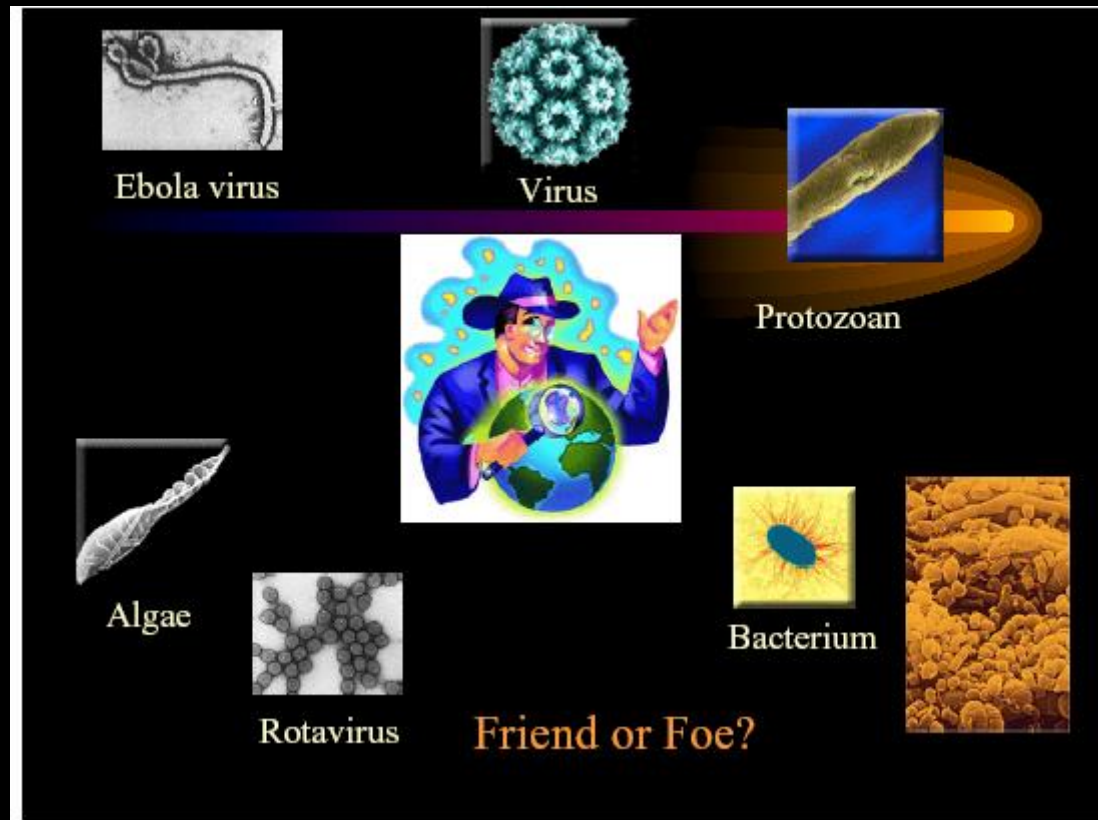


Medical Microbiology

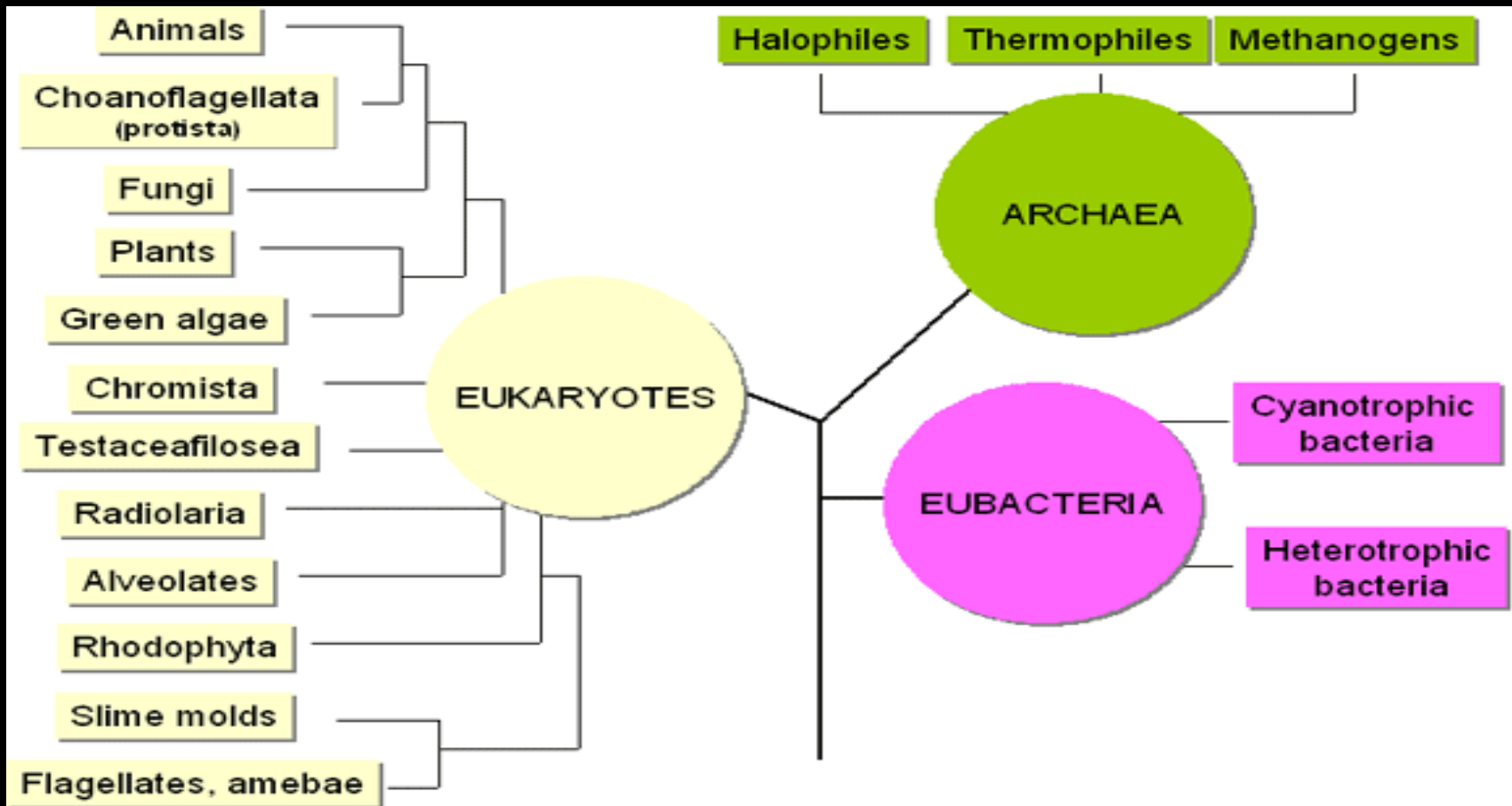
Dr. Kaya Sürer

Near East University Medical Faculty
Infectious Diseases and Clinical Microbiology

What is microorganisms?



What is microorganisms?



What is microorganisms?

- **Microorganisms are creatures that are not directly visible to the unaided eye.**
- **Viruses , bacteria, fungi, protozoa and some algae are all in this category**

What is microorganisms?

- The study of microorganisms (including bacteria, viruses, fungi and parasites) which are of medical importance and are capable of causing diseases in human beings
- Most can only be seen with the microscope!

Why they are important?

- Infection is one of the most important causes of mortality and morbidity in the population.
- Approximately 30% of patients who stay in the hospital are using antibiotics
- 1 in 10 patients acquires an infection whilst in hospital.

Distribution of microorganisms

- Air
- Soil
- Water
- Animals
- Human body

Where microorganisms?

Habitat	Approximate number of bacteria
Garden soil (surface)	$9.7 \times 10^6/g$
Garden soil (30 cm deep)	$5.7 \times 10^5/g$
Lakewater (shallow)	$10^4/ml$
Lakewater (deep)	$10^2/ml$
Sea water	$1.1 \times 10^3/ml$
Human skin	$10^6/sq\ cm$
Human mouth	$10^7/ml$
Human intestine	$4 \times 10^{10}/g$
Milk	10^3 to $10^6/ml$
Cheese	$10^8/g$
Sunlit surface	few
Air	few

Microorganisms and Human Beings

- **Beneficial activities:** Most microbes are of benefit to human beings, some are necessary(nitrogen, carbon cycles, etc)
- **Harmful activities:** A portion of microbes cause diseases and are dangerous to human, and these are really that concern us in the study of medical microbiology,

