

In: **A Concise Review of Veterinary Virology**, Carter G.R., Wise D.J. and Flores E.F. (Eds.).
International Veterinary Information Service, Ithaca NY (www.ivis.org), Last updated: 28-Oct-2005;
A3410.1005

Poxviridae

G.R. Carter¹ and D.J. Wise²

¹Professor Emeritus of the Department of Medical Sciences and Pathobiology, Virginia-Maryland Regional College of Veterinary Medicine, Virginia Tech, Blacksburg, Virginia, USA; ²Department of Biology, Concord University, Athens, West Virginia, USA.

Table of Contents

Viral Characteristics	Contagious Ecthyma
Classification	Pseudocowpox
Orthopoxvirus:	Capripoxvirus:
Vaccinia	Sheeppox, Goatpox
Variola	Lumpy Skin Disease
Cowpox	Avipoxvirus:
Feline Cowpox	Fowlpox
Horsepox	Canarypox
Camelpox	Leporipoxvirus:
Buffalopox	Myxomatosis
Monkeypox	Suipoxvirus:
Parapoxvirus:	Swinepox
Bovine Papular Stomatitis	Glossary

The double-stranded DNA virions of this family are the largest and most complex of known animal viruses. They infect many vertebrate and insect species. Unlike other viruses, some poxviruses are large enough to be seen with a light microscope.

Viral Characteristics

- Large, enveloped (some virions contain double envelope), double-stranded DNA viruses (see Fig. 10.1).
- The capsid / nucleocapsid is brick-shaped to ovoid containing the genome and lateral bodies (function unknown).
- The large complex genome consists of a single, linear molecule of double stranded DNA that codes for approximately 200 proteins. The ends are ligated to each other so the DNA molecule is continuous, without free ends.
- These are the only DNA viruses known to complete their replication cycle in the cytoplasm.
- In the cytoplasm, the dsDNA is used as a template for both mRNA production (for translation of proteins) and copies of the genome for progeny virions; viral enzymes largely mediate both processes. As the virions are large and complex, the mechanism associated with virion assembly is largely unknown. Virions are released from the cell by budding.
- Viruses of this family possess at least 10 major antigens with a common nucleoprotein antigen, which accounts for cross-reactivity among species.
- There are at least 10 viral enzymes contained within the virus particle, many of which function in nucleic acid metabolism and genome replication.
- Poxviruses remain viable in scabs for long periods.
- Some (mainly orthopoxviruses) produce hemagglutinins that agglutinate red blood cells.
- Eosinophilic inclusions called Guarnieri bodies may be produced in infected cells/tissues.



Figure 10-1. Poxviridae (220 - 450 x 140 - 260 nm). Indicated are the surface tubules, the envelope (present only when virions have budded), the biconcave core that surrounds the nucleoprotein, and the lateral bodies (function unknown). - To view this image in full size go to the IVIS website at www.ivis.org . -

Classification

The Poxviridae consists of two subfamilies, Chordopoxvirinae (poxviruses of vertebrates) and Entomopoxvirinae (poxviruses of insects).

There are eight genera in the subfamily Chordopoxvirinae. They are, with significant diseases, as follows:

Orthopoxvirus:

- Vaccinia
- Variola
- Cowpox
- Feline Cowpox
- Horsepox
- Camelpox
- Buffalopox
- Monkeypox

Parapoxvirus:

- Bovine Papular Stomatitis
- Contagious Ecthyma / orf
- Pseudocowpox / milker's nodules
- Ectromelia / mouse pox: An important disease of laboratory and wild mice

Capripoxvirus:

- Sheeppox
- Goatpox
- Lumpy Skin Disease

Avipoxvirus:

- Fowlpox

Leporipoxvirus:

- Myxomatosis
- Rabbit and squirrel fibroma: Benign tumors; natural host the cottontail rabbit

Molluscipoxvirus:

- Molluscum contagiosum: A common disease of children

Suipoxvirus:

- Swinepox

Yatapoxvirus:

- Yaba monkey tumor virus and related viruses

Poxvirus Infections: General

Poxviruses infect the epidermis and produce focal lesions that frequently become proliferative and later necrotic. Rare generalized infections can be fatal. Poxviruses occur naturally in most veterinary species, except the dog.

