Poxviridae
(Lecture-2)

Dr. Savita Kumari
Department of Veterinary Microbiology
Bihar Veterinary College, BASU, Patna

Infections caused by cowpox virus- Cowpox

- Reservoir hosts- rodents
- From reservoir host, virus occasionally spreads to domestic cats, cows, humans and zoo animals
- Clinical cowpox disease in cattle extremely rare, but occurs sporadically in enzootic areas
- Produces lesions on teats and the contiguous parts of udder of cows
- Spread through herds by the process of milking

Infections caused by cowpox virus- In cats

- In domestic cats–infection may be systemic and more severe than in cattle or humans
- First small papules appear on head or forelimbs, eventually ulcerate
- Scab formation and then complete resolution in about six wks
- Few animals have signs of coryza or conjunctivitis
- Rarely, pneumonia and pleural exudation develop

Diagnosis: By histopathology, EM or virus isolation

Members of the genus Parapoxvirus

- Parapoxviruses infect a wide range of species
- Generally causing only localized cutaneous or mucocutaneous lesions
- These viruses are zoonotic
- Orf virus

  (contagious ecthyma/contagious pustular dermatitis virus)
- Pseudocowpox virus
- Bovine papular stomatitis virus

Orf virus (contagious ecthyma/ contagious pustular dermatitis virus)

- Disease – Orf (syn. contagious pustular dermatitis, contagious ecthyma, scabby/sore mouth)
- Important disease of sheep and goats, primarily affects young animals
- Camels and humans- also susceptible to infection
- Virus transmitted- through direct or indirect contact
- Under dry environmental conditions, virus stable, survive in scab material for months

Pathogenesis

- Virus entry through skin abrasions
- Virus is epitheliotropic, produces proliferative wart like lesions
- Virus replicates in epidermal keratinocytes
- Infected cells release an endothelial growth factor which is implicated in epithelial cell proliferation
- Papular lesions progress to vesicles, pustules and eventually to scab formation

..

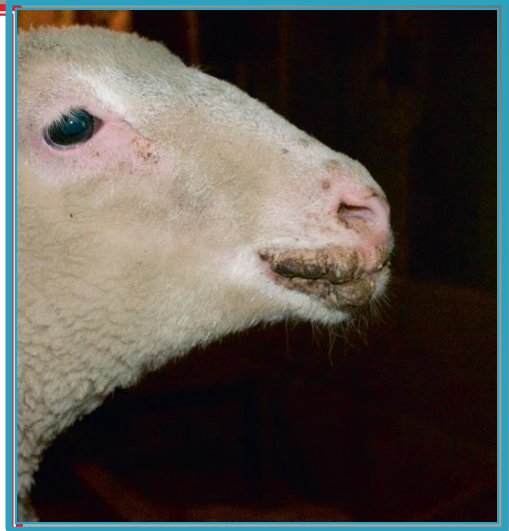
- Proliferation of cells underlying scabs produces verrucose masses
- In absence of secondary bacterial infection, lesions usually heal within four weeks

Clinical Signs & lesions

- Incubation period- up to seven days
- Severely affected animals may lose weight and be predisposed to secondary infections
- Morbidity- high in young animals
- Mortality- usually low unless buccal cavity lesions prevent lambs and kids from suckling or to eat

Clinical Signs & lesions

- Lesions most often occur on commissures of the lips and on the muzzle
- also develop in mouth (affecting gums, palate and tongue), on feet, genitalia and teats
- Mild lesions may go unnoticed



Lesion on the lips of lamb

Orf in goat

Oral lesion of orf

Human orf virus infection

Diagnosis

- Based on characteristic appearance and distribution
- Virus present in lesion material can be identified by electron microscopy

Treatment and control

- No specific treatment
- Antibiotic therapy reduces effect of secondary bacterial infection
- In endemically infected flocks, control is based on the use of live vaccine
- Ewes vaccinated several weeks before lambing
- Commercial non-attenuated virus vaccines derived from infected scabs collected from sheep or from virus grown in cell culture used

