# ***FIELD EPIDEMIOLOGY, PRINCIPLES, PRACTICE & APPLICATION AT FIELD Part 2***

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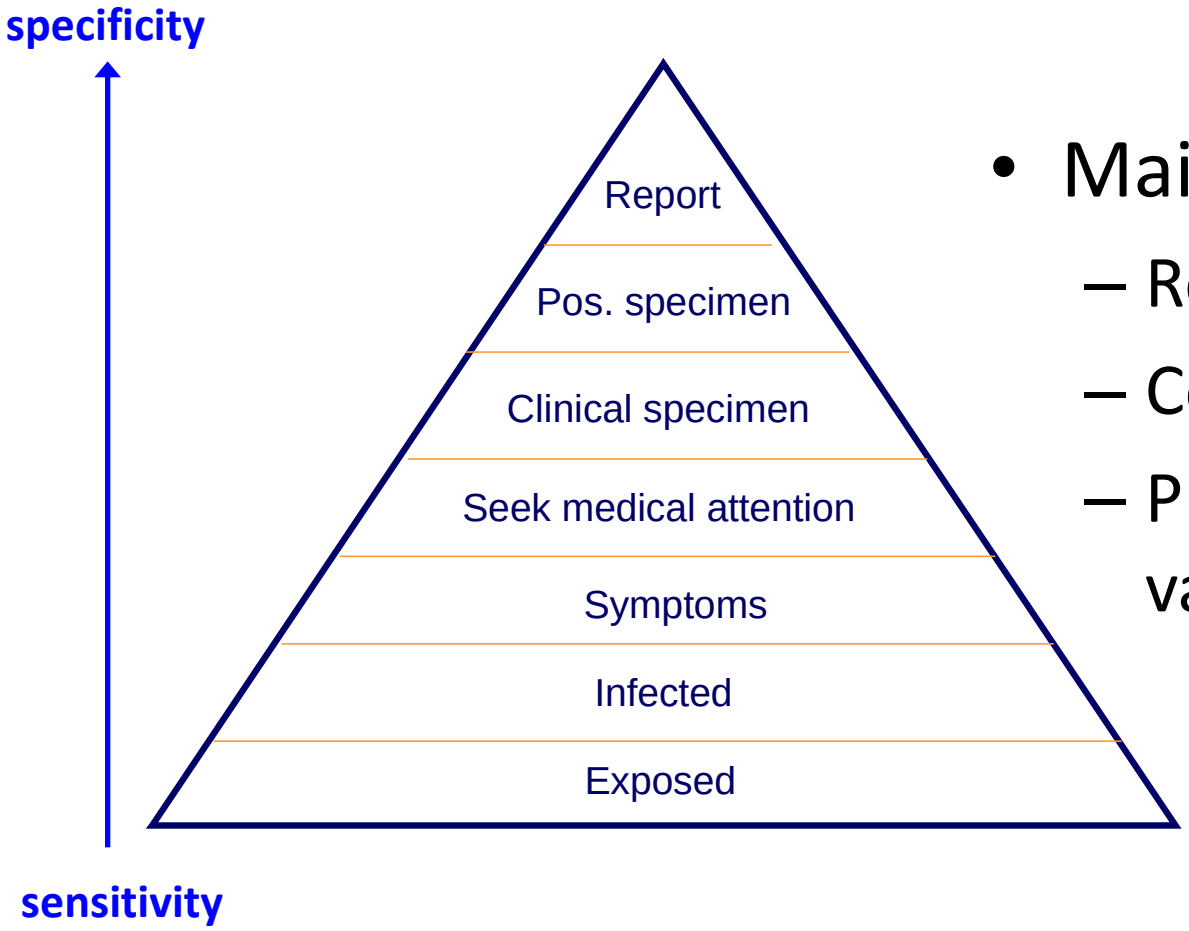
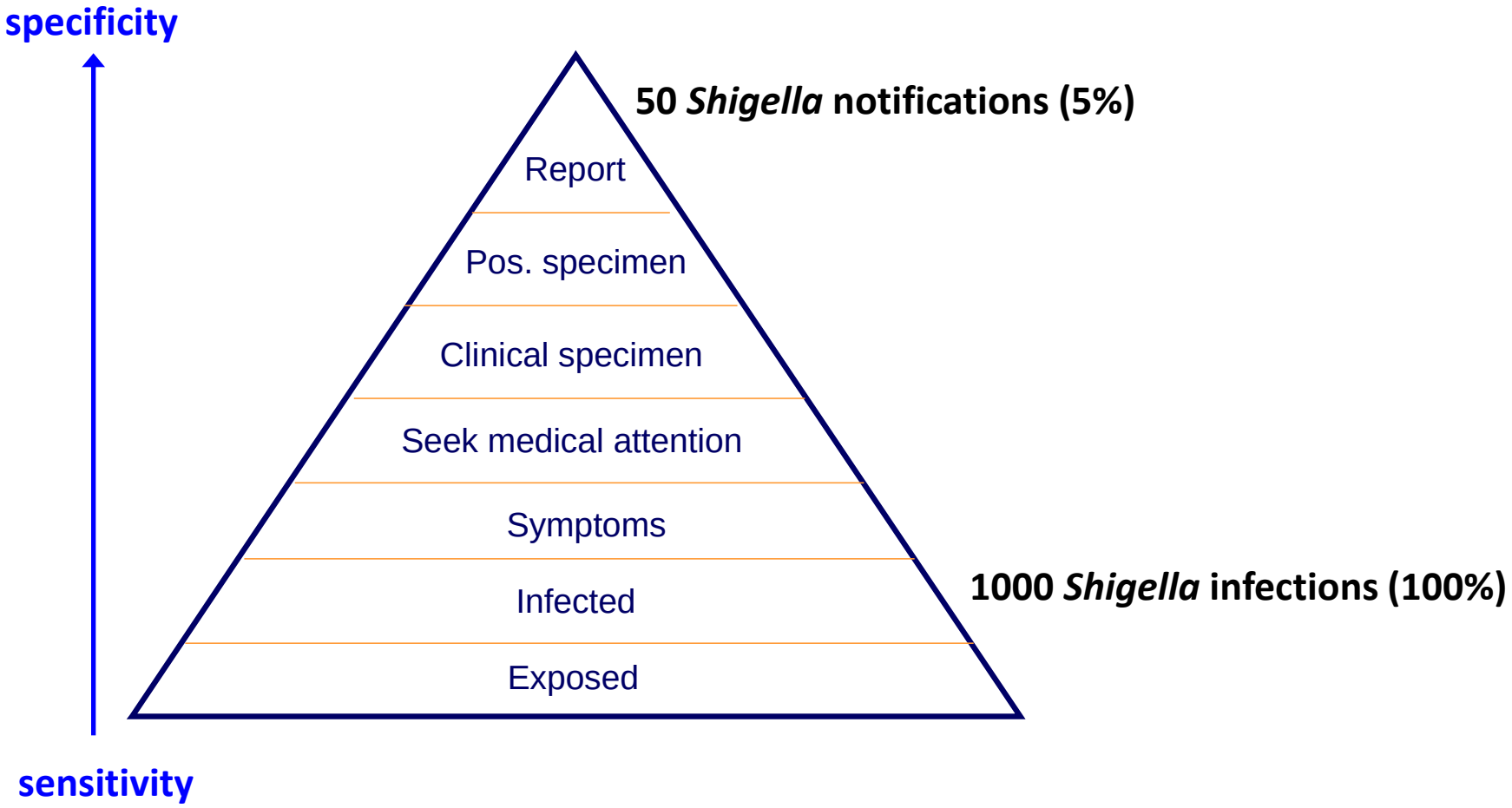
# Current surveillance systems for communicable diseases




- Main attributes
  - Representativity
  - Completeness
  - Predictive positive value

# From infection to detection
# Proportion of infections detected



# Definition of Signal

**Data and/or information considered by the *Early Warning and Response system as representing a potential acute risk to human health.***

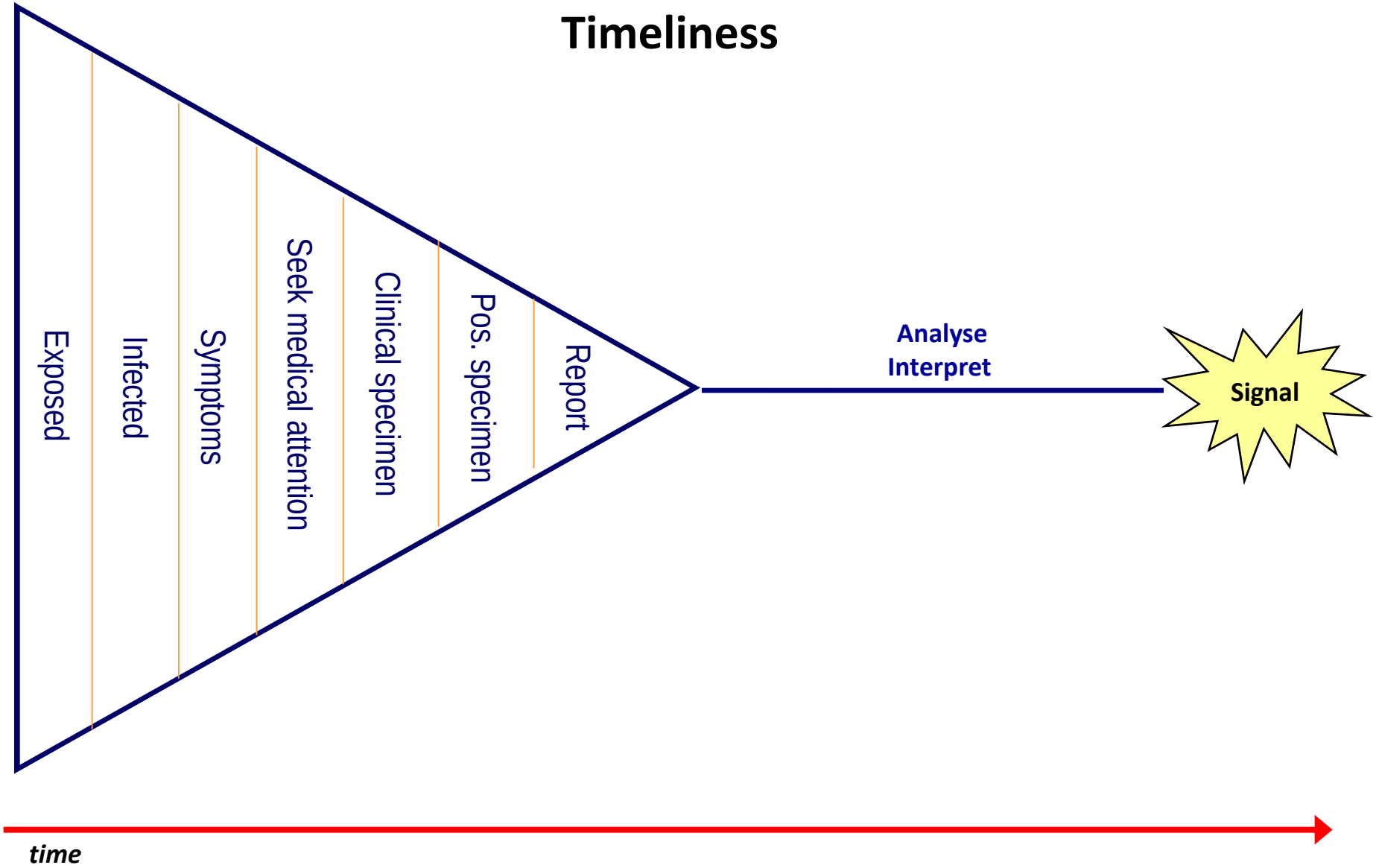
***Signals*** - *reports of cases or deaths (individual or aggregated), potential exposure of human beings to biological, chemical or radiological and nuclear hazards, or occurrence of natural or man-made disasters.*

***Signals -*** *through any potential source (health or non-health, informal or official) including the media.*

*Once identified* ***signals must be verified.***

*When it has been verified,* ***a signal becomes an "event".***

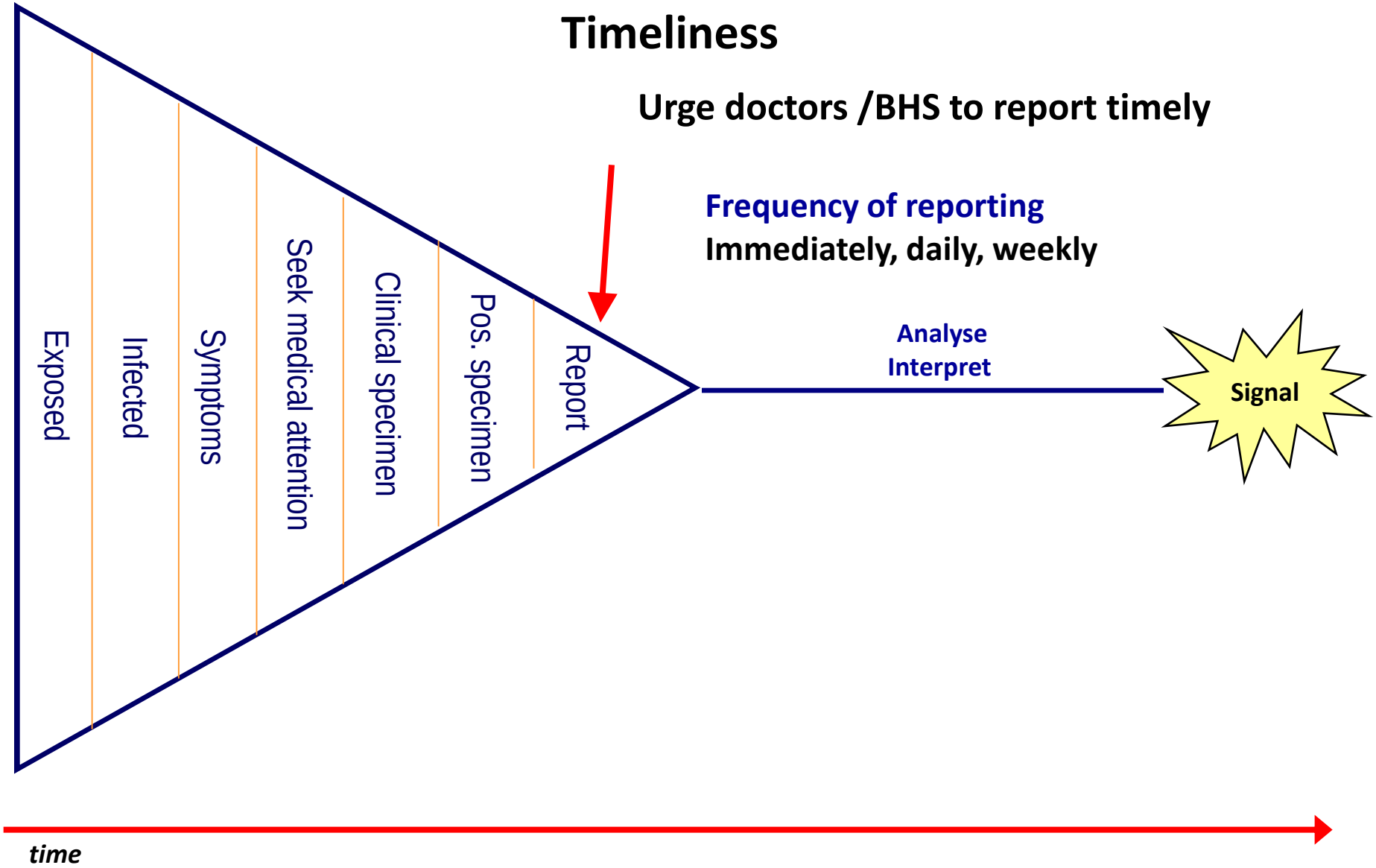
# From infection to detection:
# **Timeliness**



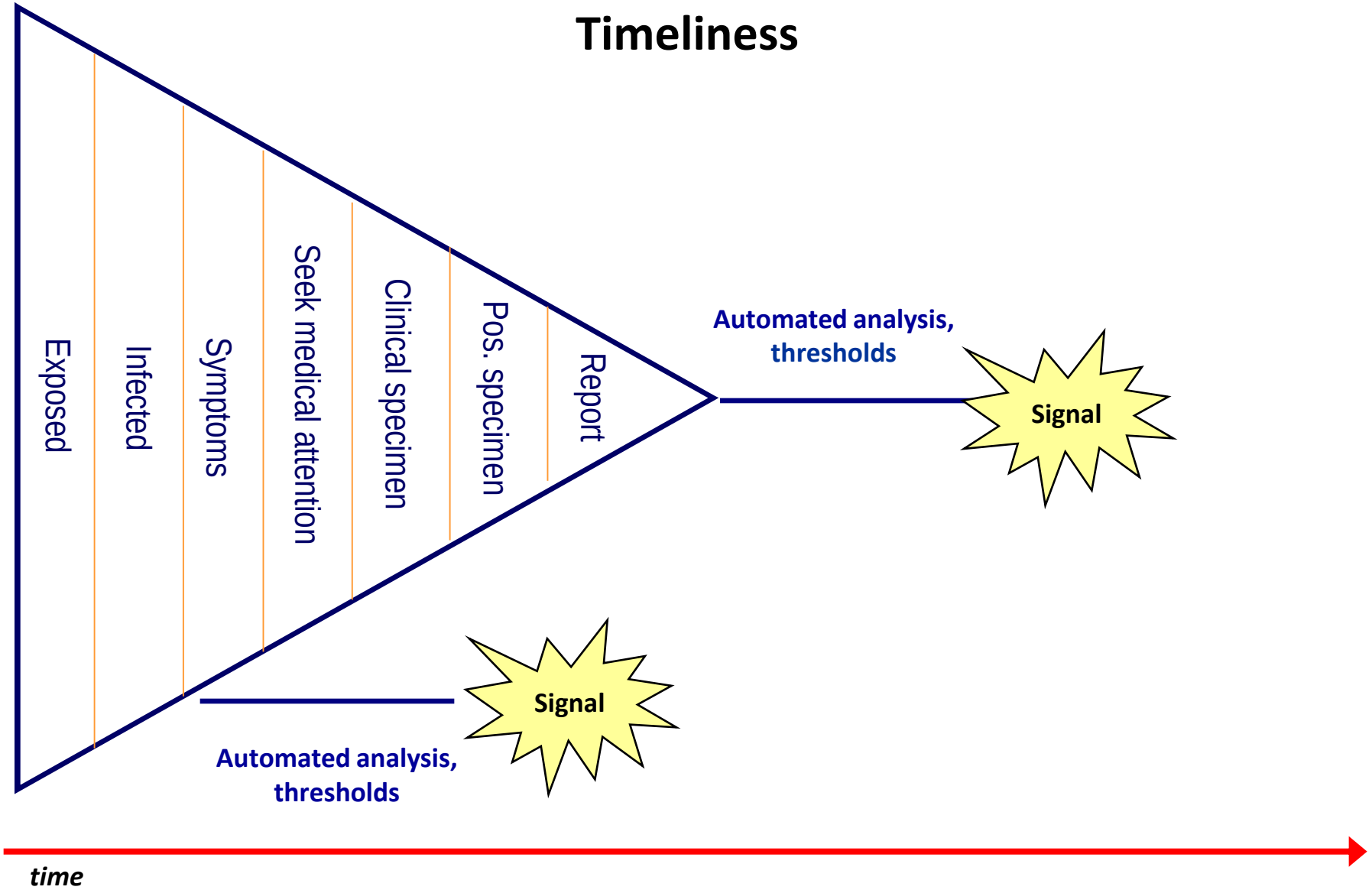
# From infection to detection:
# **Timeliness**

