

# African Horse Sickness



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Special thanks for materials  
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from presentations by:

- Dr Corrie Brown, “African Horse Sickness”  
CSU Foreign Animal Disease Training Course,  
College of Veterinary Medicine and Biomedical  
Sciences, August 1-5, 2005.
- Professor Alan Guthrie, Department of  
Veterinary Tropical Diseases, Faculty of  
Veterinary Science, University of Pretoria,  
“African Horse Sickness” presented at the  
FEAD course in Knoxville, Tenn. 2005.

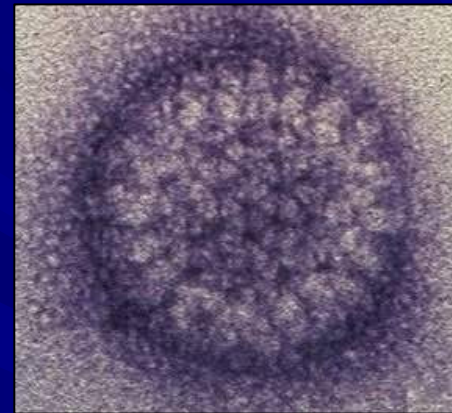
# Images

- Pathological lesion images marked “USDA” were taken by staff photographers at the Plum Island Animal Disease Center lab and were presented by Dr Corrie Brown
- Images of symptoms marked “Guthrie” were presented in Tennessee by Dr Alan Guthrie



# African Horse Sickness

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





# African Horse Sickness

African horse sickness (AHS) is an infectious but noncontagious, insect-borne viral disease affecting all species of equids.



It is transmitted in the field by at least two species of *Culicoides*.





African Horse Sickness is an OIE reportable disease.

African Horse Sickness



**If you hear hoof beats, look for horses....**



[www.hedweb.com/animalag/horsesw.htm](http://www.hedweb.com/animalag/horsesw.htm)

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**But don't forget to look for  
zebras too**



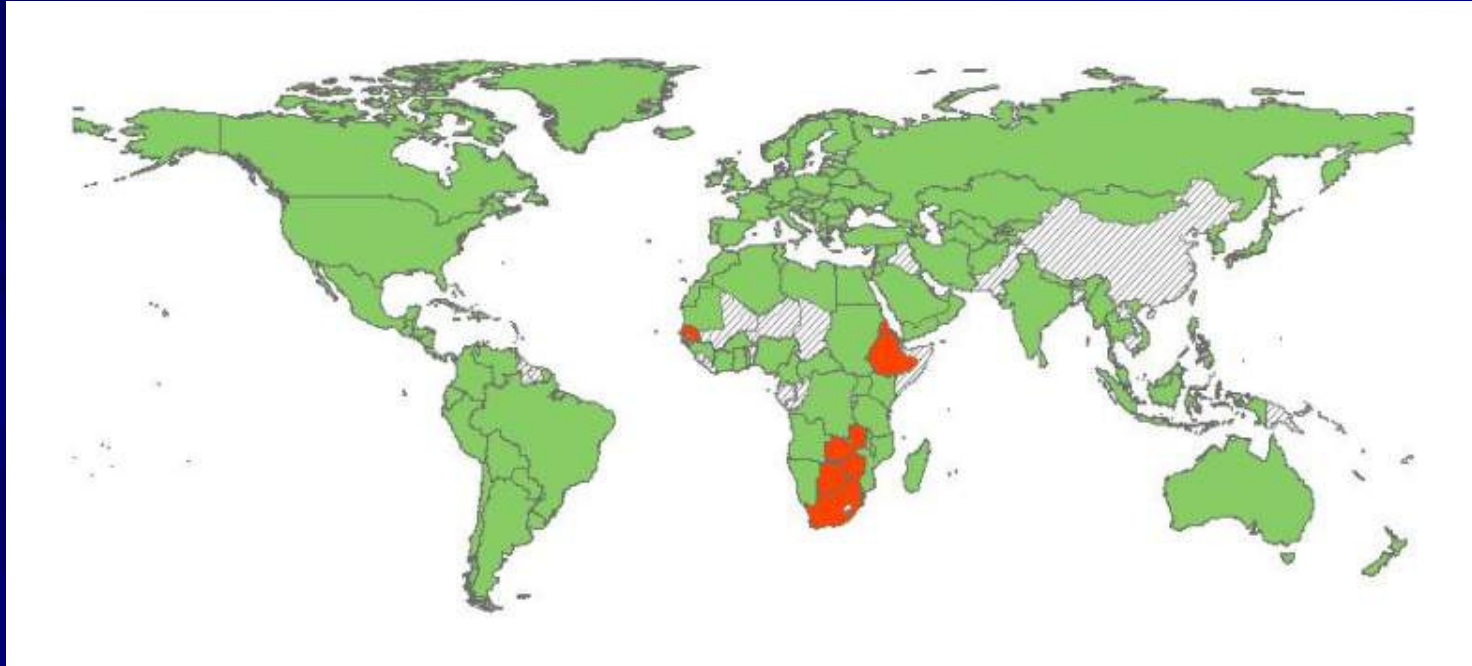
<http://www.singerhuetten.at/Afrika/Serengeti%202%202003.htm>

African Horse Sickness








## African Horse Sickness in the World in 2004. OIE



[http://www.oie.int/eng/info/en\\_presdistribgeo.htm](http://www.oie.int/eng/info/en_presdistribgeo.htm)

-  Disease reported present
-  Disease reported absent
-  Data unavailable or incomplete

African Horse Sickness



# Etiology

African Horse Sickness is caused by an Orbivirus of the family Reoviridae

- Viscerotropic virus
- Family: Reoviridae, Genus: *Orbivirus*
- Nine different serotypes of the virus have been described



# Serotypes

All serotypes of AHS virus occur in eastern and southern Africa; this distribution reflects the geographic pattern of zebra, which cycle the virus asymptotically and probably serve as a reservoir for the virus.





# Serotypes

Only African Horse  
Sickness virus serotype  
9 is found in West Africa  
where zebra do not  
occur.





# Serotypes

Periodically, AHS virus spreads beyond sub-Saharan Africa and the disease has caused major epizootics extending as far as Pakistan and India in the east and Morocco, Spain and Portugal in the West.





# Virus Characteristics

The virus can be inactivated by:

- repeated freezing and thawing
- by treatment with acetic acid (at pH of 6.3 or lower), remaining for 2 weeks at 37°C, or being placed for 5 minutes at 70°C.



# Host Range

In order of decreasing severity of disease:

- Horses
- Mules
- Donkeys
- Zebras





Approximately 70-95 percent of all horses developing the disease will die



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yet the mortality percentage for mules is only about 50 percent and for donkeys only 10 percent.



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# Role of Zebras

- AHS virus overwinters in zebras in Kruger National Park, from where it spreads westwards and southwards every year.



Image courtesy of Dr Corrie Brown



# Zebras

- AHS remains endemic in zebra populations across South Africa
- They harbor the virus and are often the source of sudden outbreaks in Africa



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# Host Range

- Dogs can also become infected by eating infected meat.
- 1987-90 outbreak in Spain:  
Dogs that did not consume infected meat were found to be seropositive, suggesting infection by arthropod bites.



