Colloquium on Zoonoses and Neglected Infectious Diseases of Africa

1 to 4 November 2011

Indaba Hotel, Johannesburg, South Africa

PROGRAMME AND ABSTRACT INFORMATION

Sponsors

The main sponsor of the colloquium is the **Belgian Development Cooperation** (DGD). Funding is made available through the 3rd Framework Agreement between DGD and the Institute of Tropical Medicine of Antwerp, Belgium.

The **European Union** is partially financing the organisation of the Workshop on Research Priorities for Zoonoses and NTDs of Africa, and is financially supporting the participation of several delegates to the colloquium.

THE BELGIAN DEVELOPMENT COOPERATION .be

A tribute to a true friend and colleague: Peter Van den Bossche

(16.03.1962 – 11.11.2010)

The death of our dear friend and colleague, Peter van den Bossche, in a car accident in Antwerp in the early morning of 11 November 2010 brought us all to a stand still and to moments of intense reflection and introspection.

Like some of you I have been privileged to have been a close friend and colleague of Peter: in my case for almost 20 years. My first encounter with him was when he was part of the Regional Tsetse and Trypanosomosis Control Programme (RTTCP) in Harare, Zimbabwe. As part of the RTTCP he made invaluable contributions to the control of tsetse and trypanosomosis in countries such as Zambia, Malawi and Mozambique and established active collaboration with many colleagues in the Region. His colleagues who worked with him in the RTTCP spoke highly of him as a bright young scientist with a passion for his work and life in general. Peter liked the African bush and he loved a "braaivleis" (barbeque) and to share a beer or two around a fire with his friends and colleagues!

Peter was awarded a PhD from the University of Pretoria in 2000 for a dissertation entitled "*The development of a new strategy for the sustainable control of bovine trypanosomosis in southern Africa".*

He and his family decided to return to Belgium in 2000 where he became Head of the Disease Control Unit in the Department of Animal Health, Institute of Tropical Medicine, Antwerp. In order to retain his expertise in the Region he was appointed as an Extra-ordinary Professor in the Department of Veterinary Tropical Diseases (DVTD), Faculty of Veterinary Science, University of Pretoria, South Africa in 2000, a position that he occupied until his untimely death. Several MSc and PhD students in Malawi, Zimbabwe, South Africa and Mozambique studied under his supervision. He did not only supervise their work, but he was also a true mentor!!!

Peter left a distinct footprint in the lives and memories of his friends, colleagues and numerous postgraduate students. He was a highly productive and versatile person with an international profile. Some of his recent achievements in the international context include participation in undergraduate elective courses at the Universities of Utrecht and Cambridge, Coordinator of the PRINT Regional Training Programme in the SADC Region, promoter of numerous postgraduate students, and elected Secretary General of the Association of Institutes of Tropical Veterinary Medicine (AITVM).

Beside his impressive research and training outputs, Peter had the exceptional ability to see the "bigger picture", to phrase relevant and applicable research questions, to put ideas into action, and above all, to interact with his colleagues and friends in a constructive and respectful manner. I had the privilege of sharing his office with him in the days immediately before the tragedy and of benefiting from his innovative inputs on many collaborative projects. Peter added value and enriched our lives in many ways: he made a huge difference! His death leaves an "enormous hole" that we will find very difficult to fill and have to deal with in the time to come.

By: ***Koos Coetzer,*** *Deputy Dean: Research, Postgraduate Studies and Internationalization*
Faculty of Veterinary Science, University of Pretoria, South Africa

UNIVERSITEIT VAN PRETORIA
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Faculty of Veterinary Science

INSTITUTE OF TROPICAL MEDICINE ANTWERP

Colloquium 2011

Welcome!

On behalf of the Scientific Steering and Organising Committees I would like to warmly welcome you to Johannesburg, South Africa, and the Colloquium on Zoonoses and Neglected Infectious Diseases 2011.

This colloquium is organised jointly by the Institute of Tropical Medicine (ITM, Belgium) and the Department of Veterinary Tropical Diseases of the University of Pretoria (DVTD, South Africa). It is the second in a series of three regional colloquia on research for the control of neglected infectious diseases, including zoonoses. After the first of these thematic colloquia was held in Latin America in 2009 we are very pleased to focus the attention in this 2011 colloquium on the disease concerns in Africa.

We trust that the event will offer a platform for animal and human health researchers and professionals to debate common challenges and identify key research priorities for the future.

I would like to thank everyone who has had a hand in planning for the Colloquium, and in particular our sponsors for their support.

Best wishes for a successful colloquium and inspirational discussions.

Anita Michel
Chair of Scientific Steering Committee

Marleen Boelaert
ITM, Antwerp

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Organising institutions

- Department of Veterinary Tropical Diseases of the University of Pretoria, South Africa
- Institute of Tropical Medicine, Antwerp, Belgium

Colloquium organisers

Scientific steering committee
DVTD
Anita Michel (chair)
ITM
Tanguy Marcotty
Marleen Boelaert
INRB
Pascal Lutumba

Organising committee
DVTD
Rene Perridge (co-chair)
Fransie Lottering
ITM
David Hendrickx (co-chair)
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Colloquium on Zoonoses and Neglected Infectious Diseases of Africa

1 to 4 November 2011, Johannesburg, South Africa

Scope

The burden of neglected infectious diseases (NID) and zoonoses on the African continent, both in terms of disability-adjusted life years and economic cost, is huge by any standard. Durable, cost-effective and well informed control efforts are key in tackling these diseases and require significant input from the academic world. As resources in the context of NID and zoonoses research are extremely limited, especially when compared to HIV/AIDS, malaria and tuberculosis, there is a strong need for identifying key research priorities in terms of disease control. Much can also be gained from a cross-disciplinary approach to disease control, including sharing of resources, a notion which is underlined by the 'one-health' philosophy, which acknowledges the link between human, animal and environmental health.

This colloquium is an important opportunity to focus attention on the considerable experience and achievements of many African countries in the research and control of neglected tropical diseases and zoonoses. The event will promote the exchange of knowledge and expertise between researchers from Africa and elsewhere. The overall objective is therefore to exchange experiences, generate insights and agree on research priorities which can contribute to the control of neglected infectious diseases and zoonoses in Africa.

The colloquium encourages African scientists and their peers from other continents to share their experiences and draw strength from exchange of knowledge and ideas.

This colloquium is the second of three regional meetings on neglected infectious diseases the ITM is co-organising with its partners, the first of which was held in Lima in 2009. As part of our global approach to contribute to the fight against neglected infectious diseases and zoonoses, it is envisaged to organise the third colloquium in this series in Asia in 2013.

Colloquium Programme

Tuesday, 1 November

SESSION 1 – Opening

Content:

- Official opening
- Academic session in memory of Prof Peter Van den Bossche (ITM, †11/11/2010)

Speakers:

Prof Gerry Swan, Dean
Faculty of Veterinary Science, University of Pretoria, South Africa
Prof Bruno Gryseels, Director
Institute of Tropical Medicine, Belgium
Prof Koos Coetzer, Deputy Dean
Research, Postgraduate Studies and Internationalization, Faculty of Veterinary Science, University of Pretoria, South Africa
and
Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, South Africa
Dr Justin Masumu
Institut National de Recherche Biomédicale, Democratic Republic of Congo
Dr Guy Hendrickx
Avia-GIS, Belgium

Room: Auditorium

Start time: 18:00

Welcome reception 19:30 – 20:30

Wednesday, 2 November

SESSION 2 - Disease Surveillance and Intersectoral Approach to Control

Room: Auditorium
Start time: 8:30
Coffee break: 10:35 – 11:00
End time: 12:45

Key note & invited presentations

Session chairs: Koos Coetzer
Department of Veterinary Tropical Diseases, University of Pretoria, South Africa
Jean-Jacques Muyembe
Institut National de Recherche Biomédicale, DR Congo

Time	Title	Presenter
8:30 – 8:45	Introduction to the scientific programme by the Chair of the Scientific Steering Committee	Anita MICHEL University of Pretoria, South Africa
8:45 – 9:15	Intersectoral approach to surveillance and control of viral zoonoses: Missed opportunities and lessons learnt	Lucille BLUMBERG National Institute for Communicable Diseases, South Africa
9:15 – 9:35	Intersectoral approach from a veterinary perspective	Katinka DE BALOGH Food and Agriculture Ogranization, Italy
9:35 – 9:55	Intersectoral approach from a medical perspective	Kariuki NJENGA Centre for Disease Control, Kenya
9:55 – 10:15	Viral haemorrhagic fevers, situation in DR Congo	Jean-Jacques MUYEMBE Institut National de Recherche Biomédicale, DR Congo
10:15 – 10:35	DISCUSSION	

Session chairs: Emmanuel Swai - *Veterinary Investigation Centre, Tanzania*
Pascal Lutumba -*Institute National de Recherche Biomédicale, DR Congo*

Time	Title	Presenter
11:00 – 11:15	# 27. Use of Geographic Information System Tools in Targeting Control of Helminth Infections	Deborah MBOTHA Kenya
11:15 – 11:30	# 70. A Health and demographic surveillance system in livestock (HDSS-Live)	Darryn KNOBEL South Africa
11:30 – 11:45	# 74. Scaling up Early Detection and Treatment to Reduce Buruli Ulcer Morbidity in the Asante Akim North District of Ghana	Anthony ABLORDEY Ghana
11:45 – 12:00	# 69. 'they need the business perspective!' The use of private veterinarians for the control of zoonotic trypanosomiasis in northern Uganda	Kevin BARDOSH United Kingdom
12:00 – 12:15	# 63. Institutionalisation of participatory strategies for dengue control in Cuba: a muddling-through experience	Dennis PEREZ Cuba
12:15 – 12:45	DISCUSSION	

Wednesday, 2 November

SESSION 3 – The Role of Animals in Disease Transmission

Session chairs: Justin Masumu - *Institut National de Recherche Biomédicale, DR Congo*
Lucille Blumberg - *National Institute for Communicable Diseases*

Rooms: Auditorium → break-out rooms 1, 7, 8
Start time: 13:45
Coffee break: 15:15 – 15:45
End time: 17:00

Key note presentation

Time	Title	Presenter
13:45 – 14:15	The role of animals in disease transmission in kinetoplastic diseases	Eric FÈVRE University of Edinburgh, United Kingdom
14:15 – 14:35	DISCUSSION	
14:35 – 14:45	Summary of break-out session topics	Tanguy MARCOTTY, ITM

Break-out session 1:

Session name: Food Producing Animals

Session moderator: Rudovick Kazwala - *Sokoine University of Agriculture, Tanzania*
Room: Auditorium

Time	Title	Presenter
14:45 – 15:00	Introduction by session moderator	Rudovick KAZWALA, Tanzania
15:00 – 15:15	# 22. Smallholder Dairy Farmers' Awareness and Risk Behaviour for Milk-Born Zoonoses Transmission In Northern Malawi	Stanly Fon TEBUG Germany
15:45 – 16:00	#91 How to control neglected zoonoses in the absence of accurate recognition by the veterinarian, the medical doctor and the community?	Tanguy Marcotty Belgium
16:00 – 16:15	# 62. A study on bovine tuberculosis and associated risk factors for humans in Swaziland	Mcebo Edwin DLAMINI Swaziland
16:15 – 17:00	DISCUSSION	

Break-out session 2:

Session name: Climate Effect & Environment

Session moderator: Guy Hendrickx - *AVIA-GIS, Belgium*
Room: Lecture room 8

Time	Title	Presenter
14:45 – 15:00	Introduction by session moderator	Guy HENDRICKX, Belgium
15:00 – 15:15	# 78. Possible Effects of Environmental Changes on Increase and Spreading of Canine and Human Visceral Leishmaniasis in Morocco	Allal DAKAK Morocco
15:45 – 16:00	# 85. Quand Médecins et Vétérinaires unissent leur force: cas d'une stratégie intégrée de lutte contre la brucellose au Niger	Abdou Razac BOUKARY Niger
16:00 – 16:15	# 46. Modeling the effect of age and temperature on the	Rachid OUIFKI

	population dynamics of tsetse flies	South Africa
16:15 – 17:00	DISCUSSION	

Wednesday, 2 November

Break-out session 3:

Session name: Challenging the reservoir paradigms

Session moderator: Paul Gibbs - *University of Florida, United States of America*
Room: Lecture room 7

Time	Title	Presenter
14:45 – 15:00	Introduction by session moderator	Paul GIBBS, USA
15:00 – 15:15	# 55. Rabies in Greater Kudu (*Tragelaphus strepsiceros*) in Namibia	Terence Peter SCOTT South Africa
15:45 – 16:00	# 18. The importance of domestic animals in the epidemiology of sleeping sickness in Fontem: The dual role of pigs.	Guy Roger NJITCHOUANG Cameroon
16:00 – 16:15	# 53. Visceral leishmaniasis in bihar, India;the role of domestic animals	Epco HASKER Belgium
16:15 – 17:00	DISCUSSION	

Break-out session 4:

Session name: Vectors & Ecology

Session moderator: Sue Welburn - *University of Edingburgh, United Kingdom*
Room: Lecture room 1

Time	Title	Presenter
14:45 – 15:00	Introduction by session moderator	Sue WELBURN, UK
15:00 – 15:15	# 45. Field studies of the contact between humans and tsetse in Zimbabwe	Glyn VALE Zimbabwe
15:45 – 16:00	# 43. Modelling the control of trypanosomiasis using trypanocides or insecticide-treated livestock	John HARGROVE South Africa
16:00 – 16:15	# 1. Epidemiology of Visceral Leishmaniasis in Algeria: an Update	Amel ADEL Algeria
16:15 – 17:00	DISCUSSION	

18:30 for 19:00
African themed evening in Chief's boma,
Indaba Hotel

Thursday, 3 November

SESSION 4 – Diagnosis and Burden of Disease

Session chairs: Pascal Lutumba - *Institute National de Recherche Biomédicale, DR Congo*
Jakob Zinsstag - *Swiss Tropical and Public Health Institute, Switzerland*

Room: Auditorium → lecture rooms 1, 7, 8
Start time: 8:30
Coffee break: 10:15 – 10:45
End time: 12:30

Key note & invited presentations:

Time	Title	Presenter
8:30 – 9:00	The burden of disease: real or perceived? Diagnostic challenges and their implications.	Jakob ZINSSTAG Swiss Tropical and Public Health Institute, Switzerland
9:00 – 9:20	Burden of disease from a veterinary perspective	Rudovick KAZWALA Sokoine University, Tanzania
9:20 – 9:40	Burden of disease from a medical perspective	Paul VAN HELDEN Stellenbosch University, South Africa
9:40 – 10:10	DISCUSSION	
10:10 – 10:15	Summary of break-out session topics	Tanguy MARCOTTY, ITM

Break-out session 1:

Session name: Diagnostics development

Session moderator: Paul Van Helden - *Department of Biomedical Sciences, Faculty of Health Sciences, Stellenbosch University, South Africa*
Room: Auditorium

Time	Title	Presenter
10:45 – 11:00	Introduction by session moderator	Paul VAN HELDEN, South Africa
11:00 – 11:15	# 20. Preliminary findings of a comparison of diagnostic tests for rabies in Ethiopia	Reta DIGAFE Ethiopia
11:15 – 11:30	# 59. Use of FTA card methodology for sampling and molecular characterization of Echinococcus granulosus in Africa	Franck BOUÉ France
11:30 – 11:45	# 54. Post-Mortem Examination and Laboratory-Based Analysis for the Diagnosis of Bovine Tuberculosis Among Dairy Cattle in Ecuador.	Freddy PROANO-PEREZ Ecuador
11:45 – 12:30	DISCUSSION	

Thursday, 3 November

Break-out session 2:

Session name: Assessment of Disease Burden

Session moderator: Alexandra Shaw – *AP Consultants,* United Kingdom
Room: Lecture room 7

Time	Title	Presenter
10:45 – 11:00	Introduction by session moderator: # 65 Treating cattle to save people: economics of sleeping sickness control in Uganda	Alexandra SHAW *UK*
11:00 – 11:15	# 15. Assessment of human exposure to highly pathogenic avian influenza h5n1, in rural Gharbiya, Egypt	Mahmoud ELTHOLTH Egypt
11:15 – 11:30	# 35. Baseline burden estimate for brucellosis and bovine tuberculosis, planning of an intervention, and demonstration of cost-effectiveness of one-health intervention package	Marie DUCROTOY United Kingdom
11:30 – 11:45	# 39. The economic burden of Visceral leishmaniasis on households in south-eastern Nepal	Surendra URANW Nepal
11:45 – 12:30	DISCUSSION	

Break-out session 3:

Session name: Risk Analysis

Session moderator: Esther Schelling - *Swiss Tropical and Public Health Institute, Switzerland*
Room: Lecture room 1

Time	Title	Presenter
10:45 – 11:00	Introduction by session moderator	Esther SCHELLING, Switzerland
11:00 – 11:15	# 3. Prévalence et Facteurs de Risque de la Brucellose chez les Bovins a Proximité du Parc National Kruger (Afrique du Sud)	Brice ADJAHOUTONON South Africa
11:15 – 11:30	# 31. A delay differential equations model for the impact of mass chemoprophylaxis and insecticide treated cattle on the control of T. b. rhodesiense	Damian KAJUNGURI South Africa
11:30 – 11:45	# 58. Lack of Knowledge Favours Bad Practices Leading to Transmission of Taenia Solium Cysticercosis in Tanzania	Maria Vang JOHANSEN Denmark
11:45 – 12:30	DISCUSSION	

Thursday, 3 November

Break-out session 4:

Session name: Emerging Voices on the Control of NIDs

Session moderator: Marleen Boelaert – *Institute of Tropical Medicine, Belgium*
Room: Lecture room 8

Time	Title	Presenter
10:45 – 11:00	# 25. Kala-azar control in NEPAL : reducing the gap between public health office and medical doctors	Surendra URANW Nepal
11:00 – 11:15	# 4. Challenges of the Soil Transmitted Helminthiasis (STH) Control Program Implementation in a Rural District in Indonesia	Bintari DWIHARDIANI Indonesia
11:15 – 11:30	# 67. Impact des interdits liés au traitement de la THA sur le contrôle de la maladie.	Alain MPANYA Democratic Republic of Congo
11:30 – 11:45	# 66. Schistosomiase et géohelmintiases en République Démocratique du Congo: Connaissances, attitudes et pratiques des populations et des professionnels de la santé.	Sylvie LINSUKE Democratic Republic of Congo
11:45 – 12:30	DISCUSSION	

SESSION 5 – Drug Use and Drug Resistance

Room: Auditorium
Session chairs: Katja Polman – *Institute of Tropical Medicine, Belgium*
Samson Mukaratirwa - *University of Kwazulu-Natal, South Africa*
Start time: 13:20
End time: 15:30
Coffee break: 15:30 – 16:00

Key note & invited presentations:

Time	Title	Presenter
13:20 – 13:50	#91 Antihelmintics: a long-term solution to control zoonotic and neglected helminthes	Stanny GEERTS Institute of Tropical Medicine, Antwerp, Belgium
13:50 – 14:10	Immunisation as an alternative to anthelminthic use	Marshall LIGHTOWLERS University of Melbourne, Australia
14:10 – 14:30	DISCUSSION	

Abstract presentations

Time	Title	Presenter
14:30 – 14:45	# 17. Ivermectin mass treatment outcome for onchocerciasis control in co-endemic areas with Loiasis in DR Congo	Rogers Galaxy NGALAMULUME KABUAYA Democratic Republic of Congo
14:45 – 15:00	# 21. Knowledge and perception of *Taenia solium* taeniosis and cysticercosis in Eastern Zambia: Impact on control and therapy strategies	Séverine THYS Belgium
15:00 – 15:15	# 81. Oxfendazole treatment trial to control porcine cysticercosis in Angónia District, Mozambique	Maria VANG JOHANSEN Denmark
15:15 – 15:30	DISCUSSION	

Thursday, 3 November

SESSION 6 – General Discussion on Research Priorities & Closing

Content:
- Summary of the EC workshop on research priorities
- Plenary discussion on research priorities
- Official closing of the colloquium

Moderators: Marshal Lightowlers - *University of Melbourne, Australia*
Jean-Jacques Muyembe - *Institut National de Recherche Biomédicale, DR Congo*

Room: Auditorium
Start time: 16:00
End time: 17:00

Thursday Evening Entertainment (Optional, at delegates' own expense)

Busses will depart to the Monte Casino Entertainment Centre at 18:00. Please remember to register with Fransie Lottering at the Colloquium Reception Desk no later than 09:00 on Thursday.

