Viral diseases
Module # 8 - Component # 3

Viral diseases

Objective

Identify the symptoms of important viral diseases of wildlife and understand the control of these diseases.

Expected Outcome

- List the most common symptoms of various important viral diseases.
- Know how these diseases are transmitted.
- Assist veterinarians in the control of these various diseases.

Plains zebra: Equus quagga
**Rinderpest**

This disease was introduced to Africa, firstly in 1884 from the Middle East by the Italian military. This transmission died out in Sudan in 1884. However, the Italian military introduced it again in 1889 from the Middle East, but this time into Ethiopia. Seven years later, it was in Southern Rhodesia (now Zimbabwe) thanks to oxen transport.

Seeing the spread of the disease, a 1000 km [621.3 mi] fence was erected across the whole of South Africa north of the Orange River. This was done hoping that the disease could be stopped by not allowing any animals across the fence line. It crossed into the Cape (in 1896) through Aliwal North, presumably by local farmers.

Why was this such a problem? Rinderpest has a very high morbidity rate, which means it is exceedingly contagious and transmits before the host shows symptoms. The Mortality rate at this time was greater than 95%. It affects cloven-hooved animals, with cattle and buffalo being particularly susceptible. Rinderpest is remembered as the worst animal Pandemic in recent history, killing 99% of all the cattle and buffalo on the African continent. When it had run its course, only 50 buffalo were left alive south of the Equator. Game animals were unjustly blamed for its spread.

One positive (or negative depending on your point of view) event can be attributed to the disease though, by killing off such vast numbers of animals, specifically the buffalo and some other species, the Tsetse fly found itself without a host and vast areas of previously uninhabited land became available.

This deadly disease is highly contagious and only affects cloven-hooved animals. A single virus causes it, although different strains exist. These strains differ in their ability to cause disease, their ease of transmission and affinity for various hosts.

Infection is through inhalation. Clinical symptoms include:

- Acute fever reaction
- Watery to purulent eye and nose secretions
- Difficult breathing
- Constipation followed by diarrhoea
- Ulcers in the mouth, gums and the tongue
- Dehydration
- Death after 6 to 12 days
- Mortalities greater than 80%

Some animals take months to recover and can act as carriers of the disease.
Rinderpest eradicated

On the 25th of May 2011, the following press release was provided:

Animal health delegates meeting in Paris today declared that rinderpest, a highly contagious disease in cattle and other animals, is eradicated, marking the first time humans have snuffed out an animal disease in the wild. The delegates, during the annual World Organization for Animal Health (OIE) conference, unanimously adopted a resolution that officially recognises that all 198 countries that have animals susceptible to rinderpest are free of the disease, the OIE said in a press release.

Today's eradication declaration is only the second time humans have eliminated a disease. The first was smallpox in 1980. Dr Bernard Vallat, the OIE's director-general, said in the statement that the eradication declaration is a historic event. "It's a major breakthrough, not only for science but also for the cooperation policies amongst international organisations and with the international community as a whole," he said. He credited the world's veterinary community, which had faced tough obstacles, given that many affected countries had scarce resources for fighting the disease.

In October 2010, the United Nations Food and Agriculture Organization (FAO) set the stage for official eradication when it announced that animal health authorities were ending all field activities to control rinderpest. The virus does not infect humans, but the ancient disease has been considered a potential biological weapon because of its devastating effect on cattle and buffalo herds. Over many centuries, rinderpest outbreaks caused widespread famine and struck down millions of domestic and wild herds in Europe, Asia, and Africa. Though the disease never gained a foothold in the Americas, Australia, or New Zealand, veterinary experts worried about rinderpest spreading to the areas because the cattle herds are naïve to the virus.

Ann Tutwiler, FAO deputy director, said in the statement that eradicating rinderpest has been one of the FAO's top priorities. "With the eradication of the disease in live animal livestock production around the globe has become safer and the livelihoods of millions of livestock farmers are less at risk," she said. "There are important lessons to be learnt when it comes to defeating other animal diseases."

The FAO is expected to adopt a similar measure in June at its conference in Rome. It will also discuss a follow-up plan for maintaining rinderpest eradication. Several labs still keep rinderpest virus stocks for vaccine production, so as a next step, the OIE and FAO are preparing recommendations on limiting use of the virus only for vaccine research, in compliance with international biosecurity measures, the OIE said. Rinderpest eradication efforts have been underway since 1989 when the OIE launched a system for countries to reach the disease-free status. The FAO's Global Rinderpest Eradication Program has also played a vital role in eliminating the disease. Rinderpest was a notifiable disease. Previous Control measures included:

- Quarantine
- Culling of infected animals
- Precautionary vaccination
Foot-and-mouth disease

Although several different strains are identified, one virus causes this highly contagious disease of cloven-hooved animals. Infection is primarily via inhalation, although infection via the mouth is also possible.

