostic sensitivity and specificity (Godfroid et al. 2002; Nielsen 2002).

In addition, serology does not permit any *Brucella* species identification. Indeed, *B. abortus* can be found in species other than cattle such as sheep (Ocholi et al. 2005), pigs (Stoffregen et al. 2007) and dogs (Forbes 1990). *Brucella melitensis* was reported to occur in camels (Gwida et al. 2011) and in different antelope species (Ostrowski et al. 2002). The isolation, identification and characterization of circulating *Brucella* species is thus of paramount importance to define a given host species as reservoir or spill-over. *Brucella* isolation has been severely lacking in many developing countries and the risk of transmission to different species including wildlife and man has been mostly speculative (Marcotty et al. 2009). Time for improvisation should now be over and serious efforts to better document brucellosis suspicions in livestock, wildlife and humans should be made in a collaborative approach to define accurately the zoonotic risk associated to animal brucellosis.

Bovine tuberculosis and brucellosis at the wildlife/livestock/human interface

Jacques Godfroid[1,2], Anita Michel[2],
Henriette van Heerden[2], Tanguy Marcotty[1,3]

Background:
Brucellosis is thought to be widely distributed in sub-Saharan livestock and wildlife. The different important *Brucella* species for livestock (*Brucella abortus*, *Brucella melitensis*, *Brucella suis*) have preferential hosts (cattle, sheep and goat, pig, respectively) but may infect several hosts including wildlife and humans. This means that all mammalian species are thus potential reservoirs of *Brucella* spp. However, the presence of brucellosis, particularly in sheep, and goats, pigs, camels and wildlife, is rarely demonstrated in sub-Saharan Africa. Furthermore, it is not clear whether wild ruminants act as reservoir or spillover hosts and human brucellosis is rarely diagnosed among non-commercial rural communities.

Bovine tuberculosis (due to *Mycobacterium bovis*) affects preferentially cattle but *M. bovis* may also infect several mammalian hosts including wildlife and humans. Although recent studies have provided insights into the significance of zoonotic tuberculosis in developing countries in Africa, the extent to which zoonotic transmission contributes to the burden of human tuberculosis in these areas is still largely unknown. It has been demonstrated that under nomadic conditions, the risk of exposure to *M. bovis* was increased significantly by creating multiple herd contacts Unfortunately, there are only very few studies that have investigated the prevalence of zoonotic tuberculosis in rural

communities in developing countries. Importantly, from a few recent reports it appears that both *M. bovis* and *M. tuberculosis* are transmitted between humans and cattle (Michel et al., 2010).

Lessons to be learned from vets:

Although human to human transmission of *Brucella* spp. and *M. bovis* have been documented, this has no epidemiological importance. In other words, a livestock and/or wildlife reservoir has (almost) always to be identified. Given the patchy distribution of brucellosis and bovine tuberculosis, it is of prime importance to assess proficiently the presence of both pathogens in animals in a given area where infections are believed to be present in humans.

Lessons to be learned from medics:

No association between human brucellosis and Human Immunodeficiency Virus (HIV) serostatus was found in a recent study in Northern Tanzania (John et al., 2010). Only nosocomial transmission of multidrug-resistant tuberculosis due to *M. bovis* among HIV-infected patients has been demonstrated to date (Vekemans et al., 1999).

It is generally accepted that bovine tuberculosis results from a single infection with a single *M. bovis* strain. This dogma is challenged today, as it has been shown to be invalid for *Mycobacterium tuberculosis* infections in humans (Warren et al., 2004). This suggests that *M. bovis* multiple infections may be frequent in cattle in Africa, implying high reinfection rates in cattle and a higher risk of transmission for humans. These findings will influence our understanding of the epidemiology of bovine tuberculosis in high-incidence regions.

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Despite its high burden on human health, hydatidosis has remained a neglected zoonoses mostly associated to sheep breeding and nomadic communities, in which the prevalence may reach 10% among older persons (Craig et al. 2008). This parasitic zoonosis is caused by a tiny cestode, *Echinococcus granulosus*, which lives in the intestine of canines. Hydatidosis is caused by its larval stage and occurs in numerous species (mostly herbivores), including man. These species are infected through the ingurgitation of eggs disseminated in the environment with canines' faeces. Hydatic cysts are mostly found in livers and lungs but may virtually be found in any organ. They are quite pathogenic in humans where they can reach very large sizes (several kg). Canines infect themselves when feeding on animal species infected with hydatic cysts.

Given the rather low host-specificity, several wildlife species are expected to be receptive to either the adult or the larval stage of *E. granulosus*. Yet, their reservoir role is unknown. In endemic areas, domestic animals play the most important epidemiological role and control in humans does not affect the epidemiology at all since humans are usually considered as a dead-end for the parasite. Thus, intersectoral collaboration is particularly indicated to control this zoonosis.

Apart from hygienic measures including the destruction of infected carcasses and organs, control of dogs, reduced contacts with infected dogs or egg-contaminated material, interventions could be operated at different levels. For instance, dogs could be regularly treated with anthelmintics and this could be combined with rabies vaccination campaigns. Livestock could be vaccinated against the larval stage (Lightowlers 2006) and this could be synchronized with other vaccination programs such as brucellosis. Finally, detection, diagnosis and treatment of human cases could be combined with tuberculosis control programmes for instance. Such initiatives would require an accurate estimation of the burden of the disease in humans and an equitable share of the responsibilities between the different sectors involved.

These two lectures emphasised different aspects of neglected zoonoses. While other neglected zoonoses might also present very specific features, the need for improved diagnosis in the reservoir species, improved understanding of the epidemiology of endemic zoonoses, improved burden assessment in human beings and enhanced intersectoral collaboration has been demonstrated.

Exclusive interview with key informants:

Intersectoral collaboration on an international level

Lucille Blumberg, Deputy director, National Institute of Communicable Diseases, South-Africa

Katinka De Balogh, FAO, Animal Health Service, Veterinary public health

How would you define "intersectoral collaboration" in one word?

"Working together", to share resources, share knowledge, and to solve problems in a cost-effective way.

Trust. It is not sectors that collaborate, it is people who collaborate. You need to believe that this collaboration will result in something positive, that it makes sense.

Where do you think medics and vets must join forces?

I think the effort to join medics and vets has been driven by vets. I think that the human health people don't recognize what the issues are because they are overwhelmed by other priorities: HIV, TB and malaria and because of that, they don't see the animal diseases as a huge problem.

Especially for the zoonotic diseases, but also in other fields such as antimicrobial resistance, food-borne diseases,...

We have realised that there are many sectors which need to work together. This should include cooperation between the medical and veterinary sectors, but also with other sectors, be it environmental health, wildlife, water and sanitation, education,… This cooperation should be a joint effort. We can all contribute to improved life and livelihoods of people.

