



# Natural History of Disease and Concepts of Prevention and Control

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# Session Objectives

1. To describe **theories** postulated for the development of diseases
2. Explain the concepts of **iceberg phenomenon** of diseases
3. Understand the **relationship between host, environment and agent** in disease causation
4. Define the term **prevention**
5. Identify the **level of prevention** in relation to stage of disease development
6. Identify the **measures** applied at each level of prevention.

# Session Overview

- Theories of Disease Causation.
- Natural History of Disease
- Spectrum of Disease
- Iceberg of Disease
- Concept of Prevention
- Modes of Intervention

**Etiology**

**Risk Factors**



**Diagnostic  
measures**

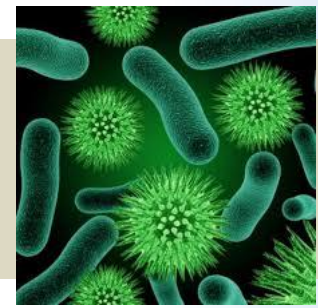
**Therapeutic  
measures**

**Preventive  
measures**

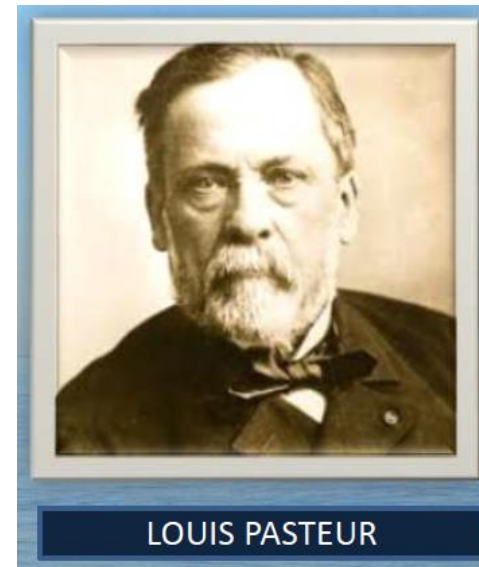
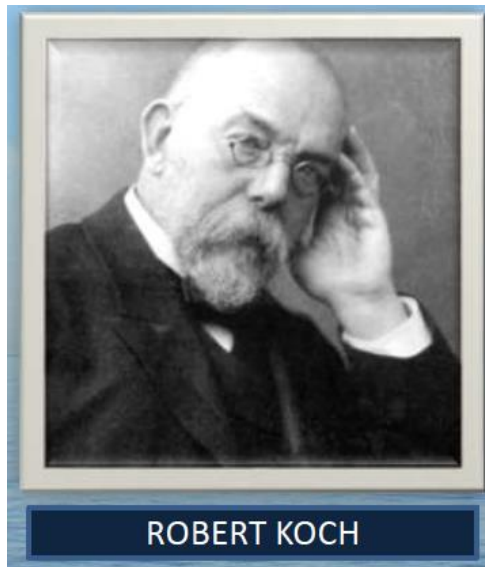
# Theories Of Disease Causation



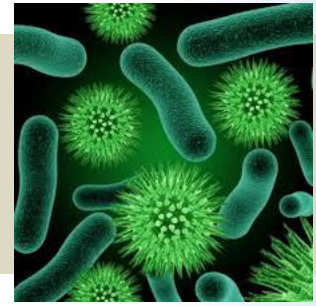
# Germ Theory



- In the second half of 19<sup>th</sup> century
- Proposed by Robert Koch and Louis Pasteur (discovery of bacteria).

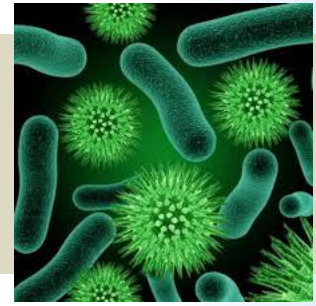


# Germ Theory

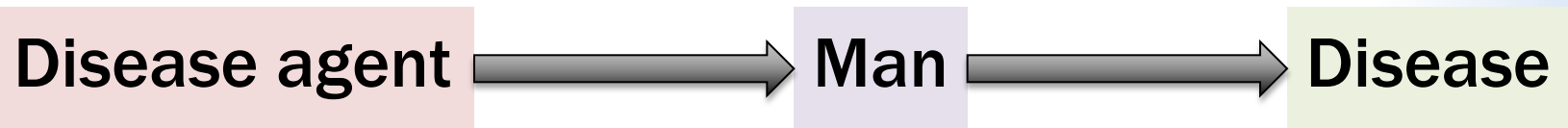


Every human disease is caused by a microbe or germ, which is specific for that disease and one must be able to isolate the microbe from the diseased human being.

# Germ Theory



One to one relationship between causal agent and disease.

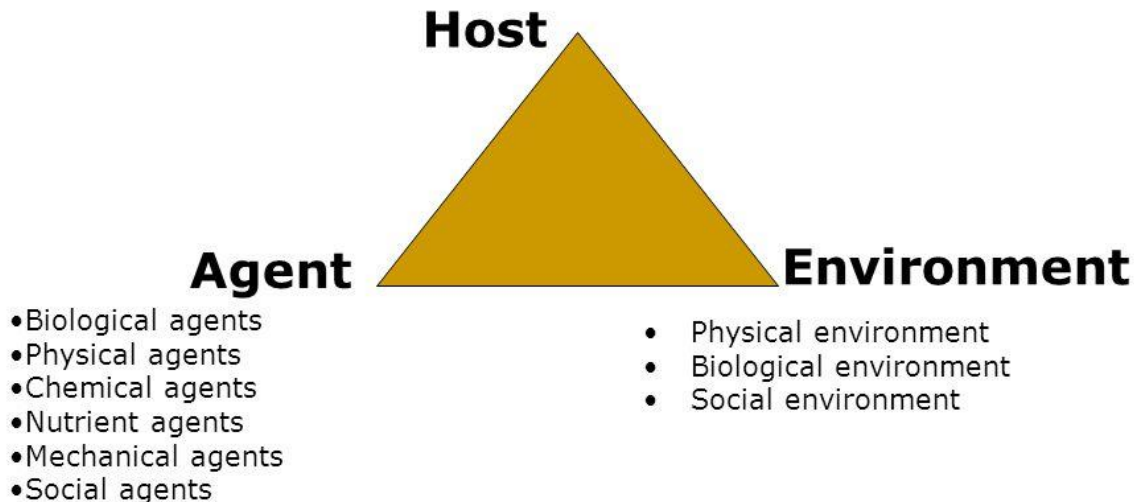




# The Epidemiological Triad

## Epidemiologic triad

- Demographic characteristics
- Biological characteristics
- Socioeconomic characteristics

