

Veterinary infectious diseases:

Infectious diseases are caused by exposure to pathogenic living organisms (causative agent) not normally present in the animal which create a disturbance leading to develop signs or illness. There are hundreds of different diseases caused by such factors as infections, diet, genetics, and aging. In this lesson, however, we discuss only diseases arising from the disorder of a tissue or organ caused by microbes or their products.

Infectious disease agents

Aetiology (etiology)/: the study of organism that cause or considered the causative agent of an infectious disease. Infectious agents enter the individual through the skin, mucous membranes, lungs, mouth, or reproductive tract.

✓ **viruses**

Viruses are very small non-cellular organisms that consist mainly of genetic material with no cellular structure. They are too small to be viewed directly under a light microscope.

✓ **Prions**

prions are protein molecules that cause degenerative central nervous system (CNS) diseases such as scrapie in sheep, and bovine spongiform encephalopathy (BSE) .

✓ **bacteria**

are tiny single-celled organisms that usually require a high-powered microscope to be seen. some bacteria cause tissue reactions that may or may not produce pus, and some produce harmful or poisonous waste products. bacteria in the blood is referred to as **bacteremia**; harmful bacterial waste products in the blood **septicemia**; and toxins in the blood **toxemia**.

✓ ***rickettsiae***

Rickettsiae are bacteria-like obligate intracellular organisms, rod shaped to coccoid. The diameter of the individual cell is from 0.3–1 μm , that can cause diseases producing symptoms.

✓ **fungi**

Fungi are single-celled organisms that are larger than bacteria and can often be viewed at low power under a microscope. a single organism is called a fungus and multiple organisms are called fungi. Fungal diseases may also be called mycosis or mycotic diseases.

✓ **parasites**

Common parasitic diseases of animals are caused by arthropods, worms, and protozoa. Arthropods (flies, ticks, fleas, lice, mites) generally infect the skin and digestive system; worms

(nematodes, tapeworms, flukes) infect the skin, digestive system, and circulatory system; and protozoa infect the digestive and reproductive systems.

Source of infection:

Animal sources of infectious microorganisms may be ¹animals which are just colonized by an infectious agent (meaning the pathogen resides in or on the body, but is not associated with any clinical disease or host response), ²animals in the pre-clinical (incubation) phase of disease, ³animals with acute disease, ⁴animals with chronic disease caused by persistent infection, and ⁵animals that are recovering from clinical disease but are still shedding the infectious agent all these infected animals called **carrier host carrier** *is, an individual who invisibly infected with a pathogen and spreads it to others without any notice.*

People can be an important source of zoonotic pathogens, and like animals they may be colonized or infected. Contamination on a person's clothing or body, particularly the hands, can also be a source of infectious microorganisms.

Other potential sources include **food, water**, and an animal's own indigenous microflora, which may be difficult to control. **Non-living objects**, including medical equipment, supplies and drugs, animal bedding, environmental surfaces and waste that have been contaminated can also be important sources.

For an infectious agent to continue to exist and be spread, it must have a permanent place to reside. The **reservoir** *is the primary habitat in the natural world from which a pathogen originates.* Often it is a human or animal carrier, although soil, water, and plants are also reservoirs. This is the individual or object from which an infection is actually acquired but these infections and diseases may be spread or transmitted from human to human, human to animal, and animal to human.

Transmission:

The routes or patterns of infectious disease **transmission** are many and varied.

The spread of diseases is by **direct** or **indirect** contact with living or non-living objects and can be horizontal or vertical. The term **horizontal** means the disease is spread through a population from one infected individual to another; **vertical** mean transmission from parent to offspring via the ovum, sperm, placenta, or milk.

Mode of transmission:

- ✓ **Direct transmission:** in this way a physical contact must occur between the skin or mucous membranes of the infected animal such as venereal diseases.
- ✓ **Indirect transmission:**

A pathogen with an indirect transmission route must go through a development phase outside the host before it can infect a new susceptible person or animal. This development will take place in a specific intermediate host, vector, or type of environment, in this way the infectious pathogens need a conveyer to transport into the hosts.

1. Vehicle -borne

non-living material commonly used by animals that can transmit infectious agents such as combs , bedding, surgical instruments other equipment used in the field.

2. Food -borne and water-borne

Contaminated Food and water considered a vehicle of pathogens, the source of the agent can be soil, the handler, or a mechanical vector. The transmission of infection by contaminated food and water with feces or urine termed the **fecal-oral route**.

3. Air-borne

Occurs by spreading of either airborne **droplet** or **aerosols** are moist particles containing the infectious agent. Microorganisms remain suspended in the air for long periods dispersed widely by air currents; also may infection acquired by the spores of fungi or bacteria in soil when released by digging or by wind they may be inhaled by another host. Airborne transmission of pathogens in veterinary clinics is very rare.

4. Vector-borne

Vector is a live animal that transmits an infectious agent from one host to another. The majority of vectors are arthropods such as fleas, mosquitoes, flies, and ticks, although larger animals can also spread infection; for example, mammals, birds, rodents.

