

Infection Model

By

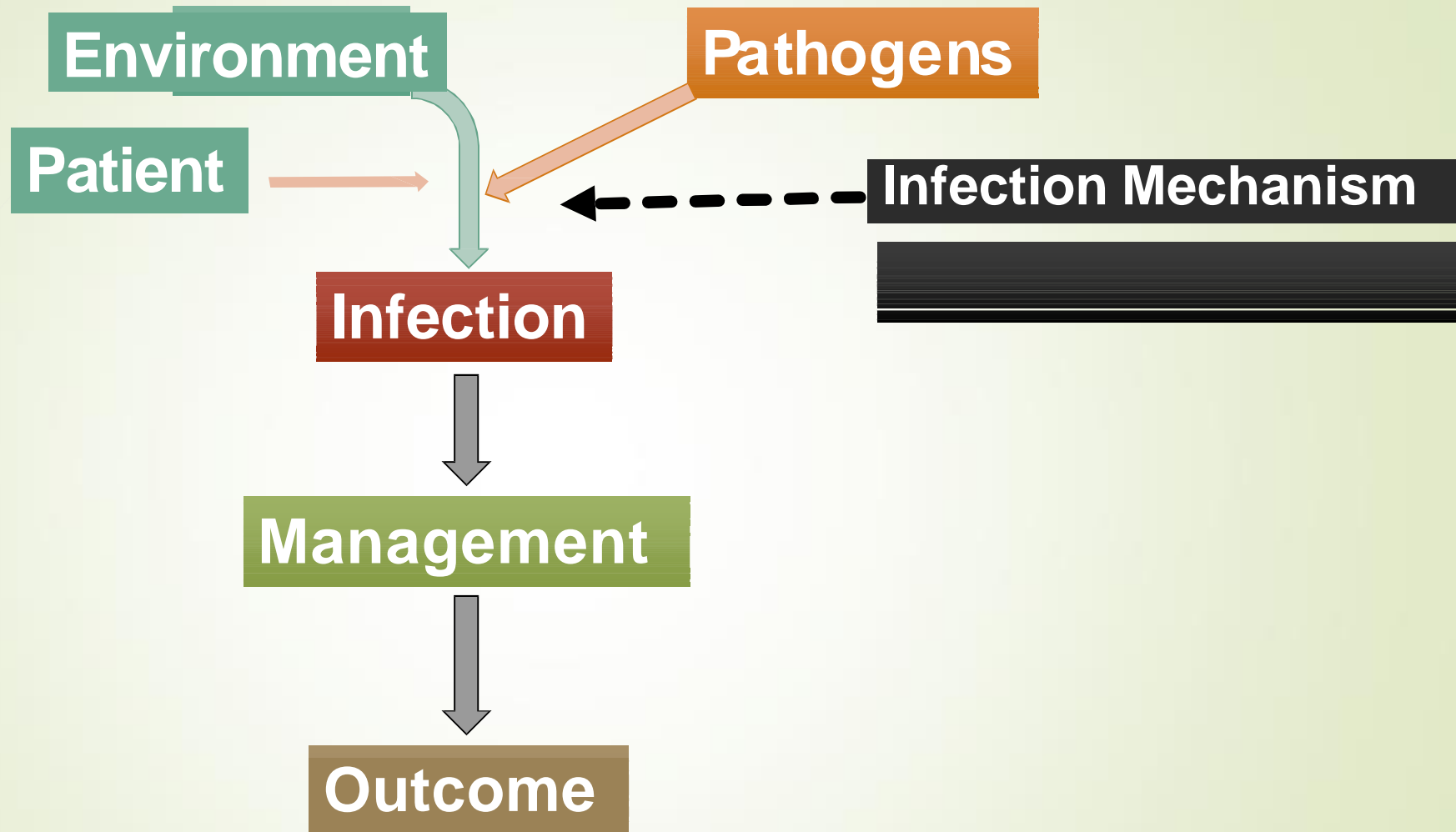
Dr. ali baay

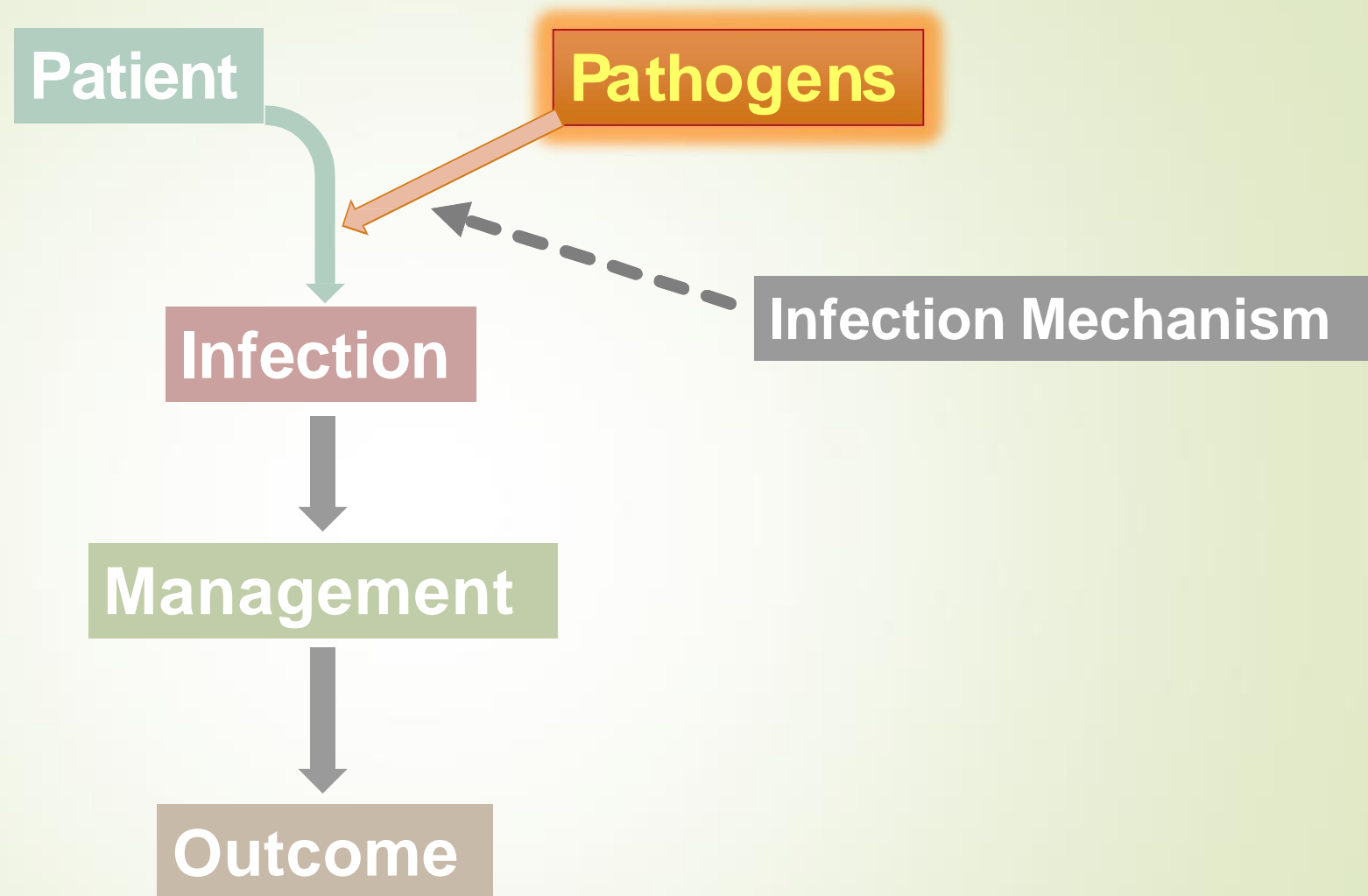
Learning outcomes

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- ❖ Understand and describe a model of infection.
- ❖ Understand the principles of classifying pathogens and to start to accumulate names and key characteristics of some common microbes.

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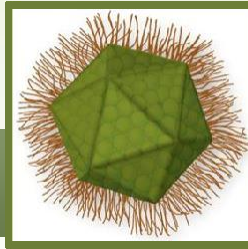




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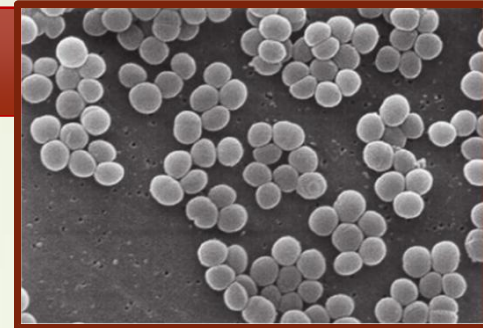
Pathogens

Virus



Prokaryotes

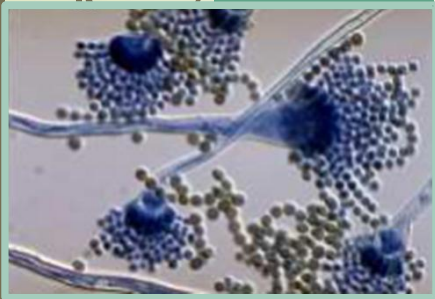
Bacterium



Eukaryotes

Fungus

Mold



Yeast



Parasite

protozoa



helminth



Definition of viruses

An infective agent that typically consists of a nucleic acid molecule (DNA or RNA) in a protein coat, is too small to be seen by light microscopy, and is able to multiply only within the living cells of a host.

Prokaryotes

are organisms without a cell nucleus & the genetic material present in non-organized structures (plasmid) & no any other membrane-bound organelles as nuclear membrane , microtubules , endoplasmic reticulum or mitochondria.

Most are unicellular

Example bacteria & cyanobacteria


Eukaryotes are organisms whose cells are organized into complex structures by internal membranes and a cytoskeleton. The most characteristic membrane bound structure is the nucleus with distinct nuclear membrane & genetic material formed as chromosomes.

The cytoplasm contain all the organelles as mitochondria & ER.

Animals, plants, fungi, and protozoa are eukaryotes.