# Host Range

- There is no evidence that humans can be infected by field strains of the disease. However, intranasal exposure to neurotrophic vaccine strains has caused encephalitis and retinitis in humans.



# Incubation

- In experiments, African Horse Sickness usually has a 5 to 7 day incubation period.
- In natural infections, circumstantial evidence indicates that the incubation period is from 7 to 14 days.



# Clinical Signs

- Infected horses remain viremic for approximately 18 days, although the fever may be present for another 4 to 8 days, if the animal should live that long. Despite their reduced mortality, the viremic stage in donkeys may last for up to 28 days. Zebras appear to be very similar to donkeys in this regard.



# Clinical Signs

## ■ First Sign:

Fever of 102°F to  
106°F,

(38.9°C - 41.1°C)



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# Clinical Signs

Most Common Sign

- Congestion of the conjunctivae
- Severity of congestion is good indication of severity of infection



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# Clinical Signs

## Lower Eyelid Conjunctivitis



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# Clinical Signs

After initial signs, the disease can progress in one of four ways:

- Peripheral (Cardiac) called “Dikkop” in S. Africa
- Central (Pulmonary) called “Dunkop” in S. Africa
- Mixed Form (Acute)
- Mixed Form (Fever)



# Clinical Signs: Pulmonary

- Fever up to 104°F to 106°F
- Increasingly more rapid respiration and abdominal expiration
  - Respiratory rate may reach 60-70 per minute
- Coughing and Sweating



<http://www.vet.ed.ac.uk/animalpain/Pages/images/Optimised%20Images/optphotos/EQsweating.jpg>



# Clinical Signs: Pulmonary

- Horse may appear colicky (getting up and down, and rolling)
- As pulmonary distress increases:
  - Animal stands with forelegs apart
  - Head extended
  - Nostrils dilated





# Clinical Signs: Pulmonary



Once foam appears in nostrils, death follows rapidly.

Animal may drink and eat, even in terminal stages.



# Clinical Signs: Pulmonary



African Horse Sickness

Photo courtesy of Plum Island



In my few encounters with the disease, I was struck by the extreme respiratory distress including froth pouring from the nostrils, extensive hydrothorax and hydropericardium, supraorbital edema and a gelatinous infiltration of subcutaneous tissue and intermuscular fascial planes along the ligamentum nuchae and muscles of the shoulder.

Dr Botlhe Modisane 2006





In 2004, South Africa reported 196 outbreaks resulting in 335 cases and 166 deaths. The case fatality rate was even higher in 2003, with 89 outbreaks resulting in 510 cases and 441 deaths. Prior to this outbreak, the Western Cape province had been declared an AHS-free zone from which horses could be exported. - Mod.PC]



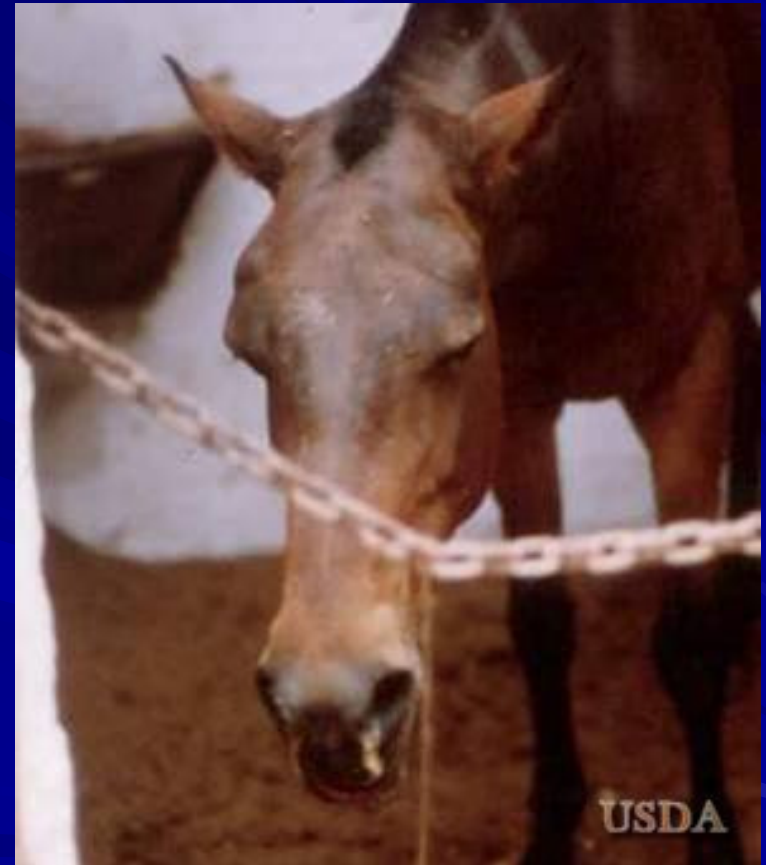
# Clinical Signs: Cardiac

- Incubation is usually longer (7-14 days)
- Fever of 102-106°F usually lasts 3-6 days



# Clinical Signs: Cardiac

- At the end of the febrile period, marked swelling of the head and neck may occur





# Clinical Signs: Cardiac

- Classic areas for swelling are:
  - Supraorbital fossa
  - Conjunctiva
  - Lips, cheeks, tongue
  - Intermandibular space
  - Laryngeal area
  - Neck, brisket, ventral thorax





# Clinical Signs: Cardiac

## Peri-orbital swelling



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# Clinical Signs: Cardiac

- No edema of the lower parts of the legs occurs
- Petechial hemorrhages on the ventral surface of the tongue and in conjunctiva may occur
- As edema progresses, there may be restlessness and signs of abdominal pain and pulmonary edema



# Clinical Signs: Cardiac

- Finally, animal becomes prostrate, and dies
- Again, animal may eat and drink, even in terminal stages





# Clinical Signs: Cardiac



<http://www.vet.uga.edu/vpp/IVM/ENG/Modes/definition03.htm>

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# Recovery: Cardiac

- If the disease is not fatal, the edema will subside over 3 to 8 days.



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# Clinical Signs: Mixed Form (acute)

- Mixture of pulmonary and cardiac forms
- Signs of one may be predominate
- The mixed form is more frequently seen at necropsy



# Clinical Signs: Mixed Form (acute)



<http://www.vet.uga.edu/vpp/IVM/ENG/Horse/index.htm>

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# Clinical Signs: Mixed Form (fever)

- Mildest form
- Can be subclinical or inapparent
- Occurs in zebras, donkeys, and horses with heterologous immunity.
- Fever is usually intermittent—usually normal temperature in the morning, but is febrile in the afternoon
- Fever may reach 104°F in 1 or 2 days



# Clinical Signs: Mixed Form (fever)

- Other Clinical Signs:
  - Increased respiratory rate
  - Mild conjunctival congestion
  - Accelerated pulse
  - Loss of appetite is rare and mild
  
- After 1 or 2 days, there is a rapid recovery



- Morbidity is dependant upon exposure
- Mortality varies with serotype and strain; mortality in naïve horses can be high