In theory, it sounds very nice, but in practice there are unfortunately many factors that make it difficult.

Lucille Blumberg	*Katinka De Balogh*
What limits do you see to this "Intersectoral collaboration" between the medics and the vets in low resources societies?	
I think particularly in low resources societies the medic's are overwhelmed by the big three (HIV, malaria, TB). These require full resources, which limits the funding, energy, time or interests for the animal's side effects or the zoonoses.	I think that when you start to collaborate with other sectors, you might come into areas where you don't have all the competencies. In the case of trypanosomiasis or any zoonotic disease, when you don't know what happens in the animal field, it is difficult to predict what can happen in the human health field, and vice-versa. There is always the problem of resources. There is a need to install mechanisms to incentivise this intersectoral collaboration. I think his mechanism would work best at the municipal level, because there is much closer contact between the different sectors at that point.
How do you think that your organisation can contribute to improve "Intersectoral Collaboration" or promoting the "One Health" concept?	
I think it's by giving very practical examples of how things could work and actually save time and money, such as in the case of rabies. Even in low resource countries money is spent on first exposure prophylaxis for rabies exposed people, to a considerable cost. If the same effort could go into preventing rabies, I think we would see a very positive benefit. You need to give people practical examples where intersectoral collaboration is important with benefits for both sides. Our institute has a special interest in zoonotic diseases and we've got experience in bringing vets and health people together. Through our experience with, for example large outbreaks of rabies it obvious that different sectors need to collaborate.	FAO believes in the one health concept, and can bring to the table not only the veterinary field, but also forestry, fishery, information on statistics, and data from the agricultural sector. We can contribute thanks to collaborations with the WHO and OIE. I also want to name UNICEF, where there are opportunities, as for example in the Animal Health Clubs which were formed in schools in Sierra Leone. I think the whole education sector is important and UNICEF can play an important role in communication and sending out messages.

Re-evaluating burden of disease estimates for neglected tropical diseases

Filip Meheus

The burden of disease is increasingly being summarized using disability adjusted life years (DALYs). This health metric is an aggregate measure of premature mortality, morbidity and disability and has been adopted by health policy makers and the international community at large as a guide for resource allocation. It is also frequently used for analyzing the cost-effectiveness of health interventions.

However, as noted by King & Bertino (2008) inherent flaws in the estimation of DALYs result in a "systematic undervaluation of the importance of chronic diseases, such as many of the neglected tropical diseases (NTDs)". The high burden these diseases place on affected households and communities are not very visible in country and regional data on burden of disease when using standard epidemiologic data because of their focal nature. For example in the case of HAT foci the prevalence can be high, often around 1%, and in the absence of control this prevalence can rise relatively rapidly, sometimes to over half the population of certain villages (Boelaert et al. 2010). Thus, the burden of this disease falls very heavily on some locations (Lutumba et al., 2007).

One of the issues with DALYs is the exclusion of non-health outcomes such as the economic burden of NTDs on the livelihood of affected households. We review here the problems related to the estimation of DALYs for the two main vector-borne protozoan NTD infections: human African trypanosomiasis and (visceral) leishmaniasis and look more closely at the economic impact of these diseases.

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Theme 2 - Burden assessment

Filip Meheus (Department of Public Health, Institute of Tropical Medicine) gave a review of the various methods which can be used to assess disease burden in humans, as well as the limitations of these methods in the context of neglected tropical diseases. Prof. Jakob Zinsstag (Swiss Tropical and Public Health Institute) highlighted the difficulties in combining disease assessment in humans and animals and proposed a few solutions to improve burden quantification of zoonoses.

Quantifying the burden of diseases is essential for informing decision making processes and for reason related to advocacy. Basically, disease burden can be split into two components: economic (impact on livelihood) and health burden. Today, health burden is mostly computed using the disability adjusted life years (DALY) measure (Murray 1994). This single metric accounts for the mortality and the morbidity of diseases. Life expectancy of diseased patients is compared to the average life expectancy in the most favourable conditions (using life expectancy in Japan as a basis) whereas morbidity is converted into years of life lost by multiplying the duration of the disease by a disability weight ranging between 0 (good health) and 1 (death). The merit of this metric is that it proposes a relatively objective ranking for prioritising health interventions. However, the disability weight is difficult to establish objectively and might vary across different areas, depending on the perception people have of a disease. In addition, comparing life expectancy in developing countries to the Japanese standard might not be ideal, even though it is necessary to compare the impact of diseases across different areas.

In 2002, HIV/AIDS, malaria and tuberculosis were considered as the infectious diseases with the highest impact on human health whereas the burden of neglected tropical diseases such as leishmaniosis and trypanosomiasis only reached about 2.5% of AIDS burden (WHO 2004). Yet, taken together, neglected tropical diseases have a higher impact than malaria or tuberculosis (Hotez et al. 2007), indicating that these diseases deserve attention as a whole. In addition to this, the DALY measure has a reputation for underestimating the burden of neglected tropical diseases (King & Bertino 2008). Firstly, DALY only consider the individual risk of developing diseases and ignore the concept of disease ecology, failing to acknowledge the implications of context on the burden of disease for the poor. In fact, disability might have a much stronger impact in poverty situations (small disabilities might have very severe consequences) and disability weights of neglected tropical diseases are often underestimated by international expert panels. Finally, DALY ignore the non-linear relationship between investment and health gain in the “poverty trap” (investments produce less gain than predicted by a linear model).

The burden of zoonoses on animal and public health

Jakob Zinsstag

Although industrialized countries have been able to contain recent outbreaks of zoonotic diseases, many resource-limited and transitioning countries have not been able to react adequately. The key for controlling zoonoses such as rabies, echinococcosis, and brucellosis is to focus on the animal reservoir. In this respect, ministries of health question whether the public health sector really benefits from interventions for livestock.

Cross-sectoral assessments of interventions such as mass vaccination for brucellosis in Mongolia or vaccination of dogs for rabies in Chad consider human and animal health sectors from a societal economic perspective.

Here we present a method to assess cross-sector data estimating the burden of zoonoses. A big challenge is that parameters for the estimation of Disability Adjusted Live Years (DALY's) are not readily available. Animal-Human transmission models provide a tool to assess the dynamics of the effects of interventions to animals and humans.

Combining the total societal benefits, the intervention in the animal sector saves money and provides the economic argument, which opens new approaches for the control of zoonoses in resource-limited countries through contributions from multiple sectors (modified from: Zinsstag et al., 2007).