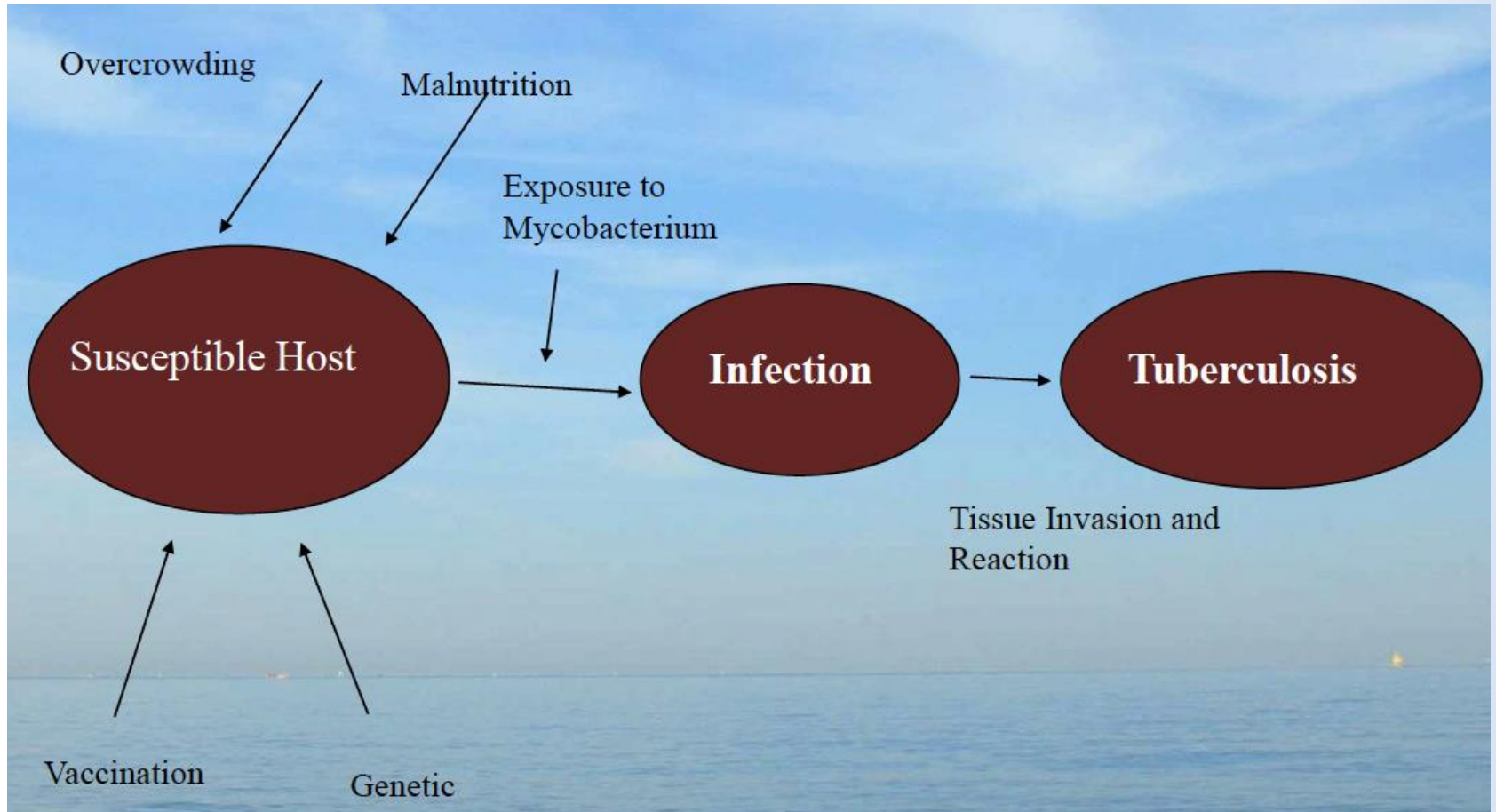


# The Epidemiological Triad

## Example

Not everyone exposed to tubercle bacteria develops tuberculosis but the same exposure in an undernourished or immunocompromised person may result in clinical disease and exposure occurs more in **overcrowding**.

# The Epidemiological Triad



# The “BEINGS” Model of Disease Causation

## A complex interplay of nine different factors

- **B**iological factors innate in a human being,
- **B**ehavioural factors concerned with individual lifestyles,
- **E**nvironmental factors as physical, chemical and biological aspects of environment,
- **I**mmunological factors,
- **N**utritional factors,
- **G**enetic factors,
- **S**ocial factors,
- **S**piritual factors and
- **S**ervices factors, related to the various aspects of health care services.

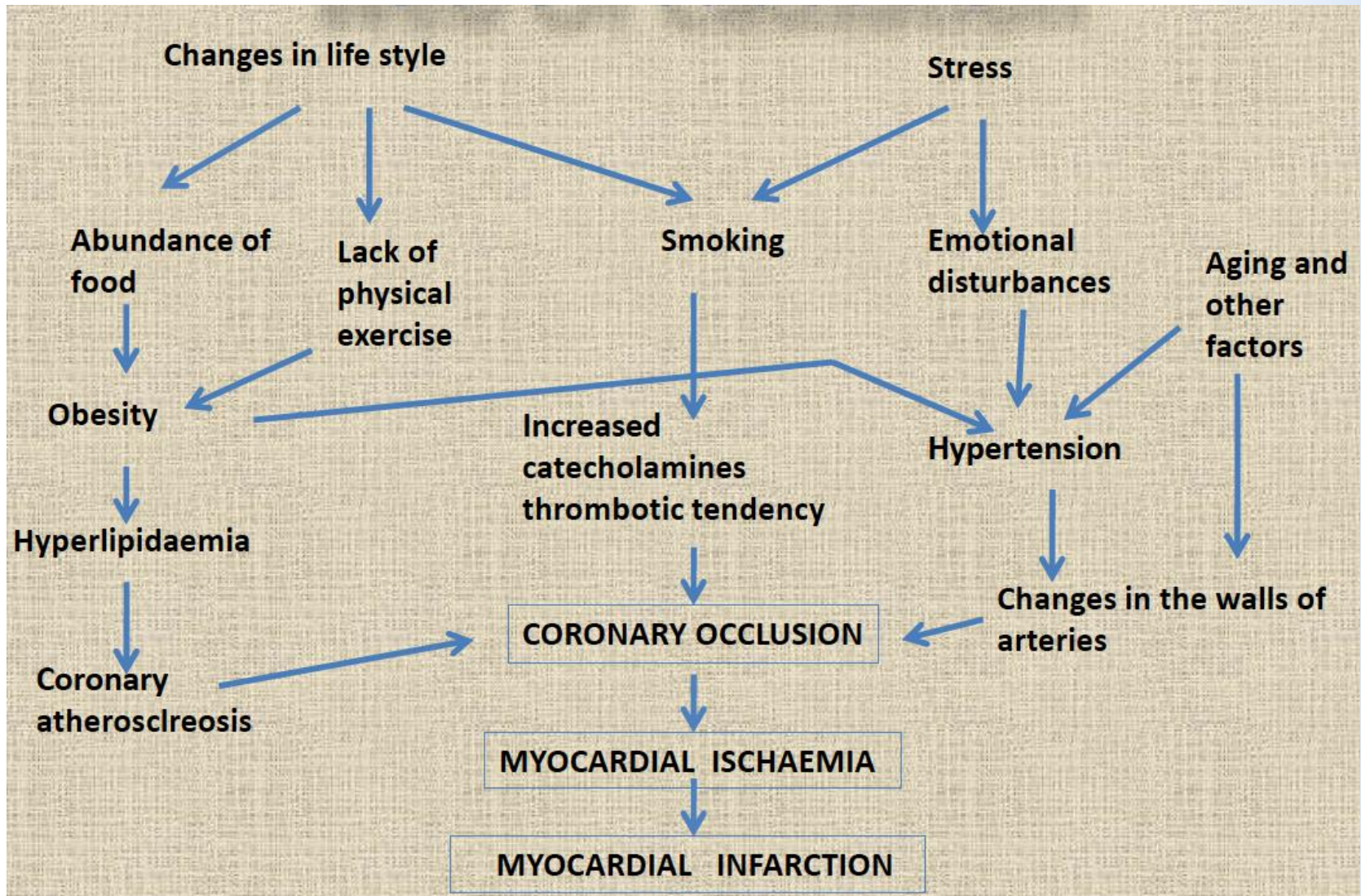
# The Theory of “Web of Causation”

