

# Medicine

Week 7 - Microbiology and Infectious Diseases



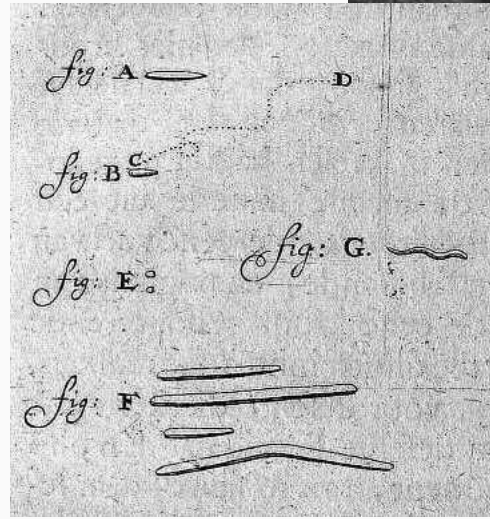
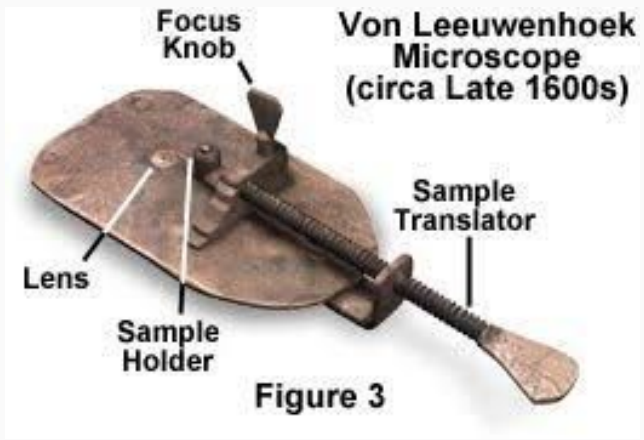
# What is Microbiology?

Microbiology is the study of all living organisms that are too small to be visible with the naked eye



# A little bit of history...

Antoni Van Leeuwenhoek



However, microorganisms weren't attributed to being the cause of disease

## Miasma theory



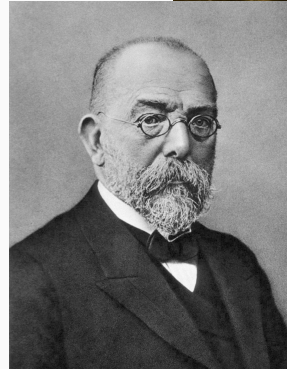
# The Miasma Theory of Disease

- Before the end of the 19th century most people believed in that diseases such as cholera and the bubonic plague were caused by **miasma**, which they believed was a noxious form of "bad air" that was produced from rotting organic matter.
- It was thought that diseases came from this air, and that they couldn't be passed between individuals



# Louis Pasteur

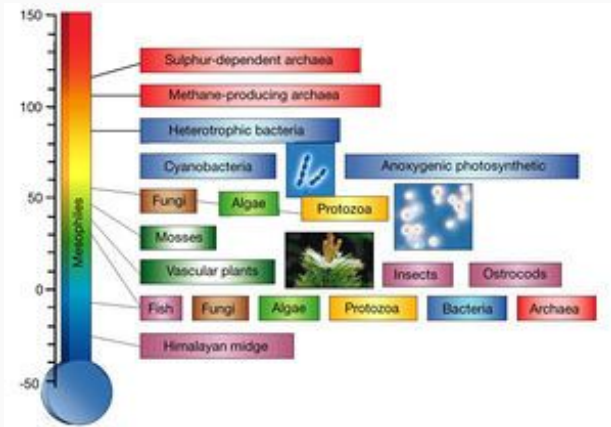
- Conducted a number of experiments in the 1860's that proved the link between disease and micro-organisms
- This was known as **Germ Theory**
- Germ theory was further proven by experiments by another scientist known as Robert Koch





# Microorganisms are everywhere

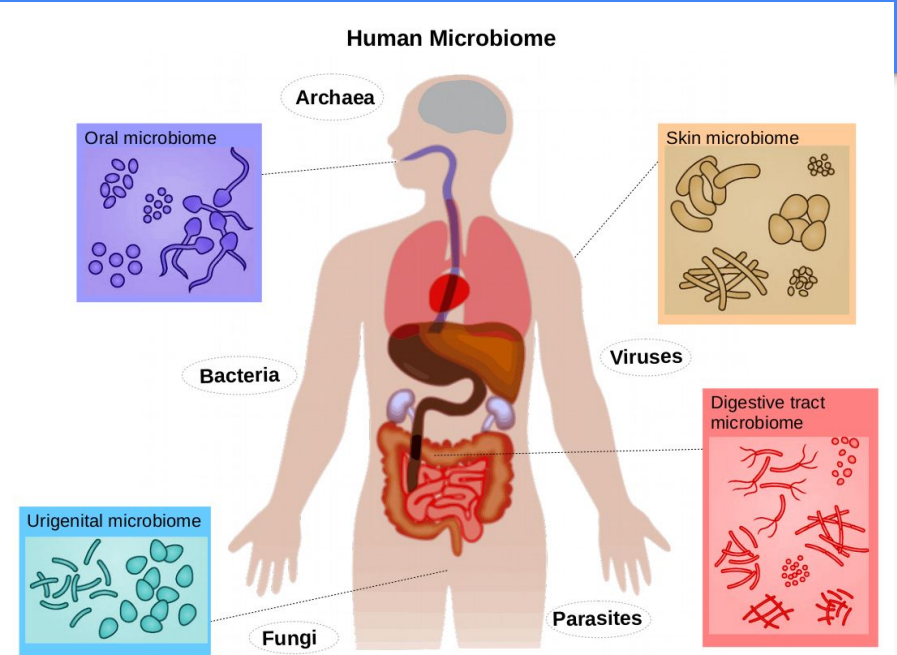
- Scientists think that there are  $5 \times 10^{30}$  different types of microorganisms in the
- They are found almost everywhere on earth