Non-classified organisms : as they
can not achieve the definition of any
of the above mention definitions




How pathogen interacts with the host to produce disease

Successful infectious microorganisms must take certain obligatory steps

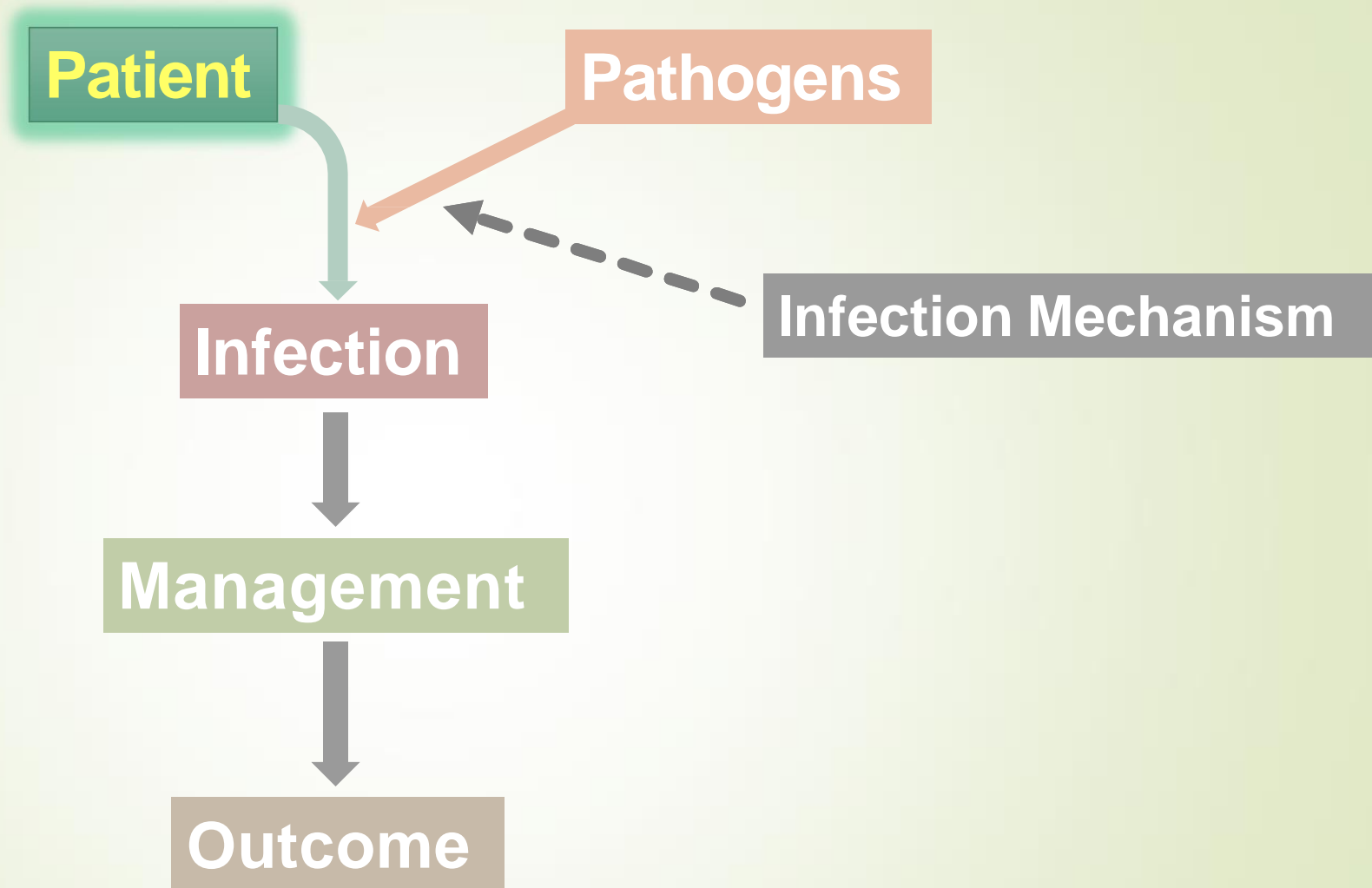
Obligatory steps for infectious microorganisms

Step	Requirement	Phenomenon
Attachment \pm entry into body	Evade natural protective and cleansing mechanisms	Entry (infection)
Local or general spread in the body	Evade immediate local defences	Spread
Multiplication	Increase numbers (many will die in the host, or en route to new hosts)	Multiplication
Evasion of host defences	Evade immune and other defences long enough for the full cycle in the host to be completed	Microbial answer to host defences
Shedding from body (exit)	Leave body at a site and on a scale that ensures spread to fresh hosts	Transmission
Cause damage in host	Not strictly necessary but often occurs ^a	Pathology, disease



So not all exposure lead to infection
(colonization)

Not all infection lead to disease
(normal flora)