Many poxviruses produce an infection resulting in changes conveniently summarized in order of development as papule, vesicle, pustule, and finally scabs or crusts. Secondary bacterial infections are not uncommon. Recovery from poxvirus infection usually is followed by long-term immunity.

Many poxviruses can be cultivated on the chorioallantoic membrane of chicken embryos producing focal lesions or "pocks" and most can be grown in cell cultures.

Because of their large size, poxviruses can be seen with light microscopy in stained smears. Virus elementary bodies stained by various procedures, including Gutstein's and Giemsa, can be readily seen either as aggregates (acidophilic cytoplasmic inclusions) or singly.

Poxviruses may survive for years in dust.

Some mammalian poxviruses are considered oncogenic and have been associated with epidermal and fibromatous hyperplasia.

Orthopoxvirus

Vaccinia Virus

This poxvirus, like the cowpoxvirus, is an Orthopoxvirus. The original vaccine to prevent human smallpox was prepared from virus isolated from the teats of cows with "cowpox". The current vaccine strain of vaccinia virus differs considerably from that of cowpox. The origin of vaccinia virus is not clear. It has been suggested that the virus evolved from cowpox virus, or as a recombinant of cowpox virus and smallpox virus.

Vaccinia virus and variola have about 150 genes in common (differing in more than 30 genes) and are antigenically similar, which is the basis for vaccination with vaccinia to prevent variola infections (e.g., smallpox). Variola has a limited host range (only infects humans), whereas vaccinia has a much larger host range. The reasons for these host-range differences are not completely understood. Also, the replication of vaccinia virus is more localized.

When vaccinia virus was used as a vaccine, there was occasional spread from humans to cows with the development of teat lesions.

A rare complication of smallpox vaccination is postvaccinal encephalitis.

Poxviruses have been used as a vector for vaccines against other viral infections. The French oral rabies vaccine for foxes is a recombinant poxvirus virus expressing the glycoprotein G (gG) of rabies virus. Poxviruses are also being considered as vectors for other viral proteins.

One should not forget the epochal contribution of Jenner (1796) in effectively vaccinating humans against smallpox using cowpox virus. Jenner's experiments are considered a hallmark in modern vaccinology.

Variola Virus

This virus, which belongs to the genus Orthopoxvirus, is the cause of the frequently fatal disease of humans, smallpox.

This disease was eventually eradicated in the world population in 1977. Stocks of variola virus are held still in central laboratories in the U.S. and Russia. The World Health Organization (WHO) has recommended the destruction of these existing stocks of the virus. There is great concern that variola virus might be used as a biological weapon by terrorists. The recent bioterrorist concern led to the U.S. to vaccinate people against variola.

It was recently shown that monkeys are susceptible to variola and can thus be used in the testing of antiviral drugs.

Cowpox

Cause

Cowpox virus (orthopoxvirus).

Occurrence

Additional hosts are human beings and various animals, including large zoo cats, domestic cats (see feline cowpox below), anteaters, and rodents. The latter are considered the natural reservoir hosts.

Cowpox occurs sporadically in various countries of Western and Eastern Europe, but the disease is thought not to exist in North America.

Transmission

Milkers and milking machines are the main means of spread. Insects may also serve as mechanical vectors for the virus.

Clinical & Pathologic Features

Cowpox virus produces what is usually a benign infection of the udder and teats. Papules are first seen, followed by vesicles, which rupture leading to scab formation. Scabs drop off in about two weeks. Losses in milk production result from the soreness of affected teats and also from secondary bacterial infection, which may complicate the disease and contribute to development of mastitis.