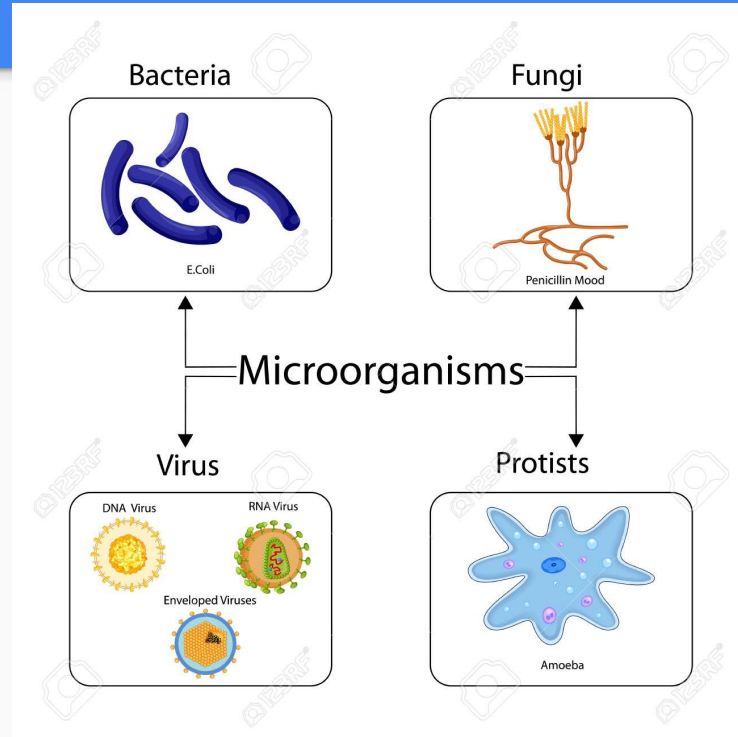


# DID YOU KNOW:

- Over 90% of the cells in our body are microorganisms



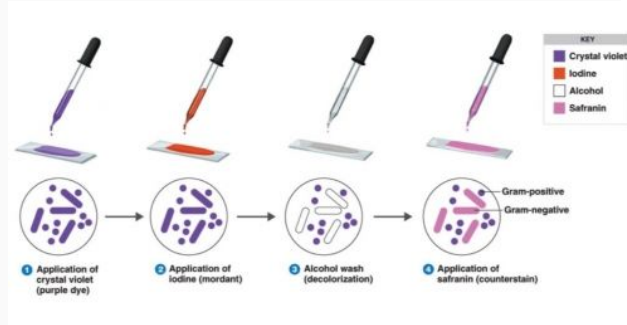
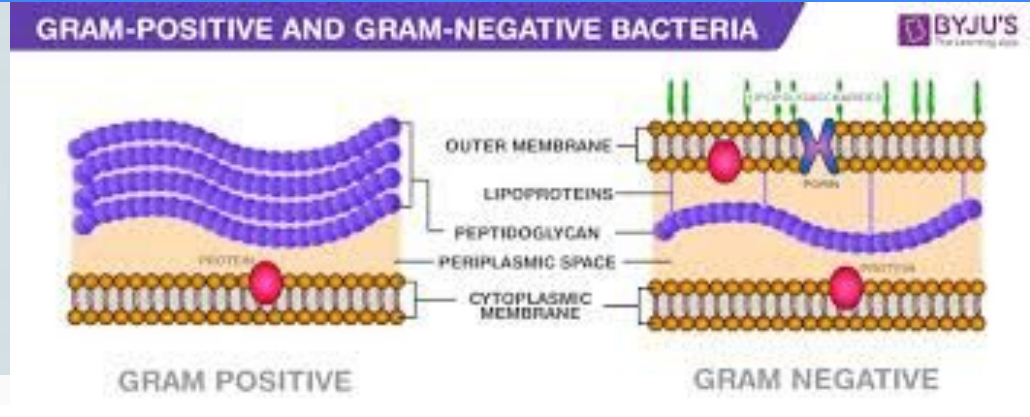
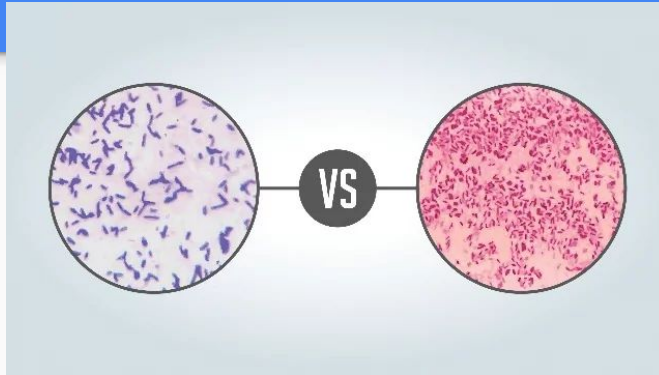
# Microorganisms are classified into different types



