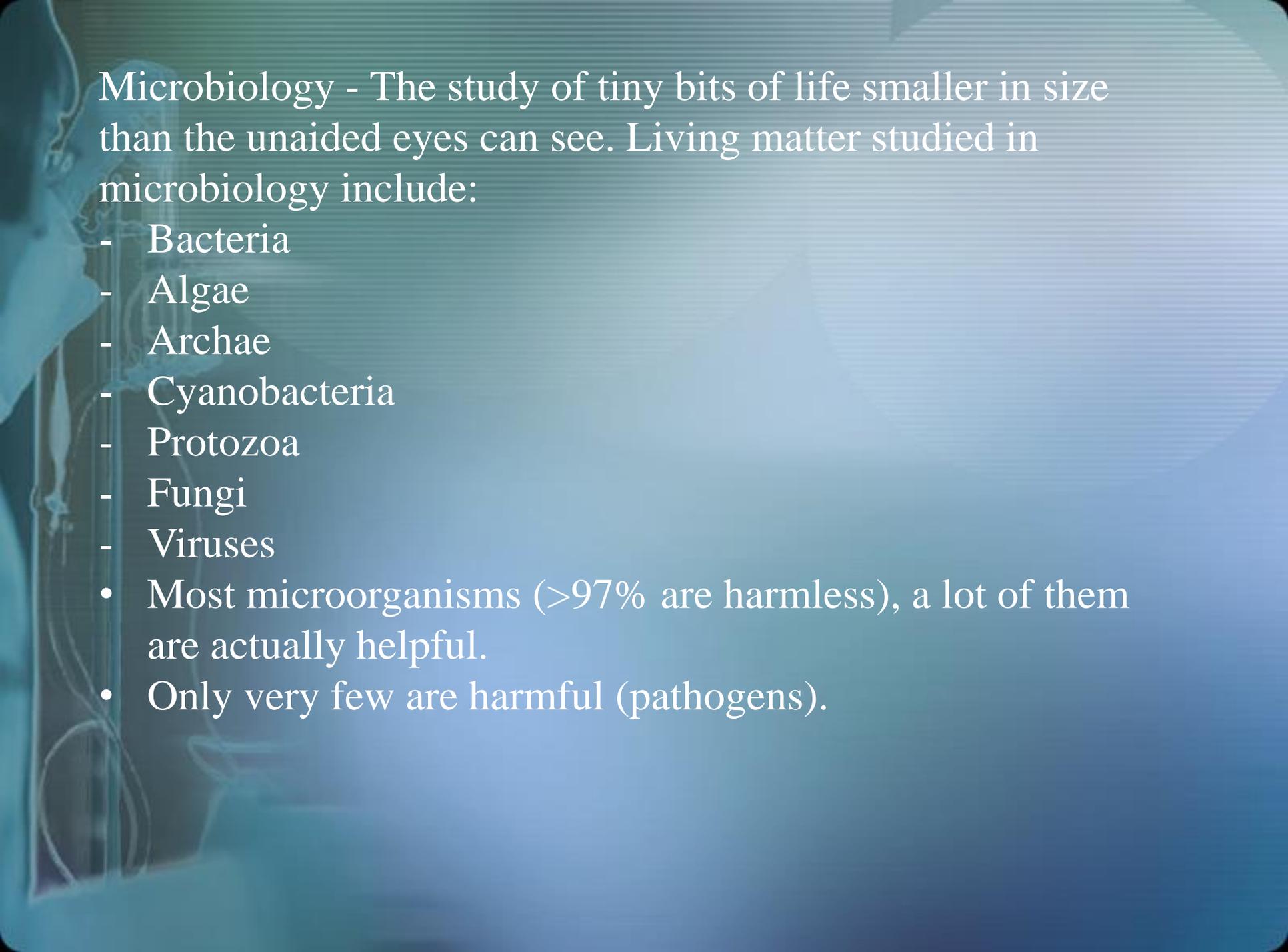


History of Microbiology

Charles Okolie, PhD.