Diagnosis

- Clinical specimens: Vesicular fluid, scabs, and scrapings from lesions.
- It is difficult to clinically distinguish cowpox from pseudocowpox and other infections of the teats.
- Diagnosis is most easily confirmed by the examination of distilled water lysates of lesion material by electron microscopy. Orthopoxviruses are "brick-shaped" as opposed to the virions of pseudocowpox (a parapoxvirus), which are ovoid in appearance.
- Cowpox virus can be cultivated in cell cultures of bovine and human origin, and on the chorioallantoic (CA) membrane of chicken embryos. The latter method of cultivation also provides a means to differentiate cowpox virus from pseudocowpox virus, which does not grow on the CA membrane. Vaccinia virus produces smaller pocks on the CA membrane than does cow pox.

Prevention

- Vaccination is not practiced.
- Prevention is best accomplished by sound milking practices. Milkers and milking machines can spread the virus.

Public Health Significance

Milkers may contract the infection from cows. The human infection usually involves a single, benign lesion on the hand or face. Serious systemic disease has been reported in immunosuppressed individuals.

Feline Poxvirus Infection

(Feline cowpox)

Cause

An orthopoxvirus identical to cowpox virus.

Immunosuppression due to feline leukemia or feline immunodeficiency virus infection can greatly increase susceptibility to the cowpox virus.

Occurrence

Feline poxvirus infection is a moderately frequent disease that occurs in Europe and Asia. As mentioned under cowpox, the causal virus has a wide host range including zoo cats (lions, cheetahs, pumas, etc.) in addition to the domestic cat. Wild rodents are the natural reservoir of the virus.

Cowpox is an uncommon source for the feline disease. Most feline infections are derived from another cat and occasionally from contact with wild rodents.

Clinical & Pathologic Features

The disease is seen most often in a chronic form but an acute form occurs occasionally and particularly in non-domestic cats.

The virus causes mainly skin lesions, usually multiple, characterized by the formation of papules, followed by vesicles, then pustules and finally scabs. The lesions are randomly distributed over the body. Secondary bacterial infection can aggravate the disease and delay healing. Severe cases may be anorexic, lose condition and develop pneumonia, conjunctivitis and diarrhea.

Full recovery usually takes place within two months.

Diagnosis

- Clinical specimens: Vesicular fluid, scabs, and scrapings from lesions.
- Virus isolation is not difficult but is expensive and time consuming.
- Electron microscopy of material from unfixed scabs or biopsies for the presence of the morphologically characteristic virus is a useful procedure.
- Direct fluorescent antibody staining of scab or biopsy material is probably the most reliable and practicable procedure.
- Several serological procedures, including indirect immunofluorescence and ELISA, are employed to detect antibodies. They are not ordinarily used for diagnosis.
- Histopathologic sections of skin show typical epidermal intranuclear inclusions.

Treatment

- Broad-spectrum antibiotics for secondary bacterial infections.
- Prevent scratching with a collar or by bandaging paws.

Public Health Significance

About half of the cowpox virus infections in humans (infrequent) are thought to be acquired from cats. As mentioned for cowpox virus, the human infection usually involves a single lesion on the hand or face and serious systemic disease has been reported in immunosuppressed individuals.

Horsepox

(Contagious pustular stomatitis, grease-heel)

Cause

Horsepox virus (orthopoxvirus).

Occurrence

Horsepox is a rare disease occurring sporadically in Europe.

Transmission

It is spread by contact and fomites such as combs, saddles, harness, etc.

Clinical & Pathologic Features

Papules, vesicles, and pustules occur on the skin of lips, nares and oral mucous membranes; nasal discharge, fever and salivation are characteristic.

The clinical course varies from about 10 days to a month.

An infection of the pastern and fetlock region with pustules and crusts may be due to horsepox virus, although this is not yet certain.

Transmission to humans has been reported.

Diagnosis

- Clinical specimens: Vesicular fluid, scabs, and scrapings from lesions.
- Diagnosis is most easily achieved by electron microscopic demonstration of poxvirus particles in distilled water lysates of lesion material.

Prevention

The disease is so infrequent that control measures have not been required.