# Bacteria

- Bacteria are the oldest of all the microorganisms
- Bacteria are microscopic, single-celled organisms. They are among the earliest known life forms on earth. There are thousands of different kinds of bacteria, and they live in every conceivable environment all over the world. They live in soil, seawater, and deep within the earth's crust.
- Do you think all bacteria cause disease?

# Gram Positive vs Gram Negative Bacteria



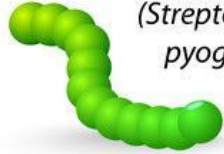
# SHAPES OF BACTERIA

## COCCI

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**Diplococci**  
(*Streptococcus pneumoniae*)



**Streptococci**  
(*Streptococcus pyogenes*)

### **Tetrad**

depositphotos



**Staphylococci**  
(*Staphylococcus aureus*)



**Sarcina**  
(*Sarcina ventriculi*)

## BACILLI



**Chain of bacilli**  
(*Bacillus anthracis*)



**Flagellate rods**  
(*Salmonella typhi*)



**Spore-former**  
(*Clostridium botulinum*)

## OTHERS

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**Vibrios**  
(*Vibrio cholerae*)



**Spirilla**  
(*Helicobacter pylori*)



**Spirochaetes**  
(*Treponema pallidum*)

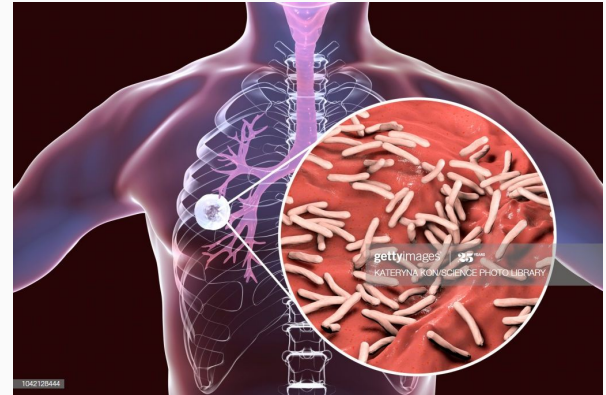
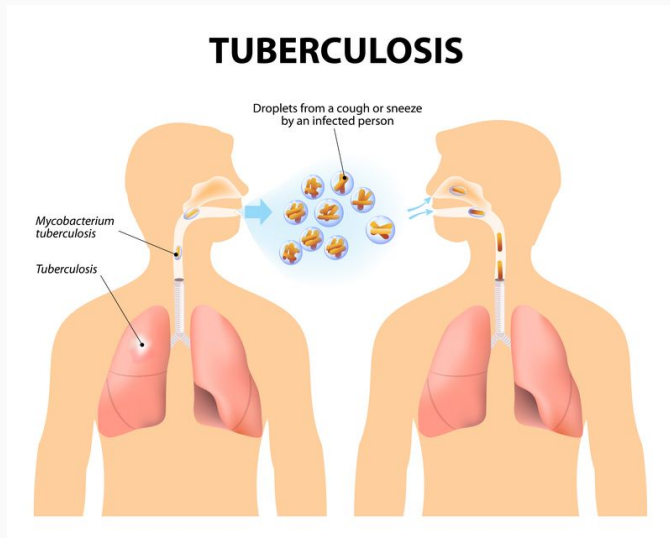
# Have a look at this xray and MRI:

What do you see?



