**Onion Mitosis Lab**

**I. Background/Introduction**:

The red onion, *Allium cepa*, is widely used for cooking across the globe. The cells at the base of the red onion bulb, can divide quickly into a growing root system. As this root system expands, the cells collect water and nutrients from the surrounding soil. The ability for these root cells to divide into new, genetically identical, daughter cells through the cell cycle allows the onion bulb to collect the needed resources to grow a new onion plant. Because the cells at the tip of an onion root grow quickly and independently, they serve as an excellent model to view the phases of the cell cycle.

The cell cycle consists of **interphase** (cell growth) and **mitosis** (cell division). Mitosis is the division of a cell nucleus. Mitosis is a process that requires about 24 hours. While you need to learn what is happening in each stage of mitosis, understanding the results of mitosis is more important. Mitosis is a process that sorts out identical copies of DNA (chromosomes) into two identical daughter nuclei. The cell also divides into two cells by **cytokinesis** (cell division). Mitosis allows for genetic continuity. **Genetic continuity** means that mitosis is a process that makes sure that the daughter nuclei contain exactly identical copies of the DNA present in the original “parent cell”. Mitosis is used for growth and replacement of cells. Every plant and animal grows from a zygote (single fertilized egg cell) to billions or even trillions of cells through mitosis.

In this lab you will observe prepared slides of onion root tips stained and calculate the amount of time an onion root tip cell spends in each phase of the cell cycle.

**Pre-Lab Questions: (do on the back of the lab handout.)**

1. **What is the purpose of this lab?**
2. **Summarize interphase.**
3. **Summarize mitosis.**
4. **What is genetic continuity and why is it important?**
5. **Why does an onion cell need to divide?**

**Materials:**

1. **Light microscope**
2. **Prepared slide of mitosis**

**Procedure:**

1. **Plug in light microscope, remove cover, and obtain a prepare slide of an onion root tip.**
2. **Focus on the tip of the onion root with the 4x objective. You should observe cells in many different phases.**
3. **At the 4x objective use a smart phone in your group to take a photo of your field of view.**
4. **In your field of view find a cell in interphase, prophase, metaphase, anaphase, and telophase. Draw these cells in your data section.**
5. **For each phase, count how many cells you observe in each phase of the cell cycle (interphase, prophase, metaphase, anaphase, and telophase). Record on the data table.**
6. **Collect data from two other groups. Place in field 2 and 3 portion of data table.**
7. **Find the amount of time an onion root cell spends in each phase of the cell cycle.**
   1. **Count total number of cells for each phase**
   2. **Divide the number of cells counted for each phase by the total number of cells**
   3. **Multiply this number by 24 to find the number of hours spent in this phase**
8. **Return microscope slide, turn off microscope, and cover microscope.**

**Data:**

**Phase Diagrams**

**Interphase Prophase**

**Metaphase Anaphase Telophase**

What is a distinguishing **visible** feature of each stage of mitosis?

Prophase-

Metaphase-

Anaphase-

Telophase-

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Stage of the Cell Cycle | Number of cells  Field 1 Field 2 Field 3 Total | | | | Proportion of total cells counted | Time in each stage |
| Interphase |  |  |  |  |  |  |
| Prophase |  |  |  |  |  |  |
| Metaphase |  |  |  |  |  |  |
| Anaphase |  |  |  |  |  |  |
| Telophase |  |  |  |  |  |  |
| Total Cells |  |  |  |  |  |  |

Conclusion:

1. **Based on your data, how would you rank the phases of the cell cycle from longest to shortest.**
2. **Based on what you know about the cell cycle, why does your data make sense? Why was the longest phase the longest? Why was the shortest phase the shortest?**
3. **How well do you think this data extends to other cell types? Why would they be the same, or why could they be different?**
4. **What could you not visualize in the lab? What do these structures do in the cell cycle?**
5. **What would be a research question to find more information based on the data collected? What would you do in this experiment?**