

**Infectious Diseases of Wildlife and
Emerging Environmental Health Issues at
the TFCA interface**

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CATEGORIES OF DISEASE

- AFRO-ENDEMIC DISEASES THAT ARE CLINICALLY “SILENT” IN THEIR TRADITIONAL HOSTS
- MULTI-SPECIES DISEASES THAT ARE INHERENTLY PATHOGENIC IN MOST OF THEIR HOSTS
- FOREIGN ANIMAL (ALIEN) DISEASES
- EMERGING OR RE-EMERGING DISEASES / ZOOZOSES
- DISEASES ASSOCIATED WITH ENVIRONMENTAL HEALTH

**AFRO-ENDEMIC INFECTIONS ARE USUALLY
ASSOCIATED WITH SPECIFIC WILDLIFE
HOSTS**

- THESE INFECTIONS ARE GENERALLY “SILENT” IN THEIR TRADITIONAL HOSTS.
- THESE INFECTIONS ARE IMPORTANT BECAUSE THEY FREQUENTLY CAUSE SEVERE DISEASE IN DOMESTIC ANIMALS
- MOST OF THESE DISEASES ARE OF GREAT CONCERN TO AFRICA’S AGRICULTURAL TRADING PARTNERS (AND HENCE THE O.I.E.)

**EXAMPLES OF AFRO – ENDEMIC
DISEASES AND THEIR NATURAL HOSTS**

- BUFFALO : FMD, THEILERIOSIS
- WILDEBEEST : MALIGNANT CATARRHAL FEVER
- WILD SUIDS : AFRICAN SWINE FEVER
- ZEBRA : AFRICAN HORSE SICKNESS
- BUFFALO, TRAGELAPHS, WILD SUIDS AND ELEPHANTS –PREFERRED TSETSE HOSTS : NAGANA
- BUSHBUCK : BOVINE PETECHIAL FEVER.

**ENDEMIC FOOT AND
MOUTH DISEASE IN
AFRICA**

THE BUFFALO CONNECTION

**FOOT AND MOUTH DISEASE (FMD) – AN
EXAMPLE OF A DIRECTLY CONTAGIOUS DISEASE THAT HAS
STRATEGIC TRANSBOUNDARY ANIMAL HEALTH IMPLICATIONS**

- THE AFRICAN STRAINS OF FOOT AND MOUTH DISEASE (SAT1, SAT 2 & SAT 3) ARE CURRENTLY LIMITED TO THE AFRICAN CONTINENT.
- AFRICAN BUFFALO ARE THE NATURAL DEFINITIVE HOST OF THESE VIRUS STRAINS AND THEIR TOPOTYPES
- GENERALLY, FMD INFECTION IN BUFFALO IS ASYMPTOMATIC.
- FMD INFECTION IN BUFFALO IS PERSISTENT - LASTS FOR YEARS AND MAY BE LIFE - LONG.
- FREQUENTLY MORE THAN ONE STRAIN OF FMD MAY BE FOUND CIRCULATING IN A BUFFALO HERD.