Microorganisms and Human Beings

Not all bacteria cause disease

Few bacteria are always pathogenic



Many bacteria are potentially pathogenic



Most bacteria are never pathogenic



Microorganisms and Human Beings



Microbiology

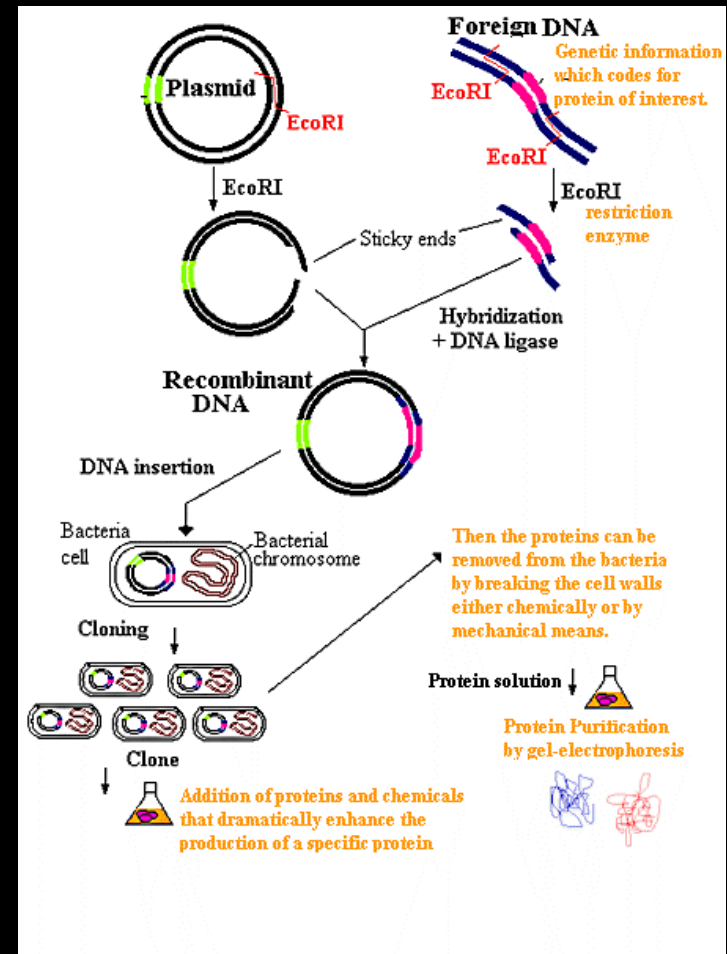
- Microbiology is the biology of microorganisms.
- It is a bioscience for the study of the evolution, classification , morphology, physiology, genetics, ecology of microbes under certain definite conditions,
- The law of their life activities, and their interaction with human being, animals or plants as well as with natural environment.

Microbiology

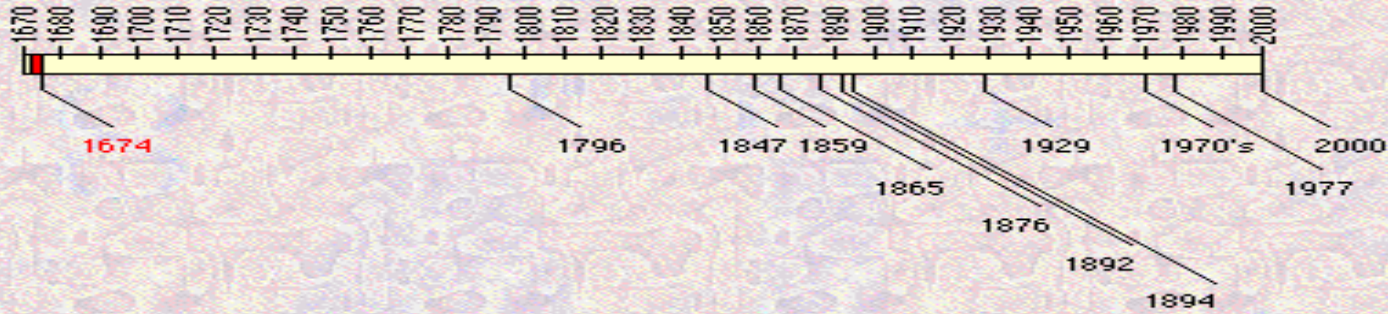
- The medical microbiology is one of the essential basic sciences for medicine
- It is the study of biological characteristics of microorganisms and their relationships with human hosts