**Urge doctors /BHS to report timely**

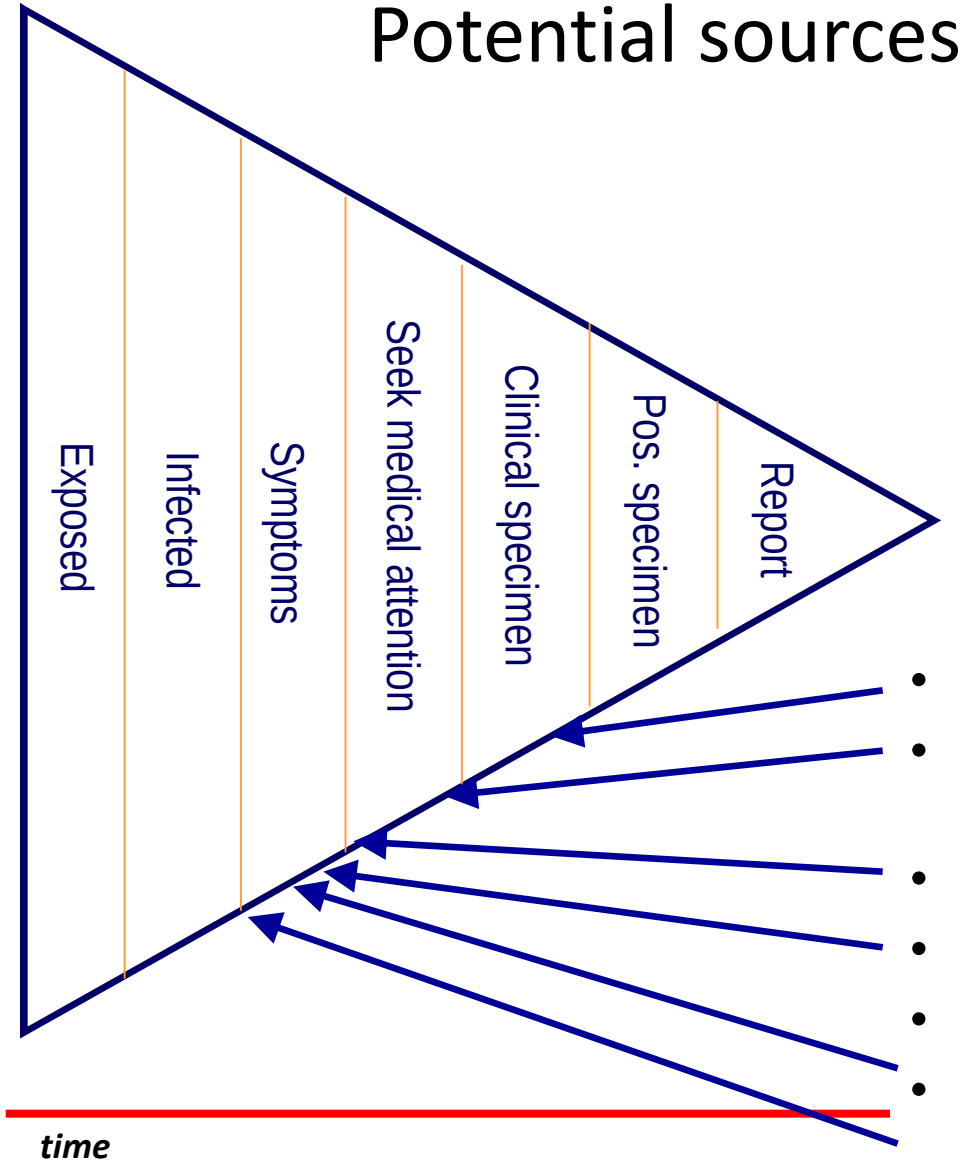
**Frequency of reporting**
**Immediately, daily, weekly**



# From infection to detection:
# **Timeliness**



# Potential sources of early signals




**Sensitive systems for new, unusual or epidemic diseases**

- Laboratory test volume
- Emergency & primary care total patient volume, syndromes
- Ambulance dispatches
- Over-the-counter medication sales
- Health care hotline
- School absenteeism

# The epidemiologic approach: Steps to public health action

**SURVEILLANCE**
- Detect outbreaks & threats
- Detect infectious cases
- Monitor trends in population
- Monitor exposed individuals
- Monitor treated individuals
- Direct interventions
- Evaluate interventions
- Generate hypotheses

**DESCRIPTIVE**
- What (case definition)
- Who (person)
- Where (place)
- When (time)
- How many (measures)

**ANALYTIC**
- Why (Causes)
- How (Causes)

**MEASURES**
- Count
- Time
- Rate
- Risk/Odds
- Prevalence

**STUDY DESIGN**
- Design
- Implementation
- Analysis
- Interpretation
- Reporting

**THREATS TO VALIDITY**
- Chance
- Bias
- Confounding

**INFERENCES**
- Epidemiologic
- Causal

**ACTION**
- Clinical
- Behavioral
- Community
- Environmental

# Infectious disease epidemiology

***Infection***

The entry and development or multiplication of infectious agent in the body of mans or animals.

***Contamination***

The presence of an infectious agent

***Infestation***

The present of living infectious agent on *exterior surface* of the body. (lodging, developing and reproduction of  parasite ) ( Gastrointestinal tract is as exterior surface for infestation of intestinal parasites.)

# The Infectious Disease Process

- Etiologic Agent
- Reservoir
- Portal of Exit
- Mode of Transmission
- Portal of Entry
- Susceptible Host

# Source and reservoir

***Source***

person, animal, object or substance form which an infectious passes or is disseminated to the host.

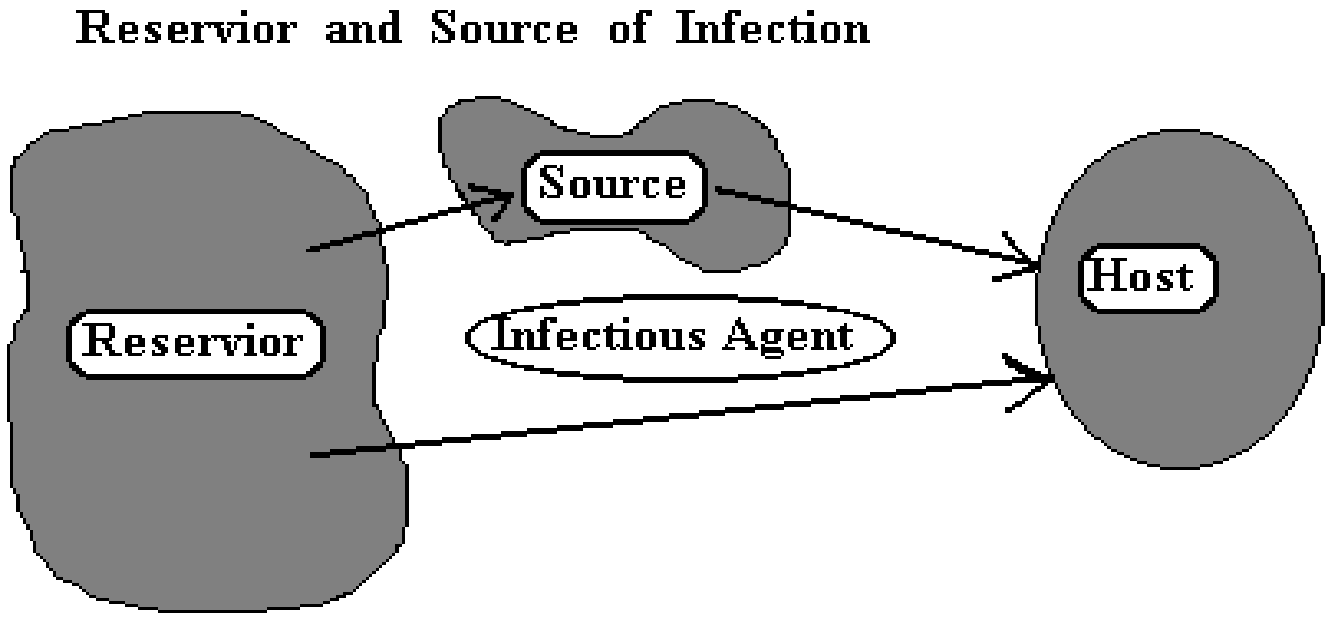
***Reservoir***

in which infectious agent live sand multiply

- Human reservoir
- Animal reservoir
- Reservoir in non-living things – Soil, Water, Food, etc.

# Source of Infection

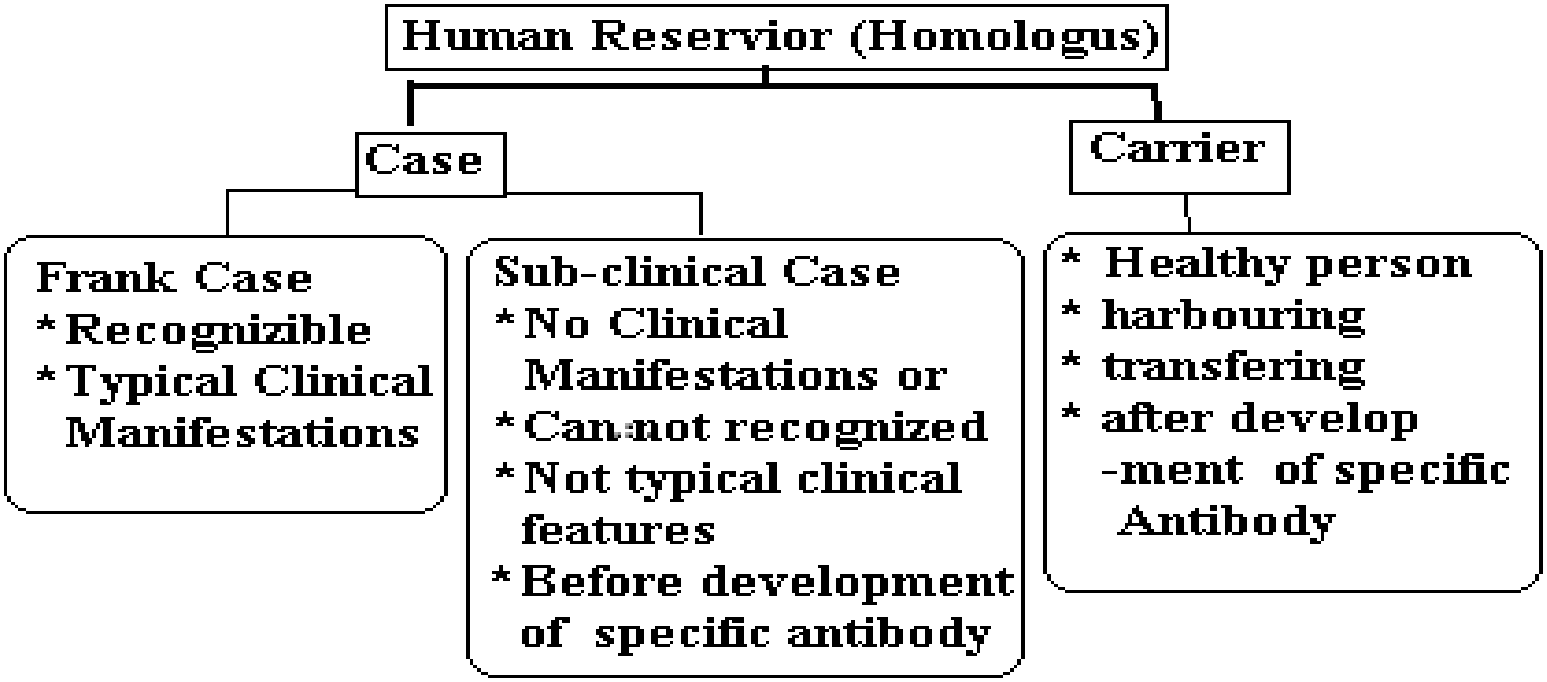
- The person, animal, object or substance from which an infectious agent passed to the host.



# Reservoir

1. Human
    a. Acute clinical cases
    b. Carriers
        1. Inapparent Infections – sub clinical cases
        2. Incubatory
        3. Convalescent
        4. Chronic
2. Animal
3. Environment (free-living)

# *Classification of Human Reservoirs*



# *Classification or Type of Carriers*

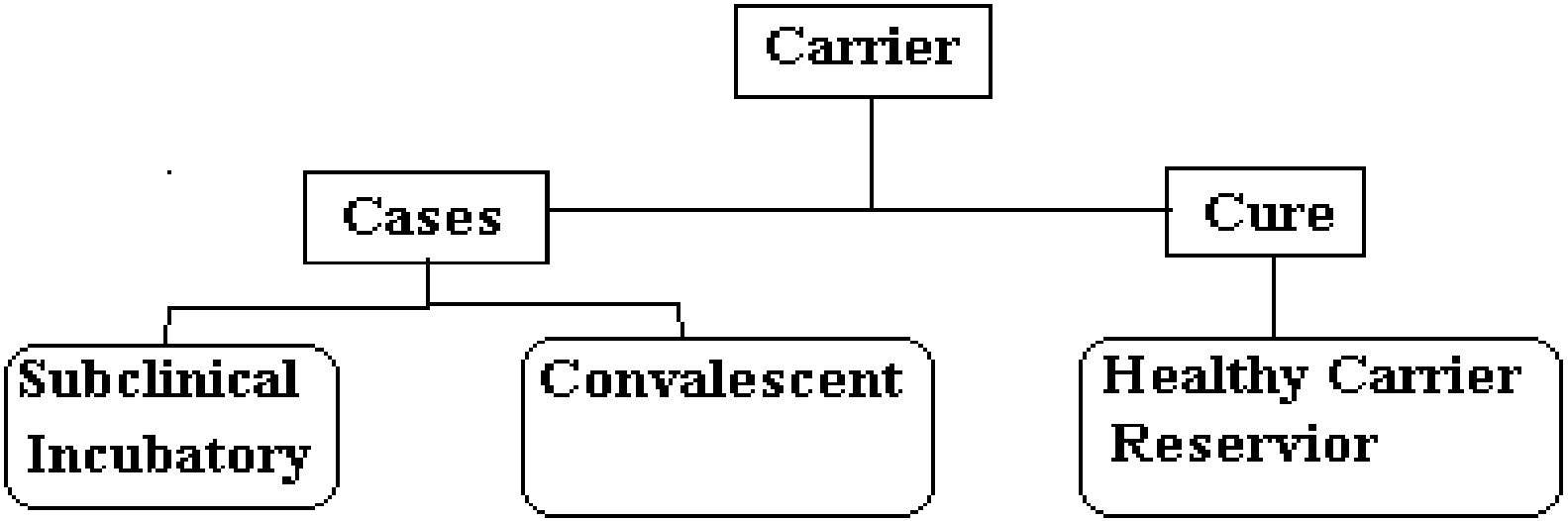
A. According to **clinical symptoms**

- Healthy carrier – the carrier state may occur in an individual with an infection that is in appearance through its course- eg, Typhiod Mary, Hepatitis B, Poliomyelitis, Cholera, Meningococcemia, Salmonella, Diphtheria .
- Incubatory Carrier – the carrier state may occur during incubation period eg- measles, polio, mumps, pertussis, influenza, diphtheria, HIV.
- Convalescent carrier – the carrier state may occur in some period continuing after recovery eg, Typhoid, Bacillary or amoebic dysentery, Cholera, Diphtheria, Pertussis.

