International Joint Conference
Society for Tropical Veterinary Medicine
and Wildlife Disease Association

Wildlife and Livestock
Disease and Sustainability:
What makes sense?

22-27 July 2001
Kwa Maritane Lodge and Bakubung Bush Lodge,
Pilanesberg National Park, South Africa

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LETTER FROM STVM PRESIDENT: PAUL GIBBS

Welcome to Kwa Maritane and the first ever joint conference of the Society for Tropical Veterinary Medicine and the Wildlife Disease Association. The organising committee and Event Dynamics, together with the help of our sponsors, have worked hard to make this a conference to remember!

Following the tradition of STVM, we have selected, together with WDA, a theme for the conference that is relevant to industrialised and developing nations alike. This year the theme is centered around diseases of wildlife and domestic livestock, and the relationship between conservation and sustainability.

What better place to examine this theme than the Pilanesberg National Park in South Africa? And what better partner than the Wildlife Disease Association (especially this year as they celebrate their 50th Anniversary)?

I look forward to meeting each of you and I wish you an enjoyable conference and visit to South Africa.

Paul Gibbs
President of STVM
LETTER FROM THE WDA PRESIDENT TONIE E. ROCKE

As president of the Wildlife Disease Association, it is my great pleasure to welcome you all to this important international conference hosted jointly by STVM and WDA. This meeting is particularly special to WDA as it marks our 50th anniversary as an international association, and I can think of no greater tribute to that occasion than an international meeting of this caliber at a beautiful and exciting venue like Pilanesburg National Park. It is also our Association's first meeting in South Africa and our first joint meeting with STVM, and it is with keen anticipation that we welcome this opportunity to make new friends and colleagues and perhaps to form new and productive alliances.

The conference theme of wildlife and livestock disease and sustainability is very timely and of great interest to both of our organisations and will certainly increase our understanding and appreciation of the biological, financial, and social issues and interactions between wildlife and animal agriculture. Hopefully, our discussions will also stimulate new and innovative ideas for conserving and managing both wild and domestic animals for optimal health and production, while retaining the ecological communities in which they reside, as well as their intrinsic value to society.

I recall the day Paul first approached WDA council about a joint meeting with STVM in South Africa and was very pleased when our council voted unanimously and enthusiastically to support such an endeavor, although it seemed far off at the time.

Many thanks to all those who have worked so hard and contributed so many unpaid hours to bring the conference to fruition, particularly Dave Jessup and Bob Bokma, our international conference chairs. I also personally want to thank our corporate sponsors who provided much needed funds to support participation by students and other colleagues with fewer financial resources.

I am quite certain that this year's meeting will be one of WDA's most notable, not only for the remarkable venue and fascinating scenery, but also for the outstanding programme put together by our organisers and the lasting impact of our collaboration with STVM and others interested in promoting the health and conservation of all animals.

Enjoy!

Tonie E Rocke
President of WDA
PROGRAMME OUTLINE
SUNDAY JULY 22, 2001

14:00 Earliest hotel check in time
14:00 Conference Registration opens at Kwa Maritane - Hippo room foyer
14:00 WDA Council Meeting at Kwa Maritane - Until 16:00 - Cheetah room
15:00 STVM Council Meeting at Kwa Maritane - Until 16:00 - Rhino room
16:15 Joint Council Meeting at Kwa Maritane - Until 17:00 - Cheetah room
17:30 Meeting with all Session Chairs and Co-Chairs - Hippo room
18:00 Meet-and-Greet and light Dinner at Kwa Maritane - Kwa Maritane Restaurant

MONDAY JULY 23, 2001

8:00 Opening Session - Tau & Nare room
8:40 Welcome and Business of the meeting - Tau & Nare room
9:00 SESSION 1: INTRODUCTION - Tau & Nare room
10:40 Refreshment break & Poster viewing
SESSION 2: POSTER SESSION - Rhino room
11:20 SESSION 3: DISEASE SCOURGES OF WILDLIFE AND LIVESTOCK
- Tau & Nare room
13:00 Lunch
14:00 SESSION 3: DISEASE SCOURGES OF WILDLIFE AND LIVESTOCK Continued
- Tau & Nare room
SESSION 4: SUSTAINABILITY - Tau & Nare room
15:50 Refreshment break & Poster viewing
16:10 SESSION 4: SUSTAINABILITY Continued - Tau & Nare room
17:10 Sessions to end for the day
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8:00</td>
<td>SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions</td>
</tr>
<tr>
<td></td>
<td>- Tau room</td>
</tr>
<tr>
<td></td>
<td>BACTERIA AND OTHER PATHOGENS</td>
</tr>
<tr>
<td>9:45</td>
<td>Refreshment break &amp; Poster viewing</td>
</tr>
<tr>
<td>10:15</td>
<td>VIRUSES</td>
</tr>
<tr>
<td>10:30</td>
<td>WDA STUDENT PAPERS</td>
</tr>
<tr>
<td>11:45</td>
<td>Lunch</td>
</tr>
<tr>
<td>12:15</td>
<td>STVM &amp; WDA Membership Meetings</td>
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<tr>
<td>13:00</td>
<td>TICKS</td>
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<tr>
<td>14:30</td>
<td>Sessions to end for the day</td>
</tr>
<tr>
<td>15:30</td>
<td>Bakubung residents depart from Bakubung reception on Game Drive</td>
</tr>
<tr>
<td>15:30</td>
<td>Kwa Maritane residents depart from Kwa Maritane reception on Game Drive</td>
</tr>
<tr>
<td>18:30</td>
<td>Arrival at Boma for dinner</td>
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**WEDNESDAY JULY 25, 2001**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8:00</td>
<td>SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions - Continued</td>
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<tr>
<td></td>
<td>- Tau room</td>
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<tr>
<td></td>
<td>TICK-BORNE DISEASES</td>
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<td></td>
<td>- Nare room</td>
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<td></td>
<td>TOOLS FOR MANAGEMENT</td>
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<tr>
<td>10:00</td>
<td>Refreshment break &amp; Poster viewing</td>
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<tr>
<td>10:20</td>
<td>ANTIGENS &amp; VACCINES</td>
</tr>
<tr>
<td>12:35</td>
<td>Lunch</td>
</tr>
<tr>
<td>13:20</td>
<td>BABESIA</td>
</tr>
<tr>
<td>15:05</td>
<td>Refreshment break &amp; Poster viewing</td>
</tr>
<tr>
<td>15:25</td>
<td>STVM STUDENT PAPERS</td>
</tr>
<tr>
<td>16:25</td>
<td>STVM STUDENT PAPERS - Continued</td>
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<tr>
<td>17:25</td>
<td>Sessions to end for the day</td>
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<tr>
<td>19:45</td>
<td>Banquet in Baobab room at Sun City Main Hotel</td>
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<td>Time</td>
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<td>8:00</td>
<td>SESSION 6: TUBERCULOSIS GENERAL SESSION - Tau &amp; Nare room</td>
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<tr>
<td>10:00</td>
<td>Refreshment break &amp; Poster viewing</td>
</tr>
<tr>
<td>10:25</td>
<td>SESSION 7: COMBINED SCIENTIFIC SESSION - Tau &amp; Nare room</td>
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<tr>
<td>12:25</td>
<td>Lunch &amp; LAST CHANCE FOR POSTER VIEWING</td>
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<td>13:40</td>
<td>SESSION 8: WHAT MAKES SENSE? - Tau &amp; Nare room</td>
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<tr>
<td>15:00</td>
<td>Refreshment break</td>
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<tr>
<td>15:20</td>
<td>SESSION 8: WHAT MAKES SENSE? Continued - Tau &amp; Nare room</td>
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<tr>
<td>16:40</td>
<td>SESSION 9: CLOSING SESSION</td>
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<td>17:00</td>
<td>Farewell cocktails</td>
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**THURSDAY JULY 26, 2001**

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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>8:00</td>
<td>Technical Tour departs from Bakubung</td>
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<tr>
<td>8:30</td>
<td>Technical Tour departs from Kwa Maritane with participants from both Lodges</td>
</tr>
<tr>
<td>8:30</td>
<td>SESSION 10: Tuberculosis Workshop commences - Cheetah room</td>
</tr>
<tr>
<td>10:00</td>
<td>Latest check out time at both Lodges for delegates departing on this day</td>
</tr>
<tr>
<td>10:00</td>
<td>Refreshment break</td>
</tr>
<tr>
<td>10:30</td>
<td>Tuberculosis Workshop continues</td>
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<tr>
<td>12:30</td>
<td>Lunch at Kwa Maritane for Workshop delegates</td>
</tr>
<tr>
<td>13:30</td>
<td>Tuberculosis Workshop continues</td>
</tr>
<tr>
<td>14:50</td>
<td>Refreshment break</td>
</tr>
<tr>
<td>16:30</td>
<td>Tuberculosis Workshop ends</td>
</tr>
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**FRIDAY 27 JULY 2001**

ALL POST-CONFERENCE TOURS DEPART FROM THE LODGE OF RESIDENCE

ALL RETURN TRANSFERS TO JOHANNESBURG INTERNATIONAL AIRPORT, DEPART FROM THE LODGE OF RESIDENCE
DEDICATION

The Society for Tropical Veterinary Medicine dedicates its 2001 Conference to

Dr Alain PROVOST

Dr Alain Provost was born in 1930 at Ezy-sur-Eure in Normandy, France. He is still living there and has been the deputy-mayor of his village for many years. He is married to Josette and has two married children so he is also a grand father. He graduated from the National Veterinary School of Alfort and received an award for his thesis. He graduated with a degree in mycology, microbiology and immunology from the Pasteur Institute in 1955. Straight away, he went to Chad, at the Farcha Research Laboratory, to work on virology, and specifically on RINDERPEST, for IEMVT. In 1961-62, he was a scientific advisor to Charles Mérieux, founder of the Merieux Institute. From 1962 to 1969 he was the head of Virology at Farcha and developed the « Bisec » vaccine against both RINDERPEST and CBPP, which was largely used in Africa. In 1969 he became director of this laboratory and Regional director of IEMVT for Central Africa, until 1976. From 1977 to 1988 he was Director General of IEMVT and largely responsible for the internationalisation of the Institute, its development outside Africa and the important evolution toward molecular biology. He has been retired since 1988 but remains very active in many international organisations such as the International Foundation of Science (IFS). He has published over 250 scientific papers and is a member or a correspondant of many scientific societies including the French Veterinary Academy and Overseas Scientific Academy. Dr Alain Provost is a member of the editorial board of several journals including Veterinary Microbiology, Tropical Animal Health and Production, OIE Review, EMVT Review. He was named « Extraordinary Professor » of the University of Pretoria. The list of medals he has received is too long to be included but one particular is « Chevalier de la Confrérie du Taste-Fromage », probably linked with his origin from Normandy, and the second one the Theiler Memorial Trust Award from South Africa. His Scientific influence, his devotion to tropical veterinary medicine together with his deeply human character are an example for many people.

Emmanuel Camus
The Dynamics of Maternal Antibodies to Hemorrhagic Disease Viruses (Reoviridae: orbivirus) in White-tailed Deer at an Enzootic Site
Joseph K. Gaydos¹, Darrell Kavanaugh¹, David Stallknecht¹, M.D. Murphy², 
¹Southeastern Cooperative Wildlife Disease Study, ²Department of Pathology, College of Veterinary Medicine, University of Georgia, Athens, Georgia, USA, and Eugene R. Fuchs, Kerr Wildlife Management Area, Deer Research Facility, Rt. 1, Box 180, Hunt, Texas, USA

Virus isolations and antibodies to viruses in both the epizootic hemorrhagic disease virus (EHDV) and bluetongue virus (BTV) serogroups have been reported from white-tailed deer (Odocoileus virginianus) in Texas (USA), but there are few reports of hemorrhagic disease (HD) in these populations. It has been hypothesized, but never proven, that this represents a case of enzootic stability where deer are protected from clinical HD by maternal antibodies, innate resistance, or both. In June and July of 2000, twelve native Texas white-tailed deer fawns were moved by two weeks of age from an outdoor white-tailed deer research facility at the Kerr Wildlife Management Area (Donnie E. Harmel White-tailed Deer Research Facility, Texas, USA) to an indoor facility at the University of Georgia. On July 17, 2000, serum neutralizing antibodies to one or more of five HD viruses (EHDV-1, EHDV-2, BTV-10, BTV-11, & BTV-17) were detected in 100% of the fawns. Serum neutralizing maternal antibodies to HD viruses were measured weekly through November 13, 2000, to track maternal antibody decline. On October 10, 2000 40 fawns that had remained outdoors in Texas were bled and had serum neutralizing antibody titers that suggested recent HD virus exposure. Additionally, EHDV-1 or 2 was isolated from 18% (7/40) of these fawns. Despite this, clinical hemorrhagic disease was not seen in these fawns. The (1) disappearance of maternal antibodies by October when HD epizootics and mortality are known to occur in other locations, (2) detection of antibodies and virus confirming active circulation of EHDV-1 and 2, and (3) the lack of clinical HD in these fawns support the concept that the maternal antibody component of the enzootic stability hypothesis is operative, but does not prevent infection during the animals first year or exclude the possibility of innate immunity.

