Rinderpest

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Special note of thanks

Many of the excellent images and notes for this presentation are borrowed from these 2 sources:

- From “Rinderpest” a presentation and notes by Dr Moritz van Vuuren, delivered at the Foreign Animal and Emerging Diseases Course, Knoxville, Tenn., 2005

- From “Rinderpest” a presentation and notes by Dr Linda Logan delivered to many and diverse audiences including the Colorado Foreign Animal Disease Course of Aug 1-5, 2005, Plum Island Foreign Animal Disease Diagnostics Course and others
Rinderpest (RP) is an acute or subacute, contagious viral disease of ruminants and swine, and of major importance to the cattle industry.
Rinderpest

Rinderpest is characterized by high fever, lachrymal discharge, inflammation, hemorrhage, necrosis, erosions of the epithelium of the mouth and of the digestive tract, profuse diarrhea, and death.

The “four D’s” of Rinderpest:
- Depression
- Diarrhea
- Dehydration
- Death
The virus is relatively fragile and is immunologically related to viruses that cause

- canine distemper,
- measles, and
- peste des petits ruminants
Also known as “cattle plague”

rinderpest is a mucosal disease

Rinderpest
Periodic pandemics of rinderpest throughout Africa for over 100 years….
The virus was widely distributed throughout Europe, Africa, Asia and West Asia, but never became established in either the Americas or Australia/New Zealand.
Mass vaccination and eradication efforts have steadily decreased the prevalence of rinderpest in many of these areas.
However, it currently remains endemic in the Indian subcontinent, the Near East, Egypt, and sub-Saharan Africa.
Rinderpest, the most dreaded bovine plague known, has changed the course of history many times over.
Century after century, rinderpest swept west over and around Europe and east over and around Asia with every marauding army causing the disaster, death and devastation that preceded

1. *The fall of the Roman Empire*,
2. *The conquest of Christian Europe by Charlemagne*,
4. *The impoverishment of Russia* and
5. *The colonisation of Africa.*
Rinderpest, Historic Legacy

- Concept of Quarantine & Indemnity
- Development of the clinical thermometer
- First mass vaccination campaign
- First Veterinary School: 1762 in Lyon, France
Rinderpest, Historic Legacy

- Veterinary Schools: Egypt (1827), India (1872)
- Creation of British Veterinary Dept. in 1866
- 1st International Veterinary Congress, Hamburg 1863
- Creation of OIE in 1920
Rinderpest

- Rinderpest is a disease reportable to the OIE.

- It is also on the USDA list of High Consequence pathogens.
Because rinderpest is easily transmissible between animals, it is a major concern for livestock producers.
“Rinderpest is the most dreaded bovine plague -- a highly infectious viral disease that can destroy entire populations of cattle and buffalo."
Bio-weapon

This disease ravaged cattle herds domesticated in Asia 8-9000 years ago and was used as a bio-weapon by marauding Asian armies.
Grey Steppe Cattle

- The secret weapons of the invaders were Grey Steppe oxen.
- Grey steppe cattle were asymptomatic carriers shedding rinderpest virus for months provoking epidemics that devastated buffalo and cattle populations of the invaded countries.
- The results were no transportation, untilled fields, starving peasants, and overthrown governments.
Grey Steppe Cattle

provided by Pascal Delperdange

provided by Dr Georgios Arsenos

www.ansi.okstate.edu/.../ greeksteppe-web-1.jpg

www.embryoplus.com/.../ images/hungrey1.jpg
Rinderpest
Rinderpest

- Etiology
- Host range
- Incubation
- Clinical signs
- Transmission
- Diagnosis
- Differential Diagnosis
Etiology

- Family: Paramyxociridae
- Genus: Morbilivirus
- Type: only one, with differences in virulence
Etiology

- Rinderpest
- electron microscopy

Rinderpest virus

www.virology.net/ Big_Virology/EM/rpv2.JPG
High Mortality

Can be a highly fatal disease

High morbidity, High mortality

There is a good vaccine available and proper use of it can reduce fatality

Morbidity can be greater than 90% in cattle.
Host Range

All cloven-hoofed animals are susceptible (not all are clinical)

Most clinical cases occur in cattle and water buffalo
Host Range

- European pigs are quite resistant (subclinical);
- American javelina are very susceptible.
Host Range

- Sheep, goats, and yak are mostly subclinical

http://www.geo.arizona.edu/dgesl/research/regional/asian_monsoon_dynamics/yak.htm
Host Range

- Camels – asymptomatic infections only
Host Range – Wild Animals

Most cloven-footed wild animals such as bison and deer

- Antelope
- Wildebeest
- Kudu
- Eland
- Giraffe
- Hippopotamus
- Gazelle
- Warthog
Incubation period

- Varies with strain of RPV, dosage, and route of exposure (3-15 days)

- Normally a range of 3-9 days (can be as short as 3-4 days in experimental infection; also, can be as long as 10-15 days with virus of low virulence)

- Duration: 2 or more weeks
*Virus is present in blood and secretions BEFORE symptoms appear
General Clinical Signs

Clinical signs include: a high fever; red patches with discharge from around the eyes, nose and mouth; frothy saliva from the mouth; constipation followed by diarrhea. After a few days, the infected animal dies.
General Clinical signs

- Fever
- Depression
- Nasal & lachrymal secretion
- Congested mucosas
- Mucosal erosions
- Severe diarrhea
- Leukopenia
- Death
Clinical Signs in cattle