# Post Mortem Lesions

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# Sudden Death



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# Pulmonary edema

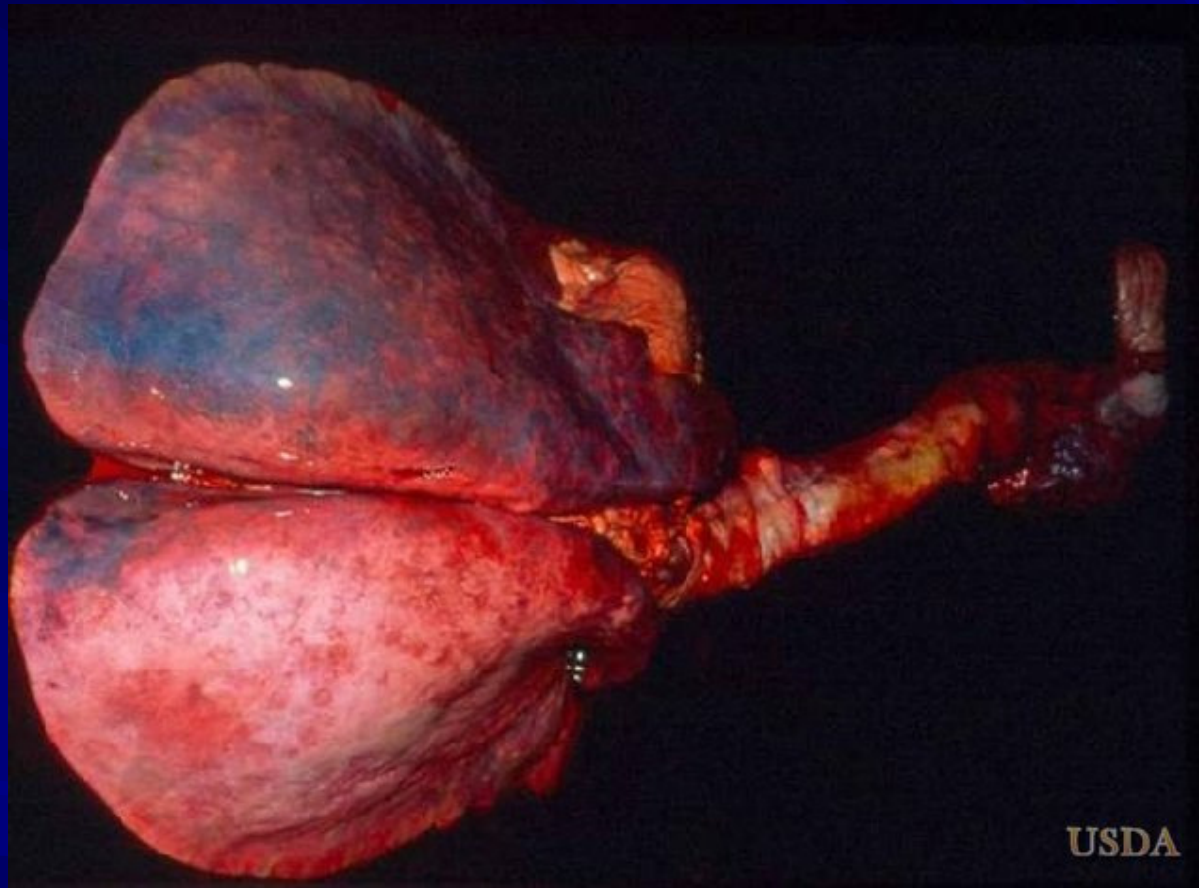


Pulmonary edema not seen in all cases;  
Rarely seen in euthanized animals

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# Pulmonary Edema



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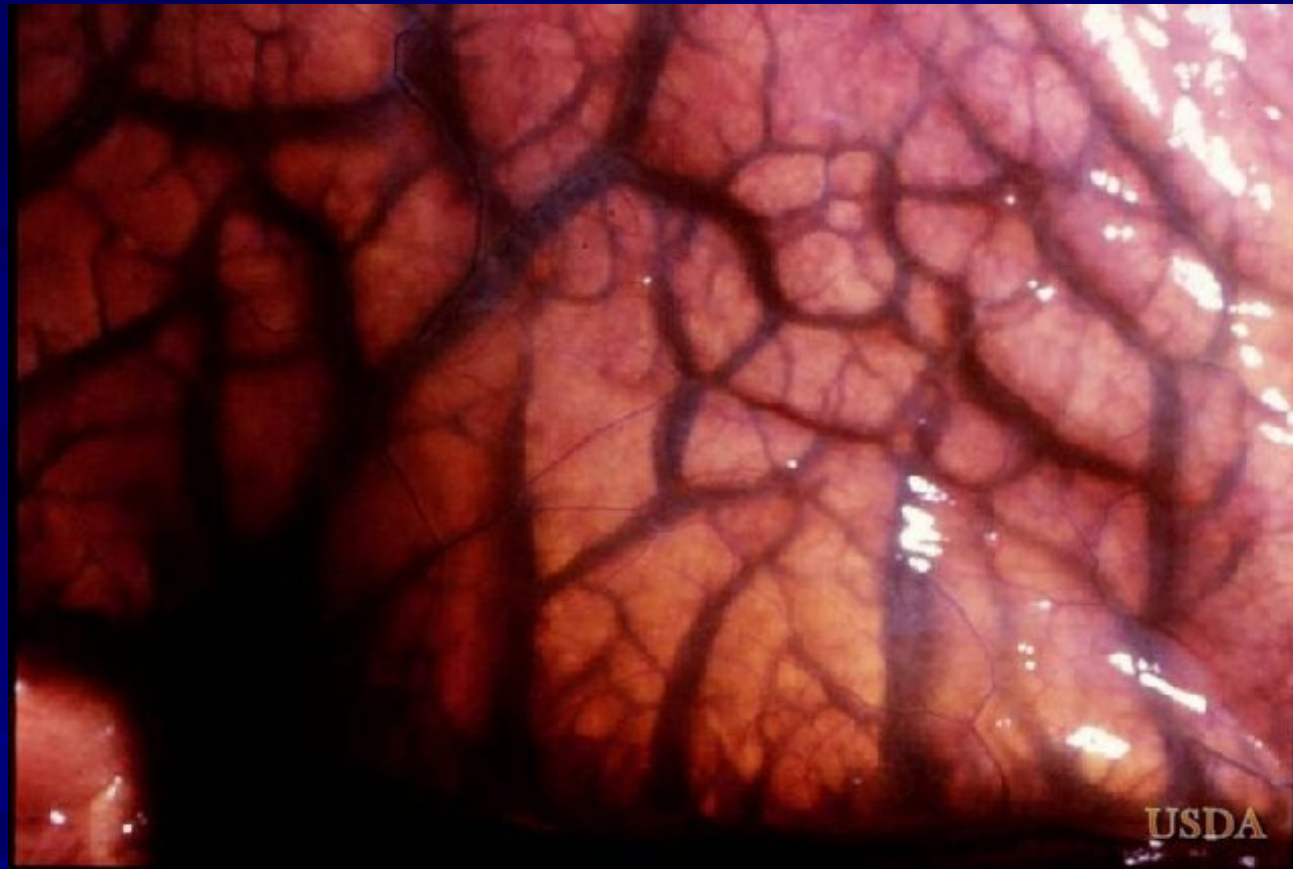
# Pulmonary Edema



