

This text introduces microorganisms, differentiating prokaryotes (lacking a true nucleus, smaller, simpler) from eukaryotes (possessing a true nucleus, larger, more complex). Key differences include the presence of mitochondria and membrane-bound organelles, ribosome size (70S vs 80S), and sterol content in the cytoplasmic membrane. Viruses (smallest infectious agents, lacking cell structure), viroids (single-stranded RNA), prions (infectious proteins), and blue-green algae (which may produce toxins) are discussed. Bacteria are classified based on shape (cocci, bacilli, spirals), size, arrangement, and staining characteristics (Gram staining, Ziehl-Neelsen staining). Bacterial ultrastructures include the nucleoid (containing a circular DNA chromosome and plasmids), ribosomes (sites of protein synthesis), inclusion granules (energy reserves), mesosomes (involved in cell division), and the cytoplasmic membrane (responsible for transport, excretion, respiration, and cell wall biosynthesis). The bacterial cell wall, composed of peptidoglycan, maintains shape and protects against osmotic pressure. Gram-positive bacteria have a thicker peptidoglycan layer and teichoic acids, while Gram-negative bacteria have a thinner layer, an outer membrane with lipopolysaccharide (LPS), and a periplasmic space. Cell wall-deficient bacteria, such as *Mycoplasma* and L-forms, are also described.