WINNER’S BIOGRAPHY: Joseph K. Gaydos received his Bachelor of Science (B.S.) degree in biology from Virginia Polytechnic Institute & State University in 1989 and his Doctor of Veterinary Medicine (V.M.D.) from the University of Pennsylvania in 1994. He is currently completing his PhD at the University of Georgia where he also is employed at the Southeastern Cooperative Wildlife Disease Study as a Staff Veterinarian/Wildlife Disease Diagnostician. Prior work in Guatemala and Zimbabwe led to his current interest in tropical livestock production and disease interactions between livestock and free-ranging wildlife. His major professor is David E. Stallknecht, Assistant Professor of Medical Microbiology. Joe enjoys the great outdoors and spending time with his wife and two daughters.
WDA SCHOLARSHIP AND STUDENT AWARDS

The Wildlife Disease Association Student Awards Committee is pleased to announce the recipients of the 2001 Scholarship and Student Research Recognition Awards:

SCHOLARSHIP AWARD

This award is given annually to a student pursuing a graduate degree and who is judged to have the best academic track record and the most scholarly promise. Selection of a winning candidate is based on college and graduate school transcripts, and an assessment of the candidate's scholarly aptitude based on academic awards, scholarships, publications, and letters of recommendation. The winner of the award receives $US 2000. This year, the WDA Student Awards committee received 10 applications for the scholarship, all from North America (Canada and USA).

This year's recipient is Ms Lori Sheeler-Gordon who is currently a PhD candidate at Texas Tech University. Ms Sheeler-Gordon's interests are infectious disease, geographic information systems, and modeling. Her PhD project involves modeling of wildlife rabies, its transmission and perpetuation in raccoons. Ms Sheeler-Gordon had a very strong academic record and is the recipient of numerous academic awards and scholarships. In sum, Ms Sheeler-Gordon is a very deserving recipient of this award, and we wish her the very best in her career.

GRADUATE STUDENT RESEARCH RECOGNITION AWARD:

This award is given annually to the student judged to have the best research project in the field of wildlife diseases. Selection of a winning candidate is based on the quality of research, written communications (publication of results), and presentation of findings at professional meetings. The winner of the award receives $US 2000 payable towards attending that year's WDA meeting where she/he is also the featured speaker in the WDA student competition.

This year's recipient is Dr Melissa Miller who is currently a PhD candidate at the University of California, Davis. Dr Miller's research project is in the pathophysiology of protozoal encephalitis in California sea otters, and her efforts have produced some notable scientific milestones in the understanding of this disease in a critically endangered population of marine mammals. Dr Miller has previously also been the recipient of the WDA scholarship thereby demonstrating her academic credentials. Dr Miller shows every promise of continuing to contribute to the field of wildlife health, and we wish her the very best in her career.
CONFERENCE ORGANISERS

SOCIETY FOR TROPICAL VETERINARY MEDICINE

President
Paul Gibbs
College of Veterinary Medicine, University of Florida, Gainesville, Florida, USA

International Chair
Bob Bokma
USDA APHIS VS, Maryland, USA

Scientific Chair
Pat Conrad
University of California, Davis, California, USA

Local Committee
Theo de Waal (Chair)
ARC - Onderstepoort Veterinary Institute, Pretoria, South Africa

Dürr Bezuidenhout
ARC - Onderstepoort Veterinary Institute, Pretoria, South Africa

WILDLIFE DISEASE ASSOCIATION

President
Tonie Rocke
USGS / NWHC, Madison, Wisconsin, USA

International Chair
Dave Jessup
IWVS, Santa Cruz, California, USA

Scientific Chair
Jonna Mazet
University of California, Davis, California, USA

Local Committee
Emily Lane (Chair)
University of Pretoria, Pretoria, South Africa

EVENT DYNAMICS

Joint Managing Director
Sandra Collier

Co-ordinator
Millissa Pietersen

Senior Consultant
Mignon Potgieter

Proceedings are distributed to all meeting attendees. Abstracts were printed as submitted. The WDA does not regard the program abstracts as a publication and they should not be cited in scientific literature.
DETAILED PROGRAMME
SUNDAY JULY 22, 2001

14:00 **Earliest hotel check in time**
Delegates travelling from Johannesburg International Airport by official transfer, will be
dropped off at the Lodge of residence, ie Kwa Maritane or Bakubung Lodge
Delegates are requested to check in at their Lodge, prior to conference registration

14:30 **1st Transfer from Bakubung to Kwa Maritane for conference registration**

14:00 **Conference Registration opens at Kwa Maritane - Hippo room foyer**
* Collect conference documentation
* For STVM Paper & Poster and WDA Plenary Paper authors: Should you wish to have
  your full paper printed in the Proceedings after the conference, this is where you hand in
  your Copyright Transfer Agreement form, as well as a hard copy and copy on disk of your
  full paper

14:00 **WDA Council Meeting at Kwa Maritane - Until 16:00 - Cheetah room**
15:00 **STVM Council Meeting at Kwa Maritane - Until 16:00 - Rhino room**
15:15 **2nd Transfer from Bakubung to Kwa Maritane for conference registration**

16:00 **Transfer from Kwa Maritane to Bakubung**
* This is for delegates staying at Bakubung who travelled on the earlier transfers and wish
  to return to Bakubung for a while prior to returning for the Meet-and-Greet function

16:00 **Until 18:00 - All presenters using Powerpoint presentations, to hand in a disk
  (containing the presentation/s) to the Production crew. This is to ensure that
  all presentations are loaded timeously for the presentation/s. Tau & Nare room**
16:15 **Joint Council Meeting at Kwa Maritane - Until 17:00 - Cheetah room**
16:45 **3rd Transfer from Bakubung to Kwa Maritane for conference registration and
  Meet-and-Greet function**
17:30 **FINAL Transfer from Bakubung to Kwa Maritane for conference registration
  and Meet-and-Greet function**
17:30 **Meeting with all Session Chairs and Co-Chairs - Hippo room**
18:00 **Meet-and-Greet and light Dinner at Kwa Maritane - Kwa Maritane Restaurant**
* A full cash bar will be available during this function
* Delegates may sign for their drinks to their room accounts at both Lodges, but you need
  to provide your guest card from the Lodge of residence
18:00 **Conference Registration Desk closes**
19:30 **1st Transfer from Kwa Maritane to Bakubung**
20:00 **2nd Transfer from Kwa Maritane to Bakubung**
20:30 **FINAL Transfer from Kwa Maritane to Bakubung**
MONDAY JULY 23, 2001

6:30 Breakfast at Bakubung opens
7:00 Breakfast at Kwa Maritane opens
7:00 1st Transfer from Bakubung to Kwa Maritane
7:15 2nd Transfer from Bakubung to Kwa Maritane
7:30 FINAL Transfer from Bakubung to Kwa Maritane
8:00 Opening session - Tau & Nare room
A Photographic journey of South Africa with renowned South African journalist, Chris Marais. Chris' great love for Travel, for Africa and his passion for the Environment is reflected in his photographs and stories
8:40 Welcome and Business of the meeting - Tau & Nare room
Welcome by the Association Chairs: Bob Bokma for STVM & Dave Jessup for WDA

SESSION 1: INTRODUCTION - Tau & Nare room
Session Chairs: Jerry Saliki (STVM) & Torsten Mörner (WDA)
9:00 M. Artois Surveillance of Wildlife Diseases on the Global Scale
9:40 K. Frölich Mutual Transmission of Important Infectious Diseases between Livestock and Wildlife in Europe
10:00 E.T. Thorne Conflicts of Authority and Strategies to Address Wildlife Diseases
10:20 P. Gibbs The Role of Deer in the Spread of Foot-and-Mouth Disease
10:40 Refreshment break & Poster viewing

SESSION 2: POSTER SESSION - Rhino room
Session Chairs: Edmour Blouin (STVM) & James Sikarskie (WDA)
Poster viewing and discussion with Poster Authors
Posters will also be open for viewing during all the refreshment breaks throughout the conference

SESSION 3: DISEASE SCOURGES OF WILDLIFE AND LIVESTOCK
- Tau & Nare room
Session Chairs: Emmanuel Camus (STVM) & Richard Kock (WDA)
11:20 E. Camus Animal Diseases Scourges Affecting Wildlife and Livestock
12:00 J.M. Mwanzia A Review of Peste des petits Ruminants in Wildlife in United Arab Emirates
12:20 A.L. Michel Implications of Tuberculosis on African Wildlife and Livestock
12:40 A. A. Latif Buffalo-associated Theileria parva: The Risk of Buffalo Translocation into the Highveld of Zimbabwe
13:00 Lunch
SESSION 3: DISEASE SCOURGES OF WILDLIFE AND LIVESTOCK Continued
- Tau & Nare room

14:00  R.G. Botzler  Avian Cholera on Northcoastal California (USA) - A 50-year Retrospective
14:20  D.E. Green  Epidemiology of >50 Amphibian Morbidity and Mortality Events in the USA, 1996-2000
14:40  J. Okori  Brucellosis in Free-ranging Impala Sharing the Same Rangeland with Cattle in Lake Mburo National Park, Uganda

SESSION 4: SUSTAINABILITY - Tau & Nare room
Session Chairs: Gary Mullins (STVM) & Michael Kock (WDA)

15:00  M. Kock & G. Mullins  Introductory remarks
15:10  M. Uhart  500 years of Non-Sustainability: Reversing Historical Under-Development in Latin America
15:30  R.B. Martin  Post-Millennium Depression: People, Parks and Politics in Tropical Africa
15:50  Refreshment break & Poster viewing

SESSION 4: SUSTAINABILITY Continued - Tau & Nare room

16:10  G. Van Dyk  Achieving Ecological and Socio-economic Objectives in Pilanesberg National Park: Lion Re-introduction Project
16:30  E.N. Wambwa  A Review of the Wildlife Management Systems in Kenya with a View to the Role of Pastoralism in Sustainable Utilization of Wildlife
16:50  M. Murphree  Yankui’s Dilemma - Conservation Versus the People in Ghana
        N. Ellenbogen  Ownership Begins Here! Theatre as a Communications Key in Wildlife and Livestock Management Systems (Note that this presentation will be made during the Boma dinner on Tuesday evening)

17:10  Sessions to end for the day
17:20  1st Transfer from Kwa Maritane to Bakubung
17:50  2nd Transfer from Kwa Maritane to Bakubung
18:30  FINAL Transfer from Kwa Maritane to Bakubung

Evening at leisure
### TUESDAY JULY 24, 2001

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>6:30</td>
<td>Breakfast at Bakubung opens</td>
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<tr>
<td>7:00</td>
<td>Breakfast at Kwa Maritane opens</td>
</tr>
<tr>
<td>7:00</td>
<td>1st Transfer from Bakubung to Kwa Maritane</td>
</tr>
<tr>
<td>7:15</td>
<td>2nd Transfer from Bakubung to Kwa Maritane</td>
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<tr>
<td>7:30</td>
<td>FINAL Transfer from Bakubung to Kwa Maritane</td>
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<tr>
<td>8:00</td>
<td>O.A.E. Sparagano&lt;br&gt;PCR and Molecular Detection for Differentiating Vibrio Species</td>
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<tr>
<td>8:15</td>
<td>J-C. Maillard&lt;br&gt;Molecular Immunogenetics in Susceptibility and Resistance to Bovine Dermatophilosis - A Functional Candidate Gene Approach and a Concrete Field Application</td>
</tr>
<tr>
<td>8:30</td>
<td>J.L. Kiel&lt;br&gt;Basis for the Extraordinary Genetic Stability of Anthrax</td>
</tr>
<tr>
<td>8:45</td>
<td>L. Touratier&lt;br&gt;Development of Studies in Current Challenges of Dourine and Differentiation of <em>Trypanosoma equiperdum</em> / <em>T. evansi</em></td>
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<tr>
<td>9:00</td>
<td>H. Tamboura&lt;br&gt;Efficacy of <em>Balanites aegyptiaca</em> (L.) <em>Del balanitaceae</em> as Anthelmintic and Molluscicid used by Traditional Vet-healers in Burkina Faso</td>
</tr>
<tr>
<td>9:15</td>
<td>C.A. Speer&lt;br&gt;Early Diagnosis of Johne's Disease in the American Bison by Monoclonal Antibodies Directed Against Antigen 85</td>
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<tr>
<td>9:30</td>
<td>M.L. Dia&lt;br&gt;Outbreaks of <em>Trypanosoma evansi</em> in Mauritania</td>
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<tr>
<td>9:45</td>
<td>Refreshment break &amp; Poster viewing</td>
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**SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions**

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<th>Time</th>
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<tbody>
<tr>
<td>8:00</td>
<td>Session Chair: Olivier Sparagano&lt;br&gt;O.A.E. Sparagano&lt;br&gt;PCR and Molecular Detection for Differentiating Vibrio Species</td>
</tr>
<tr>
<td>8:15</td>
<td>J-C. Maillard&lt;br&gt;Molecular Immunogenetics in Susceptibility and Resistance to Bovine Dermatophilosis - A Functional Candidate Gene Approach and a Concrete Field Application</td>
</tr>
<tr>
<td>8:30</td>
<td>J.L. Kiel&lt;br&gt;Basis for the Extraordinary Genetic Stability of Anthrax</td>
</tr>
<tr>
<td>8:45</td>
<td>L. Touratier&lt;br&gt;Development of Studies in Current Challenges of Dourine and Differentiation of <em>Trypanosoma equiperdum</em> / <em>T. evansi</em></td>
</tr>
</tbody>
</table>