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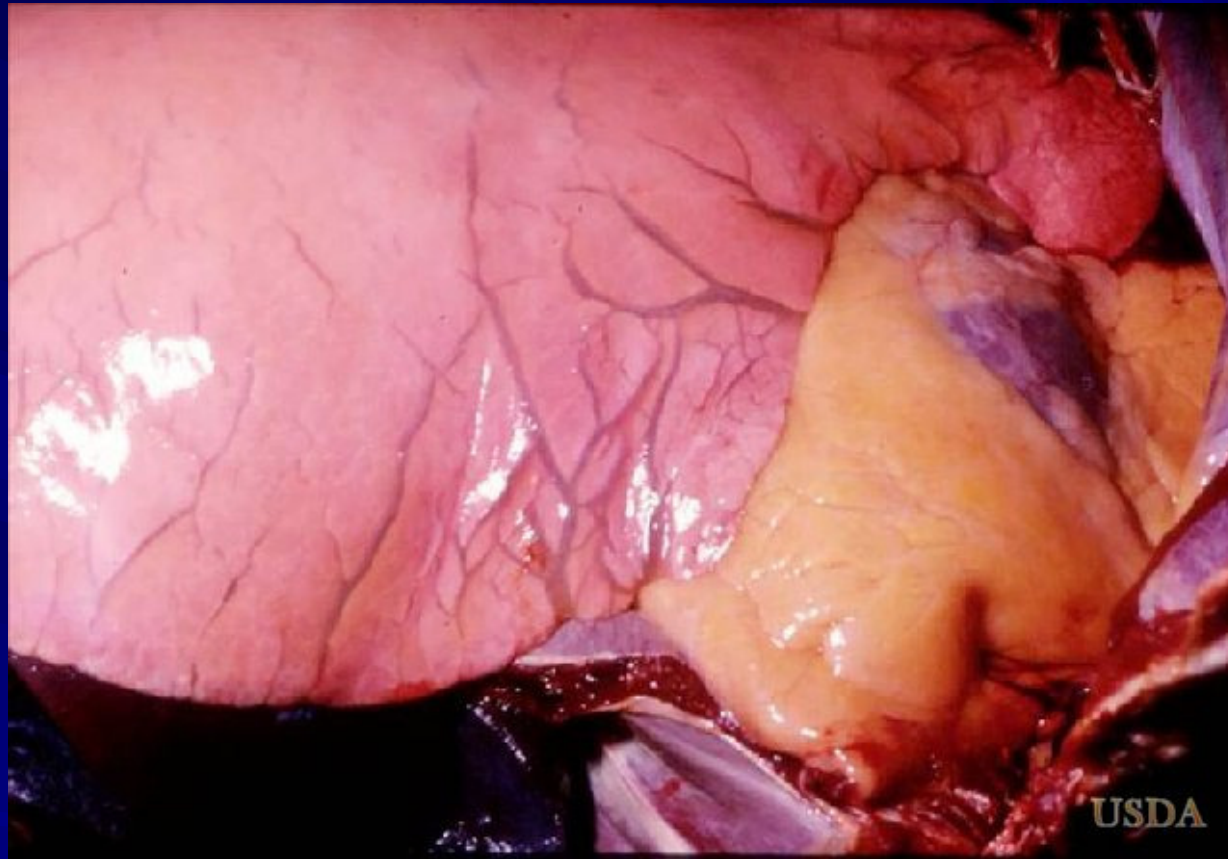
# Pulmonary edema



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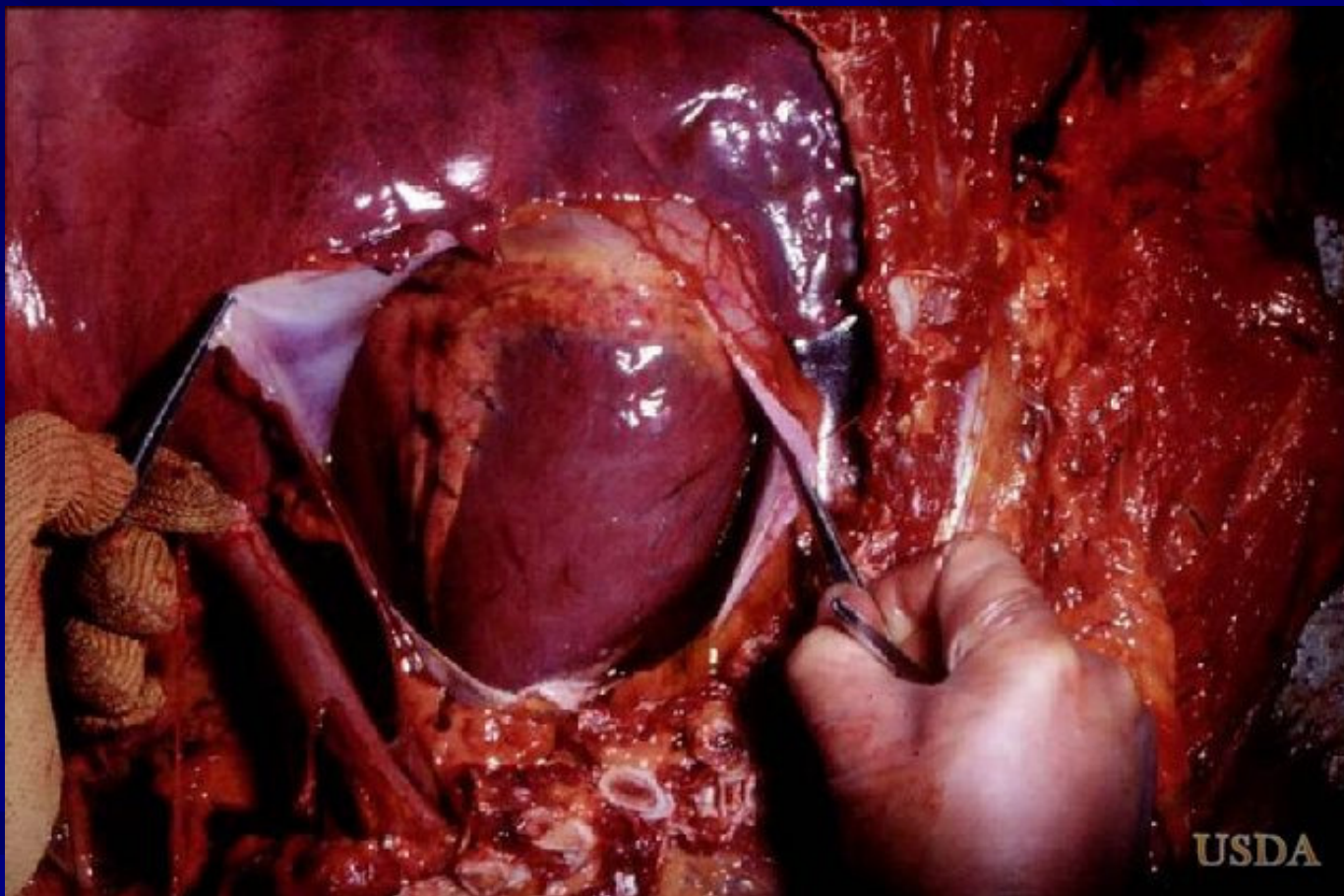
# Pulmonary edema