B. According to **duration of carrier state**

- Temporary or transient carrier – incubatory or convalescent carrier
- Chronic carrier – healthy carrier

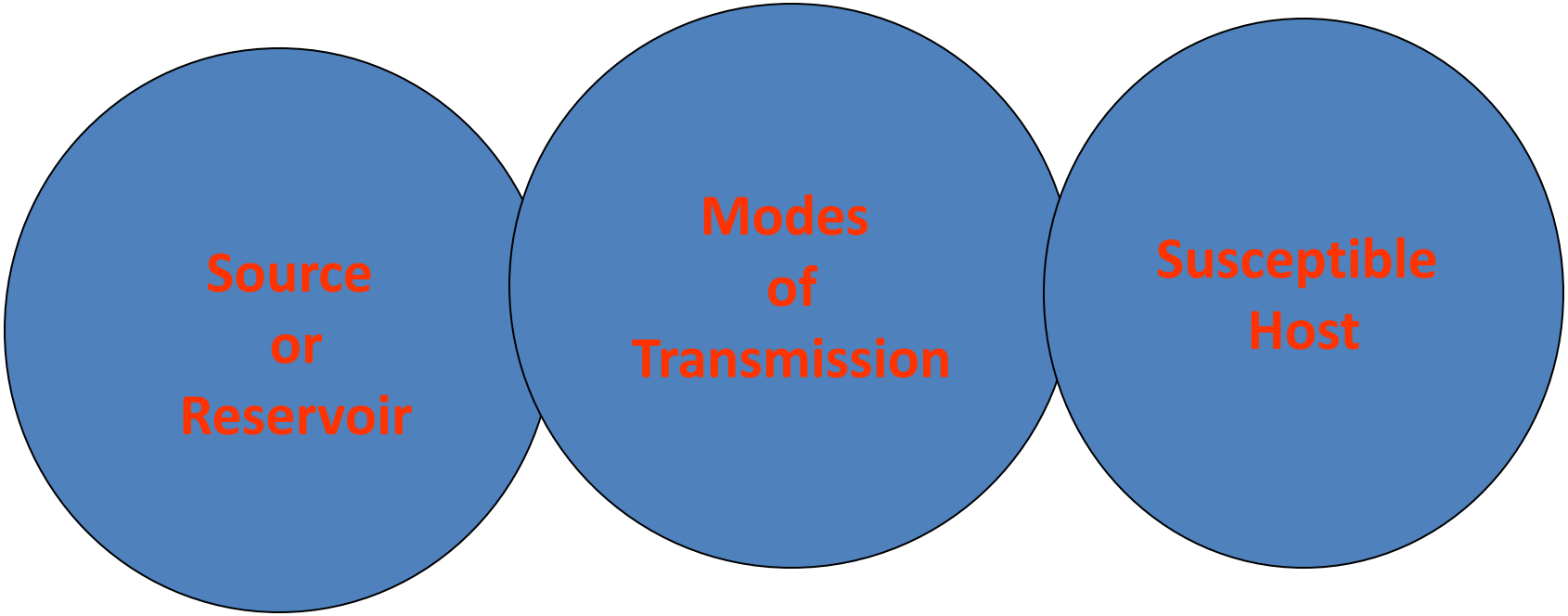
# Carriers


Carrier
Cases
Cure
Subclinical
Incubatory
Convalescent
Healthy Carrier
Reservior

# Carriers

- A person or animal that harbours a specific infectious agent in the absence of discernable clinical manifestations (disease) and serve as a potential source of infection.
- A person (apparently healthy person) harbouring the infecting organism without clinical manifestation which can transfer the organisms. (mechanical not biological involvement)

# Dynamic of Disease transmission



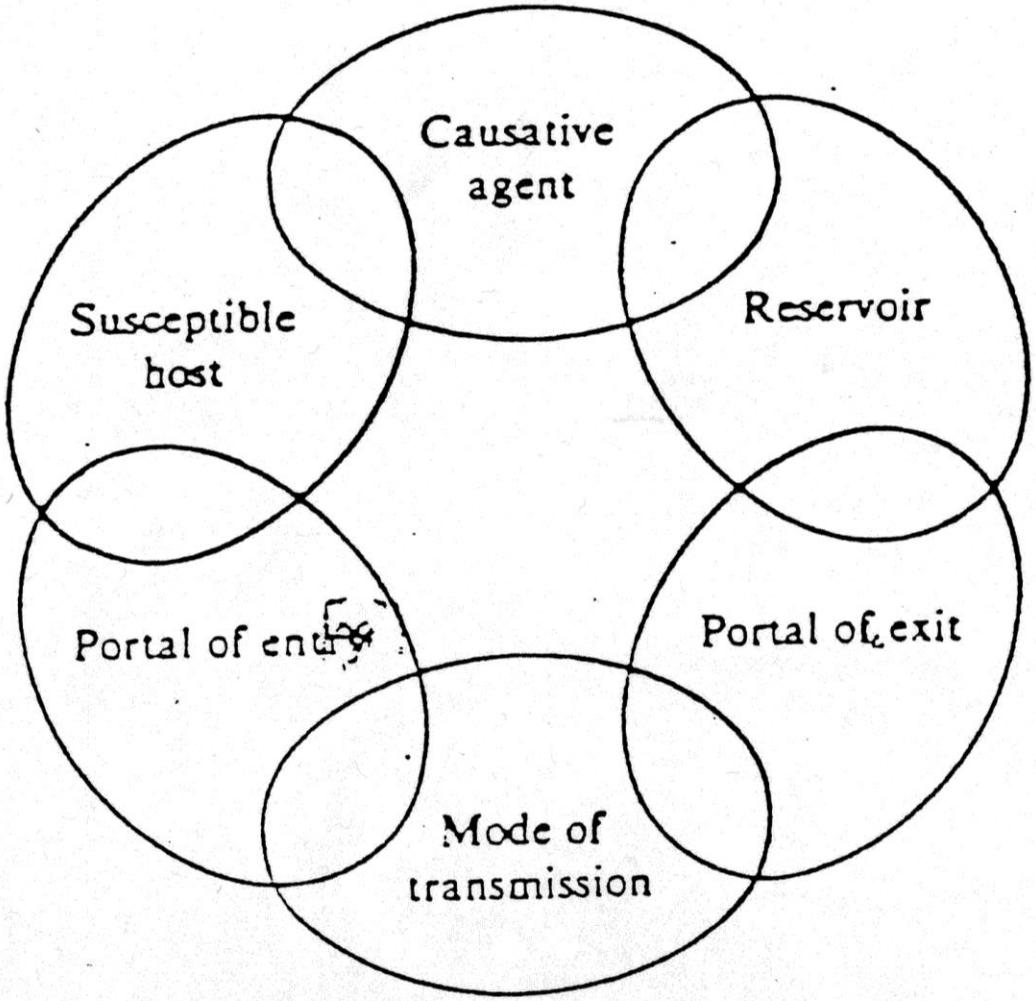
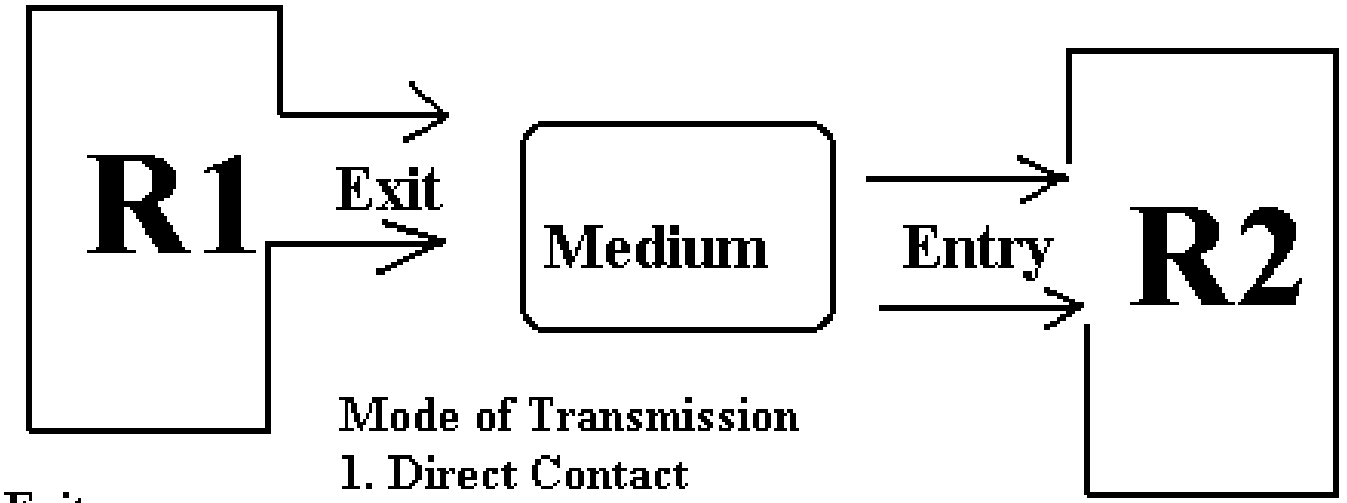



FIGURE 1.2 The chain of infection. Components of the infectious disease process.

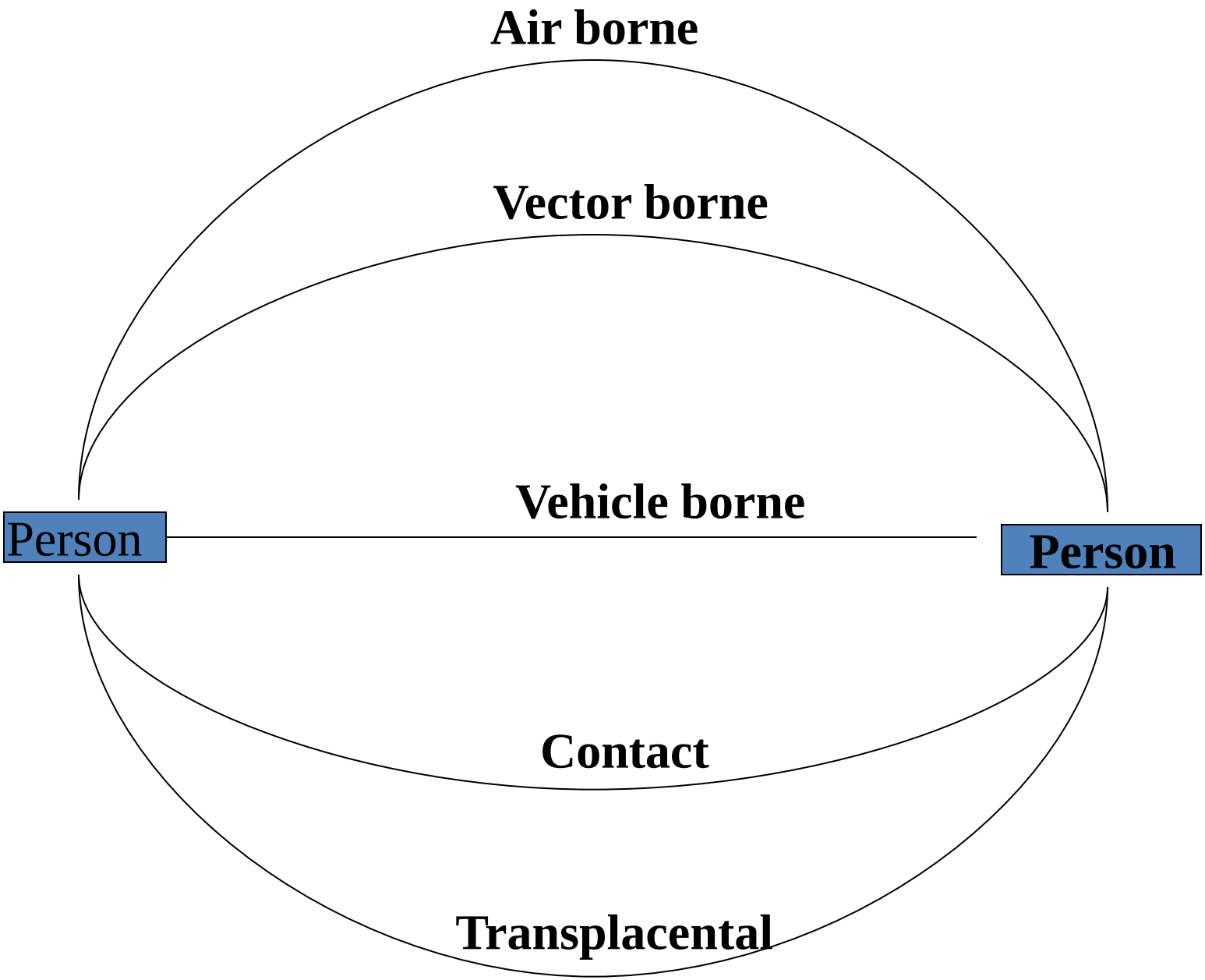
# Dynamics of Infectious Disease Transmission

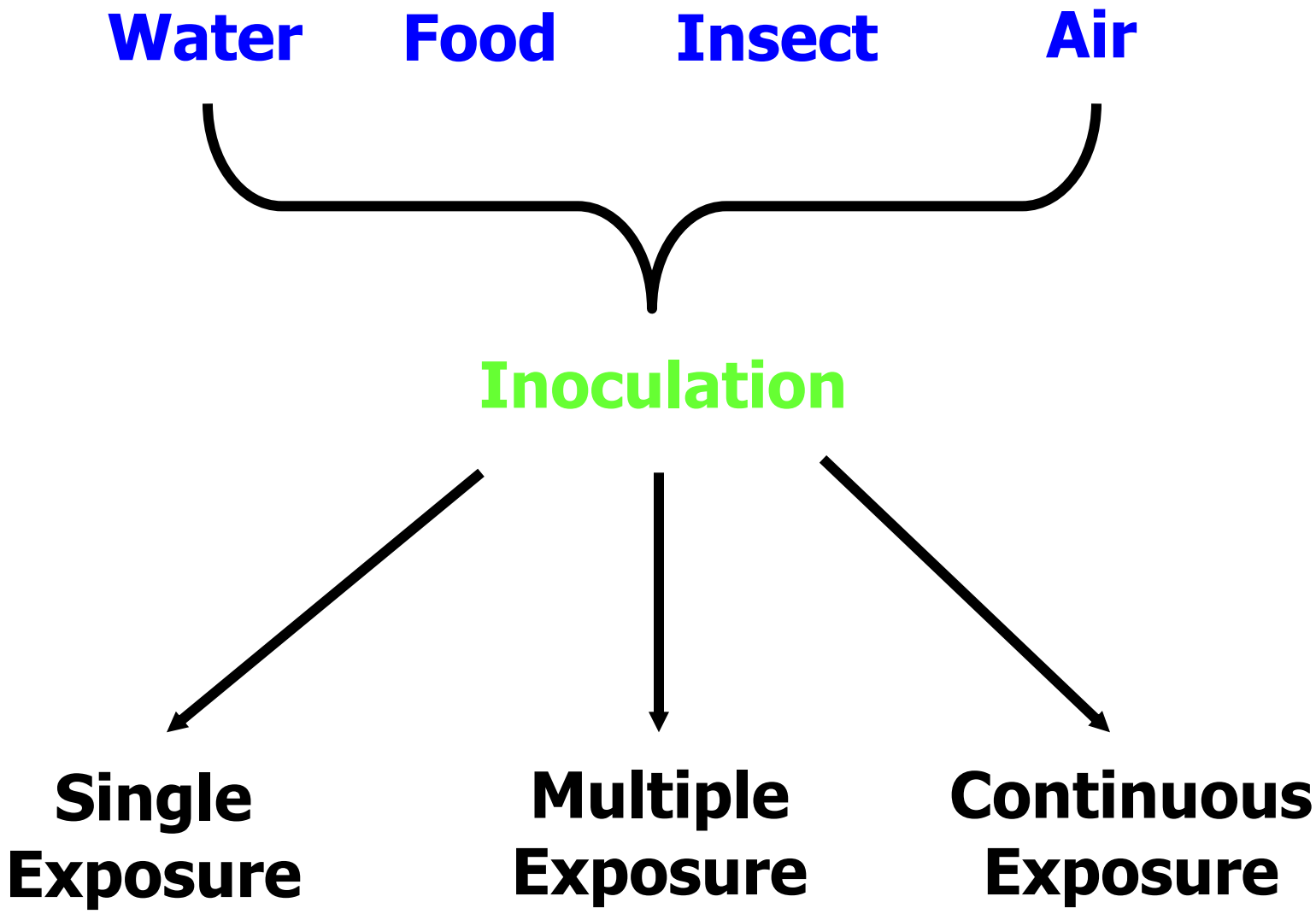



Route of Exit
1. Respiratory Tract
2. Gastrointestinal Tract
3. Urinary Tract
4. Open Lesion

Mode of Transmission
1. Direct Contact
   ( Medium not involved)
2. Indirect Transmission
   a. Air-borne
   b. Vehicle-borne
   c. Formites
   d. Vector-borne
      - Mechanical
      - Biological

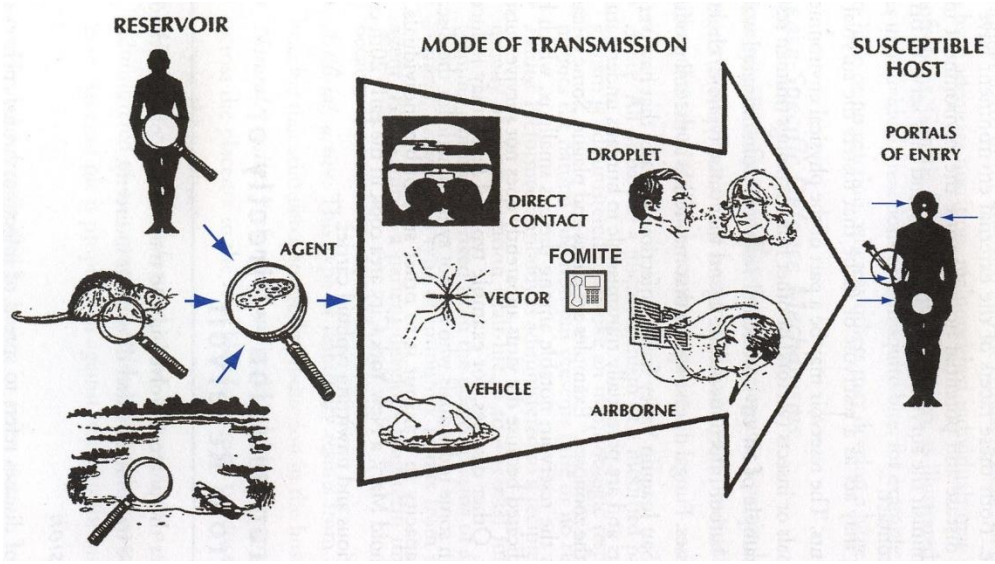
Mode of Entry
1. Respiratory
2. Gastrointestinal
3. Genito-urinary
4. Skin
5. Conjuntiva


Air borne
Vector borne
Vehicle borne
Person
Person
Contact
Transplacental


Water
Food
Insect
Air
Inoculation
Single Exposure
Multiple Exposure
Continuous Exposure

# Modes of disease transmission
## (with respect to the mechanism of contact)

- *Direct*
  - *Through body fluids*
  - *Airborne*
- *Indirect*
  - Vehicles
  - Fomites
  - Vectors



# Modes of Disease Transmission
**(with respect to the direction of transmission)**

1. Horizontal
    a. Common Vehicle
        1. Single exposure
        2. Multiple exposure
        3. Continuous exposure
    b. Contact (person-to-person)
    c. Vector
2. Vertical

# Modes of transmission

**Direct**

a) Direct contact
b) Droplet infection
c) Contact with soil
d) Inoculation into skin or mucosa
e) Transplacental

**Indirect**

Vehicle –borne

Vector borne

Air borne (droplet,dust)

Fomite borne

Unclean hand and fingers

# Portal of Escape

1. Respiratory
2. Genitourinary
3. Alimentary
4. Skin
    a. Superficial lesions
    b. Percutaneous
5. Transplacental

Fig. 7. Droplet dispersal following a violent sneeze. (From Jennison, M. W., "Aerobiology" Washington, D. C., Publ. A.A.A.S. 17, 102, 1947). Most of the 20,000 particles seen here are coming from the mouth. The authors used oblique illumination, to give a dark field effect, and high speed (1/30,000 sec flash) photography. Particles as small as 5-10 $\mu$ could be seen; images are larger than actual particle size, and objects out of focus are magnified.