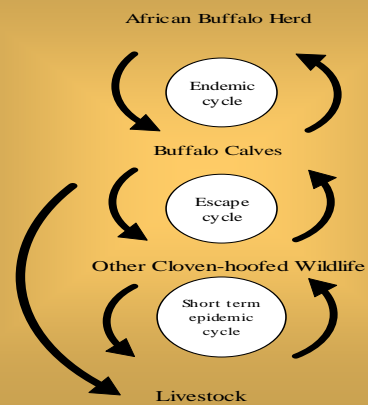
BUFFALO SOCIAL BIOLOGY IN RELATIONSHIP TO FMD VIRUS CIRCULATION

- BUFFALO ARE SOCIAL, CLOSE CONTACT ANIMALS AND GENERALLY LIVE IN LARGE HERDS.
- HEIFERS REACH PUBERTY AT 2 – 3 YEARS.
- BUFFALO COWS HAVE FIRST CALF AT FOOT AT AGE 3 – 4 YEARS. GESTATION IS 11 MONTHS
- BUFFALO COWS GENERALLY HAVE 2 CALVES WITHIN A THREE YEAR CYCLE. THEY MAY BREED UP UNTIL THE AGE OF 15 YEARS.
- BUFFALO ARE SEASONAL BREEDERS AND MOST CALVES ARE BORN IN SUMMER.
- COLOSTRAL ANTIBODIES PROTECT CALVES FROM FMD UNTIL APPROXIMATELY 6 MONTHS OF AGE.
- TRANSMISSION OF FMD VIRUS FROM ADULT CARRIER BUFFALO TO SUSCEPTIBLE ANIMALS APPEARS TO BE A RARE EVENT.
- EACH YEAR'S CALF COHORT WITHIN A HERD GENERALLY BECOMES INFECTED WITH FMD AFTER THEY ARE 6 MONTH OF AGE. THIS WOULD BE MID- TO LATE WINTER.
- VIRUS TRANSMISSION WITHIN THE ANNUAL CALF COHORT IS VERY EFFICIENT (CHICKEN POX IN A NURSERY SCHOOL ANALOGY).
- MOST CALVES HAVE BECOME INFECTED WITH ALL THREE SAT VIRUSES BY THE AGE OF 12 MONTHS.

55	B7	17-Jul-07	16mths	M	Butububu	2.8	2.1	2.0
56	B8	17-Jul-07	18yrs	F	Butububu	2.0	2.0	2.4
57	B9	17-Jul-07	12yrs	F	Butububu	2.1	2.3	2.5
58	B10	17-Jul-07	12yrs	F	Butububu	2.4	2.6	2.6
59	B11	17-Jul-07	10yrs	F	Butububu	2.4	2.2	2.4
60	B12	17-Jul-07	10yrs	M	Butububu	1.9	2.0	2.0
61	B13	17-Jul-07	16mths	M	Butububu	<1.3	<1.3	1.5
62	B14	17-Jul-07	22yrs	F	Butububu	2.5	2.0	2.5
63	B15	17-Jul-07	16mths	M	Butububu	2.3	2.6	2.5
64	B16	17-Jul-07	Sub-Adult	F	Butububu	2.7	2.2	<1.3
65	B17	17-Jul-07	3yrs	F	Butububu	2.8	3.1	1.5
66	B18	17-Jul-07	10yrs	F	Butububu	>3.1	2.3	1.9
67	C1	19-Jul-07	3mths	M	Shogumeni	1.8	2.0	2.5
68	C2	19-Jul-07	7yrs	F	Shogumeni	1.8	2.4	2.3
69	C3	19-Jul-07	10yrs	F	Shogumeni	2.4	2.2	2.3
70	G4	19-Jul-07	12yrs	F	Shogumeni	2.0	2.8	1.6
71	C5	19-Jul-07	8yrs	F	Shogumeni	2.3	2.2	1.7
72	C6	19-Jul-07	7yrs	M	Shogumeni	2.1	2.3	2.3
73	C7	19-Jul-07	4.5yrs	M	Shogumeni	2.6	2.3	1.9
74	C8	19-Jul-07	2yrs	M	Shogumeni	2.4	2.4	2.0
75	C9	19-Jul-07	1.5yrs	F	Shogumeni	2.8	2.8	1.6
76	C10	19-Jul-07	16mths	M	Shogumeni	<1.3	<1.3	2.6
77	C11	19-Jul-07	30mths	M	Shogumeni	2.2	2.2	2.7
78	C12	19-Jul-07	12yrs	F	Shogumeni	1.9	2.0	2.4
79	C13	19-Jul-07	9yrs	F	Shogumeni	2.2	2.7	2.4
80	C14	19-Jul-07	8yrs	F	Shogumeni	2.5	2.5	2.8
81	C15	19-Jul-07	30mths	F	Shogumeni	1.6	2.0	1.8
82	C16	19-Jul-07	26mths	M	Shogumeni	<1.3	2.1	<1.3
83	C17	19-Jul-07	9yrs	F	Shogumeni	1.5	2.2	2.3
84	C18	19-Jul-07	8yrs	M	Shogumeni	1.8	<1.3	2.0
85	C19	19-Jul-07	4yrs	M	Shogumeni	2.2	2.2	2.5
86	C20	19-Jul-07	2.5yrs	F	Shogumeni	2.1	2.4	1.7
87	C21	19-Jul-07	1yrs	F	Shogumeni	2.5	2.6	2.2
88	C22	19-Jul-07	8yrs	F	Shogumeni	2.4	2.4	2.4
89	C23	19-Jul-07	2yrs	M	Shogumeni	2.0	2.7	2.2
90	C24	19-Jul-07	7yrs	F	Shogumeni	2.8	2.5	2.8
91	C25	19-Jul-07	8yrs	M	Shogumeni	2.8	2.2	2.7
92	C26	19-Jul-07	3yrs	M	Shogumeni	1.5	2.2	2.0