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Patient

Person

age

gender

physiological state

pathological state

social factors

Time

calendar time

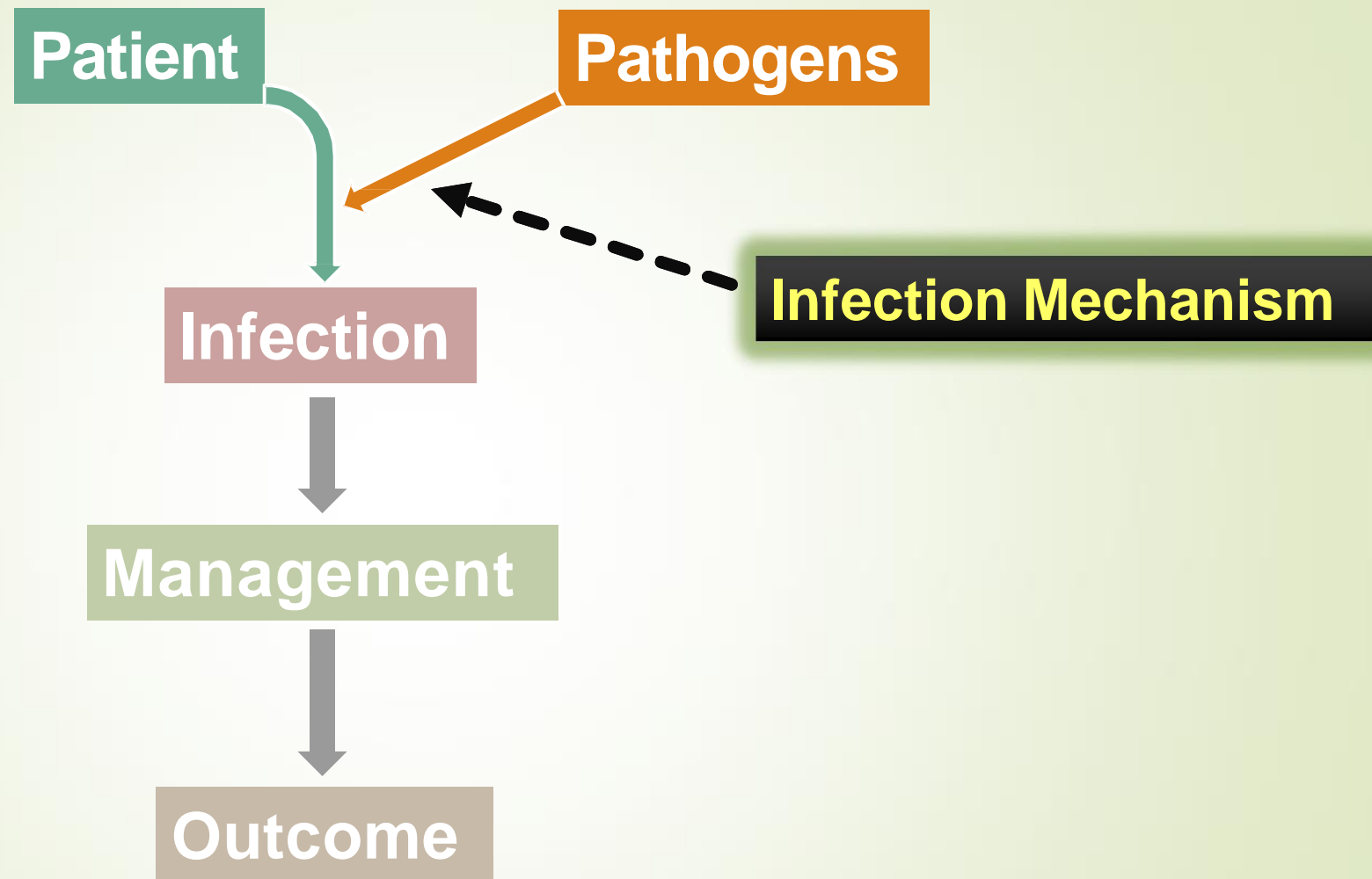
relative time

Place

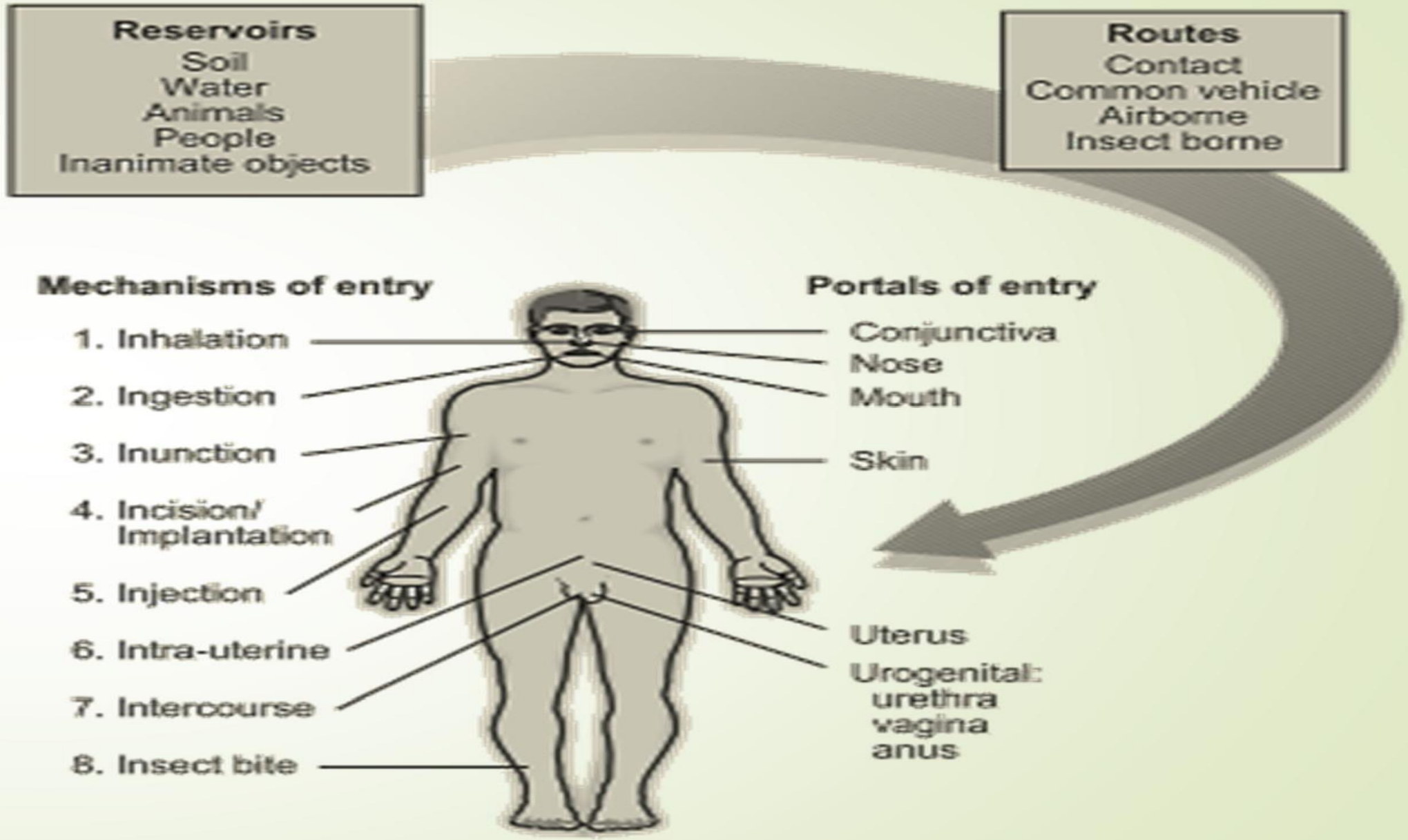
current

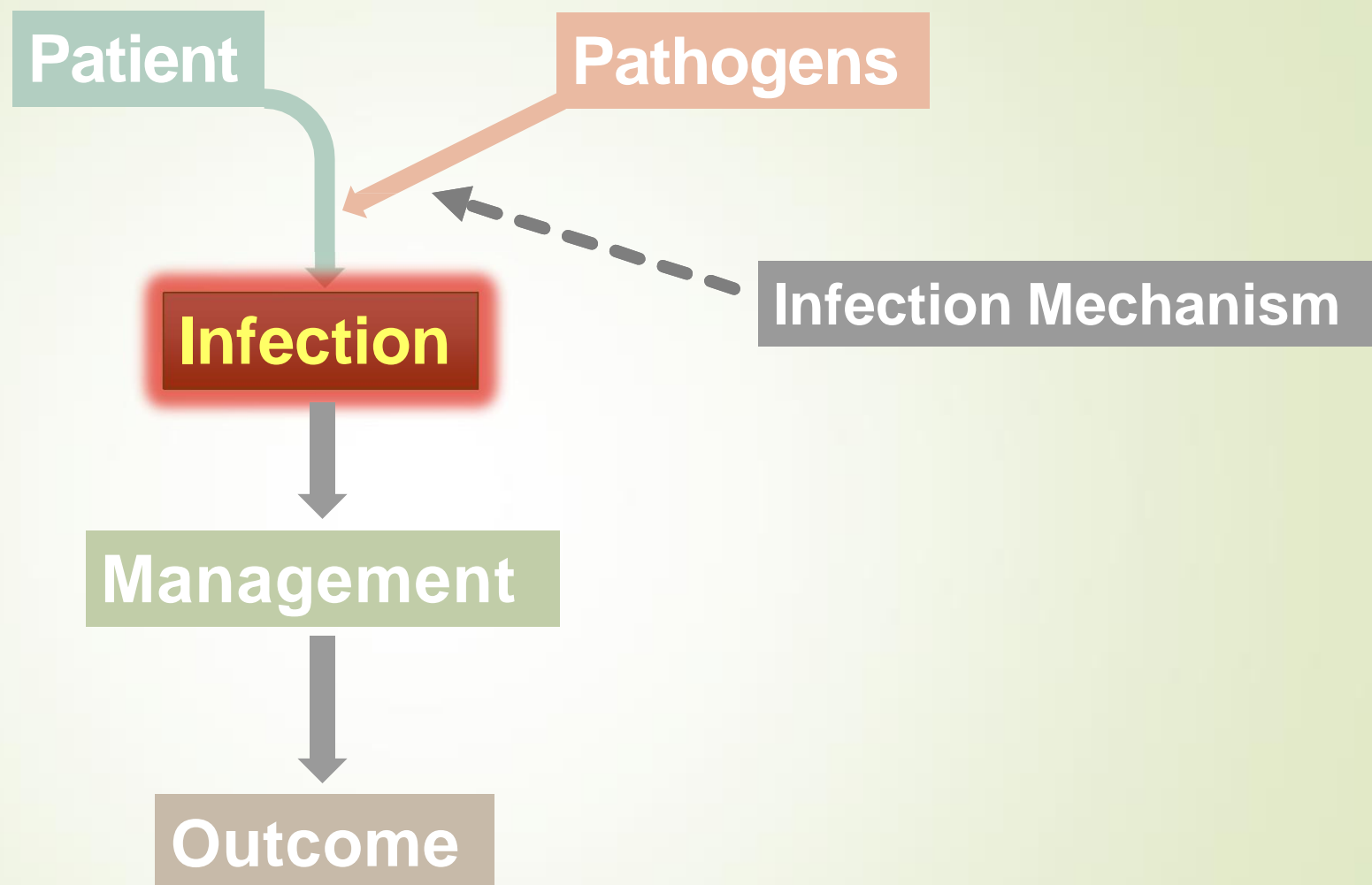
Remote





Infection Mechanism

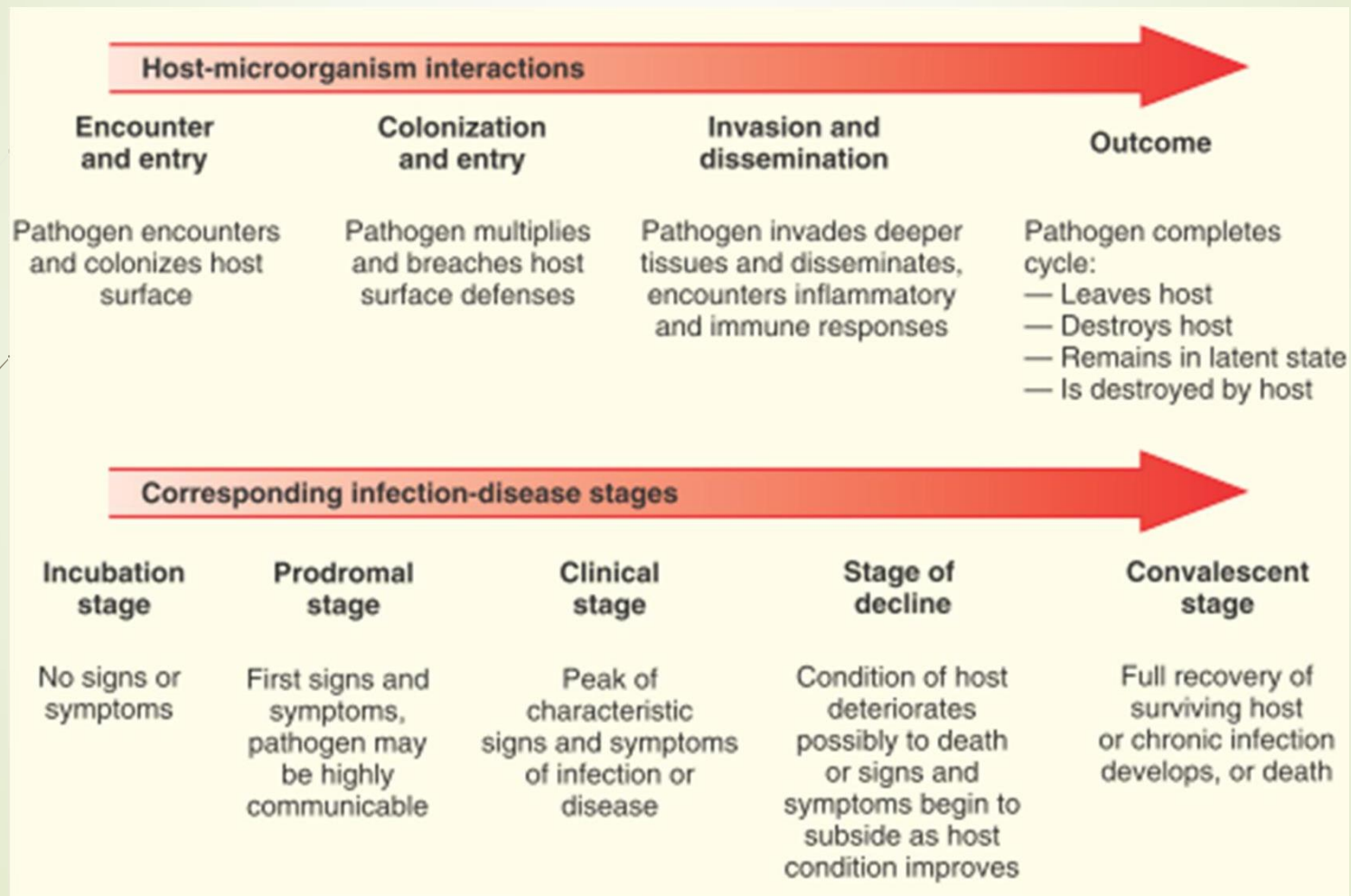


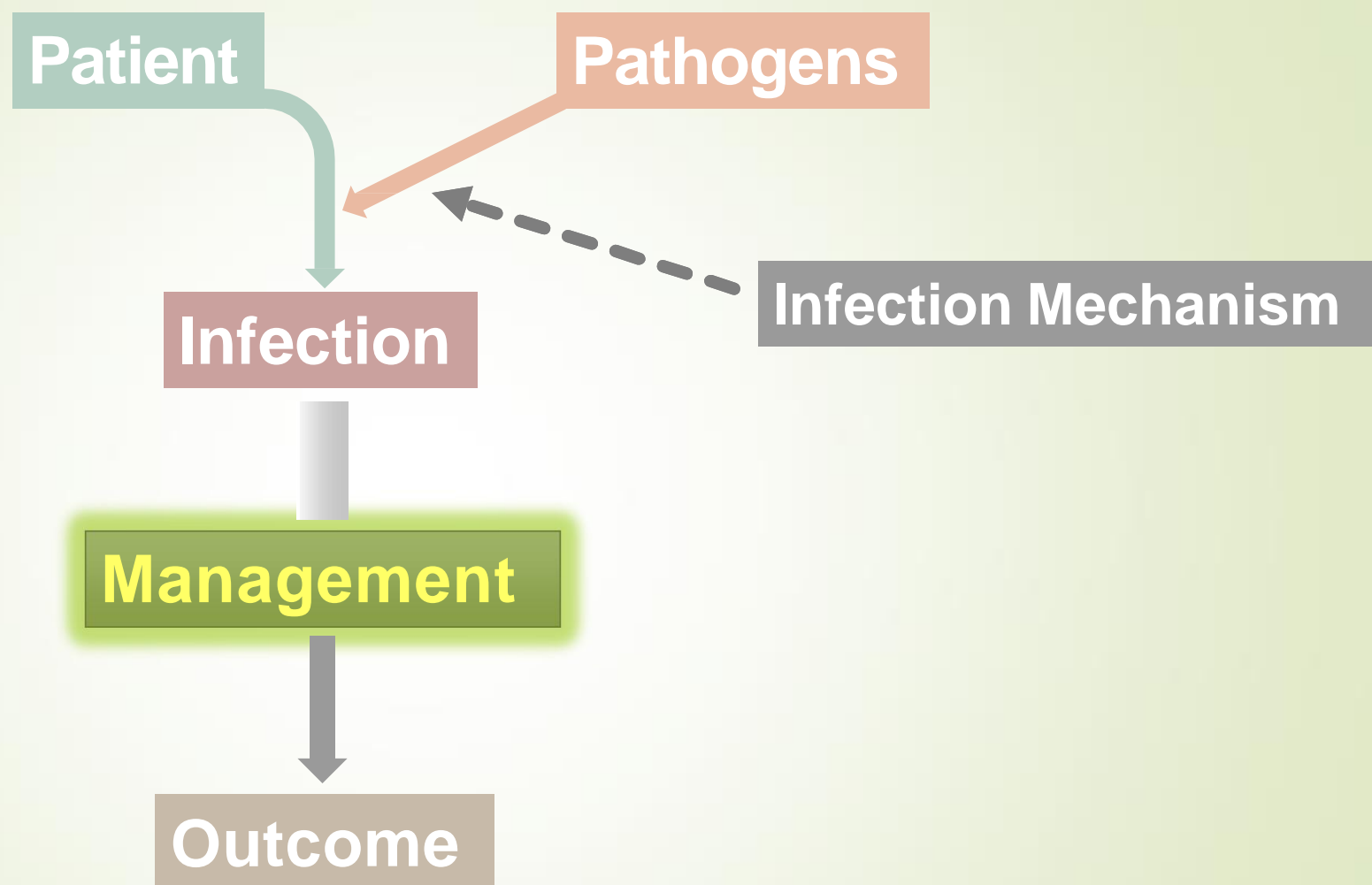


Damaging the host

Pathogens damage the host in three ways:

- Direct tissue injury (mechanical or chemical) or by subverting the cellular machinery so it becomes non-viable.