Friday, 4 November

On Friday, the 4th of November, there will be no scientific programme. An optional half-day visit to the Faculty of Veterinary Science of the University of Pretoria at Onderstepoort, the ARC-Onderstepoort Veterinary Institute and Onderstepoort Biological Products will be arranged for the morning. Busses will depart at 08:30 from the Indaba Hotel. Delegates will be able to register for this trip during the colloquium (no extra cost).

Busses will be back at the Indaba Hotel at 14:00.

The Colloquium Committees thank you for your participation and wish you a safe journey home.

SESSION 2 – Disease Surveillance and Intersectoral Approach to Control

INTERSECTORAL APPROACH TO SURVEILLANCE AND CONTROL OF VIRAL ZOONOSES: MISSED OPPORTUNITIES AND LESSONS LEARNT

Lucille Blumberg (National Institute for Communicable Diseases, South Africa)

No abstract available at the time of printing

INTERSECTORAL APPROACH FROM A VETERINARY PERSPECTIVE

Katinka De Balogh (Food and Agriculture Ogranization, Italy)

No abstract available at the time of printing

INTERSECTORAL APPROACH FROM A MEDICAL PERSPECTIVE

Kariuki Njenga (Centre for Disease Control, Kenya)

No abstract available at the time of printing

VIRAL HAEMORRHAGIC FEVERS, SITUATION IN DR CONGO

Jean-Jacques Muyembe (Institut National de Recherche Biomédicale, DR Congo)

No abstract available at the time of printing

#27 USE OF GEOGRAPHIC INFORMATION SYSTEM TOOLS IN TARGETTING CONTROL OF HELMINTH INFECTIONS

Mbotha D.R.N

Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, UK - deborahmbotha@gmail.com

Reliable and updated maps of helminth (worm) infection distributions are essential to target control strategies. Although many surveys have been conducted in endemic countries, the data are rarely available in a form that is accessible to policy makers. This is especially true in sub-Saharan Africa, where empirical data are seldom in the public domain. In an attempt to address the paucity of geographical information on helminth risk, an updatable atlas of human helminth infection in East Africa was developed.

Empirical, cross-sectional estimates of infection prevalence conducted since 1980 were identified. A number of inclusion criteria were imposed for identified information and details of survey population, diagnostic methods, sample size and numbers infected with helminths were recorded. A unique identifier linked each record to an electronic copy of the source document. An attempt was made to identify the geographical location of each record using standardized geolocation procedures and the assembled data were incorporated into a geographical information system.

Over 2,748 prevalence surveys were identified. Of these, 2,612 were geolocated and mapped. More than half were from grey literature or unpublished sources. 66% of all surveys were conducted since 2000. Comprehensive, countrywide data are available for Burundi, Rwanda and Uganda. Information for Kenya and Tanzania is typically clustered in specific regions of the country.

For all five countries, information assembled in the current atlas provides the most up-to-date and comprehensive source of data on the distribution of common helminth infections to guide the rational implementation of control efforts.

70 A HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEM IN LIVESTOCK (HDSS-LIVE)

Knobel DL, Simpson G, van Rooyen J, van Schalkwyk OL

Faculty of Veterinary Science, University of Pretoria, Private Bag x4, Onderstepoort 0110, South Africa - darryn.knobel@up.ac.za

Priority setting for the control of infectious diseases relies on effective population and health data on which to base policy. In the case of zoonoses, which exert a dual impact on human wellbeing (directly, through their effects on human health as well as indirectly, through effects on animal health and productivity), estimating the true burden of disease is a double challenge. In many developing countries, effective human population and health data are being accumulated through a network of sites operating in geographically defined populations and conducting continuous longitudinal demographic monitoring of these populations (International Network for the Demographic Evaluation of Populations and Their Health in Developing Countries, or INDEPTH). This monitoring system is known as a Health and Demographic Surveillance System (HDSS), the aim of which is to generate population-level data to guide health priorities and policies in developing countries. Here, we describe the establishment of a HDSS in Livestock (HDSS-Live) in a communal farming area at the wildlife-livestock interface in South Africa.

The core function of the HDSS-Live will be to maintain individual-level data on all livestock within a geographically-defined population, or Demographic Surveillance Area (DSA). For the demographic component, the HDSS-Live will keep track of the presence of all individual animals within the DSA. The long-standing registration and inspection of all cattle within foot-and-mouth disease (FMD) control zones at the wildlife-livestock interface in southern Africa provide a unique opportunity to capture such detailed longitudinal data at relatively low cost. Currently, all herds within the FMD control zones are registered, and all cattle within these herds are brought together at central locations ('diptanks') at weekly to monthly intervals for acaricide application and inspection for FMD. Movement of animals between diptanks is only allowed under permit. Thus, 'resident episodes' of individual animals within each registered herd can be recorded, with a resident episode initiated or terminated through paired events such as birth/death, study start/end, local movement in/out (within diptank), permitted movement in/out (outside diptank). In this way, the population within the DSA at any one time, or over a particular period, will be known, as will its composition by age and sex. Production and health parameters such as reproductive performance or disease incidence, can then be relatively easily captured.

We discuss the potential of such a system to accurately measure livestock productivity and rates of disease, to identify determinants of livestock health and productivity, and to provide a platform for testing interventions aimed at improving livestock health and productivity for human development. In the future, a network of such systems in southern Africa could contribute to reliable, accurate data to assess the burden of zoonotic and other livestock diseases on household economies.

#74 SCALING UP EARLY DETECTION AND TREATMENT TO REDUCE BURULI ULCER MORBIDITY IN THE ASANTE AKIM NORTH DISTRIC OF GHANA

Ablordey, A.[1], Amissah, D.[1], Kabiru, A.[2], Gyabaah,A.[2], Thompson, W.[2], Portaels F.[3]

Noguchi Memorial Institute for Medical Research, Accra Ghana[1] Agogo Presbyterian Hospital, Agogo, Ghana.[2] Institute of tropical Medicine, Antwerp, Belgium.[3] - aablordey@noguchi.mimcom.org

Introduction. Early detection and treatment are important in the control of Buruli ulcer (BU). This strategy reduces or prevents disabling complications associated with late stages of the disease and results in better integration of BU control activities into the primary health care system, as well as lowering of the direct and indirect treatment cost (1). The overall objective of the project is to promote active community participation in early case detection and treatment seeking, and to support health centres in confirmation and management of cases.

Method. Thirty endemic communities in Asante-Akim north district and the district hospital - Agogo Presbyterian Hospital (APH) received intervention involving strengthening community and health care facility activities through (i) Training community based surveillance volunteers (CBSVs) and health workers (HW) to identify early BU lesions and link victims and families to treatment centres. (ii) Establishment of PCR diagnostic facility for BU diagnosis in APH.

Results and Conclusion. Forty CBSVs and 40 HWs have been trained. The establishment of diagnostic facility enable BU cases to be confirmed promptly consequently waiting time to treatment initiation has been reduced from two weeks to two days. In 2010, 130 cases were reported, 105 (81%).were confirmed as BU. About 85% of confirmed cases were category I (≤5cm) and II (5-15cm) lesions.This reflects good case suspicion and referral skills of CBSVs and HWs. Antibiotic treatment supervision by community HWs with close monitoring by hospital surveillance team has improved treatment compliance.The interventions have contributed to reduction in BU morbidity in the study area.

Reference

(1). Evans MR, Phillips R, Etuaful SN, Amofah G, Adomako J, et al. (2003) An outreach education and treatment project in Ghana for the early stages of *Mycobacterium ulcerans* disease. Trans R Soc Trop Med Hyg 97: 159–160

#69 'THEY NEED THE BUSINESS PERSPECTIVE!' THE USE OF PRIVATE VETERINARIANS FOR THE CONTROL OF ZOONOTIC TRYPANOSOMIASIS IN NORTHERN UGANDA

Bardosh, K

School of Social and Political Science, The University of Edinburgh, UK - bardosh_kevin@hotmail.com

The Stamp Out Sleeping Sickness (S0S) campaign is a public-private partnership initiated in 2006 to prevent the spread of Rhodesian sleeping sickness in Northern Uganda. Initially an emergency intervention based on the mass curative and prophylactic treatment of cattle, SOS has since pioneered a business-oriented, market-driven model to the community-based control of sleeping sickness supporting veterinarians to conduct sensitisation, maintain drug shops and organise networks of para-veterinarians. Through field research conducted on the SOS-model, this paper will evaluate the barriers and opportunities of using a market-based approach to the control of zoonotic trypanosomiasis in East Africa.

Field data is based on a series of structured and semi-structured interviews, focus group discussions and participant observations conducted with farmers, village leaders, para-veterinarians, hospital staff, private veterinarians, SOS partners and district officials over a four week period in 2010. These methods were used in conjunction with the review of sales books and hospital records.

Field research shows that while reported cases of sleeping sickness have remained at relative equilibrium since 2006, the SOS-supported veterinarians have achieved a monthly insecticide coverage rate between 10 to 40% of the cattle population, which continues to grow despite low income levels and disease knowledge among farmers.

These results reveal that while the method of insecticide-treated cattle allows the possibility of using a market-driven model for the control of zoonotic trypanosomiasis, the tension between public and private goods together with the nature of vector and parasite requires a concerted and sustained effort on education and inter-sectoral collaboration.

#63 INSTITUTIONALISATION OF PARTICIPATORY STRATEGIES FOR DENGUE CONTROL IN CUBA: A MUDDLING-THROUGH EXPERIENCE

Perez D, Lefèvre P, Castro M, Toledo MI, Bonet M, Van der Stuyft P

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Introduction. Most of the effective participatory strategies in disease control have only been tested at small-scale. Therefore the challenge is to scale-up and institutionalise these strategies within control programs. We analysed early stages of the process of institutionalisation of a participatory strategy within the Cuban *Aedes aegypti* Control Program (*Aa*CP) and drew lessons for improving institutionalization of such strategies.

Methods. We conducted content analysis of strategy developers' and *Aa*CP documents and interviewed key actors involved in the institutionalisation process. We explored their understanding of the strategy, difficulties encountered in its implementation and perceived reasons for them. The deductive analysis draws on Rogers' five-stage model in the innovation process within organizations: two decision to adopt and three implementation stages. This process is furthermore influenced by external determinants: characteristics of the innovation, of the host organization, among others.

Results. The *Aa*CP's performance gap and the existence of an evidence-based participatory strategy that matched program needs led to the decision to adoption at national level. During implementation the strategy was partially reinvented to accommodate *Aa*CP characteristics. Underlying principles of the strategy were insufficiently disseminated. Consequently some reinventions were inadequate and all necessary changes in structure, practices and organisational culture of the *Aa*CP to implement the innovation did not occur. Implementation was disrupted and at this stage *Aa*CP is still struggling to find ways for future institutionalisation of the strategy.

Conclusions. Developing an adequate dissemination approach, by strategy developers, and addressing changes in organizational culture, by the host organization, are key aspects for institutionalization.

SESSION 3 – The Role of Animals in Disease Transmission

THE ROLE OF ANIMALS IN DISEASE TRANSMISSION IN KINETOPLASTIC DISEASES

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No abstract available at the time of printing

Break-out session 1: Food Producing Animals

#22 SMALLHOLDER DAIRY FARMERS' AWARENESS AND RISK BEHAVIOUR FOR MILK-BORNE ZOONOSES TRANSMISSION IN NORTHERN MALAWI

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Consumption of unpasteurised milk and physical contact with infected animals are the most common route of animal to human transmission of zoonotic diseases in many developing countries. Hence, farmers knowledge of these diseases could play an important role in their control. A cross-sectional study was carried out to assess smallholder dairy farmers' awareness of zoonotic diseases, to identify risk behaviour for milk-borne disease transmission, and to estimate the prevalence of brucellosis and bovine tuberculosis in dairy cattle in the Northern Region of Malawi.

One hundred and five farmers' awareness and risk behaviour was accessed using a structured questionnaire. Single intradermal bovine tuberculin tests using a cut-off of 4 mm were performed on 180 dairy cattle and a competitive enzyme-linked immunosorbent assay was carried out on sera from 150 cows to estimate the prevalences of tuberculosis and brucellosis, respectively.

Reported levels of awareness were 72%, 13%, 4% and 4% for bovine tuberculosis, rabies, brucellosis and bird flu, respectively. The prevalence of bovine tuberculin-positive and anti-*Brucella* reactors were 12.2% and 8.1%, respectively. Although prevalences of bovine tuberculin-positive (13.7% vs 4.7%) and anti-*brucella* reactors (9.7% vs 6.3%) were higher in Mzimba district, awareness of milk-borne diseases and mode of transmission was higher amongst farmers in Nkhata Bay district. Farmers involved in dairy farming for more than five years reported a higher level of awareness of zoonoses ($\chi^2 = 5.97$, df 1, $P < 0.05$). Over 30% and 50% of the farmers drank and sold unpasteurised milk directly to consumers either as fresh or cultured milk, respectively.

The results of this study show that milk-borne diseases constitute a potential threat to milk consumers in the study area. Farmers were more aware of zoonotic tuberculosis compared to brucellosis and consumption of unpasturised milk is a common habit. The findings of this study could serve stakeholders in planning measures to improve animal health and to reduce risk of milk-borne zoonoses transmission to humans. In order improve on the understanding of these zoonoses, more extensive studies covering other regions of the country should be encouraged.

#91 HOW TO CONTROL NEGLECTED ZOONOSES IN THE ABSENCE OF ACCURATE RECOGNITION BY THE VETERINARIAN, THE MEDICAL DOCTOR AND THE COMMUNITY?

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Some neglected zoonoses including brucellosis, bovine tuberculosis, hydatidosis and cysticercosis are still prevailing in many developing countries but seldom reported, particularly in humans. Underreporting is likely to result from the lack of surveillance in animals, the absence of cheap and effective resources for specific diagnosis in humans and the lack of recognition by the communities. Cysticercosis, hydatidosis and tuberculosis are easily identified in slaughtered animals but measures are rarely taken to reduce their transmission. For brucellosis, abortions are not commonly observed in extensive systems and serology seems to be difficult to transpose from European to overseas laboratories. In humans, the diagnosis of brucellosis, cysticercosis and hydatidosis require specific medical skills and accurate molecular methods are needed to discriminate bovine and human tuberculoses. The fact that the communities do not perceive the risk to be infected by these neglected zoonoses could be attributed to several factors: lack or inefficient information dissemination by medical and veterinary services, scarcity of the clinical cases, chronic character of the infections, symptom discrepancy in animals and humans and life cycle complexity. This presentation will propose research priorities to improve the recognition of these zoonoses in view of prioritizing interventions and developing more adapted control strategies.

#62 A STUDY ON BOVINE TUBERCULOSIS AND ASSOCIATED RISK FACTORS FOR HUMANSWAZILAND

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Bovine Tuberculosis is a chronic insidious contagious disease primarily affecting cattle (Rua-Domenech, 2005) and a wide range of domestic and wild animals, with a worldwide occurrence (Thoen,et al,2009). Human beings consuming products of infected cattle, such as unpasteurised milk and meat, are at risk of being infected by *Mycobacterium bovis*, the causative agent of BTB (Coetzer, 1994;Rua-Domenech,2005). In Swaziland, no regular BTB monitoring is performed by the Veterinary Department hence BTB should be considered a potential neglected zoonosis in Swaziland. A study has been conducted between 01/07/2009 and 30/06/2010, in which carcases found to be infected with BTB on post mortem inspection at the Swaziland Meat Industries (SMI)'s European Union approved export abbattoir, and later confirmed as positive for BTB by both the Meat Hygiene and Central Veterinary Laboratory, Swaziland, were traced back to their diptanks of origin. Those diptanks were selected for a BTB prevalence study. Since cattle slaughtered at SMI are recruited from all over the country, the distribution of the fifteen selected diptanks of study was representative of all provinces in the country.Ten percent of the animals in the selected diptanks of study,whose populations range from 500-1800 cattle, owned by about 10- 120 farmers per diptank, were randomly selected and tested for BTB using the comparative intradermal skin test; whereby it was made sure that each kraal in a diptank was included in the testing. A few BTB positive animals were slaughtered and tissue samples were collected for culturing *Mycobacterium bovis*. Concurrently with the comparative skin testing, a survey was carried out to determine livestock owners's knowledge of the zoonotic aspects of BTB. Preliminary results have indicated a prevalence at diptank level that range from 2.1%- 27.6%, with an everage prevalence per diptank of 6.4%. Gross lesions typical of *Mycobacterium bovis* infection were observed in 8 of the 25 skin test positive cattle slaughtered to date. At best, livestock owners's knowledge of the zoonotic aspects of BTB is insufficient and inadequate, with inferences of BTB drawn from human TB. This study is the first to determine BTB prevalence at diptank level and its zoonotic aspects in Swaziland. Results of the study will be used to recommend implementation of a regular BTB monitoring and control programme to the Veterinary Department of Swaziland; as well as an awareness campaign about the zoonotic aspects of BTB and intervention measures to livestock owners.

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Break-out session 2: Climate Effect & Environment

78 POSSIBLE EFFECTS OF ENVIRONMENTAL CHANGES ON INCREASE AND SPREADING OF CANINE AND HUMAN VISCERAL LEISHMANIASIS IN MOROCCO

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The Mediterranean coastal regions of Morocco are known to be endemic for human and canine visceral leishmaniasis (CanL) caused by *Leishmania infantum*. The results of our epidemiological investigations, the review of the existing data and analysis of spatial data topics relevant to disease distribution revealed increase in the number of CanL and human visceral leishmaniasis cases detected from areas where the disease was unknown. Furthermore, seroprevalence of CanL (10-41%) and virulence of the isolated strain are high. Because this geographic mobility could be associated with the environmental changes, we conducted a survey of the changes that occurred during the last 2 decades and noticed that important human-made and natural changes occurred; level and variations of water resources, rural management (new vegetation, development of irrigation network, new agro-industrial activities, deforestation, road construction, biodiversity losses. These changes may contribute to the appearance of new, and/or increase of Phlebotomine vector populations and the new economic opportunities attracted new human populations that develop cattle, sheep and goats husbandry, built new villages and new inadequate slaughterhouses that are attractive for semi-domestic and/or stray dogs; a situation that is likely to favour an increase in the population of these animals and, consequently, the sources of *L. infantum* either for dogs and human infection. Finally, the anthroponotic specie *L. Tropica*, has been found in these new foci capable of causing canine visceral infection associated with several of the classical signs and pathology including visceralisation.

85 QUAND MÉDECINS ET VÉTÉRINAIRES UNISSENT LEUR FORCE: CAS D'UNE STRATÉGIE INTÉGRÉE DE LUTTE CONTRE LA BRUCELLOSE AU NIGER.

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Bien que considérée comme une zoonose majeure, la brucellose est une maladie méconnue et négligée en Afrique subsaharienne [1]. En effet, les différents biovars circulant actuellement et leur dispersion géographique sont très peu connus dans cette région du monde [2]. Au Niger, la brucellose constitue une sérieuse menace pour la santé humaine du fait de l'absence de pasteurisation de lait et du contact étroit entre le réservoir animal et l'homme [3]. L'importance épidémiologique et les conséquences économiques de cette maladie au sein des différents systèmes de production sont aussi largement sous-estimées du fait de la faible capacité diagnostique des laboratoires nationaux [4]. La lutte contre la brucellose au sein des groupes à risque, dont les professionnels de l'élevage, nécessite des actions coordonnées entre les chercheurs s'occupant de la santé humaine et ceux de la santé animale [5]. L'expérience conduite au Niger s'inscrit dans ce cadre et vise à fédérer les compétences des différentes institutions nationales dans le but de favoriser l'émergence d'une véritable politique de contrôle de la maladie.