Foot and Mouth Disease





IN THE KNP ECO-SYSTEM, IMPALA ARE AN IDEAL SENTINAL SPECIES

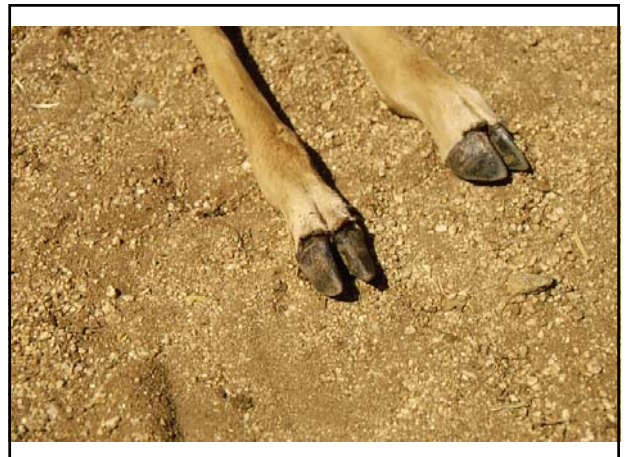
- THEY ARE EXQUISITELY SENSITIVE TO FMD INFECTION.
- THEY GENERALLY DEVELOP CLINICAL SIGNS, AND LESIONS

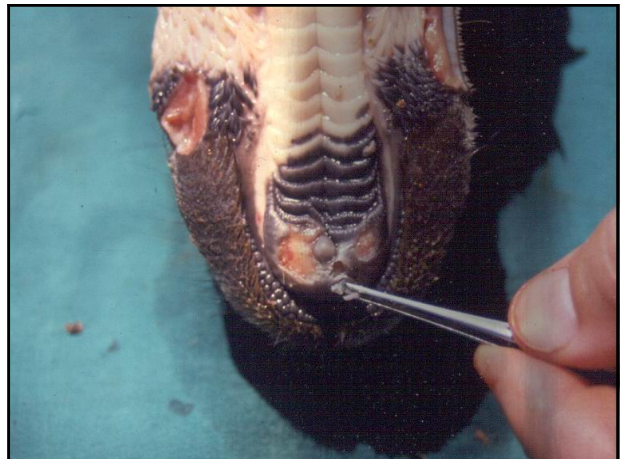
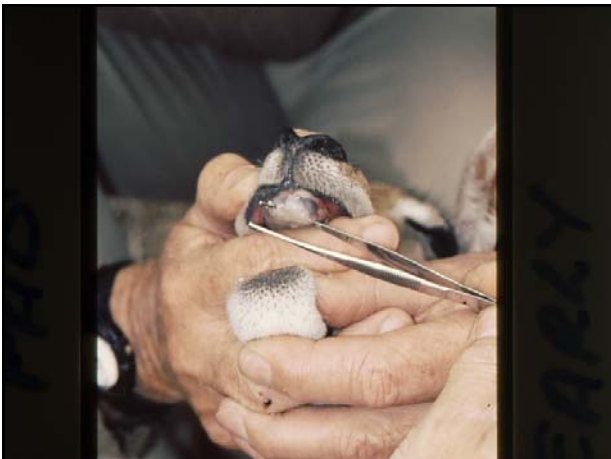
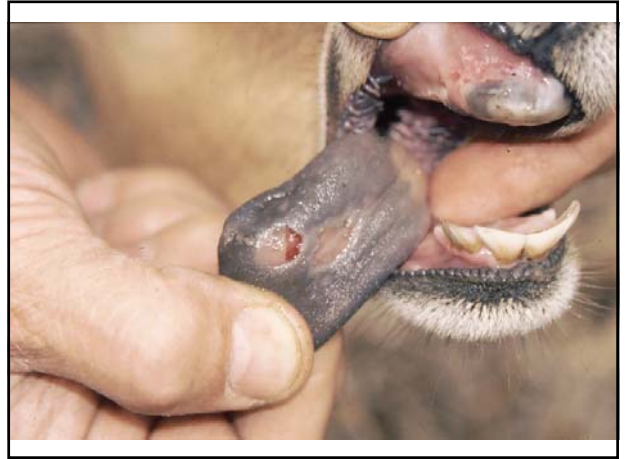
CLINICAL SIGNS INCLUDE :