- Toxicity: exo- and endotoxins damage the host locally and at sites distant to the site of microbial growth.
- Immunopathogenic injuries result when the pathogen causes the host immune system to damage the host.





Management



Where is the infection?
What is the infection?

Signs and Symptoms of Infection and Infectious Diseases

DIVIDE INTO GENERAL & SPECIFIC TO ORGANS

- General or localized aches and pains
 - Headache
 - Fever
 - Fatigue
 - Swollen lymph nodes
 - Rashes
 - Redness and swelling
 - Cough and sneezes
 - Congestion of nasal and sinus passages
 - Sore throat
 - Nausea and vomiting
 - Diarrhea

Management



Where is the infection?
What is the infection?

DIAGNOSIS

THE BEST DIAGNOSTIC WAY IS : ISOLATION
OF THE ORGANISM FROM THE BODY
SECRETAS:

In pneumonia from the sputum

Gastroenteritis from the stool

Tonsillitis from the throat swab

It should be done in all cases to confirm infection
except in

Very mild infection

Very severe infection


During an outbreaks



The isolation need :

- The patient not on antibiotic treatment
- The sample is from the correct site
- The transport media is proper
- The culture media is suitable

The culture media may be living host as in virus or artificial media used in the lab.



Other diagnostic isolation way is to isolate part of the microorganism as the nucleic acid or any antigen protein from the structure

Regarding the nucleic acid detection may need amplification by special processing

These methods are less strong in the diagnosis



Serological test

These tests used to detect the immune reaction of the immune system to the infection by detecting the antibodies secreted by the immune cells.

