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

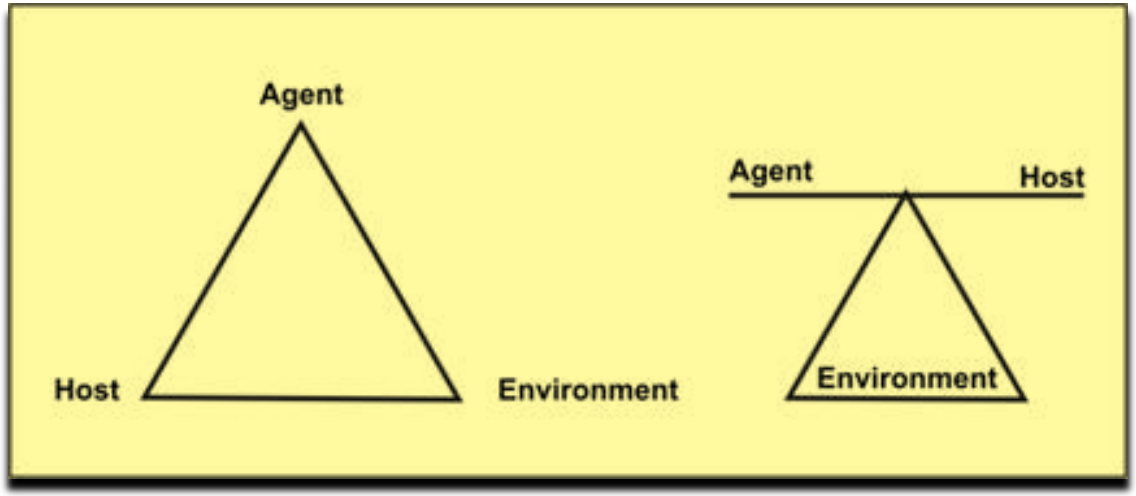
- **Enabling factor**: Which fascilitate manifestation of a disease. E.g housing and nutrition

- **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.

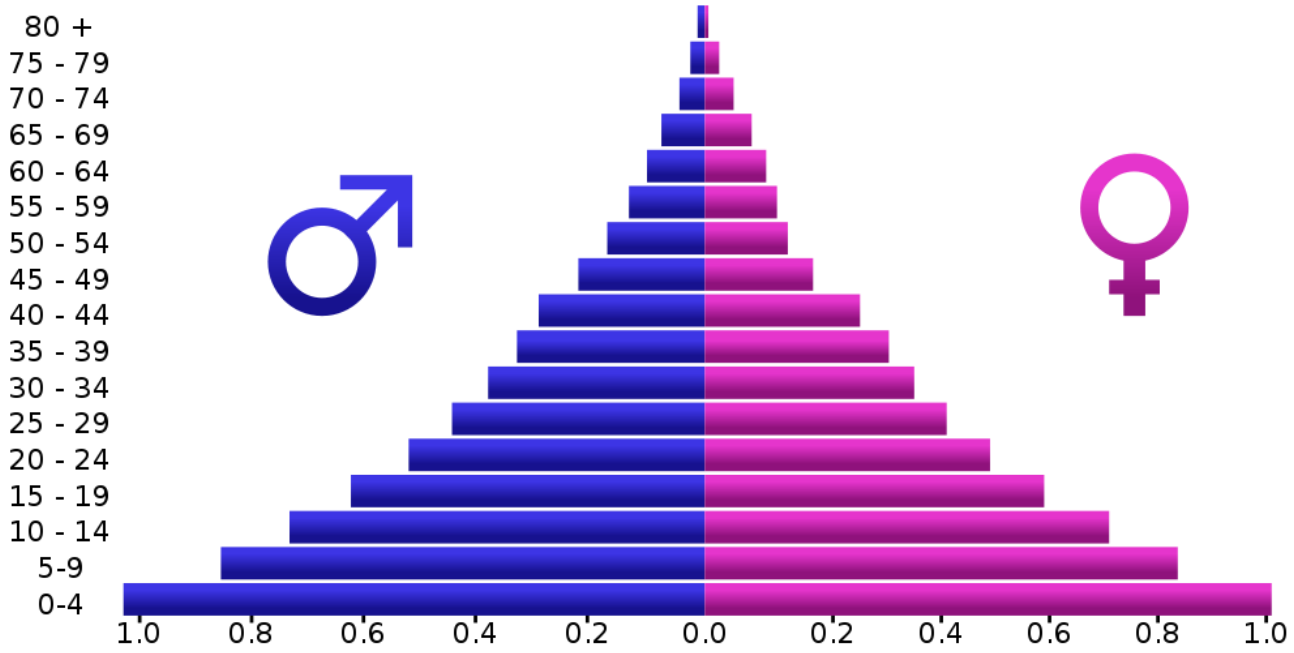
A. Host factors

- 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 habbit)
- Genotype
- Nutritional status
- Immunological status