- PILO-ERECTION (FEBRILE)
- "WALKING ON EGGS"
- VARYING DEGREES OF OVERT LAMENESS.
- SHAKING OF HOOVES
- EXCHANGING WEIGHT ON PAINFUL LIMBS
- LAGGING BEHIND HERD.
- LYING DOWN.

SALIVATION IS RARELY EVER SEEN.









OTHER CLOVEN-HOOFED WILDLIFE FOUND TO BE NATURALLY INFECTED WITH FMD IN THE KNP

- OCCASSIONALLY, CLINICAL FMD OR SEROLOGICAL EVIDENCE OF EXPOSURE / INFECTION HAS BEEN DETECTED IN OTHER SYMPATRIC UNGULATES.
- THESE INCLUDE :





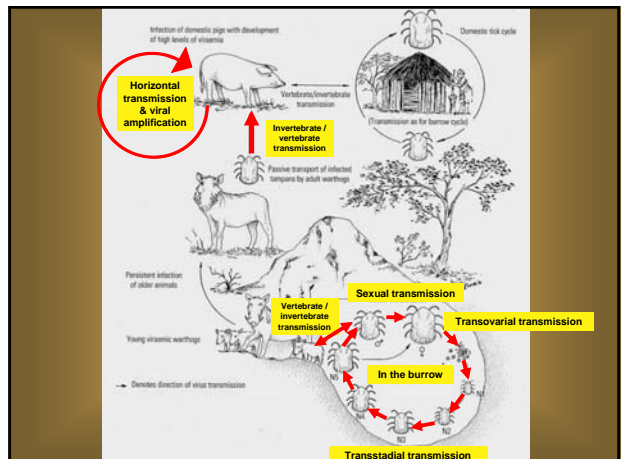
MALIGNANT CATARRHAL FEVER – THE WILDEBEEST CONNECTION



BOVINE MALIGNANT CATARRH

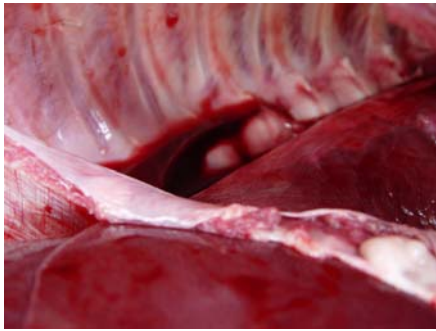


AFRICAN SWINE FEVER





FREE BLOOD IN BODY CAVITIES



HAEMORRHAGIC MESENTERIC LYMPH NODES



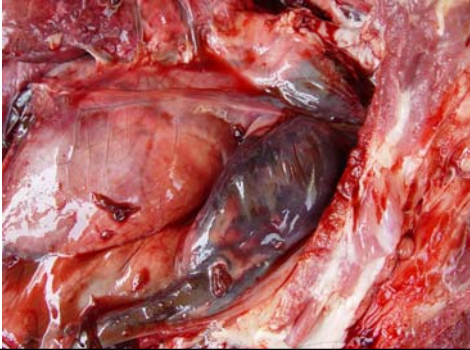
HAEMORRHAGIC LYMPH NODES



ENLARGED CURRANT JELLY SPLEEN



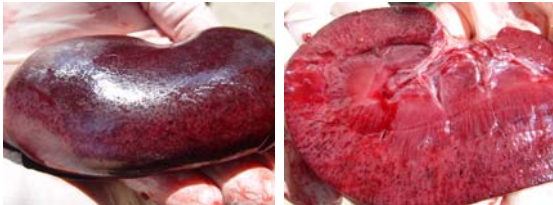
MEDIASTINAL HAEMATOMA



PULMONARY LOBAR HAEMORRHAGE



RENAL CORTICAL HAEMORRHAGES



INTESTINAL PETECHIA



AFRICAN HORSE SICKNESS

- AN EXAMPLE OF A NON-CONTAGIOUS VIRAL DISEASE OF EQUINES THAT IS TRANSMITTED BY A WINGED VECTOR



AFRICAN HORSE SICKNESS – THE ZEBRA CONNECTION



RESEARCH RESULTS

- ZEBRAS WERE FOUND TO REMAIN VIRAEIC FOR 40 DAYS POST INFECTION versus 7 DAYS IN HORSES.
- FOALS THAT HAVE LOST THEIR COLOSTRAL IMMUNITY SERO CONVERT TO ALL 9 SEROTYPES BY THE AGE OF 12 MONTHS
- 75% OF FOALS ARE BORN DURING OCTOBER TO MARCH, AND BECOME SUSCEPTIBLE TO INFECTION IN WINTER