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# Hydropericardium

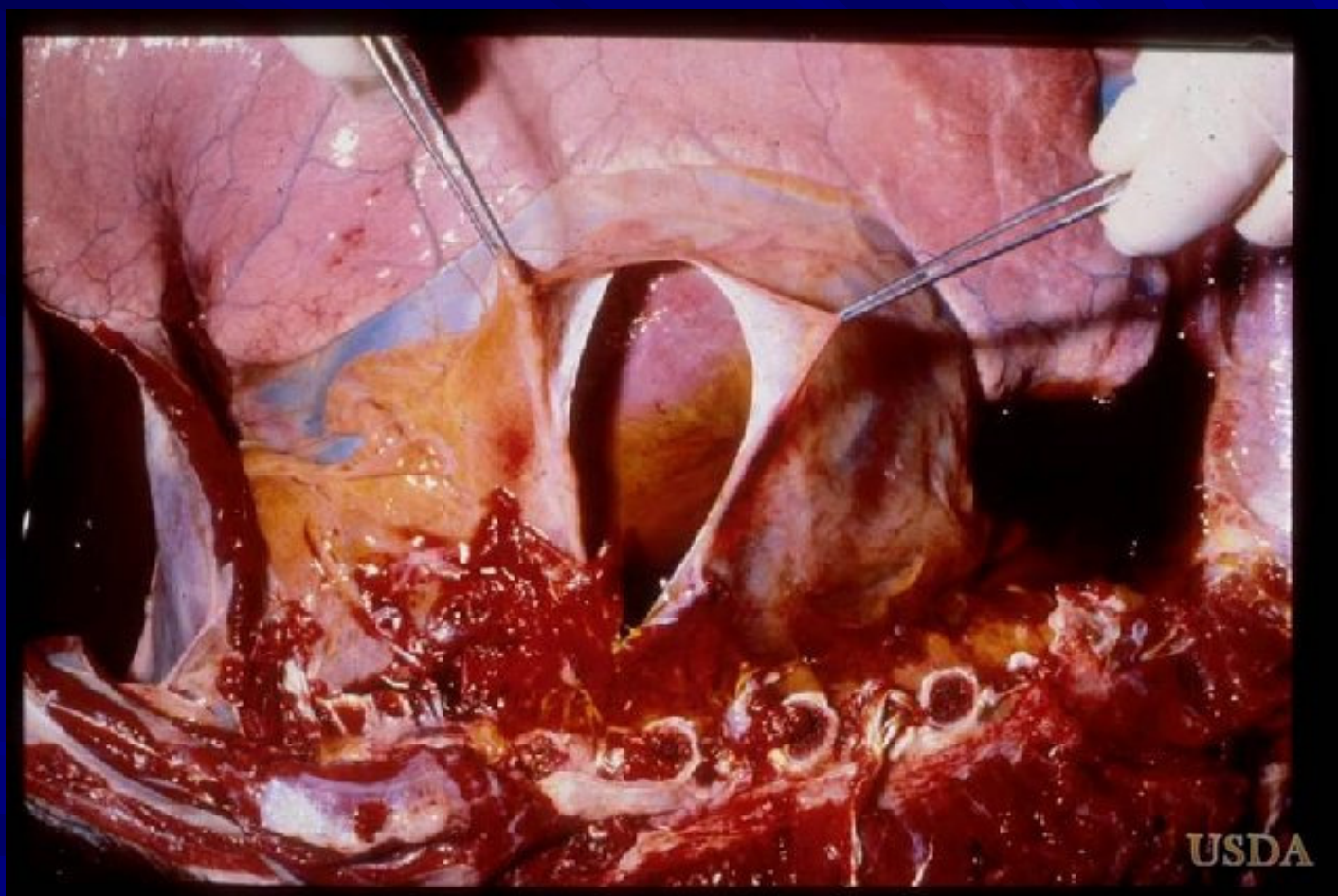


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# Hydropericardium



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# Myocardial necrosis



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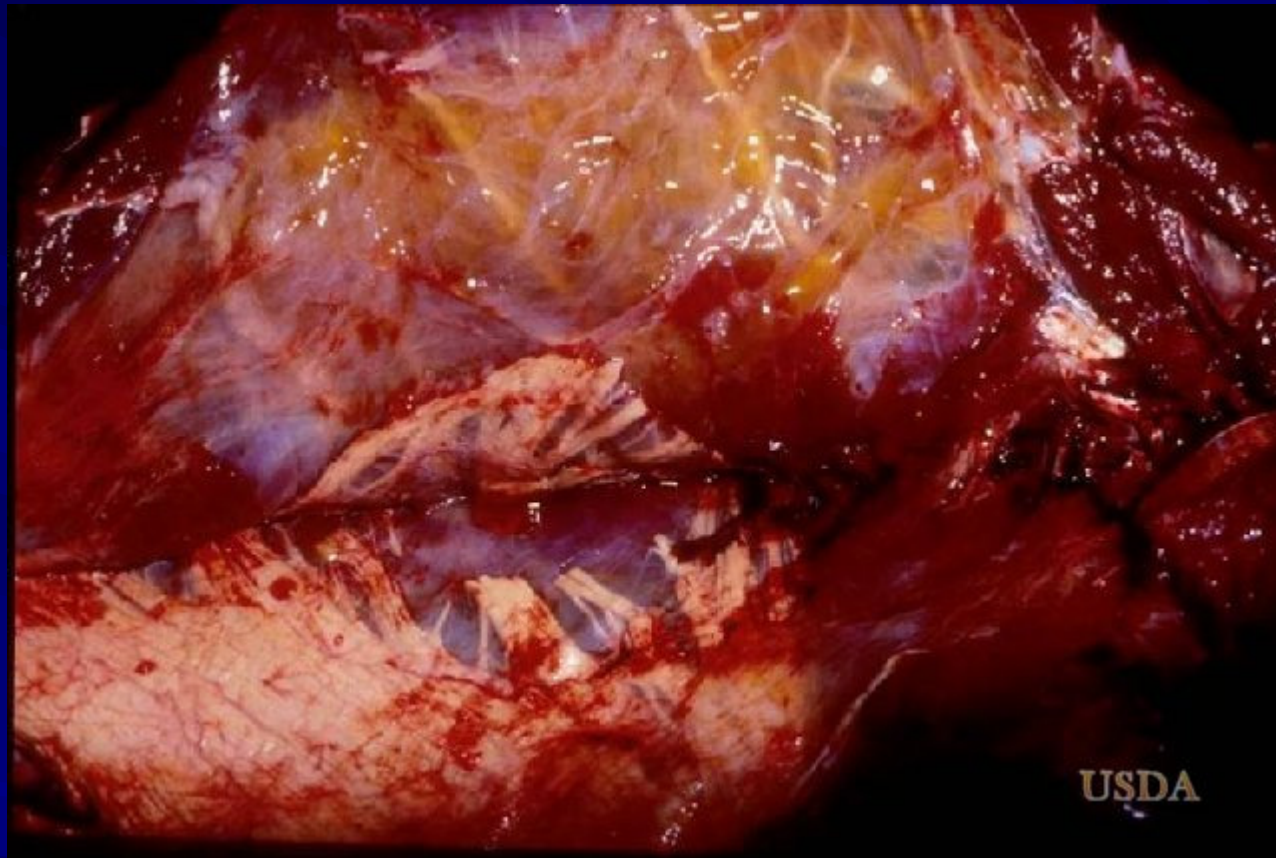
# Edema elsewhere