These tests are non- specific non- sensitive as they can affected by previous infection or exposure or by the state of the immune system & the type of Ig reaction



Non-specific general tests:

These called acute phase reactants which can change with any inflammatory reaction (infectious or non-infectious)

- +ve acute phase reactant : as ESR , WBCs or CRP
- -ve acute phase reactants : as albumin or Hb

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Management

treatment

specific

antimicrobials

surgery

drainage

debridement

dead space removal

supportive

physiological restoration

symptom relief




Management




prevent infection transmission to

- other patients
- staff
- other contacts



Outlines of prevention

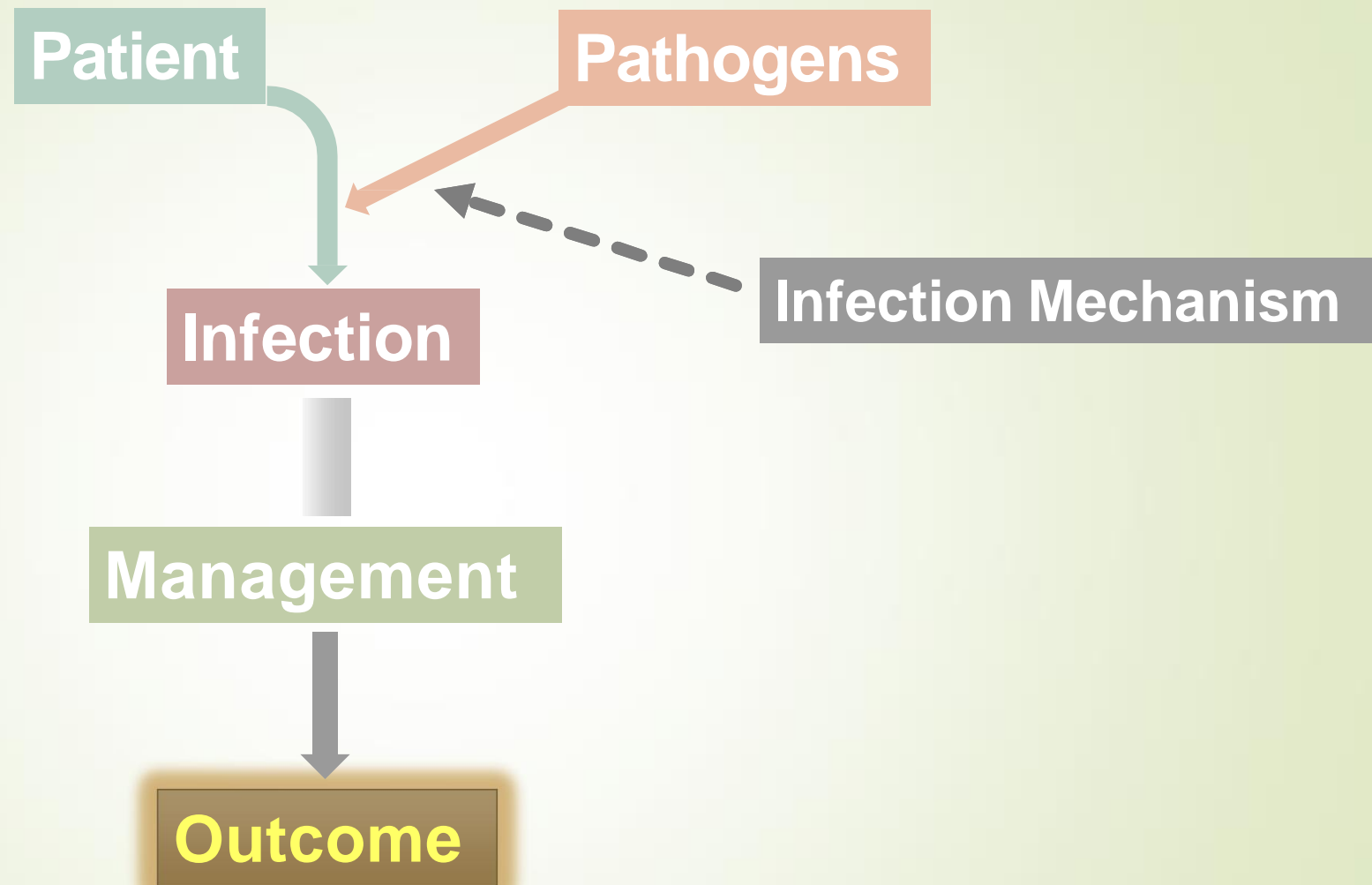
- To control the reservoir
 - To control the vectors
 - To control the individual
- 



Individual prevention:

Pre-exposure : to potentiate the immune system as Ag vaccination (active vaccination) or chemoprophylaxis

Post-exposure : to prevent the process of infection as giving hyper-immune serum or Ig(passive vaccination)



Outcome

Host factors:

- General state of health
- Integrity of surface defenses
- Capacity for inflammatory and immune response
- Level of immunity
- Impact of medical intervention

Microbial factors:

- Level of virulence
- Number of organisms introduced into host
- Body sites pathogen targets for invasion

Potential outcome

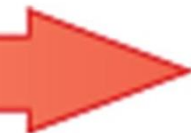
Restoration of host to complete health

Restoration of host to health with residual effects

Survival with host's health severely compromised

Death

Full spectrum of outcomes







Thanks
any questions