Analysis Of The Structure, Growth And Types Of Reproduction Seen In Pathogens And Parasites In Animals

Salmonella spp

The Salmonella bacterium is a rod-shaped motile bacterium that posesses a flagellum. A flagellum is a long thin tail that helps the bacterium to move Salmonella reproduces asexually with binary fission. Binary fission has four steps:

1. First the cell elongates and makes a replicate of the DNA. The daughter chromosomes then move to opposite ends of the cell to each other.
2. There is then a division into two of the cell wall and the plasma membrane.
3. Once the DNA is completely divided, a new cell wall is formed in the middle to separate the two cells.
4. Binary fission is now completed and the two daughter cells separate. It follows up with the lytic cell cycle which is common for many bacteria.

Like most bacteria, with the right conditions it can reproduce every 20-40 minutes Animals will become infected with Salmonella through a faecal-oral route. This happens when consuming materials (e. g water, feed, pasture grass) which is contaminated with the faeces of an infected animal. It can also be transmitted through direct contact with either an infected animal or by objects (e. g. boots, coveralls, etc) contaminated with faecal matter from an infected animal. This bacteria can live for months to years in ideal conditions such as warm, wet environments.

Symptoms of salmonella commonly seen in dogs are:

- Fever-Shock
- Lethargy
- Diarrhoea (watery, foul smelling)
- Anorexia
- Weight loss
- Dehydration
- Vomiting
- Skin disease
- Abnormal vaginal discharge
- Mucus in faeces.

However, some infected animals may not show signs of infection and illness but will instead shed the bacteria into their faeces when stressed.

Mycobacterium bovis

Mycobacterium bovis is a contagious disease that is spread through contact with an infected domestic or wild animal. The most common route of infection from Mycobacterium bovis is by inhalation of infected droplets which, from coughing, are expelled from the lungs. In calves and

humans this disease can be spread through the ingestion of raw milk from infected cows.

Because of the slow course of the disease it can take months or years for an infected animal to be killed, the animal can spread the disease to many other mates in the herd before showing any clinical signs. Therefore, movement of undetected infected domestic animals and contact with infected wild animals are the major ways of spreading the disease. Usually, in TB, symptoms take months or years to appear.

The common clinical signs include:

- Weakness
- Loss of appetite
- Weight loss
- Fluctuating fever
- Intermittent hacking cough
- Diarrhoea
- Large prominent lymph nodes.

However, the bacteria may also lay dormant in the host without causing disease.

Microsporum canis

Main animals affected by Microsporum canis are cats and dogs. However it can be transmitted to humans by direct and indirect contact with animals that are infected and through fomites. These being combs, brushes, hats, furniture, linens etc. The greatest risk in contracting the infection is contact with damaged cells on skin, nails and hair. All mammals can be infected by Microsporum canis. Microsporum canis manifests as Ringworm, which can cause a scaly crusted rash that can appear as circular, red patches on the skin. Other signs and symptoms are:

- Patches of hair loss
- Scaling on the scalp
- Itching
- Blister-like lesions.

Aspergillus spp

The body of the fungus is a mycelium, this consists of slender, tubular, pale coloured, extensively branched, thin walled hyphae. These hyphae work in two different ways, some ramify upon the substratum whereas others penetrate the substratum to absorb the food materials.

Each cell is multinucleate which is filled with things such as cytoplasm, mitochondria endoplasmic reticulum, ribosomes and vacuoles, the cross walls of the cell have a simple pore structure and the oil globules are the forms of the food material reserve. Aspergillus reproduces in several ways.

Vegetative reproduction:

Fragmentation - The vegetative mycelium will break into fragments (small pieces), these fragments will then each grow independently and create a new thallus if under the right favourable conditions.

Sclerotia - Some species produce sclerotia, these are A niger, A. terreus. This is more of a means to keep the fungus alive than propagation.

