بسم الله الرحمن الرحيم

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DISEASE PREVENTION AND CONTROL

General Principle of Prevention, Control, Elimination and Eradication of Communicable Diseases

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DISEASE PREVENTION AND CONTROL

Every disease has certain weak points susceptible to attack.

- ✓ **The basic approach in controlling disease is**
- ✓ **to identify these weak points and break the weakest links in the chain of transmission**
- ❖ **This requires sound epidemiological**
- ✓ **knowledge of the disease** - that is its
  - ➢ **magnitude,**
  - ➢ **distribution in time,**
  - ➢ **place and person,**
  - ➢ **multifactorial causation,**
  - ➢ **sources of infection and**
  - ➢ **dynamics of transmission.**
- ❖ **Frequently it may be necessary to institute**
- ❖ **more than one method of control simultaneously.**

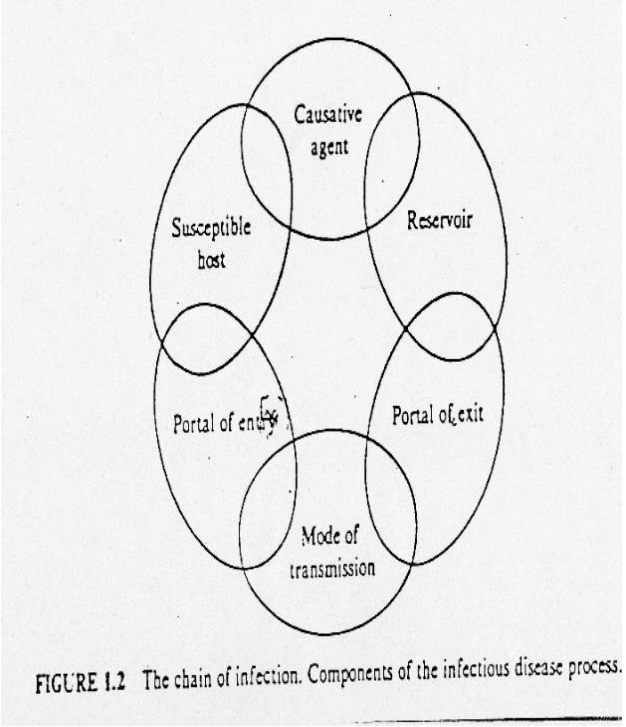


FIGURE 1.2 The chain of infection. Components of the infectious disease process.

The choice of methods

- The choice of methods will depend upon factors such as
  - Availability of proper tools and techniques,
  - Efficiency
  - Relative cost effectiveness,
  - Acceptability.
- Although effective control of a disease requires
  - ✓ knowledge of its multifactorial causation,
- Removal or elimination of a single known essential link or the weakest link may be sufficient to control a disease,
- even if complete knowledge about the aetiology of the disease in question is lacking. *example is that of John Snow controlling the cholera epidemic in London, by removing the handle of the incriminated water pump.*
- Control measures should not be delayed because of incomplete or lack of accurate knowledge of the aetiological agent

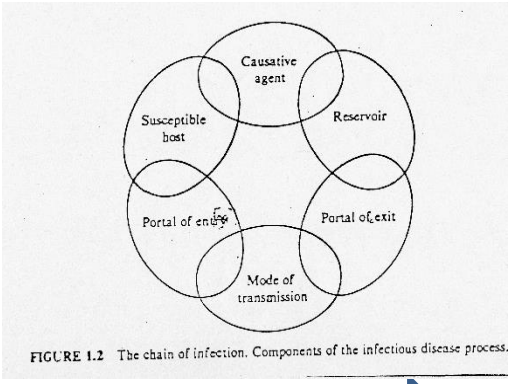
- **Disease control involves all the measures designed to prevent or reduce as much as possible the**
  - **Incidence,**
  - **Prevalence and**
  - **Consequences of disease**
- **Prevention and control activities of disease required**

- **Community Participation,**
- **Political Support and**
- **Intersectoral Coordination.**

- **Broadly these are measures related to epidemiologic investigation**

1. Agent

1. **Reservoir or source of infection**
2. **Route(s) of transmission**
3. **Susceptible host (people at risk).**



