One Health – A multi-species perspective from an Animal Disease and Food Safety Laboratory

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The Livestock Disease that changed a Continent(s)!

South African Rinderpest Outbreak in 1896

- ~ 95% (?) loss of cattle and ungulate wildlife
- Subsequent loss of predator species
- ‘Eradication’ of tsetse flies south of the Limpopo river and concurrently eradication of human and cattle trypanosomiasis
- Famine and substantial loss of human live (native people and settlers)
- Founding of Onderstepoort Veterinary Institute by Sir Arnold Theiler

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2,000 years of Rinderpest in Europe

- Cattle epidemics every 40 to 50 years
- Human losses unknown (many millions)
- Morbillivirus ancestor to measles and canine distemper virus?
- Led to the establishment of the 1st Veterinary College in Lyon, France in 1750
- **The connection between animal diseases and food security became institutionalized!**
  - **18th century emergency management!**

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Introduction of WNV into the US

- Most recent, highly publicized introduction of a zoonotic (vector borne) disease
- Diagnostic assays were available within 12 months – developed by Veterinarians!
- Surveillance and control, a multi-pronged approach
  - Avian testing (indicator species)
  - Equine testing (before wide spread vaccination)
  - Mosquito pool testing (shift in biological vector adaptation)
  - Human surveillance data protected!
- Avian, equine and MP positives came with a long/lat tag instrumental for quick and effective abatement!
- Vector-borne disease funding was removed from the 2011 budget!

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Will ‘Golf Course Rabies’ spread in the Southwest?

- Big Brown Bat rabies strain adaptation to foxes and skunks on golf courses in Flagstaff – ‘Environmental Disease’
- 1st detection in non-bat in 2001
- Significant increase in terrestrial species 2004
- ‘Complete’ adaptation to skunks and foxes by 2008
- Skunks currently hard (impossible) to control factor
- Outbreak data mapped for control purposes!
- Attempt at eradication costly and tools are not fully efficacious!

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Wildlife Disease Investigation

- Multiple concurrent outbreaks of Bighorn Sheep pneumonia
- Aerial surveillance (long/lat)
- Individuals sacrificed for diagnostic work-up (long/lat)
- Live sampling and ‘treatment’ (long/lat, individual ID tags)
- Number of tagged individuals: milestones of accomplishment!

The Sign of the Beast!? Hardly!

- Accurately capturing individual ID is one of two bottle necks in laboratory testing!
- Lack of ‘permanent’ individual ID hampers any disease control programs!
- Lack of premise ID ditto!
- T. fetus epi investigations: Submitter: Joe Smith, J lazy S, Shelley & Joe Smith, J & S Smith:
  - They are all the same
  - Time consuming searches limit on the ground progress

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Data management

- Program manager database
- (State) Agency database (DOW/HHS)
- LIMS
- Arbonet
- USDA databases
  - Multiple data entry is time consuming and expensive
  - No meta-data – no data mining!
  - Full potential cannot be reached!

What is next and how do we prioritize?

- Noro-virus and sapo-virus infection transmissible between humans and domestic livestock?
  - If yes, what would be the consequences for food safety and occupational health?
- Pigs as hepatitis E reservoir?
- Pigs and humans pass H1N1 back and forth?
- When do these diseases become a concern?
- Who determines when, the media?
- Are these new or newly detected disease agents?

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Questions for Diagnosticians, regulatory Veterinarians and public Health Officials!

- Emerging or re-emerging disease, which group will cause more damage?
- Will we know it when we see it?
- Will we see it?
  - Abandoned ‘discovery diagnostics’, aka EM or VI for highly sensitive and equally specific tests
  - Veterinary diagnostics: Still years away from micro-arrays!
- One antibiotic away from the next plague!

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The Human-Animal Bond…

- Did SIV develop into HIV through bush-meat consumption?
- TB: who's on first? H. sapiens or B. taurus/B. indicus?
- How many cats and dogs in the US have MRSA?
- …is about to get closer!
  - Xenotransplantation and gene therapy: opportunities and risks (PERV, HERV, etc)

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What do we do when we find ‘it’?

- Communication – a sisyphean task!
- Damage control:
  - Shoot the messenger!
  - Do we know where it came from?
  - Animal disease control can conflict with stronger economic factors (END 2003 in NV)!
- Positive messages are often not heard!
- A ‘frugal’ industry raises professionals with ‘frugal’ expectations:
  - State Health Laboratory – Animal Health Laboratory
  - >$$$ $1.11 pa/hh
  - NIH/NSF - ARS

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High mortality during rinderpest outbreak

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Why do we do all this?

- **To protect Human Health!**

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