- Suggested by MacMohan and Pugh.
- The various factors are like an interacting web of a spider.
- **Each factor** has its own relative importance in **causing** the final departure from the state of health, as well as **interacts** with others, **modifying** the effect of each other.

# The Theory of “Web of Causation”

- Ideally suited in the study of **chronic disease**, where the **agent is often not known** and disease is the outcome of **interaction of multiple factors**.
- This model of disease causation considers **all predisposing factors** of any type and **their complex interrelationship** with each other.

# The Theory of “Web of Causation”

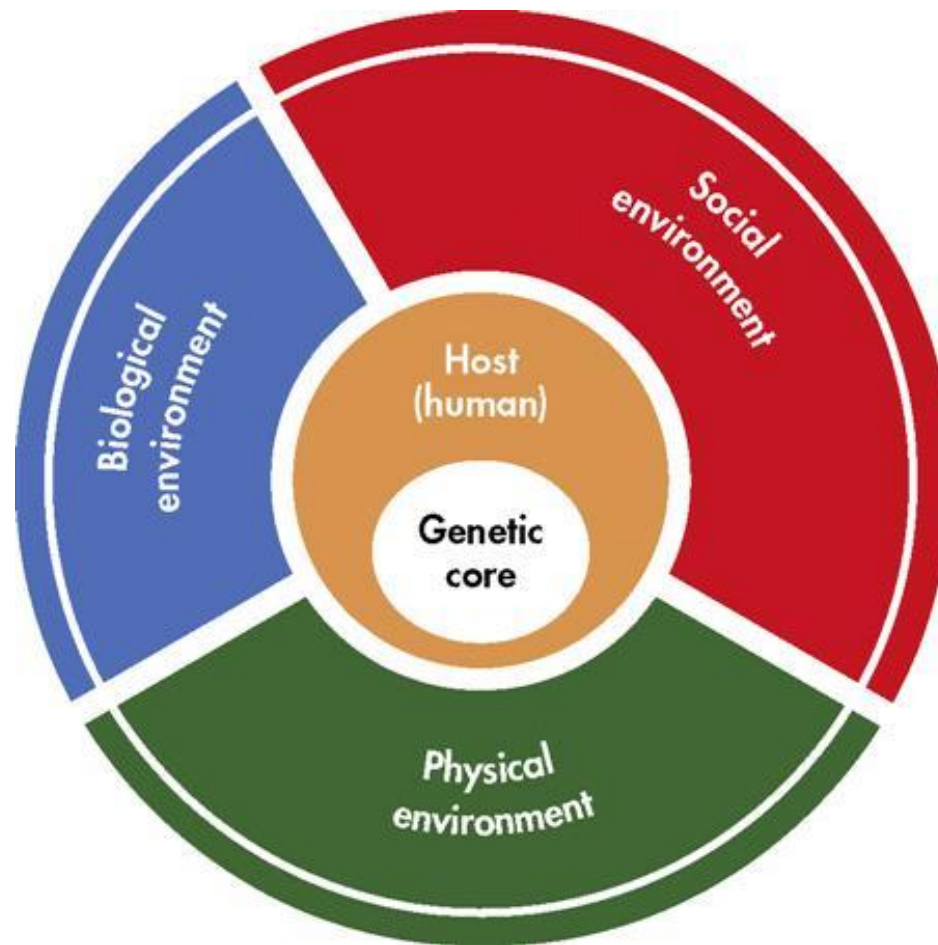


# Wheel theory

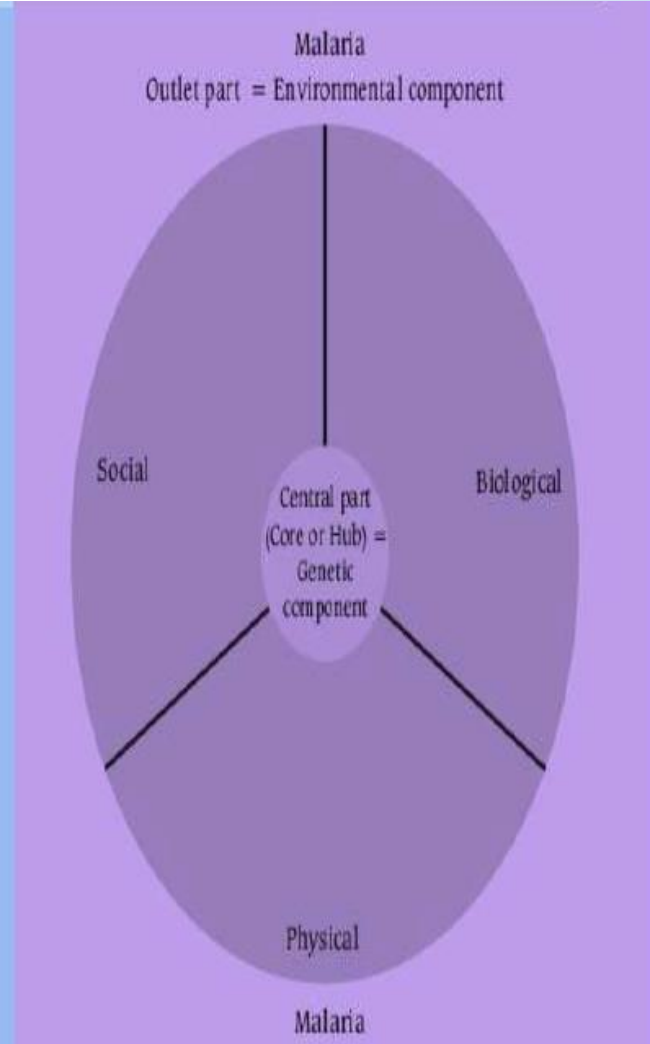
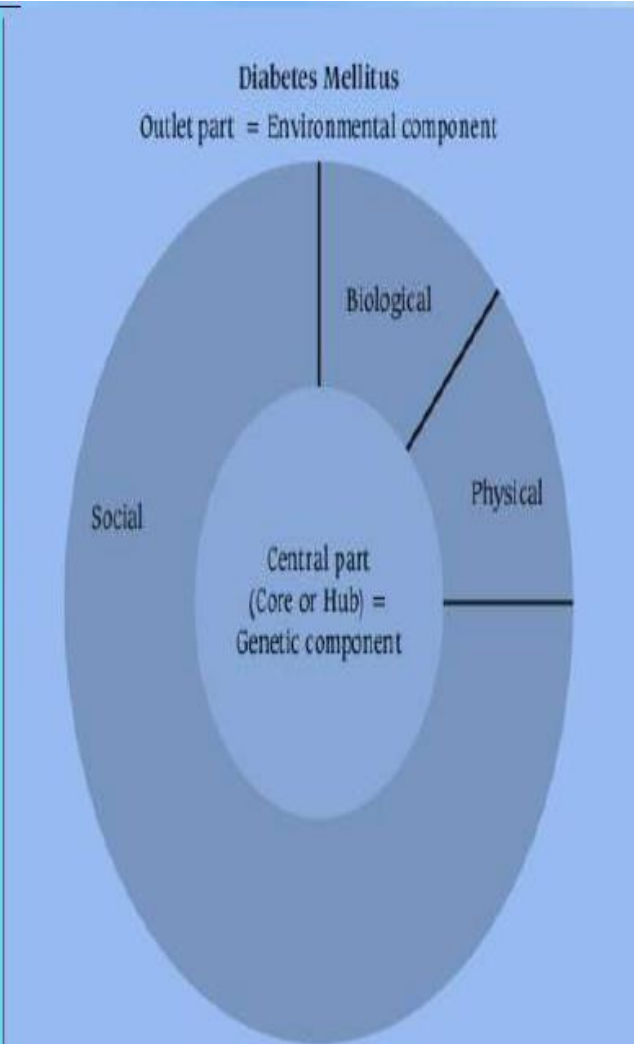
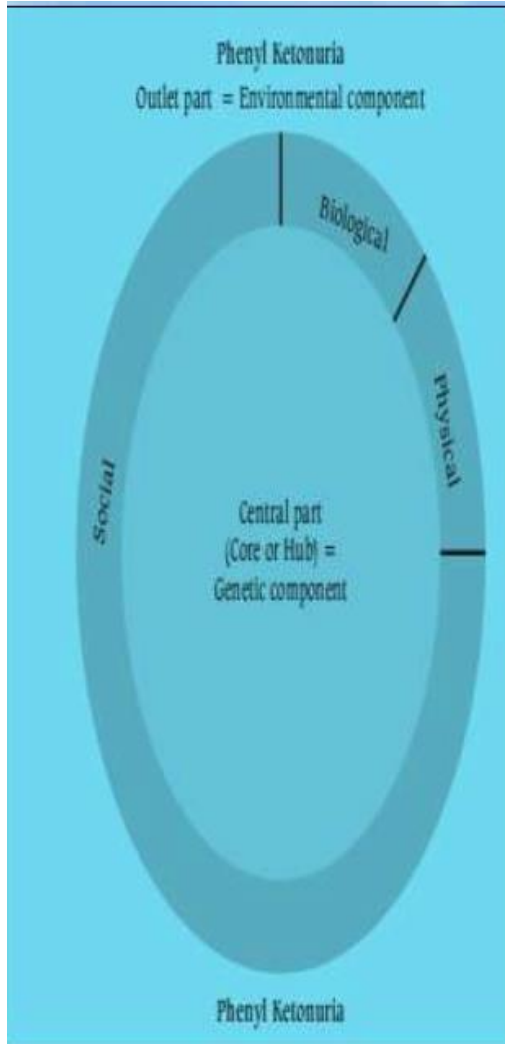
- As medical knowledge advanced, an additional aspect of interest that came into play is the comparative role of “genetic” and the “environmental” (i.e. extrinsic factors outside the host) factors in causation of disease.
- The “triad” as well as the “web” theory does not adequately cover up this differential.
- To explain such relative contribution of genetic and environmental factors, the “wheel” theory has been postulated.