The Importance of Microbiology

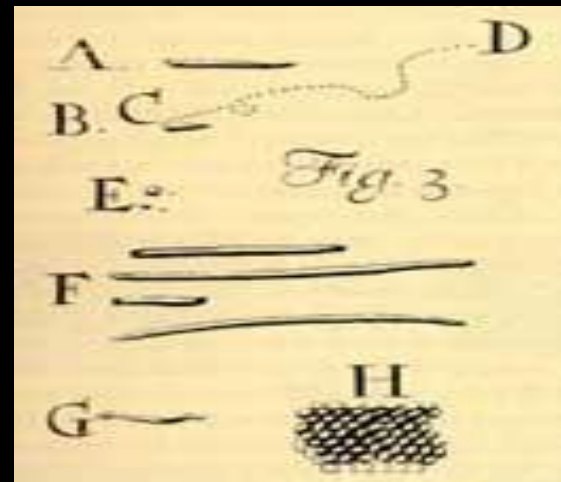
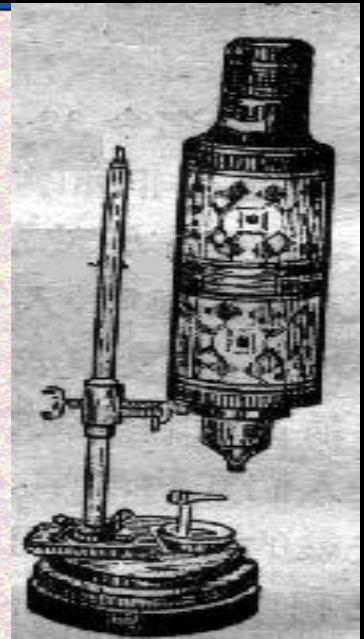
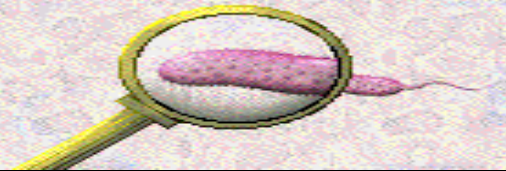
- Medicine
- Food
- Industry
- Biotechnology
- Research
- Environment