**SESSION 5.1: BACTERIA AND OTHER PATHOGENS**

- Tau room

**SESSION 5.1: WDA STUDENT PAPERS**

- Nare room

**SESSION Chair: Thierry Work**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>M.A. Miller&lt;br&gt;Protozoal Meningoencephalitis in Harbor Seals (<em>Phoca vitulina richardsi</em>) and Sea Otters (<em>Enhydra lutris nereis</em>) in California</td>
</tr>
<tr>
<td>8:15</td>
<td>P.C. Cross&lt;br&gt;Modeling the Effects of Host Movement and Vaccination on the Control of Bovine Tuberculosis in African Buffalo</td>
</tr>
<tr>
<td>8:30</td>
<td>J.K. Gaydos&lt;br&gt;Innate Host Resistance and Differences in Clinical Disease Severity between Two Groups of White-Tailed Deer Experimentally Infected with Epizootic Hemorrhagic Disease Virus (<em>Reoviridae: orbivirus</em>)</td>
</tr>
<tr>
<td>8:45</td>
<td>G. Ghneim&lt;br&gt;Leptospirosis Epidemics in California Sea Lions, 1995-2000</td>
</tr>
<tr>
<td>9:00</td>
<td>P.C. Halpin&lt;br&gt;Hematozoa and Arthropod Parasites of Turkey Vultures in Humboldt County, California</td>
</tr>
<tr>
<td>9:15</td>
<td>G. Kalema&lt;br&gt;Tuberculosis Survey in Cape Buffalo (<em>Syncerus caffer</em>), Cattle and Humans at the Wildlife / Domestic Interface in Uganda</td>
</tr>
<tr>
<td>9:30</td>
<td>K.R. Kimber&lt;br&gt;Serologic Survey of Selected Viral, Bacterial, and Protozoal Agents in Captive and Free-Ranging Ungulates from Central Kenya</td>
</tr>
</tbody>
</table>
SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions continued
SESSION 5.2: VIRUSES
- Tau room
Session Chair: Brian McCluskey

10:15 F.L.M. Roger  
(presented by C.Y.M. Rahantamalala)  
Epidemiological Features of African Swine Fever in Madagascar

10:30 S. Fagbo  
The Evolving Transmission Pattern of RVF in the Arabian Peninsula

10:45 E.W. Howerth  
Experimental Vesicular Stomatitis in Horses

11:00 B.J. McCluskey  
Use of Sentinel Herds to Study the Epidemiology of Vesicular Stomatitis in Colorado, USA

11:15 W. Vosloo  
The Possible Role that Buffalo Played in the Recent Outbreaks of Foot and Mouth Disease in South Africa

11:30 Lunch

SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions continued
SESSION 5.3: Ticks
- Tau room
Session Chair: Sidney Ewing

13:00 N. Barre  
(presented by M. De Garine-Wichertitsky)  
Effects of the Association of Cattle and Rusa Deer (Cervus timorensis russa) on the Maintenance of Viable Cattle Tick Boophilus microplus Population

13:15 R.G. Pegram  
Eradication of the Tropical Bont Tick in the Caribbean: Is the Caribbean Amblyomma Program in a Crisis?
<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:30</td>
<td>M.J. Burridge</td>
<td>Control and Eradication of Reptilian Tick Infestations, with Particular Reference to Vectors of Heartwater</td>
<td>J. Hars</td>
<td>An Epidemic of West Nile Fever in South of France: Results of an Epidemiologic Survey on Wild Birds</td>
</tr>
<tr>
<td>13:45</td>
<td>P. Tassi</td>
<td>Tick-borne Diseases (TBDS) of Dairy Cows in a Mediterranean Environment: A Clinical, Serological and Haematological Study</td>
<td>D.E. Green</td>
<td>Comparative Pathology of Iridovirus Infections in Tadpoles, Frogs and Salamanders</td>
</tr>
<tr>
<td>14:00</td>
<td>G.H. Bechara</td>
<td>Ticks Associated with Armadillo <em>Euphractus sexcinctus</em> and Anteater <em>Myrmecophaga tridactyla</em> of Emas National Park, State of Goias, Brazil</td>
<td>L.H. Creekmore</td>
<td>Diagnosis of Chronic Wasting Disease in a Captive Elk Herd in Montana</td>
</tr>
<tr>
<td>14:15</td>
<td>S.A. Ewing</td>
<td>Transmission of American Canine Hepatozoonosis by Ixodids</td>
<td>M.A. Wild</td>
<td>Use of Tonsillar Biopsies for Ante-Mortem Diagnosis of Chronic Wasting Disease in Captive Mule Deer</td>
</tr>
</tbody>
</table>

14:30 **Sessions to end for the day**

14:40 **1st Transfer from Kwa Maritane to Bakubung**

15:00 **FINAL Transfer from Kwa Maritane to Bakubung**

15:30 **Bakubung residents depart from Bakubung reception on Game Drive**

15:30 **Kwa Maritane residents depart from Kwa Maritane reception on Game Drive**

18:30 **Arrival at Boma for dinner**

Nicholas Ellenbogen Ownership Begins Here! Theatre as a Communications Key in Wildlife and Livestock Management Systems

20:45 **1st Return Transfer to Kwa Maritane and Bakubung**

This is for delegates who wish to return earlier. PLEASE NOTE that no vehicle will depart before the vehicle is fully loaded with passengers.
**WEDNESDAY JULY 25, 2001**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>6:30</td>
<td>Breakfast at Bakubung opens</td>
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<tr>
<td>7:00</td>
<td>Breakfast at Kwa Maritane opens</td>
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<tr>
<td>7:00</td>
<td>1st Transfer from Bakubung to Kwa Maritane</td>
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<tr>
<td>7:15</td>
<td>2nd Transfer from Bakubung to Kwa Maritane</td>
</tr>
<tr>
<td>7:30</td>
<td>FINAL Transfer from Bakubung to Kwa Maritane</td>
</tr>
<tr>
<td></td>
<td><strong>SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions continued</strong></td>
</tr>
<tr>
<td></td>
<td><strong>SESSION 5.4: TICK-BORNE DISEASES - Tau room</strong></td>
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<tr>
<td></td>
<td><strong>Session Chair: Suman Mahan</strong></td>
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<tr>
<td>8:00</td>
<td>K.M. Kocan</td>
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<tr>
<td></td>
<td>Antigenic Variation of <em>Anaplasma marginale</em> in Persistently Infected Ticks</td>
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<tr>
<td>8:15</td>
<td>G. Lynen</td>
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<tr>
<td></td>
<td>Cerebral Theileriosis in African Short-horn Zebu Cattle is caused by <em>Theileria tarostragi</em></td>
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<tr>
<td></td>
<td>and not by <em>Theileria parva</em></td>
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<tr>
<td>8:30</td>
<td>O.A.E. Sparagano</td>
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<td></td>
<td>Pan Mediterranean Comparison for the Molecular Detection of <em>Theileria annulata</em></td>
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<tr>
<td>8:45</td>
<td>E.F. Blouin</td>
</tr>
<tr>
<td></td>
<td>An Assay to Evaluate the Role of <em>Anaplasma marginale</em> Major Surface Proteins 1a and 1b in Infection of Cultured Tick Cells</td>
</tr>
<tr>
<td>9:00</td>
<td>S. Semu (presented by S.M. Mahan)</td>
</tr>
<tr>
<td></td>
<td>Comparison of Specificity and Sensitivity of the MAP 1B recombinant protein with a synthetic MAP 1B peptide for diagnosis of <em>Cowdria ruminantium</em> infection</td>
</tr>
<tr>
<td>9:15</td>
<td>W.H. Stoltsz</td>
</tr>
<tr>
<td></td>
<td>Diagnostic Tests for the Detection of <em>Theileria</em> spp. Carrier Infections and their Implications for Translocation of African Buffalo (<em>Syncerus caffer</em>) in South Africa</td>
</tr>
<tr>
<td>9:30</td>
<td>M.A. Bakheit</td>
</tr>
<tr>
<td></td>
<td>The Innate Resistance of Kenana Cattle to Tropical Theileriosis (<em>Theileria annulata</em> infection) in the Sudan</td>
</tr>
<tr>
<td>9:45</td>
<td>R.C. Rosatte</td>
</tr>
<tr>
<td></td>
<td>Restoration of Elk (<em>Cervus elaphus</em>) in Ontario, Canada</td>
</tr>
<tr>
<td>10:00</td>
<td>Refreshment break &amp; Poster viewing</td>
</tr>
</tbody>
</table>
SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions continued
SESSION 5.5: ANTIGENS & VACCINES
- Tau room
Session Chair: Kathy Kocan

10:20 W.C. Davis
Use of the Mannan Receptor to Selectively Target Vaccine Antigens for Processing and Antigen Presentation through the MHC Class I and II Pathways

10:35 G.R. Reddy
Contributions of MHCII, TLR4 and NRAMP1 Genes in Conferring Cellular Immunity to *Ehrlichia chaffeensis*

10:50 J. De la Fuente
Function and Evolution of Major Surface Protein 1A of the Ehrlichial Pathogen *Anaplasma marginale*

11:05 K.M. Kocan
Tick Cell Culture Derived *Anaplasma marginale* as an Immunogen for Cattle

11:20 I. Esteves
*Cowdria ruminantium* Antigens of Around 15kDa are Potent Inducers of IFN-γ

11:35 A. Nyika
(presented by S.M. Mahan)
DNA Vaccines Encoding MAP 1 Genes of *Cowdria ruminantium*, the Agent of Heartwater, Protect DBA/2 Mice Against Lethal Challenge

11:50 S.M. Mahan
An Inactivated Vaccine Protects Cattle, Sheep and Goats Against Heartwater

12:05 D.S. Davis
Safety of *Brucella abortus* and RB51 and Strain 19 Vaccines in Coyotes (*Canis latrans*)

12:20 H.G. van Rensburg
Construction and Evaluation of a Recombinant Foot-and-Mouth Disease Virus: Implications for Inactivated Vaccine Production

12:35 Lunch

SESSION 5.5: SURVEILLANCE
- Nare room
Session Chair: Tonie Rocke

10:20 M.L. Drew
Health Surveillance of Rocky Mountain Bighorn Sheep (*Ovis canadensis*) in Idaho: The Aftermath of an Outbreak of Pneumonia

10:35 D.E. Stallknecht
Isolations of EHD and BT Viruses from White-tailed Deer in the Southeastern United States, 1990 to 2000

10:50 T. Mörner
Epizootiological Investigations on Bovine Viral Diarrhea Virus (BVDV) in Moose (*Alces alces*) and Roe Deer (*Capreolus capreolus*) from Sweden

11:05 E.S. Williams
Evil Eyes: Infectious Keratoconjunctivitis in Mule Deer (*Odocoileus hemionus*)

11:20 M.M. Uhart
Disease Interactions in Native Mara (*Dolichotis patagonum*) and Exotic Herbivores in the Patagonia Steppe

11:35 T. Rocke
Avian Vacuolar Myelinopathy in Southeastern US: The Search for the Causative Agent

11:50 C. van Riper III
A comparison of Endangered Southwestern Willow Flycatcher Blood Parasites: Arizona, USA and Chomes, Costa Rica

12:05 W.R. Hansen
Duck Plague Field and Vaccine Virus Carrier Waterfowl Identified by PCR in England, UK and Maryland, USA

12:20 C. Gortazar
Epidemiological and Clinical Study of an Outbreak of Avian Pox in Red-legged Partridges (*Alectoris rufa*) in Southern Spain
SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions continued

SESSION 5.6: BABESIA
-Tau room
Session Chair: Banie Penzhorn

13:20 P.A. Conrad
Phylogenetic Relationships of Piroplasm Isolates from Humans and Animals Inferred from the 18s Nuclear Small Subunit RNA Gene

13:35 A. Kocan
A Genotypically Unique Babesia gibsoni-like Parasite Recovered from a Dog in Oklahoma

13:50 W. Goff
The Age-related Innate Immune Response in Calves to Babesia bovis Involves IL-12 Induction and IL-10 Modulation

14:05 A. Pardini
Sequestration of Parasitised Erythrocytes in Canine Babesiosis

14:20 L.S. Jacobson
Nitric Oxide Metabolites in Naturally Occurring Canine Babesiosis (presented by F. Reyers)

14:35 T. Vaughan-Scott
Serum Tumour Necrosis Factor in Naturally Occurring Canine Babesiosis (presented by F. Reyers)

14:50 B.L. Penzhorn
Feline Babesiosis in South Africa: An Update

15:05 Refreshment break & Poster viewing

SESSION 5: GENERAL SCIENTIFIC SESSIONS - Parallel sessions continued

SESSION 5.7: STVM STUDENT PAPERS - Tau room
Session Chair: Michael Burridge

15:25 J.K. Gaydos
The Dynamics of Maternal Antibodies to Hemorrhagic Disease Viruses (Reoviridae: orbivirus) in White-tailed Deer at an Enzootic Site

15:40 F. Claes
The Expression of RoTat 1.2 Variable Antigen Type in Trypanosoma evansi and T. equiperdum

15:55 I. Esteves
IFN-γ as an Indicator of Immunization in Goats Vaccinated with a Killed Cowdria ruminantium Vaccine

SESSION 5.5: SURVEILLANCE
-Nare room
Session Chair: Tonie Rocke

S. Rossi
Survey of Classical Swine Fever in the Northern French Vosges Wild Boar Population

R.M. Mercado
Reproductive Behaviour of Captive White-tailed Deer in Relation to Progesterone Level in Does, Mexico

V. Adamczak
Function of Scent-marking Behaviour in South African Oribis (Ourebia ourebi)

P. Mukiria
Impact and Control of Vector-Borne Diseases in the Livestock-Wildlife Interface of Transmara District, Kenya

S.I. Boardman
Foot-and-Mouth Disease: Providing Information on the Cost and Consequences of Different Management Techniques

T.M. Work
Development of Tools to Monitor Health of Coral Reefs

J.T. Saliki
Emerging Morbillivirus Infections of Marine Mammals: Diagnostic Approaches

L.N. Measures
Seroprevalence of Toxoplasma gondii in Canadian Phocids - An Example of Pathogen Pollution?
16:10  D.D. Wilson
Challenges of Regulating the Importation of Reptiles into the United States

D.A. Jessup
Update on the Southern Sea Otter (Enhydra lutris nereis): Are they Trying to Tell us Something about Marine Ecosystem Health?