Camelpox

Camelpox, caused by camelpox virus (orthopoxvirus), is an economically important disease in countries of the Middle East, Asia and Northern Africa.

The time frame of pathogenesis of the disease is analogous to other orthopoxvirus infections. Pustules occur around the nose, lips and hairless areas. The disease in young camels may be severe with mortality as high as 25%; however, the disease is generally mild, running a course of about 2 - 3 weeks. The infection is occasionally spread to the hands of camel drivers.

Diagnosis is usually based on clinical signs and characteristic lesions. The diagnostic procedures used for other orthopoxvirus diseases are applicable but infrequently applied.

An attenuated strain of vaccinia virus has been used as a vaccine.

Buffalopox

This disease of water buffaloes is caused by buffalopox virus an *orthopoxvirus* that is identical or closely related to vaccinia virus. The disease is analogous to cowpox and severe outbreaks have been reported from Southeast Asia.

Monkeypox

Monkeypox virus (*orthopoxvirus*) has caused outbreaks of a minor pox disease in captive cynomologous and rhesus monkeys. Although not easily transmitted to humans, human cases have been reported in Africa. The disease in humans resembles variola and can be fatal.

In early June 2003, monkeypox was reported among several people in the U.S. Most of these were following contact with pet prairie dogs that were infected with monkeypox. This was the first report an outbreak of monkeypox in the U.S. Unlike the situation in Africa there were no deaths in the U.S. attributed to this virus.

Much research has been carried out with the monkeypox virus. An IL-4 (interleukin-4, a common cytokine) mousepox was developed by insertion of the IL-4 gene in monkeypox virus. IL-4 depresses cellular immunity enabling the IL-4 mousepox to overcome the immunity of vaccinated mice. It was feared that if this idea were applied to human smallpox virus it could have dire consequences for the prevention of smallpox by conventional vaccination.

Parapoxvirus

Pseudocowpox

(Milker's nodules, paravaccinia)

Cause

Pseudocowpox virus a *parapoxvirus* closely related to the viruses causing bovine papular stomatitis and sheep contagious ecthyma.

Occurrence

This frequent disease of cows occurs worldwide.

Transmission

Spread is horizontal, mainly by milker's hands, teat cup liners and other fomites.

Clinical & Pathologic Features

Pseudocowpox is characterized by the formation of bright red papules, followed by vesicles, scabs, and nodules on the udder and teats of cows, within a course of several weeks. Although the disease spreads slowly the entire herd is eventually affected.

Diagnosis

- Clinical specimens: Vesicular fluid, scabs; and scrapings from lesions.
- A rapid laboratory diagnosis can be achieved by the examination of distilled water lysates of lesion material by electron microscopy.
- The virus replicates in a variety of cell cultures but, unlike cowpox virus, it can not be propagated on the CA membrane of chicken embryos. Intracytoplasmic inclusions may be seen.



Figure 10-2. Pseudocowpox intracytoplasmic inclusions. - To view this image in full size go to the IVIS website at www.ivis.org . -

Prevention

- Vaccination is not practiced.
- Hygienic milking practices help control the disease.

Public Health Significance

The infection may be spread to milker's hands with the production of lesions similar to those of the bovine disease.

Bovine Papular Stomatitis

Cause

Bovine papular stomatitis virus, a *parapoxvirus* closely related to the viruses of contagious ecthyma and pseudocowpox.

Occurrence

It occurs frequently in cattle worldwide. There are reports that some strains of the virus infect sheep and goats.

Transmission

By direct contact and fomites.

Clinical & Pathologic Features

It is a mild disease of cattle usually up to two years of age characterized by proliferative, reddish, raised papules that may ulcerate on the epithelium of the mouth, muzzle and in the nostrils. Lesions may also be present in the esophagus, abomasum, and rumen.

Histologically there is hyperplasia of the mucosa of the affected organ with intracytoplasmic inclusions.