- THE MAJOR WINTER (dry season) VECTORS ARE THE DUNG-BREEDING CULICOIDES (*Culicoides bolitinos*)
- 25% OF FOALS ARE BORN IN THE PERIOD APRIL TO SEPTEMBER.
- THE MAJOR SUMMER VECTORS ARE THE WATER BREEDING CULICOIDES (*Culicoides imicola*)
- THERE ARE THUS SUSCEPTIBLES ENTERING THE POPULATION THROUGHOUT THE YEAR.

SUMMARY AND CURRENT THINKING

- ZEBRA (and rarely donkeys) ARE PROBABLY THE MAINTENANCE HOST & ULTIMATE SOURCE OF AHS VIRUSES.
- LARGE ZEBRA POPULATIONS ARE REQUIRED TO MAINTAIN THE INFECTION DURING THE INTER-EPIDEMIC PERIOD OF THE WINTER DRY SEASON.
- AS THE SUMMER WET SEASON PROGRESSES AND VECTOR ABUNDANCE INCREASES, AHS IS ALSO TRANSMITTED TO HORSES, DONKEYS AND MULES, AND THEREAFTER A DOMESTIC EQUINE CYCLE STARTS WHICH PROGRESSIVELY SPREADS UNTIL THE FIRST FROSTS.
- LONG DISTANCE SPREAD OF AHS IS PROBABLY DUE TO MOVEMENT OF INFECTED HORSES, BUT WIND-BLOWN INFECTED *Culicoides* MAY PLAY A ROLE.
- THE MAJOR AHS EPIDEMICS, WHICH OCCUR EVERY 20 – 30 YEARS ARE PROBABLY RELATED TO CLIMATIC FLUXES WHICH FAVOUR THE VECTORS, AND POPULATION FLUXES OF UNVACCINATED HOSTS.

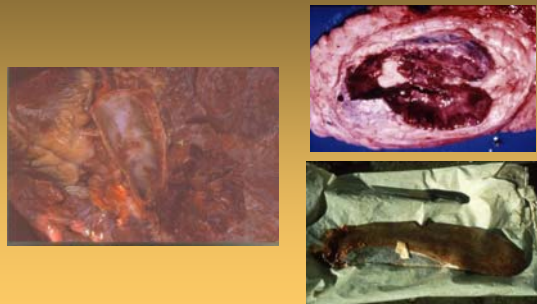
BUFFALO - ASSOCIATED THEILERIOSIS

- A SILENT TICK BORN INFECTION OF BUFFALO WHICH CAUSES FATAL DISEASE IN CATTLE

CORRIDOR DISEASE (THEILERIOSIS)



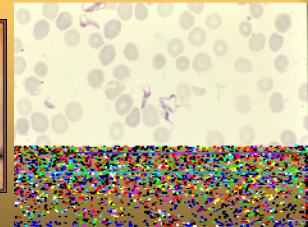
BUFFALO ASSOCIATED THEILERIOSIS : NECROPSY LESIONS



