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It's Important to Know!

BP303T — Pharmaceutical Microbiology

B.Pharm Semester 3 · Unit 1 — Introduction to microbiology and bacterial growth

Unit I: Introduction to microbiology and bacterial growth

Scope and history

Microbiology studies microorganisms and their interactions with hosts, materials and environments. Pharmaceutical microbiology applies this knowledge to contamination control, sterile products, antimicrobial testing, fermentation, quality systems and public health. Historical development includes microscopy, germ theory, pure culture methods and aseptic practice. Specific dates and attribution should be checked against the prescribed history text.

Prokaryotes and eukaryotes

Prokaryotic cells lack a membrane-bound nucleus and usually have a simpler internal organisation. Bacteria have a cell membrane, cytoplasm, ribosomes and a cell wall in many species. Eukaryotic microorganisms have a nucleus and membrane-bound organelles. Fungi are eukaryotic; viruses are acellular particles that require a host cell for replication.

Bacterial morphology and nutrition

Bacteria may be spherical, rod-shaped, curved or spiral, and may occur singly, in pairs, chains or clusters. Structures such as capsule, flagella, pili, endospore and cell wall influence survival, movement, attachment and staining. Nutrients provide carbon, nitrogen, minerals, growth factors and energy. Culture media may be defined, complex, selective, differential, enriched or enrichment media.

Growth and cultivation

In a closed culture, the growth curve has lag, log, stationary and decline phases. Temperature, pH, oxygen, water activity, nutrients and osmotic conditions affect growth. Pure cultures are isolated by dilution, streaking, spreading or other separation methods, then preserved by refrigeration, deep freezing, drying or other validated approaches. Anaerobes require removal or exclusion of oxygen. Exact preservation conditions should be checked against the prescribed text for each organism.

Measurement and microscopy

Total counts include living and non-living cells, while viable counts estimate cells able to form colonies under defined conditions. Phase-contrast microscopy improves contrast in living unstained cells. Dark-field microscopy uses scattered light to view thin organisms. Electron microscopy provides greater resolution but requires specialised preparation and does not show ordinary living growth.

Unit I: Frequently asked questions

Q: Why is the log phase important?

A: Cells divide actively and show relatively uniform physiology, so this phase is useful for studying growth and antimicrobial effects.

Q: What is a pure culture?

A: It is a culture derived from one organism or one type of organism under the stated identification criteria.

Q: What is the difference between total and viable count?

A: Total count includes cells regardless of viability, while viable count estimates cells that can grow under the test conditions.

Unit I: Key takeaways

- Pharmaceutical microbiology links microorganisms with product quality and patient safety.
- Prokaryotes and eukaryotes differ in cell organisation.
- Media composition and physical conditions determine cultivation.
- Growth commonly passes through four phases in a closed culture.
- Count and microscopy methods answer different questions.

Unit I: Practical correlation

Practical correlation: culture media. A laboratory should select media and incubation conditions that support the target organism while limiting contamination. The exact medium and incubation schedule are set out in the current practical manual for the test organism.