Lecture on factors influencing occurrence of disease in animals

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Epidemiology is a tool for carrying out

- Public health surveillance
- Disease investigation
- Analytic studies
- Progressive evaluation
Factors for disease occurrence

Factor ??
Something that helps to produce or influence a result or a disease.

Risk factor ??
Something that increases a person’s or animal’s chances of developing a disease. E.g. Smoking is a risk factor for lung cancer
Component of factor

- **Predisposing factor**: Which increases the level of susceptibility in host. E.g Age, immune status

- **Enabling factor**: Which fascilitate manifestation of a disease. E.g housing and nutrition
• **Precipitating factor:** Which are associated with the definitive onset of disease, e.g. infectious agent.

• **Reinforcing factor:** Which tend to aggravate the presence of a disease. e.g. Repeated exposure to agent in absence of an immune response
Epidemiological triangle or triad:

Traditional model of infectious disease causation.

It has three components: an external agent, a susceptible host, and an environment (brings the host and agent together). In this model, the environment influences the agent, the host, and the route of transmission of the agent from a source to the host.
A. Host factors

- These are intrinsic factors which influences an individual’s exposure, susceptibility or response to an agent.
  - Age
  - Sex
  - Socioeconomic status
  - Behaviour (smoking, drug abuse, lifestyle, eating habit)
  - Genotype
  - Nutritional status
  - Immunological status
• This is associated with the occurrence of some disease e.g. bacterial or viral diseases are more frequent in young than old animal.
• Several factors which are sex associated can also influence the disease occurrence in a population.

e.g. Sex hormone of female dog make them more susceptible to male dogs

Or

sex associated occupation al hazard like KFD in human
Genotype of host

• The genetic constitution of a host it called its genotype

• Some disease appears to have totally genetic basis. Hence altered genetic structure are considered to have marked effect on disease occurrence and which can be inherited in their offsprings too.

• e.g. Haemophilia in dogs
B. Agent determinants

• Agent refers to infectious organism such as bacteria, virus, parasites or other

• These agents must be present for disease to occur (causal factor)

• They are necessary but not always sufficient to cause a disease
Koch’s postulates (for infectious disease)

- The pathogenic microorganism must be present in every case of the disease but absent from healthy animals.
- The suspected microorganisms must be isolated and grown in pure culture.
- The same disease must occur when the isolated microorganism is injected into the healthy susceptible animals.
- The same microorganism must be isolated again from the injected animals which developed disease.
Evans rule

- The proportion of individuals with the disease should be significantly higher in those exposed to the supposed cause than in those who are not;
- Exposure to the supposed cause should be present more commonly in those with than those without the disease, when all other risk factors are held constant;
- The number of new cases of disease should be significantly higher in those exposed to the supposed cause than in those not so exposed, as shown in prospective studies;
- Temporally, the disease should follow exposure to the supposed cause with a distribution of incubation periods on a bell-shaped curve;
1. Virulence & Pathogenicity

- **Virulence** is the ability of an agent to induce a disease or infection in a host in terms of severity of illness or death.
  - It is the proportion of Number of clinical cases to number of animals infected

**Pathogenicity** refers to the quality of disease induction by an agent
Factors for change in bacterial virulence

1. Mutation
   - Point mutation
   - Deletion
   - Insertion
   - inversion
2. Transposition

3. Transformation: uptake in integration into bacterial chromosome

4. Plasmid exchange

5. Conjugation

6. Transfection: phage mediated transfer of bacterial DNA
Factors for change in viral virulence

- Mutation
- Genetic recombination
- Recombination with host gene (e.g., retrovirus)
- Reassortment of virus segment
2. Gradient of infection

- This refers to variety of responses of an animal to challenge by an agent

- **Silent infection**: No clinical sign
- **Subclinical infection**: No overt clinical sign
- **Clinical infection**: overt clinical sign
3. Outcome of infection

- After an infection into a host the disease may result into chronic infection or recovery or death of the host

- **Carrier state:** Shed infectious agent without showing clinical sign.

- **Incubatory carrier:** Secrete agent during the I.P of disease

- **Convalescent carrier:** Shed an infectious agent when recovering from disease.
3. Environmental factor

• These are the **extrinsic factor** which effect the agent and opportunity for exposure.

- Geology,
- Climate,
- Surrounding,
- Vectors,
- A.H practices,
- Socioeconomic factors such as crowding, sanitation, health services, Stress etc
Climate

- **Macroclimate**: comprises of normal component of weather to which animal are exposed. E.g temperature, humidity, solar radiation

- **Microclimate**: climate that occurs in a small defined spaces