SESSION 5.8: IMMOBILIZATION
Nare room
Session Chair: Dave Jessup

16:25  G.K. Gitau
Sustainability of Dairy Heifer Calf Production in Smallholder Dairy Farms in the High Potential Areas of Kenya

M.D. Stetter
Chemical Immobilization of Free Ranging South American Fur Seals (Arctocephalus australis)

16:40  H. van Heerden
Major Outer Membrane Proteins of Cowdria ruminantium Encoded by a Multigene Family

J.M. Arnemo
Risk Assessment of Etorphine Immobilization in Moose: A Review of 1,347 Captures

16:55  M.J. Burridge
Increasing Risks of Introduction of Heartwater onto the American Mainland Associated with Animal Movements

M. Bush
Using A3080, Medetomidine and Ketamine for Anesthesia of Problem Free-ranging African Hoofstock

17:10  H.O. Sanon
Effects of Sheep and Goats Grazing on Vegetation Dynamic in Low-ground Pasture

17:25  Sessions to end for the day

17:35  1st Transfer from Kwa Maritane to Bakubung

18:05  2nd Transfer from Kwa Maritane to Bakubung

18:20  FINAL Transfer from Kwa Maritane to Bakubung

19:00  1st Transfer from Kwa Maritane to Sun City
1st Transfer from Bakubung to Sun City

19:15  2nd Transfer from Kwa Maritane to Sun City
2nd Transfer from Bakubung to Sun City

19:30  FINAL Transfer from Kwa Maritane to Sun City
FINAL Transfer from Bakubung to Sun City

19:45  Banquet in Baobab room at Sun City Main Hotel
Dress code: Smart casual

22:30  1st Transfer from Sun City to Kwa Maritane
1st Transfer from Sun City to Bakubung

23:15  2nd Transfer from Sun City to Kwa Maritane
2nd Transfer from Sun City to Bakubung

0:30   FINAL Transfer from Sun City to Kwa Maritane
FINAL Transfer from Sun City to Bakubung
PLEASE NOTE: There are NO other transfers returning from Sun City to Bakubung after this time.
### SESSION 6: TUBERCULOSIS GENERAL SESSION - Tau & Nare room

**Session Chair: Anita Michel**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>S.M. Schmitt</td>
<td>Bovine Tuberculosis in Michigan Wildlife and Livestock</td>
</tr>
<tr>
<td>8:15</td>
<td>D. Gavier-Widen</td>
<td>The Spectrum of Pathology from <em>M. bovis</em> Infection in European Badgers (<em>Meles meles</em>) and its Implications for Disease Control</td>
</tr>
<tr>
<td>8:30</td>
<td>M.L. Coetzee</td>
<td>Scientific Tools as a Practical Aid in the Management of Tuberculosis in African Wildlife</td>
</tr>
<tr>
<td>8:45</td>
<td>J.S. Nishi</td>
<td>The Hook Lake Wood Bison Recovery Project: Preliminary Results of an Attempt to Eradicate Bovine Tuberculosis and Brucellosis from Free-ranging Bison in Northern Canada</td>
</tr>
<tr>
<td>9:00</td>
<td>J.S. Nishi</td>
<td>Wildlife and Agricultural Policy as it Relates to Eradication of Bovine Tuberculosis and Brucellosis in Free-ranging Bison of Northern Canada</td>
</tr>
<tr>
<td>9:15</td>
<td>K.A. Alexander</td>
<td>The Zoonotic Importance of <em>Mycobacterium tuberculosis</em>: A Potential Threat to Free-ranging Wildlife Populations?</td>
</tr>
<tr>
<td>9:30</td>
<td>J.B. Payeur</td>
<td>Mycobacterial Isolations in Captive Elephants in the United States</td>
</tr>
<tr>
<td>9:45</td>
<td>J.B. Payeur</td>
<td>Bovine Tuberculosis in Michigan Wildlife</td>
</tr>
</tbody>
</table>

**Refreshment break & Poster viewing**

### SESSION 7: COMBINED GENERAL SCIENTIFIC SESSION - Tau & Nare room

**Session Chairs: Pat Conrad (STVM) & Jonna Mazet (WDA)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:25</td>
<td>B.H. Bokma</td>
<td>Balancing International Animal Movement Restrictions with Animal Health Status and Veterinary Infrastructure</td>
</tr>
<tr>
<td>10:40</td>
<td>M. De Garine -Wichatitsky</td>
<td>Adult Tick Burdens and Habitat use of Sympatric Wild and Domestic Ungulates in a Mixed Ranch of Zimbabwe: no Evidence of a Direct Relationship.</td>
</tr>
<tr>
<td>10:55</td>
<td>M. Giacometti</td>
<td>Domestic Sheep but not Alpine Chamois is a Reservoir of <em>Mycoplasma conjunctivae</em> in Switzerland</td>
</tr>
<tr>
<td>11:10</td>
<td>C.J. Gortázar</td>
<td>Aujeszky Disease in a Wild Boar Population from Central Spain</td>
</tr>
<tr>
<td>11:25</td>
<td>A.S. Ahl</td>
<td>Public Health Considerations of Human Consumption of Wild Game</td>
</tr>
</tbody>
</table>
11:40 S.L. Deem  
Serosurvey for Selected Infectious Disease Agents in Free-ranging Gray Brocket Deer (Mazama gouazubira) and Domestic Cattle and Goats in the Gran Chaco, Bolivia

11:55 L.E. Rogers  
Equine Infectious Anemia in Free Roaming Horses in the Uintah Basin region of Utah, USA.

12:10 M.D. Kock  
Buffalo in Botswana: Political Football, Disease Threat or a Rural Asset?

12:25 Lunch & LAST CHANCE FOR POSTER VIEWING

SESSION 8: WHAT MAKES SENSE? - Tau & Nare room  
Session Chairs: Paul Sutmoller (STVM) & William Karesh (WDA)

13:40 R.S. Windsor  
Relating National Veterinary Services to the Country's Livestock Industry: Case Studies from four Countries - Great Britain, Botswana, Peru, and Vietnam

14:00 T. Mömer  
Health Monitoring and Conservation of Wildlife in Sweden and Northern Europe

14:20 R.A. Kock  
Wildlife and Pastoral Society - Shifting Paradigms in Disease Control

14:40 P. Sutmoller  
What makes sense? Disease Aspects of the Fencing Issue

15:00 Refreshment break

SESSION 8: WHAT MAKES SENSE? Continues

15:20 M.K. Stoskopf  
Livestock Wildlife Interactions in the Marine Environment

15:40 P.A. Conrad  
New Interactive Web- and CD- based Teaching Modules on International Animal Health Problems of Wildlife, Livestock and Horses

16:00 W.R. Lance  
(Written by B. Zimmerman)  
Wildlife Disease? Livestock Disease? Who Pays the Bills?

16:20 S.A. Osofsky  
Can the Wildlife Disease Association (WDA) and the Society for Tropical Veterinary Medicine (STVM) Help the International Donor Community Reevaluate "What Makes Sense" in Regards to Wildlife and Livestock Diseases and Sustainability?

SESSION 9: CLOSING SESSION

16:40 Closing Remarks by Association Presidents: Paul Gibbs for STVM & Tonie Rocke for WDA

17:00 Farewell cocktails

17:15 1st Transfer from Kwa Maritane to Bakubung

18:00 2nd Transfer from Kwa Maritane to Bakubung

19:00 FINAL Transfer from Kwa Maritane to Bakubung
FRIDAY JULY 27, 2001

6:30  Breakfast at Bakubung opens
7:00  Breakfast at Kwa Maritane opens

ALL POST-CONFERENCE TOURS DEPART FROM THE LODGE OF RESIDENCE

ALL RETURN TRANSFERS TO JOHANNESBURG INTERNATIONAL AIRPORT, DEPART FROM THE LODGE OF RESIDENCE

8:00  Technical Tour to Onderstepoort departs from Bakubung
      For residents at Bakubung, transfer will continue to Kwa Maritane

8:20  Only Transfer from Bakubung to Kwa Maritane
      This is mainly for delegates who registered to attend the TB Workshop

8:30  Technical Tour to Onderstepoort departs from Kwa Maritane with participants from both Lodges
      For delegates who registered to take part in the Technical tour of the Faculty of Veterinary Science and the Onderstepoort Veterinary Institute in Onderstepoort, Pretoria.

SESSION 10: WORKSHOP "PATHOLOGY OF TUBERCULOSIS IN WILDLIFE"
- Cheetah room. For pre-registered participants only.

Moderators: Prof N. Kriek and Dr Dolores Gavier-Widen

PROVISIONAL PROGRAMME

9:00  Welcome words - Global importance of TB in Wildlife: Prof N. Kriek
9:05  Announcements: Dolores Gavier-Widen
9:10  Introduction: Pathology of bovine tuberculosis in cattle: Prof Prozesky
9:20  Immunopathology of tuberculosis in cattle: Prof Bill Davis
9:30  Pathology of TB in deer, deer and cattle models for vaccine testing: Dolores Gavier-Widen
9:40  Open for discussion on cattle and deer TB
10:00 Histopathology of cattle and deer sections at the microscopes

10:00 Latest check out time at both Lodges for delegates departing on this day
      Luggage may be stored at the lodge reception for delegates departing later than this time.

10:30 Refreshment break for Workshop delegates

SESSION 10: WORKSHOP "PATHOLOGY OF TUBERCULOSIS IN WILDLIFE"
Continued

11:00 TB in South African wildlife: Prof Kriek
11:50 Discussion of TB in South African and other African wildlife
12:00 Histopathology South African / African sections

12:30 Lunch for Workshop delegates
      For delegates registered to attend the TB Workshop
SESSION 10: WORKSHOP "PATHOLOGY OF TUBERCULOSIS IN WILDLIFE"
Continued

13:30  TB in European wildlife: Christian Gortazar and Dolores Gavier-Widen
14:10  Discussion on TB in European wildlife
14:20  Histopathology European wildlife
14:50  **Refreshment break for Workshop delegates**

SESSION 10: WORKSHOP "PATHOLOGY OF TUBERCULOSIS IN WILDLIFE"
Continued

15:10  **PROGRAMME TO BE CONFIRMED**
TB in American and Canadian wildlife
TB in New Zealand and Other countries
Open for TB in zoo animals, discussions, informal presentations and histopathology: all participants

16:30  **Tuberculosis Workshop to end**
POSTER ABSTRACTS
Listed in Alphabetical Order

1. A.J. Bourdichon
   The Pharmacokinetics and Tissue Residues of Diminazene, Diminazene-liposomes and Trypan in Rabbits

2. M.P. Combrink
   Residual Effect of Anti-Babesial Drugs on the Live Redwater Blood Vaccines

3. V.G. DelVecchio
   Rapid Genotyping of B. anthracis Strains by Real-time PCR

4. G. DelVecchio

5. A. Diallo
   (presented by G. Libeau)
   Goat Immune Response to Capripox Vaccine Expressing the Hemagglutinin Protein of Peste des petits Ruminants

6. S. Ducornez
   (presented by M. De Garine-Wichatitsky)
   Tick Reference Collection of the Late Dr P.C. Morel: A Tool for Tick Taxonomists and Veterinarians

7. V. Ezenwa
   Patterns of Variation in Herbivore Fecal Egg Counts Explained by Diet Type and Cumulative Rainfall

8. W. Glawischnig
   An Outbreak of Salmonella dublin in Free-living Chamois (Rupicapra rupicapra); Epidemiological Investigation using DNA-fingerprinting

9. J. Hars
   Classical Swine Fever in Wild Boar in France. Results of a Serological Study of Gruntlings Captured in the Northern Vosges Mountain Range

10. M. Hofmeyr
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    Amino Acid Content of Cell Cultures Infected with Cowdria ruminantium Propagated in a Protein-free Medium

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19. L.S. Mukai
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21. J.S. Nishi
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23. E.C. Passos
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(presented by G.H. Bechara)
PAPER ABSTRACTS
SESSION 1

INTRODUCTION
Surveillance of Wildlife Diseases on the Global Scale


OIE Wildlife Disease Working Group, Paris, France

During the past decades, movement and translocation of wildlife, including zoo animals, domestic and free-ranging wildlife, has increased world-wide. To reduce the risk of introducing new diseases into new areas and animal populations, significant diseases of wildlife in different parts of the world have been reported on an annual basis to a permanent Working Group of the OIE, the World Animal Health Organisation. The OIE is an intergovernmental international organisation based in Paris, France. Its main duty is to secure international trade in animals and their products by harmonisation of regulations and by informing the OIE Delegate of each Member Country (often the Chief Veterinary Officer of the country) of outbreaks of disease. In 1992, on the initiative of its former Director General, Dr Jean BLANCOU, an ad hoc group of experts on diseases of wildlife was created. This group sent a questionnaire to all OIE Delegates asking them to report on the main diseases that were occurring in their country. Since then, the group has improved its data collection procedure and the accuracy of these data. A range of experts were also sent the questionnaire. In 1994, the OIE International Committee agreed to give this ad hoc group the permanent status of OIE Working Group on Wildlife Diseases. This Group meets annually and reports on occurrences of significant diseases of wildlife worldwide. In addition, statements and recommendations on significant topics related to wildlife diseases are made by the group at the request of the OIE or on its own initiative.