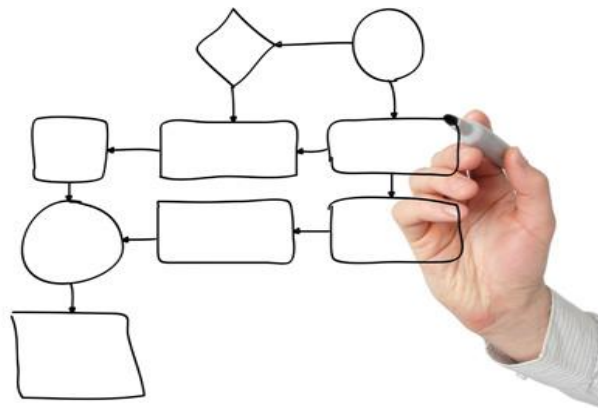
# Wheel theory



# Wheel theory



# Natural History of Disease

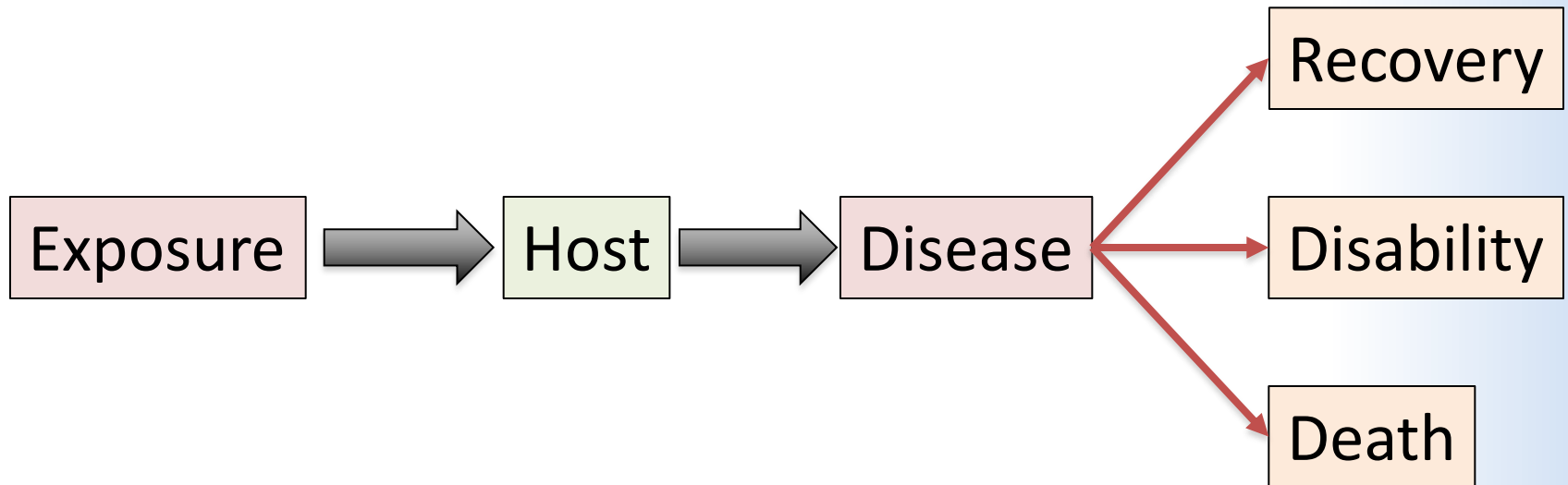


# Definition

- Natural history of disease refers to the **progress** of a **disease process** in an individual **over time**, in the **absence** of intervention.
- The process begins with ***exposure to*** or accumulation of **factors** capable of causing disease

Without medical intervention, the process ends with:

- Recovery
- Disability
- Death



# Why it is important?



# Why it is important?

- It is one of the major elements of **descriptive epidemiology**.
- Understanding the progress of disease process and its pathogenetic chain of events is must for the **application of preventive measures**.

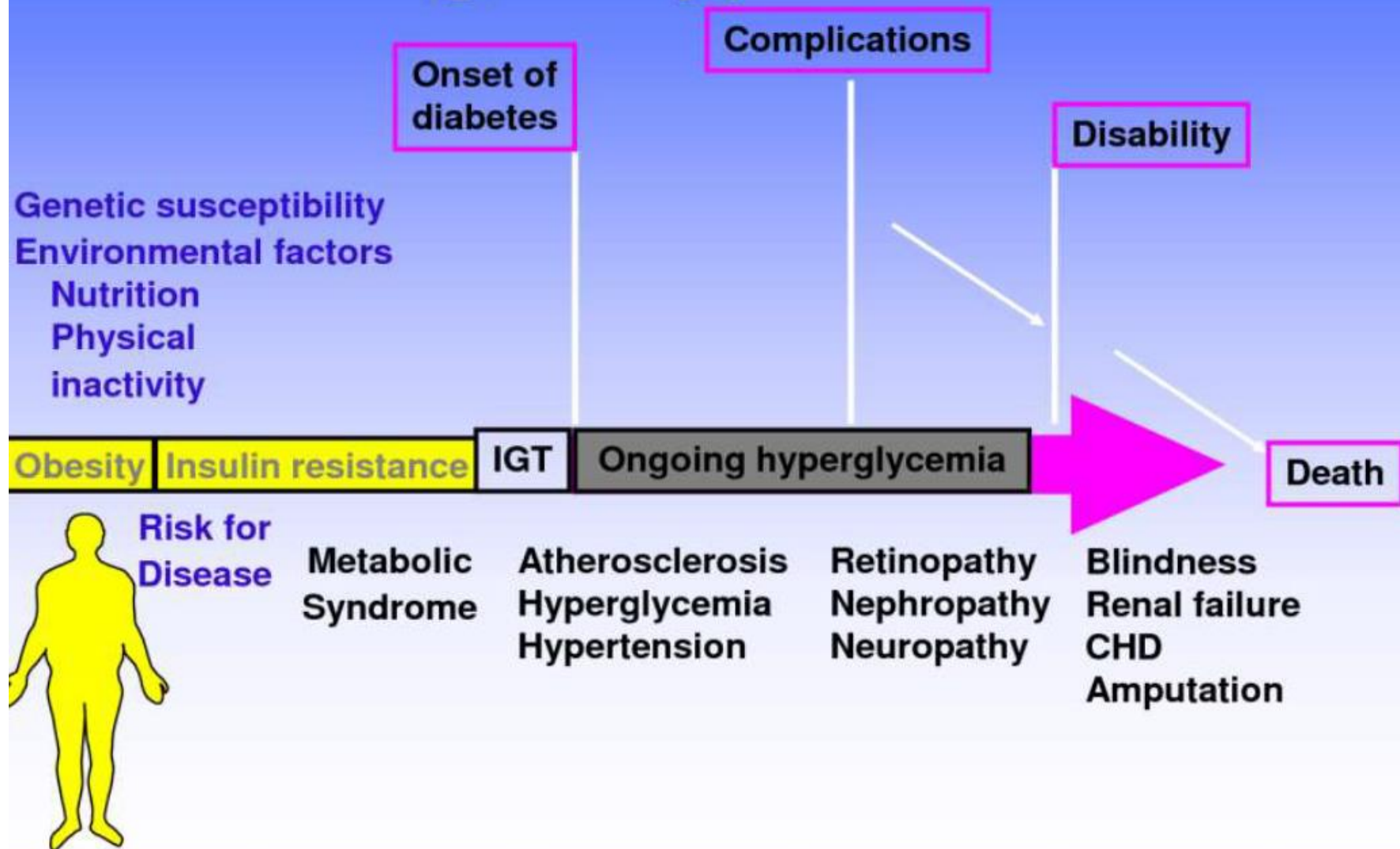
# Schematic Diagram of The Natural history of disease in a patient

Why ?

It is framework to understand the pathogenic chain of events for a particular disease, and for the application of preventive measures.

