



uBEATS Teacher's Guide:

Pharmacognosy - Medicines from Plants and Other natural resources

(Grades 11-12)

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

- Recognize that pharmacologic and toxicologic chemicals can be found in nature.
 - Discuss the sources of crude drugs used in ancient cultures and identify some related products used today
 - Explain that herbals can interact with the body in the same way as compounds developed by chemists.
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Introduction

Have you ever wondered how we have so many pharmaceuticals in today's society? Where do pharmaceuticals come from? How did ancient civilizations use plants to treat disease and other ailments?

Prior Knowledge

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

Core Idea PS1.B: Chemical Reactions. [A Framework for K-12 Science Education](#)

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in total binding energy (i.e., the sum of all bond energies in the set of molecules) that are matched by changes in kinetic energy. In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present.
- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. Chemical processes and properties of materials underlie many important biological and geophysical phenomena.

Science and Engineering Practices [NGSS](#)

- Constructing explanations and designing solution

Crosscutting Concepts [NGSS](#)

- Patterns
- Stability and change

Key Terms/Vocabulary

Pharmaceuticals, pharmacologic, toxicologic, crude drugs, herbals, metabolites, medicinal use, balance, life force *qi*, indigenous, shaman, *doshas*, spiritual balance, environmental balance, “four humors”, pharmacopeia, compounds, codeine, morphine, acemannan, digitalin, congestive heart failure, menthol, synthesis, extraction.



Science Standards

This module is related to the content of UNMC High School Alliance: Introduction to Pharmacy Science and Practice.

The profession of pharmacy is quite diverse: from medicinal chemistry and the discovery of novel therapeutic agents to the monitoring of pharmacologic effects in humans. Thus, the purpose of this class is to demonstrate to the student the wide range of expertise needed within profession. Students will walk through the history of pharmaceuticals, how products are discovered and manufactured, and how to implement pharmacology into patient care. Finally, the students will discuss the future of medicine as seen with Personalized Medicine.

Nebraska's College and Career Ready Standards for Science 2024 [Nebraska Science Standards](#)

SC.HSP.6 Structure and Function: Anatomy & Physiology

- Gather, analyze, and communicate evidence of the relationship between the structures and physiological processes of the human body systems.

SC.HSP.3 Chemistry: Structure and Properties of Matter

- Evaluate a solution to a complex, real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Extensions of the lesson

- o 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 about family traditions using medicines derived from plants or animals.
- As student misconceptions become apparent, the teacher may need to reinforce these important concepts:
 - The DNA of natural organisms directs the production of specific chemical compounds in those organisms. Some of those natural chemicals have positive medicinal (pharmacological) effects when administered to the human body for the treatment of disease. On the other hand, some natural compounds have negative (toxicological) effects on humans.
 - The people in ancient cultures considered disease to be an imbalance within the body, and each culture developed traditional methods of using plants to help restore a person's physical, spiritual and environmental balance. Many of the



traditional treatments are still used today in modern medicine in one form or another.

- Scientists identify the chemical compound that successfully interacts with the body's receptor, and they either extract that compound directly from the natural plant, or they synthesize that same compound in the laboratory.
- Whether a compound is extracted or synthesized, that particular chemical produces the same effects in the body.

Enrichment

- For information about career opportunities, see UNMC's [Careers in Healthcare](#).
- Students should be watchful in current events for recent stories about herbal medicines.
- To find lesson plans about natural herbs and spices used for food, see [National Agricultural Literacy Curriculum](#).
- To learn more about natural plants used for medicine, see [Online Teaching Resources about Medicinal Plants and Ethnobiology](#).
- To make connections in your community, contact local universities, medical centers, clinics, drug manufacturers, and pharmacists.