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Cell Cycle Crash Course

* Cells from an advanced malignant tumor most often have very abnormal chromosomes, and often an abnormal total number of chromosomes because chromosomally abnormal cells can still go through cell cycle checkpoints.
* Besides the ability of some cancer cells to overproliferate, lack of appropriate cell death could also result in a tumor.
* For a chemotherapeutic drug to be useful for treating cancer cells, it interferes with rapidly dividing cells.
* Vinblastine is a standard chemotherapeutic drug used to treat cancer. Because it interferes with the assembly of microtubules, its effectiveness must be related to disruption of mitotic spindle formation.
* One difference between cancer cells and normal cells is that cancer cells continue to divide even when they are tightly packed together.
* Cancer cells: When they stop dividing, they do so at random points in the cell cycle; they are not subject to cell cycle controls; and they do not exhibit density-dependent inhibition when growing in culture.
* Golgi-derived vesicles are primarily responsible for cytokinesis in plant cells but not in animal cells
* Density-dependent inhibition explained: as cells become more numerous, the cell surface proteins of one cell contact the adjoining cells and they stop dividing.
* Cyclin-dependent kinase (Cdk): is present throughout the cell cycle and is an enzyme that attaches phosphate groups to other proteins.
* A particular cyclin called cyclin E forms a complex with cdk 2. This complex is important for the progression of the cell from G1 into the S phase. The amount of free cyclin E is highest during G1.
* Actin and tubulin are proteins that are involved in binary fission as well as eukaryotic mitotic division
* PDGF is released by platelets in the vicinity of an injury
* Cyclin is a protein synthesized at specific times during the cell cycle that associates with a kinase to form a catalytically active complex
* Cdk is a protein maintained at constant levels throughout the cell cycle that requires cyclin to become catalytically active
* MPF triggers the cell’s passage past the G2 checkpoint into mitosis
* The cyclin component of MPF is destroyed toward the end of the M phase
* The MPF protein complex turns itself off by activating a process that destroys cyclin components
* Neurons and some other specialized cells divide infrequently because they have been shunted into G0.
* A cyclin activates a Cdk when it is in sufficient concentration.
* MPF reaches its threshold concentration at the end of the third stage.
* The decline of MPF activity at the end of mitosis is due to the degradation of cyclin.
* Mitosis is represented by the fourth part of the cycle.
* G1 is represented by the first or fifth parts of the cycle.
* How chromosomes move toward the poles of the spindle during mitosis: The chromosomes are reeled in by the contraction of spindle microtubules, and motor proteins of the kinetochores move the chromosomes along the spindle microtubules.
* Function of those spindle microtubules that do not attach to kinetochores: Maintaining the region of overlap of microtubules in the cell’s center.
* ATP as an energy source is required for motor proteins to function in the movement of chromosomes toward the poles of the mitotic spindle
* A mutation results in a cell that no longer produces a normal protein kinase for the M phase checkpoint. The immediate result of this mutation is that the cell would undergo normal mitosis, but fail to enter the next G1 phase.
* At the M phase checkpoint, the complex allows separase enzyme cleaves cohesins and allows chromatids to separate.
* The drug cytochalasin B blocks the function of actin. The cleavage furrow formation and cytokinesis are aspects of the cell cycle that would be most disrupted by cytochasalin B.
* If there are 20 centromeres in a cell at anaphase, there are 10 chromosomes in each daughter cell following cytokinesis
* Telophase is the phase of mitosis that the chromatids become chromosomes.
* Cell plate: plant cell in the process of cytokinesis
* In the cells of some organisms, mitosis occurs with cytokinesis. This will result in cells with more than one nucleus.