# Tuberculosis (TB)

**Tuberculosis** is an infectious disease usually caused by a bacteria known as *Mycobacterium tuberculosis*





# Signs and symptoms of pulmonary tuberculosis:



Long-Term  
Coughing

Coughing up  
Blood

Chills

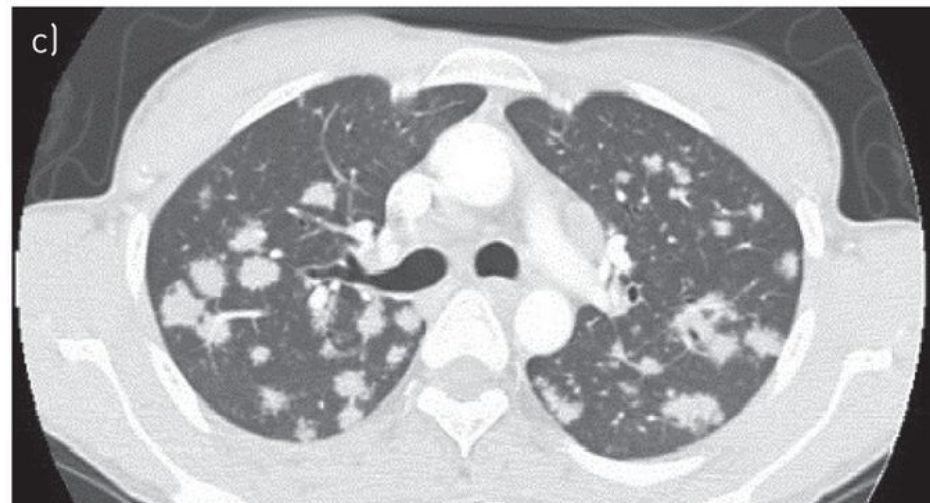
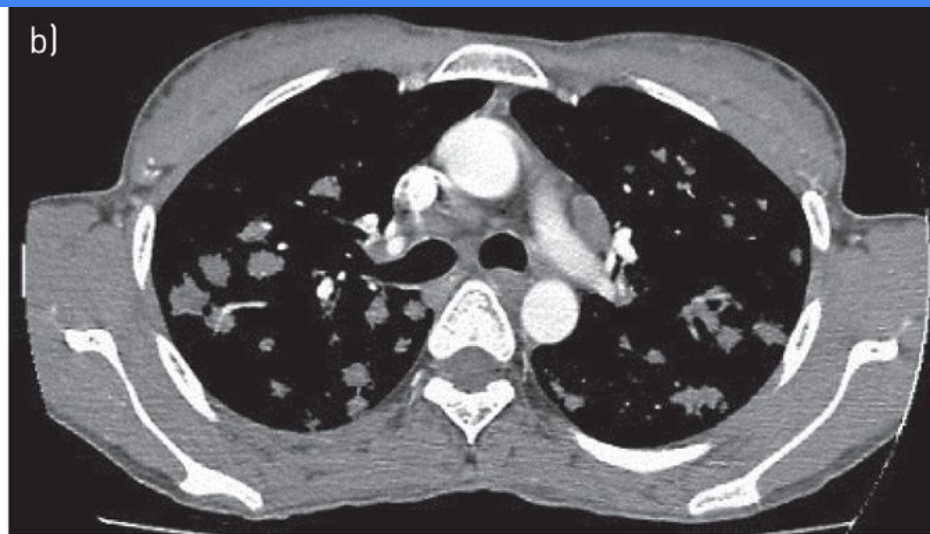
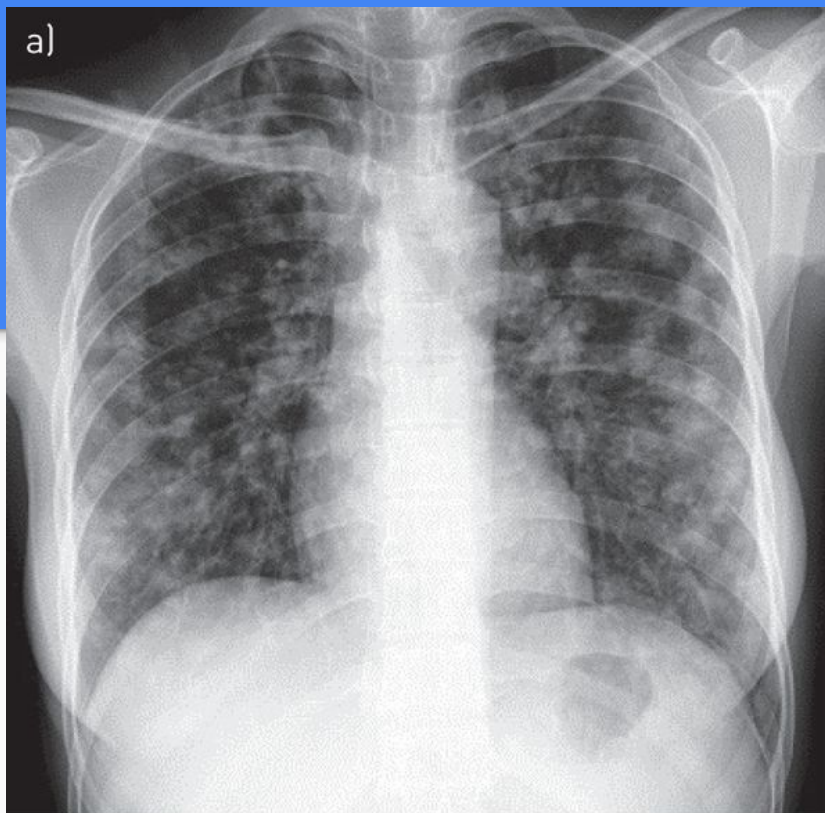