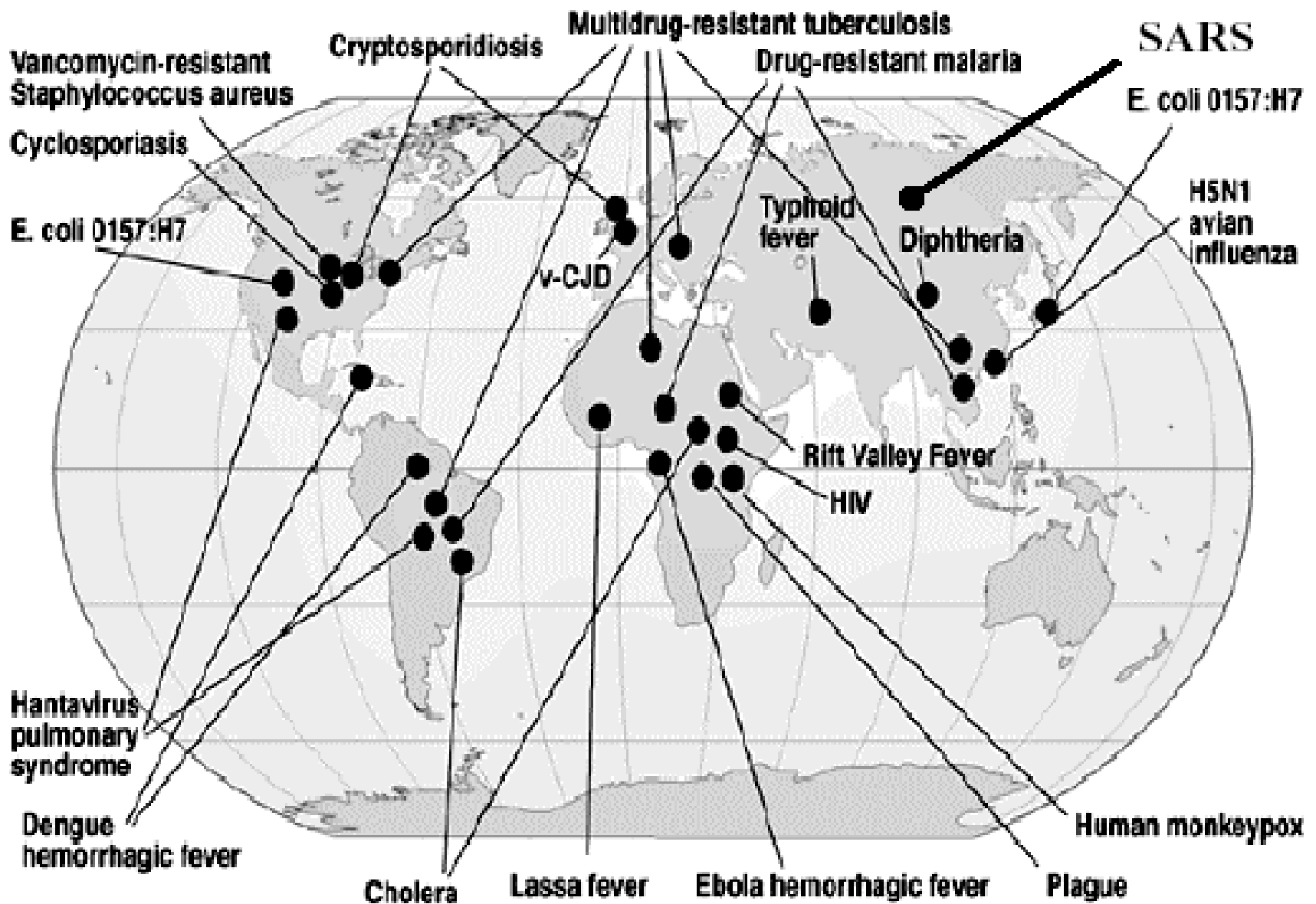


Time Line of Microbiology



1674 Antony van Leeuwenhoek discovers microorganisms.





Classification of Organisms

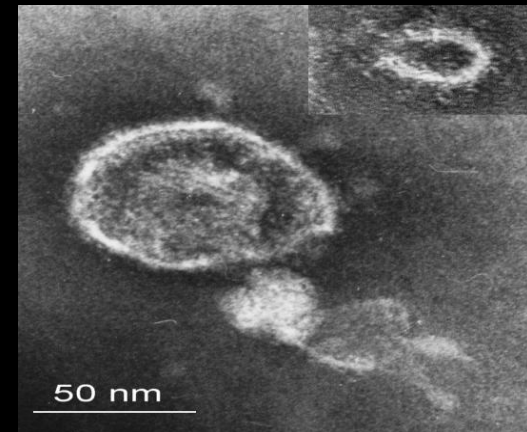
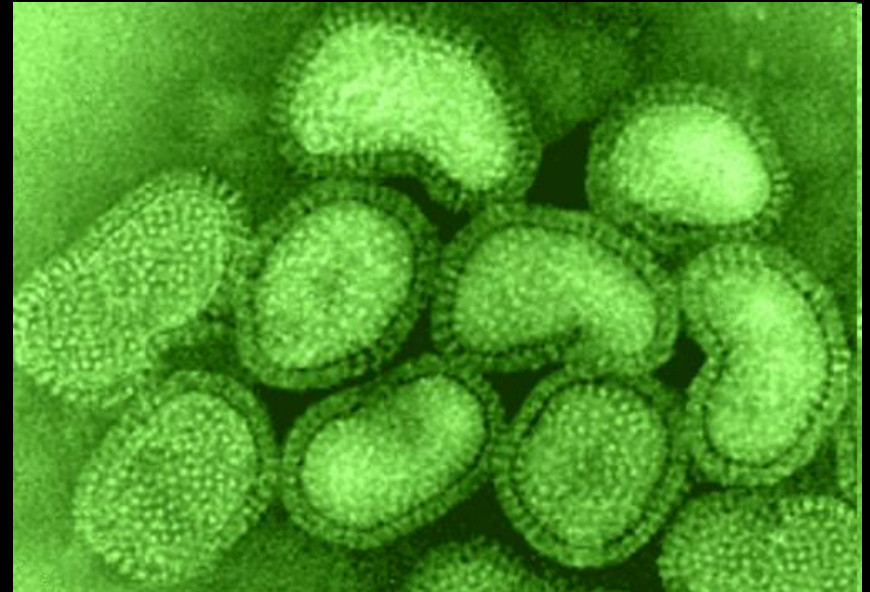
- All living organisms are classified into:
 - Kingdom
 - Phylum (family)
 - Genus
 - Species
- Organisms that can cause disease are many and varied and include:
 - Viruses
 - Bacteria
 - Fungi
 - Parasites

Relevance of Classification

- Different:
 - Diseases
 - Modes of transmission
 - Treatment-*e.g.* antibiotics don't cure viral infections

Viruses

- Small (50-300nm)
- Unable to replicate independently
- Invade host cells and use their cellular machinery to replicate
- Influenza, Chickenpox (varicella), Herpes, Rhinovirus, HIV/AIDS
- Often difficult to treat



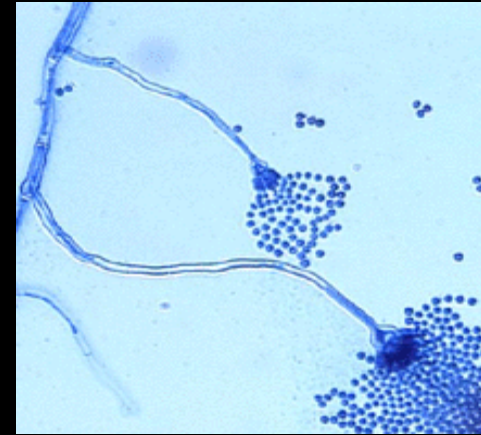
Bacteria

- 500-800nm
- Capable of independent replication
- Cause of most infections seen in hospital
- Pneumonia, bacterial meningitis, cellulitis, UTI...
- Many different species
- Treated with antibiotics