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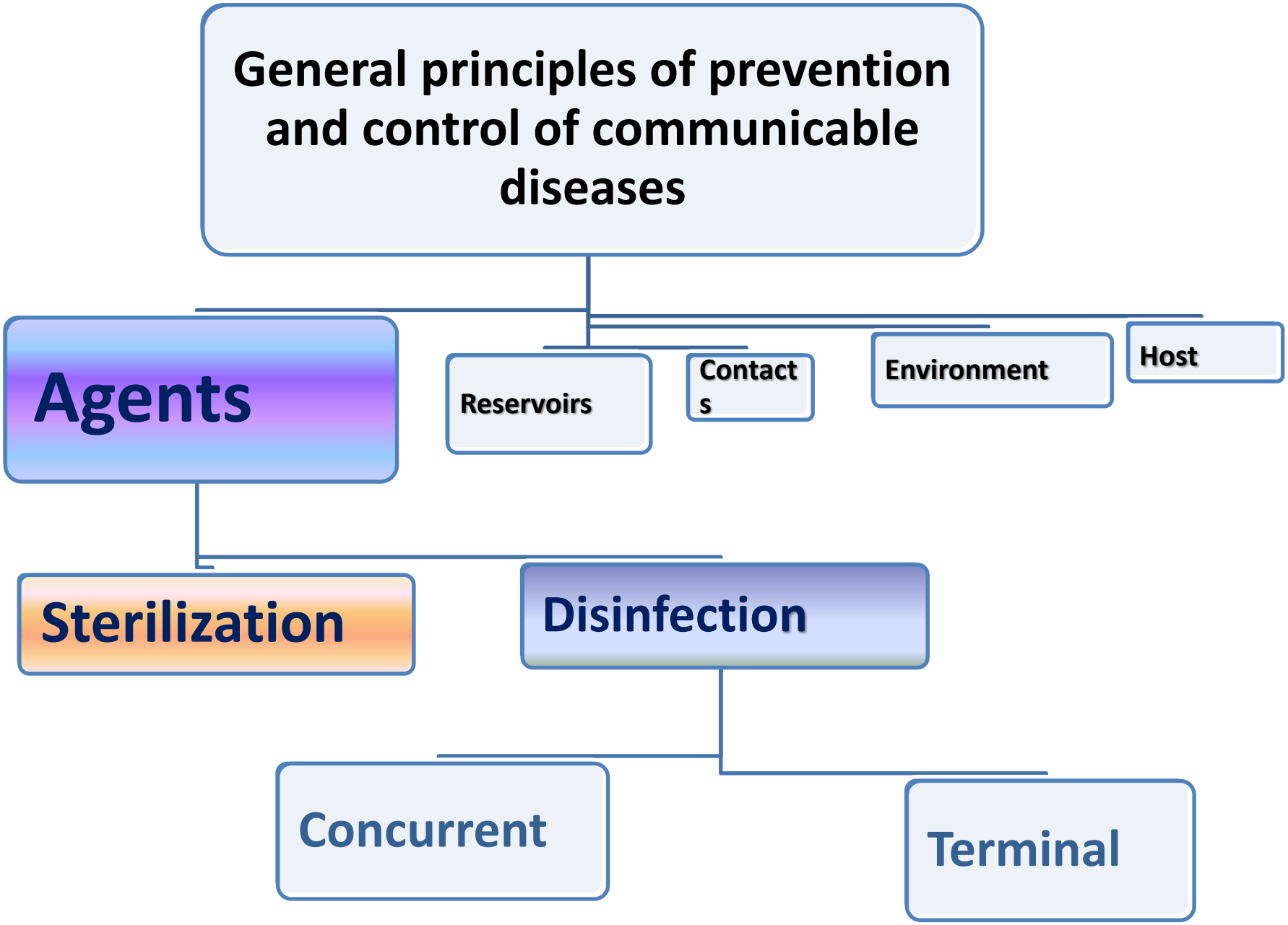

General principles of prevention and control of communicable diseases
Agents
Reservoirs
Contacts
Environment
Host
Sterilization
Disinfection
Concurrent
Terminal

1.Measures Applied to The Agent

❑ Sterilization :

- ❖ Validated process used to render a product free of all forms of viable microorganisms including bacterial spores.
- ❖ killing all forms of living organisms,
- ❖ it is used for medical and surgical instruments by direct exposure to the sterilizing agent.