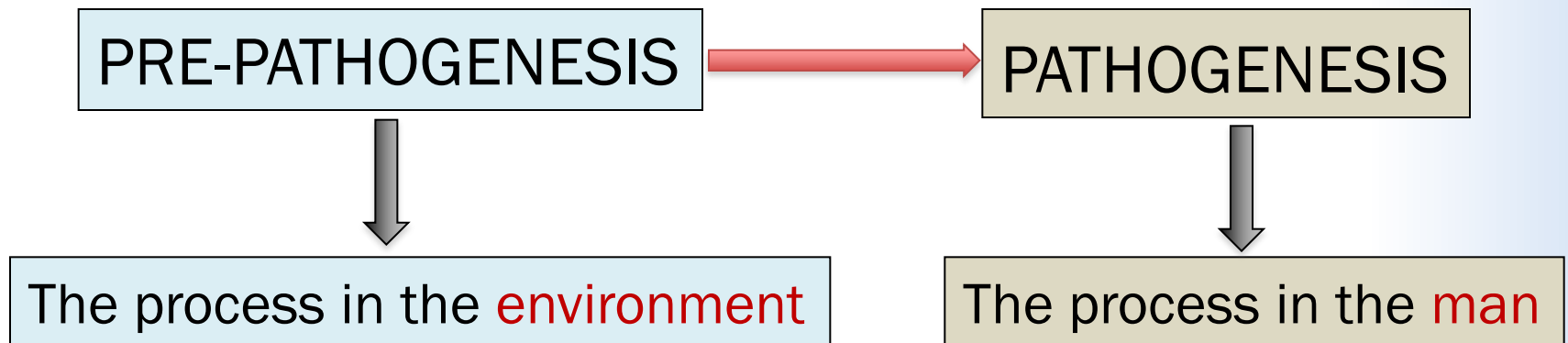


# Natural History of Obesity Leading to Type 2 Diabetes

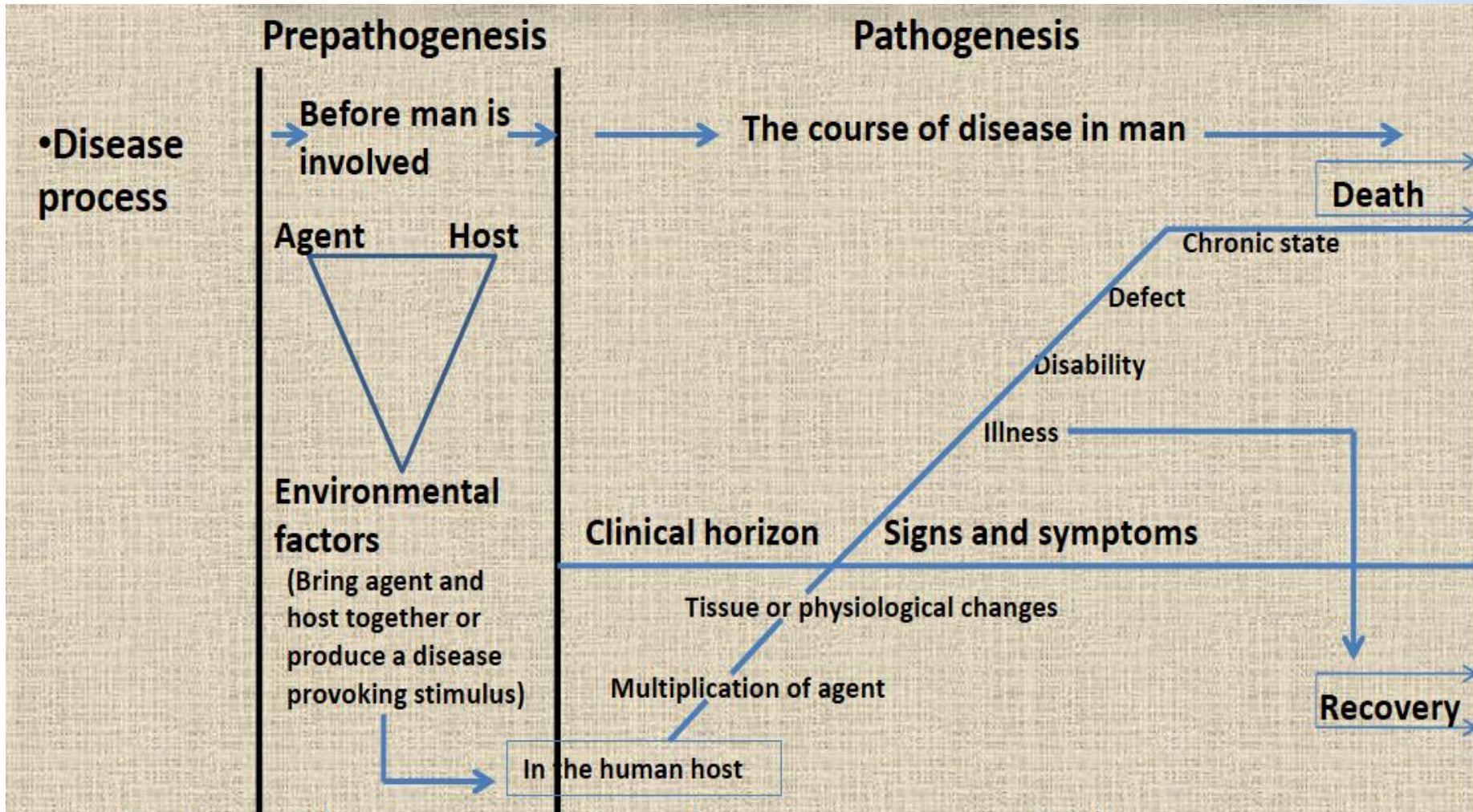


# Schematic Diagram of The Natural history of disease in a patient

Consists of two phases



# Schematic Diagram of The Natural history of disease in a patient



# Pre-pathogenesis phase

- This refers to the period **preliminary to the onset** of disease in man.
- The disease **agent** has **not** yet entered man, but the **factors** which favor its interaction with the human host are already existing in the environment.
- This situation is frequently referred to as “**man exposed to the risk of disease**”.

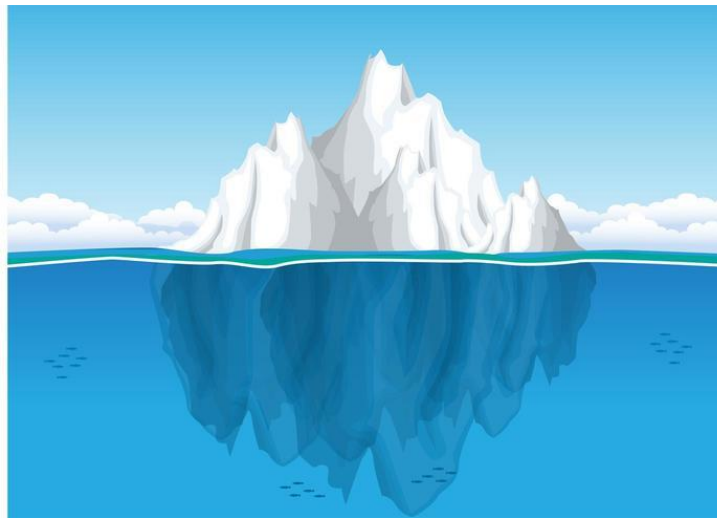
# Pathogenesis phase

- This phase begins with **entry of the disease “agent”** in the susceptible human host.
- After the entry, agent multiplies and induces tissue and **physiological changes**, the disease progresses through the period of **incubation** and later through the period of **early** and **late** pathogenesis.
- The final outcome of the disease may be **recovery**, **disability** or **death**.