This disease is endemic in certain areas in South Africa. This means that the disease is present in these areas at all times. The disease is thus constantly present in these animal populations, but clinically recognisable in only a few individuals.

Buffalo are the most important carriers of foot-and-mouth disease in the endemic areas. However, cattle that have recovered from the disease are also important carriers.
Clinical symptoms include the following:

- Classical blisters on the tongue, gums, in the mouth, the nose, between and on the hooves, udder and teats.
- These blisters rupture to leave raw ulcers in the areas mentioned above.
- These ulcers become secondarily infected with bacteria.
- Depression and feverish.
- Excessive drooling.
- Lameness.
- Low mortality (number of deaths) even though the morbidity (number of animals infected) is very high.

The disease is not a great killer but is of great economic importance. Countries that are free of this disease have very strict meat import regulations. No livestock or meat from endemic areas can be exported to these countries. The deaths that do occur are a result of heart muscle involvement or due to secondary infection.

The Kruger National Park and its surroundings are endemic areas in South Africa. Movement of livestock or meat from this area is only allowed under the instruction of the Directorate of Animal Health. Foot-and-mouth disease is a notifiable disease. The collecting and sending of samples are only to be done under the supervision of a state veterinarian.
Control measures include:

- **Quarantine.** Includes restriction of movement of people, vehicles, and animal products such as hides and horns.
- **Culling of infected** animals.
- **Vaccination** of all ruminants.

It is of great importance that game ranch owners understand the necessity for restrictions in endemic areas. This has a real influence on the livestock and game enterprises in the rest of the country. Information regarding these restrictions can be obtained from the local state veterinarian. In late 2000, South Africa experienced a significant disease outbreak, which resulted in the temporary suspension of our meat exports. The situation was controlled and contained, and the export ban was lifted.

The procedure when an outbreak occurs is to destroy all the animals on the infected farm and all the animals on surrounding farms. In addition, all transportation into and out of the area is halted until the disease has been contained. Since buffalo are wild carriers (but not sufferers of the disease), Veterinary cordon fences should be erected with a 5 km [3.1 mi] radius around reserves with infected animals.

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**African buffalo:** *Syncerus caffer*
Bovine malignant catarrhal fever - snotsiekte

This acute disease occurs commonly in cattle and from time to time in other ruminants. It is usually fatal, and only a few individuals are infected at any given time. Several strains of the virus have already been identified. There are two forms of the disease. Firstly, the African form where contact between cattle and blue- or black wildebeest is necessary to transmit the virus. The European form is transmitted between sheep and cattle. The exact mode of transmission between cattle and wildebeest is not known yet, but there is a definite increase in cattle cases during the wildebeest calving season. There does not have to be direct contact between the two species, and there is also no transmission between cattle themselves. Transmission is likely to be through an unknown vector.

The virus is endemic in wildebeest populations, and almost all animals tested were positive carriers. There are no clinical symptoms in wildebeest or any other game species for that matter. Cattle die acutely from this disease and show the following clinical symptoms:

- Fever
- Enlargement of lymph nodes
- Watery to purulent eye and nose secretions

There are no more strict control measures on the movement and/or keeping of blue and/or black wildebeest. The Afrikaans form of the name - ‘Snotsiekte’ is colloquially translated as mucous sickness - an obvious reference to the infected animal’s nasal secretions.
African swine fever

This deadly disease of domesticated pigs is highly contagious. Warthogs and bushpigs act as carriers of the virus and do not develop any clinical signs. Domesticated pigs become infected when feeding on dead warthog or bushpig tissue, or when bitten by the warthog tampan (a type of tick, external parasite) Ornithodoros porcinus. These tampans live in the burrows of the wild pigs. Warthogs thus do not transmit the virus directly to domesticated pigs but carry the infected ticks and spread the virus indirectly in this manner.

After infecting domesticated pigs, the virus spreads quickly through the whole piggery since high concentrations of the virus are shed in all bodily excretions.
The disease in domesticated pigs present in four different ways:

- In the **peracute** form, the affected pigs are found dead.
- In the **acute** form, the pigs are initially feverish, stop eating, become weak and have a staggering gate. Vomiting, bloody diarrhoea, purulent eye and nose secretions, and a blue discolouration of their ears, feet and tails may be noticed before the animal eventually dies.
- In the **subacute** form, the sows can abort. Death occurs after three to four weeks.
- The **chronic** form of the disease is very similar to other diseases and is, for this reason, difficult to identify. Symptoms could include pneumonia, emaciation, joint infections and/or ulcerative skin conditions.