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Furthermore, while NTD might show rather limited impacts on a global level, they sometimes have very severe impacts on a more local scale. This is certainly the case with focal vector-borne diseases such as leishmaniosis and trypanosomiasis (Boelaert et al. 2010). Lack of data on disease morbidity, severity and mortality seems to be another common cause of inaccurate burden estimation of NTD. For instance, leishmaniosis was found seriously underreported in India (Singh et al. 2006).

Part of the DALY's drawbacks could be overcome by the estimation of non-health outcomes (Meheus et al. 2006). Non-health outcomes include direct medical care costs, other direct costs (travel, accommodation of the relatives at the hospital…) and the productivity loss caused by the disease and its impact on livelihood. The economic impact of zoonoses on animal health could also be computed (Budke et al. 2006). In actual fact, a combination of health and non-health outcomes is recommended (Praet et al. 2009), certainly if burden on human and animal health is to be combined. These indicators, in spite of their limitations, could prove useful to compare the cost-effectiveness of control strategies.

Dog vaccination in N'Djamena (Photo: Jacob Zinsstag)

As far as zoonoses are concerned, it would be important to consider the overall societal benefit of disease control. Deterministic mathematical models have proven to be very useful for making such estimations. For instance, Zinsstag and collaborators (2009) showed that dog vaccination in N'Djamena would, in the long term, be cheaper than the treatment of exposed patients. In Mongolia, vaccinating livestock against brucellosis appears to be economically profitable both for the health sector and the livestock sector. If the vaccination costs were shared proportionally to the benefits, each DALY averted would cost $19 only (Roth et al. 2003). Unfortunately, the exact impacts of zoonotic pathogens on human health and animal productivity are often poorly estimated in low-resource societies.

Finally, depending on the value systems prevailing in various societies, animals may merely be considered as commodities on the one end of the spectrum (e.g. livestock in industrialised production settings) or as individuals with rights on the other. Therefore, quantifying animal health in economic terms might not be sufficient. In the future, developing a new indicator similar to the DALY might offer a way be of quantifying, for each cultural system, the impact of diseases on animal health and human psychological wellbeing.

Exclusive interview with participants: Intersectoral collaboration in Zambia

Gideon Zulu, Medical doctor, Petauke district hospital, Zambia

Evans Mwape, Veterinarian, University of Zambia

How would you define in one word "intersectoral collaboration"?

Team work

Joining people from different disciplines for a common goal. Working together or ***togetherness***

What should be remembered from the role of animals as a reservoir for human diseases?

It is important that we collaborate. With respect to zoonotic diseases, it is important to assess the disease burden in animal as well as in humans.

I think that burden assessment can help policy makers to prioritize research needs for scientists so that better control measures can be implemented.

What is the value of burden assessment according to you?

As a medical doctor, I think it is very important to estimate the burden of disease. When we talk about TB, HIV and malaria, knowing the burden of disease will facilitate interventions as well as estimating the cost that would be involved in implementing those interventions.

As a vet, I think burden assessment would help us to really know which type of disease we should focus our energies on and ultimately help us control diseases. This can eventually increase the incomes of the really poor who are mostly livestock keepers.

How will the lessons learnt affect your day-to-day work?

I am looking forward for collaborations with vets. Previously, we have been working in isolation, medics alone and vets alone. From now on, I hope to be able to work on a common approach to tackle diseases such as in the example of rabies.

The figures obtained by burden assessment allows you to make better informed decisions on what you need to do next.

What are according to you the factors limiting the intersectoral collaboration between the medical and veterinary professions in your country?

Mainly it is because medical and veterinary sectors are managed by different ministries and work independently. They use different funds. There is a need for a policy to address the zoonotic diseases by involving the Ministry of Health as well as the Ministry of Agriculture.

I think it all stems from the fact that right from school we go into different directions. There is no communication between the different sectors. Therefore it is unlikely that our mentors can bring us together and explain the importance of working together.

Gideon Zulu	*Evans Mwape*
Where do you think medics and vets must join forces? Do you have experience with effective collaboration between medics and vets in your country?	
In my district, yes. We have had incidents of rabies, because of the high number of stray dogs. Medics and vets collaborated in terms of vaccinations, as for example by vaccinating all the dogs as well as provide at least preventive treatment for humans.	In my country, since starting my study on cysticercosis, it has been generally very difficult to work with the medics who always seem to walk different paths which makes it difficult to actually meet them anywhere. Fortunately, now as a new generation of health professionals is coming forward, we seem to be starting to build some common linkages.
How can intersectoral collaboration be improved and what is required to improve the situation?	
It could be improved if the Ministry of Agriculture responsible for livestock and disease could work together with the Ministry of Health. One way to initiate that is by holding symposiums and inviting people from livestock and fisheries to exchange ideas with the Ministry of Health.	I think the best way this situation can be improved would be if it is really emphasised to students that cross-disciplinarity or working together with people from different sectors is very important to control diseases.
How do you imagine your discipline in five years? What is your long-term vision on the medical discipline in your country?	
Already, the government is working on neglected tropical diseases. I foresee that in the long term these zoonotic diseases will be addressed thanks to an improved intersectoral collaboration between the Ministry of Livestock and Fisheries as well as the Ministry of Health. In that way, we will be helping the people to reduce the disease burden due to zoonotic diseases.	Hopefully in the next five years we can work together with other sectors, the medics, the social scientists. Biomedical scientists and social scientists are complementary and can bridge gaps. We want to implement control measures based on what we studied on pathogens lifecycles but we often don't know whether these control measures can work in the rural communities. Social scientist can contribute to tell us which sort of control measures are more acceptable to the communities. If we can have medics on board, it will help to control the disease in both the animal and human field and eradicate diseases.

The fight against zoonotic diseases, a challenge for public and veterinary health: Niger experience

Boukary A.R.[*1,2,x], Badé M.A[2,3], Adéhossi E.[2,3] & Vias Franck S.G.[4]

Background and Rationale: Like in other countries in sub-Saharan Africa, in Niger, zoonotic diseases are a hindrance to development and a challenge to public and veterinary health (SDR, 2007). Among these diseases, brucellosis and *M. bovis* tuberculosis are of greatest concern given the importance of risk factors for transmission from animals to humans, given the inadequate diagnostic facilities and given the fairly low interest shown by the politics (Boukary et al., 2007). Indeed, whether the human or animal form, data on these two diseases are very rare. According to the infectious diseases department of the hospital in Niamey, these diseases are under-diagnosed and often mistaken for other diseases with similar clinical presentations (Adéhossi, pers. com.).

The fight against these diseases, particularly among groups at risk, requires coordinated actions among researchers and institutions dealing with human and animal health (Schwabe, 1984; Zinsstag et al., 2005). The experiment conducted in Niger is part of an effort in order to promote the emergence of genuine political control of these diseases in the country.

