



uBEATS Teacher's Guide:

Parasitology

(Grades 11-12)

This teacher guide is a supplementary text to support the use of the uBEATS Parasitology 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

- Describe the relationship between parasites and their hosts.
 - Compare parasitic protozoa, parasitic worms, and parasitic arthropods.
 - Identify diseases related to parasites.
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Introduction

You angrily smack a mosquito that just landed on your head. That's the third one on your skin in the past five minutes! On a hot and humid summer day in the Midwest, those pests can be a real nuisance. But one may ask: What drives them to cause us this pain? Are they just mad at us? Is it a defensive tactic? The answer is neither. These mosquitoes are actually gaining something from tapping into our blood vessels, as that is their source of nutrition. So, one could say that this organism benefits at the expense of our harm. This interaction between living beings demonstrates a classic example of parasitism.

Prior Knowledge

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

Core Idea LS2: Ecosystems: Interactions, Energy, and Dynamics [A Framework for K-12 Education](#)

How and why do organisms interact with their environment and what are the effects of these interactions?

Ecosystems are complex, interactive systems that include both biological communities (biotic) and physical (abiotic) components of the environment. As with individual organisms, a hierarchal structure exists; groups of the same organisms (species) form populations, different populations interact to form communities, communities live within an ecosystem, and all of the ecosystems on Earth make up the biosphere. Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment. These same interactions can facilitate or restrain growth and enhance or limit the size of populations, maintaining the balance between available resources and those who consume them. These interactions can also change both biotic and abiotic characteristics of the environment. Like individual organisms, ecosystems are sustained by the continuous flow of energy, originating primarily from the sun, and the recycling of matter and nutrients within the system. Ecosystems are dynamic, experiencing shifts in population composition and abundance and changes in the physical environment over time, which ultimately affects the stability and resilience of the entire system.

Science and Engineering Practices [NGSS](#)

- Constructing explanations and designing solutions

Crosscutting Concepts [NGSS](#)

- Patterns
- Stability and Change



Key Terms/Vocabulary

Unicellular, multicellular, parasite, host, vector, life cycle, ingestion, symbiosis, mutualism, commensalism, parasitism, protozoa, helminths, arthropods, eukaryotic, gastrointestinal tract, ectoparasites, endoparasites.

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 of 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 2024 [Nebraska Science Standards](#)

Engineering in Health Sciences: SC.HSP.17.1.C

- Evaluate a solution to a complex real-world human health problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. Solutions could include the effects on the human body or solutions for environmental public health issues.

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 regarding family experiences with head lice, parasitic worms, etc.
- As student misconceptions become apparent, the teacher may need to reinforce these important concepts:
 - Symbiosis (“living together”) includes three kinds of relationships. Mutualism is when both species gain an advantage from the relationship. Commensalism is when one species benefits while the other is neither harmed nor helped. Parasitism is when one species gains advantage at the expense of the host.
 - A parasite is pathogenic when it causes disease in the host.
 - Protozoans are larger than bacteria, but they are still microscopic.
 - Protozoans are eukaryotic because they have a true nucleus and organelles.



- Helminths (parasitic worms) are endoparasites that live deep in the host's body.
- Parasitic arthropods are ectoparasites that live on the host's skin, either on the surface or burrowing into the skin.
- Head lice do not burrow into the skin like scabies mites do, but as they live in hair they bite the skin.
- Malaria is a disease caused by a microscopic parasitic protozoan. Mosquitoes are vectors for this disease as they carry the protozoans from place to place and inject them into the host.

Enrichment

- For information about Healthcare Career Opportunities, see [UNMC Health Career Book](#).
- Students should be watchful in current events for recent stories about bedbug infestations.
- For medical information about human parasites, visit the CDC website regarding [Parasites](#).
- Elementary classroom activities regarding parasites can be found at [Parasite Sleuth](#).
- To make connections in your community, contact local hospitals, healthcare clinics, nurses, doctors, veterinarians.