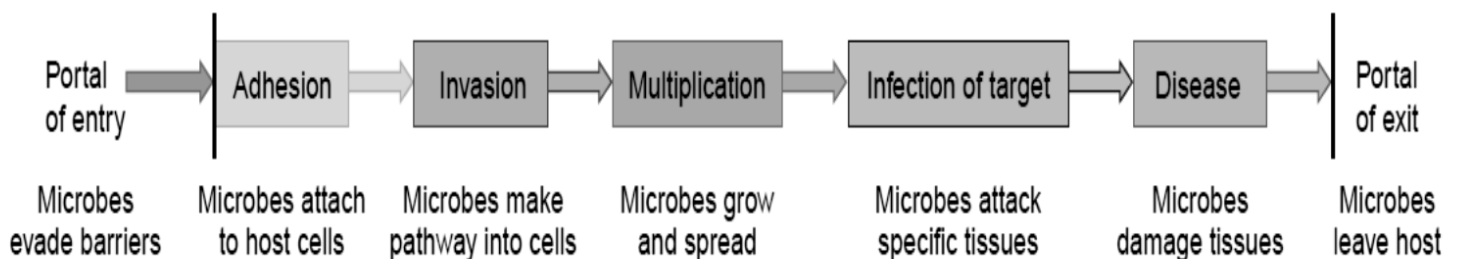
Vectors categorized into two categories a **biological vector** actively participates in a pathogen's life cycle, serving as a site in which it can multiply or complete its life cycle and **Mechanical vectors** are not necessary to the life cycle of an infectious agent and merely transport it without being infected. The external body parts of these animals become contaminated when they come into physical contact with a source of pathogens .

Pathogenesis:

is the process or mechanism of disease development. Pathogens are parasitic microbes whose relationship with a host results in infection and disease. The type and severity of infection depend on both the pathogenicity of the organism and the condition of the host. Pathogenicity is a broad concept that describes an organism's potential to cause infection or disease and is used to divide pathogenic microbes into one of two general groups. **1) True pathogens** are capable of causing disease in healthy animals with normal immune defenses. Examples of true pathogens include influenza virus, plague bacillus, and malaria protozoan.

2) Opportunistic pathogens cause disease when the host's defenses are compromised or when they become established in a part of the body that is not natural to them. Opportunists are not considered pathogenic to normal healthy animals and, unlike primary pathogens, do not generally possess well-developed virulence properties. Examples of opportunistic pathogens include *Candida albicans*.

the relative severity of the disease caused by a particular microorganism depends on the **virulence** of the microbe. The virulence of a microbe is determined by its ability to establish itself in the host and cause damage. Any characteristic or structure of the microbe that contributes to the infection or disease state is called virulence factor. Virulence can be due to a single factor or to multiple factors.



Factors that weaken host defenses and increase susceptibility to infection:

- Old age and extreme youth (infancy, prematurity)
- Genetic defects in immunity and acquired defects in immunity
- Surgery and organ transplants
- Organic disease: cancer, liver malfunction, diabetes
- Chemotherapy/immunosuppressive drugs
- Physical and mental stress
- Other infections

In addition to immune status of the host, the success of a pathogen in infecting an animal will depend on the **infectious dose (ID)** of the pathogen , The infectious dose is the number of pathogens which have to enter the body of a susceptible person to cause infection. Infections with a low infectious dose are more likely to be spread by direct animal to- animal contact than infections with a high infectious dose. Examples on infectious dose for some pathogens:

Measles 1 virus

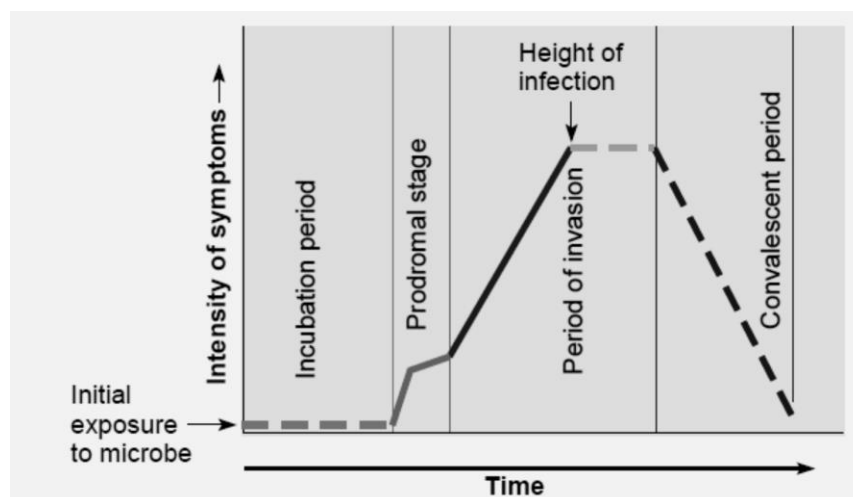
Brucellosis 10–100 cells

Anthrax 8,000–50,000 spores

Cholera 100,000,000 cells

Clinical infection phases:

As the body of the host responds to the invasive and toxogenic activities of a pathogen, it passes through four distinct phases of infection and disease: the **incubation period**, the **prodrome**, the **period of invasion**, and the **convalescent period**.