Methodology: With the support of Belgian institutions (ITM, ULg, VSF-Belgium, VAR), the project began with the establishment of a multidisciplinary research team (universities, laboratories, research centres) collaborating with policymakers (ministries, decentralised government), officials of professionalised services (hospitals, training) and development agents (NGOs). A joint research protocol was then validated by an ethics committee in Niger. The research took place between April 2007 and August 2010 in urban and suburban areas of Niamey and in rural areas. It involved people at risk and their herds and flocks. The study included: 1. the determination of the true prevalence of these diseases, 2. the molecular epidemiological study of pathogens in animals and humans and 3. the study of risk factors for transmission. Laboratory tests were conducted in Niger and Belgium.

Results: The project allowed:

- On the structural level, the establishment of a permanent consultation framework and the synergy of action between the various international and national institutions with the creation of a network of information exchange and skills transfer.
- The production of scientific references and improved knowledge about the epidemiology of the diseases studied with the characterisation of strains of *M. bovis* and *Brucella* spp. in animals. Characterisation of strains in humans is underway.
- Capacity building and promotion of young researchers through the supervision of several theses and dissertations related to the theme of the study.

Based on this experience, recommendations are made to make this a sustainable collaboration.

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Theme 3 - Voices from the field

This session proposed three joint presentations from the field. Abdou Razac Boukary (veterinarian) and Mallam Abdou Badé (physician) reported their collaboration on the epidemiology of zoonotic tuberculosis and brucellosis in Niger. Then, Hamid Sahibi (Institut Agronomique et Vétérinaire Hassan II) and Hind Filali (social scientist at the Institut National de l'Administration de la Santé) presented their experience on people's knowledge and perception of hydatidosis in the High Atlas in Morocco and tried to show how collaboration between the human and animal health sectors could contribute towards a better control of this zoonosis. Finally, Saskia Hendrickx (International Livestock Research Institute) and Cyrille Pissang (VSF-Belgium) explained how Participatory Epidemiology and Participatory Disease Surveillance contributed to the control of animal diseases in Africa and how these methods could be advantageously used in human health.

Razac Boukary performing a TB skin test in cattle in Niamey (Niger)

Although the prevalence of brucellosis and zoonotic tuberculosis in Niger is poorly documented due to the absence of relevant control initiatives in livestock, both diseases are suspected to be endemic in livestock as well as humans (Cosivi et al. 1995; Sheik-Mohamed & Velema 1999). The purpose of the study in Niger was to better describe the occurrence of these two infections, both in livestock and in humans, through an intersectoral collaboration between veterinary and medical scientists. Selected herds were tested and *Brucella* and *Mycobacterium bovis* bacteria were isolated from infected animals for molecular characterisation whereas humans with a high-risk of exposure (farmers, butchers…) were tested for serology.

Human tuberculosis cases were also typed to allow discrimination between *M. tuberculosis* and *M. bovis*. This collaboration highlighted the fact that common interests are shared between the two professions and that close collaboration allows for a better understanding of the transmission of zoonotic diseases to man, and could possibly also lead to improved diagnosis of exposed humans. Unfortunately, the initiative received little support from decision makers.

Nevertheless, sharing the limited resources of both sectors (transport, storage and laboratory facilities) is another way of valuing the One Health concept.

In Morocco, hydatidosis caused by *Echinococcus granulosus* remains a serious zoonotic issue, particularly in the High and Middle Atlas (Dakkak 2010). In spite of decades of efforts by the government, the disease continues to be prevalent among humans, often requiring them to undergo surgery. In these sheep-breeding societies, dogs play important roles for herding and security.

However, dogs must usually secure their food themselves, as they are not fed. They are often found roaming around abattoirs and slaughter slaps where they are left to feed on infected organs. In theory, controlling *E. granulosus* should be relatively simple: dogs, which play the main disease transmission role, should not be allowed to feed on infected organs. In theory, controlling *E. granulosus* should be relatively simple: dogs, which play the main disease transmission role, should not be allowed to feed on infected organs. They should be treated with appropriate anthelmintics on a regular basis while stray and feral dogs should be controlled (culled) (Acha & Szyfres 2003). These measures are likely to significantly reduce the incidence of hydatidosis both in livestock and humans. Yet, this strategy has not worked and it was suggested that a better understanding of people's perception and understanding of the disease, coupled with a better collaboration between the human health and the veterinary sectors could improve the situation.

Indeed, preliminary results indicate that the communities have a very poor understanding of the transmission of the parasite and fail to identify the main risk factors. They know that dogs present a number of hazards (including bites, rabies…) but fail to understand that they disseminate *E. granulosus* eggs in the environment, including drinking water. The authors therefore suggest encouraging intersectoral collaboration, involving communities, medical and veterinary experts, to identify the most appropriate way to break the parasite's cycle. Such an approach could help inform community education activities, which in turn could reduce infection risks in endemic areas.

Discussion with the symposium participants (Photo: Mike Claes)

Perception of Hydatidosis in rural area of Middle and High Atlas Morocco

Sahibi H.[1], Thys S.[2], Rahali T.[1], Marosi A.[1], Filali H.[3], Marcotty T.[2] & Rhalem A.[1]

Cystic echinoccosis is a worldwide health problem mainly in Mediterranean countries. The presence of this disease in endemic areas has important impact on the public health and causes serious economic losses. The illiteracy, very basic infrastructures and limited economic resources in rural and suburban areas in Morocco, play an important role in the distribution of this disease. In such a frame, mode of water supply, sheep breeding, high population of stray dogs, conditions of slaughter houses create ideal situation for the spread of the disease and the exposure of women and young people to the parasite. A total of 25 focus groups among butchers, male and female villagers in Middle and High Atlas (5-13 persons in each focus group) were organised to assess the perception of cystic echinoccosis with reference to the socio-cultural aspects. The results showed very limited knowledge on the life cycle of the parasitic agent and health hazards in relation to dogs. Collaboration between medical and veterinary professionals on these issues is well indicated since improved control of dogs is likely to benefit both human health and animal production. The perception of the disease, target messages and recommendations for a prophylactic program will be discussed.

