

CELL CYCLE REGULATION

The Regulation of the Cell Cycle

- The cell cycle is an essential event that occurs in every living body, and it must be properly regulated for cells to function properly.

Understanding the Cell Cycle

- The cell cycle can be separated into two primary stages: interphase and mitosis. Interphase is further divided down into three stages: G1, S, and G2. During G1, the cell grows and prepares for DNA replication, which occurs in the S phase. Following DNA replication, the cell enters the G2 phase, which is when it prepares to divide. Mitosis has four stages: prophase, metaphase, anaphase, and telophase, followed by cytokinesis.

Checkpoints in the Cell Cycle

- The cell cycle includes three significant checkpoints: the G1/S, the G2/M, and the M checkpoint. These checkpoints ensure the cell cycle occurs normally and that any defects are fixed before the cell divides.

G1/S Checkpoint

- The G1/S checkpoint occurs as the G1 phase transitions into the S phase. The cell checks for DNA damage or mutations at this checkpoint before entering the S phase and replicating its DNA.

G2/M Checkpoint

- The G2/M milestone marks the shift from the G2 to the M phases. This checkpoint guarantees that the cell's DNA is properly copied and that it is prepared to undergo mitosis.

M Checkpoint

- Before the cell enters anaphase, the M checkpoint ensures that the chromosomes are correctly positioned on the metaphase plate during mitosis.

Genes Involved in the Regulation of the Cell Cycle

There are two main types of genes involved in the regulation of the cell cycle: proto-oncogenes and tumor suppressor genes.

Proto-Oncogenes

- Genes known as proto-oncogenes promote cell division. They generate proteins that facilitate the cell cycle's progression from one stage to the next. A few instances of proto-oncogenes are cyclin D, E, and A.