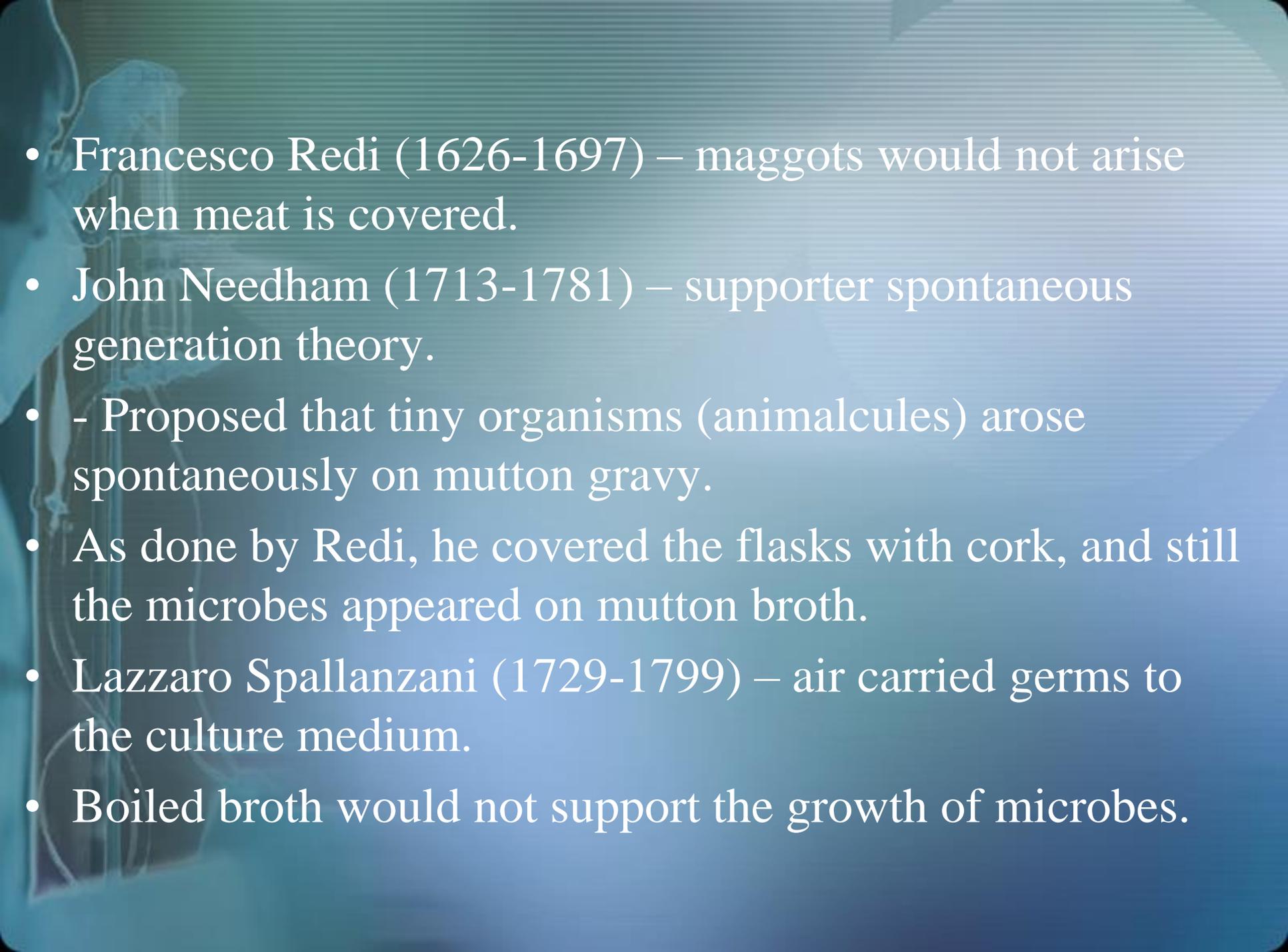
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Microbiology - The study of tiny bits of life smaller in size than the unaided eyes can see. Living matter studied in microbiology include:

- Bacteria
- Algae
- Archae
- Cyanobacteria
- Protozoa
- Fungi
- Viruses
- Most microorganisms (>97% are harmless), a lot of them are actually helpful.
- Only very few are harmful (pathogens).