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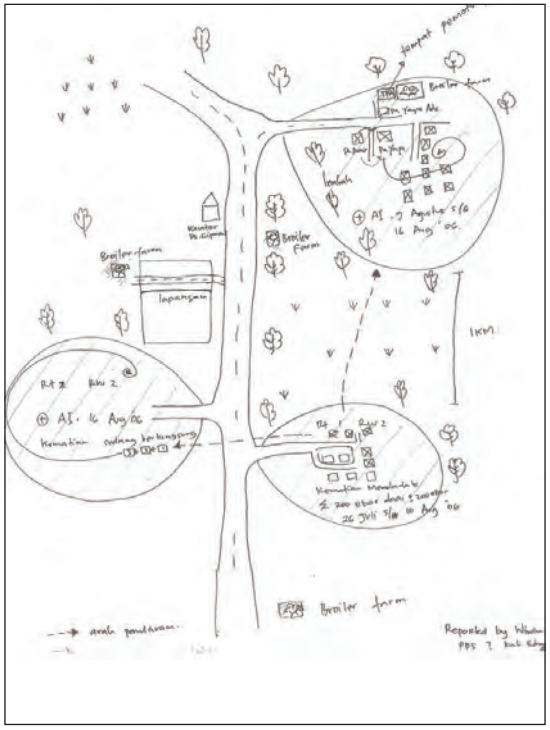
Dogs feeding on abattoir wastes in Morocco (Photo: Hamid Sahibi)

Participatory epidemiology relies on participatory rural appraisal (PRA) techniques to collect epidemiological knowledge and intelligence. It is based on the fact that communities usually have a certain understanding of the most prevailing diseases in their livestock (Mariner & Roeder 2003). PRA techniques are qualitative methods used to collect information from key informants from remote communities. Their main advantages are their speed, flexibility and straight forward implementation. However, collected data is often subjective and requires careful interpretation. Such methods allow for a good estimation of the local epidemiology and impact of diseases, as well as people's perceptions of the diseases, especially in remote areas where disease surveillance by governments is difficult to assure (Jost et al. 2007). As far as zoonotic diseases are concerned, participatory epidemiology methods have been successfully used to evaluate the spread of Highly Pathogenic Avian Influenza in Egypt (Ismail & Ahmed 2010) and Indonesia (Azhar et al. 2010) in 2006-2008 and Rift Valley fever in Kenya in 2006-2007 (Jost et al. 2010). The experience gained in the livestock sector in regard to participatory epidemiology could prove useful to the medical sector for collecting data on neglected or emerging diseases in remote areas (Freifeld et al. 2010).



Village map drawn by the community representing the spread of Pathogenic Avian Influenza in Indonesia in 2006 (Saskia Hendrickx)

Participatory epidemiology in animal and human health

Cyrille Pissang[1], Saskia Hendrickx[2]

In Participatory Epidemiology (PE) the approaches employed are largely based on participatory rural appraisal (PRA) techniques which were developed to empower communities to diagnose and prioritize their own development needs as well as to formulate solutions. These techniques are well established in development practice (Pretty, 1994). The techniques were adapted in the years 1990 and 2000 to gather disease related information. When PE is used to conduct surveillance for a particular disease it is called participatory disease surveillance (PDS). In East Africa, PDS was extensively used by veterinarians for rinderpest surveillance as part of the global eradication campaign of the disease. It was a very useful approach in remote or armed conflict areas such as Southern Sudan. In these areas, even though there were no formal veterinary services, livestock keepers had a wealth of knowledge about diseases and determinants of disease (FAO, 1996; Mariner and Roeder, 2003).

Subsequently PE/PDS was applied in surveillance of other major livestock diseases such as Foot and Mouth Disease (FMD), Peste des Petits Ruminants (PPR), Rift Valley Fever (RVF) and in recent years for Highly Pathogenic Avian Influenza (HPAI) in countries such as Indonesia, Egypt and many countries in East and West Africa (Jost et al., 2007). In human health, many organizations, especially non-governmental organizations (NGO's), have also applied participatory approaches for disease related issues. Tools such as seasonal calendars for diseases, simple ranking and matrix scoring have been successfully used.

Although use of these approaches is relatively wide spread, the methodology is not taught at any veterinary or medical school. In 2007, the Participatory Epidemiology Network for Animal and Public Health (PENAPH) was set up to facilitate capacity building, research and information sharing among professionals interested in participatory approaches to epidemiology. As part of this process, the network wishes to promote minimum training guidelines, good practice and continued advancement of methods. Apart from training of trainer courses, PENAPH is promoting the inclusion or PE in academic curricula. A training course in PE was recently given at the Faculty of Veterinary Medicine of Chiang Mai University (Thailand) as part of their MSc course in Veterinary Public Health and, following a request from the African Field Epidemiology Network (AFENET), PENAPH also provided a training course for the Ugandan fellows of the Filed Epidemiology and Laboratory Training Program (FELTP). More of these collaborations are needed to create awareness about the usefulness of these approaches in certain situations and to further develop capacity in the field.

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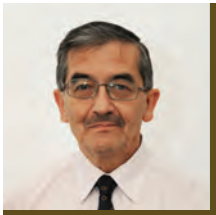

Exclusive interview with participants: Intersectoral collaboration in Ecuador

Marcelo Placencia, Medical doctor, Ecuador, Speciality: clinical neurology

Freddy Proaño-Perez, Veterinarian, Ecuador, Speciality: bovine tuberculosis

What should be remembered from the "Voices from the field" ?

The situation differs a lot from place to place. The examples from Morocco and Niger are interesting but are not readily applicable to Ecuador. What is important is the projections one can make from the experience gained elsewhere.

The situation in Africa and some Latin American countries, and developing countries in general is almost the same. We need political will and economical support from the government, otherwise it is difficult to work together. I think this is the most difficult aspect that we have to deal with. When we are working in the field or in the lab we need that kind of support.

Do you have examples of effective collaboration in Equador ?

As far as I know, there were very few successful collaborations between physicians and veterinarians in Ecuador. There must have been some. But, personally, I do not know any.

When we work on zoonotic diseases, most of the time we find people affected by these diseases, and we cannot treat them because we are vets. So, we need to find specialists or medics who are interested to work with us. We are doing this on brucellosis as well as for cysticercosis. For the moment on tuberculosis we haven't found humans affected by animal sources. However, most of the work is done by vets: the diagnosis, the treatment of the samples. I think the collaboration between vets and medics should be established in the beginning of the planning of the work.

Marcelo Placencia	*Freddy Proaño-Perez*
What are the limiting factors for the intersectoral collaboration in your country?	
The main limiting factor is, according to me, the respective scope of the medical and veterinary professions. Vets are part of the animal production sector and, as a consequence, are more concerned about productivity of animals than their health. For, instance, they promote the use of hormones in spite on obvious side effects in animals, such as is the case with poultry. Physicians, on the other hand, are more focused on medicalization and fail to develop holistic approaches.	In Ecuador, the zoonotic disease are not well know nby medics. Sometimes they are misdiagnosed, because it is not very common to find people affected by those diseases or sometimes they are confounded with another disease because they don't know.
What is required to improve the situation ?	
A good vision needs to be developed, with very clear objectives. But who should develop this vision? The political authorities might need to play a role at this level.	We need to work together and we need a specific training in that sense. For us, the vets, the zoonotic diseases are well known, but not all medics know how to diagnose them. I think the training is very important.
What is your long-term vision on the veterinary discipline in your country?	
The long term vision I have is the privatisation of health services. The integration of "One Health" in the private sector might be even more challenging than in the public sector.	The situation for the veterinary discipline is improving because we have a good proposition for the government to start changing some structures. For instance, we are now changing some laws, in the policy of Ecuador. I think this is a good start and also the quality of the education is taken care of now. I hope it can continue on this line.