❑ Disinfection :

- ❖ Disinfection is less lethal than sterilization because it
- ❖ destroys most recognized pathogenic microorganisms but
- ❖ not necessarily all microbial forms (e.g., bacterial spores).
- ❖ killing the infectious agents outside the body
- ❖ by direct exposure to chemical or physical agents.

(a) Concurrent disinfection
(b) Terminal disinfection
(c) Precurrent (prophylactic) disinfection

Types of Disinfection

1 Concurrent disinfection
2 Terminal disinfection

(a)concurrent Disinfection

❖ application of disinfective measures **as soon as possible**

- **after the discharge of infectious material from the body of an infected person,** or
- **after the soiling of articles** with such infectious discharges

❑ **In other words**, the **disease agent is destroyed as soon as**

- **it is released from the body, and**

❖ in this way **further spread of the agent is stopped.**

❖ **Concurrent disinfection consists of usually disinfection** of

- ✓ **urine, faeces, vomit, contaminated linen, clothes, hands,** dressings, gloves, etc

❖ **throughout the course of an illness.**

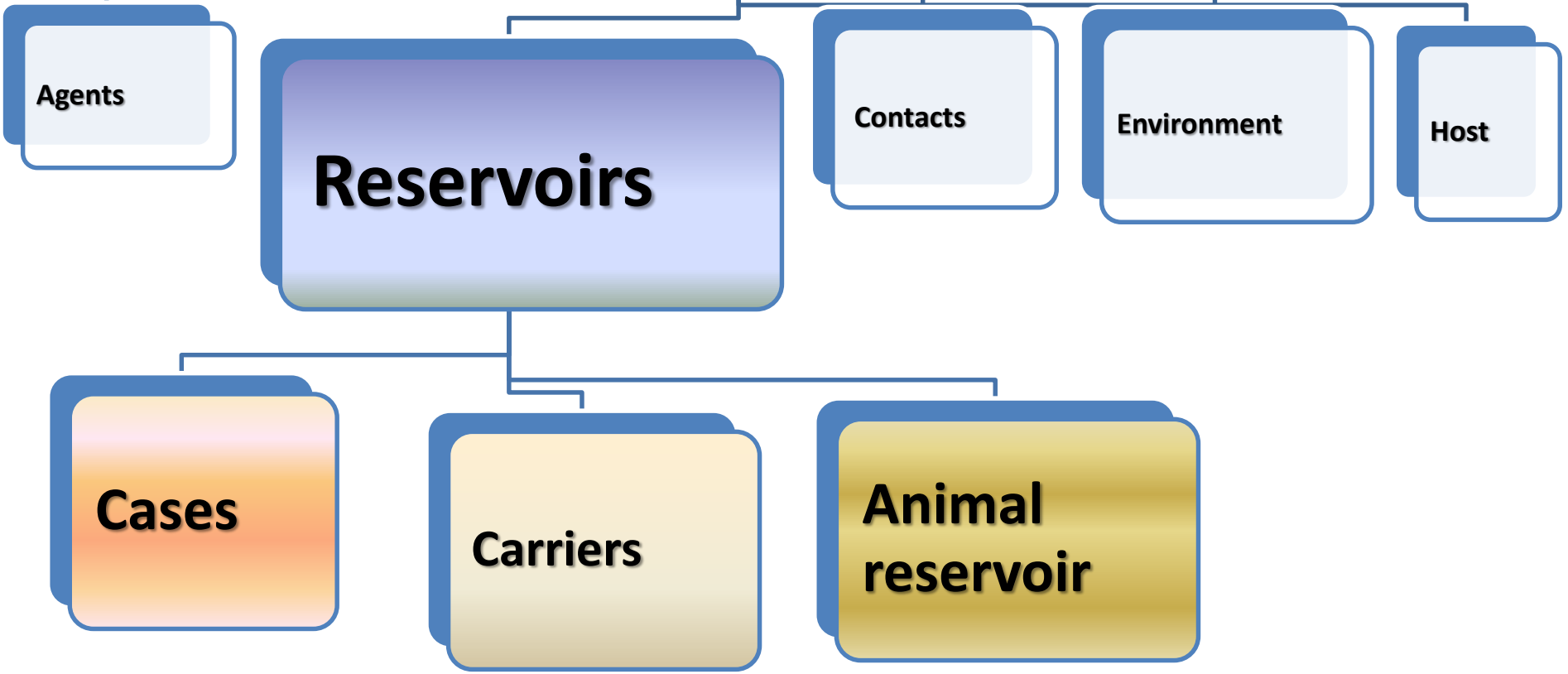
(b) Terminal disinfection :

