



Acid fast staining of patient's sputum

emergence of TDR TB

or more of the six classes of second-line drugs





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Dr. K. Gopinatha Rao Memorial Lecture

Delivered by

Prof. Valakonda Nagaraja

Visiting Professor, Bangalore
Faculty, Bangalore



Guest of Honor

Prof. D. Narasimha

Professor, Bangalore
Bangalore
Bangalore



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International Microorganisms Day
16th and 17th September 2024 | Prasanthi Mission, India

Microbial Pathogens
Microbial pathogens are microorganisms that can cause disease in a host and include bacteria, viruses, fungi, protozoa, worms and prions.

Bacteria
Bacteria is a very common form of organism. There are million different types of bacteria. Some can be found in soil and other things which have been identified as well as harmful to us.

- Tuberculosis**
- Pneumonia**
- Cholera**

Virus
A virus is a infectious agent consisting of a segment of nucleic acid and protein coat. It is not a cell and cannot be seen with a microscope.

- Smallpox**
- AIDS**
- Corona**

Fungi
Fungi are a group of organisms that are eukaryotic and heterotrophic. They are found in soil, water, and air. Some fungi are beneficial, while others are harmful.

- Ringworm**
- Athletes foot**
- Microplasmids**



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HOST DEFENSE MECHANISM

I UG: Sumrma Subba, S.Archana, Eritika Adhikary

Host Defense Mechanism
 Complex systems that protect the body from infections and diseases. These mechanisms work together to identify, attack and eliminate foreign invaders, ensuring the body's protection.

IMMUNITY
 Immunity involves the body's ability to recognize and defend against harmful substances, diseases, and infections.

HOW DOES IT WORK?
 Innate immunity is body's first line of defense, responding rapidly to infections. Adaptive immunity is the body's second line of defense, which takes time to develop but provides long-lasting protection. After exposure to a substance, such as a disease or an antigen, the body's immune system is activated. This process involves the following components:

- Macrophages
- Natural Killer (NK) cells
- Dendritic cells
- T cells
- B cells
- Cytotoxic T cells (CD8+)
- Regulatory T cells

HOW DO VACCINES WORK?
 1. **Antigen**: A small piece of the pathogen is introduced into the body.
 2. **Antigen Presentation**: The antigen is presented to T cells, which recognize it as foreign.
 3. **Response**: The immune system mounts a response, including the production of antibodies and activation of T cells.

VACCINES
 Biological preparations that induce immunity to a disease. They contain antigens that stimulate the immune system without causing the disease.

HOW THEY WORK?
 Vaccines work by training your immune system to recognize and fight off harmful germs, such as viruses and bacteria, before they can cause a disease. They do this by introducing a small amount of the germ or a piece of it into your body. This triggers an immune response, which produces antibodies and memory cells. If you are ever exposed to the actual germ, your immune system will recognize it and fight it off before it can cause a disease.

Harnessing mRNA: The Next Frontier in Vaccine Development
 mRNA vaccines use a copy of messenger RNA to instruct cells to produce a protein that triggers an immune response. This process trains the immune system to recognize and fight the actual pathogen if encountered.

Advantages:

- Rapid development
- Targeted response
- Stable at room temperature

Challenges:

- Delivery to target cells
- Stability of mRNA
- Potential for allergic reactions

Future Prospects:

- Personalized medicine
- Expanded applications for infectious diseases and cancer

(Bibliography) Major Sources of the content

www.ncbi.nlm.nih.gov
 www.pbs.org
 www.who.int

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HOSPITAL ACQUIRED INFECTION

Infection developing in patients after admission to the hospital which was neither present nor was in the incubation period at the time of hospitalisation.

MODES OF TRANSMISSION

CAUSES

- URINARY CATHETERS (CAUTI)
- SURGICAL PROCEDURES (SSI)
- MECHANICAL VENTILATION (VAP)
- CENTRAL VENOUS CATHETERS (CLABSI)

ROUTES OF TRANSMISSION

- Direct contact
- Airborne
- Parenteral route
- Oral route

TYPES OF HAI

- CAUTI (Catheter associated urinary tract infection)
- VAP (Ventilator associated Pneumonia)
- CLABSI (Central line associated blood stream infection)
- SSI (Surgical site infection)

STANDARD PRECAUTIONS

References: Essentials of Medical Microbiology, Anurag K Saxena, Textbook of Microbiology, Dr. C P Bhowmik, www.downloadart.org.in



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OF MICROORGANISMS
 Dr. Biswaprakash, Shivam

Microorganisms are usually viewed with a microscope.

MICROORGANISM

PROKARYOTES

EUKARYOTES

CELLULAR

ACELLULAR

Fungi

Algae

Virus

Viroid

Prion

FUNGI
 Fungi are eukaryotic organisms that include microorganisms such as yeasts, molds, and mushrooms. These organisms are found in every type of habitat. Reproduce both sexually and asexually. There are an estimated 2.2-2.3 million species of microscopic fungi, making them most diverse organisms on Earth. E.g., Aspergillus, Rhizopus, Penicillium.