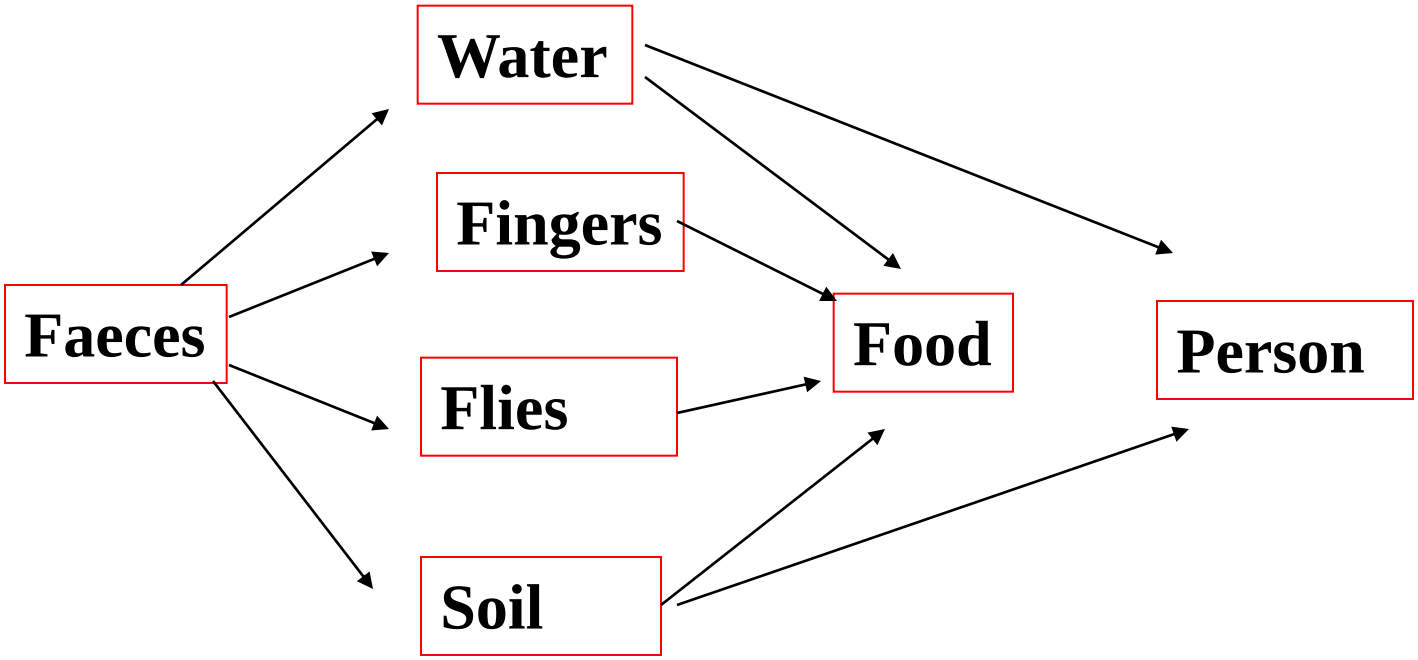
# Examples

Correspondence Between Portal of Exit (Escape) Mode of Transmission and Portal of Entry

| Portal of Exit | Mode of Transmission | Portal of Entry | Type of Disease |
|---|---|---|---|
| Respiratory secretions | Airborne droplets, fomites | Respiratory tract | Common cold, measles |
| Feces | Water, food, fomites, flies | Alimentary tract | Typhoid, poliomyelitis |
| Lesions, exudate | Direct contact, fomites, sexual intercourse | Skin, genital membranes | Carbuncles, syphillis, gonorrhea |
| Conjunctival exudate | Fomites, flies | Ocular mucous membrane | Trachoma |
| Blood | Bloodsucking arthropod vector | Skin (broken) | Malaria, yellow fever, epidemic typhus |

# Fomites

Articles that convey infection to others because they have been contaminated by pathogenic organisms. eg, Handkerchief, drinking glass, eating utensils, door handle, clothing and toys, surgical instruments, and dressing.


Water
Fingers
Faeces
Food
Person
Flies
Soil

**Primary Case**

The individual who introduces the disease into the family or group under study.

**Index Case**

The first case of a disease in a family or other defined group to come to the attention of the investigator.

**Serial Interval**

The gap in time between the onset of the primary case and the secondary case.

# Incidence

In a population of susceptible individuals, what proportion will develop the specified outcome?

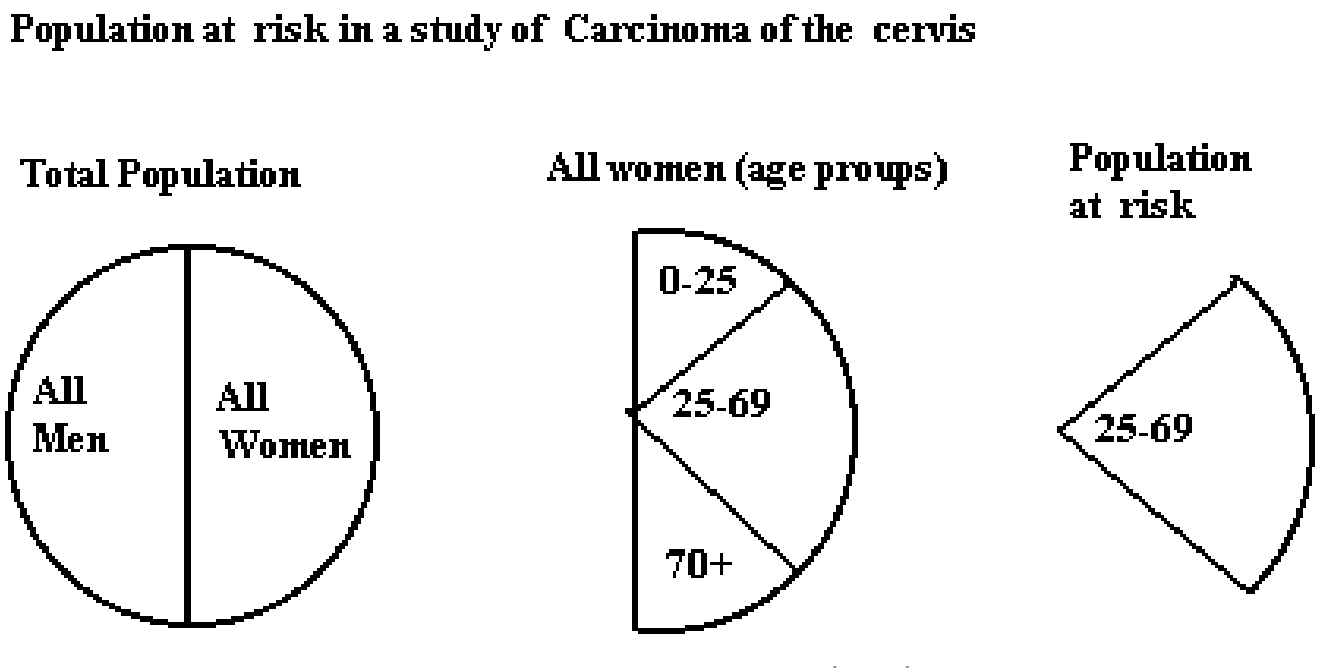
$$\text{Incidence Proportion} = \frac{\text{Number of new cases}}{\text{Population at risk}}$$

# Population at risk

- Portion of a population that is susceptible to a disease
- Population at risk of developing carcinoma of the cervix:

  -Female population

  - Age>30 and <70



# Incidence Proportion/Attack Rate

In an outbreak of salmonella food poisoning, 27 of the 135 people who ate the chicken salad became ill. What is the attack rate?

$$\text{Attack Rate} = \frac{\text{Number of new cases}}{\text{Population at risk}}$$

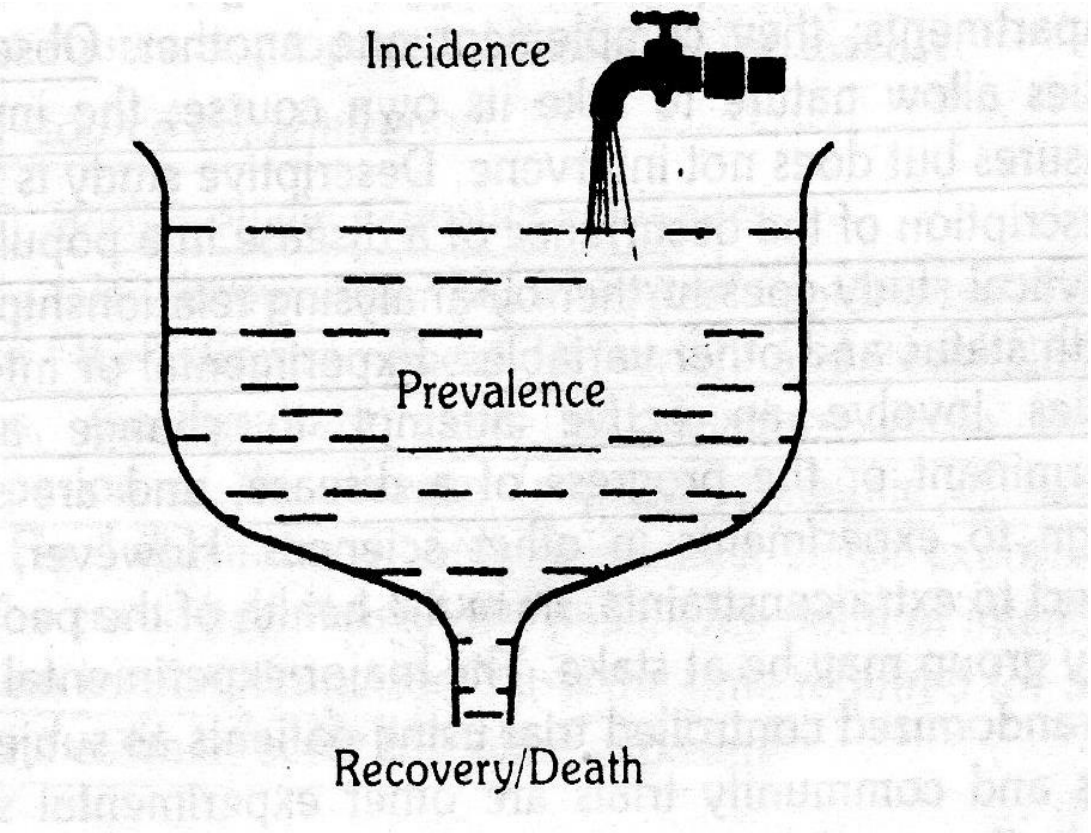
$$\text{Attack Rate} = \frac{27}{135} = 0.20$$

# Secondary Attack Rate

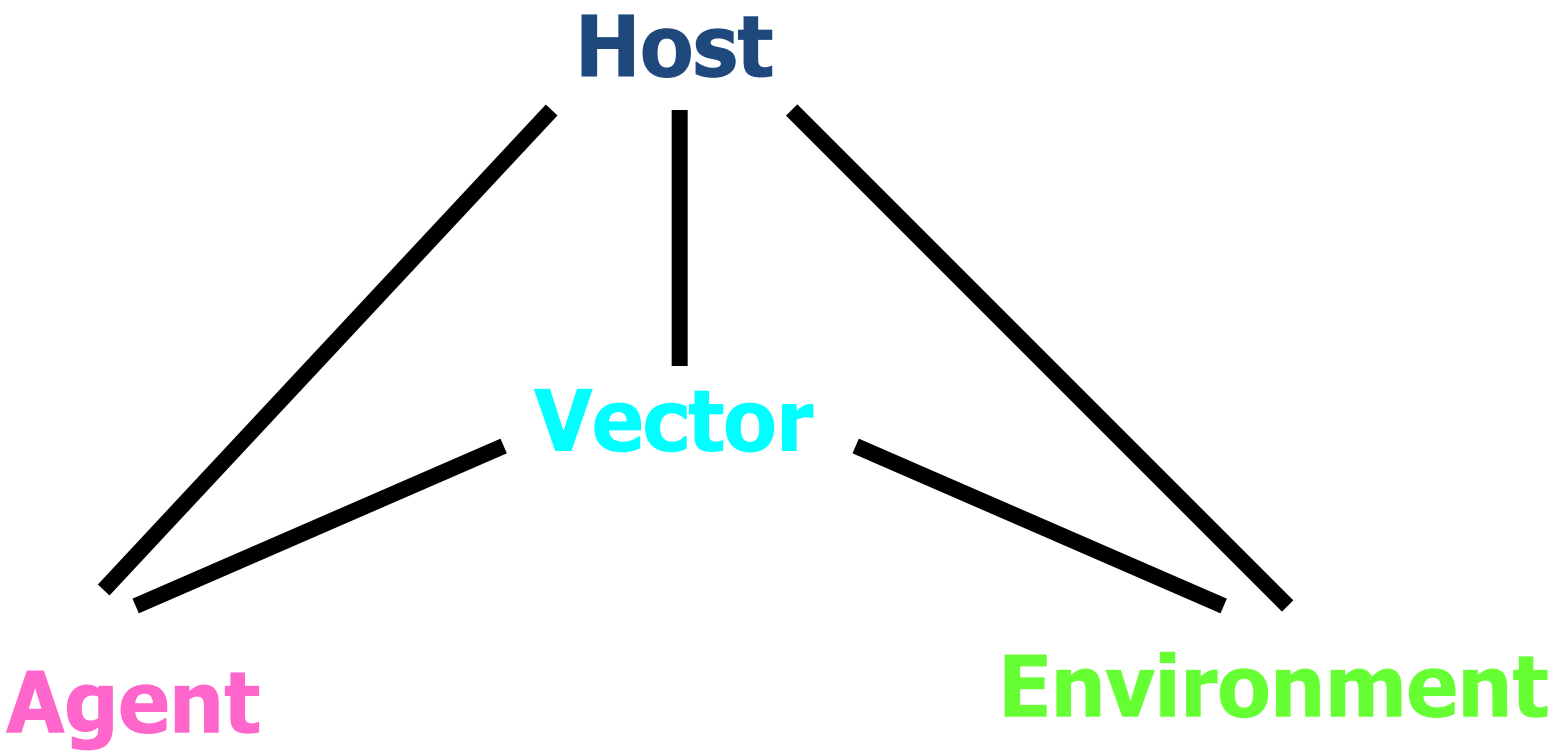
- The number of exposed persons developing the disease with the range of the incubation period following exposure to the primary cases.
- The proportion of contacts who get a communicable disease as a consequence of contact with the case.

$$\text{Secondary Attack Rate} = \frac{\text{Number of exposed persons developing the disease within the range of incubation period}}{\text{Total number of exposed persons or Susceptible Contacts}} \times 100$$

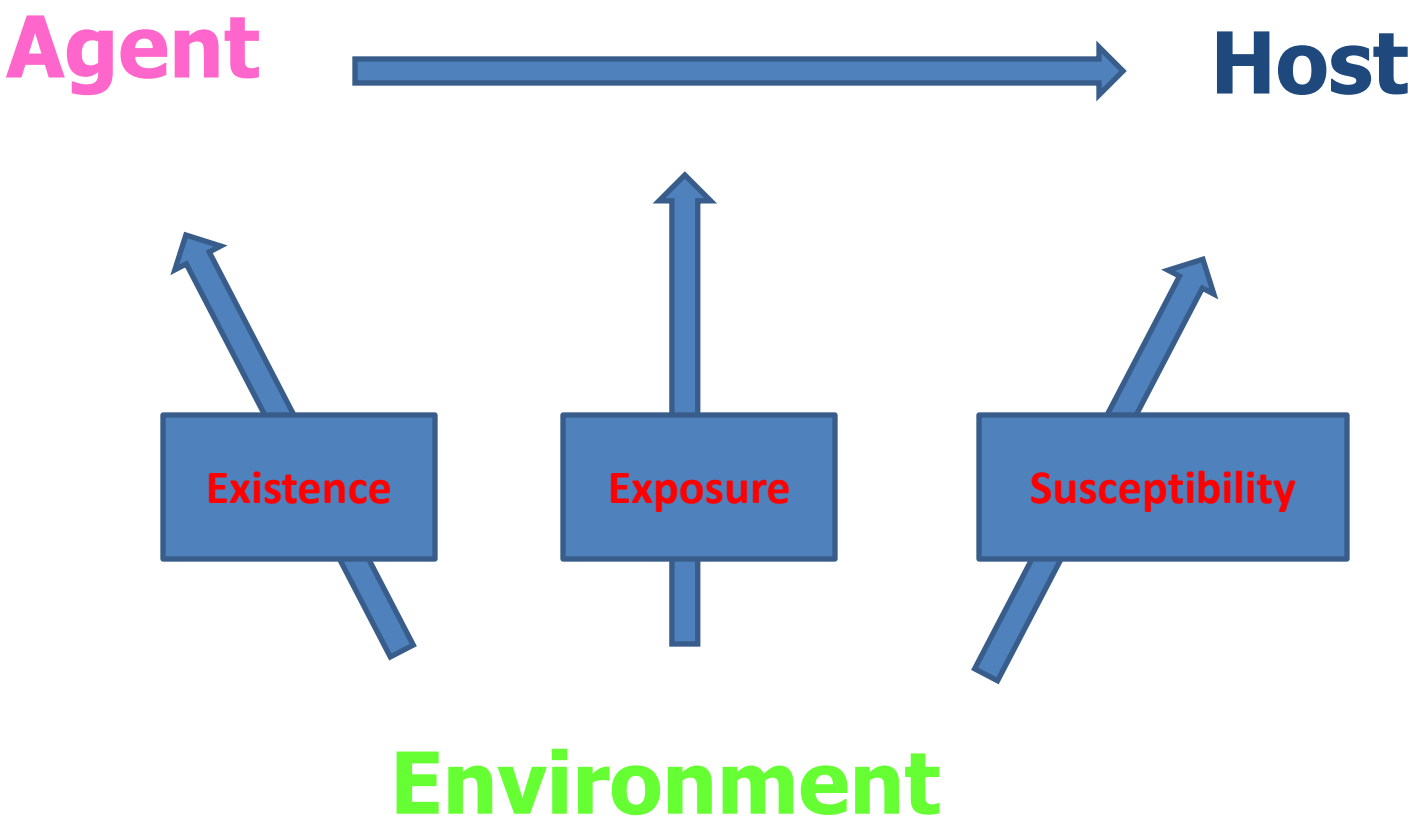
# Incidence Vs Prevalence



# Describing a Disease



# Epidemiological Triad of a Disease



# What are the uses of Epidemiological Triad of a Disease

1. To identify the weakest link
2. To identify the most appropriate measure for prevention
3. To study the natural history of disease