- Application of disinfective measures **after the patient has been removed by death or to a hospital** or
- **has ceased to be a source of** infection (by treatment). or after **other hospital isolation**

(c) Precurrent (prophylactic) disinfection :

- **Disinfection of water by chlorine**,
- **pasteurization of milk** and
- **hand washing may** be cited as examples of precurrent

General principles of prevention and control of communicable diseases



II. Controlling the reservoir

If the first link in the chain of causation (i.e, the disease agent) **is** consider be **the weakest link**,

logically, the **most desirable control measure would be to eliminate the reservoir or source**, **if that could be possible**.

- **Elimination of the reservoir may be easy with the animal reservoir** (e.g., bovine tuberculosis, brucellosis),
- **but is not possible in humans in whom the**

❑ **General measures of Reservoir control comprise** :

1) Early Diagnosis,
2) Notification,
3) Isolation,
4) Treatment,
5) Quarantine,
6) Surveillance and
7) Disinfection –

all directed to reduce the quantity of the agent available for dissemination.

early diagnosis, notification, isolation, treatment, quarantine, surveillance disinfection

(1) Early Diagnosis and Case finding

- **Rapid identification is the first step** in **the control of a communicable disease.**
- It is the **cornerstone on which the organization of disease control is built.**
- **laboratory procedures may be required to confirm the** diagnosis.

- **Early diagnosis is needed for**

(a) **the treatment of patients**

(b) for epidemiological investigations, e.g. to

***trace the source** of infection from the

***known or index case** to the unknown or

*the **primary source** of infection

c) **to study the time, place and person distribution**

(descriptive epidemiology)

(d) for the **Establishment of prevention and control measure**

early diagnosis,
notification,
isolation,
treatment,
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surveillance
disinfection

(2) Notification

Notification is an important source of epidemiological information

- It enables **early detection** of disease outbreaks, **which**
- **permits immediate action to be taken by the health authority to control their spread.**

❑ **Once an infectious disease has been detected** (**or even suspected),**

❑ **it should be notified to the:**

❖ **Local health authority,**

- whose responsibility is to put into **operation control measures**, including the provision of medical care to patients, perhaps in a hospital.
- **The diseases to be notified vary from country to country;**
- **and even within the same country.**

Controlling the reservoir

Usually, diseases which are considered to be serious Dangers to public health are included in the list of notifiable diseases.

- **Notifiable diseases may also include non-communicable diseases**

❑ **Under the International Health Regulations (IHR),** WHO.

Reporting:

- ❑ diseases **in man** are reported to the **local health authority**
- ❑ **in animals** are reported to **veterinary or agricultural authority**
- ❑ **Zoonotic diseases** are reported to **both authorities**.
- ❑ Diseases **under international regulations** are reported to **WHO.**
- ❑ **The aim of reporting**
  - ➢ **provide information** to permit **appropriate control measures**
  - ➢ **compare the frequencies of diseases occurrence between different countries**

(3) Isolation

Isolation is the oldest communicable disease control measure. **It is defined as:**

"separation, for the period of communicability of infected persons or animals from others in such places and under such conditions, as

- **To prevent or limit the direct or indirect transmission of the infectious agent from those infected to those who are susceptible, or who may spread the agent to others"**

❖ **In general, infections from human/animal can be done by**

- **Physical Isolation of the case or carrier, and if necessary,**
- **treatment until free from infection,**
- **provided cases and carriers can be easily identified and**
- **carrier rates are low.**

purpose of isolation

❖ **The purpose of isolation is**

To Protect the community by preventing transfer of infection from the reservoir to the possible susceptible hosts.