The role of animals in public health: source of disease or shield

Michel Van Herp & Peter Maes

At what point would a medical emergency NGO be interested in the health of animals? When a major humanitarian crisis (complex humanitarian emergencies or natural disasters) occurs, the MSF focus is, during the acute phase of the crisis, to ensure the vital needs of the affected populations ("life-saving activities »). The "ten main priorities in public health" define the work of those involved. Medical staff are in charge of controlling the mortality and the morbidity. These staff assure that quality health care is offered, establish a system of sanitary information and follow up on the diseases with epidemic potential (measles, bacterial meningitis : diseases with only human transmission). However, in certain emergencies, animals can have a substantial role. A refugee camp can be infested by rodents carrying the Lassa fever virus or a flood can be followed by an epidemic of leptospirosis. The watersupply of communities can be contaminated via animals by the hepatitis E virus. A cholera epidemic can emerge from a group of fishermen living in close proximity to contaminated water (e.g. in the great lakes region). But the role of animals remain marginalized and the doctors have little or even no contacts with the veterinarians.

If we widen the notion to sanitary crises, the implication of animals may be crucial in a certain number of them. The role of reservoir played by animals for a number of endemic infectious diseases (trypanosomiasis, brucellosis, monkeypox, anthrax, Crimean-Congo hemorrhagic fever) is well known. Animals can also play a role of amplifier in the development of human epidemics (Rift valley fever, ebola, plague, japanese encephalitis, bird flu) and regrettably, still too often, the human cases serve as sentinel in the release of the alert and the search for the animal source. The vector driven epidemics (malaria, dengue) concern mainly insects and the place of the entomologists is therefore very important. Knowledge of "human - vectors – animals" interactions sometimes allow us to transform animals into shields for humans. When dealing with a zoophilic mosquito, the pulverizing of insecticides on cattle has allowed to constrain a malaria epidemic in an Afghan refugees camp in Pakistan. The vaccination of the livestock, the pets and even the wild fauna allow the prevention of human epidemics (rift valley fever, rabies).

However the relation is not only one-way. Humans can also contaminate the animal. Evidence indicating the new H1N1 virus being passed on by humans to pigs is a recent example. It is then that the vaccination of the breeders must be recommended. Other human activities, often illegal, can contribute to the appearance of a sanitary crises: the smuggling of products from the poultry industry (export of H5N1), the massive use of antibiotic (creation of resistance) or other medicines (clenbuterol) used for the cattle breeding, not to mention environmental contamination (e.g. DDT, mercury).

To tackle these sanitary crises, coordination of the various actors is essential to address the problem in its entirety. But if the pathogenic agents are capable of crossing the barrier of the species, there remains more work to do so that humans cross the barriers of their disciplines.

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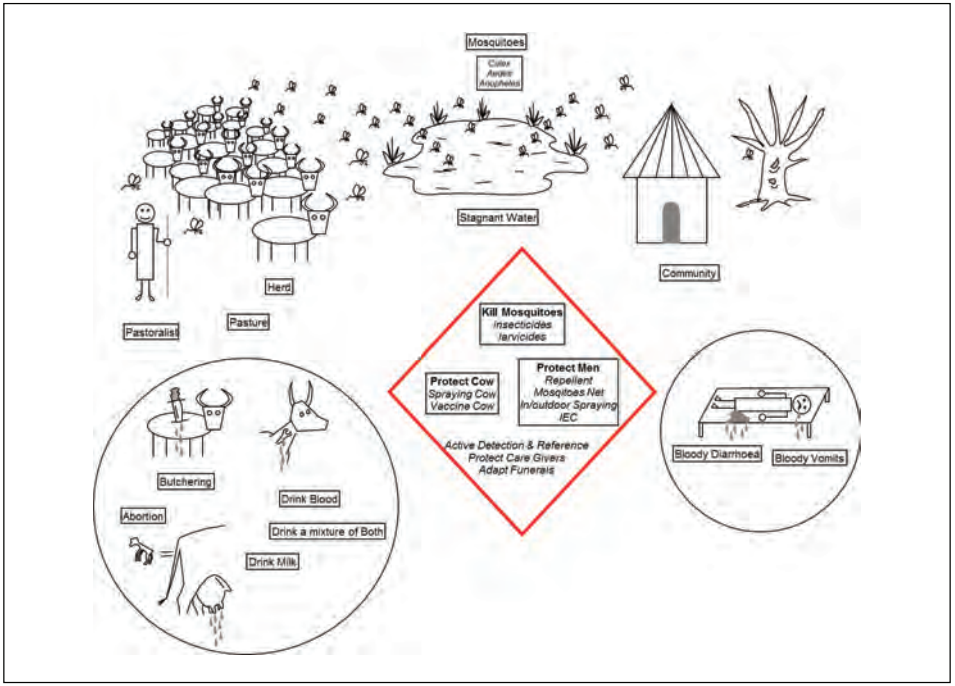
The road ahead

Dr Michel Van Herp (MSF Belgium) introduced this session with a provocative presentation entitled "The role of animals in public health crisis: source of diseases or shield?" in which he challenged the audience with a number of questions. These questions were then addressed during a "buzzing with coffee", after which they were further discussed in a plenary session. For the "buzzing with coffee" participants were asked to approach other participants, preferably from a different field of activity, and discuss with them the benefit and way forward of intersectoral collaboration.

"Médecins sans frontières" (MSF) is a NGO that specialises in humanitarian crisis and emergencies. Its main goal is to provide assistance to populations in distress, whether they are victims of natural or man-made disasters and armed conflicts, independently of race, religion, creed or political convictions. MSF mostly employs physicians and health workers, but people with various other backgrounds may be hired, depending of the organisation's needs. It appears that, in emergency situations, very few health issues are related to animals. Most contagious diseases prevailing in refugees' camps originate from human reservoirs with the exception of Lassa fever and leptospirosis which are transmitted by rats and, to some extent, cholera, which may survive in fish. Yet, veterinarians are usually not considered as experts in rats or fish. The same applies to the provision of water, which is one of the top priorities in refugee's camps and for which veterinarians cannot contribute much. Yet, insecticide-treated animals could be advantageously used as a target for mosquitoes and ticks and protect people from malaria, Rift-Valley fever or Crimean-Congo haemorrhagic fever.