African swine fever is a notifiable disease and is strictly controlled. Control measures include:

- Restrictions on the movement of wild and domesticated pigs and products of pig origin.
- Culling of all infected and in-contact pigs.
- Prohibit contact between wild and domesticated pigs.
African horse-sickness

This disease is **not contagious, and horses cannot infect each other directly.** The virus is **transmitted by biting midges** (a small mosquito-like insect) from the genus *Culicoides.* The disease **spreads** either by **movement of infected hosts or the midges.** It can spread over great distances if equine animals incubating the disease are transported by vehicle, ship, or aircraft. Because midges transmit the disease, it **has a seasonal occurrence.** Its prevalence is influenced by climatic and other conditions that favour the breeding of *Culicoides* species.

The disease kills horses in one of two forms, either by a **swelling of the head** or **pulmonary (lung) problems.**

*Zebras* can become **infected but are highly resistant** to the disease and do **not show** any **clinical symptoms.** Zebra foals receive immunity from their colostrum and then develop full immunity.

Dogs **feeding on infected horsemeat** can become ill. It is not known if other carnivorous animals can be infected. For this reason, it is advised that infected horsemeat should not be fed to wild carnivores. This disease has **little direct wildlife ramifications,** except for **horseback safaris** and **horseback patrols** through game reserves.
Rabies

This **acute, deadly disease affects all mammalian species**. Several different strains of the virus are identified. Animals become infected with the virus **when bitten by an infected carrier animal**. However, the disease can also be transmitted through close contact with saliva from infected animals. This was the case in Namibia, where kudu became infected through eating leaves contaminated with infected saliva.

The most important transmitters of rabies in South Africa are:

- **Domestic dogs** *(Canis domesticans)*
- **Yellow mongoose** *(Cynictis penicillata)*
- **Black-backed jackal** *(Canis mesomelas)*
- **Bat-eared fox** *(Otocyon megalotis)*
- **Honey badger** *(Mellivora capensis)*
- **Small spotted genet** *(Genetta genetta)*

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**Black-backed jackal**: *Canis mesomelas*
However, it is important to realise that all mammals can potentially transmit rabies. The interval of time between the invasion of the body by the rabies virus and the appearance of the first signs of disease is known as the disease’s incubation period.

The incubation period of rabies varies tremendously depending on:

- Degree of **virulence** (ability to cause clinical disease) of the specific virus strain.
- **Amount of virus transmitted.**
- The severity of the **bite wound.**
- Nervous supply to the area where the animal was bitten.
- Distance from bite-wound to the animal’s brain.

It can be as short as **21 days, to as long as 1 - 2 years in animals and up to 20 years in humans.**

**Yellow mongoose: Cynictis penicillata**
Rabies is a progressive disease and can be divided into three phases:

- Initial phase
- Aggressive phase
- Paralysis phase

Clinical symptoms during the different phases are:

**Initial phase:**

- **Behavioural changes**, i.e. wild animals lose their fear of humans and appear tame.
- Excessive drooling.
- Decreased appetite.
- Increased libido.
- Erections in male animals.
- Increased urination.
- Animals either become aggressive or paralysed after this phase.

**Aggressive phase:**

- Infected animals will attack other animals without reason.
- Anxious facial expression.
- Eating or chewing strange objects.
- Run around aimlessly.
- Hydrophobia.

**Paralysis phase:**

- Dropped bottom jaw.
- Excessive drooling.
- Progressive paralysis.
- Abnormal sounds.

The virus lives in the nervous tissue and saliva. It migrates from the saliva to the brain via nerves, causing brain damage. From the brain, it is transmitted back to the saliva via nerves.
When an animal is suspected of being rabid, do not attempt to catch or inspect it. Rather contact the nearest veterinarian or preferably the relevant state veterinarian. The diagnosis is confirmed on the animal's brain tissue in the laboratory. For this reason, a suspected case of rabies should not be killed with a shot to the head. The removal of the brain and sending of samples are best left to a veterinarian.

The emergency treatment of a person bitten by a suspected rabid animal consists of:

- Rinsing the wound with large amounts of water with or without soap.
- Removing any foreign matter from the wound.
- Do not stop the bleeding immediately, as this is advantageous for the patient unless the bleeding is profuse.
- Get the patient to a doctor as soon as possible.
- The animal should be killed, and a veterinarian should send appropriate samples to confirm if the animal is suffering from rabies.
- There is a course of modern drugs available to treat the disease.