Asexual Reproduction: This type of reproduction takes place by the hyphae called conidiophores. A proportion of the cells in the fungus are called foot cells, these cells each produce a special erect branch as an outgrowth. This is the young conidiophore. This then turns into an elliptical or globular multinucleate head called vesicle, which is from the swelling of the tip of the conidiophore. This in turn forms many arranged outgrowths which are tubular and called sterigmata or phialides.

Sexual reproduction: This type of reproduction is rare. Most species of Aspergillus are homothallic, however there are a select few species that are heterothallic. This takes place by the forming of male and female sex organs. Aspergillus can be transmitted to Humans, birds, cows, dogs, dolphins and horses. There are multiple modes of transmission. These can be through inhalation of airborne conidia, exposure to contaminated water, for example during showering, and nosocomial infections. There are multiple types of Aspergillus, the most common types are systemic aspergillosis, nasal aspergillosis.

Nasal aspergillosis is the most common form of aspergillus in dogs. Clinical signs of this include:

- Nasal discharge, often has a strong odour, can last weeks and up to months, it does not respond to antibiotics and is commonly only effects one nostril.
- Nosebleeds - Rough, inflamed and ulcerated (because of discharge being irritating) edges of the nostrils.

  Signs of systemic aspergillosis in dogs depends upon where the fungus becomes established in the body. Common sites of infection include the bones and the intervertebral discs in the body. These signs include:

- Lamenes
- Weakness
- Incoordination
- Fever
- Weight loss
- Appetite loss
- Uveitis (deep inflammation of the eye)
- Many dogs can develop draining tracts in areas of infection. Draining tracts are holes with puss or blood discharge oozing out of them.

Canine parvovirus

Canine Parvovirus is a viral infection/virus meaning it only contains DNA and RNA making it incapable of reproducing unless it invades a cell. Canine parvovirus is transmitted by contact

with infected faeces or vomit. This is often carried on the dog on its paws and hair/fur. This can be easily transferred onto the human body, clothing, shoes carpets, pet bowls and other surfaces meaning it can be spread a lot quicker. The most susceptible areas for the transmission of Parvo virus are urban areas because it can easily be taken into peoples' homes where it can then be left for dogs to become infected. They become infected by licking or sniffing the contaminated items. The most common clinical signs of intestinal Parvovirus are:

- Severe, bloody diarrhea
- Lethargy
- Anorexia
- Fever
- Vomiting
- Severe weight loss.

Rabies virus

Also called Rhabdoviruses. Rabies Genome has five proteins that include: Nucleoprotein, phosphoprotein, matrix protein, glycoprotein, and polymerase. It is approximately 180mm long and 75mm wide.

Rhabdoviruses have two main components to their structure, a helical ribonucleoprotein core and a surrounding envelope. Rabies virus, like most viruses uses a host cell for reproduction. Endocytosis is used to aid the process, and then fuses with the membrane. On the surface of the host there are binding proteins, the virus attacks these proteins for reproduction. All mammals are susceptible to Rabies however there are only a few certain species that are important for the virus to live on.

These being skunks, foxes, and coyotes; also several species of bats. The transmission of Rabies begins with the saliva of an infected host and is passed onto an uninfected animal. Modes of transmission are most commonly through the bite and virus infected saliva. However, although rare it can spread through mucous membranes e. g. eyes, nose and mouth; also through aerosol transmission and corneal and organ transplantations. In all warm-blooded hosts Rabies virus causes an acute encephalitis with the outcome almost always being fatal. The first nonspecific signs of Rabies:

- Lethargy
- Fever
- Vomiting
- Anorexia.

Progressive signs show within a few days and include:

- Cerebral dysfunction
- Cranial nerve dysfunction
- Ataxia
- Weakness
- Paralysis
- Seizures

- Difficulty breathing
- Difficulty swallowing
- Excessive salivation
- Abnormal behaviour
- Aggression and/or self-mutilation.