

# Introduction to Microbiology

Microbes outnumber all other creatures on earth: While invisible to the human eye, bacteria, viruses, fungi, parasites, and prions are essential for life and for medicine. This course will provide you with an overview of the most important terms and concepts in the vast field of microbiology. Tutor **Ms. Zareen Khan** will help you identify the different microbes and the diseases that they cause.

# Introduction to Microbiology

- ▶ The topics covered in the course include:
- ▶ Definition and types of microbes
- ▶ Components of bacterial cells
- ▶ Good and bad viruses
- ▶ Reproduction and function of yeasts
- ▶ Definition of prions
- ▶ Bacterial diseases like staphylococcus and streptococcus
- ▶ Fungal diseases and their treatments
- ▶ Life cycles of parasites like malaria or worms
- ▶ Detection and treatment of Mad Cow Disease and other prion diseases

# Leraning Goals

- \* You will understand the extent, origin and functions of the human microbiome.
- \* You will appreciate the ways that bacteria enter and spread in their hosts.
- \* You will be familiar with the different types of bacterial toxins and their activities.
- \* You will know the mechanisms of action of members of the different classes of antimicrobials, and how resistance emerges.



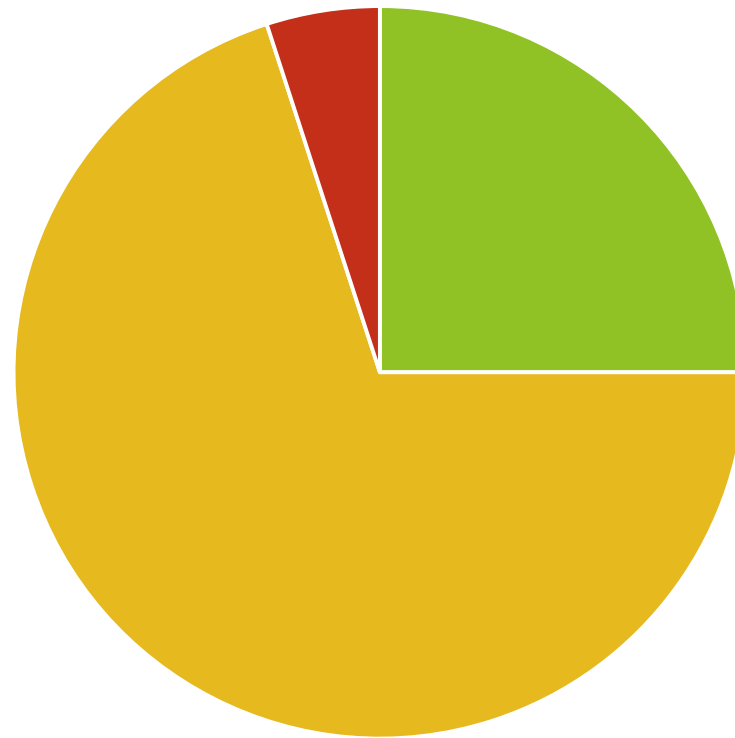
# Human Microbiome

- ▶ The Human body is home to trillions of microbes - the Microbiome



# Human Microbiome

Cells in Human Body



■ Human ■ Bacterial ■ Fungal

# Human Microbiome

- ▶ Wherever the human body is exposed to the outside world, there is a microbial community
- ▶ Our Microbiome helps us extract energy and nutrients from the food we eat, inhibits pathogens, and probably much more
- ▶ 99% Microbes contribute an extra 2,000,000 genes to the 20,000 gene human genome
- ▶ That forms nearly 2.5 Lbs = weight of the microbiome
- ▶ Viruses outnumber bacteria by about 5:1
- ▶ That is roughly 3 Pints = Volume of the microbiome

# How do we get our Microbiome?

- ▶ During development -mothers womb -amniotic fluid
- ▶ During Birth - birth canal, mothers skin and that of caregivers
- ▶ Breast Milk
- ▶ Soil, Water
- ▶ New and diverse foods
- ▶ People, pets, plants

