BIO152 Cell Biology

Learning Objective Notes

Contents

Cell Structure

Introduction to cells

Learning objectives:

- *Understand cell theory*
- *Identify limiting factors for cells*
- *Identify features that distinguish prokaryotes from eukaryotes*

Understand cell theory

1. *All organisms consist of one or more cells*
2. *The cell is the basic unit of life*
3. *All cells come from pre-existing, living cells*

All cells contain: plasma membrane, DNA, ribosomes, cytoplasm

Identify limiting factors for cells

- *Cells need to exchange molecules, gases, etc over large surface area*

Two options:

- *Cells remain unicellular but are small and unsuccessful (bacteria)*
- *Large, multicellular, complex organisms, but still with small cells*

Prokaryotes vs Eukaryotes

	Prokaryotes	Eukaryotes
Cell No.	Single-celled	Single or multi-celled
Growth	rapid	slow
Size	Small 0.5-3µm	Large (5-20µm)
Nucleus	None	Yes
Membrane-bound organelles	None	Many
Chromosome (DNA)	Single circular	Double linear
Ribosomes	Small 70S	Large 80S
Cell wall	Mostly present	Present in some
Cell division	Binary fission	Mitosis
Examples	Bacteria & archaea	Animals & plants

Cell ultrastructure

Learning objectives:

- *Name major organelles in eukaryotic cells and describe structure and function*
- *Describe distinguishing features of plant and animal cells*

Major organelles in eukaryotic cells

Organelle	Structure	Function
Cell Membrane	*Phospholipid bilayer with pores (proteins)* *Polar head, non polar tail*	• *Define compartment* • *Cell to cell communication* • *Endocytosis (taking in external environment) and exocytosis (secretion)*
Nucleus	*Double membrane, pores, nucleolus*	• *Chromosomes (DNA)* • *Histones: DNA binding proteins*
Mitochondria	*Double membrane, cristae (inner folds), DNA, matrix, enzymes*	• *Cristae generate ATP for energy* • *Aerobic respiration* • *Electron transport*
Endoplasmic Reticulum	*Single membrane, lumen inside, attached to nucleus*	• *Rough = protein synthesis* • *Smooth = lipid/steroid synthesis, detoxification*
Golgi Apparatus	*Single membrane-bound sacs, lumen*	• *Forms vesicle and secretes from cell by fusing with membrane* • *Synthesis of complex sugars (polysaccharides)*
Lysosome	*Single membrane bound vesicle*	• *Destroy/lyse material in vesicles* • *Recycle cell contents* • *Store enzymes*
Chloroplast	*Double membrane, thylakoids in third membrane joined by tubular membranes, forms granum*	• *Photosynthesis*
Peroxisome (plant and animal)	*Vesicle, single membrane, crystalline core*	• *Buds from ER* • *Packages and destroys hydrogen peroxide (h202) by turning into water and oxygen using catalase* • *Protects from damaging reactive oxygen species*