Méthodologie. Les recherches ont démarré en 2007 par la mise en place d'un cadre de concertation multidisciplinaire comprenant des chercheurs de différents horizons. Un protocole de recherche conjoint a été par la suite élaboré et validé par un comité d'éthique au Niger. Les investigations se sont déroulées dans les espaces urbains et périurbains de Niamey ainsi que dans les zones rurales. Elles ont porté sur la détermination de la prévalence de la brucellose au niveau animal et humain, l'étude de l'épidémiologie moléculaire des agents pathogènes et les facteurs de risque de transmission de la maladie à l'homme. L'échantillon animal était composé de 5 195 animaux (3 170 bovins ; 1 186 ovins et 839 caprins) appartenant à 681 ménages répartis dans 45 sites de production laitière. Les analyses de laboratoire ont été effectuées au Niger et en Belgique. Les techniques i.Elisa et Rose Bengale (TRB) ont été utilisées. Des cultures ont été effectuées sur 17 hygromas de bovin. Des prélèvements sanguins ont été aussi effectués sur 97 personnes à risque et analysés par RBT. Les données ont été analysées au moyen des logiciels STATA et CART.

Résultats. Chez les animaux, la prévalence individuelle réelle (PIR) variait en fonction des sites et de l'espèce animale (OR=10,9). Selon le système de production considéré, PIR était comprise entre 1,0 et 4,5% chez les bovins. Elle se situait entre 0,9 et 3,4% chez les ovins et elle était inférieure à 1% chez les caprins. La prévalence réelle au

niveau du troupeau (PRT) était comprise entre 30 et 80%. La souche *Brucella abortus* biovar 3 a été identifiée. Au niveau humain, la prévalence apparente était de 7,2%. Les professionnels de la viande (bouchers) et les éleveurs laitiers étaient les plus affectés. Les principaux facteurs de risque identifiés chez les animaux étaient : le mélange des animaux sans quarantaine préalable (OR=1,6), la présence dans le troupeau de femelles ayant avortés (OR=2,4) et la pratique de la transhumance (OR=2,3).

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#46 MODELING THE EFFECT OF AGE AND TEMPERATURE ON THE POPULATION DYNAMICS OF TSETSE FLIES

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Recent investigation on field data for various species of tsetse flies has shown that they not only die of exogenous factors but also due to endogenous causes and that mortality does in fact change with age. To account for this factor, Hargrove (1990) developed an age-dependent mortality formula for adult tsetse flies. Another factor that affects mortality in tsetse flies is temperature; Hargrove (2004) modeled the mean mortality as a function of temperature.

We extended Hargrove's formulae to account for the simultaneous effect on mortality of both age and temperature. The mortality rate is modeled as the sum of two exponential terms with three (temperature dependent) parameters. Forward sensitivity index method is used to analyse the relative impact of each of the parameters. Our analysis shows that adult mortality is most sensitive to the changes in the parameter controlling the rate of aging of adult tsetse. The parameters controlling mortality among flies during the first week of adult life were shown to have smaller effects on overall mortality and growth rates. Biologically, the parameter behavior is observed to be consistent with the effect of temperature on adult mortality. In addition, a linear relationship of the pooled mortality at equilibrium with this parameter was obtained.

We further modeled the dynamics of the population of tsetse flies by a partial differential equation that accounts for age and temperature changes. We used the extended temperature-dependent mortality rate and a temperature dependent pupal duration (time needed for pupae to become adults) from Hargrove (2004). Temperature was estimated using daily average temperature records on Antelope Island, Lake Kariba, Zimbabwe. Data for female G. pallidipes collected at Rekomitjie Research Station, Zimbabwe were used to validate the model, and the simultaneous effect of both age and temperature on the dynamics of the female tsetse population was investigated. Finally, the effect of seasonality on the catch of flies grouped as nulliparous, young and old, parous flies was explored.

Our results demonstrate that any tsetse control intervention carried out during the hot-wet season of the year may require much effort and resources, with the risk of not achieving excellent results. The second quarter of the year, (cool-dry season) may also require many resources and efforts but not as many as the first quarter. According to our model, the best period for carrying out any intervention program aimed at eradicating trypanosomiasis through tsetse control is during the hot-dry season.

Break-out session 3: Challenging the reservoir paradigms

#55 RABIES IN GREATER KUDU (TRAGELAPHUS STREPSICEROS) IN NAMIBIA

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Rabies is a fatal zoonotic disease that affects all mammals, and although this is the case, only certain species - primarily carnivores – are able to maintain and transmit the disease. However, in Namibia, there have been two unique epizootics of rabies in Greater Kudu – a herbivorous antelope found in high densities in Namibia. In the first major epizootic, an estimated 30,000 – 50,000 kudu died from rabies between 1977 and 1982, which amounted to 20-40% of the total kudu population in Namibia. The second major epizootic began in 2002 and is still ongoing. Conservancies in Namibia have reported kudu losses ranging from 30-70%. Due to the magnitude of rabies in kudu, it is suspected that horizontal transmission and maintenance of the virus within this species is occurring. It has been experimentally shown that non-bite transmission via the deposition of infected saliva on mucous membranes is possible, although this has not been shown to occur under natural circumstances. Full genome sequencing of 4 Namibian isolates from kudu and jackal was performed as well as sero-epidemiological studies on kudu and eland. It was shown that the kudu isolates are different from jackal isolates in several regions of the genome, suggesting that horizontal transmission may be occurring as the virus is diverging from the initial source of infection. Future research aims to collaborate with the Namibian government and other agencies in order investigate pathways for effective rabies control in Namibia – including the development of an oral bait vaccine to target rabies in kudu.

#18 THE IMPORTANCE OF DOMESTIC ANIMALS IN THE EPIDEMIOLOGY OF SLEEPING SICKNESS IN CAMEROON FONTEM FOCUS: THE DUAL ROLE OF PIGS

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The need for an in-depth knowledge on the role of domestic animals in the maintenance of sleeping sickness in Fontem, Cameroon, is the rational for these studies which attempted to assess the importance of animal reservoir, study tsetse host preference as well as tsetse vectorial competence for *Trypanosoma brucei gambiense*. A total of 397 domestic animals (225 pigs, 87 goats, 65 sheep and 20 dogs) were sampled and 2695 tsetse were captured but only 1596 of the latter were dissected and midgut isolated. Parasitological and molecular tests were carried out on all samples. The PCR-heteroduplex technique was used for blood meals identification.

Parasitological analysis revealed infection rates of 21.66% for animals, and 1.2% for tsetse flies. The sub-species *Trypanosoma brucei gambiense* was identified in tsetse flies (0.6%) and animals (9.92%). Three domestic animals species were concerned: pigs (11.55%), goats (3.45%) and sheep (15.38%). Tsetse host preference analysis revealed that 55.1% of flies' blood meals were taken on pigs, 25.2% on human, 1.2% on goats and 17.6% on wild animals. 81.5% of all human meals were collected from sites distant from pigsties whereas only 18.5% were collected from sites very close to pigsties. The Apparent densities of tsetse flies were globally higher in biotopes associated with pigsties, particularly in April when "écoclimatiques" and "écidioclimatiques" conditions are favorable for tsetse development.

These studies showed that domestic animals are reservoirs of *T. b. gambiense* capable of sustaining the disease. It also revealed that pigs constitute, in certain conditions, a barrier to tsetse/human contact.

53 VISCERAL LEISHMANIASIS IN BIHAR, INDIA; THE ROLE OF DOMESTIC ANIMALS

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INTRODUCTION: Studies investigating the role of domestic animals in transmission of Visceral Leishmaniasis (VL) on the Indian Subcontinent have shown contradictory results. Most studies were observational and were conducted in high incidence villages only. Many were underpowered and not adequately controlled for confounding.

METHODS: Over a 3-year period we conducted 3 annual surveys in an area of Bihar comprising of 50 villages. We registered and verified all cases of VL for the year preceding each survey; we collected data on ownership of

animals and on whether or not these animals were kept indoor. All households enrolled were geo-referenced to calculate kernel densities for various animals. We also collected data on potential confounders such as socio-economic status. Data was analyzed using a binomial multilevel model with village as random effect.

RESULTS: We enrolled 81,210 individuals and confirmed 207 VL cases. We found a weak but statistically significant association with ownership of goats (OR 1.5, p=0.006). Keeping goats indoor was not a statistically significant risk factor among goat owners (OR 1.5, p=0.19). We found no association between VL and ownership of bovines (OR 1.1, p=0.47) or keeping bovines indoor (OR 1.2, p=0.48); there was no association with kernel density for bovines (OR 0.8, p=0.23) or goats (OR 1.1, p=0.32)

CONCLUSION: In a large study, controlled for socio-economic factors and for clustering at village level, we found only a weak association between VL and ownership of goats which merits further investigation. Currently there is no evidence to change animal husbandry practices.

Break-out session 4: Vectors & Ecology

#45 FIELD STUDIES OF THE CONTACT BETWEEN HUMANS AND TSETSE IN ZIMBABWE

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A fuller understanding of the epimemiology and control of human African trypanosomiasis depends on greater knowlege of the contact between humans and the vectors, i.e., tsetse flies (*Glossina* Spp.). While we know much about the relationship between hosts and the savannah species of tsetse, e.g., *G. morstans morsitans* Westw. and *G. pallidipes* Aust., most is known about contact with the non-humans that usually form the main diet of these tsetse. Even with the other tsetse species, for which human hosts can be more important, our understanding of the responses to people is superficial. Moreover, with all tsetse almost all of our data refer to the contact occuring when men enter the normal woodland habitat of the flies. What happens when tsetse enter the distinctive habitats of humans, e.g., buildings and vehicles, is largely neglected.

To help produce a more balanced knowledge for *G. m. morsitans* Westw. and *G. pallidipes* Aust., field studies were performed at Rekomitjie Research Station, Zimbabwe. Catches from men in woodland confirmed the long-standing indications that men are attacked mostly by *G. m. morsitans* males, that mobile men are attacked several times more than stationary men, and that nearby cattle reduce the numbers of tsetse on the men. More intriguingly, the attack of mobile or stationary men was shown to be little affected if the men had sources of artificial ox odour, or were freshly showered and used anti-perspirant to reduce some components of their odour.

Men in and on a truck were attacked as much as men alone if the baits travelled at an average speed of 1.2km/h. However, the catches from the men on the truck increased 13-fold when the truck travelled at 10km/h. *G. pallidipes* was particularly responsive to vehicles in hot weather.

Male and female tsetse of both species were found in various buildings in the morning and evening throughout the year, irrespective of whether they were occupied by humans or had smokey fires inside or out, ie, had repellent odours that are highly effective in most other situatuons. Many tsetse entered buildings in the middle of hot days, apparently to seek refuge. Men in or near buildings were attacked about as much as men in woodland, but the proportion of females in samples of *G. m. morsitans* from men in buildings was abnormally high (49%, N=278). Many of these flies were old enough to transmit trypanosomiasis.

Studies of responses to men would be safer and cheaper if man-like traps were available. Catches from ox-like traps became more like those from men if men, or odourless models of men, were beside the trap, or if odour from hidden men were released nearby. Prototypes of man-like traps caught few flies. Identification of the effective components of human odour is important for further development of man-like traps and for understanding man/fly contact with all tsetse species.

INSECTICIDE-TREATED LIVESTOCK

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Across sub-Saharan Africa, a variety of *Trypanosoma* spp transmitted by tsetse flies (*Glossina*) result in >10,000 cases/year of Human African Trypanosomiasis (HAT), with an estimated burden of ~1.3 million DALYs. Losses of cattle amount to about 3 million/year and overall economic losses are estimated at $3-5 billion. We use mathematical models to investigate simple ways in which the diseases could be combated. Rogers (1988) model for trypanosomiasis is generalised to allow for the situation where tsetse feed off three or more host species and is used to investigate the potential of trypanocides and insecticide-treated cattle for controlling or eradicating trypanosomiasis, both in livestock and humans. Trypanocides alone cannot be used to eradicate *T. vivax* and *T. congolense*, even where tsetse feed only on cattle – except in the unlikely events that the drug is 100% effective and all cattle are permanently on treatment. With a 4-day tsetse feeding cycle, *T. brucei* could be controlled – but only in the absence of wildlife hosts, and only if more than 70% of the livestock are always disease free at any given time. With a 2.5-day cycle the proportion rises to 90%. Where tsetse take any more than 1% of their meals off (un-treated) wild mammalian hosts the basic reproductive rate (R_0) even for *T. brucei* is always greater than unity. The same, naturally, also applies to the more readily transmitted *T. vivax* and *T. congolense*.

The use of insecticide-treated cattle (ITC) should provide a more potent tool for controlling, or even eradicating, trypanosomiasis. Where cattle and humans provide all blood-meals for tsetse the R_0 for *T. brucei* can be brought to < 1 if as little as 15% of cattle are treated with insecticide. The same end can be achieved for *T. congolense* and *T. vivax* with 45% or 75% of cattle treated, respectively. Cost-effectiveness can be improved by treating only the largest members of any herd. If tsetse can feed off wildlife, trypanosomiasis control using ITC is harder because the wildlife constitute a reservoir of infection that is unaffected by the intervention. With all cattle always treated, R_0 for *T. brucei*, *T. congolense* and *T. vivax* was only < 1 if cattle provide 40%, 50% or 90% of tsetse blood-meals, respectively. ITC will obviously be most effective against all species of trypanosomiasis in those cases where tsetse take the greatest proportion of their blood-meals off cattle. This tends to be the case more for Morsitans group vectors, such as *G. m. morsitans* and *G. pallidipes*, of animal trypanosomiasis in southern and eastern Africa than it is for the Palpalis group vectors, such as *G. palpalis*, of HAT in central and west Africa. Nonetheless, the smaller proportion of cattle required to be treated for the effective control of *T. brucei* means that the use of ITC can still be very effective in controlling, or even eradicating HAT.

#1 EPIDEMIOLOGY OF VISCERAL LEISHMANIASIS IN ALGERIA: AN UPDATE

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Few data are available on the burden of visceral leishmaniasis (VL) in Algeria, a zoonotic disease caused by L.infantum. We studied the epidemiological profile of VL and canine leishmaniasis (CanL) in Algeria between 1998 and 2008. We investigated all the VL cases notified by the National Institute of Public Health and surveyed in parallel all VL cases admitted to five university hospitals of Algiers between 1998 and March 2009. In 2008 we estimated the prevalence of CanL in six cities of the Algerian coastal area in a cross-sectional survey carried out on 2184 dogs and examined the spatial correlation between VL and CanL.

Fifteen hundred and sixty-two VL cases were reported in Algeria between 1998-2008 with an average annual incidence rate of 0.45 cases per 100,000 inhabitants, of which 81.42% were in the age range of 0-4 years. Mila, Bejaia, Illizi, Biskra, Bouira, Tizi-Ouzou and Setif were the most endemic areas. VL cases were detected year-round, with a peak notification in May and June. One hundred and seventy patients were admitted to the university hospitals in Algiers in the same period, and less than 1 in ten had been officially notified. Comparison between VL notification and CanL prevalence showed a comparable increasing trend from west to east along the Algerian coastal area, consistent with zoonotic transmission.

SESSION 4 – Diagnosis and Burden of Disease

THE BURDEN OF ZOONOTIC DISEASE: REAL OR PERCEIVED? DIAGNOSTIC CHALLENGES AND THEIR IMPLICATIONS.

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While many industrialized countries have controlled or even eliminated zoonotic diseases, most of the developing countries lack financial means and technical capacity to do so. Prior to engaging in zoonoses control in developing countries, government authorities require evidence for the profitability and cost-effectiveness of interventions. Hence, estimates of cost of disease to society and benefits of interventions are still needed prior to policy decisions. Typically zoonotic diseases affect animals and humans in terms of financial losses, animal and human suffering and in some cases emotional distress.

Premature death, clinical disease and persisting disability can occur in animals and humans. In principle we can estimate losses in healthy life time for animals and humans. There is a clear set of parameters and a mathematical theory for human life, which is outlined below. For animals no such theory has been developed yet. One reason for this is the human-animal relationship, which is highly variable between species. Most human societies clearly distinguish between the status of humans and animals, they have a "speciesist" attitude. The status of animals is determined by the social, cultural and religious background. For example dogs can be kept as pets, for which owners spend large amounts for nutrition and health, or dogs can be used for food, or as watchdogs, or they are fed in the street for religious reasons. How can we assess the burden of a disease to a dog? There is hardly a universal approach and we have to find locally adapted contextualized ways, which take the perceived status of a dog into account.

For livestock, like cattle, there exist similar issues. Again we could argue that the burden of disease of cattle, sheep and goat could be measured in saved healthy life. But what is the natural lifespan of a production animal, from the animal's perspective or from the human perspective? Most societies take an anthropocentric point of view and readily convert the role of livestock as source of food, clothing, manure, and transport into monetary value. The burden of disease in livestock is thus expressed as a cost of disease estimate. Monetary losses can occur from a reduction in fertility resulting in smaller herds, or losses in meat, milk, wool or hide. Standard ways of assessing cost of disease use demographic herd simulation combined with mathematical models of disease transmission. They consider disease frequency related losses in productivity parameters. Here we have to deal with the question of how to measure disease frequency. Often we relay on serological diagnosis, which may better reflect past disease, e.g. in brucellosis, rather than acute disease. We have to ask then for example: What is the proportion of brucellosis seropositive sheep that have aborted, or how much has the milk yield in tuberculosis intradermal test positive animals decreased. There is a general lack of such data and better evidence for disease related productivity losses is dearly needed.

Livestock populations can degrade pastoral ecosystems if their number exceeds the pastoral production capacity. Endemic zoonotic disease like brucellosis or bovine tuberculosis affect livestock marketing and trade and livestock farmers prefer to accumulate animals. This may further enhance degradation of pastures. The control and possible elimination of zoonoses and transboundary diseases has therefore an important ecological dimension, which we may take into account from an extended human-environment systems perspective.

The burden of disease in humans has well defined theoretical foundations. One of the most widely used measuring unit is the disability adjusted life year (DALY). It is the sum of years of life lost from a disease (YLL) and the number of years lived with a disease (YLD). The governing parameters are the age and gender stratified disease incidence and mortality, the duration of untreated disease and a weighting term for disability. DALYs are patient centred. In some zoonoses like rabies, there is additional emotional suffering which is generally not taken into account by the DALY estimate. Rabies exposed patients may suffer emotional distress until they know that the rabies post exposure treatment is effective. In the case of clinical rabies, the family and care givers also suffer emotionally in a way that may lead to post traumatic stress syndrome. We propose here a framework for perceived psychological distress, which could be used as a complement to the standard DALY estimates.

The estimation of the burden of zoonotic diseases offers a unique opportunity to reflect broader considerations of standard disease burden by their ecological, socio-cultural and psychological dimensions. The better we understand these extensions the higher is the effective societal and ecological burden and the better we can advocate their control.

BURDEN OF DISEASE FROM A VETERINARY PERSPECTIVE

Rudovick Kazwala (Sokoine University, Tanzania)

No abstract available at the time of printing

BURDEN OF DISEASE FROM A MEDICAL PERSPECTIVE

Paul Van Helden (Stellenbosch University, South Africa)

No abstract available at the time of printing

Break-out session 1: Diagnostics development

 # 20 PRELIMINARY FINDINGS OF A COMPARISON OF DIAGNOSTIC TESTS FOR RABIES IN ETHIOPIA

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Rabies is estimated to cause 24,000 human deaths in Africa each year. The development of fatal disease in human can be prevented by adequate post-exposure prophylaxis (PEP), however, it is far more efficient to control and eventually eliminate canine rabies through community supported vaccination campaigns. Rabies surveillance in animals as the yardstick for targeted PEP administration and for impact assessments of control strategies has to be based on reliable laboratory diagnosis.

Several laboratory techniques have been used for rabies diagnosis. However, the methods available have limited utility under field conditions because they are costly, time consuming and need higher technical skills and equipment. This became the bottleneck for a better understanding of the epidemiological patterns and burden of the disease in Africa in general, and Ethiopia in particular. Recently, the Rapid Immunodiagnostic Test (RIDT) for detecting rabies virus has been developed. Validation studies so far showed that the RIDT had a slightly lower sensitivity (91.7%-100%) and high specificity (100%) compared to the Florescent Antibody Test (FAT) being considered as gold standard.

The diagnostic performance of a rapid immunodiagnostic test kit for rabies virus detection under field conditions was evaluated using 115 brain tissue samples collected from different species of animals in Ethiopia. The test was conducted in parallel with FAT. The sensitivity and specificity of RIDT was found to be 96.5 % and 100%, respectively, when compared to FAT. The RIDT is easy to perform, the test procedure is short, and the result can be obtained within 5 to 10 minutes. Furthermore, the kits could be stored at room temperature and used without additional laboratory equipments. Therefore, this test could be an option for rabies surveillance and better understanding of rabies epidemiology in areas where there is no access to standard laboratory test. However, a standardized protocol needs to be followed, as with different available procedures a varying level of sensitivity was observed. While this may be important for the surveillance, it is pivotal for the diagnosis of animals with human contact and adequate and targeted PEP.