Fever

Chest Pain

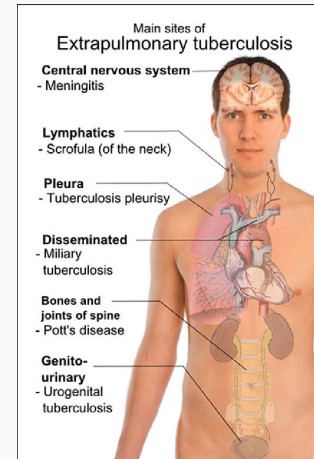
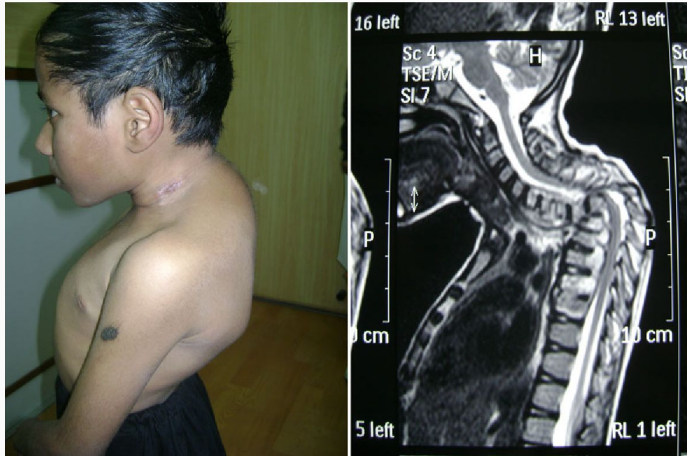
Fatigue

- The majority of TB cases are “latent TB”, meaning that they do not have any signs and symptoms
- The bacteria are said to be sleeping



# Extra pulmonary TB

- TB Bacteria that are found somewhere other than the lungs
- TB that is found in the spine is known as **Pott's Disease**

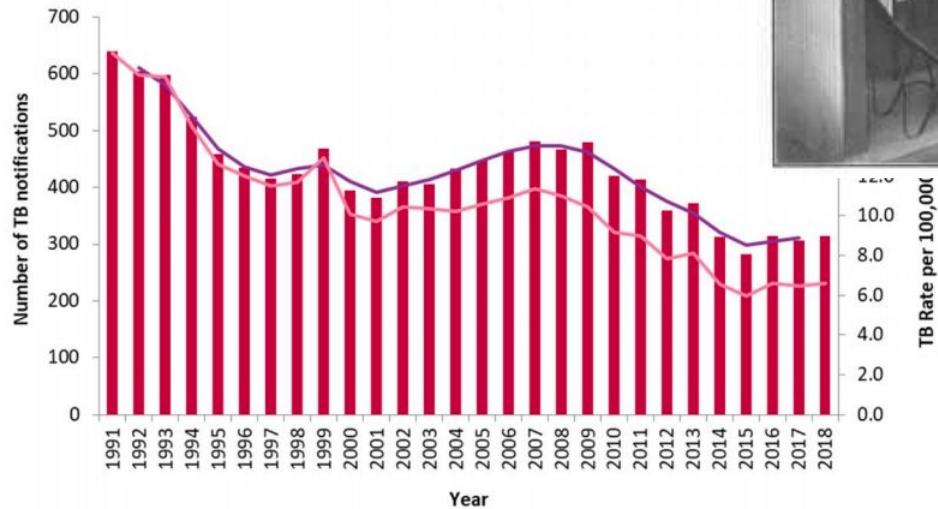








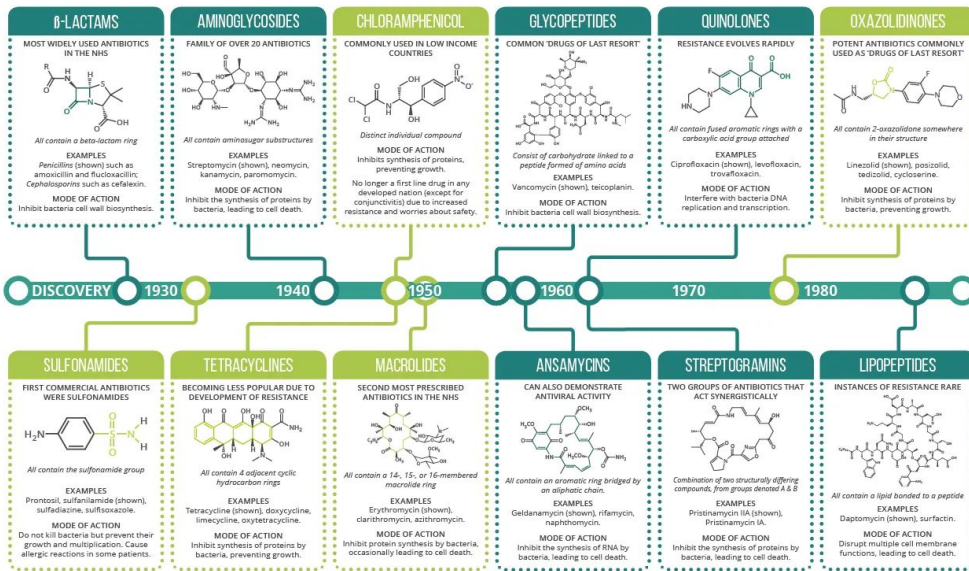
# TB notifications, rates & 3 year moving average



