

# DESTINATION BIOTECH Teacher Notes

Episode 3

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## Topic Overview

Dive into the dynamic world of antimicrobial resistance, where the age-old battle between humans and bacteria takes a thrilling twist! Picture this: as we use antibiotics to fight infections, something extraordinary happens. Like characters in an epic saga, bacteria evolve, adapting to these drugs, their new archenemies. This is natural selection in action, reshaping bacteria to survive and thrive in an antibiotic-rich environment.

What's the catch? Over time, with the widespread use of antibiotics, some bacteria morph into superbugs, resistant to our medicinal arsenal. This resistance, born from genetic mutations and nature's selection process, turns once-treatable infections like staph into formidable foes. Picture a race against time, as scientists develop new antibiotics, only for bacteria to outsmart them again.

This relentless tug-of-war means that diseases once easily conquered are resurging, posing new challenges. It's a fascinating, yet daunting reminder of the constant evolution in the microscopic world and our ongoing struggle to keep pace. Welcome to the ever-changing battlefield of biology, where understanding and innovation are our best weapons!

## Conversation Overview

Join Dr. Adina Howe and first-year graduate student Nicole Geerdes for an exciting look into their adventures in water and environmental quality! Dive into their latest research projects, uncover how their dynamic lab team tackles environmental mysteries, and get the inside scoop on their ground-breaking discoveries about manure runoff. This isn't just science – it's a journey into the heart of our planet's health. Ready to be part of the action?

## Included NGSS Dimensions

**Science & Engineering Practices:** Obtaining, Evaluating, and Communicating Information

**Disciplinary Core Ideas:** MS-, HS-LS2 (Ecosystems: Interactions, Energy, and Dynamics)

**Crosscutting Concepts:** Stability and Change

## Terms from the Podcast (in the order discussed)

Microbes: organisms that are too small to see with the naked eye, like bacteria or fungi

Nuanced: subtle and complex

Census: a study of the traits of individuals that make up a population

Sequencing Technology: biotechnology that tells us the nucleotides (A, T, C, or G) in a DNA sequence

Pathogens: organisms that cause disease

Isolates: purified chemical compounds

## Ideas & Notes for Classroom Use

### Podcast

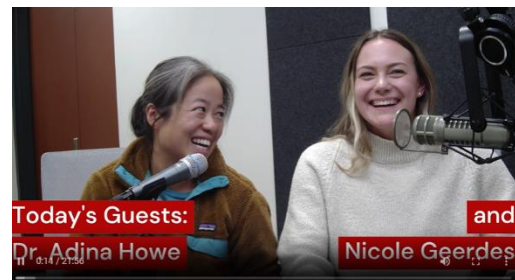
- This podcast is approximately 20 minutes long and is available in two versions – video with audio, and audio only. A transcript is also available for download.
- Vocabulary words that may be new to students are highlighted in the video version.
- Best practice may include pausing the podcast for in-the-moment whole-class and small-group discussions

### Student Reflection Sheet

- Begin by providing students with the basic information about the podcast.
- Ask students to consider the “Before the Podcast” prompts and discuss them before watching or listening to the podcast.
- After enjoying the podcast, consider the remaining questions

## Activity: Learn to Read a Scientific Paper

This educational activity is designed to teach students how to read and understand a scientific paper, supplemented by an accompanying podcast for context. It involves a guided reading of the paper, using age-appropriate strategies to dissect its structure and content. For older students (grades 6-12), the focus is on understanding abstracts, methodologies, results, and conclusions, while younger students (grades 3-5) concentrate on titles, images, and simplified sections. The activity includes a podcast listening session, group discussion, individual reflection, and an optional extension activity involving presentations or posters. The goal is to enhance comprehension of scientific literature, critical thinking, and integration of auditory and visual learning.



### Possible Post-activity Discussion Questions:

- What was the main research question of the paper, and why is it significant in the field of study? *This question encourages students to identify and understand the central focus of the research.*
- How did the methodology used in the study contribute to the findings? *This prompts students to think critically about the link between methods used and the results obtained.*
- What are the key findings of the study, and how do they impact our understanding of the topic? *This question helps students to summarize the main results and comprehend their relevance.*
- Were there any limitations in the study, and how might they affect the results? *This encourages a deeper analysis of the study's reliability and any potential biases.*
- How does the information in the podcast complement or contrast with the paper? *This question integrates learning from both the podcast and the paper, promoting a comprehensive understanding.*

### Preparation:

1. Familiarize yourself thoroughly with the content of both the paper and the accompanying podcast to anticipate areas where students might need extra guidance.
2. Ensure all required materials, such as copies of the paper, note-taking supplies, and access to the podcast, are available for the students.
3. Formulate insightful questions that will stimulate critical thinking and discussion among the students.

### Take-aways:

- Students' ability to read and comprehend scientific literature will be enhanced.
- Students improve critical thinking and analytical skills.
- Better integration of auditory and visual learning using the podcast and the paper.
- Increased confidence in discussing scientific topics.

### Additional links and resources

- Dr. Howe's information: <https://www.bcb.iastate.edu/people/adina-howe>
- Dr. Howe's research publications: <https://scholar.google.com/citations?user=ixR8YE8AAAAJ&hl=en>
- Original Prairie Strip paper: <https://doi.org/10.1002/jeq2.20333>

