## Communication(4.1)

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| **How cells communicate:** | Cells communicate with each other using chemical signals. The signals are proteins or other molecules produced by a sending cell and are often secreted from the cell and released into the extracellular space. |

## Types of Communication

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| **Juxtacrine Signaling** | Two cells adjacent from each other directly contact each other to communicate with each other |
| **Paracrine Signaling** | Communication over short distances where a cell send out a signal to nearby cells which results in the change in the behavior of the nearby cells |
| **Autocrine Signaling** | A cell sending a chemical signal or message to itself. The cell would release the chemical signla and have a receptor to recieve the signal. |
| **Endocrine Signaling** | The sending of a ligand to another cell for it to receive a specific signal. Different from endocrine as it isn't between two nearby cells but instead two cells on different parts or sides of the body. |

## Cell Cycle(4.6)

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| **What is it?** | The sequence of steps prior to cell division(which is crucial to survival as it replaces bad cells). |

## Cell Cycle(4.6) (cont)

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| **Interphase** | Contains phases G1, S, and G2 which is over 90% of the cell cycle. During interphase, the chromatin of the cell is threadlike so when looking at a cell undergoing interphase a centrosome can be spotted. During S phase the centrosome is duplicated. **G1:** is a period of intense growth and activity. **S:** is used to strand for the synthesis of DNA. The DNA is replicated so the cell no has two sets of the same DNA. **G2:** the cell continues to grow in order to finish cell division |
| **Mitosis** | Where the cell is divided and is broken down into prophase, metaphase, anaphase, and telophase. Cytokinesis is after mitosis and it is where the cytoplasm is divided to create the two new cells. |

## Signal Transduction(4.2)

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| **What is it?** | When a small collection of signaal molecules produce a large response across the cell, usually called the cascade effect. The response to the effect can be growth, gene expression, or secretion of molecules. |
| **Reception:** | When the ligand/signal beinds to the receptor protein in the target cell. Results in a change in the shape of the cytoplasm of the inside of the receptor |
| **Transduction:** | When the signal is transmitted through the cell and later amplified |
| **Response:** | When the signal is carried out |

## Signal Pathways(4.3)

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| **Gene Expression** | When the instructions of our DNA is converted into a product. Signaling Pathways can alter the amount of Gene expression that is occuring |
| **Pathway** | *Insulin:* The Pancreas has a sensor attached to it in the bloodstream so that when glucose level rises it knows it. The results in the release of insulin to the blood which will go and signal the liver that there is too much glucose in the blood. The liver will then take the glucose and store it as glycogen which allows the glucose levels to decrease and bring the bloodstream back to normal |
| **Low Glucose?** | If glucose in the body was in a low level the body will also respond. The pancreas will once again sense the change and instead release glucagon into the blood. This will travel and signal to the liver that sugar levels are low which results in the liver breaking done the stored glycogen back into glucose and release it into the bloodstream |
| **Overall** | Cells communicate and respond to changes in the environment but the environment can also influence cells to elicit a response. Things such as light, temperature, and chemicals |



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## Changes in Signal Pathways(4.4)

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| **Mutations** | Mutations affect the cell cycle by disrupting the production of proteins or prevent the cell from regulating its cell cycle. When unregulated cells can do cell division with no restriction which can be dangerous. |
| **Chemicals** | Chemicals also have the ability to alter the signaling pathway. Chemicals can denature the proteins by changing the pH in a solution. Temperature can have the same result. |
| **Inhibitors** | Lastly there are inhibitors that block the sites of receptor proteins so that ligands can't bond and send a signal to the cells. |

## Feedback(4.5)

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| **Overall** | Based on environment, timing, and coordination there can be either positive or negative feedback. Organisms use feedback to maintain homeostasis and respond to the environment |
| **Negative Feedback** | Are responses of reactions and leads to a decrease in those reactions. They maintain homeostasis by creating optimal internal environments. An example is blood sugar regulation. Insulin used when eating food is an example. **Negative feedback is basically when outputs from a system are fed back into it** |
| **Positive Feedback** | This is feedback that tends to increase a process and its output. This can also be referred to as the snowball effect. An example of this could be childbirth. |

## Feedback(4.5) (cont)

**Both feedbacks regulate the body**

## Regulation of Cell Cycle(4.7)

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| **Cell Cycle Check points** | **Mistakes in duplication can lead to mutations that can lead to cells being abnormal or cancer.** At checkpoints the progression of the cell cycle is halted until everything is clear, if not the cell is usually told to do apoptosis. **G1:** During the G1 checkpoint the cell is checked to make sure it is big enough and has the proper proteins/nutrients for the S phase. If not big enough or not ready to proceed then the cell will go back to phase G0. **G2:** At this checkpoint there us a DNA synthesis chepoint during the S phase. Here there is a check to make sure that the DNA has all been replicated correctly. If so then the cell can move onto M-phase. **Metaphase checkpoint:** |

## Regulation of Cell Cycle(4.7) (cont)

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| **Genes and Proteins** | Proteins such as P53 can regulate mitosis. p53 will notice any damage that has been done to the DNA by either heat or chemicals and stop cell division. It then triggers enzymes that will repair the damaged region. If the DNA is successfully repaired then p53 will allow for DNA replication and cell division to continue. If not then the cell will go through apoptosis. |



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