# Antibiotics work against bacteria only

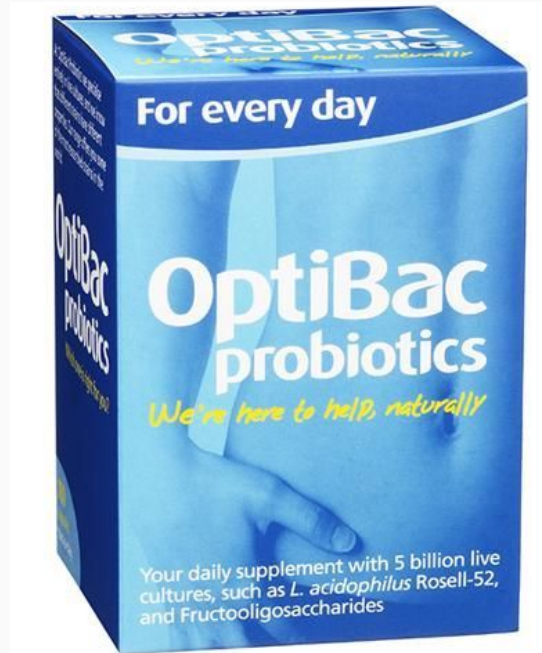
## DIFFERENT CLASSES OF ANTIBIOTICS - AN OVERVIEW

**Key:** ● COMMONLY ACT AS BACTERIOSTATIC AGENTS, RESTRICTING GROWTH & REPRODUCTION ● COMMONLY ACT AS BACTERICIDAL AGENTS, CAUSING BACTERIAL CELL DEATH



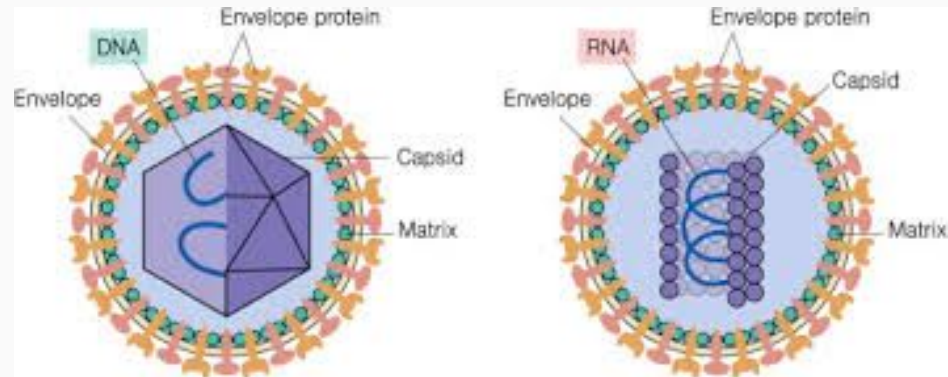


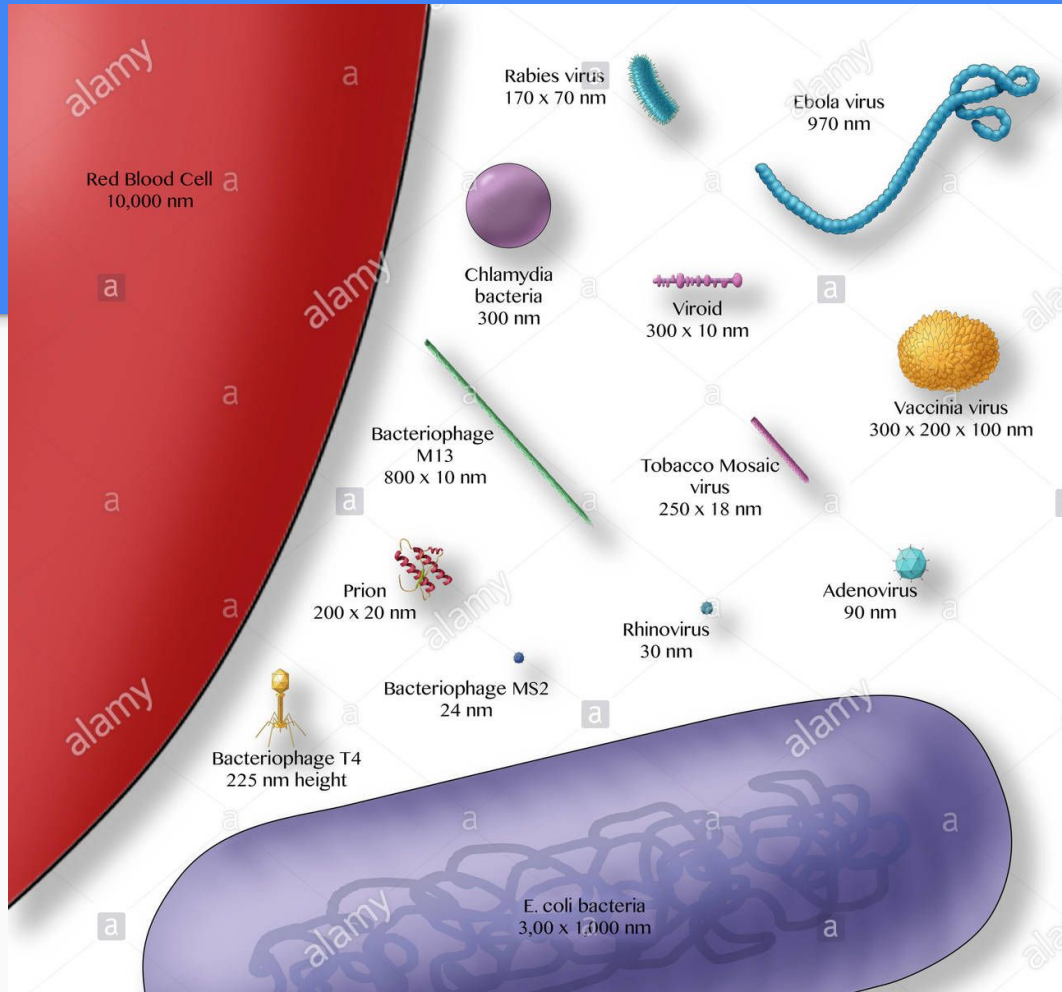
There is also lots of “good bacteria”