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# Edema elsewhere



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# Edema elsewhere



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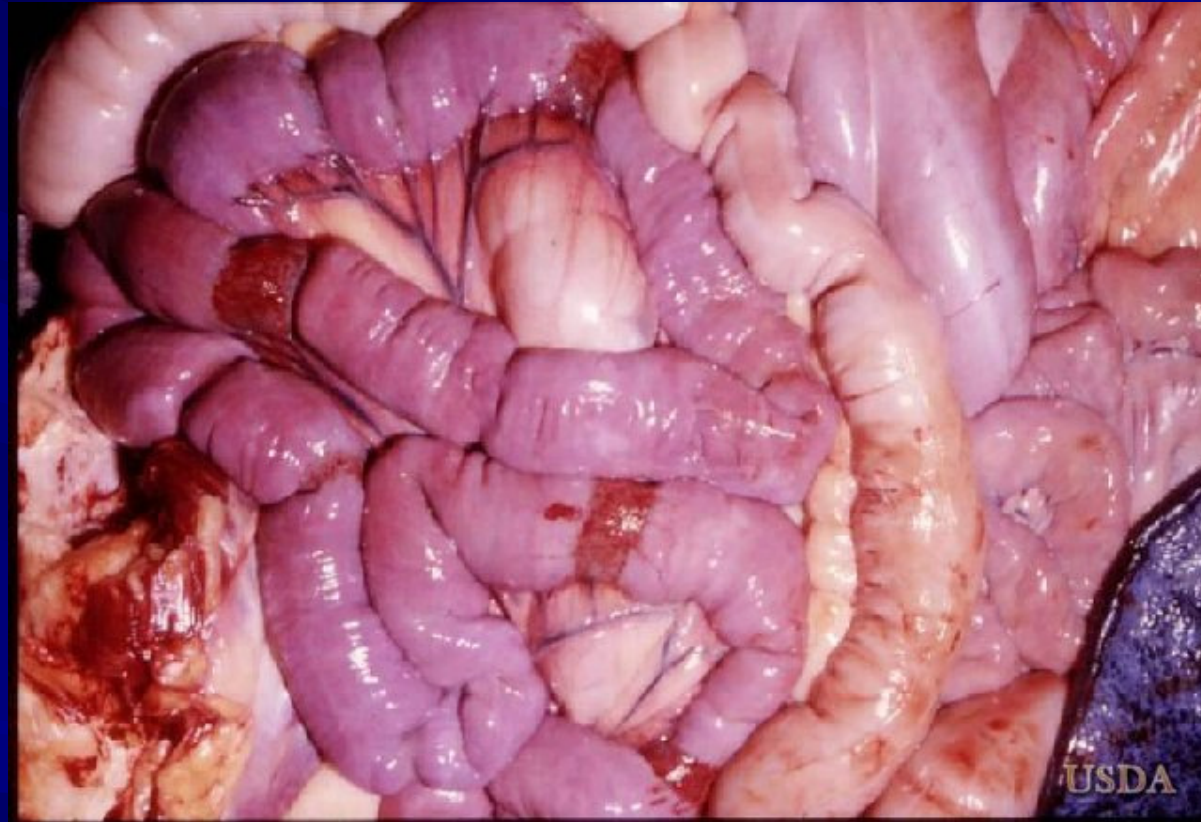
# Edema elsewhere



