



uBEATS Teacher's Guide:

Adverse Drug Effects

(Grades 11-12)

This teacher guide is a supplementary text to support the use of the uBEATS “Adverse Drug Effects” 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

- Differentiate between an adverse drug event and a medication error.
 - Identify different drug reactions.
 - List possible outcomes to various drug reactions.
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Introduction

Advertisements for prescription medications can be intimidating at times. Medical professionals inform us that any time we add medication to our bodies, we are adding substances that are designed to cause helpful changes. But sometimes the resulting changes are not what were expected. This module explains the big picture of adverse drug effects.

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 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

Adverse drug event, adverse drug reaction, medication error, pharmaceutical drug, prescription drug, drug therapy, complications, side effects, secondary effects, allergic reaction, immune system, hypersensitivity, anaphylaxis, anticipated reactions, idiosyncratic reactions.



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 a 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 2017 [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

- 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 **privately** examine a Product Information sheet that accompanies a prescription medication used in the home.
- As student misconceptions become apparent, the teacher may need to reinforce these important concepts:
 - Pharmaceutical drugs are administered because they are intended to produce a beneficial effect in the body. Adverse effects are reactions that are unintended, unwanted, uncomfortable, and sometimes have dangerous consequences. They are not the same as positive side effects.
 - Adverse drug reactions are also distinct from medication errors. Medication errors are rare and must be corrected immediately when discovered. On the other hand, adverse drug reactions are often “expected” in the sense that they have been identified as possible by testing throughout the drug approval process. Such “anticipated reactions” can occur even when no mistakes are being made by doctor, pharmacist, or patient. These adverse reactions can be specific to a



patient's unique body chemistry, age, comorbidities, polypharmacy, or cumulative dose over time.

- Some adverse drug reactions are not anticipated at all. Idiosyncratic drug reactions are rare and unpredictable. In fact, they most often appear when a drug has not been tested well enough or long enough to expose the possibility of such a reaction. When an idiosyncratic reaction does occur, it must be reported to the drug manufacturer to update their data on the drug.
- Some adverse drug reactions involve a response by the patient's immune system. In the case of an allergic reaction, the patient should stop taking the medication immediately and contact the doctor or pharmacist for further instructions.
- On the other hand, some adverse reactions are temporary and mild enough to tolerate until the problem resolves itself in a matter of days. But moderate and severe reactions need medical attention immediately.

Enrichment

- For information about career opportunities, see UNMC's [Careers in Healthcare](#).
- Students should be watchful in current events for recent stories about adverse drug interactions.
- For more information about drug reactions, see [Adverse Drug Reaction v. Drug Allergy](#).
- To learn more about reporting adverse drug events, see [MedWatch](#).
- The U.S. Food and Drug Administration provides information about the safety of medications at [Finding and Learning about Side Effects](#).
- A classroom lesson about the safety of medications is available at [A Dangerous Mix](#).
- To make connections in your community, contact local universities, medical centers, clinics, drug manufacturers, and pharmacists.