uBEATS

uBEATS Teacher's Guide:

Histology of Epithelial and Connective Tissue

(Grades 11-12)

This teacher guide is a supplementary text to support the use of the uBEATS "Histology of Epithelial and Connective Tissue" module for grades 11-12.

To help students develop the knowledge necessary for an incredible future in health care, we created UNMC Building Excellence in Academics Through STEM (uBEATS), an online health science resource for Nebraska students.

UNMC uBEATS modules are short (15 minutes or less), interactive online health science modules to supplement curriculum taught in grades 6 – 12. These do not replace curriculum but are a supplement for teachers and students incorporating evidence-based information and UNMC expert guided material. Each module is chunked into sections with formative and summative assessments with immediate feedback provided.

Tips on how to utilize uBEATS modules:

- Internet access is required to view uBEATS modules.
- For those who have access to one-to-one technology, modules can be used in or outside of the classroom as a topic introduction, extension, or review.
- For classrooms without individual student devices modules can be used in whole group instruction. Formative assessment questions can use the teacher's preferred call and response method and summative assessment questions can be displayed on the board and answered individually by students or printed and distributed to students after viewing the module.

Objectives

- Identify the four basic tissues in the body.
- Compare the characteristics and fuctions of epithelial and connective tissues.
- Identify epithelial and connective tissues via microscope.

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Introduction

There are four major types of tissue in the body: epithelial, connective, muscle, and nervous. Epithelial tissue is found in the skin or in your mouth. Connective tissue can be found in the spaces between other tissues and organs. For example, connective tissue can be found in the capsules that surround organs, like your kidneys, or around arteries and veins throughout your body. Muscle tissue is found in your muscles, such as your biceps brachii or your gastrocnemius. And finally, nervous tissue is found in your neurons that send messages from your peripheral nerves to your central nervous system. In this module we are talking about epithelial and connective tissue. These tissues are complex and can be found all over the human body. Epithelial tissue is made of three types of cells: squamous, cuboidal, and columnar. Squamous cells are flat, hexagonal cells. These cells are often wider than they are tall. Cuboidal cells are cube-shaped and can have microvilli or cilia. Columnar cells are tall and narrow. These cells can also have microvilli or cilia. Transitional epithelial tissue can be cube-shaped (cuboidal) or tall and thin (columnar) when in areas where the body does not stretch. In areas where the body does stretch, these cells often resemble squamous cells since they are flat and loosely resemble hexagons. This module does not cover the other two types of tissue, muscle tissue and nervous tissue.

Prior Knowledge

Before beginning this module, the student should understand the Next Generation Science Standards (NGSS) featuring Three-Dimensional Learning.

Core Idea LS1.A: From Molecules to Organisms: Structures and Processes A Framework for K-12 Education

- Systems of specialized cells within organisms help them perform the essential functions of life, which involve chemical reactions that take place between different types of molecules, such as water, proteins, carbohydrates, lipids, and nucleic acids. All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Outside that range (e.g., at a too high or too low external temperature, with too little food or water available), the organism cannot survive. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Science and Engineering Practices NGSS

- Developing and using models
- Constructing explanations and designing solutions

Crosscutting Concepts NGSS

- Systems and system models
- Structure and function
- Stability and change

Key Terms/Vocabulary

Epithelial tissue, connective tissue, muscle tissue, nervous tissue, squamous cells, cuboidal cells, columnar cells, loose areolar connective tissue, dense connective tissue, fibroblast, macrophage, lymphocyte, collagen, cartilage, hyaline cartilage, fibrocartilage, elastic cartilage, spongy bone, compact bone, blood, bone marrow, abrasion, diffusion, secretion, absorption, tendon, ligament, simple epithelium, stratified epithelium, lymphatic vessels, alveoli, kidney tubules, microvilli, cilia, bronchioles, auditory tubes, uterine tubes, larynx, urethra, cornea, salivary gland ducts, ovarian follicular cells, mammary gland ducts, vocal folds, tensile strength, intervertebral disk, pubic symphysis, sternum.

Science Standards

This module is related to the content of **UNMC High School Alliance: Introduction to Pathology and Microbiology**

Pathology is the study of disease processes. The field lays the foundation for all clinical medicine and medical research. All diseases begin at the cellular level and changes in the structure and function of tissues ultimately lead to symptoms that health care providers see on a daily basis. This course will introduce students to medical terminology, normal histology and gross/microscopic pathology, allowing students to correlate the findings they see into basic clinical concepts.

Nebraska's College and Career Ready Standards for Science 2017 Nebraska Science Standards

Structure and Function: SC.HSP.6.1.F.

- Construct an explanation based on evidence that animals have structures that function to support survival, growth, behavior, and reproduction.

Structure and Function: Anatomy & Physiology: SC.HSP.6.2.A

- Communicate scientific information that explains the patterns of organization in the integumentary system.

Structure and Function: Anatomy & Physiology: SC.HSP.6.3.A

- Communicate scientific information that explains the patterns of organization in the skeletal system.

Extensions of the lesson

- To help students become more familiar with the Key Terms of this module, the teacher can use the vocabulary list for a classroom Word Wall or integrate the vocabulary into classroom word games during review sessions.
- As student misconceptions become apparent, the teacher may need to reinforce these important concepts:
    - Epithelial tissue has complex functions that include maintaining a barrier to protect underlying tissue, yet at the same time allowing certain substances to pass through on their way in or out.
    - Squamous cells are flat, cuboidal cells are cube-shaped, and columnar cells are tall and thin.
    - Each of these epithelial cell types can be found in a single layer (simple) or in multiple layers (stratified). Stratified tissue can be multiple layers of one type of cell, but other stratified tissue can include one type of cell in the bottom layer and a different type at the top.
    - Connective tissue includes many varieties of cells for a multitude of functions, including insulation, protection, separation of organs, joining of other tissues for movement and support, storage of compounds, exchange of chemicals.
    - Connective tissue can be loose or dense, regular or irregular, liquid or solid.

Enrichment

- For information about Healthcare Career Opportunities, see the UNMC Health Career Book.
- Students should be watchful in current events for recent advancements in cell biology and medicine.
- To view online microscopic images of tissue types, see The Histology Tutor.
- For a laboratory view of microscopic epithelial cells, see Human Cheek Cells.
- To make connections in your community, contact local hospitals, healthcare clinics, nurses, doctors, medical laboratories.