Age of host

- This is associated with the occurrence of some disease e.g bacterial or viral diseases are more frequent in young than old animal



Sex of the host

- 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

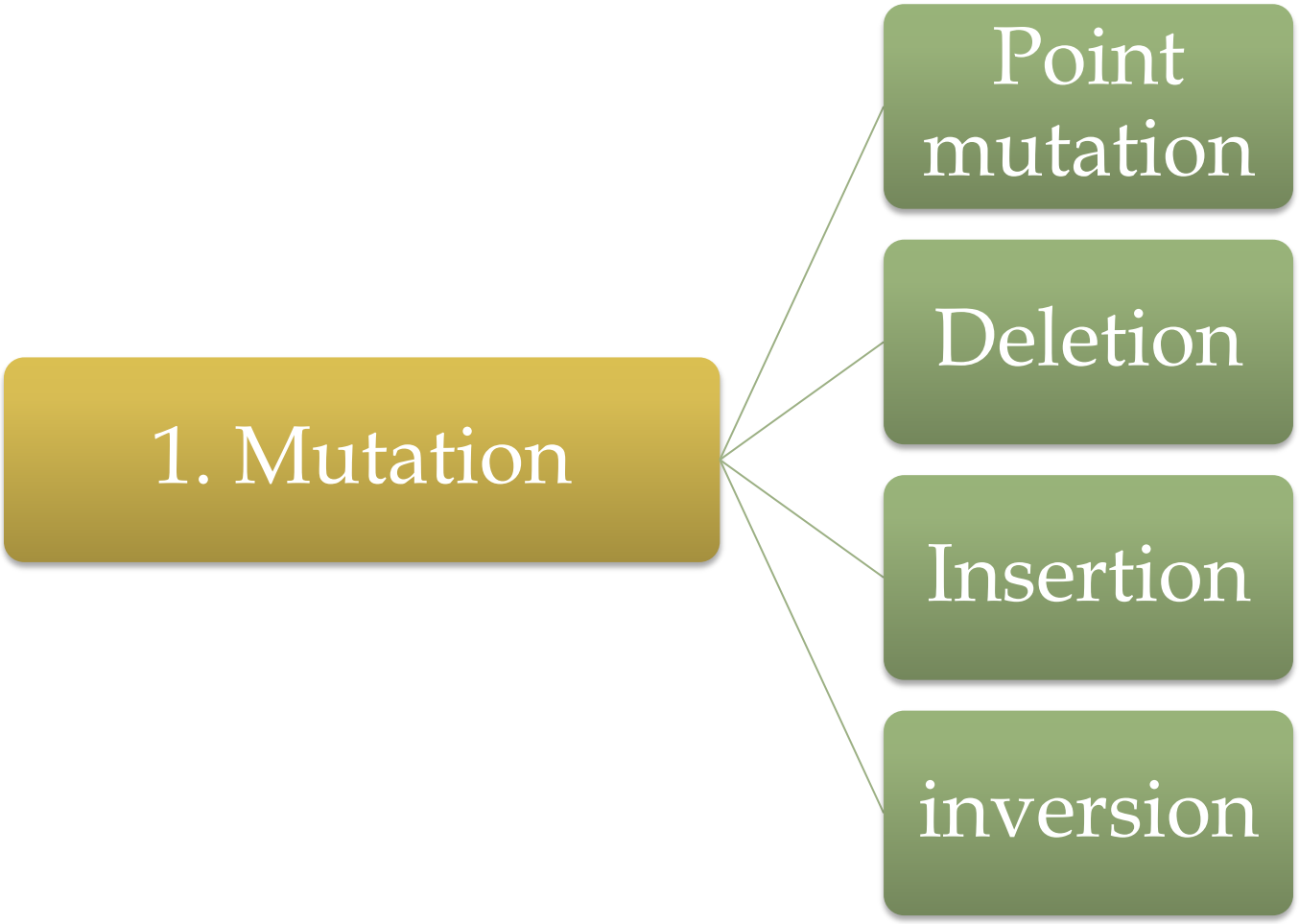
- The proportion of individuals with the disease should be significantly higher in those exposed to the supposed cause than in those who are not;
- Exposure to the supposed cause should be present more commonly in those with than those without the disease, when all other risk factors are held constant;
- 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



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

Eg 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