As far as the 2006-2007 Rift-Valley fever outbreak in East Africa is concerned, veterinary services obviously failed to control the virus in livestock and the diagnosis was only made when the first human cases were reported. Often, indeed, diseases go unnoticed in animals, where they have little impact in terms of morbidity and mortality. This is precisely the reason why controlling zoonotic pathogens in animals for the sole sake of improved animal production is not always profitable. A stronger intersectoral collaboration would have permitted a more accurate estimation of Rift-Valley fever outbreak risk in humans in East Africa. In addition, it might be advantageous for the medical sector to contribute financially to the vaccination of livestock against Rift Valley fever to reduce the risk of outbreak in humans.



Rift-Valley fever in East Africa in 2006-2007 (Michel Van Herp)

The One Health initiative has mostly been driven by vets. The audience of the symposium tried to identify the reasons for the lack of interest of the medical profession to collaborate with veterinarians. Indeed, veterinarians are too often seen by the medical profession as a very specific risk group for zoonoses. Physicians, throughout the world, are mostly trained as clinicians: their primary interest is to treat sick individuals. Epidemiological considerations such as the source of diseases, transmission of diseases and disease ecology do not seem to attract many of them. However, medical epidemiologists have realised the importance of wildlife and livestock as source of emerging and zoonotic diseases.

The medical profession might not be convinced that emerging and zoonotic diseases have a high impact on human health. Would there be evident added value for collaboration, collaboration would be spontaneously initiated and promoted by the medical sector. Therefore, at this stage, what is probably the most severely missing is a good understanding how the different disciplines, including veterinary medicine, can actually benefit human health. Ideally, medical students should be exposed to these issues during their studies. They should also be given the opportunity to have a broader understanding of disease ecology. Such lectures could be organised jointly by medical, veterinary and biology faculties.

Medical students and professionals should have a chance to meet with students and professionals from other sectors. Education is a unique opportunity to promote the One Health concept advocating for a holistic approach of health integrating human health, animal health and environmental health.

Intersectoral collaboration often seems easier to implement in less developed countries because of reduced administrative barriers. However, collaboration needs to be institutionalised for long term sustainability. Today, most international organisations (WHO, OIE, FAO…) are aware of the need to view human and animal health in a global system, integrating many different wild and domestic species (including man) and considering an international perspective with numerous contacts and exchanges favouring the transmission of pests, vectors and pathogens. If pathogens are able to cross species and geographic barriers, scientists should make an effort to cross their discipline barriers!

Finally, Katherine Homewood (Biological Anthropology, University College of London), who unfortunately failed to attend the conference, advocates for the need to consider social science in One Health efforts in low-resource societies. Improved understanding of disease ecology and epidemiology by physicians and veterinarians is not sufficient. Scientists must understand the local knowledge and perception people have of diseases prior to attempting implementing control strategies. Moreover, good understanding of local knowledge is a prerequisite to quality epidemiological surveys because preliminary and complementary qualitative studies permit the right questions to be addressed in quantitative surveys, the right sampling frame and categories to be defined and a greater accuracy in data interpretation and analysis.

Enthusiastic symposium delegates (Photo: Mike Claes)

One health, local knowledge and the significance of qualitative work

Katherine Homewood

Western medical and veterinary science command powerful tools of diagnosis, prevention and cure, and one-health provision offers a wider and more effective reach in the developing world. Yet the disease burden in poor rural LDC populations remains immense, partly due to lack of resources and infrastructure, but also due to the very different social and cultural contexts of disease. Even if the resources are available, it is never simply a case of rolling out scientific knowledge from lab to people's lives. Negotiating with local knowledge is of real importance. Local knowledge may convey new insights modifying established scientific understanding of key aspects such as risk factors or the context of transmission. Even where local knowledge does not map neatly onto western scientific models, and is not necessarily 'right' in scientific terms, it constitutes a deep structure informing local behaviour in ways not easily influenced by educational campaigns: understanding this is fundamental to bringing about positive change. Local knowledge structures people's priorities and choices. A poor grasp of local knowledge can lead to medical and veterinary action being misunderstood in ways creating lasting damage, and even more so in one-health interventions with additional potential for confusion.

Medical and veterinary scientists understand the need to work with social sciences to achieve better outcomes, but often overlook the need for prior and complementary qualitative research. Although well-designed quantitative surveys may be useful for population-level generalisations, prior qualitative work is essential to develop an understanding of local knowledge as the overarching context of health interventions. Anthropological, ethnoveterinary and ethnomedical studies address the interface between local and western scientific knowledge, underpin formulation of pertinent research questions and representative sampling frames, and permit greater accuracy in interpretation and analysis of data. Good qualitative data are necessary to an accurate understanding of the ways local people construct categories, processes, relationships and perceptions, and the way they will understand research questions or interpret what they observe of interventions. Qualitative work is particularly critical in a cross-cultural context, and is essential to the internal validity of subsequent structured work.

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Conclusions

Intersectoral collaboration should start at school:

- Common courses in disease ecology, epidemiology, environmental health etc. could be considered
- Formal and informal exchanges between medical, veterinary and biology students should be promoted
- Roles and competences of other professions involved in public health should be better known

The One Health concept should not only be advocated among scientists but also among decision makers:

- Intersectoral collaboration needs to be institutionalised for long term sustainability
- The medical and the veterinary sectors must keep their autonomy but should nevertheless also be looking for opportunities to collaborate

The impact of neglected zoonoses on human and animal health should be better quantified:

- DALY underestimate the impact of neglected tropical diseases
- DALY underestimate the impact of diseases in poor communities
- Ranking diseases using DALY might be biased
- Comparing disease impact in different countries using DALY might not be correct
- DALY could be useful to compare control strategies
- Economic impact of diseases (including in animals) needs to be taken into account

Intersectoral collaboration in low-resource countries includes:

- Research on zoonoses and emerging diseases
- Control of zoonoses and emerging diseases
- Surveillance of zoonoses and emerging diseases, including participatory epidemiology
- Use of antimicrobials and presence of pollutants in people, food, domestic animals, wildlife and environment
- Social sciences studies

Exclusive interview with key informants: Intersectoral collaboration at donor level

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Carola von Morstein, GTZ, Germany, the Division of Agriculture, Fisheries and Food

How would you define "intersectoral collaboration"? in one word

Catalyst. Intersectoral collaboration is an essential catalyst. We need a global vision. Such a vision existed in the antiquity, well before Rudolf Virchow!

Population health

What should be remembered of the sessions and the meeting in general?

It was another very interesting meeting. With this type of meeting, we slowly but surely contribute to the dismount of interdisciplinary barriers. I highly appreciated the anthropological considerations, really.