Diagnosis

- The major importance of bovine papular stomatitis is its resemblance to foot-and-mouth disease and vesicular stomatitis from which it should be differentiated.
- Clinical specimens: Scrapings from lesions.
- Diagnosis is usually based on gross and microscopic lesions.
- A rapid laboratory confirmation can be obtained by the electron microscopic examination of distilled water lysates of lesion material.
- The virus replicates in a variety of bovine cell cultures producing cytopathic changes, including cytoplasmic inclusions.

Prevention

Hygienic milking practices.

Public Health Significance

Infection of milker's hands with lesions similar to those caused by bovine papular stomatitis virus have been reported.

Contagious Ecthyma

(Sore mouth, orf, contagious pustular dermatitis)

Cause

Contagious ecthyma virus, a parapoxvirus that closely resembles the viruses of pseudocowpox and bovine papular stomatitis.

Contagious ecthyma (CE) of goats is caused by an antigenically distinct virus, which does not cross-react with the CE virus of sheep.

Occurrence

Hosts of CE are sheep, goats, various wild ruminants, and human beings. It is an important, highly contagious, widely occurring disease of mainly sheep and goats.

Transmission

It is spread by direct contact and fomites. Insects may play some role as mechanical vectors.

Clinical & Pathologic Features

The disease is characterized clinically by the development of pox-like lesions on the lips and nose; and, less frequently, in other parts of the mouth and on the udder, teats, vulva, and coronet of the feet. Affected animals frequently show a worsening foot condition and weight loss. Losses are rare, but may occur in young lambs because of difficulty in feeding. Veterinarians and sheep handlers should avoid contact with infectious material.

Diagnosis

- Clinical specimens: Lesion material.

- Diagnosis is usually made on the basis of clinical signs and lesions.
- Laboratory confirmation is most easily and rapidly obtained by the demonstration of parapoxvirus in lesion material by electron microscopy.
- The virus can be propagated in a variety of cell cultures in which it produces a slowly developing cytopathic effect, including the production of cytoplasmic inclusions.

Prevention

- Sheep and goats can be effectively immunized with a live virus vaccine derived from scab material. The vaccine is administered to ewes at about 2 months before lambing by scarification of the thigh (axilla). Lambs are not vaccinated unless there is an outbreak.
- Care must be exercised when using the vaccine, as it is infectious for humans.

Public Health Significance

The lesions in human beings, although more proliferative, are similar to those in sheep and occur most frequently on the hands, forearms and face and take up to two months to heal. Regional lymph nodes may be sore and swollen.

Avipoxvirus

Fowlpox

Cause

Antigenically related fowlpox viruses of the genus Avipoxviruses.

Occurrence

The hosts are chickens, turkeys, grouse, quail, pheasants, canaries, pigeons, sparrow, starlings and other avian species. Identical viruses do not necessarily affect these species, but all are antigenically related. The disease is highly contagious and occurs commonly worldwide.

Transmission

Mainly by direct contact with infected birds and fomites, particularly contaminated litter.

The virus enters the skin (cutaneous form) through minor abrasions or by the bite of mosquitoes; or, entry may be via the oral or nasal mucous membranes via aerosol droplets leading to the diphtheric form of fowlpox.

Clinical & Pathologic Features

Fowlpox affects adult and young chickens and turkeys most often during the fall and winter. Mortality is usually low, but may be as high as 50% with the diphtheric form.

Lesions that resemble those of other pox diseases are normally present on the comb, wattles, around eyelids, and on other featherless areas. Birds usually recover within 1 month.

The diphtheric form is more severe and is often complicated by secondary bacterial contamination. Lesions involve the mouth, pharynx, trachea, orbit, and sinuses. This form of the disease may be confused with infectious laryngotracheitis as typical cutaneous pox lesions may not be seen.

Diagnosis

- Is usually based on typical clinical and pathologic findings.
- Demonstration of acidophilic cytoplasmic inclusions called Bollinger (aggregates) and Borrel (single) bodies in tissue scrapings and sections is diagnostically significant.
- The virus can be readily cultivated on the chorioallantoic membrane of chicken embryos, where it produces focal or diffuse pock lesions.
- The electron microscopic examination of distilled water lysates of lesions is a rapid means of diagnosis.