- Aristotle (384-322BC) – Living organisms might have developed from non-living matter (Theory of spontaneous generation).
- Roger Bacon – Disease is caused by a minute “SEED” or “GERM” (The germ theory of disease).
- One of the major contributions to microbiology was the assembly of pieces of glass by Anton von Leuwenhoek (1632-1723) which he used to examine life unseen to the naked eyes. This invention led to the development of the modern microscope and the scientific method of thinking - curiosity.
- Described animalcules in 1676 (bacteria, yeasts, protozoa, and algae) – father of bacteriology and protozoology.
- The term microbe was first used by Sedillot in 1878.

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- Francesco Redi (1626-1697) – maggots would not arise when meat is covered.
 - John Needham (1713-1781) – supporter spontaneous generation theory.
 - Proposed that tiny organisms (animalcules) arose spontaneously on mutton gravy.
 - As done by Redi, he covered the flasks with cork, and still the microbes appeared on mutton broth.
 - Lazzaro Spallanzani (1729-1799) – air carried germs to the culture medium.
 - Boiled broth would not support the growth of microbes.

GOLDEN ERA:

Louis Pasteur

- He is the father of Medical Microbiology.
- He pointed that no growth took place in swan neck shaped tubes because dust and germs had been trapped on the walls of the curved necks but if the necks were broken off so that dust fell directly down into the flask, microbial growth commenced immediately.
- Pasteur in 1897 suggested that mild heating at 62.8°C (145°F) for 30 minutes rather than boiling was enough to destroy the undesirable organisms without ruining the taste of the product, the process was called Pasteurization.

- He invented the processes of pasteurization, fermentation and the development of effective vaccines (rabies and anthrax).
- Pasteur demonstrated diseases of silkworm was due to a protozoan parasite.



*Contributions of *Loius pasteur*:*

- He coined the term “microbiology”, aerobic, anaerobic.
- He disproved the theory of spontaneous germination.
- He demonstrated that anthrax was caused by bacteria and also produced the vaccine for the disease.
- He developed live attenuated vaccine for the disease.

John Tyndall (1820 - 1893)

- He discovered highly resistant bacterial structure, later known as endospore.
- Prolonged boiling or intermittent heating was necessary to kill these spores, to make the infusion completely sterilized, a process known as Tyndallisation.

Lord Joseph Lister (1827-1912)

- He is the father of antiseptic surgery.
- Lister concluded that wound infections too were due to microorganisms.
- He also devised a method to destroy microorganisms in the operation theatre by spraying a fine mist of carbolic acid into the air.



Robert Koch (1893-1910)

- He demonstrated the role of bacteria in causing disease.
- He perfected the technique of isolating bacteria in pure culture.
- Robert Koch used gelatin to prepare solid media but it was not an ideal because
 - (i) Since gelatin is a protein, it is digested by many bacteria capable of producing a proteolytic exoenzyme gelatinase that hydrolyses the protein to amino acids.
 - (ii) It melts when the temperature rises above 25°C.



Koch's postulates

Postulate 1

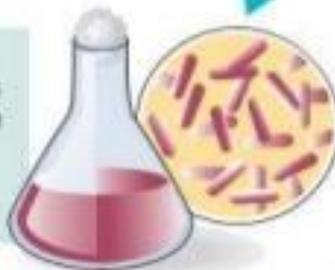
The same microorganisms are present in every case of the disease.



Anthrax bacilli Spore

Postulate 2

The microorganisms are isolated from the tissues of a dead animal, and a pure culture is prepared.



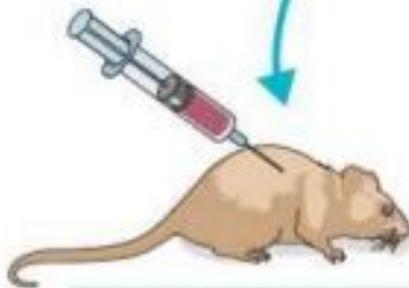
Postulate 4

The identical microorganisms are isolated and recultivated from the tissue specimens of the experimental animal.



Postulate 3

Microorganisms from the pure culture are inoculated into a healthy, susceptible animal. The disease is reproduced.



Fanne Eilshemius Hesse (1850 - 1934)

- One of Koch's assistant first proposed the use of agar in culture media.
- It was not attacked by most bacteria.
- Agar is better than gelatin because of its higher melting pointing (96°c) and solidifying ($40 - 45^{\circ}\text{c}$)points.