# Infection Basics

- ▶ Exogenously Acquired Infections
  - ▶ Bacteria in the environment
  - ▶ Food, water, air, objects, insect bites, animals
- ▶ Endogenously Acquired Infections
  - ▶ Caused by agents on or in us
  - ▶ Alteration of Microbiome eg. Clostridria and antibiotics
  - ▶ Injuries introduce skin bacteria eg. Staphylococci



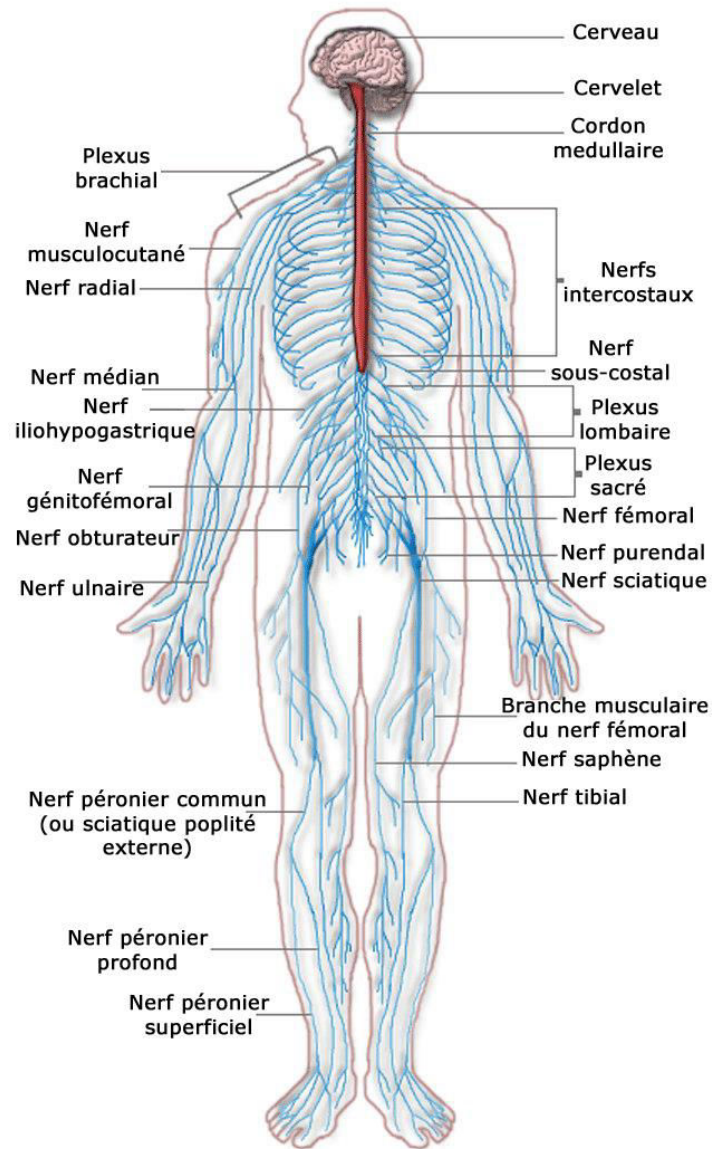
# Gaining Entry

## Mucous membranes

- Breathing, eating, sex
- Cholera, Whooping Cough, Gonorrhoea

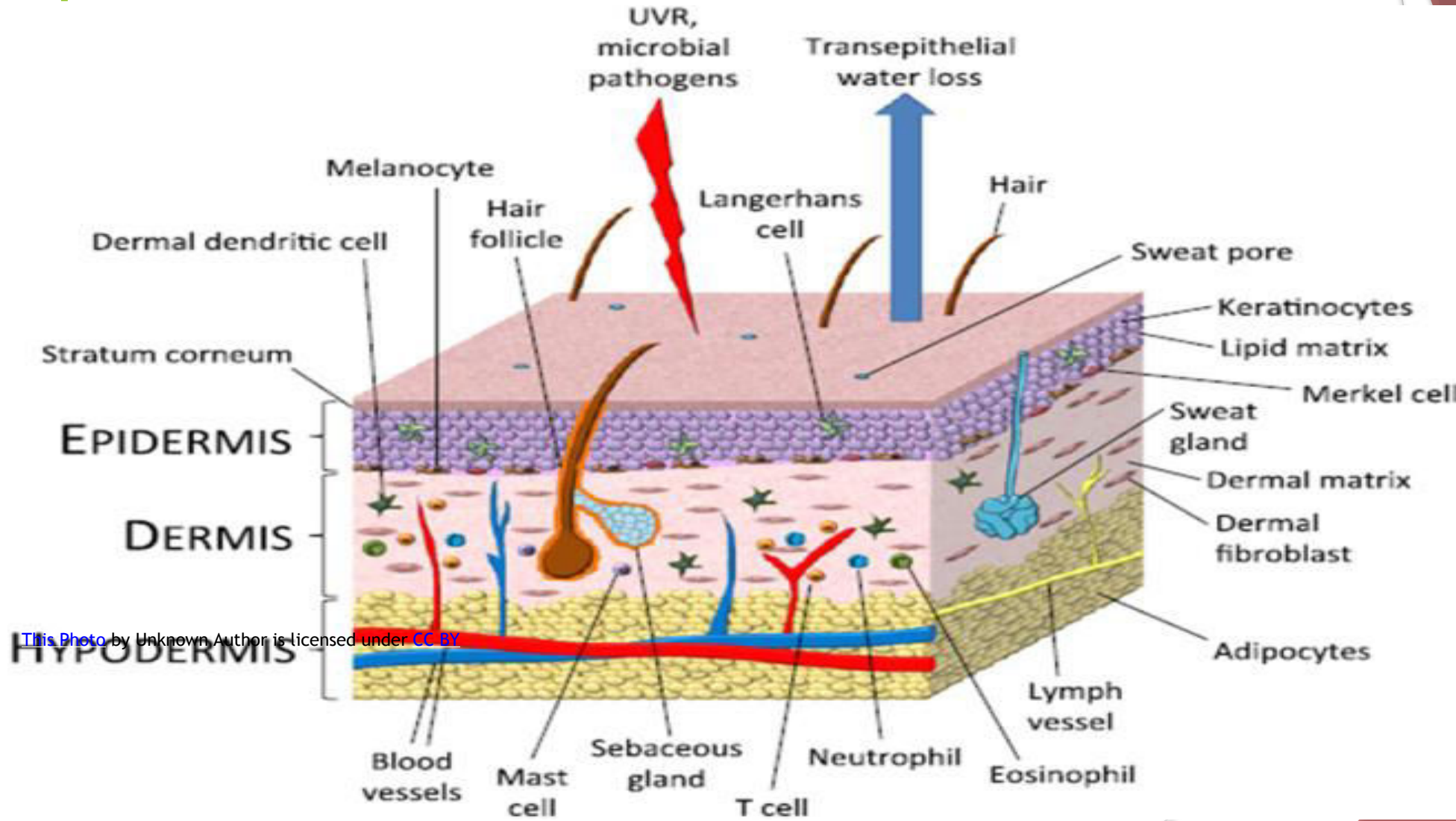
## Penetration

- Invasion into cells, tissues
- Insect bites
- Scratch, Injury



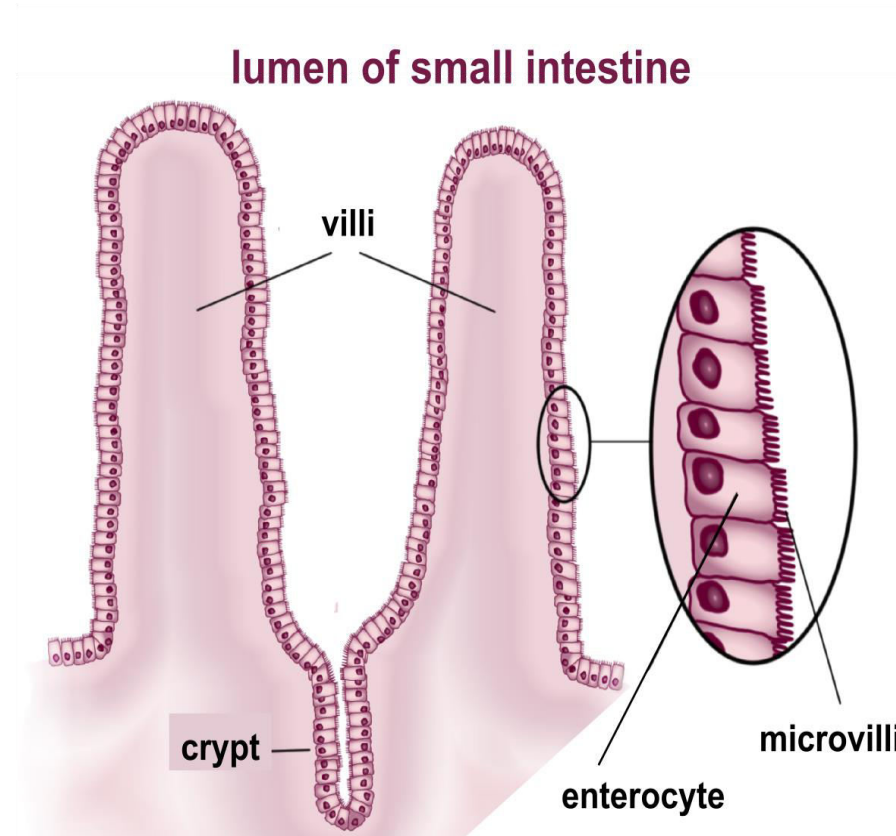