Animal diseases are listed by the OIE according to their seriousness and contagiousness. Among list A diseases, classical swine fever in European wild boars, foot and mouth disease (FMD) in African hoofed mammals, and Newcastle disease in cormorants mainly from the USA and Canada region were regularly reported. Among list B disease, Anthrax in Africa, and bovine tuberculosis (TB) and rabies in a wide range of species across many continents are also reported frequently. The Working Group has also established a 'Wildlife list' including diseases that cause, or can cause, serious problems for wildlife in different parts of the world.

Other topics covered by the Group include the sanitary risk associated with the translocation of wild animals, necropsy procedure, and difficulties associated with the specificity of diagnostic tests for some infections, namely TB. Several significant events were recorded in a range of species from apes to frogs.

The efficiency of the annual report of the Working Group has been improved. Any problems that remain are associated with a bias in the countries providing data – most coming from the Northern Hemisphere – or with difficulties either in reporting sensitive diseases or assessing the efficacy of control methods: FMD and TB are especially problematic regarding these aspects. Most of the data gathered through the Group's reporting system are relayed to the OIE Delegates through the annual report, which is also sent to all contributors. Many of the topics addressed by the Working Group are to be presented in a forthcoming issue of the OIE Scientific and Technical Review.
Diseases of Humans and their Domestic Mammals: Pathogen Characteristics, Host Range and the Risk of Emergence

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Pathogens that can be transmitted between different host species are of fundamental interest and importance from public health, conservation and economic perspectives, yet systematic quantification of these pathogens is lacking. Here, pathogen characteristics, host range and risk factors determining disease emergence were analysed by constructing a database of disease-causing pathogens of humans and domestic mammals. The database consisted of 1415 pathogens causing disease in humans, 616 in domestic ungulates and 374 in domestic carnivores. Multi-host pathogens were very prevalent amongst human pathogens (61.6%) and even more so amongst domestic mammal pathogens (livestock 77.3: carnivores 90.0%). Pathogens able to infect human, domestic and wildlife hosts comprised a similar proportion of disease-causing pathogens for all three host groups. 196 pathogens were associated with emerging diseases, 175 in humans, 29 in livestock and 12 in domestic carnivores. Across all these groups, helminths and fungi were relatively unlikely to emerge whereas viruses, particularly RNA viruses, were highly likely to emerge or be OIE pathogens. The ability of a pathogen to infect multiple hosts, particularly hosts in other taxonomic orders or wildlife, were also risk factors for emergence and OIE pathogens. Close co-operation between medical, veterinary and wildlife researchers is clearly essential in order to understand the complex epidemiology of multi-host pathogens.
Mutual Transmission of Important Infectious Diseases between Livestock and Wildlife in Europe

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Although many data on infectious diseases in wildlife are available in various European countries, there is more need for systematic surveillance and co-ordinated research. Successful oral vaccination of foxes (Vulpes vulpes) against rabies has been practised in Europe since 1978 and has intensively reduced the occurrence of this disease in foxes. Classical swine fever (hog cholera) is affecting wild boars (Sus scrofa) and domestic pigs in several parts of Europe. Mutual transmission between pigs and wild boars mainly occurs by ingestion of virus-contaminated food or water. Presently, hog cholera has been officially recorded in wild boars in six European countries: Germany, Italy, Austria, France, Slovakia and Czech Republic. Mutual transmissions of myxomatosis and rabbit haemorrhagic disease in domestic and wild rabbits (Oryctolagus cuniculus) are reported in many European countries. Both diseases in combination have dramatically reduced local rabbit population densities. In 1985, a new disease was identified in Swedish moose (Alces alces), designated as Ālvsborg disease. This wasting syndrome probably has a multi-factorial aetiology. Studies of bovine viral diarrhoea (BVD) in Germany have indicated that distinct BVDV-strains might circulate in free-ranging roe deer (Capreolus capreolus) populations and that virus transmission is independent of domestic livestock. Sequence analysis of the BVDV isolated from roe deer showed a unique position of this roe deer strain within the BVDV group I. Similar results were obtained in a serological survey of alpha-herpesviruses in deer from Germany. Serological surveys performed in different free-ranging ungulate species revealed the presence of alphaherpesviruses related to bovine herpesvirus-1 in seven European countries. In a study of malignant catarrhal fever in deer in Germany, the seroprevalence and positive PCR results detected in sheep samples, which originated from the same area as the antibody-positive fallow deer (Cervus dama), might indicate that in this case sheep are the main reservoir animals. In eastern Germany, European wild boars were investigated for the occurrence of pseudorabies virus infections, which appear to be endemic in the wild boar population and persist separately without affecting the domestic pig population. Contagious ecthyma is a common disease in domestic sheep and goats and can also affect several wild ungulates, e.g. chamois (Rupicapra rupicapra), muskox (Ovibos moschatus), and reindeer (Rangifer tarandus). Important bacterial diseases like tuberculosis, paratuberculosis, brucellosis, and tularemia are transmitted between livestock and wildlife. Bovine tuberculosis in Europe is still periodically reported from Spain, Italy and the UK. The presence of a common Mycobacterium (M.) bovis genotype for example in wild boars and cattle in northern Italy as well as in cattle, badgers, and deer in the UK confirms the possible interspecies transmission. Paratuberculosis has been reported from different wild animal species. It is not yet clear whether several ruminant species like red deer (Cervus elaphus) and ibex (Capra ibex) are infected by domestic animals. Brucellosis is affecting a broad range of livestock and wildlife in all European countries. Brucella suis biovar II infection recently increased in domestic pigs, leading to the assumption that a reservoir in wild boar and European brown hare (Lepus europaeus) was a source of this pathogen. Tularemia, which mainly occurs in rodents and lagomorphs, may also affect domestic animals. In Scandinavia outbreaks in hares have been reported in the last few years.
Conflicts of Authority and Strategies to Address Wildlife Diseases

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Although the same basic methods are used to study, diagnose, and manage diseases of domestic animals and wild animals, managers of wild animal diseases face significant difficulties that are relatively unimportant in management of diseases of domestic animals. Some of these difficulties are inherent in the wild nature of truly free-ranging animals, while others are related to a lack of knowledge and/or tools necessary to effectively manage diseases of concern. All of these difficulties are compounded by varying perceptions of ownership and management jurisdiction. In addition, wild animals capture the interest of diverse constituencies, including some advocacy groups that have little concern for the health of domestic animals. Many important wildlife disease problems may be successfully managed for the benefit of both wildlife and livestock interests. Success will depend on sharing both responsibility and support for such management among a broad range of agencies and constituencies, on setting realistic goals and timetables for disease management in free-ranging populations, and on recognizing and overcoming technical challenges unique to managing the health and viability of valuable wildlife resources.
The Role of Deer in the Spread of Foot-and-Mouth Disease

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The continuing epidemic of foot-and-mouth disease (FMD) in the United Kingdom has led to veterinarians and others questioning whether wildlife species (particularly deer) are perhaps playing a more significant role in the maintenance of the epidemic than is currently acknowledged. Similar concerns concerning deer are being expressed in the Netherlands, which has also had a FMD epidemic in 2001.

Many wildlife species are known to be susceptible to FMD virus, but it has been very difficult to assess their role in transmission of disease to domestic livestock (Thompson, Bengis, and Brown, 2001). The general opinion is that wildlife species are not a significant factor in maintaining an epidemic. While the African Cape Buffalo is believed to maintain FMD virus in the absence of infection in domestic livestock in Southern Africa, no comparable situation has been discovered in any other wildlife species elsewhere in the world.

The susceptibility of 5 species of free-living deer in the UK was studied experimentally in the 1970’s as a follow up to the 1967/68 epidemic (Gibbs et al., 1975). It was observed that red, fallow, sika, roe and muntjac deer were all clinically susceptible to FMD virus and were able to transmit disease to their own species and to cattle and sheep exposed to them. In view of the limited geographical distribution and populations at that time, it was concluded that deer were not likely to be important species in the maintenance of an FMD epidemic in the UK.

In the intervening period between these studies in the 1970’s and today, the deer populations of the UK and countries, such as The Netherlands, have risen significantly. This paper will illustrate the disease in deer and will review current knowledge on the role of wildlife species in the 2001 FMD epidemic in the UK. The validity of the earlier conclusions on the role of deer in the epidemiology of FMD in Western Europe will be examined.


DISEASE SCOURGES OF WILDLIFE AND LIVESTOCK

SESSION 3

International Joint Conference - Society for Tropical Veterinary Medicine and The Wildlife Disease Association 2001

Clear 3 km zone from each occurrence of DE! Suspected cases in red deer in Scotland in 1970's. 5 SP carcasses. Red Fallow, Bubonic like sheep silent spread.
Animal Diseases Scourges Affecting Wildlife and Livestock

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Animal pathology is the main constraint on herd productivity in Africa. Diseases supposed to be controlled or to have disappeared are re-emerging. Wild animals are often playing a key role in maintaining the diseases or even in spreading them. Three examples underline the narrow link between domestic and wild animals in disease transmission:

Rinderpest has been controlled in most African countries thanks to massive vaccination campaigns in the cattle population. However, Rinderpest still persists in East Africa, mainly in the wildlife living in national parks. It is a lineage II virus with pathogenic effects in wild animals but the virus is very mild for cattle. The global eradication programme has to be revised in the light of this new epidemiology.

African Swine Fever is re-emerging in West Africa and appeared recently in Madagascar where 60% of the pigs died from the disease. The virus can be maintained in a selvatic epidemiological cycle through wild Suidae and Ornithodoros ticks.

Heartwater is a major constraint to the improvement of animal production in Africa, Madagascar and several islands in the Indian Ocean and in the Caribbean. Many wild animals and not only ruminants could play a role as reservoirs. More importantly, infected ticks which are the main reservoir, can be transported on long distances by birds, feral dogs, etc.

Understanding the interactions between wildlife and domestic animals is a prerequisite to understand the epidemiology of many infectious diseases and therefore to design sound control measures.
Studies on Rinderpest in East, West and Central Africa 1994 – 2000

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Rinderpest remains the most serious potential threat to the wild and domestic ungulate populations of Africa. On the positive side, the African community with assistance from International donors (mainly the EU), through the OAU – IBAR Pan African Rinderpest Eradication campaign (PARC) has made considerable progress in the last 20 years, with the virus close to extinction on the continent. There are 2 remaining foci of virus in Africa: in Southern Sudan, Eastern Equatoria and in the Somali Ecosystem. As the virus distribution has declined, the identification of virus and immunosterilisation of the remaining infected populations of cattle has become more difficult due to the social, political and epidemiological complexities of these areas. One important factor is the presence of considerable surviving free ranging domestic pastoral and wild ruminant populations.

The close association between livestock and wildlife in this part of Africa provided the opportunity to develop an abstract ecosystem based monitoring system for determining the activity and distribution of the virus. The rationale was based on the difficulties of interpreting serological results from a vaccinated pastoral cattle populations compared to unequivocal serological results obtained from wildlife, which were unvaccinated. This wildlife serosurveillance was financed under PARC.

A baseline has been obtained for rinderpest antibody prevalence in a wide range of wild ruminants in 7 countries in West, Central and Eastern Africa. From this data the status for the region, as mentioned above has been inferred. The methods, results and conclusions will be presented. The problems with different species, laboratory tests and the interpretation of results will be highlighted.

The initiative has proven to be extremely valuable in this critical phase of eradication and will remain a core activity for the future surveillance activities under the Pan African Programme for the control of Epizootics (PACE).