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# Hemorrhages



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# Hemorrhages

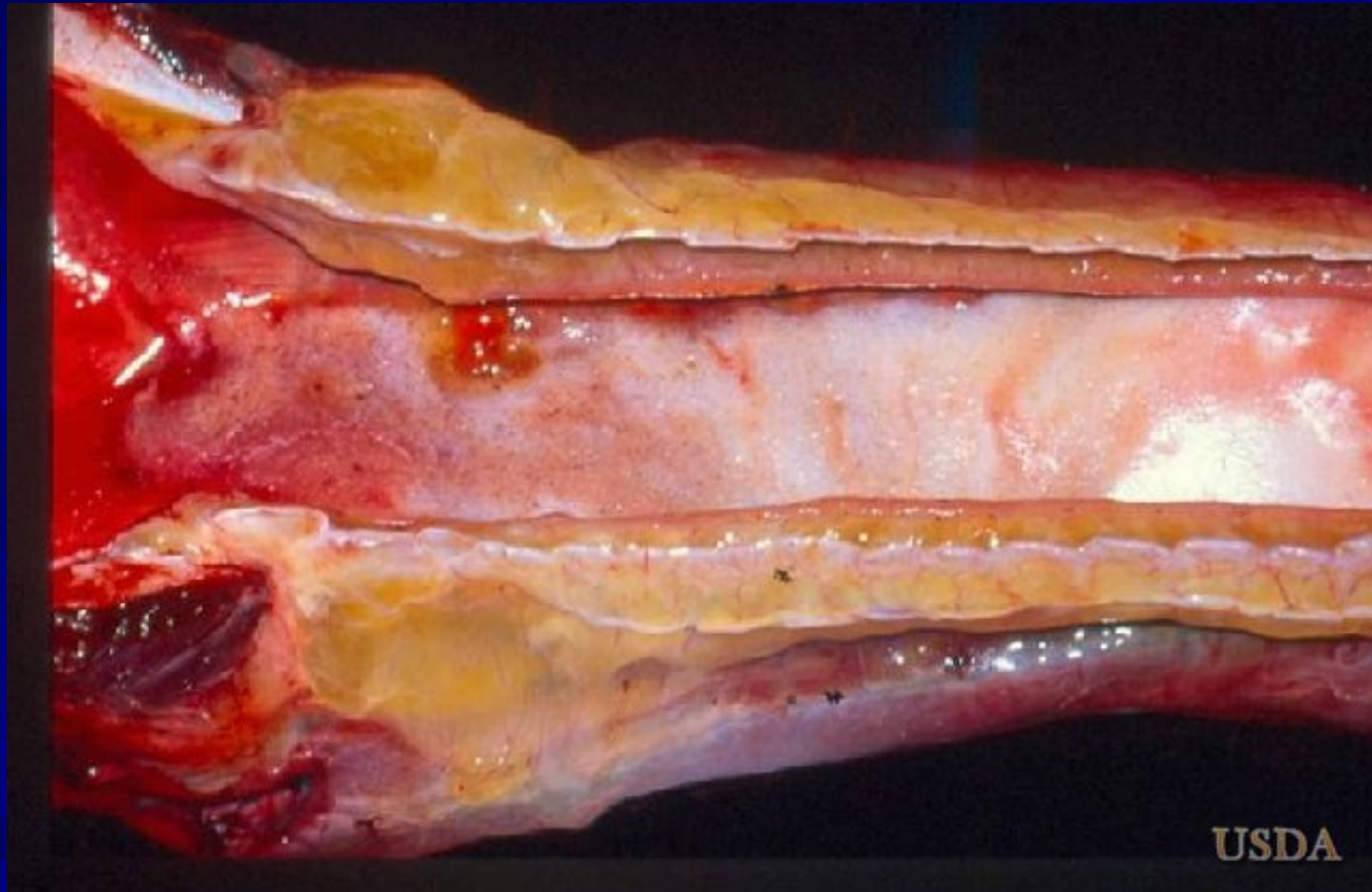


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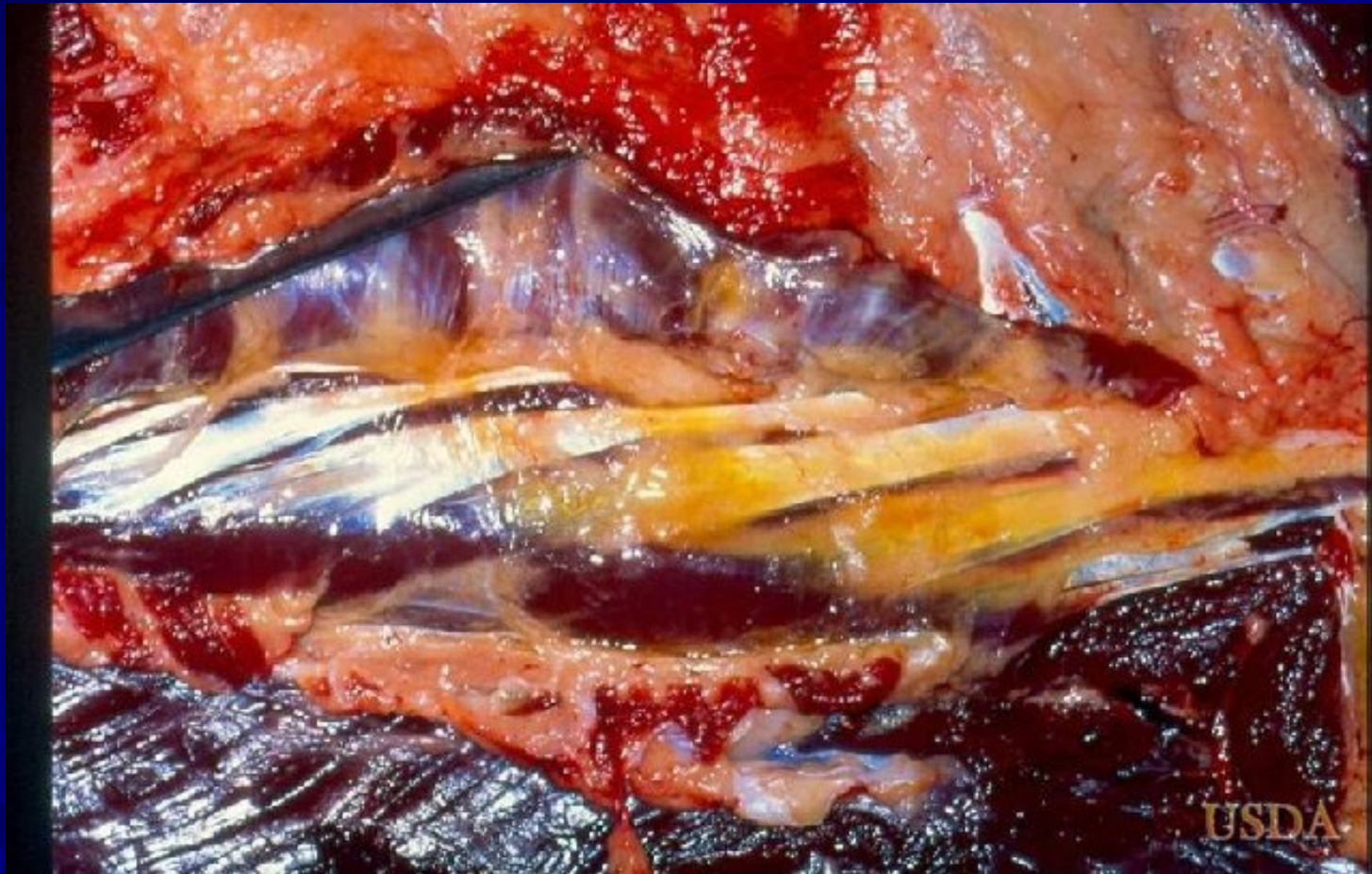
# Lesions



