## uBEATS Teacher's Guide:

# Acute Inflammation, Chronic Inflammation, and Tissue Repair

## (Grades 11-12)

This teacher guide is a supplementary text to support the use of the uBEATS "Acute Inflammation, Chronic Inflammation, and Tissue Repair" 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

- Explain the differences between acute and chronic inflammation.
- Differentiate between regeneration and repair.
- Discuss factors that can affect wound healing.


ubeats@unmc.edu

# Introduction

Isn't it amazing how the human body responds to wounds and injuries? This module explores some of the processes of healing, from immediate body responses to longer-term strategies. In addition to the type of tissue injured, there are other factors that also influence the healing time.

# Prior Knowledge

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

**Core Idea** LS1.A. Structure and Function

- ***By the end of grade 12***. 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. A Framework for K-12 Education.

**Science and Engineering Practices** **NGSS**

- Constructing explanations and designing solutions

**Crosscutting Concepts** **NGSS**

- Structure and function

# Key Terms/Vocabulary

Acute inflammation, chronic inflammation, vasoconstriction, vasodilation, chemical mediators, tissue regeneration, tissue repair, collagen, skin, fascia, tendon, vertebral disc, joint surfaces of bones, smooth muscle, nerve, blood vessel, ligament, intrinsic, extrinsic, acute trauma, chronic trauma, muscle/tendon strain, ligament sprain, grades of severity, infection.

# 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 daily. 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

Biology Structure and Function: Anatomy & Physiology SC.HSP.6.6.E.

- Develop and use a model to explain the relationship between the cardiovascular/respiratory systems and other body systems.

# 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.
- To help the students see personal relevance, suggest that they have a private conversation at home to discuss the variety of injuries that have been experienced within their own family and the healing processes involved with those injuries.
- As student misconceptions become apparent, the teacher may need to reinforce these important concepts:
    - Acute inflammation is the body's initial response to injury and usually lasts a few days. If the inflammation is still there after a couple of weeks, it may be a sign of a more serious infection.
    - Chronic inflammation may be the body's way to reduce blood flow to an infected area so that the infection does not spread. During chronic inflammation, there are fewer white blood cells going to the injury site.
    - Regeneration rebuilds the injured area using the same tissue that was originally there. Repair, however, uses a different type of connective tissue to fill the wound site.
    - Wound healing can be affected by intrinsic factors (general health, age, nutrition) or extrinsic factors from the outside (foreign objects, medication, infection).
    - Acute trauma is a single occurrence that causes a wound or injury, as opposed to chronic trauma which is repetitive trauma leading to a wound or injury.
    - Infections can be bacterial, viral, or fungal.

# Enrichment

- For information about Healthcare Career Opportunities, see the UNMC Health Career Book.
- Students should be watchful in current events for recent advancements in medicine.
- For a lab investigation Involving polymers (which students call “slime”) that can be involved with wound healing, read Medical Applications of Cross-Linked Hydrogels from the Journal of Chemical Education.
- To make connections in your community, contact local hospitals, healthcare clinics, nurses, doctors, medical laboratories.


ubeats@unmc.edu