The confirmation of the final eradication of rinderpest from Africa will ultimately depend on the demonstration of the absence of antibody in wild ruminant populations.
A Review of Peste des petits Ruminants in Wildlife in United Arab Emirates

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Peste des petits ruminants (PPR) is an acute viral disease of sheep and goats caused by a morbillivirus and is associated with high morbidity and mortality. In wildlife, the disease has been reported to affect Gazelles (Gazellinae), Ibex and Laristan sheep (caprinae), and Gemsbok (Hippotraginae). The disease is widespread in the Middle East in sheep and goats and could be playing a significant role in frequent wildlife outbreaks in private collections in the region.

This paper reviews recent outbreaks of the disease in wildlife in United Arab Emirates. A disease outbreak in Dorcas gazelle (Gazella dorcas species) and in Wild sheep (Ovis vigne) is discussed. Epidemiology, clinical signs and gross pathology are described.
Implications of Tuberculosis on African Wildlife and Livestock

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Tuberculosis in animals is a contagious disease caused by *Mycobacterium bovis*, a bacterium with a very wide host spectrum. Infection with this pathogen is followed by a chronic disease progression in which clinical signs usually appear only in the terminal stage. Excretion of infectious particles, which leads to transmission of the disease to other animals can, however, commence relatively shortly after infection.

In most countries, tuberculosis caused by *M. bovis* is mainly a disease of domestic cattle and can be controlled effectively by means of a test and slaughter programme. Once the infection spills over into a wild animal species with maintenance host potential, it is most difficult to control. Depending on the extent of interaction between infected wildlife and livestock, continuous re-infection of cattle can cause substantial economic losses and a risk to human health especially in rural African communities.

In South Africa, African buffalo (*Syncerus caffer*) represent the most important maintenance host for *M. bovis*. Social herd structure, behavioral patterns and a relatively high susceptibility to *M. bovis* make buffalo an optimum reservoir species, which not only maintains the infection but produces an increasing infection incidence. It also contributes strongly to the spread of the disease to other species, which either feed on them or become exposed to environmental sources of infection.

The long term management and control of tuberculosis under free ranging conditions is vastly complicated by the fact that due to the slow and chronic character of the disease its detection lags substantially behind the actual spread. Therefore ongoing epidemiological investigations into the transmission of *M. bovis* within and between animal species play a crucial role in the strategic planning of meaningful control measures.
Buffalo-associated *Theileria parva*: The Risk of Buffalo Translocation into the Highveld of Zimbabwe

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Current control methods for buffalo-derived *Theileria parva* infection of cattle (or Corridor disease) are aimed at limitation in possible cattle/buffalo contacts. However, there has been an increase in the introduction of game animals, including buffalo, into the highveld to establish private game reserves on condition that they are confined in separate and secured paddocks. Due to shortages of pastures cattle were grazed into buffalo paddocks resulting in outbreaks of buffalo-derived theileriosis.

This paper reports the results of epidemiological observations carried out on some game parks in the highveld of Zimbabwe. *Rhipicephalus appendiculatus* ticks were collected in large numbers from buffalo grazed pastures to assess the infection rate with *Theileria* parasites in the salivary glands. The infection rate with *Theileria* in these ticks were high and produced fatal theileriosis in susceptible cattle. Similarly, adult *R. appendiculatus* ticks artificially fed as nymphs on the buffalo in the game parks produced fatal infections in susceptible cattle. *Theileria parva* (Boleni), the vaccine used to immunize cattle against theileriosis, and a buffalo-derived *T. parva* stablimate (BV-1) were inoculated in naïve buffalo born and raised in captivity at Mazoe Field Station, to study the *Theileria* carrier-state in these animals. The two buffalo, which had received the Boleni stablimate showed no clinical theileriosis reaction. The buffalo, which had received stablimate BV-1 developed fever, high schizont parasitosis and 15% piroplasms parasitaemia. *R. appendiculatus* ticks fed as nymphs on these two groups of buffalo, were found infective to susceptible cattle. It is concluded that increased transmission of pathogenic buffalo-derived *T. parva* through a breakdown in the present strict tick control or by movement of carrier-cattle could pose a serious threat to the cattle industry in Zimbabwe.
Avian Cholera on Northcoastal California (USA) – A 50-year Retrospective

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Avian cholera (Pasteurella multocida infection) first was documented in wildfowl of the north coast of California (USA) in March 1945. The disease has been documented on at least eight sites in 19 different years and annual mortality has ranged from several birds to an estimated 10,000 wildfowl. With rare exception, coots (Fulica americana) have suffered a disproportionate mortality in all epizootics; their representation in the population of dead birds has been substantially greater than their representation in the live population. However, both sexes and all age groups seem to be equally susceptible to avian cholera among coots. On one coastal site (Centerville), a consistent sequence of mortality was observed over a three-year period of monitoring, with coots dying first, followed by tundra swans (Cygnus columbianus) and wigeon (Anas americana); pintails (Anas acuta), shovellers (Anas clypeata) and mallards (Anas platyrhynchos) died later in the epizootics. Position of a species in this sequence was positively correlated to its mean flock size and time spent on land. A similar sequence was not consistently observed in subsequent epizootics at other north coast sites. The Centerville site was the first or only site affected with avian cholera on California’s north coast between 1945 and 1979. After 1979, avian cholera ceased being observed at Centerville; reasons for this disappearance are unclear. In recent years, avian cholera has been observed most consistently at a second coastal site (Lake Talawa), approximately 150 km north of Centerville; avian cholera first was confirmed there in 1977 and epizootics have been observed on at least 12 occasions since then. Possible reasons for some of these patterns will be assessed.
Epidemiology of >50 Amphibian Morbidity and Mortality Events in the USA, 1996-2000

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Internationally, few amphibian mortality events have been reported, with notable exceptions of mortalities in Great Britain, the former Yugoslavia, Russia, Costa Rica, Panama, Ecuador, Canada and Australia. In the last 5 years, over 50 amphibian morbidity and mortality events in the United States have been investigated epidemiologically and diagnostically at the US Geological Survey’s, National Wildlife Health Center. These casualties involve abundant species as well as declining, threatened and endangered species.

About 30 amphibian mortality events were attributed to iridovirus infections (Iridoviridae, genus: Ranavirus). These viral epizootics occurred in 11 states in the months of May through September. In aquatic amphibian species or aquatic stages of terrestrial amphibians, these epizootics had a gradual onset in which initial mortalities were 2 to 5 amphibians per site, then increased to 50 to >100 casualties per day. Duration of iridovirus mortality events was 2 to 6 weeks. Iridovirus mortality events involved only tiger salamanders in the western United States, but in eastern states, 11 species of anurans and salamanders were affected. Overall casualty rates at a site were usually estimated as >90% of all larval amphibians, resulting in minimal or no detectable recruitment for that year. At three eastern sites, iridovirus mortality events have recurred for 2 to 4 consecutive years.

Infection by chytrid fungus (Batrachochytrium dendrobatidis) caused six amphibian mortality events. Chytrid epizootics in five states were associated with marked population declines. Mortalities attributed to chytridiomycosis occurred only in adult (post-metamorphic) frogs or toads. Although chytrid infections have been detected repeatedly in tadpoles and larvae, mortalities have not been reported. Chytrid epizootics are insidious and belie their devastating effects on populations: often only one sick or dead adult anuran is found per two surveys at a site. Internationally, chytrid epizootics and mortality events have been seen only in anurans in Costa Rica, Panama, Australia, and possibly Peru, Ecuador and Venezuela. At this time, chytridiomycosis is the only infectious disease associated with multiple declining amphibian populations in the western United States.

A previously undescribed dermocystidium-like fungus infection has contributed to five mortality events in tadpoles. Because this systemic fungal infection often occurs in conjunction with other pathogens (iridovirus and chytrids), no specific epidemiological information is available. Morbidity or mortality events also have been attributed to selenium toxicosis (2); anchorworms, Lernaea sp. (1); ichthyophonous sp. (2); Dermosporidium penneri (2); and metacercaria of multiple fluke species (5). Toxicosis was suspected in three mortality events in which all lifestages of amphibians were affected, as well as fish, birds, and invertebrates.
Bucellosis in Free-ranging Impala Sharing the Same Rangeland with Cattle in Lake Mburo National Park, Uganda

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Antibodies reactive with *Brucella abortus* strain were detected in adult male impala (*Aepyceros melampus*) and cattle (*Bos indicus*) serum samples using the compliment fixation test (CFT) assay. Blood samples were collected in Lake Mburo rangeland, Western Uganda from 57 impala and 141 cows bled from 1998 to 1999. The sero-prevalence of *Brucella abortus* in impala and cattle was found to be 3.5% and 14%, respectively. A sero-prevalence of 21.2% and 4.91% was noted in cows in the eastern and northern ranches, respectively adjacent to the park. Impala that tested sero-positive were from the eastern ranching area. This serologic data shows that there is a risk of exposure of impala to the *Brucella abortus* in the shared rangeland with infected cattle populations. There is a possibility that infection is cycling in the impala populations and therefore acting as a possible source of re-infection for cattle.
SESSION 4

SUSTAINABILITY
Development and environmental impact have fused irreversibly (in Latin America) and have become an issue of critical concern. The origins of this situation are usually attributed to the European colonization of the Americas in the XV century.

Today, Latin America suffers from global issues concerning international development such as external debt, unfavorable terms of trade and protectionism, and threats to the environment such as soil degradation, urban growth, air and water pollution, over-exploitation of natural resources including terrestrial wildlife and marine fisheries, loss of biodiversity, climatic change, loss of ozone layer, poor toxic waste management, etc. In Latin America underdevelopment and poverty are both cause and effect of environmental deterioration. Although this region retains a favorable ratio between resources and population compared to other parts of the world, present growth rates will impose increasing pressure on the capacity of the ecosystems.

"A) "take as much as you can" legacy of a colonization process based on unlimited resource exploitation continues to rule the minds of Latin Americans. There is no deep-rooted consideration of sustainability, and insufficient public awareness of today’s environmental reality. The first tendency of most development projects (governmental and private) is still biased towards the cheapest methods of exploiting resources (and obtaining immediate economic benefits).

Priority environmental issues to address are common to other parts of the world:

1. Deforestation and forest management
2. Coastal ecosystem management
3. Erosion
4. Biodiversity loss, and
5. Urban life quality

Latin America needs progress and development but economic growth must not continue to be self-destructive. The present crisis impels Latin America to define a "new development", retreating on its own non-sustainable steps, to meet world demands for the XXI century.
Post-Millennium Depression: People, Parks and Politics in Tropical Africa

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Harare, Zimbabwe

The highest valued land uses in the semi-arid savannas of southern Africa are those based on sustainable use (in the broadest sense) of wild endemic resources. Net annual returns possible from land under wildlife management may be as high as US$1,000/hectare depending on the type of use and how it is marketed. At the same time, this wildlife tourism industry is fragile and totally vulnerable to political instability — as demonstrated in Zimbabwe in the past year.

The southern African sub-region stands poised on the brink of a significant development in the Gaza-Kruger-Gonarezhou Transfrontier Conservation Area (GKG TFCA) which could promote this ecologically desirable form of land use and extend it over a large area. Perhaps the largest obstacles to realising the vision are the issues of tenure rights amongst local communities, veterinary measures and stakeholder communication with the government agencies who will negotiate the agreements.

The high profile of the project could well result in landholders (both communal and commercial) being marginalised in the planning process. Local communities in southern Africa have yet to realise any real empowerment over the natural resources on their land. The prominence of land tenure issues on the political agenda of the participating countries raises fears that government agencies may lose sight of the economic opportunities that will ensure the long term sustainability of land use.

Veterinary issues are one of the most significant practical barriers to implementation of the TFCA ‘dream’ which sees wildlife populations moving freely between the various landmasses regardless of international or property boundaries. There is still a tacit assumption amongst many veterinarians that domestic livestock is the priority form of land use and measures to protect and promote it dominate land use issues. It is unlikely that government veterinary services will allow populations of buffalo (which are critical to the viability of wildlife-based tourism ventures) to exist outside the new Foot and Mouth Disease fence, thus, the alignment of the fence will determine which areas can ultimately become part of the TFCA. Although governments have pledged to discuss this with stakeholders and to ensure that the final alignment will reflect their wishes, there is a real risk that many tourism (and thus economic) opportunities will be closed off.

Bruner et al (2001) recently published a paper in Science that claims that protected areas are effective in conserving tropical biodiversity. This author sees the greatest threat to biological diversity not in the pressures which parks are facing from surrounding human populations but as coming from within. Corrupt practices coupled with centralised power structures are becoming common in the agencies that purport to manage and protect parks. If the TFCA vision is to become reality, it will require reductions in the central planning role of state bureaucracies, the broadening of democratic institutions - including empowerment of local communities - and the genuine representation of stakeholders in the planning process. Veterinarians, in particular, need to examine closely the raison d’être of their mandates.
Achieving Ecological and Socio-Economic Objectives in Pilanesberg National Park: Lion Re-introduction Project

Gus van Dyk

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In early 1993, 19 lions (Panthera leo) were introduced into Pilanesberg National Park (PNP). The primary objective for the introduction was to establish the region as an attractive venue for tourists seeking to view “Big 5”. Lions were identified as a major draw-card for foreign tourists in particular and a crucial component for the socio-economic development of the greater Pilanesberg region including surrounding communities, small businesses and major tourism developments such as Sun City. A secondary objective was to establish a complete ecological community which, until then lacked significant predation. A highly interventionist approach towards lion population management was adopted in order to achieve the PNP objectives. The selection of the founder population was based on a number of considerations including their disease profile (Feline Aids), their availability, their genetic profile, their prey selection and their reputation as man-eaters and/or stock raiders. As a result of this selection PNP has become a significant source of lions for reintroduction projects across the sub region. The lion introduction project has also provided a blue print for the introduction and management of other large carnivores into PNP including cheetah and wild dog. The benefits of having a lion population in which each animal is known offers unique research opportunities. The Pilanesberg ecological community has benefited from the re-establishment of its top predator. Lions have made a significant contribution to the park in direct economic returns from increased tourism, live sales and hunting.
A Review of the Wildlife Management Systems in Kenya with a View to the Role of Pastoralism in Sustainable Utilization of Wildlife

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This paper defines pastoralism and examines the different wildlife management systems in Kenya including those that combine livestock and wildlife. The perceptions of, and the relation to wildlife of large scale, individual ranches will be compared with that of community-owned group ranches. Long term changes in the ecology, and the social and economic impacts on the different ecosystems are identified.

