

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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PROF. DR. WAQAR AL-KUBAISY

DISEASE PREVENTION AND CONTROL

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

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PROF. DR. WAQAR AL-KUBAISY

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.**

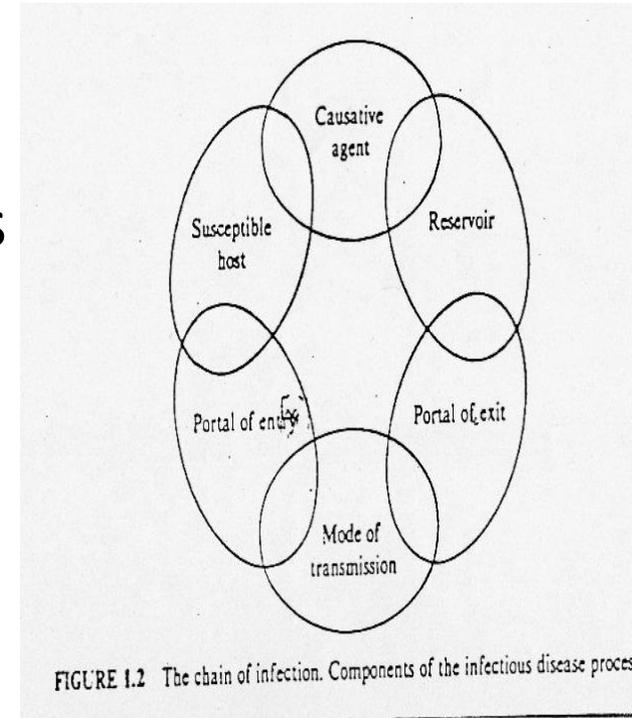
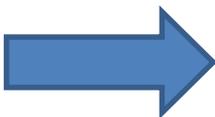


FIGURE 1.2 The chain of infection. Components of the infectious disease process.

- ❖ The **choice of methods** will **depend** upon **factors** such as
 - **Availability** of proper tools and techniques,
 - **Efficiency** التكلفة
 - Relative **cost effectiveness**,
 - **Acceptability**. → درجة القبول
- ❖ 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.* مقبض
- ❖ **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

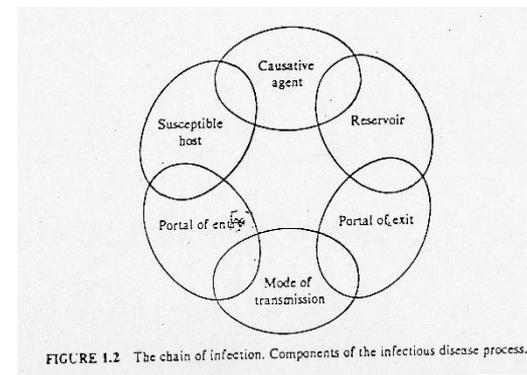
□ **Prevention** and control activities of disease required

- Community Participation,
- Political Support and → اجراءات الحكومة
- Intersectoral Coordination. → كل القطاعات تُساهم

□ 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).



General principles of prevention and control of communicable diseases

Agents

Reservoirs

Contact
s

Environment

Host

التطهير (التخلص من Pathological Agent)

Sterilization

تحقيق (الطضاء على حياة ال Agent)

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,** disinfection not kill spores
- ❖ 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** بعد امتساح المواد 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**

هي عملية تنظيف وتطهير شاملة تُجرى بعد خروج المريض (أو وفاته/نقله) من غرفة أو جناح، خاصة إذا كان مصابًا بعدوى معدية

(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

Agents

مستودع المرض
Reservoirs

Contacts

Environment

Host

Cases

Carriers

**Animal
reservoir**

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**, → التبليغ الطوري

3) **Isolation**,

4) **Treatment**,

5) **Quarantine**,

6) **Surveillance** and

7) **Disinfection** –

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

النشر

(1) Early Diagnosis and Case finding

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

❖ **Rapid identification is the first step** in the control of a communicable disease.

حجر الأساس

➤ 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

تتبع العدوى

*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,
quarantine,
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
الطب البيطري الزراعة
- ❑ **Zoonotic diseases** are reported to **both authorities**.
الأمراض المشتركة
- ❑ 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

Controlling the reservoir

عزل للمرضى

(3) (Isolation)

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

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

أطول فترة عدوى للمريض

"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*.
الطاعون

❑ Isolation **at home**: if home is suitable for patients of *typhoid, meningitis, whooping cough, poliomyelitis and hepatitis A*.
شلل الأطفال

❑ **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

(5) (Quarantine)

حجر
للأشخاص
الأصحاء
المعرضين للمرض

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

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 disease

□ 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

□ 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

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

Cont. Treatment Chemoprophylaxis

early diagnosis,
notification,
isolation,
treatment,
quarantine,
surveillance
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. → all populations
- ❖ 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.

الأمران مطلوبان

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)** → الأضرار المنقولة بالغذاء

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 أماكن تكاثره

- ❖ **vector and its breeding places.**

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

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" → مناعة القطيع

- ❖ 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 immunoglobulin, 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!