Fungi

- Eukaryotes (as are humans!)
- Divided into yeasts & moulds
- Cause a range of diseases
e.g.:
 - Thrush
 - Athletes foot
 - Invasive & allergic aspergillosis
- Complex, large organisms
- Many diseases are opportunistic



Microbiology

- Medical Microbiology studies are usually performed on human blood and body fluids.
- Medical Laboratory Technicians and Medical Laboratory Technologists perform the studies.
- Education level: 2 year for the technicians and 4 year for BS

Microbiology

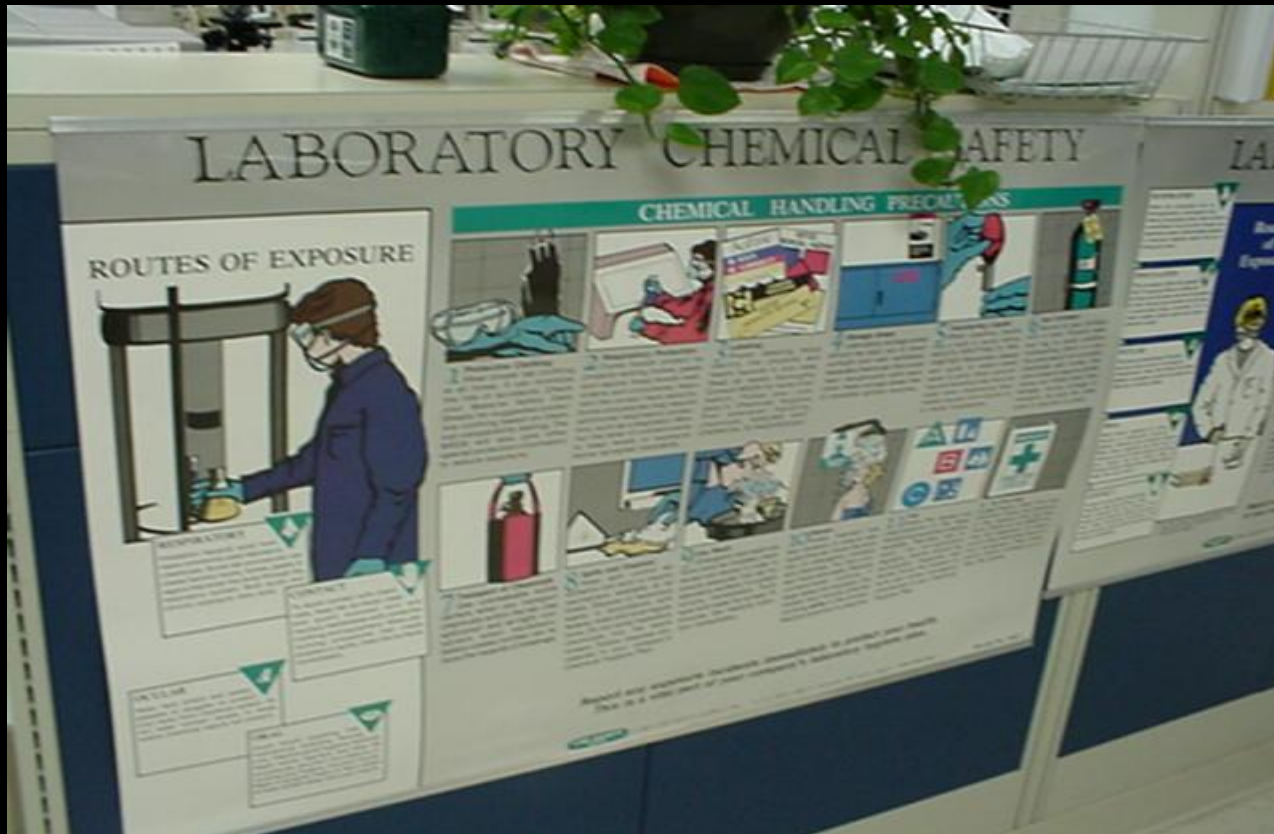
- Microorganisms can cause disease in humans.
- Microbiologists determine the type of microorganism causing the disease and find a drug, usually an antibiotic, to inhibit the microorganism.
- Microbiologists continue to study the microorganisms through research to determine new antibiotics.

Microbiology

- Microorganisms are studied in
 - clinical hospital laboratories,
 - reference laboratories,
 - research facilities.

Microbiology

- All laboratories post signs regarding safety.



Microbiology

LABORATORY BIOSAFETY

RESPIRATORY
Avoid all conversations with the public, the press, or other laboratory staff, including those outside of your facility, that are done through any respiratory system. Notify your supervisor if you have a respiratory infection, such as the common cold, flu, or other respiratory illness.