A review is made of the legislation, policy and land tenure issues pertaining to utilization. It outlines how these factors have affected sustainable utilization of wildlife and influenced the development of the industry in the country. The role that Kenya Wildlife Service (KWS) has played in community-based conservation from the inception of a pilot utilization program in 1989 is reviewed. The challenges faced and the lessons learnt from this program including aspects of revenue sharing are discussed. The current management strategy being employed in charting the way forwards by KWS and collaborating non-governmental organizations is examined. Focus is on the current emphasis to promote the sustainable use of wildlife by communities and to increase community responsibility for wildlife management through enterprise development. This approach aims to enable communities to realize direct benefit from wildlife therefore encouraging them to conserve wildlife on their land, especially in those areas that act as dispersal areas for National Parks and Reserves. The evolving perceptions of community groups towards wildlife as a resource are considered and case examples are given of pastoralist groups that have modified their traditional management systems to include wildlife utilization.

The impact of disease at the wildlife/livestock interface is also briefly mentioned in relation to the perceived economic impact on pastoralists.
Yankui’s Dilemma: Conservation Versus the People of Ghana

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The past twenty years of conservation have seen a shift in conservation approaches that have realised the importance of people in conservation and wildlife management. To this extent, in most conservation circles the concept of community involvement is no longer an issue of debate. In Africa especially, the growth of CWM has flourished influenced in part by the following factors:

Initially the post-colonial state in Africa maintained much of the restrictive legislation of the colonial period especially in respect of access and tenureship over natural resources. However, the nature of the post-colonial state has changed considerably in the past twenty years often in response to significant economic, political and demographic changes. These changes have resulted in governments being unable to allocate sufficient financial and human resources to manage and control the use of natural resources in the manner prescribed by colonial legislation.

Development philosophies and approaches that involved devolution of greater access rights and responsibilities to communities began in the 1980’s. Successes, particularly in southern Africa, resulted in increasing number of other countries adopting similar approaches to address similar problems in their own situations.

Donor agencies, also encouraged by the approach as a means to meet conservation and developmental objectives, have allocated more of their resources to funding community-based projects and programmes.

International conservation, initially sceptical of community-based approaches, has largely adopted the approach as valid, although areas of friction remain regarding the utilisation of certain species of wildlife. Changes in international perceptions have been heavily influenced by the growing voice of the “South” in international fora such as the Rio Earth Summit, Convention for Biological Diversity and the World Conservation Congress of IUCN.

While there have been many success stories there have also been several failures. These failures should not be taken as a condemnation of the approach but as a lesson of what not to do. Often in the development of a community project a problem arises in understanding what community involvement means and how to marry conservation objectives with socio-developmental priorities. In Ghana, there has been considerable effort to develop programmes that incorporate community aspirations into specific conservation objectives. While there has been some success, there have also been considerable inherent problems with these programmes. One - and this is not exclusive to Ghana - is the tendency for conservation programmes to want to fit community aspirations into conservation objectives as opposed to finding ways of using conservation to help fulfil community aspirations. When community-based conservation programmes fail to recognise this they are generally unable to deliver on their expected outputs. Some critics have used this to dismiss the community approach and advocate the more conventional conservation approach based on exclusionary laws, with strict law enforcement and international regulation as the only means to secure fragile and threatened natural resources. This poses a dangerous reversion to a paradigm that has significantly failed in Africa, and much of the developing world, especially in regard to wildlife outside of protected areas.
SESSION 5

GENERAL SCIENTIFIC SESSIONS
BACTERIA AND OTHER PATHOGENS
PCR and Molecular Detection for Differentiating Vibrio Species

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Vibriosis is an economically important disease of fish, marine invertebrates (particularly Penaeid shrimps) and large marine mammals responsible for high mortality rate in aquaculture in diverse farming locations throughout the world. Furthermore some species, such as Vibrio vulnificus, may infect humans. Not all Vibrio species are pathogenic to marine animals and within the same taxon there may be a broad variation in pathogenicity. Vibrio cells may exist in a so-called viable but non-culturable (VBNC) form preventing traditional diagnostic methods to be used.

Using a 16S-based PCR we obtained species-specific profiles, as multiple bands were amplified with our method. On the other hand by using a 23S-based PCR we obtained a single 470-bp band for all the species. DNA sequences obtained from the 23S rRNA gene amplified products allowed us to identify species-specific probes for Vibrio parahaemolyticus, V. alginolyticus, V. anguillarum and for a cluster of taxonomically related species: V. carchariae/harveyi/campbelli. These multiple detection probes were then applied to analyze a diverse range of strains isolated from environmental samples in The People's Republic of China and Europe, the results of which are discussed in this paper. A phylogenetic tree based on the 23S sequences confirmed previous results obtained by western blotting.
Molecular Immunogenetics in Susceptibility and Resistance to Bovine Dermatophilosis- A Functional Candidate Gene Approach and a Concrete Field Application

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Bovine dermatophilosis is a severe skin infection inducing a loss in productivity and a 15% mortality rate. This disease is associated with the tick *Amblyomma variegatum*. Currently, no vaccine is expected and chemoresistance phenomena decrease the means of control (acaricides and antibiotics). Breeders observed that the disease seemed to be controlled by genetic determinism. Based on an 8 year-long ecopathological survey of 568 zebu Brahman cattle from several herds located in Martinique Island (FWI), we classified into two extreme groups 123 unrelated animals of both sexes, reared in the same environmental conditions. The most resistant individuals (*n* = 61) were never infected whereas the susceptible individuals (*n* = 62) showed severe clinical signs and later died. Using a functional candidate gene approach we studied the DNA polymorphisms of several targeted genes encoding molecules implicated in known mechanisms of both non-specific and specific immune responses.

The most significant results were obtained within the Major Histocompatibility Complex (MHC) where the BoLA-DRB3 and DQB genes encode molecules involved in the pathogen/host interface mechanisms, particularly in the antigen presentation to T cell receptors. Firstly in the highly polymorphic BoLA-DRB3 exon 2 encoding the antigen binding groove, we found a particular CESFLQKN amino acids sequence present in the 5 official alleles DRB3.2*0301, *0302, *0901, *0902, and *1202, which correlates with the susceptibility. On the other hand, we found another strong correlation between susceptibility and the BoLA-DQB*1804 allele. Finally, the most interesting observation is the strong linkage of both previous DRB3.2 and DQB alleles in a unique particular BoLA class II haplotype, which constitutes a highly significant marker (*P*<0.0001) of susceptibility to bovine dermatophilosis. This haplotype marker of susceptibility was also found in other bovine populations either of the same breed (Brahman zebu of Madagascar) or of different breeds (Gudali zebu in Cameroon, Sudanese zebu and trypanotolerant Baoulé cattle in Burkina Faso and Creole cattle in Guadeloupe (FWI)). A eugenic marker assisted selection was developed in the field by eliminating the animals with this haplotype of susceptibility, and the disease prevalence was reduced from 0.76 to 0.06 over 4 years. On the other hand, the BoLA-DRB3.2*4201 linked to the DQB*1805 constitutes a haplotype correlating with the resistance character (*P*<0.001). Based on the BoLA DRB3/DQB haplotypes, F1 crossbreeding plans are in progress to study the genetic transmission of the genotypic and phenotypic characters of dermatophilosis resistance and susceptibility.

In conclusion, we discuss several hypothesis at the molecular and cellular levels to better define the exact role of the MHC molecules in diseases control and to answer the question: how MHC diversity is selectively maintained by natural selection imposed by the pathogens?
Basis for the Extraordinary Genetic Stability of Anthrax

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Recently, Bacillus anthracis, Bacillus cereus, and Bacillus thuringiensis have been claimed to be the same species, distinguished only by the presence of specific plasmids (Helgason et al, Appl. Environ. Micro. 66, 2000). In fact, the 500 plus isolates of anthrax bacillus from around the world represent one of the most genetically homogenous microbes in the world. They only appear to differ by a few oligonucleotide sequences that show various degrees of duplication within the plasmids and genome (Keim et al, J. Appl. Micro. 87, 1999). The divergence they do show may have arisen recently (geologically) from their introduction into domesticated animals. The last common ancestor of the Bacillus Group probably emerged about 1.2-1.5 billion years ago from their anaerobic ancestors (Brown et al, Molec. Micro. 14, 1994), about the time of the second large release of oxygen into the earth’s atmosphere (Kerr, Science 286, 1999). Since B. anthracis retains about a 90% homology with B. cereus, little divergence or evolution has occurred in the microbes since this time. Spontaneous mutants of anthrax are rare.

Recently, we have generated such a mutant (Alls/Gifford Strain from Sterne Strain) on enriched high nitrate growth medium. This mutant demonstrates a bizarre curling morphology, very small colonies, delayed spore production, and resistance to heat curing of its pX01 plasmid. It spontaneously reverts on less enriched medium. We have also isolated from Sterne Strain B. anthracis, three genes, and their respective genetic probes, that are required for survival on enriched nitrate medium. When hybridized against restriction endonuclease fragments of Pseudomonas aeruginosa, Pseudomonas stutzeri, B. licheniformis, B. thuringiensis, B. cereus, B. globigii v. niger, and B. anthracis (Sterne Strain) genomic DNA, no hybridization or various hybridization patterns were observed. No hybridization was seen with the pseudomonads, little or none with B. licheniformis or globigii, at variance patterns with B. cereus, and different (but the closest to B. anthracis) with B. thuringiensis. Examination of 8 of the most diverse strains of anthrax from around the world showed the same phenotypic behavior as Sterne on the enriched nitrate medium. The one deviation noted was one of two African strains, the one being like the other 6. Evidence that the pX01 plasmid controls the nitrate metabolism of anthrax, which can in turn lead to genetic damage or death of the vegetative form, strongly suggests that the genetic stability is related to this control, and its subsequent internal selective pressure.

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Development of Studies in Current Challenges of Dourine and Differentiation of *Trypanosoma equiperdum* / *T. evansi*

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During its 20th annual meeting in Paris (May 1999), the OIE ad hoc Group on NTTAT expressed its concern about several current features of dourine: discrepancies in some results of the serological diagnosis with the complement fixation test (CFT) which is the only international diagnostic test officially recognised by the international organisations for the transportation of *Equidae*; persistence or suspicion of dourine in several Asian, European and African countries, impossibility of differentiating *T. equiperdum* from *T. evansi* and of isolating new strains of *T. equiperdum* throughout the world since 1981.

Taking account of these facts it was recommended, in agreement with the Directorate, Federal Veterinary Service of Russia in Moscow, to carry out comparative trials on the value of CFT/dourine at the OIE Reference laboratory for dourine (All-Russian Research Institute of Experimental Veterinary Medicine, VIEV, Moscow) with the reagents (antigens and sera) of 7 countries, which have a wide experience in the field of dourine diagnosis, including Russia, USA, P.R. China, South Africa, France, Italy and Germany.

Thanks to a fruitful international co-operation these ring trials have been achieved. The obtained results show an overall concordance, which was submitted for appreciation to the OIE Standards Commission in charge of the Manual of Standards for Diagnostic Tests and Vaccines.

Such trials are the starting point of further studies, which are briefly described and which can be enumerated as follows:

- improvement of isolation of new strains of *T. equiperdum* from clinical dourine cases;
- identification of specific markers for *T. equiperdum* which allow its discrimination from the other species within the subgenus *Trypanozoon* (*T. brucei* and *T. evansi*);
- experimental infection of horses with *T. equiperdum* strains to investigate its pathogenicity compared to *T. evansi*;
- phylogenetic studies;
- proposal and validation of a new internationally recognised diagnostic test for dourine.
Efficacy of *Balanites aegyptiaca* (L.) *Del balanitaceae* as Anthelminthic and Molluscicid Used by Traditional Vet-healers in Burkina Faso

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Fast growing prices of modern veterinary drugs, more resistance occurring frequently to current medicinal molecules commonly used by veterinary practitioners and persistence of major diseases as constrains to animal production in rural areas in most of underdeveloped countries, particularly in Burkina Faso (West Africa), explains the importance given nowadays to indigenous knowledge systems about pharmacopoeia both for humans and animals. The recipes, generally based on plants, are found around the village or watershed area, very well known by healers, less expensive, efficient and culturally accepted and integrated by populations into their day-to-day life.

