
Cells – The Building Blocks of Life

Activity

Participant Guide

Description and Estimated Time to Complete

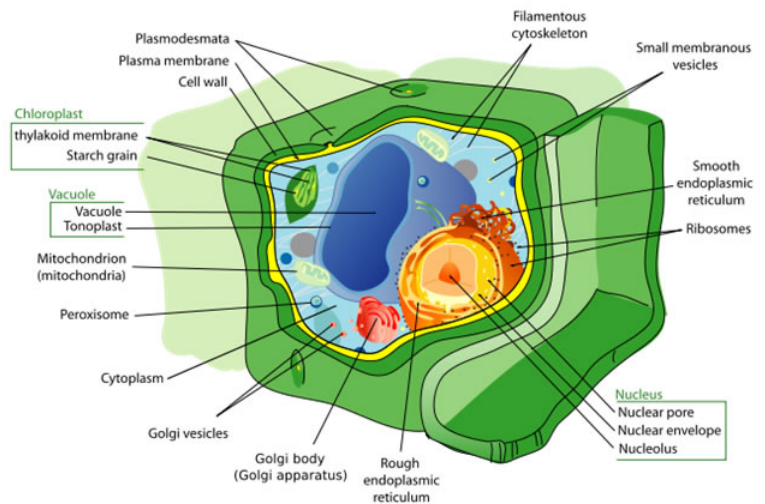
This learning module provides a review of “cells”, the smallest unit exhibiting the properties of life. It discusses how these cells are being used in bioMEMS as well as other micro and nano-sized devices. This activity provides a research opportunity that enables you to study how cell structure, function, and growth are being used bioMEMS. You should attain a greater understanding of cells and cellular organelles as presented in the related unit "Cells-The Building Blocks of Life".

Estimated Time to Complete

Allow several days to complete your primary research and prepare to present your findings in class.

Introduction

Cells are highly complex and organized, and there is consistency within levels of complexity in different cell types. Knowledge of the organization and function of subcellular organelles provides an understanding of the organization and complexity of the cell. For example, in eukaryotic cells (*right*), the nucleus and ribosomes are organelles that process information, while mitochondria and chloroplasts are organelles that process energy.



The following activity allows you to investigate a specific question about cell structure or function and how your findings relate to the field of bioMEMS.

4. Write a 1-2 page synopsis of your findings.
 - a. Include the rationale for your choice of an experimental system.
 - b. Would the data required to answer the question be easier to collect by working on an entire plant or animal, or on a population of cultured cells?
 - c. What might be the advantages or disadvantages of working on a whole organism versus a cell culture?
 - d. How can, or how does your question and your findings relate to bioMEMS?
5. Use your synopsis to create a presentation that informs and instructs others about the question and the experimental design strategy you chose to answer the question. Your presentation should also summarize a possible or existing relationship between your findings and bioMEMS.
6. Answer the Post-Activity Questions.
7. You may be asked to present your findings to other participants.

Post-Activity Questions / Answers

1. How do cells communicate with their environment, including other cells? What happens if the communication is disrupted?
2. Unlike bacterial cells, the nucleus of a eukaryotic cell is bounded by a double-layered membrane with complex pores. How do you think this might affect traffic between the DNA and cytoplasm of a eukaryotic cell compared with a prokaryotic cell?
3. What might the surface area to volume ratio have to do with cell size and complexity?

Summary

Looking at the emerging field of bioMEMS, one area of major interest is the development of miniature and portable instrumentation for cell-based microassays and sensor applications. Some challenges facing investigators are

- how to incorporate living cells into sensors and diagnostic devices,
- how to create environmental conditions conducive to cell organization into tissue-like structures, and
- how to sort and concentrate bacterial cells on a micro-fluidic biochip.

Applications in both diagnostic and therapeutic areas (health diagnostics, environmental risk management, and food safety) are just a few of the areas impacted, and all rely on a basic knowledge of a cell.

Support for this work was provided by the National Science Foundation's Advanced Technological Education (ATE) Program through Grants. For more learning modules related to microtechnology, visit the SCME website (<http://scme-nm.org>).