Prevention

- Vaccination is widely practiced in high-risk flocks. The most widely used and safest product for chickens is the pigeon poxvirus, which is highly immunogenic, but is of low pathogenicity for chickens. It is propagated in embryonated eggs and administered by the wing-web stick method or by brushing defeathered follicles.
- Vaccination during the first few weeks of life, with revaccination at 8 to 12 weeks is recommended.
- Turkeys are usually vaccinated at 2 to 3 months of age with a fowlpox vaccine by the thigh stick method.

Canarypox

Infections with closely related avipoxviruses occur occasionally in many avian species; however, the form seen in canaries is particularly severe, with mortality sometimes reaching 100%. The disease is frequently systemic, and inclusion bodies may be seen in the liver, salivary glands, pancreas, and other organs. There is no effective vaccine.

Canarypox virus has been used as a vector for animal vaccines, including West Nile virus disease in horses and distemper virus disease in dogs.

Capripoxvirus

Lumpy Skin Disease

(Neethling virus)

Cause

Lumpy skin disease virus, a capripoxvirus.

Occurrence

Lumpy skin disease is endemic on the African continent with higher prevalence in the central and southern regions. The main hosts are cattle, but also buffalo, giraffe, and impala; all ages are susceptible. An interesting feature of the disease in unvaccinated cattle is that it occurs in epidemic form every 5 - 6 years.

Transmission

The virus is thought to be spread mechanically by biting flies.

Clinical & Pathologic Features

The incubation period is usually 2 to 4 weeks. Some animals may be subclinically infected or only show a mild febrile response with few skin lesions.

Clinical signs include fever, lacrimation, and nasal discharge. The more severely affected may develop numerous nodules over large areas of the skin and on mucous membranes of the eye, nose, mouth, and genitalia. Nodules may become necrotic leading to secondary bacterial infections. Morbidity may be as high as 20% but mortality is generally low.

Diagnosis

- Clinical specimens: Biopsies (fresh and fixed) from lesions.
- Gross and microscopic findings are suggestive.
- The finding of typical poxviruses in lesion material by electron microscopy is supportive, but confirmation requires virus isolation (lamb cells) and identification of the virus by electron microscopy and/or immunological methods.
- An antigen-capture / trapping ELISA can also be used in detection of the virus.
- Antibodies can be assayed by indirect immunofluorescence, virus neutralization and Western blot.

Prevention

- This is a reportable disease. State and federal regulatory officials should be contacted if lumpy skin disease is suspected.
- Modified live virus vaccines are used as well as a live, attenuated strain of sheeppox virus.

Sheep and Goatpox

Cause

Sheeppox virus (capripoxvirus). There are some differences in the viruses involved and a distinction is sometimes made between the viruses causing predominantly sheeppox and goatpox. Our discussion will assume the diseases are essentially similar in the clinical aspects.

Occurrence

Sheep and goatpox occurs in Africa, southeastern Europe and Asia.

Transmission

Spread is by direct contact and fomites.

Clinical & Pathologic Features

Sheeppox (goatpox) is the single most severe pox disease of domestic animals. The infection is generalized, and mortality rates may exceed 50% in young lambs and kids. Pox lesions occur on the skin and on mucous membranes of the respiratory and digestive tracts. Severely affected animals frequently develop pneumonia.

Diagnosis

- Clinical specimens: Lesion material (scabs, liquid).
- A highly presumptive diagnosis is based on clinical signs and lesions. Confirmation is most easily and rapidly obtained by the electron microscopic demonstration of poxvirus in distilled water lysates of lesion material. The virions are morphologically similar to the orthopoxviruses, being "brick" shaped as opposed to the virions of contagious ecthyma (a parapoxvirus), which are ovoid in appearance.
- Eosinophilic intracytoplasmic inclusions are seen in skin cells.
- The virus can be propagated in cell cultures derived from goats, sheep, and cattle.
- An antigen-trapping ELISA can also be used in detection of the virus.