#59 USE OF FTA CARD METHODOLOGY FOR SAMPLING AND MOLECULAR CHARACTERIZATION OF ECHINOCOCCUS GRANULOSUS IN AFRICA

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Cystic echinococcosis is a parasitic disease caused by the cestode *Echinococcus granulosus* widely distributed in Africa. Monitoring of this parasite needs to have access to cysts samples on intermediate hosts observed at the slaughterhouse.

In order to facilitate the sampling on the field and the analyses, the French National Reference Laboratory for *Echinococcus sp*. has developed a tissue derived DNA sampling with FTA card technology. The DNA samples were realized by application of the FTA paper on the germinal layer after opening the cysts. DNA extractions has been realised after several weeks of storage at room temperature. PCR assays have been realised with primers for generic cestode (NAD1, CO1) or specific for *E. granulosus* species or genotype. The validation of the sampling technique was realised with frozen cysts stored in the laboratory and from field samples realised at the slaughterhouse in Morocco by veterinarian technician during meat inspection.

Material cyst from E. granulosus G1 G2 G3 G6-7, E. multilocularis and a large spectrum of Taenid species were sampled using FTA card and analyse by PCR and sequencing after DNA extraction. All samples realized on the lab and on the field, have allowed a molecular characterisation.

Cyst derived DNA from FTA samples can be useful for easy sampling, storage and rapid, safe and cheap shipment. The use of the FTA methodology facilitates studies on the field to investigate the presence and genetic characterization of *E. granulosus* in African's countries. Sampling will be made in Morocco, Senegal and Mauritania for molecular analyses.

 # 54 POST-MORTEM EXAMINATION AND LABORATORY-BASED ANALYSIS FOR THE DIAGNOSIS OF BOVINE TUBERCULOSIS AMONG DAIRY CATTLE IN ECUADOR.

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Bovine tuberculosis (BTB) is present in most developing countries where surveillance and control activities are not or inadequately implemented. In Ecuador, there is no BTB control program in place. Veterinary inspection performed in slaughterhouses allows for the detection of macroscopic lesions reminiscent of BTB, but the presence of *Mycobacterium bovis* must be confirmed by laboratory methods. This study aimed at comparing the performances of the standard diagnostic tools used to identify *M. bovis* in tissue specimens sampled from suspicious animals. During a two years period, 1390 cattle were inspected at the Machachi abattoir located in the most important dairy area in northern Ecuador. A total of 33 animals with granulomatous lesions were detected, representing 2.33% (16/687) and 2.42% (17/703) animals examined per each year of study. 94 tissue specimens were sampled and screened for the presence of mycobacteria. Acid-fast bacilli were identified in 33.3% of the suspicious cattle (11/33) and suggestive microscopic lesions in 27.3% (9/33) examined by direct microscopy and histopathology, respectively. Culturing on Stonebrink medium and 16S-rRNA-based polymerase chain reaction (PCR) yielded 36.4% (12/33) and 27.3% (9/33) of positives, respectively. Compared to culture, other diagnostic procedures displayed a lower sensitivity, with 56.5% for PCR, and 43.5% for direct microscopy and histopathology; however, the specificity was higher (94.4% for PCR and microscopy, and 97.2% for histopathology). We conclude that reliable post-*mortem* laboratory testing either requires the combination of a set of available diagnostic tools or necessitates the development of improved new-generation tools with better sensitivity and specificity characteristics.

Break-out session 2: Assessment of Disease Burden

65 TREATING CATTLE TO SAVE PEOPLE: ECONOMICS OF SLEEPING SICKNESS CONTROL IN UGANDA

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Controlling zoonotic diseases offers the possibility of both improving human health and livestock productivity, thus, in the case of neglected zoonoses in Africa, helping to alleviate poverty. Quantifying the dual burden of these diseases and the likely cost-effectiveness of control measures poses a number of challenges: the estimation of 'what if' scenarios in order to asses the impact of control, the assessment of the level of under-reporting of the disease in humans, the quantification of livestock losses and the need to combine monetary figures with the standard non-monetary measure of the burden of disease in humans: the disability-adjusted life year (DALY). The issues involved are particularly well illustrated by the example of zoonotic human African trypanosomiasis (sleeping sickness) existing alongside animal trypanosomiasis and tick-borne diseases in cattle.

Uganda is the only country in Africa where both the zoonotic and non-zoonotic forms of sleeping sickness are present, the former caused by *Trypanosoma brucei rhodesiense* and found in the southeast of the country, the latter by *T. b. gambiense* and found in the northwest of the country. By 2004 it had become clear that due to a combination of factors, notably restocking in a conflict zone with cattle originating in *rhodesiense* endemic areas of the country, this form of the disease was rapidly spreading northwestwards towards the *gambiense* zone. A disaster threatened – not only of an epidemic of the disease in people but also of the geographic merging of the two forms of the diseases posing, huge diagnostic and treatment challenges. To mitigate this, the Stamp out Sleeping Sickness (SOS) public-private partnership was created. By 2008, some 250,000 cattle had been mass-treated with trypanocides to reduce the animal reservoir of the human form of the disease and nearly 600,000 sprayed with an insecticide which controls both tsetse flies and ticks at a full economic cost of less than $0.50 per application. The spread of the disease was successfully halted. Depending on the assumptions made, the number of DALYs averted by SOS would range from 424,000 (over half a million before discounting) to 67,000. Monetary benefits were estimated in terms of savings by health services and patients on health care seeking, diagnosis and sleeping sickness treatments. The DALY burden could also be expressed as a monetary approximation of lost income from premature death and ill health – often policy-makers find a total monetary benefit more informative than a combination of DALYs and money. While the DALYs averted vary greatly, depending what proportion of individuals are assumed to have been found and treated, the total monetary estimates thus obtained by adding savings in health care costs to an estimate of lost income, vary less: from US$ 6.9 to US$ 12.7 million. Alongside these figures are substantial monetary benefits to cattle production from the reduction of tick-burdens, tsetse and nuisance flies and from a lowered incidence of tick-borne diseases and animal trypanosomiasis, whose estimation will be tackled by ongoing field investigations.

The authors gratefully acknowledge the role of the whole SOS partnership (www.stampoutsleepingsickness.com) in this work.

#15 ASSESSMENT OF HUMAN EXPOSURE TO HIGHLY PATHOGENIC AVIAN INFLUENZA H5N1, IN RURAL GHARBIYA, EGYPT

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In Egypt, the first outbreak of HPAI H5N1 in poultry was on February 2006. Since then the virus has been circulating in poultry and new human cases continue to appear. To date, the potential routes and extent of human exposure to the virus have not been systematically investigated. The aim of this study is to assess the risk of human exposure to HPAI H5N1 in rural Gharbiya. A cross sectional survey was conducted in 32 villages in which data for the characteristics of poultry production, marketing and the frequency of human contact with poultry were collected.

The results show that >80% of households keep poultry and this coexists with a high density of poultry farms and widespread live poultry sellers. Home consumption of poultry meat and eggs are the main reasons for keeping poultry. The extent to which humans in the study area are exposed to poultry through household poultry keeping

and live bird marketing is made clear by our study and may explain why HPAI H5N1 infection has established as endemic in the Nile Delta region. The analyses of the frequency of human contact with poultry demonstrated that adult females are more likely to contact with poultry than other groups of the population. The assessment model shows that the probability of human exposure to HPAI H5N1 via rearing poultry is higher than via other routes. Vaccination of poultry as a risk mitigation strategy is better than culling poultry given the characteristics of the poultry production in the study area.

#35 BASELINE BURDEN ESTIMATE FOR BRUCELLOSIS AND BOVINE TUBERCULOSIS, PLANNING OF AN INTERVENTION, AND DEMONSTRATION OF COST-EFFECTIVENESS OF ONE-HEALTH INTERVENTION PACKAGE

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ICONZ or the 'Integrated Control of Neglected Zoonoses' is a large collaborative project supported by the EU, incorporating 7 Case Studies, one of which is being conducted in Nigeria and is of focus here. The Nigeria Case Study is comprised of three phases. The first phase is currently underway and involves the collection of data (using cluster sampling methodology) on the 'burden' of the bacterial zoonoses cluster (comprising Brucellosis and Bovine Tuberculosis) on human and animal populations in two contrasting study sites (the Jos Plateau where the pastoral Fulani practise traditional migration, and the Kachia Grazing Reserve where populations are purportedly sedentary but in reality still practise dry season migration). The 'burden' estimate for Brucellosis will be derived from human and cattle seroprevalence (using the Rose Bengal Test), and socioeconomic data on cattle production losses (e.g. fertility), monetary expenditure on human and animal health and non-monetary losses to human health. For Bovine Tuberculosis, occurrence of disease will be estimated using the Comparative Intradermal Skin Test. Phase two will consist of designing and planning an intervention based on the evidence collected during Phase 1. Cost-effectiveness of the intervention will be demonstrated in Phase 3 (in real terms if the intervention is administered or modelled if it is not). This will be accomplished by comparing the costs in terms of burden or losses of Brucellosis or Bovine Tuberculosis against the benefits and costs (modelled or real) of disease control, thereby demonstrating the added value of transdisciplinary, holistic or 'one-health' intervention packages.

 # 39 THE ECONOMIC BURDEN OF VISCERAL LEISHMANIASIS ON HOUSEHOLDS IN SOUTH-EASTERN NEPAL

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BACKGROUND. Visceral leishmaniasis (VL) is a deadly disease affecting poor people living in precarious conditions. Studies from other countries showed that VL leads to substantial direct and indirect costs. We examined the economic impact of VL on households living in urban and rural areas of south-eastern Nepal.

METHODS. We interviewed 283 recent VL patients (115 urban and 168 rural) with structured questionnaire about health seeking behaviour, direct medical and non-medical costs and coping strategies. We assessed the income of the patient and household as well as productivity losses resulting from illness.

RESULTS. The majority of urban patients (52%) visited an unqualified provider first, while rural patients visited a public provider (51%) with a median number of two prior to treatment. The median delay of presentation to qualified health provider was shorter for urban compared to rural patients (14 versus 24 days).

The total median cost of a VL episode was similar for urban and rural patients (i.e. US$183). Loss of income represented more than 60% of total costs for both groups. Overall, the median total expenditure represented 67% and 57% of annual per capita income for both groups. Using savings and taking a loan were the commonly used coping strategies.

DISCUSSION. Despite drugs and diagnostics being provided free of charge, household still incur substantial costs. Strategies to cope with VL expenditure such as taking loan at high interest rate result in households being pushed further into poverty. Ignoring these costs will seriously hamper VL control efforts.

Break-out session 3: Risk Analysis

#03 BOVINE BRUCELLOSIS NEAR KRUGER NATIONAL PARK IN SOUTH AFRICA: PREVALENCE AND RISK FACTORS

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Bovine brucellosis is a neglected zoonosis causing important economic losses in livestock and presenting a risk of transmission to humans. In South Africa, *Brucella abortus* has been identified in cattle as well as some wild ruminants, which are suspected to play a reservoir role for cattle. The objective of this study was to carry out a systematic review on the prevalence and risk factors of brucellosis in Africa and to identify, through a serological study in cattle in the vicinity of the Kruger National Park, the role of wildlife reserves on the epidemiology of cattle brucellosis.

In the initial screening of the systematic review, publications were retained if they met the following criteria: original study, study in bovine, study location in Africa and study objectives related to prevalence or risk factors of bovine brucellosis. The criteria used in the quality screening were: sampling appropriateness and indication of diagnostic tests used. From the initial 1099 articles, 42 met these selection criteria and were studied in detail. According to data extracted from the systematic review, Rose Bengal Test (RBT) is the most commonly used test in Africa. The prevalence varied from 1,40 to 16,00 % for RBT and from 1,45 to 20,48 % for RBT interpreted in series with ELISA or Complement Fixation Test. The most common risk factors reported are age, sex, herd size and geographical location. Proximity to wildlife reserves was identified as a risk factor in one study.

In the field study, serological tests (Rose Bengal Test and Indirect ELISA) were made among 901 randomly selected cattle from 19 dipping tanks in the territory of the tribal chief Mnisi in the municipality of Bushbuckridge. A Bayesian model was used to estimate the true prevalence in the study area. Sex, age, proximity to wildlife reserves and water streams were studied as potential risk factors for brucellosis. Finally, spatial clusters were determined using a spatial analysis in a Poisson discrete model. In the study area, the true prevalence was low (1.43%). The apparent prevalence (parallel combination of serological test results) varied significantly between the dipping tanks (0% to 13%). The age (>4 years) was significantly associated with a lower prevalence in cattle (OR: 0.34; p=0.02). Vaccination of young females did not seem to influence these results because the seroprevalence varied similarly in males and females. A primary cluster with a relative risk of 3.20 ($p \leq 0.05$) was identified in an area distant from the park but centered on Hluvukani, the most important urban center of the study area, and the main road.

The conclusion is that proximity of urbanized areas, human activities and movements of cattle are likely to play a much more substantial role on the epidemiology of bovine brucellosis than the proximity of wildlife reserves.

#31 A DELAY DIFFERENTIAL EQUATIONS MODEL FOR THE IMPACT OF MASS CHEMOPROPHYLAXIS AND INSECTICIDE-TREATED CATTLE ON THE CONTROL OF T. B. RHODESIENSE

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In East Africa, cattle are considered an important reservoir of *Trypanosoma brucei rhodesiense*, a parasite that causes human African sleeping sickness. We use a mathematical model to examine the transmission of *T. b. rhodesiense* in humans and cattle by tsetse vector species, *Glossina fuscipes fuscipes*. A delay differential equations model is used to evaluate and compare the impacts, on the incidence of *T. b. rhodesiense* in humans, of mass chemoprophylactic treatment of cattle, and vector control through insecticide-treated cattle. An analytical expression was obtained for the basic reproduction number (R0) of the model, and numerical values for the endemic equilibrium point. Sensitivity analysis of the basic reproduction number and the endemic equilibrium were carried out to determine the relative importance of each parameter for the transmission and prevalence of *T. b. rhodesiense* disease. Sensitivity results show that tsetse control through increased tsetse mortality is more effective, than mass prophylaxis, in reducing the transmission of *T. b. rhodesiense* in both humans and cattle. Treatment of infected humans and cattle combined with tsetse control are effective in the reduction of *T. b.*

rhodesiense prevalence. A numerical analysis show, for R0 to be less than one, the critical proportions of cattle needed to be kept on chemoprophylaxis, or treated with insecticides, are 75% and 20% respectively. Numerical simulations of the model were carried out to investigate the impact of each intervention on the incidence of *T. b. rhodesiense* in humans and a cost-effectiveness analysis of each control programme was also done. Results show that controlling *T. b. rhodesiense* through the use of insecticide-treated cattle with each cow treated at $7.0 per year gives a cost-effectiveness ratio of $280.10 per human infection avoided (at a discounted rate of 3%) if 20% of the cattle population is treated for 7.5 years. Using chemoprophylaxis as the control measure with each cow treated at $4.0 per year gives a cost-effectiveness ratio of $938.05 per human infection avoided (at a discounted rate of 3%) if 75% of the cattle population is treated over a 13 year period. In conclusion, the control of tsetse vectors through insecticide-treated cattle is more effective at reducing the incidence of *T. b. rhodesiense* in humans over a short period of time and at a low cost compared to mass chemoprophylaxis.

#58 LACK OF KNOWLEDGE FAVOURS BAD PRACTICES LEADING TO TRANSMISSION OF TAENIA SOLIUM CYSTICERCOSIS IN TANZANIA

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Prevalence of *Taenia solium* cysticercosis is very high in both pigs and humans in southern Tanzania. The aim of this study was to assess community perceptions and practices related to cysticercosis in Mbeya rural district, southern Tanzania. A cross-sectional study was conducted in spring 2008, using three different data collection methods, i.e. questionnaires, in-depth interviews, and focus group discussions with 149, 14 and 45 participants, respectively. Snowball and random sampling was used to recruit participants. Community knowledge regarding cysticercosis and its transmission was not present, but many people knew about epilepsy in humans (*nzilisi*, 'repeated acts of fits') and 'white nodules' in pigs. *Nzilisi* was perceived as witchcraft but also contagious whereas 'white nodules' were perceived as the result of poor pig keeping. 'White nodules' had six different local names. Among the questionnaire responders, 89% kept pigs and these were mainly free roaming. Although 92% of the households had latrines, indiscriminate defaecation by children was frequently observed. Ingestion of undercooked pork was common especially in beer-pork bars. Treatment of *nzilisi* was sought after advices from relatives and social networkers in all different treatment sectors. 'White nodules' were treated in different ways, the most common being mixing salt and sodium bicarbonate in the pig's feed (31%). A local herb, '*Utupa*' (*Tephrosia spp.*) was also used as treatment. According to one farmer, veterinary officials did not know how to treat 'white nodules'. This study highlights the urgent need to include education as a central component in control of *T. solium* cysticercosis.

Break-out session 4: Emerging Voices on the Control of NIDs

#25 KALA-AZAR CONTROL IN NEPAL : REDUCING THE GAP BETWEEN PUBLIC HEALTH OFFICE AND MEDICAL DOCTORS

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BACKGROUND. Visceral Leishmaniasis (VL) is a neglected vector-borne disease caused by *Leishmania donovani* and is a major public health problem in Nepal. The national control program is part of a regional VL elimination initiative and advocates early diagnosis and treatment in district hospitals and focal indoor residual spraying (IRS) around affected households by the district public health office (DPHO). However, IRS lags behind and quality of care for VL in hospital is poor. We wanted to reduce the gap between the DPHO managers and medical doctors by piloting better coordination mechanisms in an action research approach.

METHODS. We selected Mahottari district for this pilot study end 2010 and did a qualitative and quantitative baseline assessment. We then created a VL control task force including district doctors, nursing and DPHO staff. We trained the task force, encouraging especially the doctors to engage more actively in VL control at district level. The task force planned to meet once a month to discuss progress towards VL elimination. An action plan was prepared and monitored on a quarterly basis. No incentives were provided to task force members.

RESULTS AND DISCUSSION. VL is generally not considered a priority by the DPHO, given they have 37 disease control programs to manage. At baseline there was no coordination between program managers and district doctors on VL, as they did not communicate. The pilot study shows the feasibility of a dedicated intersectoral task force. We will present data on performance indicators and discuss the issue of scaling-up.

#04 CHALLENGES OF THE SOIL TRANSMITTED HELMINTHIASIS (STH) CONTROL PROGRAM IMPLEMENTATION IN A RURAL DISTRICT IN INDONESIA

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Introduction. The prevalence of STH in Maluku Tengah district was 70%. The district health office faces some difficulties to conduct helminthiasis control activities as recommended by the Minister of Health. The study aims to identify the difficulties and propose recommendations to overcome them.

Method. In depth interviews were conducted to ten key persons in health centers, a district hospital, sub district government, district health office, and provincial health office. Focus group discussions were conducted among general practitioners, nurses, and community health workers in a sub district. The interviews and discussions were recorded, transcribed, coded, and analyzed to identify the challenges and local suggestions for STH control.

Result. The challenges were related to the problems on governance and coordination, resource management, community participation, and physical condition of the district.

After the initiation of health system decentralization, the district health office was in transition time to take the full leadership to manage the district prioritized health problems, while the management support of the provincial health office had slowly terminated. Low budget allocation for health programs in the district budget resulted in insufficient funding to run a good quality programs, provide medicines, laboratory supply, and infrastructures, tough the central government still allocated some funding to support the decentralization process. Unlike the TB and malaria program, helminthiasis control program did not get any financial support from externals donors.

The communities had difficulties to maintain a healthy and hygienic life style which contribute to high transmission of helminthes infection. There are still regions where the population do not have the habit to defecate in the latrine, either because they can not afford to have a latrine or because of the habit. Public latrines are available in some villages with different rules of maintenance from the village authorities.

The community health workers were motivated to give health education to the populations and to refer them to health centers, but they were not trained and organized to perform such activities

The district consists of islands which raises the problems of access. This condition contributed to the difficulties to transport the medicines and other materials, to have regular monitoring and surveillance, and to supervise the health centers. The population could not reach health centers and hospital easily.