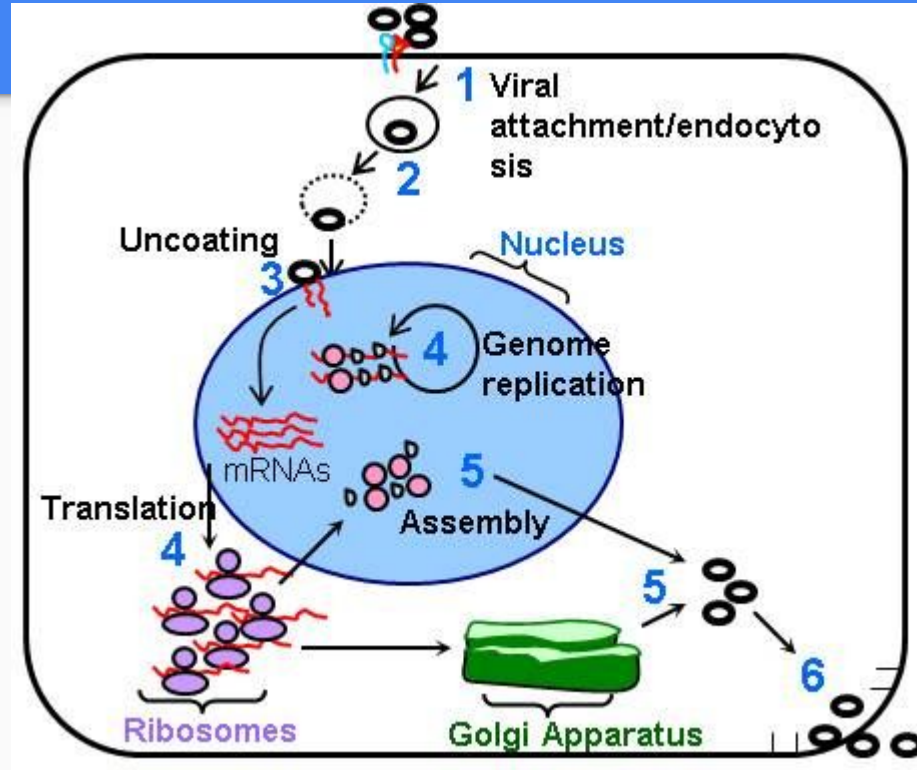
# Viruses

- Viruses are the smallest microorganisms typically ranging from 0.02 to 0.3 micrometers
- Viruses depend completely on their host cells to reproduce.
- Viruses have an outer cover of protein and an RNA or DNA core and sometimes enzymes needed for the first steps of viral replication.





# Viruses depend on their host cell to replicate:

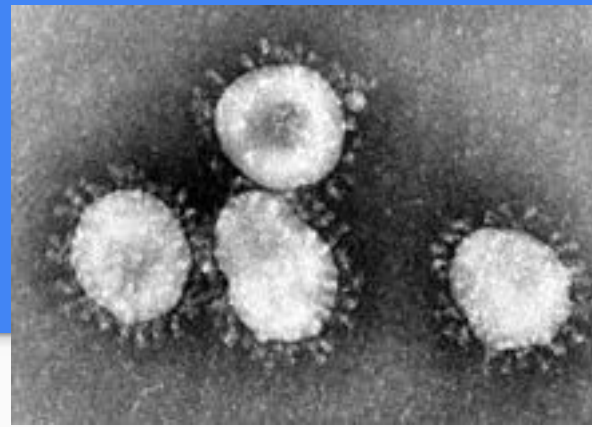


# There are a huge amount of viruses

- Many viruses can cause diseases:



# Coronavirus

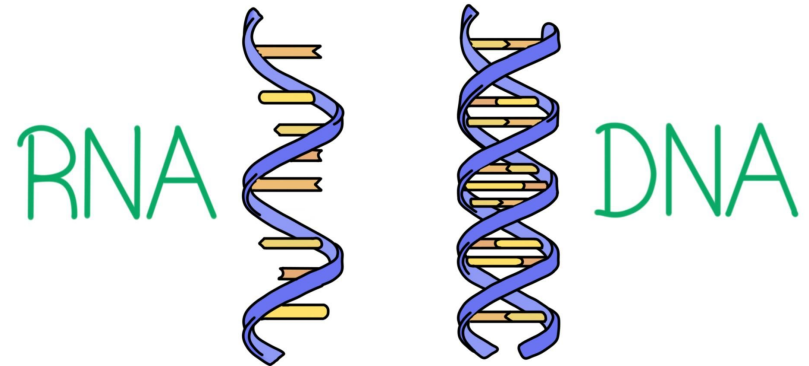


Coronavirus are a family of viruses

Coronaviruses are large spherical particles with bulbous surface projections<sup>1</sup> The diameter of the virus particles is around 120 nm

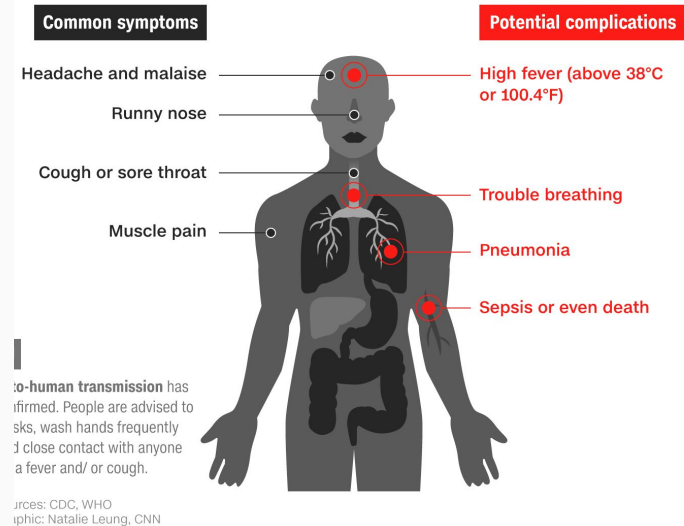
The **viral envelope** consists of a layer of lipidd, also known as fats.

Coronaviruses contain RNA



# One particular coronavirus is SARS-CoV-2

- This is the virus that causes Covid-19
- Transmission is believed to be primarily by respiratory droplets





# Treatment

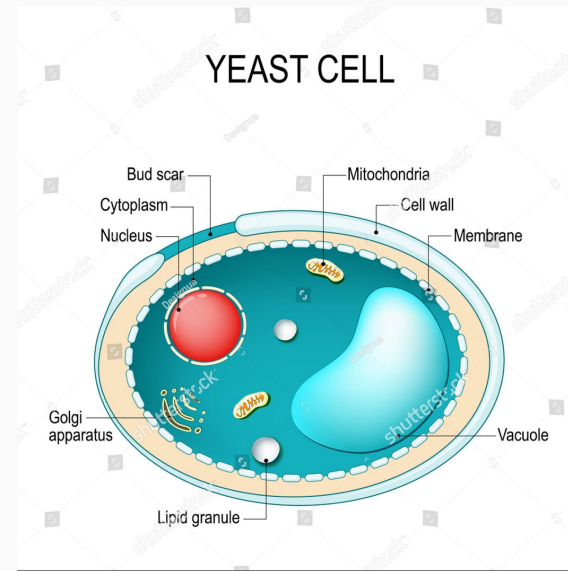
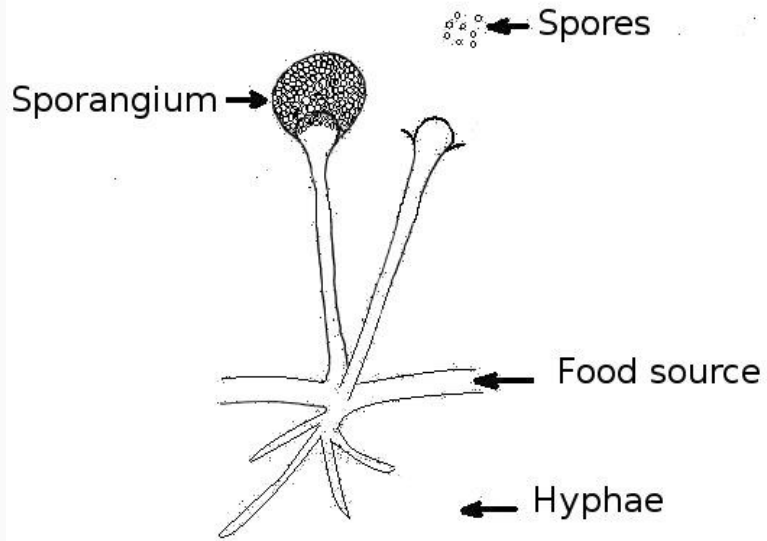
- Supportive treatment currently



# Fungi

- Fungi are a group of microorganisms that contain moulds and yeasts.





# Fungi have a wide array of uses

