

Diseases and populations

Epidemiology training
Animal health cooperation platform
Embassy of France to the OECS States

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Epidemiologic triad of a disease

Factors important in establishment & transmission of diseases

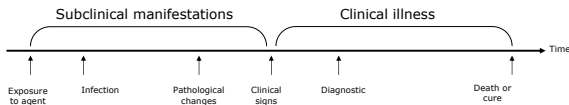
- Agents
 - Biological (bacteria, viruses...)
 - Chemical (poison, smoke...)
 - Nutritional (lack, excess...)
- Host characteristics:
 - Age, sex, breed
 - Immune status
 - Behavioral factors
 - Other physical attributes that promote resistance or susceptibility
- Environmental factors
 - Temperature, humidity
 - Housing, density
 - Stress, pollution...



Objective = deciphering web of causation

Concepts of infectious diseases

□ Spectrum of disease in individuals



□ Incubation period

- Interval between effective exposure to an agent and onset of clinical illness
- Related to quarantine

Concepts of infectious diseases

□ Iceberg concept

- Clinical or non clinical
 - Preclinical
 - Subclinical
 - Chronic
 - Latent
- Carrier status
 - Limited duration, intermittent or chronic



Concepts of infectious diseases

□ Mode of transmission

- Direct or indirect (vector, common vehicle)

□ Pathogenicity

- Ability to produce clinical signs. Proportion of infections that results in disease

□ Virulence

- Ability to produce severe clinical signs. Measure of disease severity.

□ Case fatality

- Proportion of affected individuals which die from disease. Closely related to virulence.

Temporal distribution of disease

□ Sporadic

- Cases occur irregularly & do not seem to be associated with any factor

□ Endemic/enzootic

- A disease that is established within a population that remain at a fairly stable prevalence (can be hypo, meso or hyperendemic) example: CSF in Haiti

□ Epidemic/epizootic

- Any significant increase in the number of persons/animals affected by a disease example: leptospirosis in Guyana
- The first occurrence of a new disease example: FMD in UK

□ Pandemic/panzootic

- Widespread, universal disease penetration over a wide geographic area example: HIV, influenza 1918

Epidemic curve

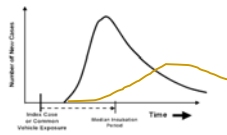
□ Typical epidemic curve has 4 segments:

- Endemic level: expected
- Ascending part: ± steep
- Plateau
- Descending branch: depending on intervention (vaccination...)

+ possible secondary peak (introduction of new susceptible animals)

- Time series analysis possible for long epidemic curves: seasonal, cyclical, secular or erratic trends

Epidemic curve of propagated disease
Epidemic Curve of Point Source Epidemic



Spatial distribution of disease

□ Cartographic or analytic methods



Dynamics of disease transmission

□ Age-time interactions

- Age effect: morbidity ↑ with age
- Current effect: disease frequency varies with calendar time
E.g.: cirrhosis ↓ during prohibition
- Cohort effect: disease frequency varies by year of birth
E.g.: Chernobyl

□ Immunity

- Individual immunity: innate, passively or actively acquired.
Depends on agent, challenge dose and environment
- Herd immunity: resistance of a group to a disease to which a large proportion of the members of the group are immune
 - Related to small likelihood of infected encountering susceptible animal
 - Not necessary to immunize 100% of population