Conclusion and Recommendation. Political commitment from the district government and health office is needed to prioritize health sector and control on high prevalence disease. This will result on better health allocation in district budget and better investment on health system and health service. As consequence there will be improvement on supply system, laboratory capacity, health communication, and community health workers capacity.

Advocacy is needed to encourage multi sector participation, to sensitize the donor to finance the helminthiasis programs, and to obtain more political commitment. Innovative ways to rationalize the resource such as integration into regular well run programs, multi sectoral collaboration, and involvement of village administration should be evaluated in this context.

#67 IMPACT DES INTERDITS LIÉS AU TRAITEMENT DE LA THA SUR LE CONTRÔLE DE LA MALADIE.

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Des interdits liés au traitement de la maladie du sommeil ont été rapportés dans les études menées dans les provinces de Bandundu et du Kasai Oriental en République Démocratique du Congo. Malgré que, ces interdits ont été identifiés comme un obstacle majeur dans le contrôle de la maladie du sommeil, leur origine et leur base rationnelle ne sont pas bien connues. Une bonne documentation de ces interdits permettrait d'améliorer l'adhérence au traitement des malades tel est le but de cette étude.

Nous avons recourus à des focus groups et des interviews approfondies auprès des anciens malades, des malades et des prestataires des soins au Kasaï Oriental et au Bandundu.

Ne pas marcher sous le soleil, ne pas faire des travaux lourds et ne pas faire des rapports sexuels pendant la période de traitement et de repos (6mois) sont des interdits majeurs vécus par les malades. Ils sont très répandus dans les communautés. Ces interdits sont prescrits par les prestataires de soins et sont entretenus par les membres des communautés. Ces interdits sont très anciens et auraient été instaurés par les techniciens sanitaires dans les années 1960-1970. Ces interdits seraient liés à l'arsobal (melarsoprol).

Les interdis ont été instaurés de manière empirique avec un cercle vicieux entre prestataires et communautés. Une sensibilisation destinée à l'abandon des interdits inutiles est donc nécessaire pour les prestataires des soins et les communautés (malades). L'usage des médicaments efficaces, peu toxique et avec moins d'effets secondaires facilitera l'adoption d'un comportement favorable au contrôle de la maladie.

#66 SCHISTOSOMIASE ET GEOHELMINTIASES EN REPUBLIQUE DEMOCRATIQUE DU CONGO: CONNAISSANCES, ATTITUDES ET PRATIQUES DES POPULATIONS ET DES PROFESSIONNELS DE LA SANTE

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Une meilleure connaissance des déterminants sociaux qui influenceraient la propagation ou l'élimination de la schistosomiase et géo-helminthiases permettrait une amélioration des stratégies de contrôle. Cette connaissance permettra non seulement d'orienter les stratégies mais aussi d'élaborer des messages de sensibilisation basés sur l'évidence. Le but de notre étude a été donc d'évaluer les connaissances, les attitudes et les pratiques des communautés et des personnels de la santé.

Nous avons effectué une enquête dans les milieux ruraux de la province du Kasaï Oriental précisément dans les Zones de Santé de Kasansa, Cilenge et Bipemba. Nous avons recouru aux focus group et aux interviews approfondies.

Les symptômes liés à la schistosomiase et géo-helminthiases sont connus de façon générale mais le mode de transmission pour les deux affections est méconnu. Une confusion a été notée entre l'amibiase et la schistosomiase. Le principal facteur de risque rapporté est l'eau non potable et aucune liaison directe n'est établie entre le contact avec la rivière (baignage, lavage des habits etc.) et la schistosomiase. Par contre les communautés rapportent les faits d'uriner ou de déféquer dans la rivière comme attitude et pratiques régulières. Les deux maladies sont perçues comme étant graves. Les moyens de prévention sont méconnus. Ils observent encore des mauvaises pratiques.

L'importance et la gravité de la schistosomiase et des géo-helminthiases sont connus des communautés. Les attitudes et pratiques dangereuses sont présentes par méconnaissance du risque réel pour la schistosomiase notamment. Une sensibilisation basée sur les messages issus de cette enquête est indispensable.

SESSION 5 – Drug Use and Drug Resistance

91 ANTIHELMINTICS: A LONG-TERM SOLUTION TO CONTROL ZOONOTIC AND NEGLECTED HELMINTHS

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An overview will be given of the ongoing Mass Drug Administration (MDA) programmes for the prevention and control of helminthiases in sub-Saharan Africa. These programmes are directed against onchocerciasis, lymphatic filariasis, schistosomiasis and soil-transmitted helminths using a set of four drugs (ivermectin, diethylcarbamazine, praziquantel, albendazole or mebendazole). The sustainability of these initiatives will be critically reviewed with particular emphasis on the risk of development of drug resistance.

IMMUNISATION AS AN ALTERNATIVE TO ANTHELMINTHIC USE

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No abstract available at the time of printing

#17 IVERMECTIN MASS TREATMENT OUTCOME FOR ONCHOCERCIASIS CONTROL IN CO-ENDEMIC AREAS WITH LOIASIS IN DR CONGO

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The National Onchocerciasis Task Force (NOTF) of DRC successfully launched a first large-scale ivermectin mass administration for onchocerciasis control in Kasai region through community-directed treatment with ivermectin (CDTI) strategy in 2000. However in 2004, during mass treatment with ivermectin in two forest provinces (Bas-Congo and Tshopo), 64 SAEs, including severe fatigue, generalized arthralgia, encephalitis, neurologic disorder, coma, and 19 deaths, following ivermectin mass treatment were reported among treated persons. Similar SAEs had previously been reported in CDTI for onchocerciasis control in mass drug distribution endemic areas for both onchocerciasis and *Loa loa* infection in Cameroon rainforest areas from 1989 to 2002. *Loa loa* is, like *Onchocerca volvulus*, transmitted from person to person by a small biting fly (*Chrysops* species). In contrast to Onchocerciasis, Loaisis is often asymptomatic. Episodic angioedema (Calabar swellings) and subconjunctival migration of an adult worm can occur. However, individuals harboring high *Loa* microfilarial loads are at risk of developing serious neurological reactions after treatment with ivermectin. In 2004, investigation missions initiated by the Mectizan Expert Committee and the Technical Consultative Committee of APOC were undertaken. Recommendations and preventive measures for the safe mass drug administration were formulated.The main objective of this study is to determine the incidence of SAEs following ivermectin mass treatment in co-endemic areas for onchocerciasis and loiasis in DR Congo, to describe the demographic and clinical profile and outcome of these SAEs, and to discuss their implication for the current mass drug treatment strategy. We retrospectively analyzed ivermectin treatment outcome of three onchocerciasis provincial projects contained in annual technical reports submitted by the provinces to the NOCP, and those submitted by NOCP to APOC and the MDP from 2006 to 2009. Data were analyzed by Epi Info 3.5.1. Incidences, treatment coverage, and lethality rates were calculated. Statistical significance test was set at $P = 0.05$. The $\chi 2$ test was used to assess associations between coma and age, sex, and early clinical signs and symptoms. The overall incidence of serious adverse events in the three provinces studied was 1 per 10,000 people treated over a four- year period. The median age of SAEs was 34 years (range: 6-96 years); the ratio of male to female was 2:1. Sub conjunctiva haemorrhage was the most initial frequent sign reported among all 303 SAEs. The overall therapeutic coverage increased from 20% in 2006 to 63% in 2009. North Ubangi had gotten the highest incidence rate of SAEs ever reported in Africa. The overall lethality rate due to ivermectin treatment was 4%. The incidence of SAEs following ivermectin treatment has been documented for the first time in DRC. The overall incidence rate is similar to what is described in the literature, but there is important local heterogeneity. Taken individually, North Ubangi should not scale up ivermectin treatment to new communities. Mass treatment in former communities should be supervised by national and provincial level in strict application of MDP guidelines. There is a need for a qualitative research to understand the perception and determinants of acceptability of the treatment

#21 KNOWLEDGE AND PERCEPTION OF TAENIA SOLIUM TAENIOSIS AND CYSTICERCOSIS IN EASTERN ZAMBIA: IMPACT ON CONTROL AND THERAPY STRATEGIES

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Background: *Taenia solium* taeniosis/cysticercosis is an important parasitic zoonosis in many developing countries. The adult tapeworm occurs in humans (taeniosis), while the metacestode larval stage (cysticercus) develops in pigs (cysticercosis). Cysticercosis may also occur in humans upon ingestion of eggs and may cause severe neurological disorders. As one of the neglected tropical diseases, cysticercosis has received less attention with regard to its sociological determinants. While several methods, including therapy, to break the lifecycle of *T. solium* are known and risk factors have been studied in Eastern Zambia, no control strategy has so far been applied in the country.

Aim: To assess the communities' knowledge and perception of *T. solium* and its control in Eastern Zambia in view of identifying obstacles to treatment and prevention methods and, eventually, developing effective control strategies.

Method: A total of fifteen focus group discussions (7-10 participants in each) with men, women and children in separate groups, were organised in a highly endemic rural area of Petauke district. Discussions covered knowledge and perceptions on possible control methods, including human (and porcine) (mass) treatment, pig management, pork consumption, hygiene, defecation practices and taeniosis diagnosis.

In addition, two individual in-depth interviews were conducted with a veterinary assistant and a medical officer from the study area, focusing on their knowledge and capacity to diagnose the parasite and provide appropriate treatment.

Results: Preliminary results indicate that communities are not aware of the lifecycle of *T. solium* and often confound it with roundworms. While keeping pigs enclosed is not perceived as an option given the difficulty to feed them, mass-treatment collected a much higher consent among the three different groups. They hesitate to use latrines because of defecation related taboos. People usually do not notice that they are infected by adult *T. solium*, do not even observe proglottids in faeces and, as a consequence, do not seek for treatment. Epilepsy causes stigma and common belief relates the disease's origin to pigs but villagers do not relate it to the *T.solium* cysticercosis/taeniosis disease complex.

Unlike the veterinary assistant, the medical officer seemed to know about tapeworm infection and its related risk factors but diagnosis is still difficult, reportedly because of the absence of appropriate laboratory facility. Vermox® (mebendazole) if often used for treatment in spite of its poor efficacy on taenids, unlike praziquantel or niclosamide.

Conclusion: Cultural barriers and lack of awareness seem to hinder most control measures against taeniosis/cysticercosis. Given the difficulty to identify carriers of adult *T. solium*, regular and systematic treatment of human communities might be recommended. There is an urgent need for improved communication and information exchange among all stakeholders, i.e. public- and veterinary public health sectors, scientific community and rural communities to ensure a complementary appropriate set of control strategies for sustainably reducing disease burden.

#81 OXFENDAZOLE TREATMENT TRIAL TO CONTROL PORCINE CYSTICERCOSIS IN ANGÓNIA DISTRICT, MOZAMBIQUE

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A randomized controlled field trial to evaluate the effectiveness of a single oral dose of 30 mg/kg of oxfendazole (OFZ) treatment for control of porcine cysticercosis was conducted in 4 rural villages of Angónia district, north-western Mozambique. Two hundred and sixteen piglets aged 4 months were recruited and assigned randomly to OFZ treatment or control groups. Fifty four piglets were treated at 4 months of age (T1), other 54 piglets treated at 9 months of age (T2) and matched with 108 controls from the same litters and raised under same conditions. Baseline data were collected on the prevalence of porcine cysticercosis based on Ag-ELISA, and knowledge and practices related to *Taenia solium* transmission based on questionnaire interviews and observations. All animals were followed and re-tested for porcine cysticercosis by Ag-ELISA at 9 and 12 months of age where the study was

terminated. Overall prevalence at baseline was 5.1% with no significant difference between groups. At the end of the study, infections were found in 66.7% of the controls, 21.4% of the T1 and 9.1% of the T2 pigs. There was a significant reduction in the prevalence of *T. solium* cysticercosis if pigs were treated with OFZ either at 4 months (OR = 0.14; 95% CI: 0.05, 0.36) or at 9 months of age (OR = 0.05; 95% CI: 0.02, 0.16). Strategic treatment of pigs in endemic areas should be further explored as a means to control *T. solium* cysticercosis/taeniosis.

Poster presentations

#2 CANINE LEISHMANIASIS IN ALGERIA: TRUE PREVALENCE AND DIAGNOSTIC TEST CHARACTERISTICS IN GROUPS OF DOGS OF DIFFERENT FUNCTIONAL TYPE

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A Bayesian approach was used to assess the prevalence of Canine leishmaniasis and evaluate three serological diagnostic tests: indirect fluorescent antibody test (IFAT), direct agglutination test, and particle gel immuno-assay (PaGIA) for Canine leishmaniasis (CL) in Algiers.

Four hundred and sixty-two dogs were involved in this study and divided in four groups according to their functional type: stray dogs, farm dogs, national guard dogs and pet dogs.

The stray dog group showed the highest prevalence of leishmaniasis (11.7%), followed by the national guard dogs (9.7%) and the farm dogs (5.9%). IFAT was shown to be the most sensitive test in all groups. However, IFAT specificity was considerably lowered in the farm dog group: 65.2% versus 94.5% for the stray dogs. A considerable drop in PaGIA specificity was noted in the stray dogs group. The results of the current study demonstrate the variability of test characteristics in different situations and underline the danger of using standard values, without verifying their appropriateness for the specific purposes

#6 A TOOL TO ASSESS AND COMMUNICATE THE QUALITY OF ASSUMPTIONS IN MICROBIAL RISK ASSESSMENT

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Quantitative microbial risk assessment (QMRA) is the process used to estimate the probability and severity of health risks resulting from the ingestion of food-borne pathogens. The overall quality of a QMRA largely depends on the quality of the model input parameters, the model structure, and the assumptions made. A thorough evaluation of the assumptions in a risk assessment is necessary since they are often treated as well-established knowledge.

The approach known as the Numeral Unit Spread Assessment Pedigree (NUSAP) system was chosen to evaluate assumptions made in the METZOON model, a QMRA farm-to-fork risk model that was developed to assess the risk of human salmonellosis through consumption of pork in Belgium. The assumptions in the METZOON model were identified, prioritized and critically reviewed during a workshop. The pedigree matrix used to assess the assumptions, contained four pedigree criteria: influence of situational limitations, plausibility, choice space and agreement among peers. In addition, the expected influence of the assumptions on the outcome of the METZOON model was assessed.

From a list of 39 assumptions identified by reviewing the risk model, 13 assumptions were prioritized and analysed. The quality of the assumptions was visually communicated by means of a diagnostic diagram. The NUSAP evaluation was helpful to pinpoint the strengths and the weaknesses in the METZOON model, and showed that it is a useful tool to improve the quality of the QMRA process. The NUSAP approach for the evaluation of assumptions can be easily implemented to other zoonoses and neglected infectious diseases.

#8 A PILOT SURVEY ON MYCOBACTERIUM BOVIS IN CAMELS IN MAURITANIA

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Mauritania Bovine Tuberculosis Data are not available, but a big part of livestock spend through Mali border, where the prevalence rate reaches more than 10 %. The aim of this study is to establish a situation of bovine tuberculosis especially in camel where the disease has been diagnosticated twice in the past (1983 and 1985). This survey permitted to inspect 2437 carcasses during the period of 13 to 23 June 2008 in the Nouakchott slaughterhouse. Samples were realized every time we noticed lungs or liver lesions. A total of 937 camel carcasses, 750 bovine and 750 goats have been inspected leading to 28 samples from which 21 are camels, 05 from cattle and 02 from goats. Samples are analysed in the Mycobacterium laboratory of the National Institute of Public Health and in a private lab of anatomopathology. Three samples are already positive (02 camels and 01 bovine). For anatomopathology, 7 samples are strongly suspected.

#10 NESSERIA MENINGITIS NMX OUTBREAK IN BURKINA FASO, 2009-2010

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Centre MURAZ of Bobo-Dioulasso (Burkina Faso) organized in 2009 and 2010 a system of Cerebro-Spinal Fluid (CSF) collection in eight pilot Districts as an initial step for the future Ministry of Health's led strategy of individual surveillance in a context of meningococcal conjugate A vaccine introduction.

CSF samples were analyzed with Polymerase Chain Reaction (PCR). This allowed for meningitis etiologies dynamics studies in the pilot Districts.

Because of geographical difficulties and lack of means, less than 40 % of suspected cases had their CSF analyzed at PCR reference laboratory. In 2009, among confirmed cases at reference laboratory, *Sp (Streptococcus pneumonia)*, *NmA* (*Neisseria meningitis A*) and *Hib (Hemophilus influenzae b)* were responsible respectively for 90%, 6.6% and 4.4% of cases. In 2010, serogroup distribution among confirmed cases was: *Sp* 62.7%, *NmX* 32.2% and *NmA* 5.1%. *Sp* which was continuously present in Burkina Faso takes more significant proportions, just as serogroup X which until there was sporadically encountered. The attack rates of *NmX* were tree to twelve times higher than for *NmA* in the two Districts where *NmX* has been notified.

As a consequence of such results, efforts must be maintained in epidemiologic surveillance field and in reinforcement of laboratory capacities. A plea must be made on one hand for pneumococcal vaccine introduction in Burkina Faso and on other hand towards manufacturers for taking into account serogroup X into meningococcal polyvalent vaccine composition.

 # 11 ABATTOIR-BASED STUDY ON THE EPIDEMIOLOGY OF CAPRINE TUBERCULOSIS IN ETHIOPIA

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Tuberculosis (TB) is an infectious disease caused by acid-fast bacilli of the genus *Mycobacterium* with granulomatous lesion affecting practically all species of vertebrates including humans. It also adversely affects the international trade of animals and animal products. In Ethiopia, *M. bovis* in cattle has long been reported with a prevalence ranging from 3.4 to 50%. Research findings elsewhere indicate that goats readily acquire *M. bovis* from infected herds of cattle during co-grazing and sharing the same premises. It is also well documented that goats are the most common incidental spillover hosts of *M. bovis.* In this line, research work on *M. bovis* status in Ethiopia is not covering the whole range of livestock species. It is biased towards cattle even though mixed farming of livestock species is widely practiced in the country under different production systems which poses a high risk of inter-and intra-species TB transmission. The status of TB and the strains of *Mycobacterium* in goats are lacking; and the inter- and intra-species transmission patterns of the disease remains unstudied. Therefore, this work aims to

undertake a cross-sectional study on goat tuberculosis from March 2011 to September 2011 at Luna export abattoir to estimate abattoir prevalence of TB in goats, identify the species and strains of *mycobacterium* isolates involved, and assess potential risk factors. The study populations are local breeds of male goats that are brought to the abattoir from different parts of the country and approved to be healthy during antemortem examination. A total of 1,545 goats are randomly selected after stratifying the animals according to their geographical origin. Detailed postmortem examination will be conducted on sampled animals. Tissues or organs with lesions suggestive of TB are collected aseptically for mycobacteriological culture and further molecular studies like genus typing, deletion typing and spoligotyping. For each individual animal examined: age, geographical origin, breed, presence or absence of lesion, anatomical site affected, pathology scoring and *mycobacterium* species and strains involved will be recorded and finally analyzed using appropriate statistical package. Finally, first findings with regard to the strain (spoligotype) and species of *mycobacterium* affecting goats of Ethiopia, burden and inter-species transmission pattern of the disease are reported.

#12 BOVINE TUBERCULOSIS IN CATTLE: TRUE PREVALENCE AND RISK FACTOR APPRAISAL IN CATTLE AND CATTLE PROFESSIONALS IN THE HIGHLANDS OF CAMEROON

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The tuberculin skin tests are the choice techniques worldwide for the diagnosis of bovine tuberculosis (BTb) in live animals. The OIE-recommended >4 mm cut-off point for an increase in skin thickness is used to define a test as positive. However, the accurate diagnostic ability of the tests is affected by many factors including environmental stressors, host factors, prevalence of BTb in tested populations, nature of tuberculin used and country's disease status and control programme. Therefore, a perfect cut-off point for a tuberculin skin test positive result in a specific geographic area may not be useful in another. Furthermore, BTb is *widespread* in cattle in Cameroon but neglected, though it has intense zoonotic potential and public health implications. The article describes the assessment of various cut-off points of comparative tuberculin skin test based on anti-BTb antibodies detection in Cameroonian cattle. Previous tuberculin skin tests data were reviewed while the risks of BTb in cattle and cattle handlers were assessed in the regions. The findings confirmed the importance of defining appropriate tuberculin tests cut-off values to maximize detection of BTb in different environments. Application of the ≥ 2-mm cut-off point for comparative tuberculin skin tests would maximise accurate detection of BTb in cattle in the highlands of Cameroon. High BTb prevalence rates were observed in the regions while survey of cattle professionals showed overwhelming evidence of risks for exposure and transmission of BTb among cattle and to cattle professionals. The study provides keys for significant reduction of zoonotic BTb in Cameroon.

