

Lecture_1

Lecture 1 notes

- DNA damage detected by ATM and CHK
- ATM and CHK activates p53
- p53 activates BAX and BAK
- BAK and BAX makes mitochondria porous
- cyt C from mitochondria exits the mitochondria and enters the cytoplasm
- cyt C roams in cytoplasm and binds to APAF to form a complex which gives rise to "Caspase Cascade"
- Produces calcium dependent nucleases
- DNA get damaged because of these nucleases
- This is the signaling for cell death / intrinsic apoptosis
- **Uses of cell signaling:**
 - Signaling helps in cell death
 - Cell death is important to prevent spread of disease
 - Signaling can lead to necrosis
 - If proper necrosis doesn't happen the organs won't develop
 - Necrosis is active during child development
 - Neurotransmission
 - Hormonal messaging
 - Transcription and Translation
- **Cell signalling**
 - Group of cells interact with each other to perform a given task
 - Definition of cell signalling:
 - "Cells in plants and animals perform various tasks to get a particular metabolic process"
 - "For this they should communicate with each other"
 - "This communication is via cellular messages which is a kind of stimulus given to the cells"
 - "These messages affect the physiochemical properties of the cells"
 - "This messaging is highly regulated, because any deviation from these messages will lead to disease or disease like conditions"
- **Cell signalling is based on three different processes:**

- **Reception:**

- The ability of the cells to detect a signalling molecules is called reception.
- Reception happens via the help of receptor
- Example:
 - TNF (tumour necrotic factor) is a signalling molecule which binds via TNFR (tumour necrotic factor receptor)
- **A process by which a signalling molecule will interact with the cells, generally a receptor is associated with such kind of molecules**

- **Transduction:**

- Transduction is a process by which the signalling molecule will give rise to series of changes inside the cells to reach a destination
- Example:
 - Lac permease give permission for lactose to enter the cell
 - Allolactose will bind to repressor to activate the operator
 - Polymerase will bind to ribosomal binding sites (RBS) and does the production of B gal
- *Transduction is when signalling molecule binds to receptor it leads to series of changes inside the cells. This is often associated to Release of secondary messenger and other molecules to perform specific task*

- **Response:**

- The final activity Which has happened in response to the signalling molecule"

- **Signal Transduction:**

- Signal Reception
- Signalling molecule binds to receptor
- Ligand gated ion channel
- Receptor tyrosine kinase
- G Protein receptors
- Integration
- Amplification
- Effect on Target
- Termination

- **Signals:**

- Signals should be unique in such a way that it should be recognized by the machinery Designed for its detection
- It should be small so it can travel from site of manufacturing to site of requirement

- Most of the signalling molecule take advantage of vascular system
- Some release on diffusion
- They will take help of some carrier protein

- **Receptor:**

- Protein molecule present on the cell surface. It receives the chemical signals originating externally from the cell
- Binding to this receptor allows some molecules to enter directly inside the cells
- In certain cases the cell to cell interaction takes place while in others simple diffusion takes place
- Can be present on cell membrane, plasma membrane, cytoplasm, nucleus
- They will bind to ligands which can be peptide or other molecules
- When ligands binds to receptor it leads to conformational changes in receptor
- This binding can trigger the cascade of biochemical reactions so that a biochemical process can start or can be terminated

- **Ligand Gated Ion Channels:**

- They are those channels that open in response to binding of a ligand

- **Receptor Tyrosine Kinases**

- Dimerisation of Tyrosine to form tyrosine residue
- Phosphorylation of tyrosine residue