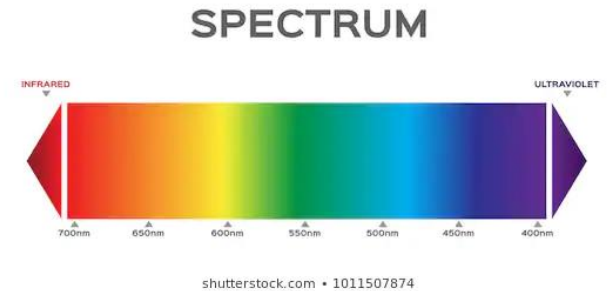
# Pathogenesis phase

- In **chronic diseases**, the early pathogenesis phase is **less dramatic** and is also called as **pre-symptomatic** phase.
- During pre-symptomatic stage, there is **no manifest disease**. The **pathological changes** are essentially below the level of the “clinical horizon”.
- The **clinical stage** begins when **recognizable signs or symptoms appear**.
- By the time signs and symptoms appear, the disease phase is already well advanced into the **late** pathogenesis phase.

# Spectrum of Disease and Iceberg Phenomenon



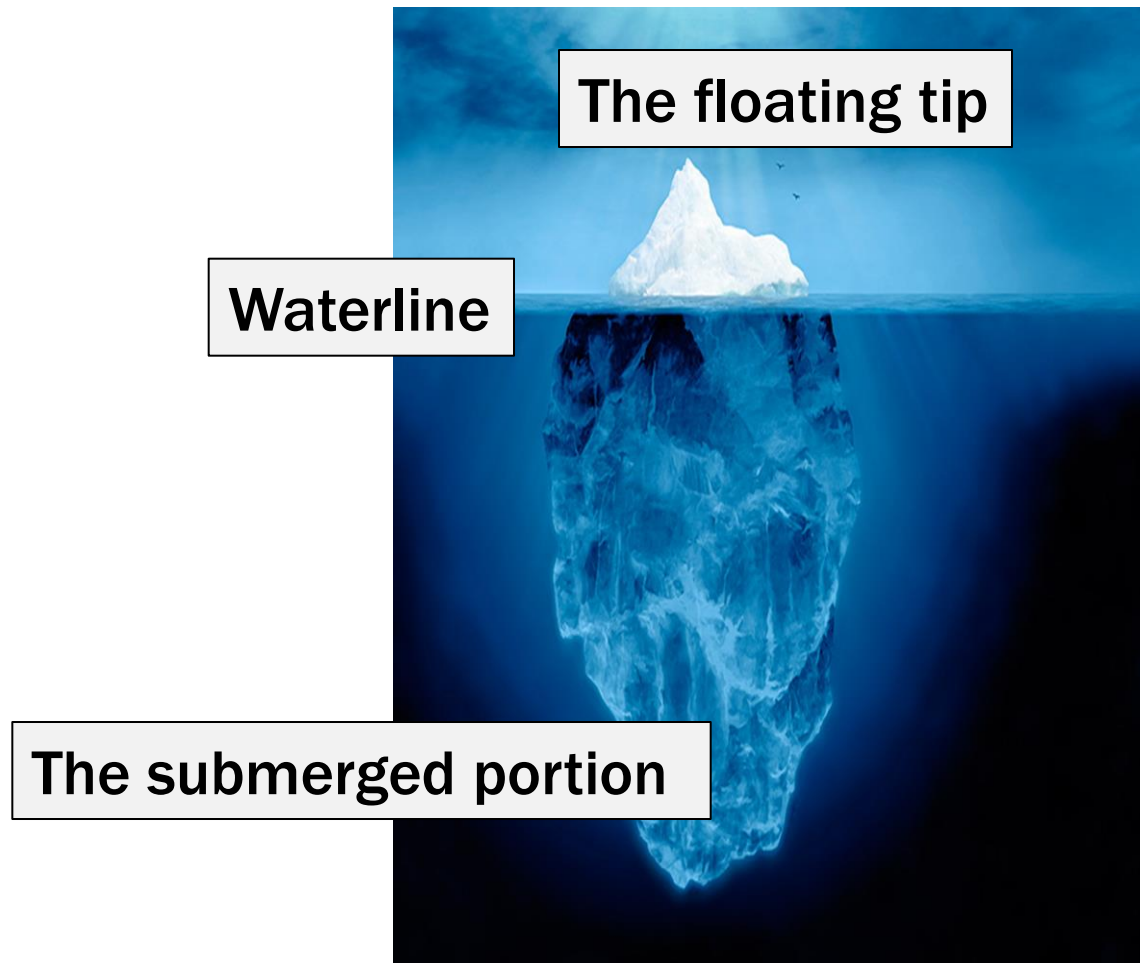
# Spectrum of disease



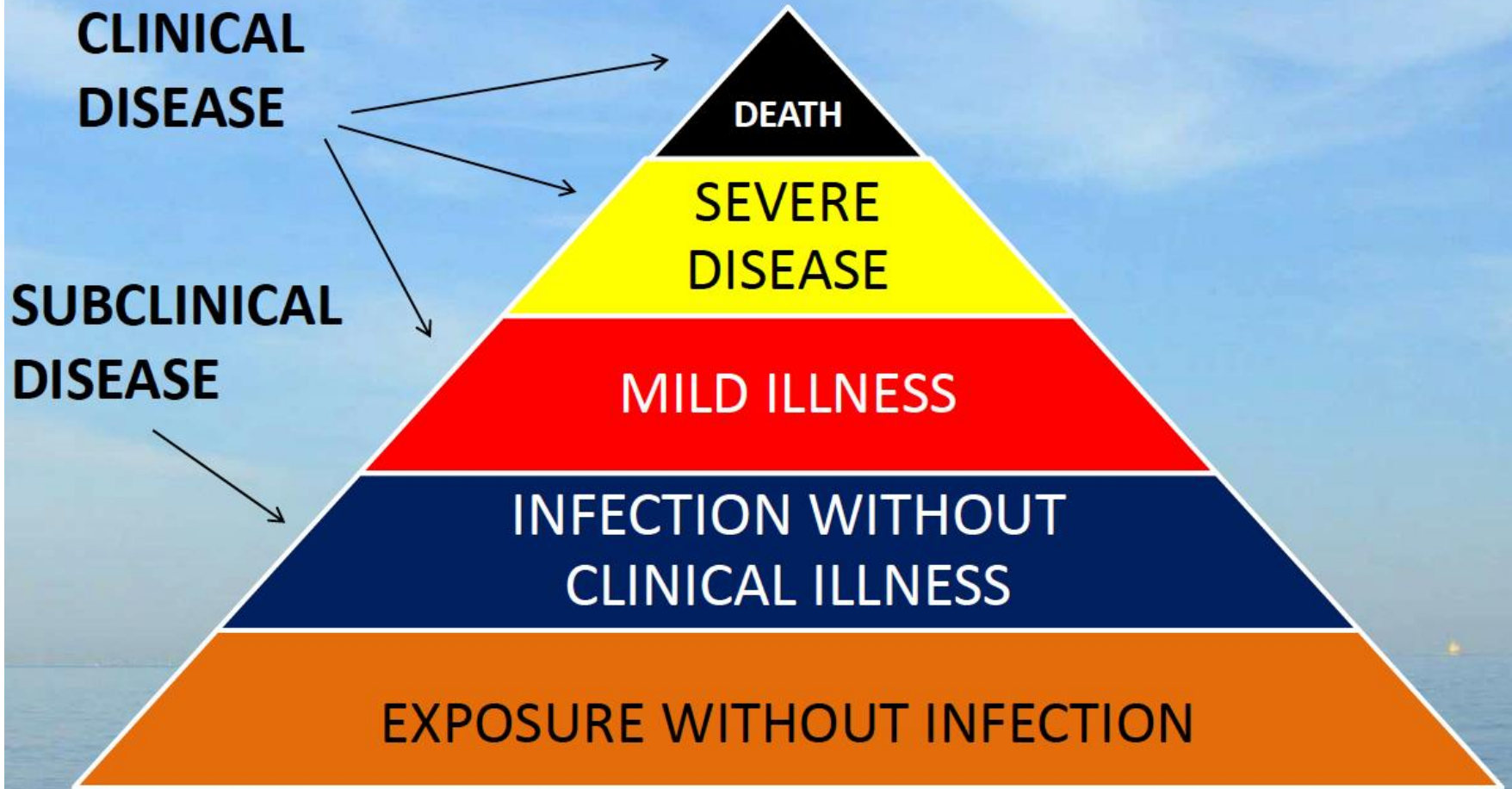
- It is a *graphic* representation of **variations in the manifestations of disease**.
- At the one end of disease spectrum are **sub-clinical infections** which are not ordinarily identified, and at the other end are **fatal illnesses**.
- In the middle of spectrum lie illnesses ranging in severity from **mild to severe**.
- These different manifestations are the result of **individuals' different states of immunity and receptivity**.



# Iceberg of disease



# ICEBERG CONCEPT OF DISEASE



# Concept of Prevention



# Prevention of disease

*Prevention is the process of intercepting or opposing the “cause” of a disease and thereby the disease process.*

## **Successful prevention depends on:**

- Knowledge of causation
- Dynamics of transmission
- Identification of risk factors and risk groups
- Availability of prophylactic or early detection and treatment measures
- Organization to apply these measures
- Continuous evaluation

# Prevention of disease

## Levels Of Prevention

- Primordial prevention
- Primary prevention
- Secondary prevention
- Tertiary prevention

# Primordial prevention

- It is the prevention of the emergence or **development of risk factors in population groups** in which they **HAVE NOT** yet appeared.
- **For example**, many adult health problems (e.g., obesity and hypertension) have their **early origin in childhood**, so efforts are directed towards **encouraging children to adopt healthy lifestyles** ( e.g, physical exercise, healthy dietary habits etc.)
- The **main intervention** in primordial prevention is through **individual and mass education**.

# Primary Prevention

- It can be defined as “ **action taken prior to the onset of disease**, which removes the possibility that a disease will ever occur.
- It signifies **intervention in the pre-pathogenesis** phase of a disease.

# Primary Prevention

## Two types of strategies

- Population( mass ) strategy
- High risk strategy



# Primary Prevention

## Population strategy

- directed at **whole population** irrespective of the individual risk levels.
- directed towards socio-economic, behavioral and lifestyle changes.

## High risk strategy

- Includes **identification** of “**High risk groups**” in the population and bring **preventive** care to these risk group.
- e.g., People having the family history of Hypertension, allergic disease, Diabetes .

# Secondary prevention

- Defined as “**action which stop the progress of a disease at its initial stage and prevents complications**”.