#13 GESTION DE LA SCHISTOSOMIASE DANS UNE ZONE URBANO-RURALE (CAS DE LA ZONE DE SANTÉ DE BIYELA)

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L'estimation de l'importance de la schistosomiase est basée sur une enquête scolaire incluant les enfants de 3ème année primaire ou âgés de 9-10 ans. Le faible pourcentage de scolarisation peut fausser cette estimation. Il est donc nécessaire pour les pays sous-développés de vérifier cette assertion.

Nous avons mené une enquête à l'école et dans les ménages de la zone de santé de Biyela. Les facteurs de risque de la schistosomiase ont été aussi recherchés. Une enquête supplémentaire a été réalisée pour déterminer la capacité opérationnelle de prise en charge de la schistosomiase au niveau de la zone de santé. Outre les questionnaires, des examens de laboratoire ont été réalisés sur les selles (Kato - Katz) et les urines (Bandelettes réactives).

Les proportions des cas de schistosomiase trouvées à l'école et dans les ménages ne sont pas statistiquement différentes (p= 0,55). En effet, à l'école la proportion a été de 6,9% (14/203) et dans les ménages 5,5% (13/235). Les facteurs de risque habituellement cités dans différentes publications : l'âge, le sexe, situation socio-économique, manque d'hygiène, disponibilité de l'eau se sont révélés statistiquement non significatif dans notre étude. La prise en charge n'est pas optimale par manque de possibilité diagnostique et de médicaments.

En conclusion, la méthode de l'OMS est applicable dans la zone de santé de Biyela. Une étude ultérieure est nécessaire dans une vraie zone à scolarité inférieure à 50%.

#16 AN INTEGRATED APPROACH TO RAPID RESPONSE TO ZOONOTIC DISEASES: THE AVIAN INFLUENZA EXAMPLE IN AFRICA

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Generally agricultural and human public health sectors are not familiar with each other's approaches to investigate disease outbreaks yet investigation methods are similar. The two sectors do not have regular fora to discuss and communicate about integrated approaches to investigation and control of zoonotic diseases and related research development.

The US Centers for Disease Control and Prevention (CDC) took a joint animal and human public health approach to investigation and response to first signs of possible Avian Influenza (AI) cases/outbreaks. It developed a multidisciplinary rapid response team training curriculum, based on the CDC/WHO/OIE/FAO principles of outbreak response vis-à-vis AI. Training was implemented in collaboration with national governments and the InterAfrican Bureau for Animal Resources (IBAR). Participants gain technical insight and modus operandi to each other's areas of responsibility vis-à-vis AI outbreak investigation and response.

The curriculum was developed for AI outbreak investigation and response, but the principles taught are also valid in the response to other emerging and re-emerging zoonotic diseases, as has been shown in a few African countries. Rapid response teams training is expected to improve the quality and timeliness of technical interventions. However, the establishment and maintenance of multidisciplinary rapid response teams at national and sub-national levels requires commitment from decision makers.

An overview of the rapid response team training curriculum, challenges and successes in its implementation in selected African countries is presented and discussed. Policy implications for the set-up of the legal framework for multidisciplinary approaches to diseases investigation and control are also addressed.

#24 AFLATOXICOSIS AS A NEGLECTED ZOONOSIS IN EGYPT: DETECTION, ASSESSMENT AND CONTROL TRIALS

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Aflatoxicosis is the group of acute toxic syndromes appeared in both human and animals after exposure to high levels from aflatoxins which produced by *Aspergillus flavus* and *A. parasiticus.* A main chain for aflatoxin transmission is from contaminated forage to dairy cattle and, consequently, from their secreted milk to consumers. The different types of aflatoxins, i.e. B_1, B_2, M_1 and M_2, were determined in this chain using competitive ELISA test. Forge samples (n= 160), cow and buffalo's milk (n=240) and urine samples from exclusively milk feeders early children (n=120) were all analyzed for the presence of aflatoxin types. The recorded aflatoxin values exceeded the European legislations in 63, 38 and 26% of the forage, milk and urine samples, respectively. Natural protective measures, using smoldered plant fumes as fungicidal agents, were applied to inhibit mycotoxigenic fungi growth on animal forages. These applications succeeded to prevent the growth of fungal strains and their secretion of aflatoxins in animal feed. The applied technique could be considered as an effective solution to deal with aflatoxin transmission as foodborne zoonosis.

#26 VACCINE SAFETY STUDIES WITH FLEXIBLE SELF CONTROLLED CASE SERIES METHOD

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The statistical method, self-controlled case series, was developed to investigate the strength of association between a time-varying exposure to vaccine and its adverse effects, using only cases (individuals with the side effect). This

method has two important advantages: it requires information on only cases and unlike cohort and case control methods it automatically adjusts for fixed confounders, such as gender, socio economic status, birth weight etc. The method allows age dependent baseline incidence (the rate of newly diagnosed cases during a specific time period where there is no exposure to vaccine)

It has been used widely in pharmaco-epidemiology, particularly in the study of vaccine safety.

Two versions of the method will be described: parametric, for which the baseline incidence is split into specified age groups, and semi-parametric, in which the age specific relative incidence is left unspecified.

In the parametric model poor choice of age groups can give misleading results, while the semi-parametric model may run into computational problems as the number of cases increases.

We are modelling the age effect using flexible cubic splines.

#28 PREVALENCE OF SWINE TUBERCULOSIS IN CENTRAL ETHIOPIA AND MOLECULAR CHARACTERIZATION OF ITS CAUSATIVE AGENTS

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Tuberculosis, an ancient and often neglected disease, is an infectious, granulomatous disease caused by acid-fast bacilli of the genus *Mycobacterium*. All species, including humans, and age groups are susceptible to the organism, with cattle, goats, and pigs most susceptible and sheep and horses showing a high natural resistance. All the three types of tubercle bacilli: *Mycobacterium tuberculosis*, *M. bovis*, and *M. avium* complex affect swine. The disease continues to cause significant economic losses to swine producers throughout the world and has both economic and veterinary public health importance. Although tuberculosis due to *M. bovis* has been nearly eradicated in many developed countries, it still poses a threat to animal production and public health in developing countries. Moreover the importance of *Mycobacteria* in swine has not been given same attention as it is for cattle, camel and goats in these nations. However swine are considered to be among the important animals in the epidemiology of tuberculosis. The identification of *Mycobacteria* species is generally based on the traditional methods of Ziehl-Neelsen acid-fast staining and growth characteristics and to species level by the reaction to phenotypic and biochemical tests. Recently molecular techniques have been ingeniously developed and are widely used. The detection, identification and genotyping of *Mycobacteria* are important assets for the control of tuberculosis. So far no study has been carried out in Ethiopia concerning the species, strains and the epidemiology of tuberculosis in swine. This research therefore aimed at determining abattoir prevalence; investigating risk factors associated with the occurrence and transmission of the disease; and characterizing the molecular biology of the causative agents. The research field work is designed as a cross-sectional study in two private and public abattoirs in Central Ethiopia from March 2011 to September 2011. Comparative tuberculin skin test will be performed in swine farms where it is possible. Up on detailed post-mortem examinations on slaughtered pig specimens from suspected lesions will be cultured on two Lowenstein–Jensen media enriched one with pyruvate and the other with glycerol and incubated and followed regularly for at least eight weeks. Microscopic examination of colonies from culture positive media using the Ziehl–Neelsen staining method will be performed to select acid-fast bacilli positive isolates. Heat killed AFB positive samples will be used as source of DNA template. The DNA will be amplified using multiplex PCR for molecular techniques including genus typing, deletion typing and spoligotyping to aid the differentiation of species and strains. By the end of the study strains of mycobacterial species circulating in swine in the country will be identified and characterized. The prevalence of swine tuberculosis and its risk factors will also be determined.

#29 THE IMMUNE MODULATORY EFFECT OF RIFT VALLEY FEVER STRAINS

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The non-structural S gene (NSs) clones of RVFV were monitored for their immune modulator effects by analysing the variability of NSs activity on the IFN-β promoter. Twenty six African isolates of RVFV from animals, humans, and insects sources were subcloned. Amplicons of the NSs genes including a C-terminal FLAG-tag were ligated into BglII /SalI sites of expression plasmid pI.18. After co-transfection of the recombinant NSs-carrying expression vectors with the reporter plasmid p125-luc into Vero E6 cells, luciferase activity was monitored. Additionally, expression of NSs in Vero E6 cells was monitored by immunofluorescence staining. Two RVFV NSs proteins

(isolates R7 and R18) led to significant IFN-beta induction whereas the remaining 24 showed efficient suppression of IFN-beta promoter activity. NSs-R7 which failed to inhibit IFN-beta induction could not be detected by immunofluorescence tests despite having an intact FLAG-tag. This might be attributed to a point mutation in the NSs gene which results in the replacement of a leucine by proline. Sequencing of the NSs-R18 revealed a large internal in-frame deletion identical to the mutation described for the naturally occurring RVFV mutant clone 13.

Assessing permissiveness of human DCs for RVFV strains, we demonstrate for the first time that RVFV doesn´t replicate in pDCs but does in mDCs. On the other hand, wt virus induced more proinflammatory cytokine IL-6 compared to clone 13 in pDCs. High amounts of proinflammatory cytokines combined with complete lack of IFN responses in epithelial cells and pDCs might be responsible for the severe outcome of RVFV wt infections.

#32 BRUCELLOSIS IN BOS INDICUS IN NIGERIA, A VETERINARY AND PUBLIC HEALTH THREAT

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The Food and Agricultural Organization and the World Health Organization consider brucellosis as the most important zoonotic disease. Brucellosis is caused by infection with gram-negative coccobacillae belonging to the genus *Brucella* (Franco et al, 2007).The prevalence of brucellosis is reported to be highest in the Mediterranean area, the Middle East and Central Asia (Pappas et al, 2006). Sub-Saharan Africa has the world's fastest growing population of whom the livelihood is to a major extend dependent on agricultural activity. Agricultural communities are most vulnerable to zoonotic diseases as not only the health and work capacity of the human population is affected but also the health, productivity and economic value of their livestock (McDermott and Arimi, 2002).

In this study we summarized available information on brucellosis in cattle obtained by passive surveillance from some states in Nigeria and active surveillance from Kano, Taraba, and Benue states of Nigeria. Samples were transported on ice from the field to the *Brucella* Research Laboratory of the NVRI in Vom, Plateau state where the RBPT was performed. The samples were also tested using an easy and rapid field test (LFA) for bovine brucellosis described by Abdoel and co-workers (2008). The results of this study indicate that brucellosis is a major disease of cattle in Nigeria. The herd prevalence among production cattle ranged from 14.0% in Kano state to 22.2% in Taraba state and the RBPT Seroprevalance was 1.2% for Kano state and 6.2% for Taraba state. A higher Seroprevalance was found for cattle tested at abattoirs in Taraba state (11.8%) and in herds kept for trade and slaughter purposes in Benue state (13.1). The RBPT seroprevalence in production cattle was similar for males and females but in trade and slaughter animals the seroprevalence in females was slightly higher (P=0.03) than in males. Seropositive animals were found in all cattle breeds. The LFA showed agreement with RBPT of 95.0% (kappa value, 0.80) for the samples from Taraba state and an agreement of 96.8% (kappa value, 0.75) for the samples from Benue state.

The high seroprevalence of brucellosis in cattle in the abattoirs in two states shows that all butchers and slaughterhouse workers are at risk of infection with *Brucella.* In Nigeria, meat generally well cooked before consumption and the risk of infection for consumers of meat may be low. The demand for milk is increasing and part of the milk is marketed through the informal circuit (Bertu *et al.,* 2010) and may be consumed without proper heating by herdsmen. Raw milk consumption could be a significant risk factor in Nigeria. Serosurveillance for brucellosis is most easily done using the LFA which allows the direct instigation of measures as results are available immediately. Measures to control the disease should include slaughtering of infected animals, annual vaccination of young animals and improved farm hygiene. Transmission to the human population may be prevented by wearing protective outfit when milking and handling animals and animal materials and by pasteurization of milk.

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#34 CLONAL DIFFERENCES BETWEEN NON-TYPHOIDAL SALMONELLA (NTS) RECOVERED FROM CHILDREN AND ANIMALS LIVING IN CLOSE CONTACT IN THE GAMBIA

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Non-Typhoidal *Salmonella* (NTS) is an important cause of invasive bacterial disease and associated with mortality in Africa. However, little is known about the environmental reservoirs and predominant modes of transmission. Our study aimed to study the role of domestic animals in the transmission of NTS to humans in rural area of The Gambia.

Human NTS isolates were obtained through an active population-based case-control surveillance study designated to determine the aetiology and epidemiology of enteric infections in Gambian children less than five years of age. Fourteen children infected with NTS were traced back to their family compounds and anal swabs collected from 210 domestic animals present in their households. Identified NTS were serotyped and genotyped by multi-locus sequencing typing.

NTS was identified from 21/210 animal sources in the households of the 14 infected children. Chickens carried NTS more frequently than sheep and goats; 66.6%, 28.6% and 4.8% respectively. The most common NTS serovars were *S*. Colindale in humans (21.42%) and *S*. Poona in animals (14.28%). MLST on the 35 NTS revealed four new alleles and 24 sequence types (ST) of which 18 (75%) STs were novel. There was no overlap in serovars or genotypes of NTS recovered from humans or animal sources in the same household.

Our results do not support the hypothesis that humans and animals in close contact in the same household carry genotypically similar *Salmonella* serovars. These findings form an important baseline for future studies of transmission of NTS in humans and animals in Africa.

#36 OLD FOCUS OF CYSTICERCOSIS IN A SENEGALESE VILLAGE REVISITED AFTER HALF A CENTURY

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Soutou is located 15 km from the administrative town/'commune' of Bignona. The villagers are predominantly farmers that rear pigs and cultivate crops. Almost all the pigs are in free range system during the dry season. The village has been hit with an outbreak of human cysticercosis in 1962 that affected 4% of the population. Two new cases were reported in 1975. Recent survey revealed porcine cysticercosis seroprevalence of 26.7% in 2008. This recent finding sparked the interest of determining the status quo of cysticercosis in the inhabitants of the village. The objective of this epidemiological study was to determine whether cysticercosis and especially neurocysticercosis is endemic in Soutou village about half a century after the 1962 outbreak.

The study was carried out from September 2009 to February 2010. It involved a questionnaire administration, serology, treatment, coproscopy and neuro-imaging. Blood samples were collected from 403 people (94%) out of 427 inhabitants present in the village during the sampling. Every sampled person was interviewed to fill a questionnaire that focused on the person's identity, epilepsy history and predisposing factors, and cysticercosis predisposing factors. The 403 sera samples were stored at -20° C until tested with Ag-ELISA and enzyme-linked immunoelectrotransfer blot (EITB) for the detection of circulating antigens and antibodies to *Taenia solium* respectively. Faecal samples from 43 niclosamide (Taeniadex®) treated seropositive people were examined for

taeniid eggs using Ritchies formalin ether concentration method and direct faecal examination under microscope. Expelled worm specimen was tested using PCR-RFLP to ascertain its species. The seropositives also underwent computed tomography (CT) scan for diagnoses of neurocysticercosis cases.

Questionnaire results characterise the study population as follows: 94% belong to the Jolla ethnic group, 97% are Christians, 48% females, 52% males, and aged between 4 and 91 years. Five persons (one male and 4 female) reported to have experienced epileptic seizures. The age-at-onset of the seizures was 10, 12, 18, 50 and 60 years. Functional toilets were reported to be available in the households of 396 (98%) respondents, whilst 3 (1%) used neighbours toilet, and 4 (1%) defecates in the bush.

By using a parallel combination (positive in at least one test) of the Ag-ELISA and EITB test results, a cysticercosis seroprevalence of 11.9% (95% CI: 8.9 - 15.4%) was found. Both tests detected a seroprevalence of 7.7% each. Seropositivity was significantly associated to older age groups (41 - 60 years old; $p = 0.001$ and 61 - 91 years old; $p = 0.028$) and absence of a household toilet ($p = 0.001$). Cerebral CT-scans showed that 23.3% (10/43) of the seropositives were affected by neurocysticercosis (presence of calcified and viable cysts in the brain). *Taenia* spp eggs was detected in 4 (9.3%) out of 43 faecal samples. The expelled tapeworm specimen was found to be *Taenia saginata.*

Although no *T. solium* tapeworm was identified, based on the results of this study plus the recent finding of high porcine cysticercosis seroprevalence, it could be concluded that Soutou is an active focus of *T. solium* cysticercosis.

#37 AN OUTBREAK INVESTIGATION OF VISCERAL LEISHMANIASIS AMONG URBAN RESIDENTS OF DHARAN TOWN, EASTERN NEPAL

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BACKGROUND. Visceral Leishmaniasis (VL) is a predominantly rural disease, common in the 'Terai' lowlands of Nepal. Since 1997, VL has also been reported from the city of Dharan. We investigated risk factors for VL among residents of Dharan town.

METHODS. We conducted an outbreak investigation including a case-control study; cases were all urban residents treated for VL between 2000 and 2008 at the BPKIHS, the only facility providing VL care. Controls were healthy persons with no previous history of VL and were selected from a census list frequency-matched for age. Data was analyzed using a binomial multilevel model with 'ward' (neighborhood) as random effect.

RESULTS. A total of 158 VL cases and 448 controls were enrolled. The distribution of cases was strongly clustered in 3 out of 19 wards. Proximity to other VL cases was a strong risk factor in the multilevel model, with an odds ratio [OR] of 4.8 (95% CI 2.6 – 8.6). Other associated factors were: 'Blood transfusion' (OR 3.6, 95% CI 1.4 – 9.1), 'Regular forest visits' (OR 2.9, 95% CI 1.7 – 5.1), 'Daily wage earner' (OR 2.5, 95% CI 1.4 – 4.4), 'Earthen floors' (OR 2.2, 95% CI 1.1 – 4.4). Sleeping on a bed rather than on the floor (OR 0.31, 95% CI 0.13 – 0.78), ownership of cattle (OR 0.11 95% CI 0.01 – 0.92) and 'Socioeconomic status' (OR 0.01, 95% CI 0.001 – 0.05, for richest versus poorest quartile) were protective factors against VL.

DISCUSSION. The results of the study suggests local transmission, but requires further entomological evidence.

#38 RISK FACTORS FOR POST- KALA- AZAR DERMAL LEISHMANIASIS IN NEPAL, A RETROSPECTIVE COHORT STUDY

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BACKGROUND. Post-kala-azar dermal leishmaniasis (PKDL) is a late complication of visceral leishmaniasis (VL) and is considered a potential reservoir in the transmission of *Leishmania donovani*. We studied the probability and risk factors to develop PKDL after VL treatment in the eastern region of Nepal.

METHODS. Between February and May 2010 trained field workers traced the patients who had received VL treatment between 2000-2009 in 5 endemic districts and screened them for PKDL-like skin lesions. Suspected cases were referred to a tertiary care hospital (BPKIHS) for confirmation by parasitology and/or histopathology. Demographic, socioeconomic and clinical risk factors were assessed in a logistic regression model.

RESULTS. Out of 680 past-treated VL patients, 37 (5.4%) with active skin lesions suspect of PKDL were detected. Out of 33 presenting to BPKIHS for dermatological assessment, 16 (2.4%) were found with PKDL. All 16 PKDL cases had been treated by sodium stibogluconate (SSG) in the past. Skin lesions developed after a median time interval of 21 months (IQR15-45).There was a significantly higher PKDL rate (29.4%) in those who received inadequate VL treatment compared to those who were treated adequately (2.0%). In the logistic regression model, ambulatory treatment [odds ratio (OR) = 11.4, 95% CI 1.5-90.0], and inadequate treatment (OR=30.5, 95% CI 6.2-150.9) were significantly associated with PKDL.

DISCUSSION. The occurrence of PKDL after VL treatment in Nepal is low compared to neighboring countries. Supervised and adequate treatment of VL is essential and could reduce the risk of PKDL development. Active surveillance for PKDL is needed.

