

VMC 321: SYSTEMATIC VETERINARY VIROLOGY

CAPRIPOXVIRUS

► Presented by:

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Taxonomy and Classification

- According to the International Committee on Taxonomy of Viruses, these diseases have the following characteristics:
 - Family: *Poxviridae*
 - Genus: Capripoxvirus, includes three species:
 - Goat pox virus (GTPV)
 - Sheep pox virus (SPPV)
 - Lumpy skin disease virus (LSDV)



Genus Characteristics

- Capripoxviruses are double-stranded DNA viruses containing around 150 kilobase pairs and are
- relatively large (230–260 nm).
- brick- or oval-shaped with enveloped capsids.
- GTPV and SPPV share at least 147 genes.
- Strains of GTPV, SPPV, and LSDV are up to 96 percent similar.
- no evidence of LSDV- cause disease in sheep and goats.

Host Range and Virus Propagation

- Capripoxvirus is restricted to cattle, sheep, and goats
- Capripoxvirus grow on the majority of primary and secondary cells and cell lines of ruminant origin.
- Primary lamb testes cells are considered the most sensitive system for isolation of capripoxvirus.
- Produces a characteristic cytopathic effect (cpe) on these cells
- Vaccine strains of capripoxvirus grow on vero cells.
- Capripoxvirus – do not grow in any laboratory animals.

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SHEEP AND GOAT POX

Susceptible Species

- Sheep (*Ovis aries*), and
- goats (*Capra hircus*).

Transmission of Sheep Pox and Goat Pox Virus

- Viruses are present in
 - Saliva
 - nasal
 - conjunctival secretions
 - Milk
 - Urine
 - Faeces
 - skin lesions under scabs.

Contd...

- Respiratory transmission is the most common mode
- Contact with open wounds or mucous membranes (especially where ulcers exist)
- Vertical transmission from ewe to lamb or doe to kid in-utero
- **Additional modes of transmission**
- Fomites
- insects (e.g. stable flies, *Stomoxys calcitrans*)
- aerosols containing pox scab

Incubation and Infectious Periods

- Incubation period ranges from 4 to 21 days
- Usually one or two weeks
- Incubation period - 21 days (OIE) .

Morbidity and Mortality

- Morbidity rates can vary from 1–75 percent
- Mortality is almost always less than 10 percent
- Mortality can reach up to 100 percent
 - exotic sheep or goats
 - young lambs and kids
 - Lactating females
 - animals with weekend immune system,

Clinical Signs

- Infection often starts with a fever
- followed by the formation of red macules 1 to 5 days later
- macules develop into 0.5–1.5 cm hard papules (raised lesions)
- Later become depressed, grey, and necrotic, surrounded by an excess of blood.
- Lesions can develop on over half of the skin's surface
- Scabs form over areas that are necrotic.

Clinical Signs

- Sheep pox and goat pox can affect
 - digestive
 - respiratory
 - urinary systems
- Systemic signs may include
 - Conjunctivitis
 - Rhinitis
 - enlargement of the lymph nodes
 - Depression
 - anorexia,
 - edema.
- Lung lesions can cause laboured breathing.

Diagnosis

- Clinical
 - Suspect in animals with characteristic skin lesions, fever, and lymphadenitis
- Laboratory
 - Virus isolation, electron microscopy
 - PCR
 - Viral antigen detection (AGID, ELISA)
 - Serology
 - Characteristic histopathologic lesions

Diagnosics

- SPPV and GTPV can be isolated in lamb testis, sheep or goat kidney cell cultures, and sheep, goat, or bovine cell lines.
- Established cell line - MDBK cell line , Vero cells gave typical CPE lesions - cell rounding, granulation, and clumping.
- Goat virus (GPV) can be grown intensively on chorioallantoic membrane (CAM) of embryonated chicken eggs
 - produced characteristic greyish white, firm and necrotic pock lesions.
- Nucleic acid recognition methods, and polymerase chain reaction
- PCR assays can distinguish the agent as a capripoxvirus, but not by specific species.
- Restriction fragment length polymorphism (rflp) assay differentiate SPPV or GTPV.