*Balanites aegyptiaca* is a sahelian tree of six to nine meters high. Its organs (i.e: leaves, bark, kernel) are widely used in Burkina Faso by vet-healers and livestock owners for animal parasitic diseases treatments. The aim of the present study was to experimentally assess the anthelminthic and molluscidical activities of its kernel powder. The in vivo experiment on goats (in village flocks and on-station animals) with doses of 30 mg/kg, 40 mg/kg and 60 mg/kg showed a partial reduction of parasitic eggs out-pout in faeces. The in vitro pharmacological study of acetonic, ethanolic and aqueous extracts of powdered kernels led to a complete helminth eggs development inhibition. Total larvae mortality was obtained and LC50 values reached 27.24; 5.82 and 129.02 ppm for acetonic, ethanolic and aqueous extracts, respectively. It also showed a complete lethality on freshwater snails of *Biomphalaria pfeifferi*. LC50 values were 60.00 ppm; 172.40 ppm and 84.15 ppm for crude kernels powder, acetonic and ethanolic extracts, respectively. Further studies will address confirmation of efficacy and therapeutic doses, which are recommended at village level uses.

Key words: *Balanites aegyptiaca* – Anthelmintic – Helminths – Snails – Goats – Burkina Faso
Early Diagnosis of Johne’s Disease in the American Bison by Monoclonal Antibodies Directed Against Antigen 85

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Johne’s disease, caused by Mycobacterium paratuberculosis, affects various ruminants, including the American bison. Johne’s disease is manifested as a chronic wasting disease exhibiting clinical signs only in older animals; usually 6-10 year old bison. Although diagnostic assays are available for *M. paratuberculosis*, they are time-consuming, labor intensive and usually incapable of detecting infections in young animals. Antigen 85 (Ag85) is a highly conserved complex of proteins that is secreted by *Mycobacterium*-infected macrophages. The Ag85 protein complex consists of fibronectin-binding proteins that are secreted early during infection by various species of *Mycobacterium*, including *M. tuberculosis*, *M. bovis*, and *M. paratuberculosis*. Thus, diagnostic assays that are based on the detection of Ag85 might provide a means for early detection of *Mycobacterium* infections.

We have generated several monoclonal antibodies (mAbs) against recombinant *M. bovis* Ag85 that specifically recognize Ag85 in Western blots of the purified antigen. At 180 days after the last inoculation of 8-10 month old bison calves with *M. paratuberculosis*, serum samples were collected and tested in Western blots with Ag85-specific mAbs, principally mAb 1.5 and mAb 96.8. Serum samples from non-infected control animals were also tested in Western blots. MAbs 1.5 and 96.8 reacted with the Ag85 complexes in the serum of animals that had been infected earlier with *M. paratuberculosis*; no reactions occurred with the serum from non-infected animals. Thus, these preliminary results indicate that monoclonal antibodies against Ag85 might eventually lead to the development of a more reliable diagnostic assay that could be used to detect early infections with *M. paratuberculosis* in the American bison as well as other ruminants.
Outbreaks of *Trypanosoma evansi* in Mauritania

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In Mauritania, the dromedary livestock is an important source of revenue. The animals are kept by shepherds, which are very mobile in the field searching good pasture and water points. This breeding method exposes dromedaries to some pathology, in particular trypanosomosis due to *T. evansi* that Mauritania breeders know very well.

From 1993 to 1997, our investigation showed that *T. evansi* is present in the dromedaries; the parasite prevalence rate using blood smear examination was 1.1% and seroprevalence rate ranged from 13% to 23% depending on the test (CATT, IFAT or Ag-ELISA). Dromedaries from Trarza region had the highest prevalence. According to the CATT test cattle, donkeys and small ruminants also appeared to be infected with *T. evansi*, but direct blood examination could not detect the parasite in these animals.

In 1999, the rainy season was very important with broad flooding in some areas. The consequence of this was an abundance of tabanids and stomoxes in the field even during the dry season. Due to these good conditions of live for *T. evansi* vectors, an outbreaks of *T. evansi* infection occurred. In 2000, our survey carried out in Trarza region showed that the prevalence rate was 17.6% using buffy coat examination and 58.8% with the CATT. In many herds, there were a lot of abortions and all breeders registered very important milk production losses. On the other hand, our investigation in the cattle market of Nouakchott showed that the parasite prevalence was 13.3% and the seroprevalence rate was 36.7%. At the cattle market, the samples were taken on animals from different regions. Statistically the prevalences were not significantly different between the areas where the dromedaries originated from. This survey, at the cattle market, allowed us also to emphasise the presence of *T. evansi* and *T. vivax* in bovine, detected by buffy coat examination.

This study indicated an outbreak of camel trypanosomosis in Mauritania and the survey in bovine animals brought new data on cattle trypanosomosis in this country.

Keywords: Mauritania, dromedaries, *T. evansi*, prevalence rate, Buffy coat, CATT.
WDA STUDENT PAPERS
Protozoal Meningoencephalitis in Harbor Seals (Phoca vitulina richardsi) and Sea Otters (Enhydra lutris nereis) in California

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Protozoal myeloencephalitis was first recognized as a cause of mortality in Pacific harbor seals (Phoca vitulina richardsi) and Southern sea otters (Enhydra lutris nereis) from California in 1992. Both free-ranging and captive sea otters and seals have been affected. Reported clinical signs include tremors, seizures, deficits in ambulation or proprioception, pupillary mydriasis, and decreased mentation or obtundation. Until recently, neurologic signs were invariably progressive and fatal, despite aggressive medical intervention.

In 1998 we initiated a long-term study on protozoal brain infections in California sea otters and harbor seals. The goals of this study were to: 1.) confirm the identity of protozoal parasites infecting otters and seals, 2.) develop and validate serodiagnostic tests for the parasites, 3.) screen serum from wild and captive otters and seals, both to expedite clinical therapy and to investigate modes of transmission of protozoal infection in wild and captive populations, and 4.) evaluate possible risk factors for protozoal exposure and disease. To date, approximately 110 southern sea otters and 15 pacific harbor seals have been examined. Cell culture of cerebrum, cerebellum, and cerebrospinal fluid (CSF) from these animals has yielded 30 isolates of two distinct types of protozoan parasites. Pathogenic protozoa were isolated from both brain tissue and CSF. In one case both parasites were isolated simultaneously from the same animal. Isolates were characterized serologically, antigenically, molecularly and ultrastructurally, and were found to be indistinguishable from Toxoplasma gondii and Sarcocystis neurona parasites that are pathogens of terrestrial animals and humans (Miller et al., In Press. Exp. Parasit. & J. Parasit). Serum was assessed for antibodies to Toxoplasma gondii, Sarcocystis neurona and Neospora caninum. Protozoan parasite culture was coupled with microscopic examination of all major tissues, plus brain immunohistochemistry, utilizing antisera raised against well-characterized isolates of Toxoplasma gondii, Sarcocystis neurona and Neospora caninum derived from laboratory animals. Data analysis for potential risk factors for protozoal infection is in progress.

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Modeling the Effects of Host Movement and Vaccination on the Control of Bovine Tuberculosis in African Buffalo

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We assess how host movement may affect vaccination control programs using a model of bovine tuberculosis (Mycobacterium bovis) in African buffalo (Syncerus caffer). In the model, we recognize two populations: a focal herd and a background population. We track the demographic and epidemiological changes of the focal population using an age-structure model with 18 age-classes and two sexes. In each age and sex category individuals are susceptible, latent, infectious, or vaccinated. Males disperse from the focal population when they are between the ages of five to twelve years old. Males from the background population immigrate to the focal herd in proportion to the number emigrating from the focal herd. We use the model to address the following questions: What is the optimal vaccination strategy with respect to the ratio of males to females in different age-classes? How does the optimal vaccination strategy depend upon movement rate between populations, transmission rate, duration that the vaccine is protective, number of vaccinations given, initial focal herd prevalence, and the background prevalence of the disease. We assess how sensitive our model is to different assumptions regarding the form of the transmission function (e.g., the mass-action transmission form $S/N$ compared with the proportional transmission form $SI/N$).
Innate Host Resistance and Differences in Clinical Disease Severity between Two Groups of White-Tailed Deer Experimentally Infected with Epizootic Hemorrhagic Disease Virus (Reoviridae: orbivirus)

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Enzootic stability has been proposed to explain the apparent lack of clinical hemorrhagic disease (HD) but high HD virus antibody prevalence in white-tailed deer (Odocoileus virginianus) from areas like south Florida and Texas (USA). It has been hypothesized, but never proven, that this may be due to innate host resistance, and or, protection of fawns through maternal antibody transfer. In the spring of 2000 white-tailed deer fawns were obtained from the outdoor white-tailed deer research facility at the Kerr Wildlife Management Area (Texas, USA), a site at which deer are considered native Texas stock and HD is considered enzootic. Fawns were also obtained from a five county area in Northeast Pennsylvania (USA), a site from which translocation was never used as a management tool and HD has never been reported. All fawns were raised indoors and housed until antibodies to epizootic hemorrhagic disease (EHD) were no longer detectable by agar gel immunodiffusion or serum neutralization (negative at 1:2). Five fawns from each group were then experimentally infected with $10^{7.1}$ TCID₅₀ EHD, serotype 1 (EHDV-1) and five from each group were experimentally infected with $10^{7.1}$ TCID₅₀ EHDV-2. Deer were closely monitored and physical examination, clinical pathology, and clotting profiles were used to assign each deer a clinical disease severity score. Clinical disease severity scores were dramatically higher for Pennsylvania deer than for Texas deer infected with EHDV-1 and 2. Clinical disease was mild if present in Texas deer, but EHDV-1 and 2 infection caused 100% and 20% mortality respectively in the Pennsylvania deer. Circulating viremia and seroconversion were similar in both groups of deer. This suggests that Texas deer from this enzootic site have an innate resistance to clinical disease caused by infection with EHDV-1 and 2. Despite this innate resistance, these deer still become infected and serve as virus amplifying hosts.
Leptospirosis Epidemics in California Sea Lions, 1995-2000

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Leptospirosis epidemics in California sea lions (CSL) have been documented since the 1970's. More recently these epidemics have increased in both intensity and frequency. The dynamics of leptospirosis infections in CSL are still unclear. We obtained CSL stranding data from The Marine Mammal Center (Marin Headlands, Sausalito, California) for the time period 1/1/95 through 12/31/00. The goal in obtaining these data is to determine which factors are involved in CSL leptospirosis epidemics. Epi Info software (Centers for Disease Control and Prevention) is being used to look for interactions between disease and such factors as age, gender, stranding location, and time of year. Also serum samples are being assayed for leptospira antibodies using the microagglutination titer test. Results are being used to generate an age-prevalence curve in an attempt to identify when in the life history infection with leptospirosis is likely to occur.

The general goal in obtaining and analyzing these data is to discern the ecological factors involved in CSL leptospirosis epidemics. With the use of classic epidemiology and modern molecular tools such as PCR we will be able to describe much more about the eco-epidemiology of this disease. Although CSL populations are doing well, leptospirosis has been documented in other marine mammals, so leptospirosis could negatively impact these other marine mammals.
Hematozoa and Arthropod Parasites of Turkey Vultures in Humboldt County, California

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Ectoparasites, hematozoa, and morphological symmetry have rarely been studied in raptors. Ectoparasites and hematozoa levels were evaluated in relation to seasonality, blood lead levels, and body symmetry on turkey vultures, *Cathartes aura*, in Humboldt County, California (USA). Approximately 70 birds were captured on three sites during four trapping sessions (Sept-Oct 2000, Jan-Feb. 2001, May-June 2001, Sept.-Oct. 2001). Each bird was tagged and dusted for ectoparasites. Blood samples were evaluated for blood lead levels and hematozoa. Measurements for asymmetry included total wing length, total tarsus length, and wing surface area. In addition, digital photographs of each side of the head were examined for facial blemishes and black feather patterns as the focus for facial symmetry. Using turkey vultures in Humboldt County, we tested the hypothesis that birds with greater morphological asymmetry would have higher parasitic intensities of ectoparasites and hematozoa.

Because of their frequent exposure to infective substances, carrion feeders, such as turkey vultures, would be expected to have a high level of immunocompetence. Thus we predict a low diversity and intensity of parasitism in these birds. While lead may suppress some immune functions, we expected that, because of the probable high level of immunocompetence of turkey vultures, it would require high levels of lead before the immune functions were adequately suppressed to allow an increase in parasite intensities. Thus we predicted little variation in parasite diversity or intensity except at very high lead levels.

Seasonal fluctuations are questionable because of the year-round maritime climate in Northern California, however, breeding and roosting patterns may influence ectoparasite loads. Residual lead levels and seasonality trends of lead infection in Humboldt County are unknown, as are the baseline lead levels and immunocompetence response to blood lead content in turkey vultures. We will be testing our prediction that turkey vultures have a superior immune response, than other avian species, to parasites and blood lead levels by their lifestyle and evolution to several avian disease immunities. We suspect their blood lead levels will not be correlated to hematozoa or ectoparasite loads. We will test if morphological features are compensated as a result of a superior immune system by the degree of developmental asymmetries of these birds.