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# Spread



# Spread

- \* Lateral propagation to contiguous tissues
- \* Dissemination to distant sites
- \* Role of host defenses



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## Multiplication

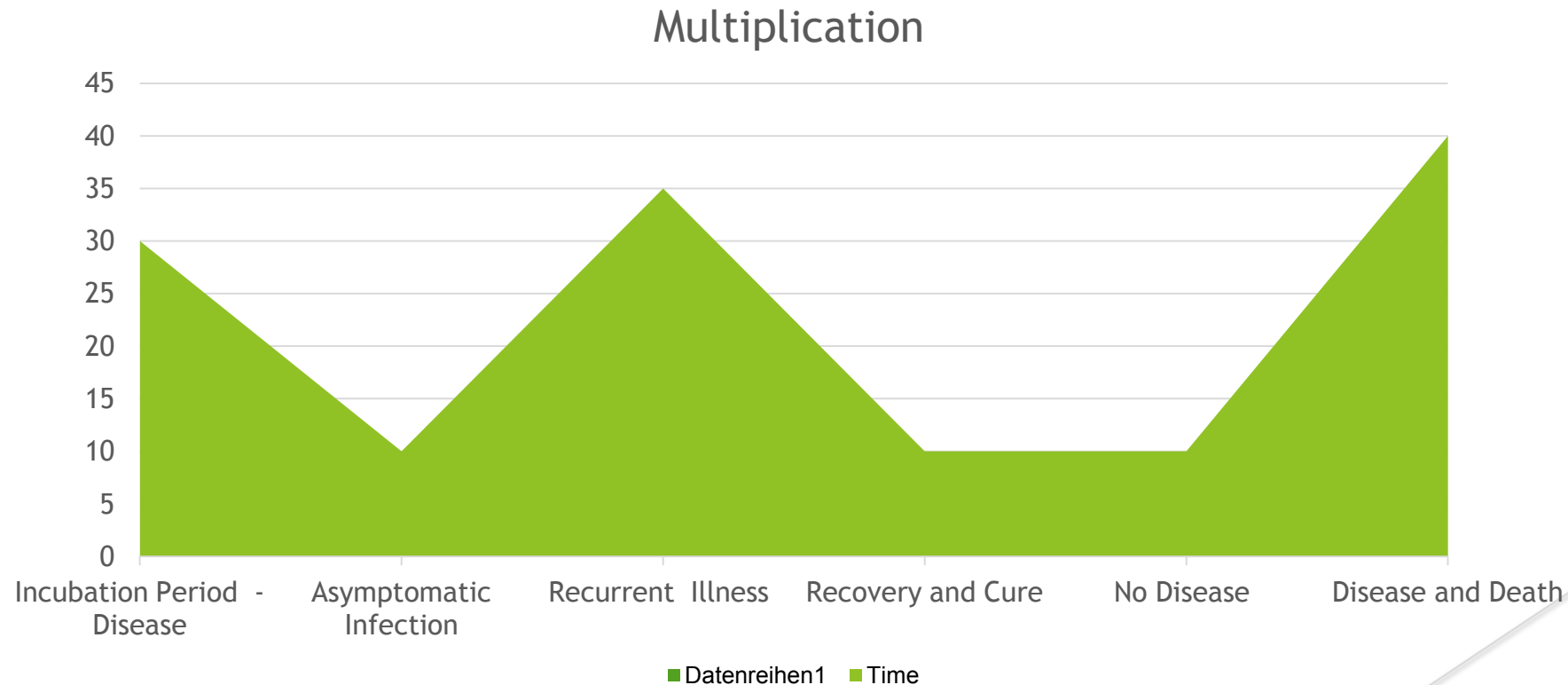
Most Infectious agents multiply to cause disease