Richard Petri (1887)

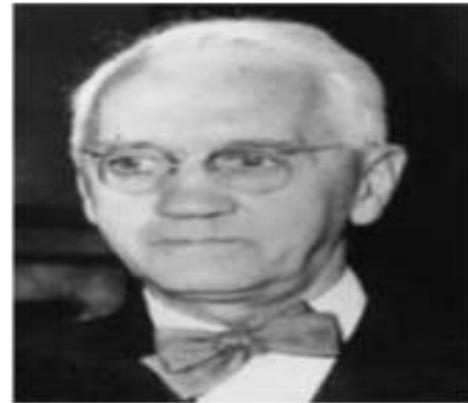
- He developed the Petri dish (plate), a container used for solid culture media.

Edward Jenner (1749-1823)

- First to prevent small pox.
- He discovered the technique of vaccination.

Alexander Flemming

- He discovered the penicillin from *penicillium notatum* that destroy several pathogenic bacteria.



Paul Erlich (1920)

- He discovered the treatment of syphilis by using arsenic
- He Studied toxins and antitoxins in quantitative terms & laid foundation of biological standardization.

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- Major twentieth-century events led to the following contributions
 - Antibiotics
 - Vaccines
 - Technology (electron microscope)
 - MALDI biotyper

The background of the slide features a stylized, semi-transparent image of a human head in profile, facing left. Inside the head, there are intricate, glowing blue and white patterns that resemble neural pathways or a complex network of connections, set against a dark blue gradient background.

- Institution Contributions

- Pasteur Institute (France)

- Medical Research Council (UK)

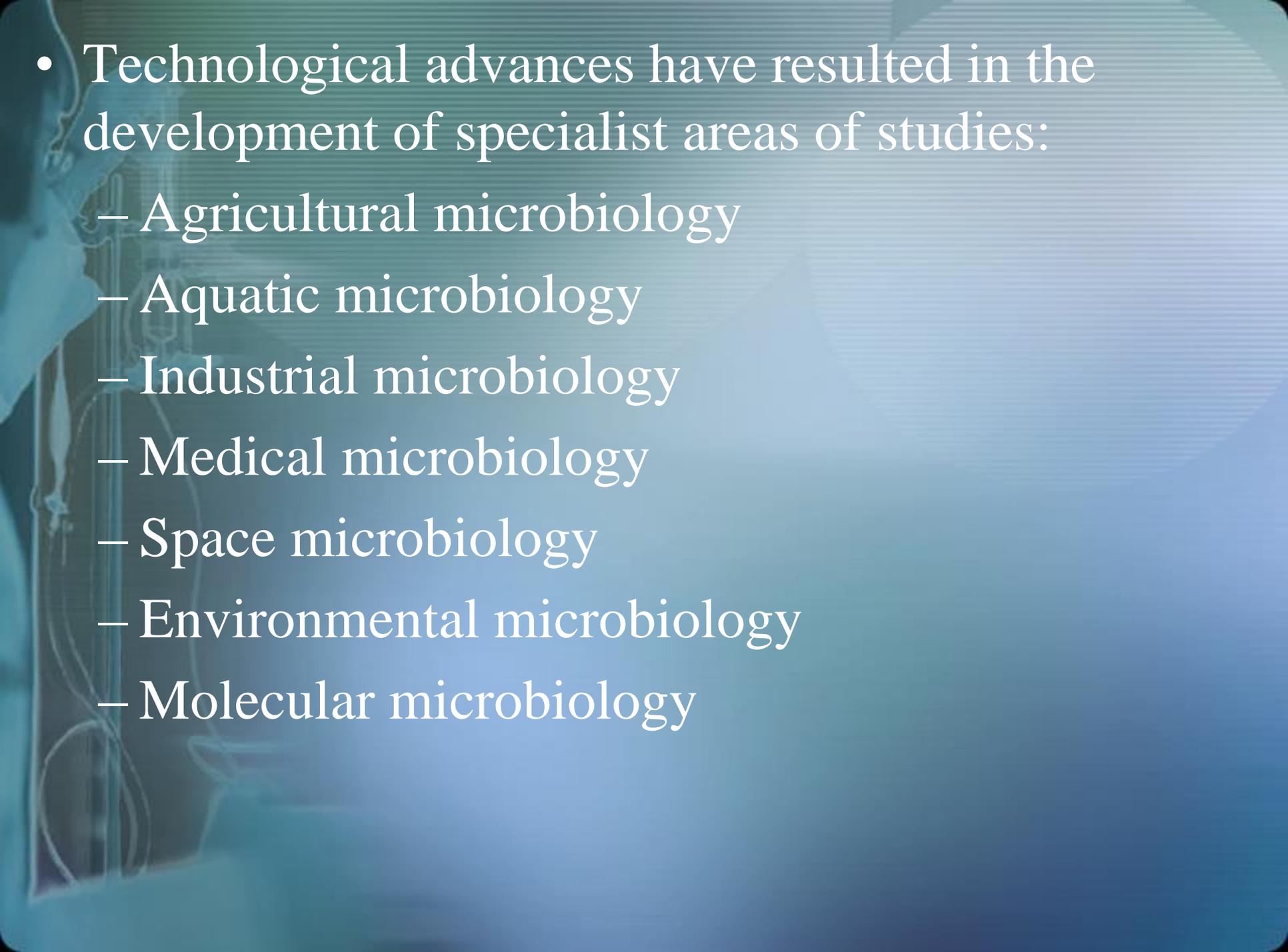
- CDC-Center for Disease Control and Prevention (USA)