African Horse Sickness



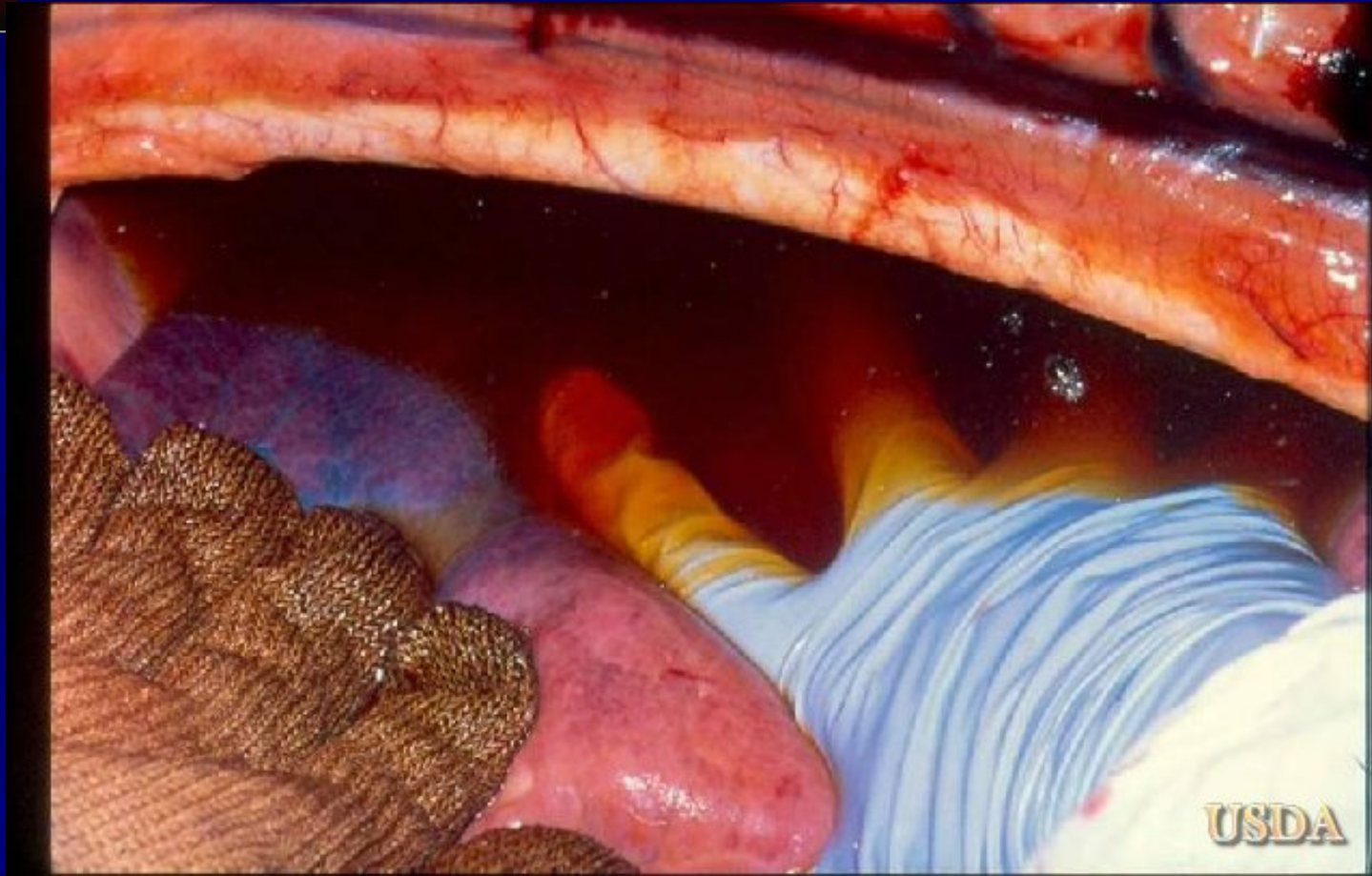
# Lesions



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# Lesions



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# Lesions



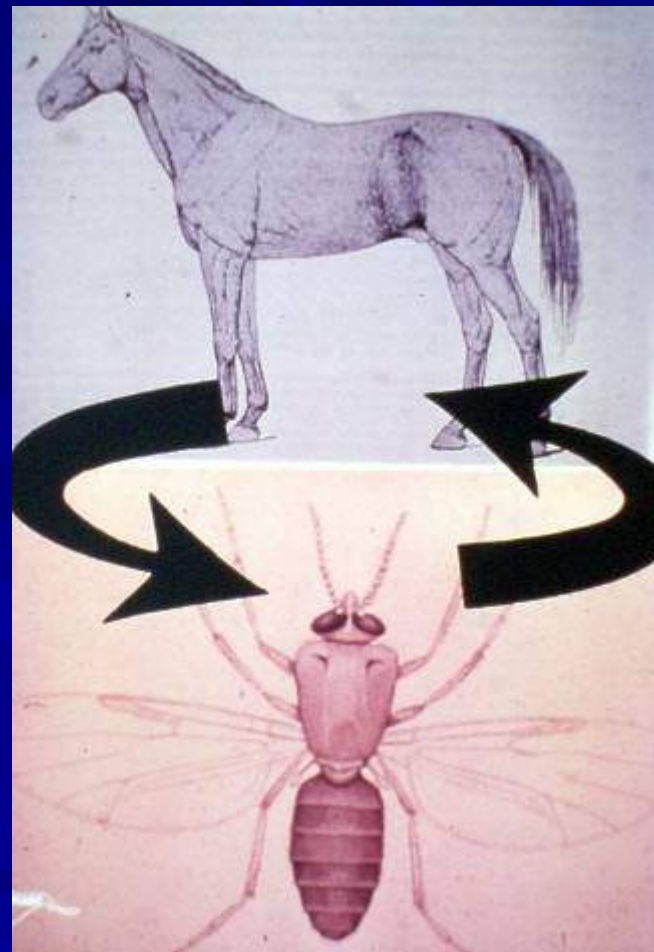
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# Transmission



<http://www.iah.bbsrc.ac.uk/images/Culicoides.jpg>



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# Transmission

- AHSV is spread primarily by *Culicoides* (ex: biting flies and mosquitoes) by transfer of blood
  - *Culicoides* are biological vectors because the disease can replicate in the midge
  - In U.S., *Culicoides* that can transmit bluetongue virus most likely can transmit African Horse Sickness
  - *Culicoides* are most active at sunset and about sunrise



# Transmission

- African Horse Sickness is **non-contagious**, but the horse is an amplifier of AHS virus and source of virus for arthropods.
- Arthropods other than *Culicoides* may spread the virus as mechanical vectors



# Other Vectors

- *Aedes aegypti*
- *Anopheles sephensi*
- *Culex Pipiens*
- *Hyalomma dromedarii*
- *Ripicephalus sanguineus*





- This particular virus favors warmer conditions, when it has a preferred vector available. It may move best in moist, mild conditions and travel long distances on the wind-borne vectors.



# Diagnosis

- AHS is difficult to pinpoint in early febrile stages
- Suspect the disease during the season when there are insect vectors



# Diagnosis

- Suspect when horses develop the following:
  - Fever
  - Dyspnea
  - Edema of the supraorbital fossa
  - Subcutaneous edema of head/neck areas
  - Pulmonary edema
  - Death



# Laboratory diagnosis

- Virus isolation – blood from live animal; spleen from dead animal
  - Vero cells, embryonating eggs, suckling mouse brain
- Serology – CF test, ELISA

Virus is closely associated with erythrocytes



# Differential Diagnosis

- Anthrax
- Botulism
- Equine infectious anemia
- Equine viral arteritis
- High doses of pyrrolizidine alkaloids
- Trypanosomosis
- Equine encephalosis
- Piroplasmosis
- Purpura haemorrhagica



# Control

- Movement restriction
- Vector control
- Test and slaughter
- Vaccination
  - MLV
  - Inactivated virus



# Vaccine in South Africa

## Vaccination Programme

- **AHS Vaccine Bottle 1 first**
- **Vaccine provided free of charge**
- **Private practitioners vaccinated horses for a fixed fee**
- **AHS Vaccine Bottle 2 given 3 weeks later**





# Disease – Economic Impact

- Horse study reveals almost \$40 billion impact on U.S. economy

Staff Reports,  
Oroville Mercury-Register  
July 23, 2005







# Donkeys and Mules are a growing segment of the equine industry



African Horse Sickness



# Disease – Economic Impact

- The horse industry in the United States contributes \$39 billion in direct economic impact to the U.S. economy and supports 1.4 million jobs on a full-time basis, according to a new study released today by the American Horse Council (AHC).



# Disease – Economic Impact

- When indirect and induced spending are included, the industry's economic impact reaches \$102 billion.



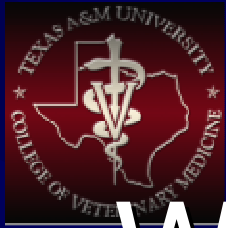


# Disease – Economic Impact

- The study also estimates the horse population in this country has reached 9.2 million.



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# World Distribution of Disease



<http://www.vet.uga.edu/vpp/IVM/ENG/Horse/vector.htm>

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- 2) Barnard, B. J. H. (1998). *Epidemiology of African Horse Sickness and the Role of the Zebra in South Africa*. African Horse Sickness. P. S. Mellor, et al. Vienna, Austria, Springer-Verlag: 13-19.
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- 6) Keeping America Free From Foreign Animal Diseases. Vol. 1. African Horse Sickness. USDA, 1997.
- 7) *Good Emergency Management Practice*. Plum Island 2002 CD-3



# References

8. Professor Alan Guthrie, U of Pretoria Dept of Tropical Vet Med, “African Horse Sickness” FEAD course Tenn, Aug 1-5, 2005. (ppt and video)
9. Corrie Brown, DVM PhD University of Georgia, Dept of Pathology “African Horse Sickness” PowerPoint presentation



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