TRYPANOSOMIASIS

- THIS DISEASE IS LOCALISED TO AREAS OR BELTS WHERE TSETSE FLIES ARE ENDEMIC.
- BUFFALO, SPIRAL-HORNED ANTELOPE, WILD SUIDS, BLACK RHINOS AND ELEPHANTS APPEAR TO BE THE PREFERRED WILD HOSTS OF THE TSETSE FLY

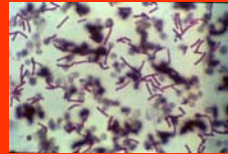
TSETSE FLIES AND TRYPS



MULTI- SPECIES DISEASES WHICH ARE INHERENTLY FATAL IN BOTH WILDLIFE AND DOMESTIC ANIMALS

- THESE DISEASES ARE NOT CONFINED TO THE AFRICAN CONTINENT
- THESE DISEASES ARE FREQUENTLY ZONOTIC
- THESE DISEASES ARE ALSO OF GREAT CONCERN TO THE INTERNATIONAL COMMUNITY AND THE O.I.E., AND MAY AFFECT TRADE IN ANIMALS AND THEIR PRODUCTS

ANTHRAX



ANTHRAX IN FREE RANGING AFRICAN WILDLIFE

- ANTHRAX OUTBREAKS IN WILDLIFE OCCUR IN CERTAIN ENDEMIC REGIONS OF THE AFRICAN CONTINENT.
- South Africa : KNP and Northern Cape
- Namibia : Etosha National Park and Caprivi Strip
- Botswana : Chobe National Park
- Zimbabwe : South Eastern and Eastern Lowveld
- Zambia : Luangwa river system
- Uganda : Queen Elizabeth National Park
- Tanzania : Lake Manyara and Serengeti system
- Kenya : Northern Frontier District
- Ethiopia : Omo National Park

CHARACTERISTICS OF ANTHRAX

- ANTHRAX is an infectious, often fatal disease of wild and domestic animals and humans, caused by a Gram positive, non-motile, endospore forming bacterium, *Bacillus anthracis*.
- The life history of *B. anthracis* differs markedly from most other pathogenic bacteria in that its persistence depends on extreme virulence and acute death of its host, whereafter it survives as a highly resistant spore during prolonged periods outside of the host.
- Anthrax is one of the oldest infectious diseases known to humankind and the biblical 5TH & 6TH plagues, that first affected livestock and then humans, were probably anthrax.

CHARACTERISTICS OF ANTHRAX (2)

- ANTHRAX IS A MULTI-SPECIES DISEASE THAT CAN INFECT ANIMALS OF MOST TAXONOMIC GROUPINGS.
- RUMINANTS AND HIND GUT FERMENTORS ARE THE MOST SUSCEPTIBLE.
- CARNIVORES AND PRIMATES ARE MORE RESISTANT
- OSTRICHES ARE THE ONLY AVIAN SPECIES IN WHICH NATURAL INFECTION HAS BEEN REPORTED.

TRANSMISSION OF ANTHRAX

- ANTHRAX SPORES PREFER ALKALINE SOILS RICH IN CALCIUM AND WITH HIGH MOISTURE CONTENT.
- IN MANY ENVIRONMENTS, WATER PLAYS AN IMPORTANT ROLE IN TRANSMISSION.
- SUCCESSIVE CYCLES OF FLOOD RUNOFF AND EVAPORATION APPEAR TO CONCENTRATE SPORES INTO DEPRESSIONS (CONCENTRATOR AREAS) .
- CARCASS SCAVENGERS MAY SPREAD THE INFECTION AND CONTAMINATE WATER POINTS
- DIRECT OR INDIRECT (BLOW FLY) CONTAMINATION OF VEGETATION, MAY ALSO BE A SOURCE OF INFECTION FOR HERBIVORES.
- CARNIVORES MAY BECOME INFECTED BY EATING INFECTED CARCASSES
- OSTEOPHAGIA BY PREGNANT OR LACTATING FEMALES, OR IN PHOSPHATE DEFICIENT REGIONS MAY BE A SOURCE OF INFECTION
- BITING FLIES MAY TRANSMIT ANTHRAX ORGANISMS MECHANICALLY FROM ANIMALS WITH HIGH TERMINAL BACTEREMIA