# Agents

- **Natural agents**
  - Sunlight
  - Air
- **Physical agents**
  - Burning
  - Hot air
  - Boiling
  - Autoclaving
  - Radiation
- **Chemical agents**
  - Phenol
  - quaternary ammonia compounds
  - Halogens and their compounds
  - alcohol
  - Formaldehyde
  - Miscellaneous (lime, ethylene oxide)

# Agent Factors

- Biological (bacteria,virus,fungus,paraiste etc.)
- Chemical (poison, alcohol, smoke)
- Physical (auto, radiation, fire)
- Nutritional (lack, excess)

# Characteristics of infectious disease agents

- Infectivity - the ability of the infectious agent to enter, survive and multiply in the host and thus produce infection or disease.
  - Infection is not synonymous with infectious disease since the result of infection can be either inapparent infection or manifest infectious disease
- Pathogenicity - the capacity of the infectious agent to cause apparent infection in an infected population
  - pathogenicity = # cases / total # infections (apparent + inapparent)
- Virulence - the severity of the disease
  - case-fatality ratio = # deaths / # cases

# Host Factors

**Nonspecific defense mechanisms:**

- Age
- Sex
- Race
- Religion
- Customs
- Occupation
- Heredity
- Marital Status
- Family Background

# Host Factors

**Disease-specific defense mechanisms:**

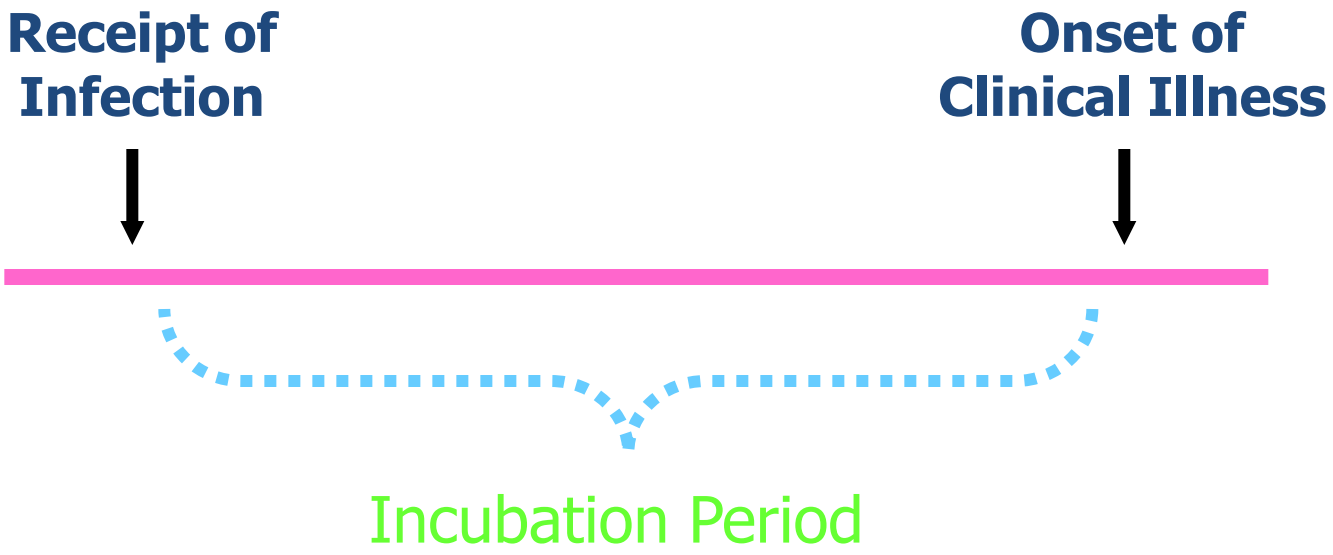
- Immunity of the host to a disease agent
  - Active
    - **Natural**
    - **Artificial**
  - Passive
    - **Natural**
    - **Artificial**

# Environmental Factors

- Temperature
- Humidity
- Altitude
- Crowding
- Housing
- Water
- Milk
- Food
- Air Pollution
- Noise

# Incubation Period (intrinsic)

- Interval from receipt of infection to time of onset of clinical illness



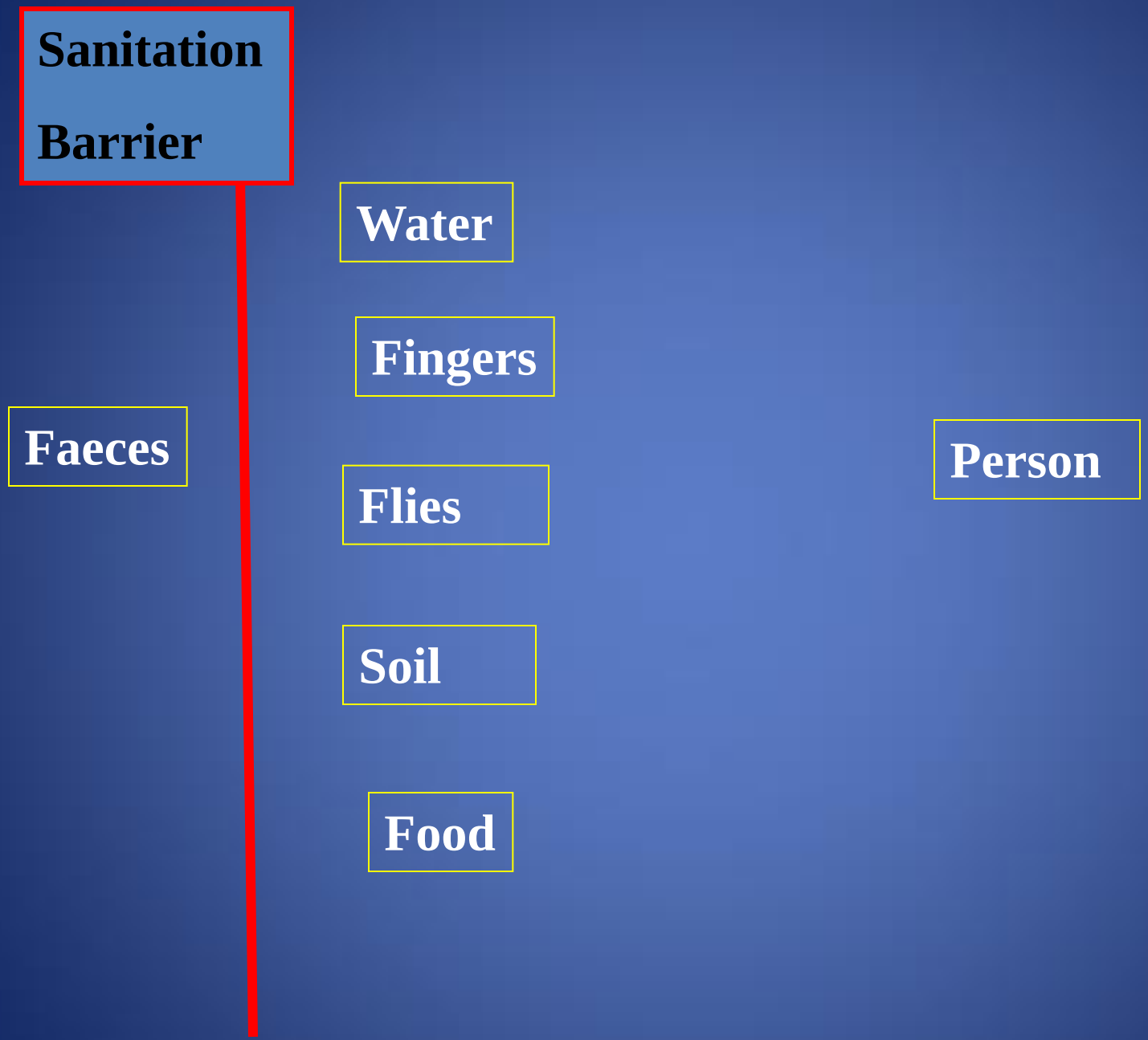
# Extrinsic Incubation Period

- ***In a vector*** (biological vector) **,** the period between entry of the infectious agent into the vector and the time at which the vector become infective; ie, readily transmission of infectious agent from the vector to a fresh host is possible. eg, Malaria, Filariasis, Dengue.

# Disease prevention and control

**Controlling the reservoir**

- Early diagnosis
- Notification
- Epidemiological investigation
- Isolation
- Treatment
- Quarantine


Sanitation Barrier
Water
Fingers
Faeces
Person
Flies
Soil
Food

**Interruption of transmission**

**The susceptible host**

1. Active Immunization
2. Passive immunization
3. Combined Passive & Active immunization
4. Chemoprophylaxis
5. Non-specific measures
6. Health advice to travellers

# Disinfection

**Types of disinfection**

1. Concurrent disinfection
2. Terminal disinfection
3. Precurrent (prophylactic) disinfection

# Descriptive Epidemiology

# ပြဿနာဖော်ညွှန်းသော ရောဂါဇစ်မြစ်လေ့လာခြင်း Descriptive Epidemiology

- မည်သည့်ပြဿနာ/ ရောဂါ/ အခြေအနေဖြစ်ပေါ်နေပါသနည်း။
- မည်မျှဖြစ်ပွားပါသနည်း။
- မည်သူတို့ ခံစားနေရသနည်း။
- မည်သည့် ကာလ၌ ဖြစ်ပွားသနည်း။
- မည်သည့် ဒေသ၌ ဖြစ်ပွားသနည်း။

စသော အချက်အလက်များကို လေ့လာခြင်းဖြစ်သည်။

## မည်သူများ ရောဂါဖြစ်ပွားကြသနည်း WHO

ဥပမာ – အသက်၊ ကျား/ မ၊ အလုပ်အကိုင်၊ ပညာအရည်အချင်း၊
စီးပွားရေးအခြေအနေ၊ ကိုယ်အလေးချိန် မပြည့်သောကလေးများ
ကာကွယ်ဆေးမထိုးရသေးသော ကလေးများ စသည်ဖြင့် –

## မည်သည့်ဒေသ၌ ဖြစ်ပွားကြသနည်း WHERE

- ကျေးရွာ/ မြို့ပေါ်/ ဝေးလံခေါင်းပါးဒေသ
- ပူပြင်းခြောက်သွေ့/ စိုစွတ်/ တောတောင်နှင့် နီးသောဒေသ
- ကျန်းမာရေးစောင့်ရှောက်မှု မရသောဒေသ

# မည်သည့်အချိန်ကာလတွင် ဖြစ်ပွားကြသနည်း/ ပိုမိုဖြစ်ပွားသနည်း
# WHEN

- တစ်နှစ်ပတ်လုံး ဖြစ်ပွားသည်
- မိုးရာသီတွင် ပိုမိုဖြစ်ပွားသည် Seasonal
- ၄-နှစ် တစ်ကြိမ် ဖြစ်ပွားသည် Cyclical

ယင်းအချက်အလက်များကို သေချာစွာသိရန် နေ့စဉ်ဖြစ်ပွားမှုနှုန်း၊ အပတ်စဉ်ဖြစ်ပွားမှုနှုန်း၊ လစဉ်ဖြစ်ပွားမှုနှုန်း၊ နှစ်စဉ်ဖြစ်ပွားမှုနှုန်းများ မှတ်ယူထားရမည်။

# Characteristics of time

- Cyclic fluctuations
- Secular time trends
- Clustering
  - Unusual aggregation of health events grouped together in space or time

# Epidemic Curves

# Some definitions…

- Endemic:
  - The habitual presence of a disease within a given geographical area; may also refer to the usual prevalence of a given disease within such an area
- Epidemic:
  - The occurrence in a community or region of a group of illnesses of similar nature, **clearly in excess of normal expectancy,** and derived from a common or from a propagated source (APHA)
- Pandemic:
  - A world-wide epidemic

# Epidemic Curve

- Distribution of the times of onset of a disease

  **In a single exposure, common-vehicle epidemic, the epidemic curve represents the distribution of incubation periods.**

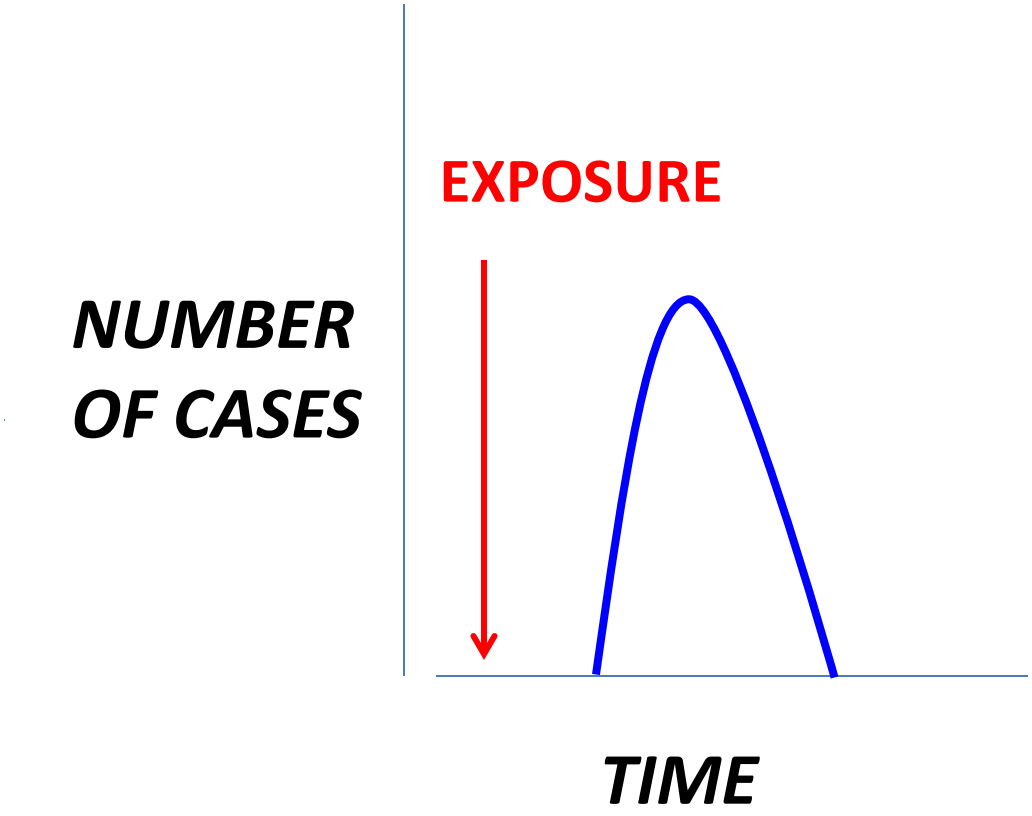
  **If the infection took place at one point in time, the interval from that point to the onset of each case is *the incubation period* in that person.**

# Epidemic Curve

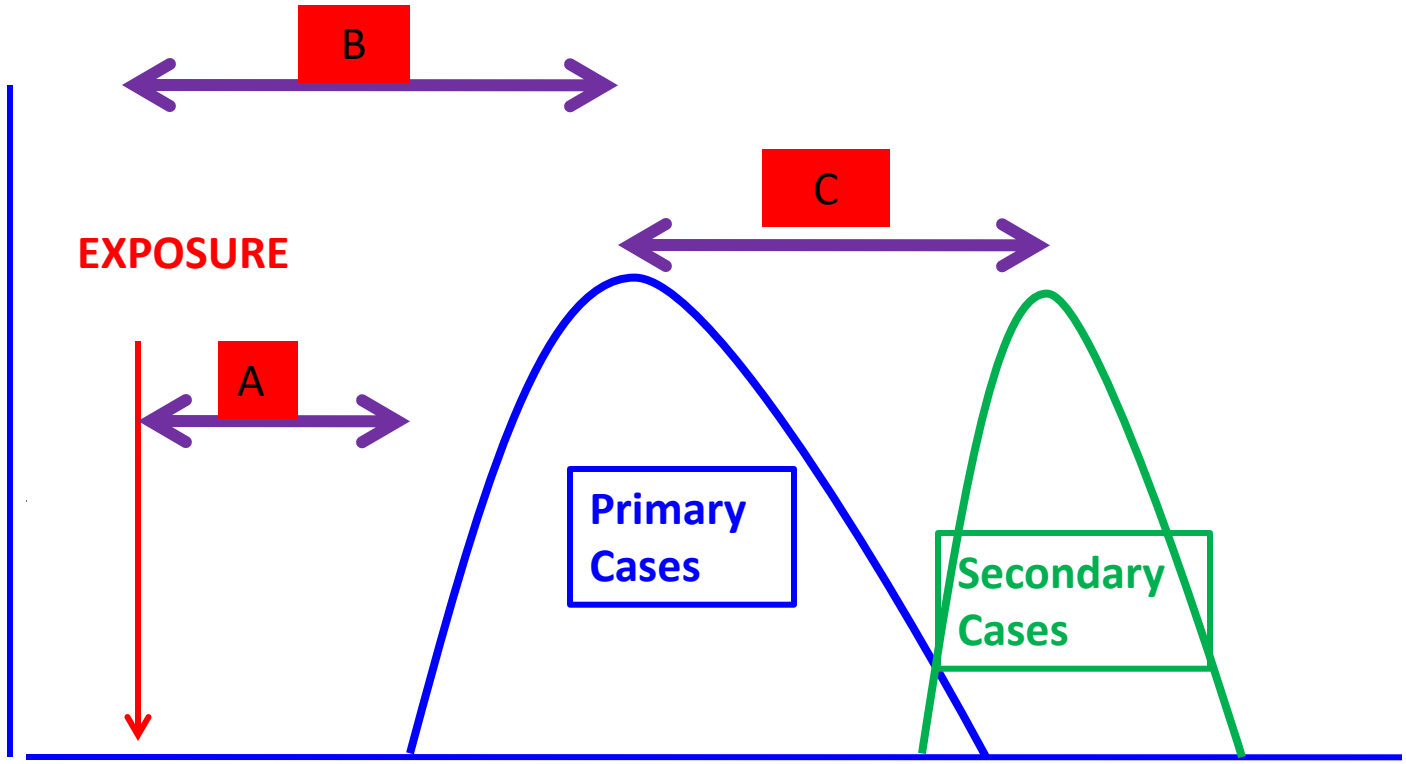
- ***A graph of the time distribution of epidemic cases is called the "EPIDEMIC CURVE"***

