Chapter 12 - The Cell Cycle

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Meiosis -division of sex cells
Mitosis - division of all cells (somatic cells)

Cytokinesis

-division of cytoplasm - usually seen in most replication situations

Chromosomes

-chromosomes are held together by cohesions

Dna is hydrophilic, therefore they are only tightly adhered at one point

Interphase - G1 phase

-when the cell is not dividing
-chromosomes are all unwound - throughout the entire nucleus
-when its carrying out normal metabolism- where a cell spends the most of its life
-cell goes into s phase only if it gets a signal - eg. A hormonal signal - cell goes from g1 to s pha

S phase

-where the cells double
-cell grows to a specific size
-Dna synthesis - 2 copies of chromosomes

G2 phase

-allows for the replication of the organelles (eg. The mitochondria, chloroplasts)

Mitosis

Prophase

- Chromatid material condensing into chromosomes
-nuclear envelope dissolves
-longest part of the cell cycle

Metaphase

ase

Metaphase
- chromosomes align in the middle of the cell- metaphase plate

Anaphase
- 2 sister chromatids become separated and migrate toward opposite poles of the cells

Telophase
- may see the beginning of cytokinesis
-chromatids unravel
-2 new daughter cells form as nuclear envelopes form again

Figure 11.7a - chromosomes should be unwound

When a cell has 2 copies of one chromosome - can not maintain homeostasis and dies. -metaphase ensures that this does not happen

How do microtubules shorten?
-it is attached to a kinetochore plate at the chromosome that pulls of subunits, shortening it
-Kinetochore aid in shedding the microtubule

Cytokinesis
-different between types of cells
-pinching of the cells allowed by the motor proteins - only in animal cells
-in plant cells- formation of cell plate - contains pores for communication between cells to happen (cytoplasmic bridge)

Cell division in bacterial cells
-no nuclear envelope
-have circular chromosomes
Cell division - binary fission

Control of the cell cycle
Social control
-cues from cells (eg. light cues)

Cancer cells

Cancer cells

-can trigger the next round of synthesis - so they keep replicating
-ignore the environment around them
-P53- what keep cells from becoming cancerous

G1 Checkpoint

-Protein Kinase - activates o=enzymes through phosphorylation
-conc of cyclin builds up - improving the function of MPF (turns on enzymes)
-eventually, conc. of cyclin crashes - turning off MP
- Makes it a cell regulating system

Activation of S-phase Proteins

-Rb binds to E2F to shut down the cell cycle
-Rb becomes phosphorylated when cyclin conc increases
-changes the shape of Rb so that it no longer can bind to E2F and shut down the cell cycle
-instead E2F produces S-phase proteins

-cell stops if it has not received a growth factor

Checkpoints: points between each stage of the cell cycle in which ineligible cells are arrested

P53

-tumour suppressor
-if DNA is physically damaged, p53 prevents the cell from going through the cell cycle

Cancer

-T-cells in immune system recognize cancerous cells
-happens when mutations occur that let them skip checkpoints (eg. Mutations in P53 or Rb)
-more common in epithelial cells as the divide the most
-when apoptosis does not occur when necessary (programmed cell death)