INHALATION
The greatest risk to your health is the inhalation of aerosols. Avoid the use of open flame. Avoid the use of open flames. Avoid the use of open flames. Avoid the use of open flames.

OCULAR
The greatest risk to your health is the inhalation of aerosols. Avoid the use of open flame. Avoid the use of open flames. Avoid the use of open flames.



ORAL
Avoid all conversations with the public, the press, or other laboratory staff, including those outside of your facility, that are done through any respiratory system. Notify your supervisor if you have a respiratory infection, such as the common cold, flu, or other respiratory illness.

CONTACT
Avoid all conversations with the public, the press, or other laboratory staff, including those outside of your facility, that are done through any respiratory system. Notify your supervisor if you have a respiratory infection, such as the common cold, flu, or other respiratory illness.

Routes of Exposure



Precautions to Reduce Exposure

 <p>Keep closed and leaky fluid containers in a well-ventilated area. Do not have a security guard in adjacent areas during transport.</p>	 <p>Wear gloves when processing, using, transferring, or disposing of infectious materials. Wash hands after working with fluids from containers.</p>	 <p>Wear a mask and eye protection to prevent contact with infectious samples.</p>	 <p>Never mouth pipette. Use a pipette with mechanical action. Do not use mouth pipettes.</p>	 <p>When using needles and syringes, follow all safety procedures and standards. Do not recap needles. Do not bend needles. Do not break needles. Do not reuse needles.</p>
 <p>After a spill, do not touch the spill. Notify your supervisor. Do not attempt to clean up the spill. Do not use your hands to clean up the spill.</p>	 <p>Do not use forceps to handle infectious materials. Use forceps to handle infectious materials. Do not use forceps to handle infectious materials.</p>	 <p>Place all infectious materials in a biohazard container. Do not place infectious materials in a biohazard container.</p>	 <p>Do not use test tubes to handle infectious materials. Do not use test tubes to handle infectious materials.</p>	 <p>After a spill, do not touch the spill. Notify your supervisor. Do not attempt to clean up the spill. Do not use your hands to clean up the spill.</p>

Report any exposure incidents immediately to protect your health. This is a vital part of your company's laboratory hygiene plan.

Microbiology

- Safety hoods are used to avoid splashing and inhaling possible pathogens.