- ***An epidemic curve may suggest,***
- ***1. Time relationship with exposure to a suspected source.***
- ***2. A Cyclical or Seasonal pattern suggestive of a particular infection***

# EPIDEMIC CURVE



# EPIDEMIC CURVE SHOWING INCUBATION PERIODS

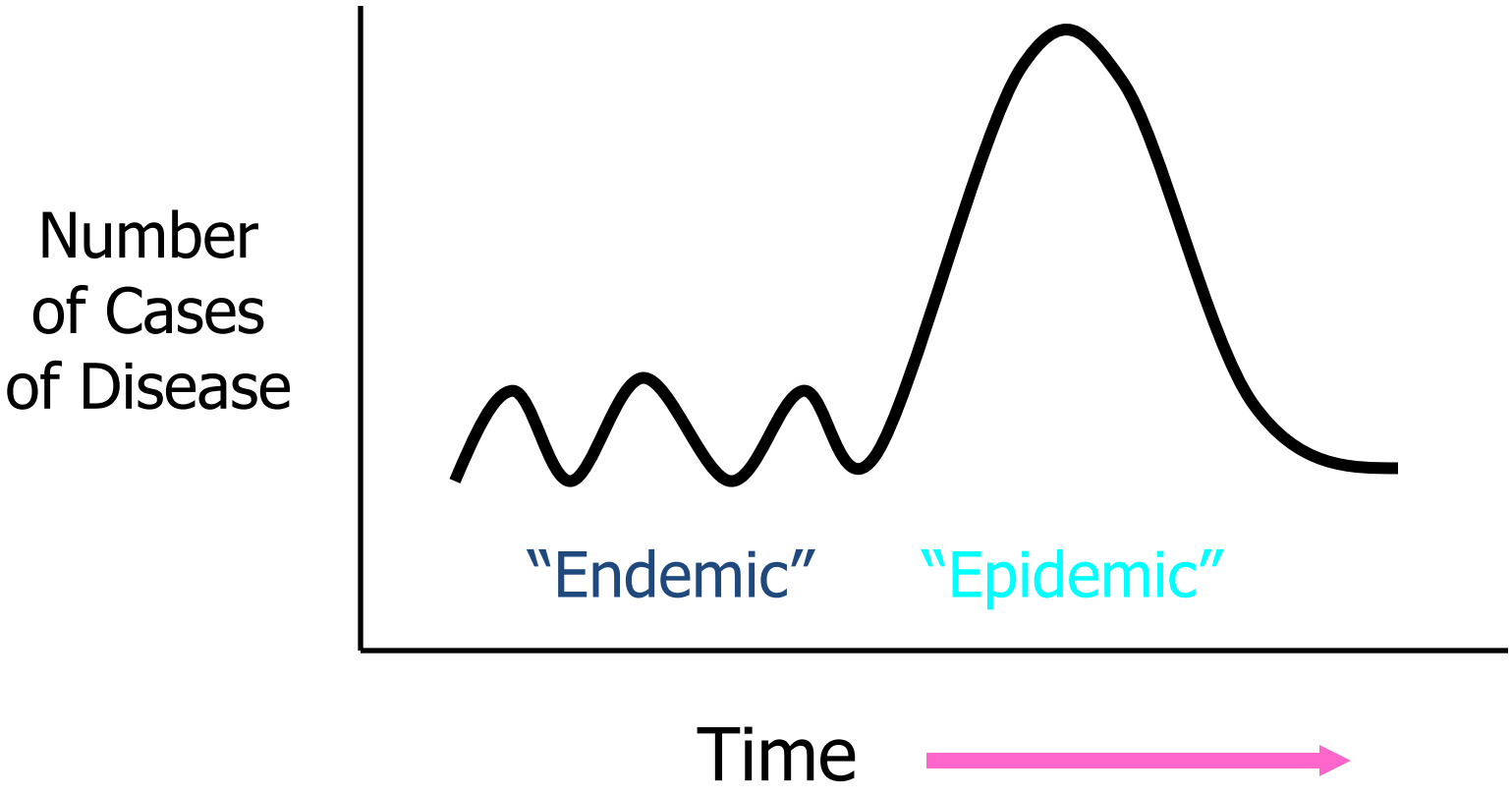



A Minimum Incubation period

B Median Incubation period

C Estimate of Average Incubation period

# "Endemic" vs. "Epidemic"



# TYPES OF EPIDEMICS

## *A. Common Source Epidemics.*

*(a) Single exposure or Point Source Epidemics*

*(b) Continuous or multiple exposure Epidemics*

## *B. Propagated Epidemics.*

*(a) person-to-person*

*(b) vector-borne*

*(c) animal reservoir*

# A. Common-source epidemics

- ***Common-source* single exposure** – epidemic which stems from a single source of exposure to a causal agent
- ***Common-source Continuous or Multiple or Repeated exposure***– epidemic due to transmission of infection through the continuously contaminated source (e.g., polluted water supply)

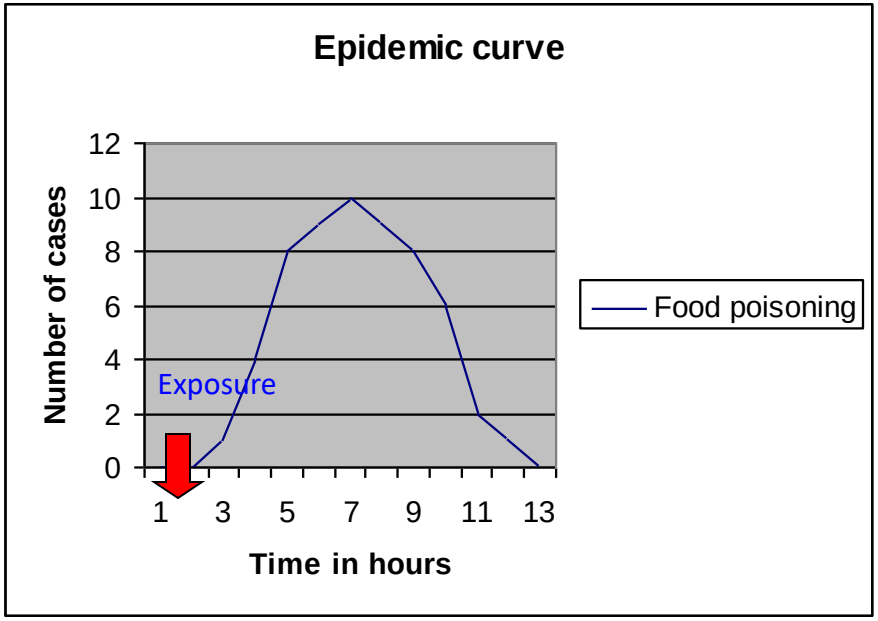
# *Common-source epidemics*

**(a) Single exposure or Point source epidemics**

Exposure to disease agent is brief & simultaneous, the resultant cases all develop **within one incubation period of the disease** e.g. , epidemic of food poisoning

- Main features of the curve: rise & fall rapidly

no secondary wave



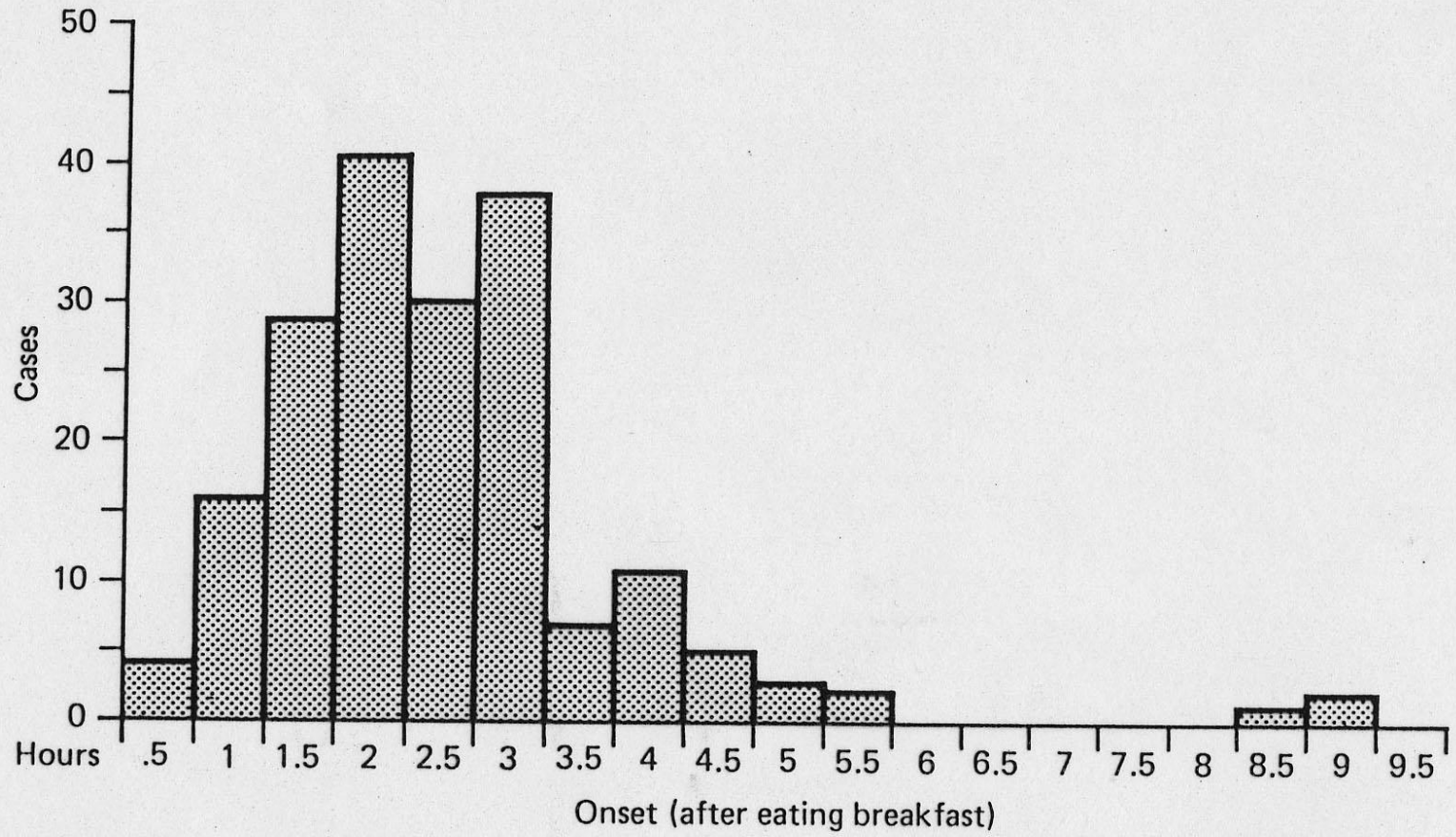



**Figure 5-13** Foodborne outbreak on an aircraft, February 1975. *(Reproduced, by permission, from von Magnus et al., 1975.)*

# *Common-source epidemics*

- ***Common Source Single Exposure Epidemic curve usually has one peak.***

- ***One point of interest is the "median incubation period".***

- ***It is the time required for 50 per cent of the cases to occur following exposure.***

# MAIN FEATURES –POINT SOURCE EPIDEMIC

- ***The epidemic curve rises & falls rapidly , with no secondary waves.***
- ***The epidemics tends to be explosive.***
- ***There is clustering of cases over a narrow interval of time.***
- ***All the cases develop within one incubation period of disease.***

# *Common-source epidemics*

- ***Common source epidemics are frequently, but not always due to exposure to an infectious agent.***
- ***They can result from contamination of the environment (air, water, food, soil) by industrial chemicals or pollutants, E.g., Bhopal gas tragedy in India & Minamata disease in Japan resulting from consumption of fish containing high concentration of methyl mercury***

# COMMON SOURCE CONTINUOUS OR REPATED EPIDEMICS

- ***If the epidemic continues over more than one incubation period, there is either a continuous or multiple exposure to a common source, or a propagated spread.***

# COMMON SOURCE CONTINUOUS OR REPATED EPIDEMICS

- ***Some times the exposure from the same source may be prolonged – continuous or repeated or intermittent – not necessarily at the same time or place.***

- ***A prostitute may be a common source on gonorrhea outbreak, but since she will infect her clients over a period of time there may be no explosive rise in the number of cases.***

# COMMON SOURCE CONTINUOUS OR REPATED EPIDEMICS

- ***A well of contaminated water or a nationally distributed brand of vaccine or food could result in similar outbreaks.***
- ***The outbreak continued beyond the range of one incubation period.(1976 – Legionnaire's disease)***
- ***There was no evidence of secondary cases among persons who had contact with ill persons.***

# COMMON SOURCE CONTINUOUS OR REPATED EPIDEMICS

- ***Water borne cholera is a familiar example, the epidemic reaches a sharp peak, but tails off gradually over a longer period of time.***

# Propagated Epidemic Curve

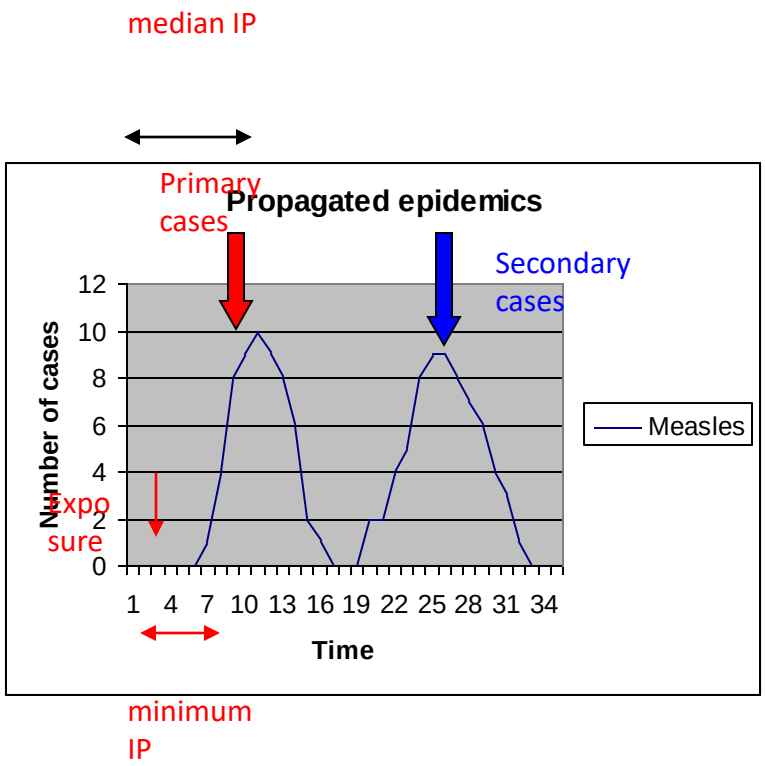
**(b) Propagated epidemics**

Most often infectious origin

Person –to-person transmission

- Main features of the curve: gradual rise & tail off

secondary waves



# PROPAGATED EPIDEMICS

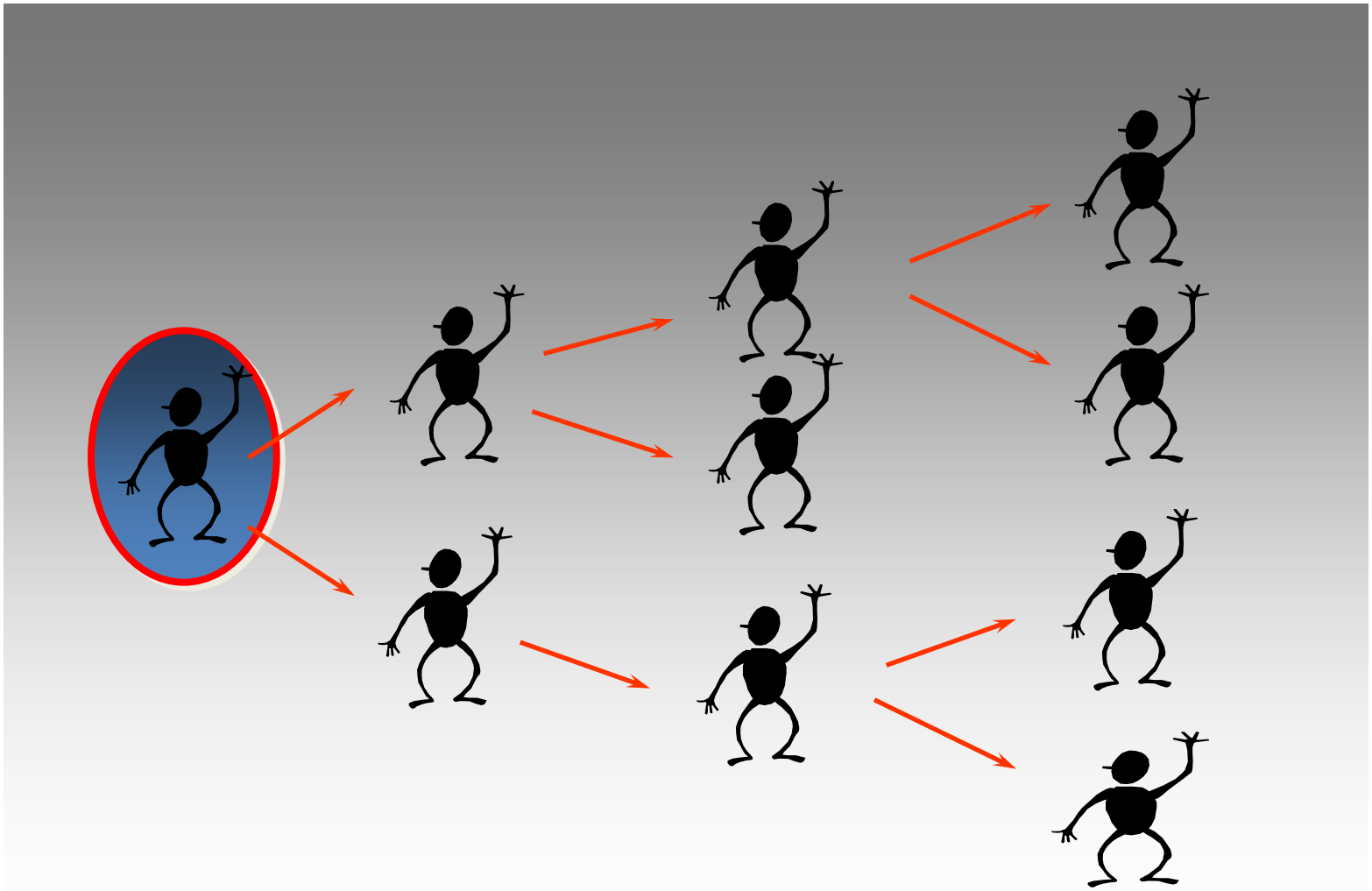
- ***A propagated epidemic is most often of infectious origin & results from person to person transmission of an infectious agent.***
- ***The epidemic usually shows a gradual rise & tails off over a much longer time.***
- ***Transmission continues until the number of susceptibles is depleted or susceptible individuals are no longer exposed to infected persons or intermediary vectors.***