Honey badger: Mellivora capensis
Control measures for rabies include:

- **Regular compulsory vaccination of all dogs and cats.**
- Preventative vaccination of any other animal species is only permitted with the consent of a state veterinarian.
- The vaccination of people by their doctor is voluntary, but it is advised that people who work with animals regularly be vaccinated.
- Control of stray dogs and cats.
- The **control of other transmitters of rabies**, such as black-backed jackals and yellow mongoose, is very controversial. It is only effective in the short run as the remaining animals will increase their reproduction rate to increase the total population.
- Trials in which bait containing a vaccine are placed out for transmitter animals are being done elsewhere globally and will probably be tested out in South Africa.

**Rabies is a notifiable disease** ➔ All suspected cases must be reported to the State Veterinarian.

Certain relatively isolated populations of the **yellow mongoose in the Karoo** and **batt-eared fox in the Western Cape** harbour the disease.

**Wild dogs** are highly susceptible, and many packs are wiped out due to it. This is the major reason why **domestic dogs are prohibited from game reserves.**
Carnivore viral diseases

Introduction

Carnivores do not suffer as much stress as herbivores (a predator/prey phenomenon). They, therefore, do not experience as many sicknesses as herbivores, even when in confinement.

Disease in carnivores is broadly (but not strictly) grouped into two taxonomically:

Canidae (dog family) diseases

- Distemper
- Parvovirus

Felidae (cat family) diseases

- Feline leukaemia
- Panleukopenia
- Rhinotracheitis
- FIV - Feline Immuno Virus, Feline AIDS
Distemper

This disease is in the same family as rinderpest and common human measles. It is a contagious disease with no vector. It is found in domestic dogs, wild dogs, jackal, foxes, and mongoose.

Clinical symptoms include:

- Human flu symptoms
- Pneumonia
- Diarrhoea
- Encephalitis
- Convulsions
- Brain damage

Zoos and other confined situations may experience significant outbreaks, especially those close to cities, where transmission from infected domestic dogs are a risk.

Strangely enough, there has been a case of 40 lions being killed by distemper, which until then was strictly known as a disease of Canids (dog family) only.

Wild dog: Lycaon pictus
Parvovirus

The virus causes suppression of the immune system. It is characterised by both high morbidity and high mortality. The virus is a mutant strain/variant of the feline Panleukopenia virus. Because it is a virus, there are no antibiotics available, although a vaccine exists. Wild dogs are particularly susceptible.

Wild dog: Lycaon pictus
Feline Panleukopenia - cat flu

This virus causes a **white cell deficiency** in affected hosts leading to **immuno-suppression**. The disease is also characterised by **high morbidity** and **mortality** and may exhibit in either an **acute or chronic** form. It causes vomiting in domestic cats. It has **no vector**, and transmission is not fully understood. The virus can live 'free' in the environment and therefore is **difficult to control** both in terms of control and spread.

All wild felines are susceptible. There is a **vaccine**, but it is **not safe to use** it on either **cheetah** or **black-footed cats**. This disease is **not of great importance** to wildlife but has been **used in bio-control** programmes, specifically the attempted eradication of feral cats from Marion Island, south of South Africa.
Feline Immuno-Deficiency Virus - FIV

This has also been somewhat incorrectly described as feline AIDS. It is very similar to the HIV strain, but affected hosts do not seem to experience the same debilitating symptoms.

In preliminary field tests, over 80% of Kruger National Park, a lion, a leopard and a cheetah tested serologically positive for the disease. The main concern that this could destroy the affected populations is unfounded. The reason being is that unlike humans with HIV, felines with FIV are reproductively active before any effects of the disease manifest. Therefore, they continue to propagate.

The disease is likely to have a yet unidentified wild reservoir. The disease is a significantly growing problem for domestic cats in the USA.

Lion: Panthera leo
Feline Leukemia

This disease, like many affecting Felidae, is also an Immuno-suppressant. It is characterised by a proliferation of white blood cells but in an abnormal form. It is not significant for wildlife.

Rhinotracheitis

This disease presents with flu-like symptoms in both domestic and wild felines. It is not a fatal disease, and a vaccine is available. It is also not a significant illness regarding wild animals.
Conclusion

Feral cats and mice are likely to be the most important vectors of many diseases. These animals are also quite prevalent in zoos at night. They cannot be effectively controlled in or out of wildlife areas. Therefore, feral cats should be regarded as vermin within the borders of formal conservation areas and should be eradicated. Their vector status is also the reason why domestic cats are not allowed into wildlife reserves.

Although far less significant than disease in herbivores, disease in carnivores does require attention by wildlife managers.