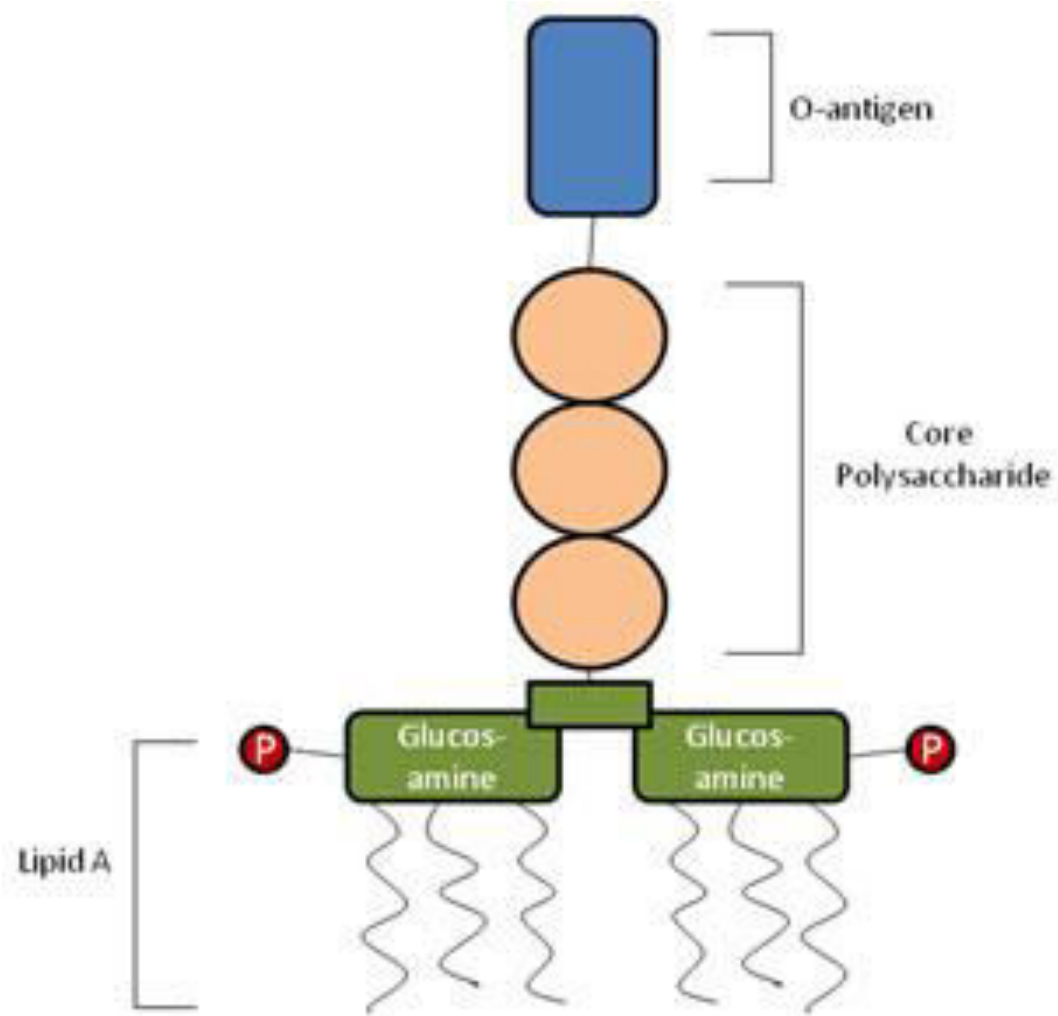
Incubation Period

Cell and tissue damage

\* A consequence of the immune response

\* Direct results of bacterial toxins ( eg. Tetanus, Botulism, Cholera, Whooping cough)



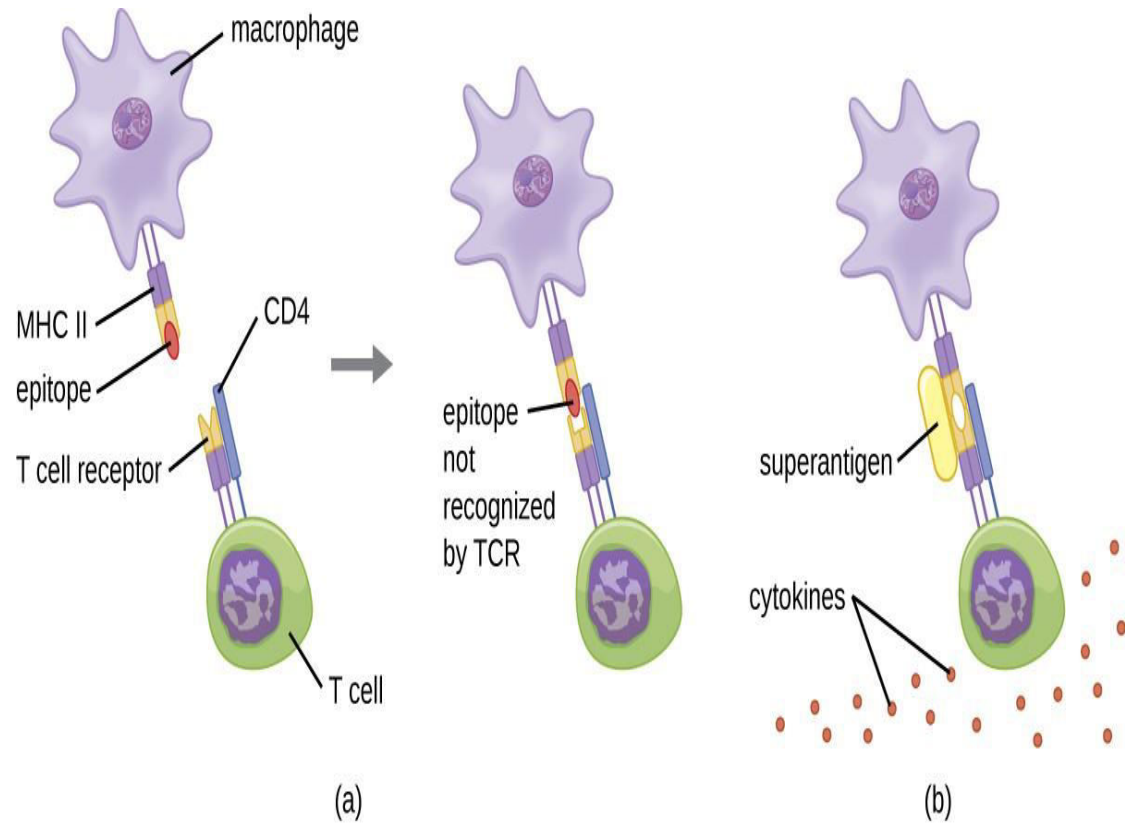


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# Bacterial Toxins

- ▶ \* Alter normal metabolism of host cells
- ▶ \* Often responsible for major symptoms of bacterial infection
- ▶ Exotoxins secreted by bacterium and type III cytotoxins modulate Intracellular targets
- ▶ Other toxins act at surface of host cells
- ▶ Exoenzymes modulate targets in extracellular matrix

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