⊕ **The**

incubation

period: is the

time from initial contact with the infectious agent to the appearance of the first symptoms takes 2-30 days.

⊕ **The prodromal stage:** The earliest notable symptoms of infection appear as a feeling of discomfort, such as head and muscle aches. This short period (1–2 days).

⊕ **The period of invasion :** infectious agent enters a tissue, during which it multiplies at high levels, exhibits its greatest toxicity. This period is often marked by fever and other prominent and more specific signs and symptoms, which can include cough, rashes, diarrhea, loss of muscle control, swelling, jaundice, discharge of exudates, or severe pain, depending on the particular infection. The length of this period is extremely variable.

- ⊕ **The convalescent period** : As the patient begins to respond (recovery) to the infection, the symptoms decline gradually.

Clinical signs and symptoms

When an infection causes pathologic changes leading to disease, it is often accompanied by a variety of signs and symptoms. A **sign** is any objective evidence of disease as noted by an observer; a **symptom** is the subjective evidence of disease as sensed by the patient. Signs tend to be more precise than symptoms and are often measured. Both can be the result of the same underlying cause. For example, an infection with streptococcal infection may produce a sore throat (symptom) and inflamed pharynx (sign). When a disease can be identified by a defined collection of signs and symptoms, it is termed a syndrome.

Signs : as Fever , Septicemia, Microbes in tissue fluids, Abnormal chest sounds Abscesses, Leukocytosis, Leukopenia Swollen lymph nodes .

Symptoms:as Chills, Pain, irritation, Nausea, Malaise, fatigue, Itching, Headache Weakness, Abdominal cramps, Anorexia.

Diagnosis:

Typical diagnosis depends on diagnostic tests used to confirm or classify disease status, provide a guide to selection of treatment, or provide an aid to prognosis. Tests included:

- ⇒ Routine examination of an animal.
- ⇒ Questions posed during history taking.
- ⇒ Clinical signs.
- ⇒ Laboratory findings – hematology, serology, biochemistry, histopathology.
- ⇒ Post mortem findings.

Epidemiology:

This term involves the study of the rate and distribution of disease and other health-related factors in defined populations. The epidemiologist collects data on the causative agent, mortality, morbidity , and sources and modes of transmission and follows the numbers and distribution of cases of disease in the community. The epidemiologist asks who, when, where, how, why, and what about diseases. The outcome of these studies helps public health departments develop prevention and treatment programs. Surveillance involves keeping data for a large number of diseases seen by the medical community and reported to public health authorities. By law, certain **reportable**, or **notifiable** , diseases must be reported to authorities.

The **prevalence** of a disease is the percentage of existing cases in a given population. The disease **incidence**, or **morbidity** rate, is the ratio of newly infected members compared to the whole population during a specified time period. **Mortality rate**, which measures the total number of deaths in a population due to a certain disease.

$$\text{Prevalence} = \frac{\text{Total number of cases in population}}{\text{Total number of persons in population}} \times 100 = \%$$
$$\text{Incidence} = \frac{\text{Number of new cases}}{\text{Total number of susceptible persons}}$$

Disease occurrence is described as sporadic, epidemic, pandemic, or endemic.

Endemic occurrence Regular and continuing occurrence of infectious diseases in populations with no time limit.

Epidemic occurrence Significantly increased occurrence of an infectious disease within given localities and time periods

Pandemic occurrence Significantly increased occurrence of an infectious disease within a given time period but without restriction to given localities.

Control and prevention:

- Education of veterinary personnel and owners.
- Hand hygiene should be used before, between and after handling patients.
- Personal protective equipment is used which includes gloves, gowns, aprons, lab coats, coveralls, masks, goggles, face shields, and boot or shoe covers.
- All equipment and areas that come in contact with animals should be thoroughly cleaned and then disinfected.
- isolation infected animal from other animals to prevent the transmission of the infectious disease to other animals.
- Eradication of dead animal by burning or buried deeply.
- Eradication of vectors such as lice, mosquitoes, flies, ticks, fleas, rodents that can transmit certain pathogens.
- Vaccination is currently the main technique used to increase resistance of animals or humans to infection . vaccine should be used when the prevalence of a particular disease in the area. Infected animal should not be vaccinated.

- Veterinary biomedical waste is a potential source of infectious disease , so should be eradicated in hygienic ways.
- Footbaths or wheel baths are used to decrease (but do not eliminate) microbiological contamination at the entrance of farms or clinics.
- In case of prevalence of high risk infectious disease, it should prevent animal transporting from an area to another by applying quarantine.
- Tell and report the authorities about the notifiable disease when appear in such area.