# PROPAGATED EPIDEMICS

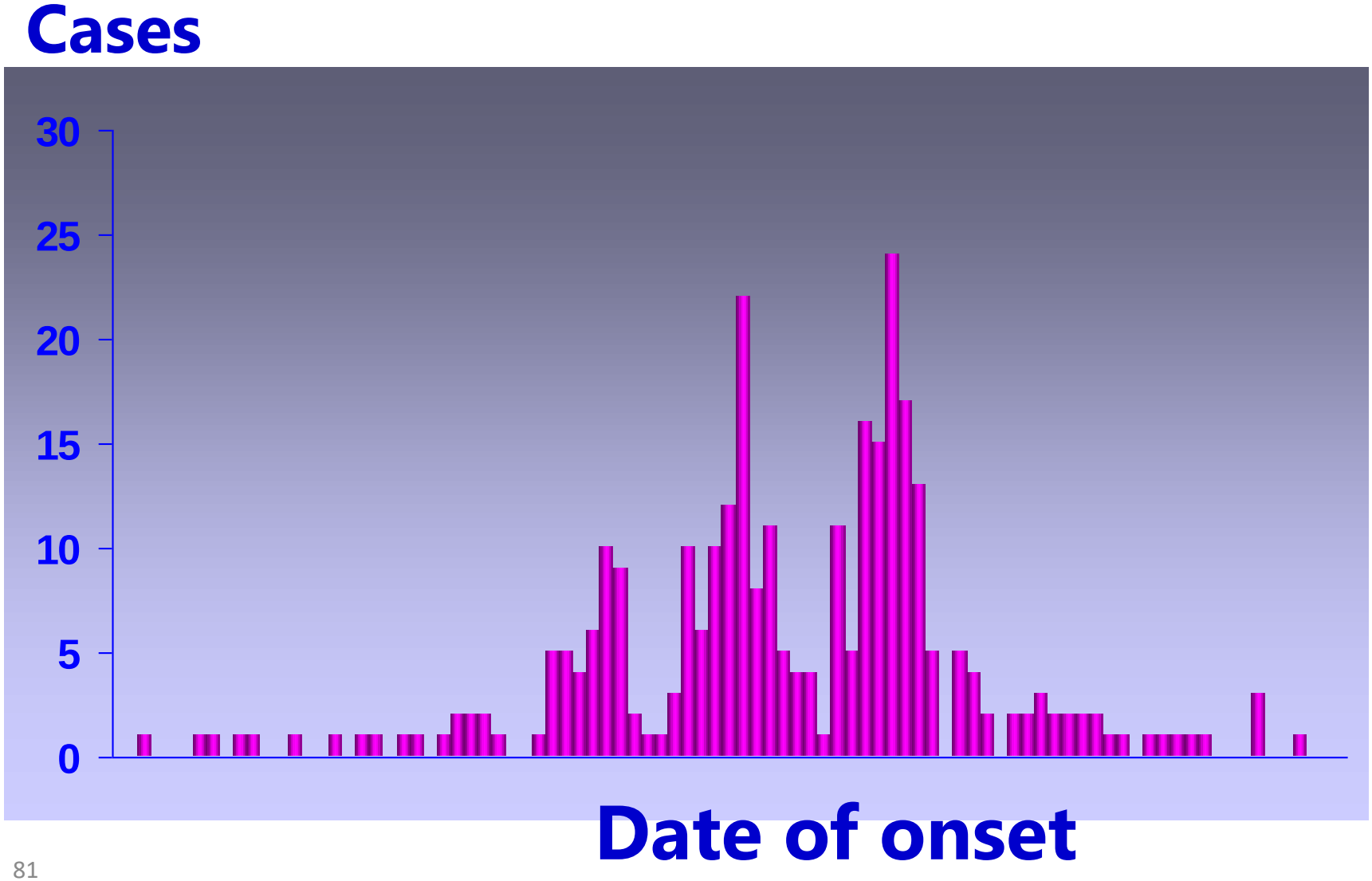
- ***The speed of spread depends upon herd immunity, opportunities for contact & secondary attack rate.***

- ***Propagated epidemics are more likely to occur where there is a regular supply of new susceptible individuals lowering herd immunity.***

# Propagated source outbreak



# Epidemic curve of propagated source outbreak



# PROPAGATED EPIDEMICS

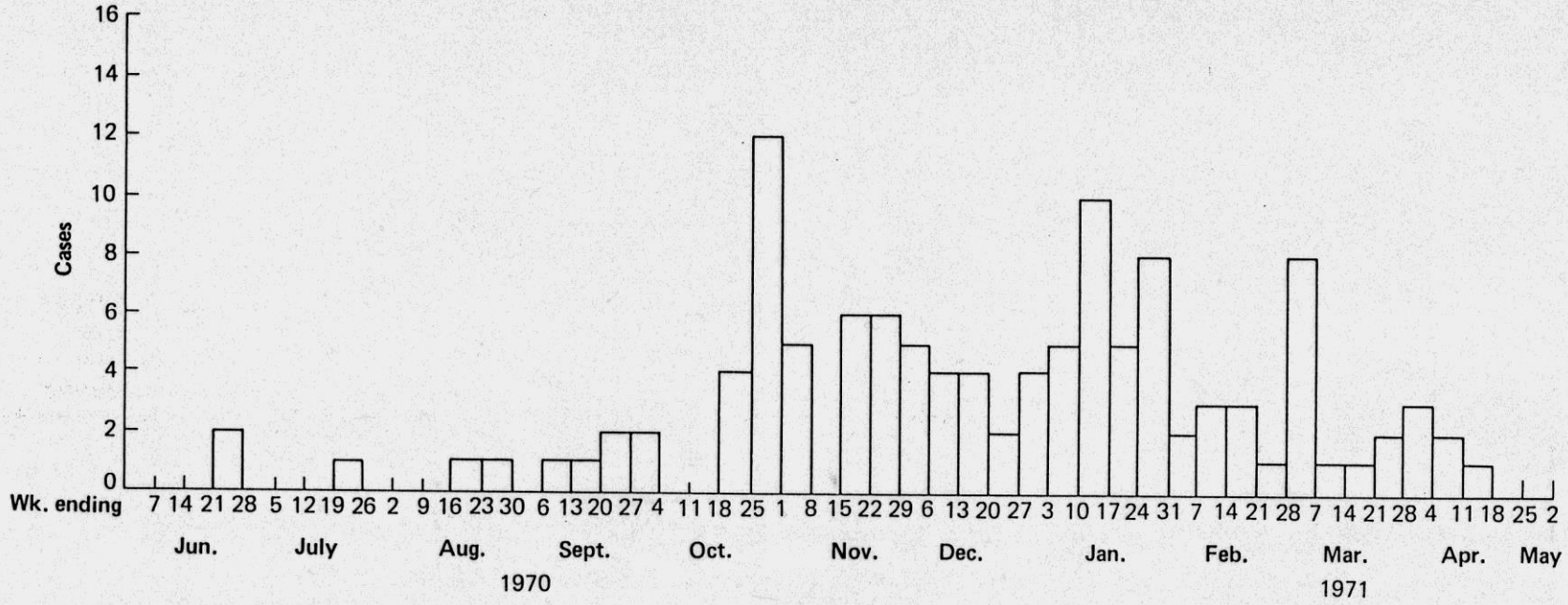



**Figure 5-8** Infectious hepatitis cases, by week of onset, Barren County, Kentucky, June 1970–April 1971. *(Reproduced, by permission, from Carman et al., 1971.)*

# PROPAGATED EPIDEMICS

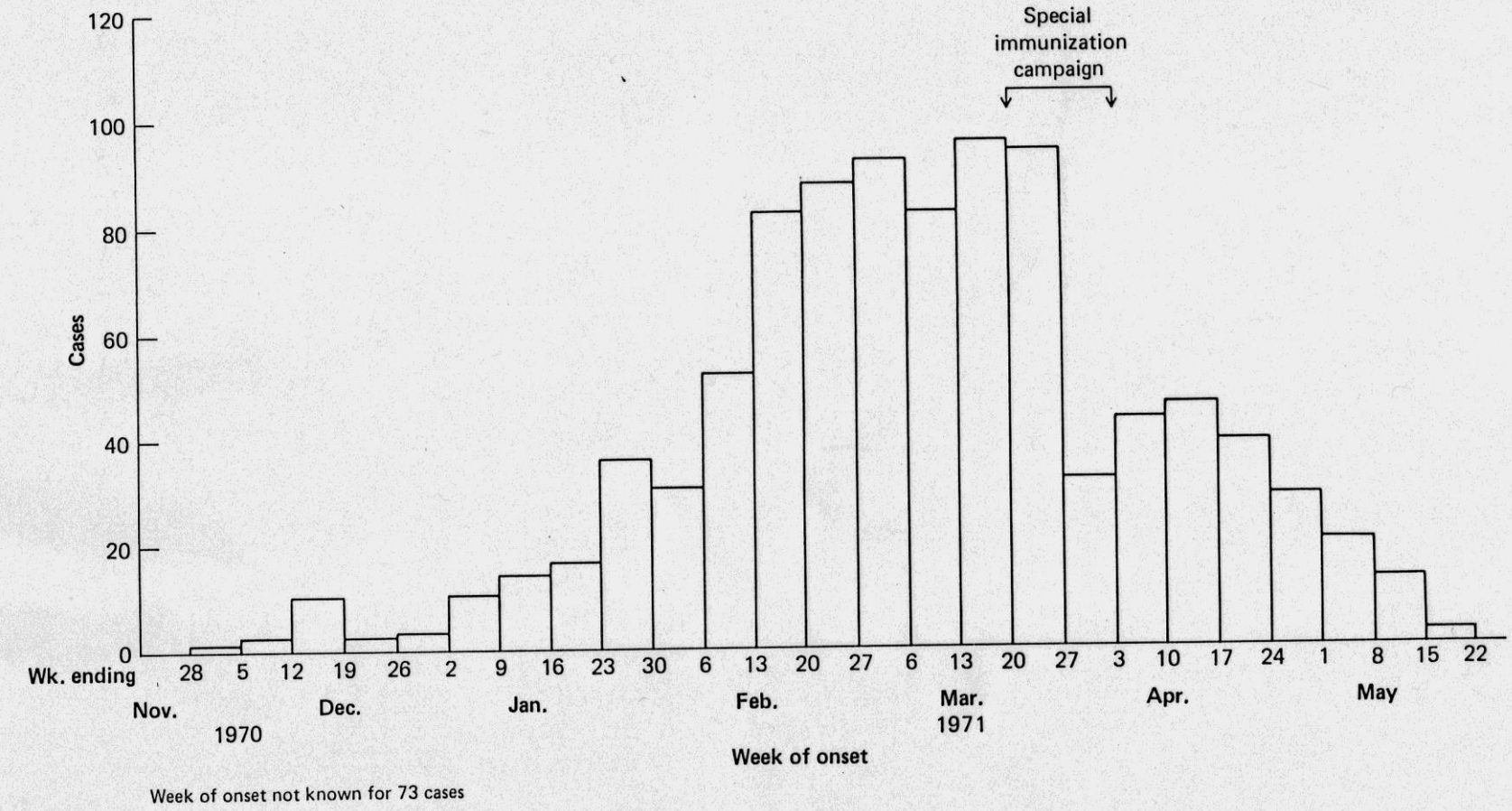



**Figure 5-7** Measles cases, by week of onset. Dallas, Texas, December 1, 1970–May 22, 1971. *(Reproduced, by permission, from Luby et al., 1971.)*

# Analytic Epidemiology

# Analytic Epidemiology

- Goes further by analyzing relationship between health status and other variables. Apart from simplest descriptive studies, epidemiological studies are analytical in character
- Concerned with the search for **causes and effects, or the why and the how questions.**
- **Quantify the association between exposures and outcomes and to test hypothesis about causal relationship.**

# Types of relationships between exposure and outcome

- Association (E and D co-occur)
- Causality (E causes D)
  - True causal association
  - Association appears causal but is due to:
    - Bias or systematic error (misclassification of E or D)
    - Confounding (other variable causes the D and this variable correlates with E)
    - Chance or random error (just this once)

# အကြောင်းတရားဖော်ညွှန်းသော ရောဂါဖြစ်မြစ်လေ့လာခြင်းဗေဒ
# Analytical Epidemiology

- မည်ကဲ့သို့ ဖြစ်ပွားသည်
- ဘာကြောင့် ဖြစ်ပွားပါသည်။
- မည်သည့် အကြောင်းတရားများနှင့် နှီးနွှယ်သည်၊

စသော အချက်အလက်များကို လေ့လာခြင်းဖြစ်သည်။

# Public Health Measures

# Prevention and control measures

- Take into account epidemiology of the disease
  - How does it infect, transmit, cause diseases?
  - Who is vulnerable/at risk, and why?
  - What can be done to prevent infection, to control further spread of disease?

- Target to stop transmission
  - Etiologic agent (eliminate the pathogen)
  - The reservoir/environment (vector, host)
  - The host (immunity, contact/exposure)

# Examples:
# Public Health Measures to Prevent Infectious Diseases

- Safe water supply
- Effective management of sewage treatment and disposal
- Programs insuring food safety
- Animal control
- Vaccination programs

# Examples:
# Measures to control the spread of the existing epidemic

- **Quarantine** – restriction of the activities of well persons or animals who have been exposed to a case of infectious disease during its period of infectiousness to prevent disease transmission

- **Isolation** – separation for the period of infectiousness of infected persons and animals from others to prevent or limit the direct or indirect transmission of infectious agents from those infected to those who are susceptible

# Periods of isolation

Periods of isolation recommended

| Disease | Duration of isolation |
|---|---|
| Chickenpox | Until all lesions crusted; usually about 6 days after onset of rash |
| Measles | From the onset of catarrhal stage through 3rd day of rash |
| German measles | None, except that women in the first trimester or sexually active, non-immune women in child-bearing years not using contraceptive measures should not be exposed |
| Cholera Diphtheria | 3 days after tetracyclines started, until 48 hours of antibiotics (or negative cultures after treatment) |
| Shigellosis<br>Salmonellosis | Until 3 consecutive negative stool cultures |
| Hepatitis A | 3 weeks |
| Influenza | 3 days after onset |
| Polio | 2 weeks adult, 6 weeks paediatric |
| Tuberculosis (sputum +) | Until 3 weeks of effective chemotherapy |
| Herpes zoster | 6 days after onset of rash |
| Mumps | Until swelling subsides |
| Pertussis | 4 weeks or until paroxysms cease |
| Meningococcal meningitis<br>Streptococcal pharyngitis | Until the first 6 hours of effective antibiotic therapy are completed |

# Methods of Epidemiology

- Public Health Surveillance
- Disease Investigation
- Analytic Studies
- Program Evaluation

# Disease Investigation

- Establish diagnosis
- Identify specific agent
- Describe according to person, place and time
- Identify source of agent
- Identify mode of transmission
- Identify susceptible populations

# 10 Steps of a Field Investigation

1. Organize Team (လှုပ်ရှားတပ်ဖွဲ့ဖွဲ့စည်းခြင်း)
2. Organize supply/ Equipments (ဆေးဝါးပစ္စည်းများစုဆောင်းရေး)
3. Prepared for field visit (ကွင်းဆင်းရန်ပြင်ဆင်ခြင်း)
4. Case-based Investigation (ရောဂါစုံစမ်းစစ်ဆေးခြင်း)
   - Symptom Analysis
   - Epidemic Curve
   - Attack rate, CFR
   - Transmission (Mode & Source)
5. Active case search (လူနာသစ်ရှာဖွေခြင်း)
   - At adjacent area
   - Home Isolation
   - Visitor Restriction
6. Case Management ရောဂါကုသခြင်း
   - For current infection and complication
   - Refer to Hospital
7. Lab investigation (ဓါတ်ခွဲစမ်းသပ်စစ်ဆေးခြင်း)
   Specimen collection AFP- Stool
   Measles- Serum
   Diphtheria- Nasal/ Throat Swab
   Whooping Cough- Nasal/ Throat Swab
   Tetanus- No
8. Other control measure
   (အခြားကာကွယ်နှိမ်နင်းရေးလုပ်ငန်းများ)
   - Vitamin A for Measles
   - Environment sanitation for Polio etc.
   - Infection control
   - Outbreak Response Immunization (ORI)
   - Restriction on 'Soon' offering & refreshment at funeral
9. Health Education
   Communication ပြန်ကြားဆက်သွယ်ခြင်း
   Awareness အသိပညာပေးမြှင့်တင်ခြင်း
10. Reporting အစီရင်ခံခြင်း
    - Initial ကနဦး
    - Daily နေ့စဉ်
      Hospital
    - Weekly အပတ်စဉ် Township
    - Final နောက်ဆုံး
      Div.