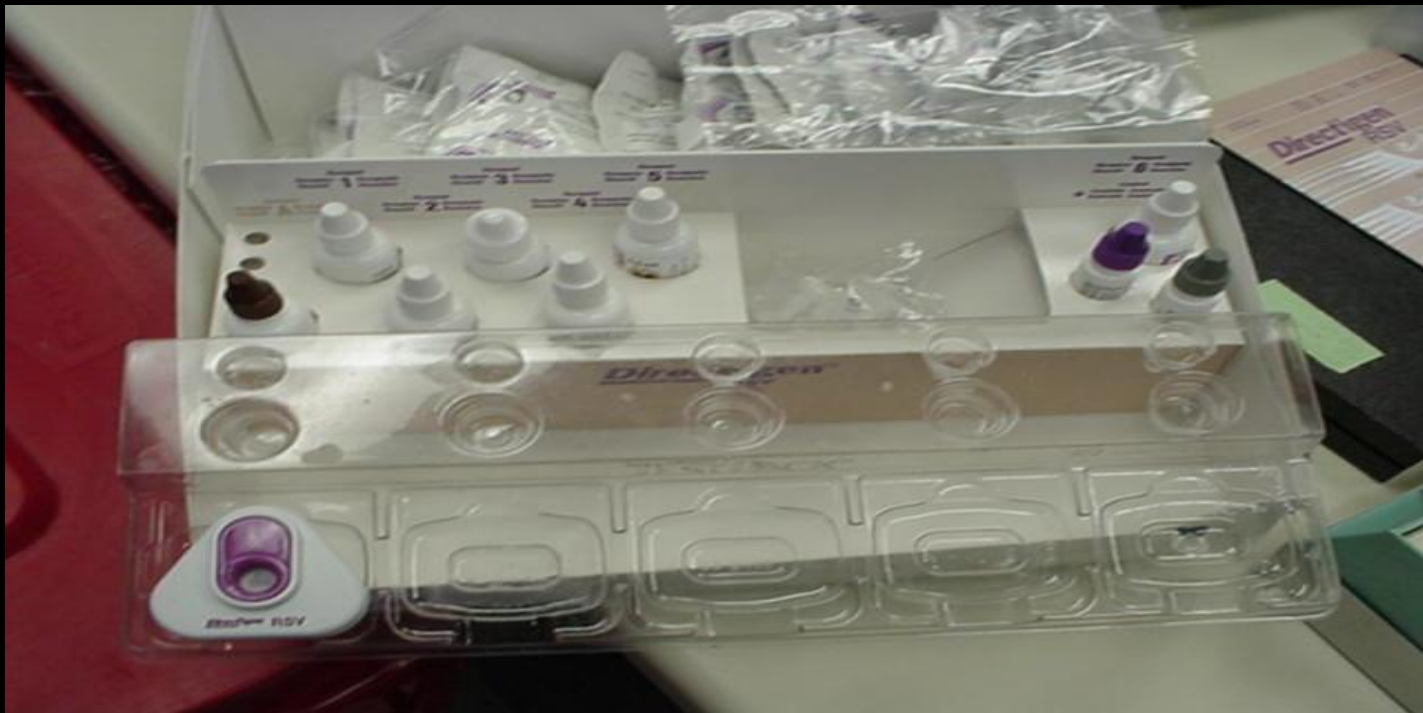
Microbiology

- A monitored refrigeration unit is essential for accurate results in microbiology.



Microbiology

- Reagents, such as those used in this strep screen, aid in diagnosis of disease.



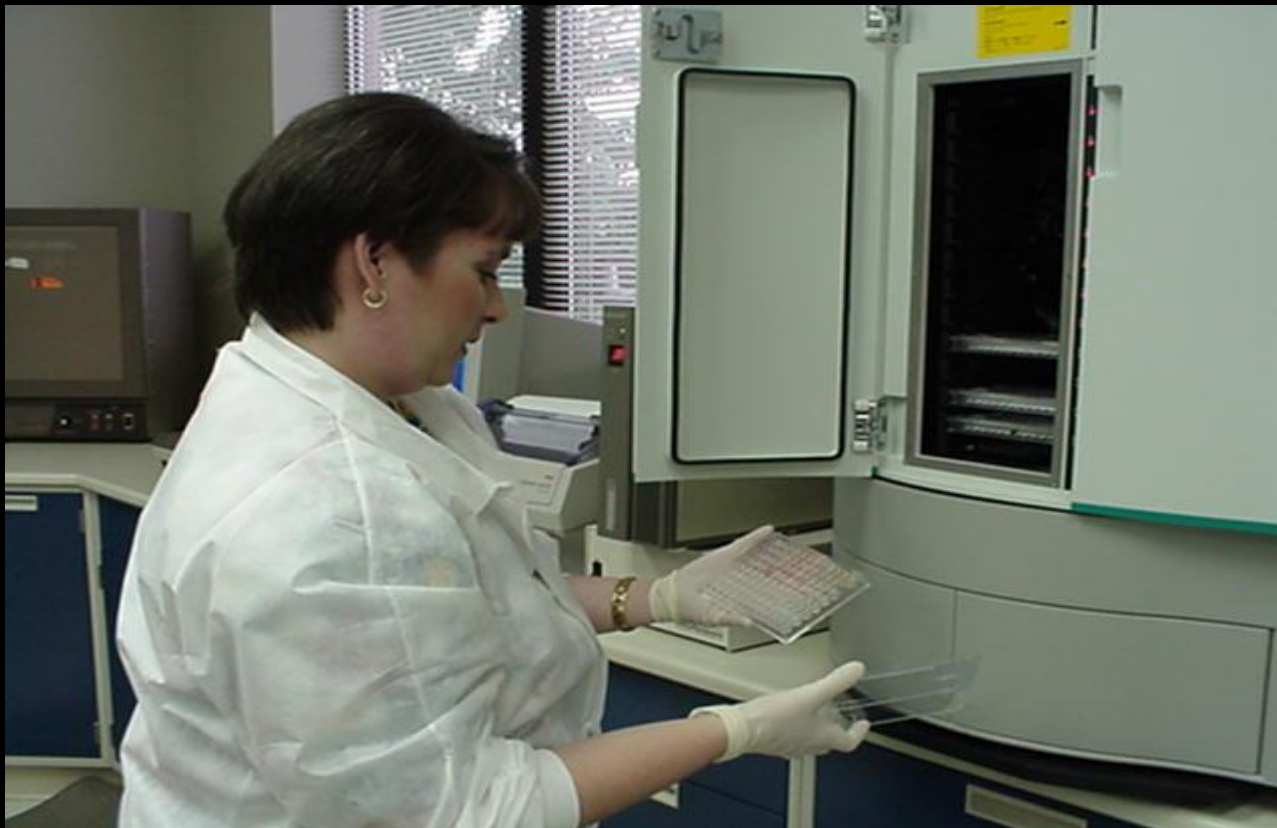
Microbiology

- Blood cultures are incubated and monitored electronically for bacterial and fungus growth.



Microbiology

- High tech instruments are used to aid in the identification of microorganisms.



Microbiology

- What is growing on this agar plate?