❖ **Place of isolation:**

- **Isolation** in a **hospital or in separate quarter** is required for ***cholera, plague.***
- Isolation **at home**: if home is suitable for patients of ***typhoid, meningitis, whooping cough, poliomyelitis and hepatitis A.***
- **Hospital isolation, wherever possible, is better than**
  - Home isolation.

❖ **The duration of isolation**

Is determined by the duration of communicability of the disease and the effect of chemotherapy on infectivity

❑ Isolation is of limited value due to:

- **Many** diseases are **highly communicable** during the **early stage**.
- The **exact period of communicability is not known** in many diseases.
- **Carriers** of infective agents may go **undetected.**
- Many **mild cases of infection spread disease without being detected**

Today, isolation is recommended only when the risk of transmission of the infection is exceptionally serious.

- In modern-day disease control, **isolation is** in most cases
- **replaced by surveillance because of improvements in epidemiological and disease control technologies.**

Surveillance

- **Surveillance:**

it is the **collection, analysis, interpretation and dissemination** of **information about a selected health event**.

- This information is **important** to **plan, implement** and **evaluate a health program**

early diagnosis, notification, isolation, treatment, quarantine, surveillance disinfection

(5) Quarantine

Quarantine has been defined as

- "the **limitation of freedom of movement** of such **well persons** or domestic **animals exposed to communicable** disease for a **period of time not longer than the longest usual incubation period** of the disease, in such manner as **to prevent effective contact with those not so exposed**" .
- Quarantine measures are also "**applied by a health authority to a ship**, an **aircraft, a train, road vehicle, other means of transport** or container, to
  - **prevent the spread of disease, reservoirs of disease or vectors of disease**"
  - **In contrast to isolation, quarantine applies to restrictions on the healthy contacts** of an infectious diseas

- ❑ **prevent the spread of disease, reservoirs of disease or vectors of disease"**
- ❖ **In contrast to isolation, quarantine applies** to **restrictions on the healthy contacts** of an infectious disease

With better techniques of early diagnosis and treatment,

It has been replaced by active surveillance.

(5) Treatment Chemoprophylaxis

- ❖ Many communicable diseases have been controlled by
- ❖ effective drugs
- ❖ **The use of drugs**
- ❖ **to Cure** clinically recognizable disease or
- **To limit its progress**

early diagnosis,
notification,
isolation,
treatment,
quarantine,
surveillance
disinfection

- ❑ **The object** of treatment is **to**
  - ➢ **kill the infectious agent when it is still in the reservoir**, i.e.,
  - ➢ **before it is disseminated**
- ❖ It is for the **sake of the patient** and

Cont. **Treatment Chemoprophylaxis**

early diagnosis,
notification,
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disinfection

- It is for the **sake of the patient** and
- to **reduce the period** of **communicability and**
- **to limit the transmission** to the contacts.
- cuts **short the duration** of illness and
- **prevents** development **of secondary cases**.

- **Treatment is also extended to carriers.**
- Treatment can take the form **of individual** treatment or **mass treatment**.
- In the latter category, **all the people in the community are administered** the drugs whether **they have the disease or not** (e.g., trachoma **Azithromycin**).

❑ . Measures applied to the carriers

Detection

Exclusion from work

Treatment apply to carrier

1. Detection:

- detection of carriers is **important** in diseases in which carriers are an **important reservoir of** infection, e.g. **Enteric fever,**

❑ **The value of detection of carrier depends on:**

❖ **Proportion** of carriers in the community.

❖ **Occupation of the carrier** and its intimacy(closeness) to contacts as **food handlers** and those **working in closed community** (*school or day care centers*)

2. Exclusion from work:

must be done if his occupation is a **food handlers** (e.g. Typhoid carrier) or a teacher (diphtheria carrier).

3. Treatment applied to the carrier state

III. Interruption of transmission

A major aspect of communicable disease control relates to "breaking the chain of transmission "or interruption of transmission

- This may mean **changing some** components **of man's environment**

✓ **to prevent the infective** agent from a patient or carrier from **entering** the **body of susceptible person**.

For example, water can be a medium for the transmission of many diseases such as typhoid, dysentery, hepatitis A, cholera and gastroenteritis.