# Prepare for field work (Rapid Response Team)

1. **Epidemiologist**
2. **Microbiologist**
3. **Clinician**
4. **Environmentalist**
5. **Administrator**
6. **Press officer**
7. **Others**

A. Investigation: knowledge, equipment, specimen collection, transportation, etc.

B. Administration

C. Consultation

# Township RRT members:

1. Township Medical Officer (as a Team leader and will also cover surveillance)
2. One Medical Officer (clinician – junior consultant, or specialist AS),
3. One medical technologist (specimen collection, lab)
4. Township Health Assistant/HA1
5. District veterinary officer

# State/Regional Rapid Response Team

1. Region/State public health director/deputy R/S public health director (as TL)
2. One consultant physician/pediatrician
3. Epidemiologist/Regional Surveillance officer/TL from Special disease control unit (SDCU)
4. Microbiologist/Pathologist/lab officer.
5. State/Regional veterinary officer

# EQUIPMENT CHECK LIST FOR FIELD INVESTIGATION

## EQUIPMENTS

Personal Equipment
Wet weather jacket
Gumboots/Boots
Protective eyewear
Protective gloves
Latex gloves
Masks (N95)
Hand sanitiser
Insect repellant
First aid kit
Toilet paper
Drinking water
Water purification tablets
Torch and batteries
Camera
Radio
Medications ( antibiotics, ORS)
Mobile phone, recharge cards,
list of numbers
Sunscreen
Disinfectant
Long lasting insecticidal net
Camping gear and personal belongings as appropriate

## STATIONERY

Note book
Clipboard
Graph paper
Standard questionnaires
Standard line lists
Outbreak Manual
Maps and street directories
Calculator
Tape measure
Pens /pencils
Plastic document pouches
Marking pen

# Incubation periods of important infections

## 6.7 Incubation periods of important infections[1]

| Infection | Incubation period |
|---|---|
| **Short incubation periods** | |
| Anthrax, cutaneous[3] | 9 hrs–2 weeks |
| Anthrax, inhalational[3] | 2 days[2] |
| Bacillary dysentery[5] | 1–6 days |
| Cholera[3] | 2 hrs–5 days |
| Dengue haemorrhagic fever[6] | 3–14 days |
| Diphtheria[6] | 1–10 days |
| Gonorrhoea[4] | 2–10 days |
| Influenza[5] | 1–3 days |
| Meningococcaemia[3] | 2–10 days |
| SARS coronavirus[3] | 2–7 days[2] |
| Scarlet fever[5] | 2–4 days |

| | |
|---|---|
| **Intermediate incubation periods** | |
| Amoebiasis[6] | 1–4 weeks |
| Brucellosis[4] | 5–30 days |
| Chickenpox[5] | 11–20 days |
| Lassa fever[3] | 3–21 days |
| Malaria[3] | 10–15 days |
| Measles[5] | 6–19 days |
| Mumps[5] | 15–24 days |
| Poliomyelitis[6] | 3–35 days |
| Psittacosis[4] | 1–4 weeks |
| Rubella[5] | 15–20 days |
| Typhoid[5] | 5–31 days |
| Whooping cough[5] | 5–21 days |

| | |
|---|---|
| **Long incubation periods** | |
| Hepatitis A[5] | 3–7 weeks |
| Hepatitis B[4] | 6 weeks–6 months |
| Leishmaniasis, cutaneous[6] | Weeks–months |
| Leishmaniasis, visceral[6] | Months–years |
| Leprosy[3] | 5–20 years |
| Rabies[4] | 2–8 weeks[2] |
| *Trypanosoma brucei gambiense* infection[6] | Months–years |
| Tuberculosis[5] | 1–12 months |

## 6.5 How to provide samples for microbiological sampling

### Communication

- Discuss samples that may require to be forwarded to another laboratory or processed urgently or by an unusual method with laboratory staff *before* collection
- Communication is the most important requirement for good microbiological sampling. If there is doubt about any aspect of sampling, it is far better to discuss it with laboratory staff beforehand than to risk diagnostic delay by inappropriate sampling or sample handling

### Indication

- Screening (e.g. collecting 'routine' urine, i.v. cannulae or sputum) in the absence of clinical evidence of infection is rarely appropriate

### Container

- Certain tests (e.g. nucleic acid and antigen detection tests) require proprietary sample collection equipment

### Collection

- Follow sample collection instructions precisely (e.g. proper collection of mid-stream, terminal and early morning urine samples, skin decontamination prior to blood culture etc.) to increase diagnostic yield

### Labelling

- Label sample containers and request forms according to local policies with demographic identifiers, specimen type and time/date collected
- Include clinical details on request forms
- Identify samples carrying a high risk of infection (e.g. blood liable to contain a blood-borne virus) with a hazard label

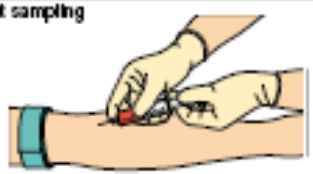
### Packaging

- Close sample containers tightly and package securely (usually in sealed plastic bags)
- Attach request forms to samples but not in the same compartment (to avoid contamination should leakage occur)

### Storage and transport

- Transport samples to the microbiology laboratory as quickly as possible
- If pre-transport storage is required, conditions (e.g. refrigeration, incubation, storage at room temperature) vary with sample type
- Notify the receiving laboratory prior to arrival of samples, to ensure timely processing

## 1 Patient sampling



Contamination of blood culture bottles should be minimised by using careful aseptic technique and following local guidelines

## 2 Sample handling

Local instructions should be followed, including safety instructions, labelling requirements, submission of paired vs. single bottles and use of multiple sets of blood cultures

## 3 Specimen transport

Specimens should be transported to the laboratory as quickly as possible. If there is a delay, the sample must be stored in conditions specified by the manufacturer of the blood culture system in use

## 4 Incubation

The specimen is incubated at 35–37°C for 5–7 days. If there has been no growth at this time, it is reported as negative and discarded

## 5 Growth detection

In most systems microbial growth is detected by constant automatic monitoring of $CO_2$ in the bottle. For significant bacteraemias this usually takes 12–24 hrs. Time to positivity (TTP) may be shorter in overwhelming sepsis and longer with fastidious organisms (e.g. Brucella spp.)

## 6 Preliminary results

If growth is detected, a Gram film is made from the blood culture medium. The results are communicated immediately to the clinician and used to guide antibiotic therapy

## 7 Incubation

A small amount of the medium is incubated on a range of appropriate culture media. Preliminary susceptibility testing may also be carried out

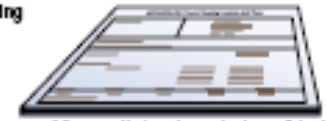
## 8 Culture results

After incubation, presumptive identification and preliminary susceptibility results are communicated to the clinician

## 9 Definitive results

For most organisms definitive identification requires a further overnight incubation to enable confirmatory and/or further biochemical tests. Definitive susceptibility testing may also require further incubation with a range of antimicrobials

## 10 Reporting



A final summary of the results is released when all testing is complete. For purposes of clinical care, liaison of the interim results (e.g. Gram film, presumptive identification and susceptibility) is usually more important than release of the final result. Effective clinical–laboratory communication is vital

Overnight incubation required

Urgent communication required

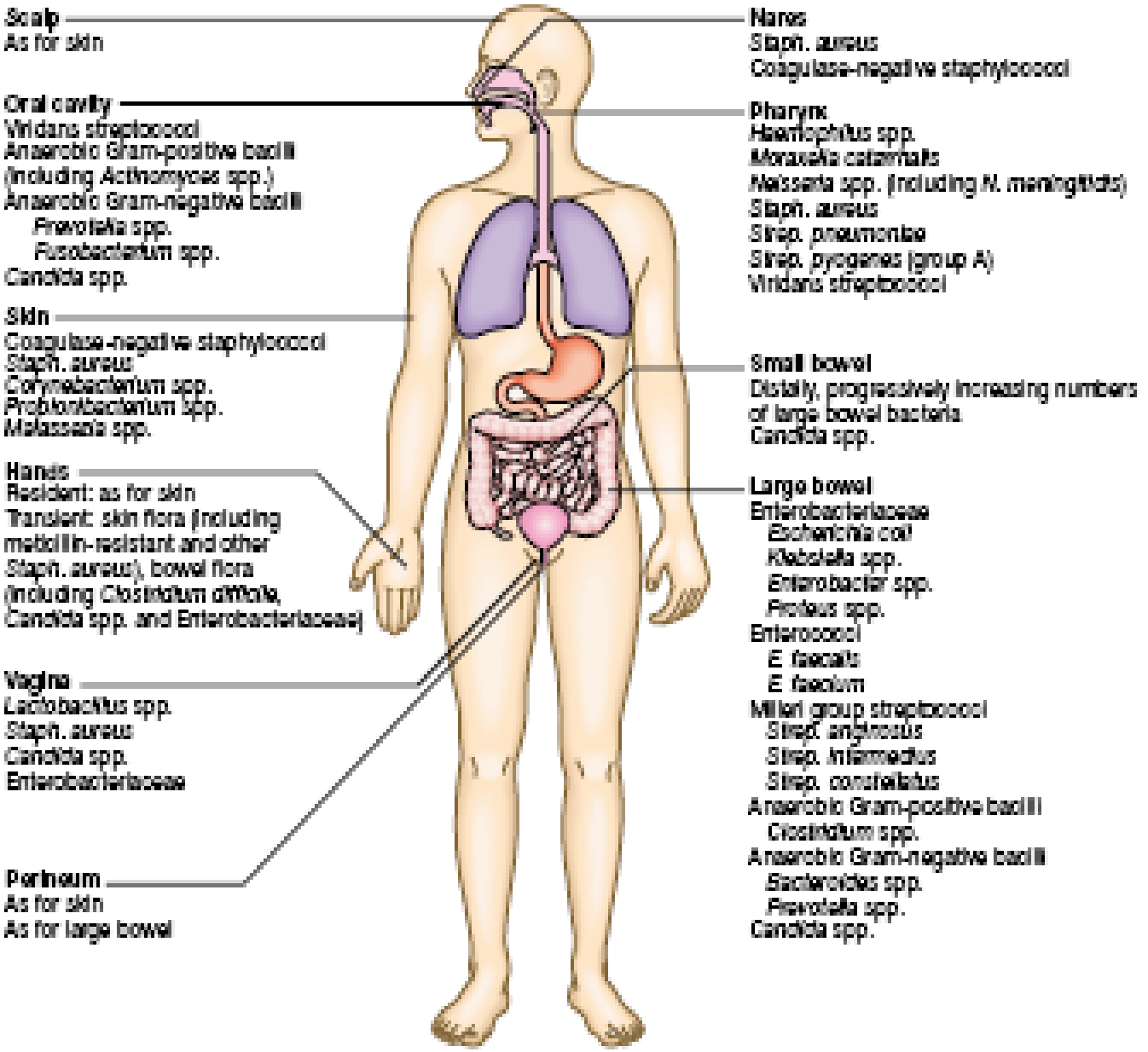



**Fig. 6.5** Human non-sterile sites and normal flora in health.

## 6.11 Types of isolation precaution[1]

| Airborne transmission | Contact transmission | Droplet transmission |
|---|---|---|
| **Precautions** | | |
| Negative pressure room with air exhausted externally or filtered<br>N95 masks or personal respirators for staff; avoid using non-immune staff | Private room preferred (otherwise inter-patient spacing ≥ 1 m)<br>Gloves and gown for staff in contact with patient or contaminated areas | Private room preferred (otherwise inter-patient spacing ≥ 1 m)<br>Surgical masks for staff in close contact with patient |
| **Infections managed with these precautions** | | |
| Measles<br>Tuberculosis, pulmonary or laryngeal, confirmed or suspected | Enteroviral infections in young children (diapered or incontinent)<br>Norovirus[2]<br>*C. difficile* infection<br>Multidrug-resistant organisms (e.g. MRSA, ESBL, GRE, VRSA, penicillin-resistant *Strep. pneumoniae*)[3]<br>Parainfluenza in infants and young children<br>Rotavirus<br>RSV in infants, children and immunocompromised<br>Viral conjunctivitis, acute | Diphtheria, pharyngeal<br>*Haemophilus influenzae* type B infection<br>Herpes simplex virus, disseminated or severe<br>Influenza<br>Meningococcal infection<br>Mumps<br>*Mycoplasma pneumoniae*<br>Parvovirus (erythrovirus) B19 (erythema infectiosum, fifth disease)<br>Pertussis<br>Plague, pneumonic/bubonic<br>Rubella<br>*Strep. pyogenes* (group A), pharyngeal |
| **Infections managed with multiple precautions** | | |
| ← Smallpox, monkeypox, VZV, (chickenpox or disseminated disease)[4] → | | |
| | ← Adenovirus pneumonia → | |
| ← SARS, viral haemorrhagic fever[2] → | | |

[1] Recommendations based on 2007 CDC guideline for isolation precautions. May differ from local or national recommendations.
[2] Not a CDC recommendation.
[3] Subject to local risk assessment.
[4] Or in any immunocompromised patient until possibility of disseminated infection excluded.
(VRSA = vancomycin-resistant *Staph. aureus*)

## 6.18 Antimicrobial options for common infecting bacteria

| Organism | Antimicrobial options* |
|---|---|
| **Gram-positive organisms** | |
| *Enterococcus faecalis* | Ampicillin, tigecycline, vancomycin/teicoplanin |
| *Enterococcus faecium* | Tigecycline, vancomycin/teicoplanin, linezolid |
| Glycopeptide-resistant enterococci (GRE) | Linezolid, tigecycline, quinupristin-dalfopristin |
| MRSA | Clindamycin, vancomycin, rifampicin (never used as monotherapy), linezolid, daptomycin, tetracyclines, tigecycline, co-trimoxazole |
| *Staph. aureus* | Flucloxacillin, clindamycin |
| *Strep. pyogenes* | Penicillin, clindamycin, erythromycin |
| *Strep. pneumoniae* | Penicillin, macrolides, cephalosporins, levofloxacin, vancomycin |

| | |
|---|---|
| **Gram-negative organisms** | |
| *E. coli*, 'coliforms' (enteric Gram-negative bacilli) | Trimethoprim, cefuroxime, ciprofloxacin, co-amoxiclav, amoxicillin (resistance common) |
| *Enterobacter* spp., *Citrobacter* spp. | Ciprofloxacin, meropenem, aminoglycosides |
| ESBL-producing Enterobacteriaceae | Ciprofloxacin, meropenem, piperacillin-tazobactam, aminoglycosides, tigecycline |
| *Haemophilus influenzae* | Amoxicillin, co-amoxiclav, macrolides, cefuroxime, cefotaxime, ciprofloxacin |
| *Legionella pneumophila* | Azithromycin, levofloxacin, doxycycline |
| *Neisseria gonorrhoeae* | Ceftriaxone/cefixime, spectinomycin |
| *Neisseria meningitidis* | Penicillin, cefotaxime, chloramphenicol |
| *Pseudomonas aeruginosa* | Ciprofloxacin, piperacillin-tazobactam, aztreonam, meropenem, aminoglycosides, ceftazidime/cefepime |
| *Salmonella typhi* | Ciprofloxacin, ceftriaxone, chloramphenicol (resistance common) |

| | |
|---|---|
| **Strict anaerobes** | |
| *Bacteroides* spp. | Metronidazole, clindamycin, co-amoxiclav, piperacillin-tazobactam, meropenem |
| *Clostridium difficile* | Metronidazole, vancomycin (oral) |
| *Clostridium* spp. | Penicillin, metronidazole, clindamycin |
| *Fusobacterium* spp. | Penicillin, metronidazole, clindamycin |
| **Other organisms** | |
| *Chlamydia trachomatis* | Azithromycin, doxycycline |
| *Treponema pallidum* | Penicillin, doxycycline |

*Antibiotic selection depends on multiple factors, including local susceptibility patterns. There are many appropriate alternatives to those listed.

# *Antimicrobial prophylaxis*

**6.20 Recommendations for antimicrobial prophylaxis in adults***

| Infection risk | Recommended antimicrobial |
|---|---|
| **Bacterial** | |
| Diphtheria (prevention of secondary cases) | Erythromycin |
| Gas gangrene (after high amputation or major trauma) | Penicillin or metronidazole |
| Lower gastrointestinal tract surgery | Cefuroxime + metronidazole, gentamicin + metronidazole, or co-amoxiclav (single dose only) |
| Meningococcal disease (prevention of secondary cases) | Rifampicin or ciprofloxacin |
| Rheumatic fever (prevention of recurrence) | Phenoxymethylpenicillin or sulfadiazine |
| Tuberculosis (prevention of secondary cases) | Isoniazid ± rifampicin |
| Whooping cough (prevention of secondary cases) | Erythromycin |

| | |
|---|---|
| **Viral** | |
| HIV, occupational exposure (sharps injury) | Combination tenofovir/ emtricitabine and lopinavir/ ritonavir. Modified if index case's virus known to be resistant |
| Influenza A (prevention of secondary cases in adults with chronic respiratory, cardiovascular renal disease, immunosuppression or diabetes mellitus) | Oseltamivir |
| **Fungal** | |
| Aspergillosis (in high-risk haematology patients) | Itraconazole or posaconazole |
| *Pneumocystis* pneumonia (prevention in HIV and other immunosuppressed states) | Co-trimoxazole, pentamidine or dapsone |
| **Protozoal** | |
| Malaria (prevention of travel-associated disease) | Specific antimalarials depend on travel itinerary (p. 352) |

*These are based on current UK practice. Recommendations may vary locally or nationally. There is currently no recommendation in the UK to administer antimicrobial prophylaxis for infective endocarditis during dental procedures.

# Report Writing

Information to be included in the final report on an epidemic

| Section | Contents |
|---|---|

1. Background
   - Geographical location
   - Climatic conditions
   - Demographic status (population pyramid)
   - Socioeconomic situation
   - Organization of health services
   - Surveillance and early warning systems
   - Normal disease prevalence
2. Historical data
   - Previous occurrence of epidemics of the same disease, locally or elsewhere
   - Occurrence of related diseases, if any
     - in the same area
     - in other areas
   - Discovery of the first cases of the present outbreak
3. Methodology of investigations
   - Case definition
   - Questionnaire used in epidemiological investigation
   - Survey teams
     - Household survey
     - Retrospective survey
     - Prospective surveillance
     - Collection of laboratory specimens
     - Laboratory techniques

# Report Writing

4. Analysis of data
   - Clinical data :
     - frequency of signs and symptoms
     - course of disease
     - differential diagnosis
     - death or sequelae rates
   - Epidemiological data :
     - mode of occurrence
     - in time
     - by place
     - by population groups
   - Modes of transmission :
     - source(s) of infection
     - route(s) of excretion and portal(s) of entry
     - factors influencing transmission
   - Laboratory data :
     - isolation of agent(s)
     - serological confirmation
     - significance of results
   - Interpretation of data :
     - comprehensive picture of the outbreak
     - hypotheses as to cause(s)
     - formulation and testing of hypotheses by statistical analysis
5. Control measures
   - Definition of strategies and methodology of implementation
     - constraints
     - results
   - Evaluation :
     - significance of results
     - cost/effectiveness
   - Preventive measures