- SPPV, GTPV and LSDV cannot be differentiated from each other by serological tests like:
 - serum neutralization test (SNT)
 - fluorescent antibody test (FAT)
 - indirect fluorescent antibody test (IFAT)
 - agar gel immunodiffusion (AGID)

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**SHEEP POX AND GOAT POX
VIRUSES DO NOT INFECT
HUMANS**

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LUMPY SKIN DISEASE

Pseudourticaria, Neethling Virus Disease, Exanthema
Nodularis Bovis, Knopvelsiekte

Lumpy Skin Disease Virus

- Family Poxviridae
 - Genus *Capripoxvirus*
- Closely related to sheep and goat pox
- Cannot be differentiated with serology



Economic Impact

- Major economic importance due to loss of production
 - Severe emaciation
 - Lowered milk production
 - Abortion
 - Secondary mastitis
 - Loss of fertility
 - Extensive damage to hides
 - Loss of draft from lameness

Morbidity/ Mortality

- Morbidity
 - Widely variable
 - 3% to 85%
- Mortality
 - Usually low
 - 1% to 3%
 - 20% to 85% in some outbreaks



Transmission and Tissue Tropism

- High titers of virus are present in papules
- papules on the mucous membranes quickly ulcerate and release virus in:
 - Nasal
 - Oral
 - lachrymal secretions
 - Milk
 - Urine
 - semen.
- Viremia may last up to 10 days, or in fatal cases until death.

Transmission

- Biting flies are significant in the mechanical transmission of LSD
- *Stomoxys calcitrans* and *Biomyia fasciata* have been implicated transmitters.
- Insects such as mosquitoes preferentially feed on hyperemic sites such as papules and if interrupted inoculate a new host intravenously

Animal Transmission

- Primary route: biting insects
- Minor route: direct contact
 - Cutaneous lesions, saliva, nasal discharge, milk, semen, muscles
- Resistant to desiccation
- No carrier state
- Spread related to movement of cattle

Clinical Signs

- Incubation period
 - 2 to 5 weeks
- Inapparent to severe infection
 - Young calves most susceptible
- Nodule development
- Decreased milk yield



Clinical Signs

- Raised, circular, firm, coalescing nodules
 - Common on head, neck, udder, perineum, legs
 - Cores of necrotic material called "sit-fasts"
- Secondary bacterial infections
- Rhinitis, conjunctivitis
- Lameness
- Abortion and sterility



Diagnosis

- Clinical
 - Characteristic skin nodules
- Laboratory
 - Virus isolation and identification
 - Electron microscopy in combination with history
 - Serology: cross-reactions with other poxviruses may occur

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PREVENTION AND CONTROL

Disinfection

- Susceptible to:
 - Ether (20%)
 - Chloroform
 - Formalin (1%)
 - Some detergents
 - Phenol (2% for 15 minutes)
- Can survive up to 35 days in the environment in desiccated scabs

Control and Eradication

- Endemic areas
 - Vaccinate cattle
 - Insect control
- Non-endemic areas
 - Keep free with import restrictions
 - Quarantine
 - Depopulation, proper carcass disposal
 - Cleaning and disinfection

Prevention

- Non-endemic areas
 - Infected animals, fomites, and animal products may introduce disease
 - Keep free with import restrictions

Control and Eradication

- Endemic areas
 - Vaccinate
- Outbreak in endemic area, small scale
 - Quarantine, slaughter infected and exposed, clean and disinfect
 - Ring vaccination
- Outbreak in endemic area, large scale
 - Massive vaccination
 - Movement restrictions

Control and Eradication

- Outbreak in non-endemic area
 - Quarantine, slaughter infected and exposed, clean and disinfect
 - Ring vaccination
- No carrier state
- Isolate infected herds and sick animals for at least 45 days after recovery

Vaccination

- Vaccination can provide effective control in endemic areas
- Killed vaccines do not provide long lasting immunity
- Attenuated virus vaccines give immunity up to 2 years



ANY QUESTIONS?



THANKS

Next topic will be Avipoxvirus