RABIES



RABIES

- IN AFRICA, DOMESTIC DOGS APPEAR TO BE THE MAJOR SOURCE AND VECTOR OF CLASSICAL RABIES.
- CERTAIN WILDLIFE POPULATIONS MAY MAINTAIN RABIES FOR SHORT TO INTERMEDIATE PERIODS OF TIME, IF THEIR POPULATION DENSITIES ARE ADEQUATE. THESE INCLUDE JACKALS, BAT-EARED FOXES AND CERTAIN MONGOOSE SPECIES.
- LARGE SOCIAL PREDATORS ARE AT HIGH RISK, AND THIS DISEASE MAY IMPACT ON THEM AT THE POPULATION LEVEL.

CLINICAL SIGNS OF RABIES

- **ABNORMAL BEHAVIOUR !!!**
- Lose fear of humans and appear to be tame ,
- May be very vocal,
- May salivate excessively,
- May become very aggressive,
- May be dumb and non reactive,
- May become paralysed.



Kudu salivating

Rabid kudu walking into house



ZOONOTIC RISK

- Humans may become infected if they are bitten by an infected animal, or have their broken skin or mucous membranes contaminated by neural tissue or saliva of the infected animal.

If bitten:

- Wash wound thoroughly with soap under running water and disinfect wound.
- Go A.S.A.P. to the nearest doctor, clinic or hospital.
- Treatment for bite (grade 3 category) exposure must include Tx with rabies immunoglobulin + vaccine

Diagnosis and Reporting

- Rabies is confirmed by doing an F/A test or histopathology on brain tissue.
- Please train field staff not to shoot the suspect animal in the head. Rather shoot the animal in the chest.
- Place carcass in a plastic bag, out of the sun.
- Report immediately to nearest veterinary official.

Prevention

Vaccination of domestic dogs and cats is the cornerstone of rabies control !



ALIEN / EXOTIC OR FOREIGN ANIMAL DISEASES

- THESE DISEASES ARE OF GREAT CONCERN TO AGRICULTURALISTS AND CONSERVATIONISTS ALIKE.
- THEY ARE NOT INDIGENOUS, AND THEIR IMPACTS ON ANIMAL HEALTH ARE UNPREDICTABLE.
- THEY MAY HAVE THE POTENTIAL TO AFFECT ANIMAL SPECIES AT THE POPULATION LEVEL.
- MOST OF THESE DISEASES ARE LISTED BY O.I.E. AND HAVE TRADE IMPLICATIONS
- SOME EXAMPLES INCLUDE RINDERPEST, CANINE DISTEMPER AND BOVINE TUBERCULOSIS

RINDERPEST

- INTRODUCED ONTO THE AFRICAN CONTINENT IN 1888.
- RESULTED IN THE GREATEST RECORDED ANIMAL HEALTH DISASTER EVENT, IMPACTING SEVERELY ON BOTH WILDLIFE AND LIVESTOCK.
- HAD A PROFOUND SOCIAL IMPACT DUE TO MASSIVE LIVESTOCK DEATHS
- MANY OF THE WILD RUMINANT AND SUID DISTRIBUTION ANOMALIES MAY BE TRACED BACK TO THE INITIAL IMPACT OF THIS DISEASE.
- RINDERPEST NOW APPEARS TO HAVE BEEN FINALLY ERADICATED FROM OUR PLANET, AFTER A DRAWN OUT AND COSTLY INTERNATIONAL CAMPAIGN.

CANINE DISTEMPER

- CANINE DISTEMPER VIRUS INFECTION IS ALSO THOUGHT TO BE A RELATIVELY RECENT INTRODUCTION TO THE AFRICAN CONTINENT.
- CD INFECTION HAS FLOURISHED IN INFORMAL COMMUNAL AND URBAN DOG POPULATIONS.
- SPILL OVER OF INFECTION HAS OCCURRED ACROSS THE BOUNDARIES OF SEVERAL NATIONAL PARKS,
- IN 1993, AN OUTBREAK OF CANINE DISTEMPER WAS THOUGHT TO HAVE BEEN PARTIALLY RESPONSIBLE FOR THE DEMISE OF MOST OF THE WILD DOGS AND 30% OF THE LIONS IN THE SERENGETI ECOSYSTEM.
- IN 2009, A CANINE DISTEMPER OUTBREAK IN LIONS WAS DETECTED IN THE SOUTH AFRICAN SECTOR OF THE K GALAGADI TRANSFRONTIER NATIONAL PARK. Unconfirmed reports of similar mortalities in lions have been received from the Botswana sector of this TFCA.
- Infected dogs in peripheral communities are thought to be the source of infection