The case definition of rinderpest is **ocular** and **nasal discharges** with any two of the additional signs:

+ fever
+ erosions in the mouth
+ diarrhea
+ dehydration
+ death
Clinical signs in cattle

Two major forms of disease

– Acute or Classic form
– Peracute form
Clinical Signs in cattle (Peracute Form)

- Most often found in highly susceptible young and newborn animals
- No prodromal signs
- High fever (104-107 °F)
- Congested mucous membranes
Clinical Signs in cattle (Acute Form)

Acute (classic) form characterized by pyrexia, erosive stomatitis, gastroenteritis, dehydration, and death

Four stages
1. Incubation period
2. Febrile period
3. Mucous membrane congestion
4. Gastrointestinal signs
Clinical Signs in cattle
(Acute Form)

- Fever - 104 to 107°F (40-42°C)
- Serous oculo-nasal discharge
- Leukopenia
- Depression
- Anorexia
- Constipation followed by diarrhea
- Oral erosions
Clinical Signs in cattle (Acute Form)

- Decreases in fever and viral titer
- Diarrhea (may be watery or hemorrhagic)
- Dehydration, emaciation
- Prostration and death 6 to 12 days after onset of illness
Clinical Signs

“Shooting” diarrhea

Rinderpest
Clinical Signs

In Africa this also includes corneal opacity which has been associated with rinderpest in buffalos and lesser kudus but has also been noted in calves together with dermatitis.
Clinical Signs

- Early

  serous ocular discharge
  (Epiphora)

Rinderpest
Clinical Signs

- Depression
- Diarrhea
- Dehydration
- Death

Rinderpest
Clinical Signs

- Photophobia
- Conjunctivitis

Rinderpest
Field case of rinderpest from Libya. This animal had lacrimation, diarrhea, anorexia as well as a fever, increased heart and respiratory rates.
Clinical Signs

Early focal mucosal erosions
Clinical Signs

Early erosions - rinderpest or trauma?
Inflammation and necrosis of cheek papillae

Rinderpest
Clinical Signs

Inflammation of cheek papillae

Rinderpest
Clinical Signs

Mucosal erosions - “cigarette burns”
Clinical Signs

Purulent discharges

Rinderpest
Clinical Signs

Purulent discharges

Rinderpest
Clinical Signs

Excessive Salivation

Rinderpest
Clinical Signs

Advanced mucosal erosions

Rinderpest
Clinical Signs

Advanced mucosal erosions

African Lineage 1
Southern Sudan 1998

Rinderpest
Clinical Signs

Shallow erosions in the mouth. Note how these have a sharp margin.
Rinderpest
Clinical Signs

Extensive mucosal erosion
Clinical Signs

Erosion under the tongue
Clinical Signs

Profuse diarrhea and dysentery

Rinderpest
Dehydration, emaciation and collapse

Rinderpest
Dehydration and death

Rinderpest
Convalescence

healing mucosal ulceration

Rinderpest
Convalescence

Rinderpest

eroded cheek papillae
Convalescence

muzzle skin sloughing

Rinderpest
Convalescence

Dried ocular discharge and nasal excoriation

Rinderpest
Lesions

Eroded hard palate

Rinderpest
Lesions

Gastro-enteritis

Rinderpest
Lesions

Hemorrhagic mesenteric lymph nodes

Rinderpest
Lesions

Hemorrhagic Peyer's patches

Rinderpest
Lesions

Linear petechial haemorrhages in colon

Rinderpest
Lesions

“Zebra striping” in the colon

Rinderpest
Lesions

Rinderpest
Intestinal Lesions

Rinderpest
Terminal Rinderpest

- Epiphora, conjunctivitis
- Necrotic stomatitis
- Diarrhea
Less virulent form of Rinderpest
Clinical Signs: Kudus

- **ophthalmia**
- cataract and uveitis
- keratitis and copious discharge

Rinderpest
Clinical Signs: swine

- Inapparent infection accompanied by modest fever
- Pyrexia, prostration, conjunctivitis, erosions of buccal mucosa, death
Clinical Signs: sheep and goats

- Clinical signs less precise than those in cattle
- Variable pyrexia and anorexia
- Inconsistent diarrhea
Transmission

- Direct Contact with infected animal
  - Respiratory and lachrymal secretions
  - Feces
  - Other body fluids

- Carriers:
  - Unknown.....wildlife?
Transmission

- Aerosol
- Vectors – tabanids*
- Ingestion
- Fomites
Transmission

There is no vertical transmission, arthropod vector, or carrier state. This makes Rinderpest virus an ideal virus to be targeted for eradication.
Diagnosis

Samples:
- Conjunctival Fluid
- Intestinal contents or feces
- Whole blood
- Lymphoid tissue, lung, intestine
- Serum
Diagnostic Tests

- Antigen Detection
- Antibody Detection
- Histopathology
Differential Diagnosis

- Bovine virus diarrhea
- Mucosal disease
- Infectious bovine rhinotracheaitis
- Malignant catarrhal fever
- Vesicular stomatitis
- Foot-and-mouth disease
Differential Diagnosis

- Salmonellosis
- Necrobacillosis
- paratuberculosis
- Bluetongue / EHD
- Mycotic Stomatitis
Rinderpest - Bibliography

1. Foreign Animal Diseases (USAHA)
3. Rinderpest, presentation to FEAD Course 2005, Knoxville Tennessee by Moritz van Vuuren
6. OIE
7. FAO
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