- NIH-National Institutes of Health (USA)

- WHO-World Health Organization (World – Switzerland)

- National Veterinary Research Institute (Nigeria)

- National Centre for Biotechnology Information (USA)

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- The background of the slide features a teal-to-blue gradient. On the left side, there is a faint, semi-transparent image of a person's profile in profile, looking towards the right. In the center and right, there are faint, semi-transparent images of laboratory glassware, including what appears to be a flask and a beaker, suggesting a scientific or laboratory setting.
- Technological advances have resulted in the development of specialist areas of studies:
 - Agricultural microbiology
 - Aquatic microbiology
 - Industrial microbiology
 - Medical microbiology
 - Space microbiology
 - Environmental microbiology
 - Molecular microbiology

IMPORTANT DISCOVERIES:

Bacteria:

- Hansen (1874) – Leprosy bacillus
- Neisser (1879) – Gonococcus
- Ogston (1881) – Staphylococcus
- Loeffler (1884) – Diphtheria bacillus
- Roux and Yersin – Diphtheria toxin

Viruses:

- *Beijerinck* (1898) - Coined the term *Virus* for filterable infectious agents.
- *Pasteur* developed Rabies vaccine.
- *GoodPasteur* - Cultivation of viruses on chick embryos.
- *Charles Chamberland*, one of Pasteur's associates constructed a porcelain bacterial filter.
- *Twort and d'Herelle* - Bacteriophages.
- *Edward Jenner* - Vaccination for Smallpox.

MODERN ERA:

Nobel Laureates

Years	Nobel laureates	Contribution
1901	<i>Von behring</i>	Diph antitox
1902	<i>Ronald Ross</i>	Malaria
1905	<i>Robert koch</i>	Tb
1908	<i>Metchnikoff</i>	Phagocytosis
1945	<i>Flemming</i>	Penicillin
1962	<i>Watson, Crick</i>	Structure DNA
1968	<i>Holley, Khorana</i>	Genetic code
1997	<i>Prusiner</i>	Prions
2002	<i>Brenner, Hervitz</i>	Genetic regulation of organ development & cell death

Likely Examination questions.

Questions may come in the examinations with special interest in:

- Elie Metchnikoff
- Alexander Fleming
- Landsteiner & Popper
- Loeffler & Frosch
- Beijerinck
- Ivanovsky
- Paul Ehrlich
- Robert Koch
- Joseph Lister
- Louis Pasteur and descendants
- Spallanzani
- John Needham
- Edward Jenner
- Animalcules

Further Reading materials available online:

- History of Microbiology by R. Parthasarathy.
- Microbiology: Introduction & history by Kalpesh Zunjarrao



Nice to meet you.
Great microbiologists.
Thank you for the
opportunity to share.