42 MOLECULAR EPIDEMIOLOGY OF MYCOBACTERIUM BOVIS AND OTHER MEMBERS OF THE MYCOBACTERIUM TUBERCULOSIS COMPLEX IN LIVESTOCK-WILDLIFE INTERFACE OF MIKUMI-SELOUS ECOSYSTEM IN EASTERN TANZANIA

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Bovine tuberculosis (BTB) caused by *Mycobacterium bovis* is transmitted and maintained in animal and human populations due to interaction between livestock, wildlife and human. The study area involves Mikumi-Selous ecosystem in vicinity with four districts inhabited by pastoralists. *M. bovis* has been reported in pastoral livestock-wildlife interface; however, the magnitude of the problem is unknown.

The current study focuses on distribution dynamics and extent of the *Mycobacterium tuberculosis* complex (MTC) infection in the pastoral cattle and wildlife animals; The study aims to establish the epidemiology of BTB, genetic variation and factors that affect the distribution of observed genotypes

The prevalence of BTB in cattle is established using single intradermal comparative tuberculin test (SICTT) while BOVIGAM® test is conducted to determine the prevalence of the disease in buffalo population. Collection of tissue organs with suspected tuberculous lesions from slaughtered cattle at abattoirs is carried out to detect and trace-back the origin place of BTB infected cattle. Mycobacterium genus typing, Deletion typing, and Spoligotyping are being conducted to identify and further characterize the MTC isolates. Information on knowledge, awareness, practice and risk factors for BTB transmission is addressed by questionnaire survey.

To date, 760 cattle and 33 buffaloes have been tested for BTB while tissue organs from 34 different wildlife animal species and tissue samples with tuberculous lesions from 12 slaughtered cattle have been cultured for MTC isolation and 100 pastoralists have been interviewed.

Current results: The prevalence of BTB in cattle is 3.2% (n=760). One buffalo from Mikumi national park reacted positive for MTC by BOVIGAM. *M. bovis* has been isolated from cattle originated from Melela, Mkata and Dete villages. More than 90% of the respondents are unaware of BTB in livestock and wildlife. These results are part of bigger ongoing study which will be completed by 2012. Thus at this stage no conclusion can be drawn regarding the investigation.

#44 DEVELOPMENT OF A NEW MODEL FOR THE CONTROL OF TSETSE AND HUMAN AFRICAN TRYPANOSOMIASIS

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Models of the control of tsetse and human African trypanosomiasis (HAT) can improve the understanding and planning of field campaigns, help in teaching ecology and epidemiology, and in identifying research priorities. The models should be user-friendly and comprehensive, covering many aspects of the basic biology of the tsetse, trypanosomes and hosts involved, and considering a wide range of control options in simulated situations that correspond closely to maps of real operational areas. Existing models do not meet all of these requirements.

To start filling the gap, a dynamic deterministic model, called "HAT-trick", was developed in Microsoft Excel and operated via Visual Basic for Applications. It runs at three successive levels, each of which can be used with suggested inputs, custom inputs, or a combination of both. The first level, i.e., the Basic, covers fundamental biological matters that are likely to apply in any situation, e,g., the growth rate, dispersal and diet of tsetse

populations and their distribution between vegetation types with various densities and types of host. The second level, ie, Map level, takes the inputs and outputs of the Basic level and adds more inputs specific to particular operational areas, up to 40,000 km^2, to produce maps for the abundance, distribution, age structure and infection status of tsetse, and for the incidence and prevalence of HAT. Inputs include data for the efficacy of treatment of HAT, and maps of vegetation, settlement types, and the numbers of various hosts, covering resident and itinerant humans, cattle protected or unprotected by trypanocidal drugs, other mammals and reptiles. The third level, i.e., Control, takes the inputs and outputs of the Basic and Map levels and adds new inputs to predict the effect of various control measures applied singly or jointly in succession or simultaneously in all or part of the operational area. Control options considered are those currently involved in most campaigns against tsetse, i.e., the use of aerial spraying, traps, targets and insecticide-treated cattle.

The model has been used to simulate HAT foci in East, West and Southern Africa, giving outputs consistent with field data. It also offered several suggestions, such as the need to look in the field for 10-90% reductions in HAT risk that are simulated to occur over areas up to six times greater than those where bait control is operated. The degree of man/fly under various field circumstances deserves fuller study. It is required to resolve the apparently gross disparity between the seemingly low rates of *Trypanosoma brucei* infections in wild tsetse, and the higher rates in cattle and wild animals.

It is hoped that the model will evolve through use and suggestions by all interested persons -- who are most welcome to become co-authors. In particular, it would be helpful to extend the model to simulate the direct control of trypanosomiasis.

#47 DOGS AS POTENTIAL MECHANICAL VECTOR OF TRANSMISSION OF BRUCELLA. SPP., IN DAIRY CATTLE IN THE SIERRA OF ECUADOR.

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In 2008 a study in cattle farms in Ecuador was set up to determine whether dogs harboured strains of *Brucella* spp., endemic at the region. Serum samples from dogs (n=151) living on farms (n=34) in Mejía canton in Pichincha province, Ecuador, were tested for antibodies against smooth *Brucella* spp., by three immunodiagnostic assays. Highly positive dogs (n=5) were euthanized in order to cultured samples of lymph nodes and organs. From a dairy farm with positive dogs, sera from cows (n=93) were analysed by two immunodiagnostic assays and milk samples from seropositive cows (n=7) were cultured. In addition, isolates were investigated by PCR-711.

85.43% of the dogs had contact with cattle and drank raw milk, 64.24% regularly ate aborted material. In total 43 dogs (30.46%) reacted positive at least to one serodiagnostic test; individual tests showed 15.89% positive reactions when tested by the Rose Bengal test (RB), 11.92% by the Wright's Slow Agglutination Test" (SAT-EDTA) and 23.85% by the indirect Enzyme Linked ImmunoSorbent Assay (iELISA). Only 13 (8.60%) dogs tested positive in all three tests. Four bovines (4.30%) were positive on RB and SAT-EDTA. *Brucella* spp. was identified in isolations from dogs (n=5) and bovines (n=1), by routine biochemical assays and PCR-711.

Our results demonstrate that control of brucellosis should not be restricted to bovines, for which economic losses are obvious. Equal attention should be given to other animals, among them dogs living on farms or in the neighbourhood of farms, as potential mechanical vector of transmission of this zoonosis.

#49 HETEROGENEOUS DISTRIBUTION OF BOVINE TUBERCULOSIS IN ZAMBIA

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Tuberculosis (TB) has emerged as a global emergency with a devastating effect upon global public health in the last few decades. Emerging TB trends have been complicated by fatal alliance with HIV and AIDS which has been implicated in increased incidence of zoonotic tuberculosis and emergence of drug resistant strains. Despite concerted efforts to control the classical tuberculosis, little is being done with regards zoonotic tuberculosis. We describe the spatial distribution of zoonotic tuberculosis in Zambia, a country severely affected by both HIV/AIDS and TB.

Results from our epidemiological studies have shown significant differences in BTB prevalence and distribution ($P < 0.0001$) according to geographical areas. Risk factors of disease occurrence were linked to the presence of the

livestock/wildlife interface areas such as in the of the Kafue basin. Cross sectional surveys both in wildlife and livestock revealed marked heterogeneous distribution in the burden of bovine tuberculosis. Molecular epidemiological studies revealed a link between livestock and wildlife tuberculosis and how *Mycobacterium bovis* strains are shared between wildlife and domestic animals and their dispersion in domestic animals within Zambia.

These results indicate that bovine tuberculosis is not homogenously distributed in Zambia underscoring the need of ascertaining its spatial distribution in a resource poor country. The results give a better understanding of the population and areas at risk and ultimately make it easy when engaging policy makers in disease control matters.

#50 CUTANEOUS LEISHMANIASIS DUE TO *LEISHMANIA TROPICA*: AN OLD DISEASE OF INCREASING IMPORTANCE IN MOROCCO

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In Morocco, 3 forms of cutaneous leishmaniasis (CL) coexist: zoonotic CL (ZCL) due to *Leishmania major*, anthroponotic CL (ACL) due to *Leishmania tropica*, and sporadic CL due to *Leishmania infantum*. While *L. tropica* CL has been endemic for decades in Center-South rural regions with a low number of human cases, in the late 1990s new epidemic urban foci emerged in the North, and then in the South. Today, *L. tropica* is widely distributed in Morocco.

In spite of preventive measures in the field, the disease still extends beyond the original boundaries and overlap with the other forms. From an initial and recognized rural hypoendemic anthroponotic transmission, the recent foci are now urban (or peri urban) and epidemic. This means that an animal reservoir is probably implicated in the maintenance of the parasite and its transmission during the active sand fly season, and thus its extension. In Africa and in the Middle-East an animal reservoir has been suspected and sometimes confirmed.

In Morocco, 2 dogs presenting with visceral leishmaniasis and infected with *L. tropica* were diagnosed in recent human CL foci in the late 1990s. Thus field surveys are urgently needed in order to look for mammals (dogs, rodents …) that could be suitable and efficient reservoirs of the parasite.

Finally, one should be aware of the transmission of potential viscerotropic *L. tropica* strains from animals to humans, and its impact on the epidemiology and management of human visceral leishmaniasis in the Mediterranean region.

#52 TH17 CELLS ARE ASSOCIATED WITH PATHOLOGY IN HUMAN URINARY SCHISTOSOMIASIS

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Introduction: It is globally estimated that more than 200 million people are infected with Schistosoma. *Schistosoma haematobium* infection that is often clinically silent can be associated with life-perilous consequences such as urinary tract damage. In inflammatory diseases, Th17 cells have been shown to mediate pathological reactions in tissues, while regulatory T cells have been identified to downregulate inflammatory reactions. Here we evaluated the balance between Th17 and regulatory T cells in human *Schistosoma haematobium-related* pathology in the Northern of Senegal where schistosoma infection is endemic.

Methodology: We selected three groups of children aged from 5 to 14 years, with and without pathology, with and without infection. Schistosoma infection status has been assessed using filtration and Kato-Katz test respectively on urine and stool, and abdominopelvic ultrasound technique was used to assess schistosomiasis-specific pathology in liver and urinary tract. Using flow cytometry, we performed T helper subsets characterization through their transcription factor and cytokine expression.

Results: Our results have shown that *S. haematobium* infected-children with bladder wall pathology express significantly more Th17 cells (CD4+RORγt+ and CD+IL-17+-producing T cells) than those without pathology. Moreover, the Treg/Th17 ratio (CD4+Foxp3+/CD4+RORγt+ ratio or CD4+IL-17+/CD4+IL-10+ ratio) was

significantly lower in children with pathology, indicating that in *Schistosoma haematobium* infected-children with pathology, the Treg/Th17 balance tends to evolve towards Th17 cells.

Conclusion: These results indicate that Th17 cells may be involved in urinary pathology in *haematobium* schistosomiasis.

#57 POSSIBLE USE AND EFFICACY OF RECOMBINANT CANINE ADENOVIRUS TYPE VACCINE EXPRESSING RABIES VIRUS GLYCOPROTEIN AS ORAL VACCINE IN DOMESTIC DOG POPULATIONS IN SOUTH AFRICA

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The fight against rabies requires a muti-pronged approach. It is dependant on various factors working in unison to achieve a singel goal- the elmination of rabies. The Kwa-zulu Natal rabies eradication programme acts as a showcase study along with two other areas to demonstrate that it is indeed possible to elimate and control rabies. One focus area of this project is the development of possible new vaccines against rabies for use in dogs.

Research into new vaccine candidates against rabies virus have focused on recombinant viruses, with one such possibility being a recombinant canine adenovirus type 2 expressing the rabies virus glycoprotein (CAV2-RG).The use of such a vaccine as oral adjunct to parenteral vaccination in domestic dogs would possibly be hampered by the presence of existing antibodies against CAV2.This study investigated the level of pre-existing immunity in domestic dog populations in South Africa. Surveillance at 2 geographically distinct sites showed between 40 and 60% seropositivity against CAV2. Furthermore the impact of pre-existing immunity against CAV2 on the efficacy of the recombinant vaccine was tested in captive Beagle puppies that were immunised with CAV2 before being immunised with the recombinant vaccine. Seroconversion levels were monitored against CAV2 as well as rabies virus. All animals that received a single dose of CAV2-RG showed dramatic increase in levels of neutralising antibodies against CAV2, but no detectable levels of neutralising antibodies against RABV were present and animals succumbed to lethal infection upon challenge with canine RABV variant. Selected individuals received a booster dose of CAV2-RG and these animals showed seroconversion against RABV and survived subsequent challenge with canine RABV variant. Due to the high level of pre-existing antibodies against CAV2 in the target population as well as the neutralising effect these antibodies have on the CAV2-RG vaccine, it would appear that other alternatives for application as recombinant vaccines need to be investigated for use in these settings.

#64 BOVINE TUBERCULOSIS IN CATTLE IN MORRUMBALA DISTRICT, MOZAMBIQUE

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Bovine tuberculosis (BTB) is one of the most important zoonotic infectious diseases in cattle worldwide. Due to economic and logistic problems, very little is known about the prevalence and epidemiology of BTB in farmed animals in Mozambique, In non-systematic regionally restricted BTB surveys conducted from 2005 to 2010 positive cases have varied from 5 to 50% of the cattle tested. Due to the close vicinity to the neighbouring country Malawi with estimated BTB prevalence of more than 10% and frequent contacts of men and animals across the border in Morrumbala district BTB prevalence of 10% to 20% have been expected. The generation of robust data as basis to implement and evaluate control (intervention) measures and the investigation of the impact of un-controlled animal movement across the border to the spreading of the disease using high resolution genotyping of the pathogen are the main objectives of this study. Furthermore, the suitability of different immunological diagnostic methods will be evaluated. A preliminary number of 128 out of approximately 3.000 cattle were analysed. Twenty animals (15,62%) showed a positive reaction, 35 animals (27,34%) an inconclusive and 73 animals (57,03%) a negative reaction. One SICTT positive reactor animal was slaughtered and a lesion compatible with BTB was found in the retropharyngeal lymph node. It is planned to test altogether 800 – 850 cattle in order to get a detailed picture of *M. bovis* prevalence and molecular heterogeneity in Morrumbala. The study is funded by ICONZ as well as the German Research Foundation (DFG).

#68 SOCIO-CULTURAL RESEARCH ON THE NEGLECTED ZOONOTIC DISEASES IN AFRICA: A REVIEW OF THE LITERATURE AND OUTLINE FOR A FUTURE RESEARCH AGENDA

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A number of endemic zoonoses in Africa (anthrax, bovine tuberculosis, brucellosis, cysticercosis, echinococcosis, leishmaniasis, rabies and zoonotic trypanosomiasis) have recently been termed 'neglected zoonotic diseases' (NZDs) calling attention to their effect on poor, marginalised communities, underestimated burden and low prioritisation. The NZDs present unique control challenges as they involve issues at the human-animal-ecosystem interface where they impose a dual burden on communities, compromising livelihood status through reductions in livestock health while causing human morbidity and mortality. Following a number of contemporary review articles on the existent social science literature on tropical diseases, this paper will review published work on socio-cultural factors relevant to the spread and control of the NZDs.

Results show that studies touching on socio-cultural factors are largely conducted by veterinarians as an appendage to epidemiological field studies and to a much lesser extent economic analysis. A limited number of knowledge, attitude and practice (KAP) surveys appear the extent of direct engagement but are unaware of their methodological limitations. Studies touching on gender dynamics, belief and value systems, traditional knowledge, decision making processes, societal organisation, market structures and human-livestock-ecosystems interaction relevant to the NZDs are sparse and limited.

Understanding socio-cultural factors are fundamental to designing and implementing effective control programmes to combat the NZDs. Presently, there is a lack of social scientists working on social and cultural issues relevant to tropical livestock and zoonotic diseases generally and the NZDs in particular. A future research agenda should appreciate the importance of socio-cultural studies complementing scientific inquiries and technical interventions.

 # 71 SPATIO-TEMPORAL PATTERNS AND SPECIES DISTRIBUTION OF BRUCELLOSIS IN NIGERIA, 2001 – 2010

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We describe the species distribution, temporal and geographical patterns associated with serological and bacteriological evidence of brucellosis in Nigeria during 2001 - 2010.

In this descriptive, retrospective study, we used official diagnostic reports and epidemiological surveys on brucellosis from the Brucellosis Research Laboratory, NVRI, Vom.

Overall, 6,901 samples were analyzed from 21 States and the Federal Capital Territory (FCT) using combination of tests. About 17.2% (1185/6901) of the tested samples were positive for brucellosis. In cattle, 860/4986 (17.2%) of tested were positive by at least one test. In sheep 41/395 (10.4%), goat 101/558 (18.1%), dogs 36/193 (18.7%), horses 34/130 (26.2%), camel 61/164 (37.2%), pigs 3/7 (42.9%) and 49/462 (10.6%) humans. The proportion of positive to tested samples was highest in 2006 (44.5%) and gradually decreased to its lowest of 9.9% in 2009. In 2010, the proportion again rose to 14.5%. Brucellosis was confirmed from FCT and 19 of the 21 States from which samples were analyzed. The proportion of positive results from these States ranged from 2.8% - 48.3%. The North-eastern States of Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe had combined positivity of 15.8% (284/1794), the North-western States of Kaduna, Kano, Katsina and Sokoto was 7.4% (92/1241) while the North-central States of Benue, Kogi, Nasarawa, Niger, Plateau and FCT had combined positivity of 19.9% (719/3622). Ekiti, Ogun, Ondo, Osun and Oyo States in South-west Nigeria had a combined positivity of 39.0% (71/182).

Brucellosis is wide spread in Nigeria, affects multiple species and poses serious economic and public health challenges.

72 COMBINING OXFENDAZOLE TREATMENT AND TSOL18 VACCINATION IN PIGS TO CONTROL TAENIA SOLIUM TAENIASIS/CYSTICERCOSIS COMPLEX IN CAMEROON

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Taenia solium cysticercosis has been studied in detail in Cameroon in both pigs and man during the past decade. Surveys have been undertaken in the major pig breeding areas of the country, particularly in the northern, the western, and the north- west regions. From these surveys, it was found that all conditions are present for the transmission of *T. solium* from humans to pigs and vice versa in these endemic regions. Strategies for taeniasis/cysticercosis control can be focused on measures targeting the intermediate host (pigs), the definitive host (humans) or a combination of both. Recently the first field test of the TSOL18 vaccine, a new and highly effective tool for prevention of *T. solium* infection in pigs developed at the University of Melbourne, was undertaken in North Cameroon. The vaccine comprises a host-protective protein from the oncosphere. It was cloned from mRNA and expressed in *Escherichia coli* as a fusion protein with glutathione S-transferase (GST) The trial in which 240 pigs were involved was an outstanding success, with parasite transmission being entirely eliminated through the combined use of the vaccine and a single treatment of the animals with oxfendazole. The general strategy adopted for the trial was to vaccinate piglets at 2-3 months of age and give a booster immunisation 4 weeks later. At the time of the second immunisation, the pigs were given oxfendazole to kill any parasites that may already have established in the animals prior to vaccination. Controls were similarly treated with anthelmintic so that any effects of the procedure could be associated with vaccination *per se*. This approach might be an interesting tool to control porcine cysticercosis in endemic areas in Cameroon and, indirectly, reduce the number of new cases of neurocysticercosis in humans. Currently, work is ongoing to examine how this approach can be implemented in other pig breeding regions of the country.

73 SEROPREVALENCE OF BRUCELLA ABORTUS AND OTHER BRUCELLA SPECIES IN WILDLIFE-LIVESTOCK A CASE STUDY OF MIKUMI-SELOUS ECOSYSTEM

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Brucellosis is one of the important zoonoses worldwide caused by *Brucella species*. A study to establish seroprevalence and risk factors in livestock-wildlife interface was carried out. There is lack of information on status of the disease in pastoral and agro-pastoral livestock and wild animal populations which interact in vast region of Mikumi-Selous ecosystem. Blood samples from 747 cattle, 196 goats, 168 sheep and 60 buffaloes were collected by venipuncture into plain vacutainer tubes. Other opportunistic samples from wild animals were collected from hunters kills. These include 4 elephants, 6 buffalloes, 6 wildbeests, 2 heartbeests, 4 bushbucks, 2 reedbucks, 1 zebra, 1 impala and 1 sable. One sample of impala was collected from a road kill. Rose Bengal Plate Test (RBPT) was used followed by Competitive Enzyme Linked Immunosorbent Assay (c-ELISA) test to confirm the results. The tests were used to detect antibodies against brucellosis in sera obtained from sampled blood. The RBPT results showed 13.9% of cattle, 0.5% of goats, 0.6% of sheep and 7.7% of buffaloes seroprevalence. However, when sera were subjected to c-ELISA test, the results observed were similar except for buffaloes which was 13.6% seroprevalence.