- Other serological procedures including indirect immunofluorescence assay and virus neutralization are used to detect antibodies but are not ordinarily used for diagnosis.

Prevention

- Both modified live virus and killed virus vaccines are used in areas where the virus is endemic.
- The disease is reportable in North America and in other countries where it doesn't occur. Outbreaks are dealt with by strict quarantine and slaughter.

Suipoxvirus

Swinepox

Cause

Swinepox virus (suipoxvirus).

Occurrence

The disease is worldwide in distribution; its incidence in the United States is low.

Transmission

The virus is mechanically transmitted by the hog louse, *Hematopinus suis*, and by contact.

Clinical & Pathologic Features

The morbidity is generally high in young pigs.

A transient low-grade fever occurs early in the course of the disease. The typical pox lesions (papule, vesicle, pustule, and scab) are seen involving the skin of abdomen, back, and side. On the lower abdomen, lesions with hemorrhagic dark centers are characteristic. The disease will usually run its clinical course without serious effects.

Rare congenital infections may occur with typical lesions on the skull and in the oral cavity of newborns.

Diagnosis

- The disease is usually diagnosed clinically, but it may be confused with other skin diseases such as mange.
- Confirmation of swinepox infection is easily accomplished by the electron microscopic examination of distilled water lysates of lesions.
- The virus can be cultivated, in swine kidney cell cultures, but not on the chorioallantoic (CA) membrane of chicken embryos. Eosinophilic cytoplasmic inclusion bodies are seen in epithelial cells of affected animals.
- In some countries, vaccinia virus causes a disease of swine that closely resembles swinepox. The vaccinia virus can be distinguished from swinepox virus by serologic means (are antigenically distinct), and by the fact that it can be grown on the CA membrane of chicken embryos.

Prevention

- Vaccination is not practiced.
- Delousing and basic sanitation are the primary control measures.

Leporipoxvirus

Myxomatosis

Cause

Myxoma virus (leporipoxvirus).

Occurrence

Myxomatosis is endemic in several species of wild rabbits (*Sylvilagus*) in some areas of North and South America and in some wild rabbit species of the genus *Oryctolagus*, in Europe, South America, and Australia.

Transmission

By direct contact and mechanically by biting insects.

Clinical & Pathologic Features

In rabbits of the genus, *Sylvilagus*, the virus only causes localized skin tumors, but in the European rabbit (*Oryctolagus cuniculus*) it produces a severe generalized infection with high mortality.

Initial clinical signs are swelling around the eyes and conjunctivitis followed by nasal discharge and swellings around the nose, mouth, and other body orifices. These tumorous swellings (myxomata) may eventually appear over the entire body. Histologically, myxomata are connective tissue tumors that consist of large star-like cells ("myxoma cells") embedded in a soft mucoid matrix.

After initial introduction to a noninfected region or country (Australia was a case in point) losses due to deaths are devastating, as high as 90%, but the disease ultimately becomes endemic with a low fatality rate.

Diagnosis

- Clinical specimens: Fresh and formalin-fixed skin nodules.
- Diagnosis is usually based on clinical signs and the characteristic gross and histopathologic lesions.
- The virus can be propagated in a variety of cell cultures and in embryonated eggs inoculated via the chorioallantoic membrane. The virus is antigenically related to the viruses of rabbit and squirrel fibroma.

Prevention

- Prevention is best accomplished by housing domestic rabbits in screened areas to prevent introduction of the virus by biting insects.
- Vaccination with the closely related rabbit fibroma virus (Shope fibroma) is practiced in Europe.

Glossary

Antigen-capture/trapping ELISA: In this method, specific antibody is used to bind (or trap) any viral antigen that may be present in the sample. Presence of any trapped antigen is then detected.

Cynomologus monkeys: From southeastern Asia, Borneo and the Philippines. Rhesus monkeys are from India.

All rights reserved. This document is available on-line at www.ivis.org. Document No. A3410.1005

Leading the way in providing veterinary information