➢ **Water treatment will eliminate these diseases.**

- **Depending upon the level of pollution, this may vary from simple chlorination to complex treatment.**

❖ Foodborne disease

is particularly prevalent in areas having low standards of sanitation.

Clean practices such as **hand washing, adequate cooking**, prompt **refrigeration** of prepared foods and withdrawal of contaminated **foods will prevent most food-borne illnesses** .

- ❖ When the **disease is vector-borne**,
- ❖ control measures should be directed **primarily at the**
- ❖ **vector and its breeding places**.

Vector control also includes **destruction of stray dogs,** control **of cattle**, **pets and other animals**

to minimize spread of infection among them, and from them to man.

❖ **On the other hand, droplets or droplet nuclei infection** are **not usually controlled effectively by attempting to**

- **interrupt their mode of spread;** **reliance is placed on**
- **early diagnosis and treatment** of patients,
- **personal hygiene and**
- **proper handling of secretions and excretions**.

- **4. Measures applied to environment**
- Chlorination of water.
- Sanitary sewage and refuse disposal.
- Rodent control.
- Vector and food sanitation.

4. The Susceptible Host

The third link in the chain of transmission is the susceptible host **or people at risk**.

may be protected by one or more of the following strategies.

A. Non-specific measures:

- **health education,**
- **good nutrition,**
- **personal hygiene and**
- **protection against accidents.**
- **adequate housing,**
- **recreational facilities,**
- **suitable working conditions,**
- **periodic selective examination**,
- **legislative measures** to formulate **integrated programme** and permit **effective programme implementation.**

B. Specific measures:

Use of specific immunization active passive and chemoprophylaxis.

(1) Active Immunization

- is one of the most powerful and cost-effective weapons of modern medicine
- One effective way of strengthen the host defences and controlling the spread of infection.
- **There are some infectious diseases whose control is solely based** on **active immunization**, ***e.g.,***
- *polio,*
- *tetanus,*
- *diphtheria*
- *measles*.

Vaccination against these diseases is given as a routine

- **during infancy& early childhood**
- with **periodic boosters** to **maintain adequate levels of immunity.**

By **reducing the number of susceptible** in the community, it augments (increase) "**herd immunity**

- **Unfortunately we do not have vaccines for every infectious disease (e.g., malaria, diarrhoeal diseases).**

- there are **immunizations against certain diseases** {which are offered to **high risk groups** or
- restricted to **definite geographic areas** where the disease is **endemic or a public health problem** {e.g., yellow fever).

(2) Passive Immunization

Three types of preparations are available for passive immunity –

(a)Normal human immunoglobulin,

(b) Specific (hyperimmune) human immurioglobulin, and

(c) antisera or anti-toxins

- It is useful only when exposure to infection has just occurred
- **duration of immunity induced is short (1-6 weeks).**
- **Undesirable reactions may occur**, especially if antiserum is of non-human origin.
- **It has a limited value in the mass control** of disease.
- **It is recommended for non-immune persons under special circumstances.**

(3) Combined Passive and Active Immunization

In some diseases (e.g., tetanus, diphtheria, rabies)
passive immunization is often undertaken in conjunction with inactivated vaccine products, to provide both mediate (but temporary) passive immunity and slowly developing active immunity.
If the injections are given at separate sites, the immune response to the active agent, may or may not be impaired by immunoglobulin .

But, according to current recommendations immunoglobulin should not be **given within 3 weeks before, or until 2 weeks after administration of a live attenuated vaccine**
For example, the antibody response to live attenuated measles vaccine is diminished in persons who receive immunoglobulin concurrently
However, there are exceptions to this rule, as for example, the simultaneous administration of hepatitis B vaccine and hepatitis B immunoglobulin .

4) Chemoprophylaxis

Chemoprophylaxis implies the

- **protection from, or**
- **prevention of, disease.**

This may be achieved by

- ✓ **Causal Prophylaxis, or by**
- ✓ **Clinical Prophylaxis :**

(i) **Causal prophylaxis implies the complete prevention of infection** by **the early elimination of the invading or migrating causal agent.** For example, there is no causal prophylaxis available against malaria.

(ii) **Clinical prophylaxis implies** the **prevention of clinical symptoms**; it **does not necessarily mean elimination of infection.**


A Big
Thank
You!