Infections caused by pseudocowpox virus

- Causes Pseudocowpox, common cause of teat lesions in milking cows
- Transfer of infection can occur through teat cups and on milkers' hands, also mechanically by flies
- Healing at the centre of the lesions produces characteristic ring or horseshoe shaped scabs
- Diagnosis- Typical parapoxvirus particles demonstrated in scab material using electron microscopy
- Control- appropriate hygienic measures at milking, use of effective teat dips
- causes milker's nodule in humans

Pseudocowpox lesion in cow's teat

Bovine papular stomatitis virus

- Disease- Bovine papular stomatitis
- Transmitted by direct or indirect contact
- Produces mild papular lesions on the muzzle and in oral cavity of young cattle
- Virions- demonstrated in skin scrapings by electron microscopy
- Transmissible to humans

Genus- Avipoxvirus

(Fowlpox and other avian poxviruses)

- Fowlpox, pigeonpox and turkeypox viruses- closely related, not strictly host-specific
- Mechanical transmission by arthropods, especially mosquitoes, provides a mechanism for transfer of viruses between different species of birds
- Fowlpox virus- highly infectious for chickens and turkeys
- Turkeypox virus is virulent for ducks
- Other avian poxvirus infections are typically cutaneous form
- In canaries, the systemic form is common, produce 80-90% mortality

Fowlpox

- Disease of domestic poultry (chickens, turkeys etc.)
- Caused by infection with fowlpox virus
- Infection is slow-spreading
- Factors such as malnutrition, debilitation and stress may contribute to the severity of disease
- persistence as latent infection and reactivation by stress may occur in a few birds
- Two forms of fowlpox-
  - ❖Cutaneous form (dry pox)
  - ❖Diphtheritic or wet form of fowlpox

Cutaneous form (dry pox)

- The most common form
- Results from infection by biting arthropods or mechanical transmission to injured or lacerated skin
- Nodular lesions develop on comb, wattles and unfeathered areas of skin
- Lesions occasionally develop on the legs and feet and around the cloaca
- The nodules become yellowish and progress to a thick dark scab
- Multiple lesions often coalesce

. . .

- Involvement of the skin around the nares may cause nasal discharge
- Lesions on eyelids can cause excessive lacrimation and predispose poultry to secondary bacterial infections
- In severely affected birds, lesions may involve both feathered and unfeathered areas of skin
- involvement of the eyelids may lead to complete closure
- In uncomplicated cases, healing occurs within 03 weeks

Diphtheritic form of disease (Wet form)

- Caused by infection via droplets
- Involves infection of mucous membranes of mouth, pharynx, larynx, esophagus, and sometimes trachea
- Yellowish necrotic lesions (cankers) develop
- Lesions coalesce and result in necrotic pseudomembrane- can cause death by asphyxiation
- Oral lesions may interfere with eating
- Tracheal involvement may lead to laboured breathing and rales

Pox lesions in mouth

Pox lesions in trachea

..

- Cutaneous infection- little mortality and flocks return to normal production on recovery
- Diphtheritic form- Mortality up to 50% in severe outbreaks, particularly when accompanied by secondary bacterial or fungal infection
- Recovered birds- immune to subsequent folwpox virus infections
- Economic losses are largely due to a transient drop in egg production in laying birds and reduced growth in young birds

Diagnosis

- Large intracytoplasmic inclusions (Bollinger bodies) containing small elementary bodies (Borrel bodies) may be demonstrable in epithelial cells
- Immunofluorescence and immunoperoxidase techniques- to identify viral antigen in intracytoplasmic inclusions
- Typical poxvirus particles demonstration by electron microscopy in material from lesions
- Virus isolation:
  - by the inoculation of avian cell cultures
  - on the CAM of 9 to 12 day old embryonated eggs

..

- Serological tests- ELISA, virus neutralization, agar gel precipitation and passive haemagglutination
- The diphtheritic form- more difficult to diagnose, because it can occur in the absence of skin lesions
- Diphtheritic form may be confused with
  - Vitamin A, pantothenic acid, or biotin deficiencies
  - T-2 mycotoxicosis- induced contact necrosis
  - Several other respiratory diseases caused by viruses

Treatment and control

- No specific treatment
- Control of secondary bacterial infection desirable
- In endemic areas, improved management and hygiene along with regular vaccination reduce the effect of disease
- Modified live fowlpox or pigeonpox virus vaccines, produced in avian cell cultures or chick embryo are available commercially

Thanks