I was very much impressed by the proper preparation and the very diverse selection of speakers to cover the different topics. The workshop was done in a very appropriate way. Sometimes, I would have wished to have less powerpoint-oriented presentations. Maybe, for the next time it would be good to add a restriction, because the discussions or clarifications sometimes came too short. Some of the presentation were a bit overloaded, but besides that I think it was excellently prepared.

Which message would you take back home?

I work for research. Knowledge is generated and eventually applied. We operate upstream. Yet, research does also include the development of tools adapted to rural areas in developing countries. Also, we should not ignore the development of socio-economic knowledge. And all the generated knowledge needs to be used in the field to control zoonoses.

I had the feeling that the 'one world - one health' concept was driven by the research side. But what was completely neglected in the last years on a political level was that a lot of money was spent, a lot of emphasis and success (also failures) have been achieved towards a one health approach with respect to the Avian Influenza. I wish that the whole issue would also be government-driven. I would have liked to see how the enormous, positive and valuable outcome from research could be linked with sources which finally have the money to finance projects.

Isabel Minguez Tudela	*Carola von Morstein*

Where exactly do you think medics and vets must join forces?

Neglected zoonoses are difficult to control even if we have the tools. We must operate in a context of poverty, with little hygiene and poor sanitation. In my opinion, we must work at the grass-root level and contribute to the overall development of these societies. For example, in Spain, where I grew up, 100% of the sheep used to be infected with hydatic cysts. Today, the prevalence is very low. Infrastructure, education and institutions improved a lot since those days. Yet, neglected zoonoses are still highly prevalent in many developing countries. It is immoral that human rabies still exists at the 21st century. It is not acceptable that 55,000 cases are recorded every year whilst control methods are known. Veterinarians and physicians have strong egos, including at institutional level. Such egos should be overcome. Joint "One Health" education programs should be promoted to break these barriers.

I think generally they should join forces. The point is not to look at a particular disease. The context was in low resource countries, in low resource locations. There are limited resources: moneywise, manpower-wise, sometimes even know-how-wise. So, I think, they have to join forces whenever they can. The very practical examples such as transport, sharing facilities etc would be a big and valuable step forward particularly. I think we are on the right way. We have to keep promoting this interdisciplinary and pragmatic way to achieve with limited resources our ways.

Séverine Thys conducting an interview with Marcello Placiencia (Photo: Mike Claes)

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In Memoriam

In the interval between the colloquium and the production of these proceedings, we lost two of our prominent colleagues. This booklet is dedicated to them.

Peter Van den Bossche (16 March 1962 – 11 November 2010) was the head of the Animal Disease Control unit at the Institute of Tropical Medicine, Antwerp. Peter tragically died in a car accident in Antwerp early in the morning of 11 November 2010, on his way to work. He was 48 years old and left a beloved wife and three children. This tragedy created a huge loss for his family and friends but also among his colleagues at the ITM and throughout the world. Between 1989 and 2000, Peter worked in southern Africa studying the ecology of tsetse flies and the epidemiology and control of livestock trypanosomiasis. In 2000, he obtained his PhD degree and joined the Institute for Tropical Medicine where he became professor in 2005. Peter was also appointed Extraordinary Professor at the University of Pretoria in 2002.

Isabel Mínguez-Tudela (08 May 1956 – 16 April 2011) was a senior scientific officer in DG Research and Innovation of the European Commission dealing mostly with veterinary issues and, more particularly, with neglected zoonoses in developing countries. Isabel was an indefatigable supporter of the "One Health" concept. Isabel died of a cancer and left a husband and two teenage daughters. Until the last day, she was very lucid and remained admirably committed in her duty. Isabel studied veterinary medicine and obtained a PhD at Complutense University of Madrid in 1987. In 1990, she moved to Brussels to work as a national expert at the DG Fisheries of the European Commission, became counsellor at the Permanent Representation of Spain to the European Union in 1992 and finally senior scientific officer in DG Research and Innovation of the European Commission in 1996.

While Peter largely contributed to the development of the "One Health" concept at ITM and to the success of this colloquium, Isabel widely promoted the concept in Europe and beyond and honoured us by participating to this colloquium.

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Leen Claes and Jacques Godfroid (Photo: Mike Claes)

Programme

Time	Title	Presenter (s)
9h00	Registration and welcome coffee	FORUM
9h30	Welcome address (official)	Bruno Gryseels, Director Institute of Tropical Medicine
9h45	Brief introduction to the day	Joep van Mierlo (VSF-B) Tanguy Marcotty (ITM)
10h00	Introduction to the One Health concept : an approach to global health challenges	Pat Conrad (University of California UC Davis)
Theme 1: **Role of animals as reservoir for human diseases** - **Moderator Joep van Mierlo (VSF-B)**		
10h30	Parasitic zoonoses: the example of echinococcosis and hydatidosis	Philip Craig (University of Salford , UK)
10h50	Bovine tuberculosis and brucellosis at the wildlife/livestock/human interface	Jacques Godfroid, (Norwegian Veterinary School)
11h10	Questions and discussion on Theme 1	
11h30	*Coffee break*	FORUM
Theme 2: Burden assessment - **Moderator Jozef Vercruysse (UG)**		
12h00	Re-evaluating burden of disease estimates for neglected tropical disease	Filip Meheus (ITM)
12h20	The burden of zoonoses on animal and public health	Jakob Zinsstag (Swiss Tropical and Public Health Institute)
12h40	Questions and discussion on Theme 2	
13h00	*Lunch Break – offered by the organisers*	FORUM
Theme 3: Voices from the field - **Moderator : Dirk Van der Roost (ITM)**		
14h00	The fight against zoonotic diseases, a challenge for human and animal health services: experience from Niger	Abdou Razac Boukary (ONG Karkara) & Mallam Abdou Badé (Hôpital Général Niamey)
14h20	Perception of Hydatidosis in rural area of Middle and High Atlas Morocco	Hamid Sahibi (Institut Agronomique et Vétérinaire Hassan II) & Hind Filali (Institut National de l'Administration de la Santé)
14h40	Participatory epidemiology in animal and human health	Saskia Hendrickx (ILRI) & Cyrille Pissang (VSF-B)
15h00	Questions and discussion on Theme 3	
The road ahead – **Moderators Lucille Blumberg (NICD, South-Africa) and Katja Polman (ITM)**		
15h20	The role of animals in public health crisis: source of diseases or shield?	Michel Van Herp & Peter Maes (Médecins Sans Frontières Belgium)
15h40	*Buzzing with coffee*	FORUM
16h10	General discussion and conclusions	All the speakers
17h10	Wrap up	The Chairs of the organising platforms & networks
17h20	Reception	FORUM

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