- It is applied in the **early pathogenesis** stage of disease.
- It reduce the prevalence of the disease by shortening its duration.
- It may also protect others in the community from acquiring the infection and thus provide, at once, **secondary prevention for the infected individuals** and **primary prevention for their potential contacts**.

# Secondary prevention

- The specific interventions used is :
  - Early diagnosis and treatment.
- e.g. , **screening** for disease for breast cancer (using mammography) and cervical cancer (using pap smear).
- Medical examinations of school children, of industrial workers and various disease screening camps.

# Tertiary prevention

- These include **all measures undertaken when the disease has become clinically manifest or advanced**, with a view to
  - prevent or delay death,
  - reduce or limit the impairments and disabilities,
  - minimize suffering and
  - promote the subject's adjustment to incurable conditions.
- **Tertiary prevention has two types of approaches**
  - disability limitation
  - rehabilitation.

# Tertiary prevention

## Disability Limitation

- These include all measures to prevent the occurrence of further complications, impairments, disabilities and handicaps or even death.

## Examples

- Complete rest, morphine, oxygen and streptokinase is given to a patient of **Acute MI**, to prevent death or complications like arrhythmias / CHF.
- Application of plaster cast to a patient who has suffered **Colle's fracture**, is done to prevent complications and further disability like mal-union or non-union.

## Prepathogenesis

## Pathogenesis

### •Disease process

Before man is involved



**Environmental factors**

(Bring agent and host together or produce a disease provoking stimulus)

In the human host

Clinical horizon

Tissue or physiological changes

Multiplication of agent

Signs and symptoms

Illness

Disability

Defect

Chronic state

Death

Recovery

### •Levels of prevention

Primary prevention

Secondary prevention

Tertiary prevention

### •Modes of intervention

•Health promotion  
•Specific protection

•Early diagnosis and treatment

•Disability limitation  
•Rehabilitation

# Levels of prevention

| Level of prevention | Phase of disease                          | Target  |
|---------------------|---|---|
| Primordial          | Underlying condition leading to causation | Total population and selected groups                      |
| Primary             | Specific causal factors                   | Total population, selected groups and healthy individuals |
| Secondary           | Early stage of disease                    | Patients  |
| Tertiary            | Late stage of disease                     | Patients  |

A decorative border of watercolor flowers and leaves in shades of yellow, pink, and green surrounds the central text. The flowers are rendered with soft, blended colors and visible brushstrokes. The leaves are in various shades of green and blue-green, also with a watercolor texture. The entire composition is set against a white background and enclosed in a thin yellow border.

thank  
you