Overall seroprevalence of brucellosis for livestock bordering Mikumi-Selous ecosystems was found to be 14.1% for cattle, 0.5% for goats and 0.6% for sheep. The seroprevalence of brucellosis for wild animals at Mikumi National Park was found to be 13.6% for buffaloes while none of the species from Selous Game Reserve seroconverted to brucella antibodies. Based on these serological tests it was concluded that brucellosis is present in pastoral and agro-pastoral livestock bordering Mikumi-Selous ecosystem and wild animals in Mikumi National Park. On the other hand Selous Game Reserve was found to be free of brucellosis. Wild and domestic animals interaction phenomenon in Mikumi-Selous ecosystem can as well be viewed as a significant means with which brucellosis is maintained in such ecosystem.

Questionnaires were also dissemminated to 137 pastoralist households to determine risk factors of transmission of the disease in the animal populations.

Univariate analysis of risk factors of transmission of brucellosis by regression analysis showed that records of abortions (p=0.004, OR=3.200) and cases of retained placenta (p=0.035, OR=2.737) in the herds/flocks were statistically significant. But when multivariate analysis was carried out only records of abortions in herds and flocks was statistically significant (p=0.017, OR=2.737).

From this study there is evidence that brucellosis is present in population of livestock in Kilosa, Kilombero, Mvomero and Ulanga Districts which border Mikumi-Selous ecosystem and Mikumi National Park. Therefore, control measures recommended includes public health educations, routine screening tests for human being with history of intermittent fever, routine surveillance of animals accompanied with proper measures for positive cases. Others include vaccinations of cattle in the area, formulation of legislations or updating of existing legislations concerning testing of animals and animal products, controlled movement of animals within the country, quarantine and preventative policies. TANAPA should construct sustainable water bodies for wild animals and furtherance of research.

#75 MULTILOCUS SEQUENCE TYPING OF CAMPYLOBACTER JEJUNI AND CAMPYLOBACTER COLI STRAINS OF POULTRY, BOVINE AND HUMAN ORIGIN IN PLATEAU STATE, NIGERIA

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Campylobacter jejuni and *Campylobacter coli* are the leading cause of zoonotic enteric infections in developed and developing countries. Molecular strain typing is essential in understanding the epidemiology of *Campylobacter* infections, especially in developing countries. We used multilocus sequence typing (MLST) technique to analyse 60 randomly selected isolates (36 poultry, 13 cattle and 11 humans) from Plateau state, Nigeria. From the 60 isolates (36 *C. jejuni*; 24 *C. coli*) genotyped, 43 sequence types (ST) were identified with 23 (53.5%) being new. From the 36 *Campylobacter jejuni* isolates sequenced, a total of 21 sequence types were identified with 9 (42.9%) being new. The most common sequence type was ST1932 (6 isolates, 28.6%), followed by ST1036 and ST607 (3 isolates, 14.3%). From the 24 *Campylobacter coli* isolates sequenced, a total of 22 sequence types were identified with 14 (63.6%) being novel. 34 STs were grouped in to 8 clonal complexes (CC) while 9 (20.9%) were unassigned. CC-828 (n = 16; 26.7%) was the most prevalent followed by CC-460 (n = 14; 23.3%) and CC -353 (n = 5; 10%). Certain CC appears to be associated with hosts (CC-607 poultry and human isolates only; CC-354 and CC-574 poultry isolates only; CC-22 human isolates only). The results of this study showed that *Campylobacter* strains isolated are highly diverse with *C. jejuni* being more diverse than *C. coli*. This study also revealed that certain ST and CC are associated with source of isolation; this is an important epidemiological finding in tracing back source of an infection.

76 MONITORING DRUG EFFECTIVENESS IN KALA-AZAR IN BIHAR, INDIA: COST AND FEASIBILITY OF PERIODIC RANDOM SURVEYS VS. A HEALTH SERVICE-BASED REPORTING SYSTEM

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***Background and Objective*:** Visceral leishmaniasis (VL) is a chronic infectious disease that is of major public health importance in the state of Bihar in India. A regional VL Elimination Initiative was launched in 2005 based on the use of the oral drug miltefosine. However, concerns were raised about development of drug resistance. Drug effectiveness cannot be assessed accurately based on the current recording and reporting system of health facilities. In 2009 a random survey was conducted in Muzaffarpur district to document the clinical outcomes of VL patients treated by the public health care system in 2008. We analyze the operational feasibility and cost of such periodic random survey as compared to health facility based routine monitoring.

***Methods*:** A random sample of 150 patients was drawn out of 1879 VL patients treated in 2008 by the 14 Primary Health Care centers (PHCs) of Muzaffarpur district. Patient records, maintained in the registers kept at these PHCs, were examined and the patients were located at their residence. Two more repeated visits were given to find patients who were untraceable during first visit. Both patients and physicians were interviewed with the help of two

specifically designed questionnaires by a team of one supervisor, one physician and one field worker. Costs incurred during this survey were properly documented and vehicle log books were maintained for present analysis.

***Results*:** Only 115 (76.7%) of the patients could be located in the first effort and finally 11 patients were not traceable on account of erroneous recording of patients' characteristics and addresses at the CHCs. Total cost of the survey amount to US$ 2603.14 and consumed 76 team-days. Per patient follow-up cost was US$ 15.51 and on average 2.27 patients could be visited per team-day. Human resource involvement constituted 75% of the total cost whereas involvement of physician costs 51% of the total cost. Twenty-eight per cent of VL patients (95% CI 20–35%) needed retreatment. Especially patients treated with antimonials (sodium stibogluconate) had a poor treatment outcome: 40% (95%CI 28–52%) of these required a second course of treatment, whereas only 15% of the 40 patients treated with miltefosine (95% CI 3–27%) did. There were some discrepancies between the results obtained through review of the health centre records and those obtained through interviews with patients.

***Interpretation and conclusion*:** The recording and reporting system currently in use in the health facilities was unable to generate the essential information on treatment outcomes. A random survey to document clinical outcomes is costly and labor intensive, but gives probably the most accurate information on drug effectiveness. A health service based retrospective cohort reporting system modeled on the monitoring system developed by tuberculosis control programs could be a better alternative. Early case detection, supervised treatment at door-step for better drug compliance, and post-treatment 6 month follow-up is the need of time for effective control of the disease. Involvement of community health workers in such monitoring would offer the additional advantage of treatment supervision and support.

#77 UNDER-REPORTING OF ZOONOTIC TRYPANOSOMIASIS IN AN ENDEMIC FOCUS IN UGANDA: RELATIONSHIP BETWEEN INFECTIONS IN CATTLE RESERVOIR AND HUMAN HOST OF DISEASE

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Human African trypanosomiasis (HAT) is a focal affliction of rural dwellers in remote sub Saharan Africa. Whilst it's an occupational hazard for fishing, hunting, herding or water/honey/firewood collection, affected localities have characteristic weak health systems or face social instability. Furthermore, existing health infrastructures prioritize pandemic diseases like HIV/AIDS and malaria neglecting low health priority ones like HAT. Caused by either *T. brucei rhodesiense* (acute) or *T. b. gambiense* (chronic), when correctly identified, infected individuals (including those that may be asymptomatic) can be treated; thus saving lives and reducing both transmission risks and geographical spread of infection. Currently the two species are spatially discrete; however they are at their closest in Uganda, the only country where both chronic and acute human infective forms occur within a single nation. In the last decade, acute disease has spread from the endemic south of the country as a result of cattle movement; thus drawing closer to localities endemic for the chronic disease in the north. This encroachment prompted initiation of Stamp Out Sleeping sickness (SOS) campaign by targeting the cattle reservoir of disease within newly effected, and at risk, in the centre of the country. The impact was a decrease in incidence in cases from the area within the campaign period. In the neighbouring older endemic focus however, cases continued to be recorded between large scale epidemic episodes. Here we evaluate the extent to which the cattle reservoir and human host population have both been infiltrated by human infective *T. b. rhodesiense* in known endemic foci.

#79 THE EPIDEMILOGY AND PUBLIC HEALTH IMPORTANCE OF CANNINE LEISHMANIASIS IN AMUDAT DISTRICT,UGANDA

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Visceral *Leishmaniasis* is an important public health disease amongst the Pokot pastoralists in Amudat district in Uganda. It is known that sand flies which suck blood from dogs infected with canine *leishmaniasis* are responsible for a prevalence of 15% of *visceral leishmaniasis* in Karamoja region. A cross sectional study was performed in all the villages of Amudat district using the dip Stick method and microscopic examination of lymph node biopsies. A total of 1245 dogs from 124 'Manyatas' were tested sequentially for *Leishmania* antibodies using the direct agglutination test or rK39 anti-gen-based dip sticks and microscopic examination of lymph node smears.

Prevalence of 14.1% was recorded in female dogs whiles 28.1% were recorded in the male dogs population; while prevalence of 12.6% for females and 25.7% for male using the dip sticks and microscopic smear examinations respectively were recorded. *Leishmania* prevalence was seen to vary according to area and grazing stategy. Age, Sex, geographical location and history of migrations were found to have independent effects on the seroprevalence. This study establishes that canine *leishmaniasis* is endemic in dog populations owned by pastoralist communities in Uganda. The implications of these findings with respect to the epidemiology, public health importance and control of canine *leishmaniasis* in Karamoja are discussed. This paper also discusses the strategies that could be used to control canine *leishmaniasis* given the challenges associated with nomadic pastoralism and insecurity in Karamoja region, Uganda.

#82 DYNAMIC OF TRANSMISSION OF PORCINE CYSTICERCOSIS IN ANGÓNIA DISTRICT, MOZAMBIQUE

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This study was conducted in four villages of an endemic area in Mozambique, to investigate incident cases of *Taenia solium* infection in pigs as indicators of ongoing transmission of the parasite. A total of 108 piglets aged 4 months were recruited and followed for 8 months. The animals were sampled and tested repeatedly for porcine cysticercosis by Ag-ELISA at 4, 9 and 12 months of age. Porcine cysticercosis was diagnosed in 5.6% (95% CI: 2.1 - 11.7), 33.3% (95% CI: 23.7% - 44.1%) and 66.7% (95% CI: 55.5% - 76.9%) of the animals, for the first, second and third sampling rounds, respectively, and varied by villages. The incidence rate of porcine cysticercosis increased significantly from 3.8 cases per 100 pig-months between 4 and 9 months of age, to 19.3 cases per 100 pig-months between 9 and 12 months of age (incidence ratio difference = 15.5; 95% CI: 12.5 - 18.5). Factors that enhance the transmission of *T. solium* cysticercosis are present in the study area, though control and educational programmes for the community should be initiated to build awareness of the transmission and impact of *T. solium* infections.

#83 DOG SOCIAL STATUS AND PROBLEM OF PARASITIC ZOONOSIS TRANSMISSION IN MOROCCO

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For the last decades, the dog population in Morocco increased exponentially due to cultural factors and lack of management strategy. At the same time, economic losses caused by diseases in ruminants reached significant levels (losses by cattle and sheep amount to approximatively 40dh, 25dh respectively). Listed human cases of rabies, echinococcosis, and leishmaniasis are increasing and their medical and surgical treatments are highly costing. Studies in different regions of Morocco have shown that the presence of the dog at the farm level in rural areas is about 95%. The number of dogs per household ranges from 2 to 9 dogs. Most of these dogs benefit from no veterinary supervision and the majority of them are stray dogs. In most cases these dogs have access to all areas of the locality and sometimes very close to houses. The fate of newborn dogs is uncertain since about 80% of them are abandoned. The results show also that more than 70% of dogs visit all the souks of the week and travel sometimes more than 100 of kilometers per week, accentuating the risk of spread of pathogens. Parasitological examination of these dogs showed the presence of fleas, ticks, ascaris, filaria, Leishmania, Ehrlichia and Echinococcus granulosis with prevalence's varying from 15 up to 80%. Close relationship between dog and human and awareness and perception of the risk of transmission of diseases were also studied and will be discussed.

#84 A CROSS SECTIONAL SURVEY ON THE PREVALENCE OF BRUCELLOSIS IN DOMESTICATED ANIMALS AT A WILDLIFE LIVESTOCK INTERFACE.

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Brucellosis prevalence and burden of disease is unknown in many rural areas where there is a close association of people and their livestock. The complexity of the epidemiology of a zoonotic disease, such as Brucellosis, could be increased due to the close proximity of wildlife. This cross sectional study aims to quantify the sero-prevalence of *Brucella abortus* in cattle, goats, pigs and dogs in such a setting and isolate and type Brucella organisms from positive individuals. The testing methods used are Rose-Bengal Test (RBT), Enzyme-linked Immunosorbant Assay (ELISA) and for isolation Intra-dermal Brucellin Skin test and typing techniques. The initial testing of ten percent of the cattle for brucellosis showed that 1.5% were ELISA sero-positive, although in some groups the prevalence was as high as 13% (95% CI 5-31%). The sero-positive herds are to be retested with RBT and the positives tested with the skin test. Two skin test positive individuals will be slaughtered to isolate the organism by post mortem. Pigs, goats and dogs are to be tested to see if there is spillover into other species due to the close association of the different species. This study will give a comprehensive overview of B*rucella abortus* prevalence in this setting in domesticated animals.

 # 86 PREVALENCE OF BOVINE TUBERCULOSIS IN ARSI ZONES OF OROMIA, ETHIOPIA

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A study to determine the prevalence of bovine tuberculosis (TB) was conducted on 625 animals (140 local Arsi cattle breeds and 485 of their crosses with pure Holstein Friesians) randomly selected from four districts of Arsi Zone and West Arsi Zone, Oromia, Ethiopia, using comparative intradermal tuberculin (CIT) test. An overall individual animal prevalence of 12.16% was recorded under traditional animal husbandry system in the study area. The higher percentage of positive results in tested animals was recorded in Arsi Zone (15.8%) where as the lower percentage of positive results was found in the West Arsi Zone (8.9%). There was statistically significant difference ($\chi 2 = 5.44$; P-value = 0.0196) in individual prevalence between the two Zones. Other epidemiological risk factors including age, sex, breed, and reproductive status of the animals were assessed for their role in the prevalence of the disease. Accordingly, a statistically significant ($\chi 2 = 4.49$, P-value = 0.0340) difference between the type of animal breeds and their reactivity to the tuberculin test were found even though not for the other epidemiological factors. This study therefore, showed that bovine TB was present in Arsi Zone and West Arsi Zone, Oromia, thus calling for further detail study on farmer awareness in its transmission for public health risks and formulation of strategic control measures in order to reduce associated economic as well as zoonotic effects.

 # 88 ASSESMENT OF BACTERIOLOGICAL QUALITY OF RAW CAMELS' MILK IN AB-'ALA, NORTH EASTERN ETHIOPIA

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In most pastoralists, camel milk management is poor and always consumed either fresh or in varying degrees of sourness in the raw state without heat treatment thus, can pose a health hazard to the consumer. This study was there fore, aimed to determine the bacteriological quality of raw camels' milk from udder and milking vessels in Ab-'Ala through the assessment of standard plate count (SPC) and identification of bacteria genera/species. The bacterial isolates from the milking vessels were *Escherichia coli* (25 %), *Rhodococcus equi* (25 %), *Alcaligens spps (*12.5 %), *Pasteurella haemolytica* (10.71 %), *Acinetobacter spps* (10.71 %), pathogenic *Staphylococcus aureus* (7.14 %), *Pseudomonas spps* (5.35 %), non pathogenic *Staphylococcus spps (1.79* %) and *Bacillus spps (*1.79 %). The isolates from udder were pathogenic *Staphylococcus aureus* (31.82%), *Rhodococcus equi* (22.73%), *Acinetobacter spps* (18.18%), non pathogenic S*taphylococcus spp* (9.09%), *Pasteurella haemolytica (*9.09%), *Escherichia coli* (4.54%) and *Alcaligens spps* (4.54%). Species of *Pseudomonas* and *Bacillus* were isolated from the milking vessels only. Among 34 samples collected directly from the udder, 15 samples (44.12 %) were free of

growth of mesophilic bacteria. According to the comparisons made with bacteriological standards of raw milk as prescribed by Bureau of Indian Standards (BIS), the bacteriological quality of the 35 samples collected from the milking vessels was 2 (5.7%) very good, 9 (25.71%) good, 11 (31.43%) fair, 11 (31.43%) poor and 2(5.7%) very poor. On the other hand, out of 34 milk samples collected from the udder, 32 (94.12 %) were graded as very good and 2 (5.88%) fair. The difference in bacterial load among the two types of specimens was statistically significant (R^2= 0.02, F= 0.49, P-value=0.002). The results of this research had indicated that milk is getting contaminated by the handling of pastoralists.

#89 USE OF RANDOM AMPLIFIED POLYMORPHIC DNA (RAPD) ANALYSIS FOR THE IDENTIFICATION OF POTENTIAL MOLECULAR MARKERS FOR T.B. BRUCEI, T.B. RHODESIENSE AND T.B. GAMBIENSE

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T. brucei subspecies are responsible for sleeping sickness and domestic and wild animals' trypanosomosis, the first animal disease of most sub-Saharan African countries. Disease control relies on accurate diagnosis and effective treatment of mammal hosts and on tsetse control. The existing parasitological and single copy gene molecular diagnostic tools are not fully effective to discriminate the three subspecies warranting the need for more sensitive diagnostic tools. Therefore, RAPD was used to find subspecies specific conserved differences for *T.b. brucei*, *T.b. rhodesiense* and *T.b. gambiense*. Subspecies specific DNA fragments were obtained with P2, P8, ILO 525 and 606 (RAPD) and REV-B-MGE primers. DNA fragments of interest were extracted from gel, cloned, sequenced and analysed by NCBI-nucleotide blast yielding successful sequences for the PCR products from *T.b. rhodesiense*, *T.b. gambiense* and *T.b. brucei* that were homologous to the expression site-associated gene 5 (ESAG5), the putative conserved dual specificity protein phosphatase (DSPase) and the ATP-dependent DEAH-box RNA helicase, respectively. However, those DNA sequences were also present in other kinetoplastids. In this study we optimised and standardised the RAPD conditions, but further investigation of the obtained amplification profiles is needed making use of the recently sequenced genomes of *T.b. brucei* and *T.b. gambiens*e.

 # 90 MYCOBACTERIUM BOVIS INFECTION IN LIVESTOCK WORKERS IN IBADAN, NIGERIA: EVIDENCE OF OCCUPATIONAL EXPOSURE

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Bovine tuberculosis (BTB) is an endemic problem in the cattle population in Nigeria and this is complicated by cultural practices that predispose livestock workers and other occupationally exposed groups to risk of infection with *Mycobacterium bovis.* In this study, a cross sectional screening of livestock traders (LT) was conducted for tuberculosis through sputum sample collection and administration of questionnaire. The specimens were cultured and isolates identified through molecular analysis using deletion typing and spoligotyping.

Culture result revealed the isolation of mycobacteria from 37.14% (26/70) of the LT screened. Molecular characterization using deletion typing technique revealed different *Mycobacterium species* (*M. bovis*=2; *M. tuberculosis*=5 and unclassified mycobacteria species=19). Four of the seven *Mycobacterium tuberculosis* complex (MTC) isolates available for spoligotyping were identified as two *M. bovis* (belonging to the Africa 1 clonal complex) and two *M. tuberculosis* respectively. Risk factors associated with infection among these workers included more than three years in livestock related business and history of cough of more than three weeks.

Our findings revealed that pulmonary infection with *M. bovis* remains a possible route of transmission among occupationally exposed workers in settings endemic with BTB. Thus, giving credence to the possibility that occupationally exposed individuals are likely sources of spread of *M. bovis* to the larger community. There is therefore the need to step up control measures against BTB and intensify public health enlightenment among workers occupationally at risk especially in countries with high burden of BTB.

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