MICROALGAE
 Microalgae is a photosynthetic microorganism contributing to a large portion of the primary food chain in aquatic ecosystems. They require abundant carbon and nitrogen of growth. Organic microalgae including Spirulina, Chlorella etc. have high concentrations of complete protein, vitamins, minerals and other essential nutrients.

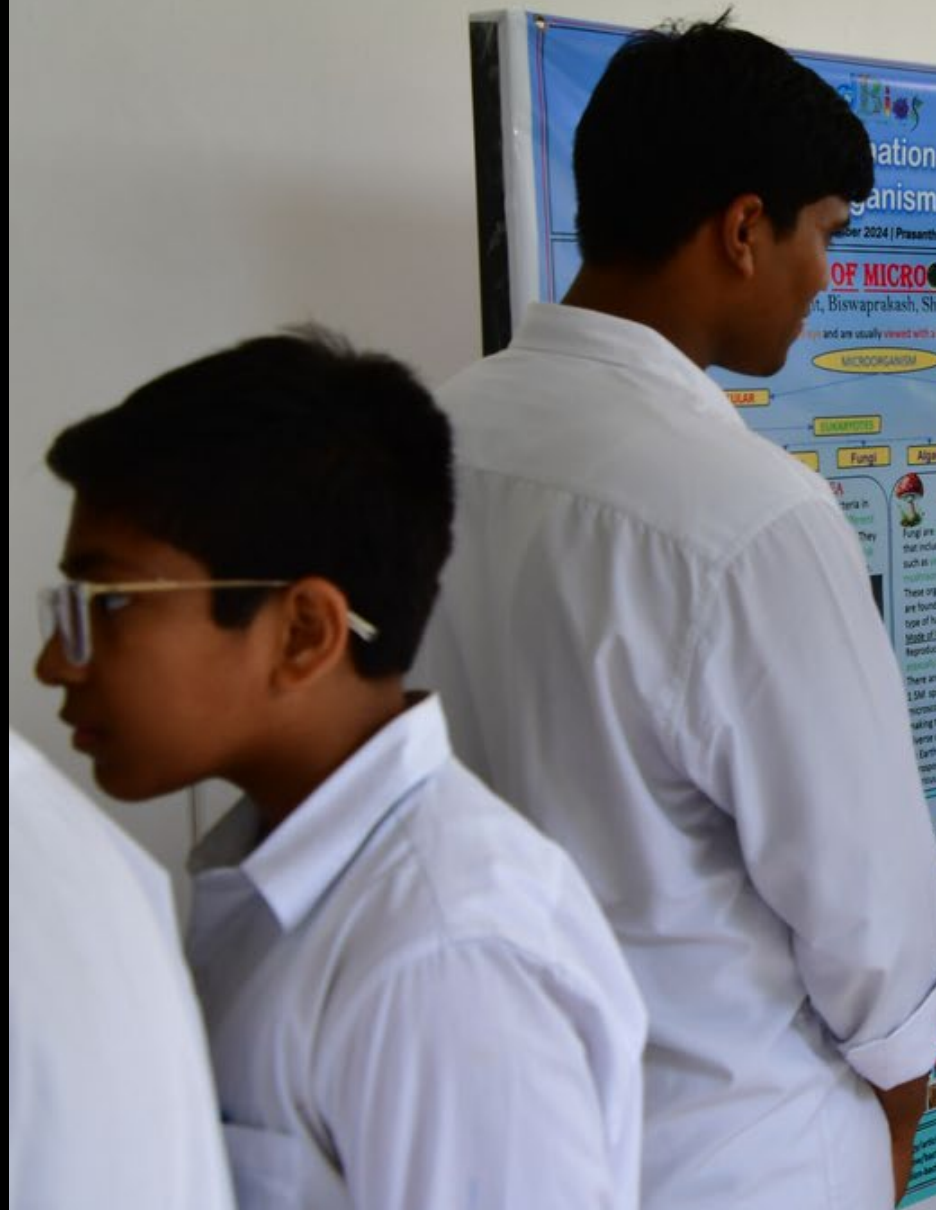
VIROID
 Viroids are small single circular RNAs that lack protective protein coating. They are highly infectious. Molecular weight of viroids from about 250-400 nucleotides.

PRION
 Prions are infectious proteins that cause brain damage and other symptoms in humans and animals. Prion diseases are transmissible and can be prevented by heat and disinfection.

DEBRIEF:
 Cerebral malaria (in humans), Borna disease (in animals), and Creutzfeldt-Jakob disease (in humans).

IN OUR CLASS:
 These are some of the microorganisms that we are studying in our class.

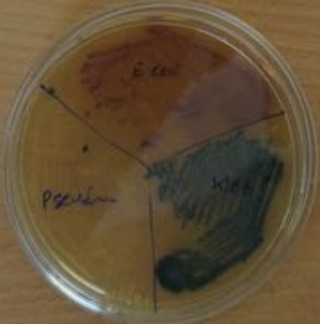
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- *Klebsiella pneumoniae* → Green
- *E. coli* → pink - Red
- *Pseudomonas aeruginosa* → White - pale
- *Staphylococcus aureus* → Bright white
- *Streptococcus* → turbid
- *Aspergillus fumigatus* → white
- *Bacterium subtilis* → orange



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