BOVINE TUBERCULOSIS

- PROBABLY INTRODUCED ONTO THE AFRICAN CONTINENT WITH COLONIAL CATTLE IN THE 18TH AND 19TH CENTURIES
- HAS BECOME WELL ESTABLISHED IN CATTLE IN NUMEROUS AFRICAN COUNTRIES
- HAS SPILT OVER INTO WILDLIFE IN SEVERAL AFRICAN COUNTRIES INCLUDING SOUTH AFRICA, ZAMBIA, UGANDA, TANZANIA AND KENYA
- HAS BEEN RECORDED IN 16 SPECIES OF WILDLIFE IN AFRICA

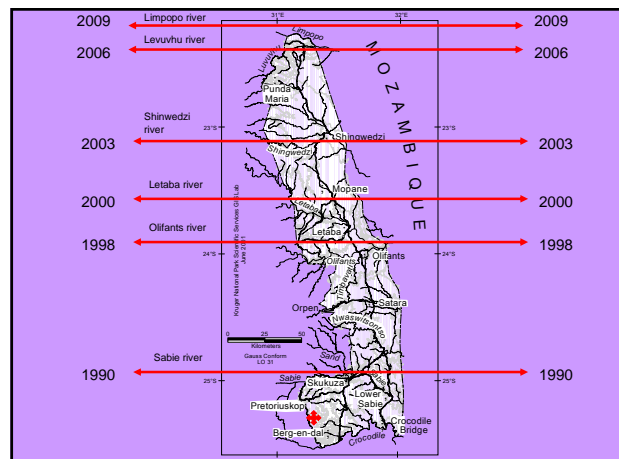
BOVINE TB IN BUFFALO



BOVINE TB IN KUDU



BOVINE TB IN LIONS



ENVIRONMENTAL HEALTH ISSUES

- ARE GENERALLY RELATED TO ECOLOGICAL DISTURBANCES OR ENVIRONMENTAL POLLUTION

CYANOBACTERIAL BLOOMS



RISK FACTORS FOR CYANOBACTERIAL BLOOMS

- FLOW DISTURBANCES OF DRAINAGE SYSTEMS - DAMS
- EUTROPHICATION OF WATER BODIES, WHICH MAY BE FROM AMPHIBIOUS MAMMALS (HIPPOS) IN HIGH DENSITIES, OR FROM SEWERAGE, AGRICULTURAL OR INDUSTRIAL POLLUTION

PANSTEATITIS IN CROCODILES



FLOPPY TRUNK DISEASE IN ELEPHANTS



INTERNATIONAL EMERGING ZONOOSES

- APPEAR TO BE RELATED TO INTENSIFICATION OF THE HUMAN / WILDLIFE INTERFACE
- INCREASED UTILISATION OF WILDLIFE PRODUCTS
- HUMAN ENCROACHMENT INTO WILDLIFE REFUGES
- ANTHROPOGENIC DISTURBANCE OF HABITATS

RELATIVELY RECENT EXAMPLES OF EMERGING VIRAL ZOOSES

- HIV-1, HIV-2 AND HIV-3
- SARS
- FILOVIRUS INFECTIONS
- H5N1 AVIAN & H1N1 PANDEMIC INFLUENZA
- WEST NILE VIRUS
- NIPAH AND HENDRA VIRUS INFECTIONS
- HANTA VIRUS INFECTION
- RIFT VALLEY FEVER

EMERGING AND RE-EMERGING BACTERIAL ZOOSES

- LYME DISEASE
- BOVINE TUBERCULOSIS
- TULARAEMIA
- BUBONIC PLAGUE
- EHRLICHIOSIS

THE END

