

Lesson Plan

Topic: Novel antibiotics to overcome drug resistance: A synthetic biology approach

Purpose: This lesson covers the problem of antibiotic resistance and an alternative way to create novel antibiotics by means of synthetic biology.

Lesson objectives:

- to examine the difference between bacteria and viruses;
- to present the problem of antibiotic resistance and ways to overcome it;
- to explain the structure and functions of amino acids, proteins, and different levels of organization of proteins;
- to introduce the topic of synthetic biology and the SYNPEPTIDE project;
- to recall the names and 1-letter codes of 20 standard amino-acids;
- to introduce the game that will help to memorize the names of 20 common amino acids;
- to discuss possible ethical or social issues, related to the development of novel antibiotics

Lesson outcomes:

Following the lesson, the students will be able to:

- to recall the main features of bacteria and viruses;
- to name 6 main differences between bacteria and viruses;
- to explain the notions “antibiotic” and “lantibiotic”;
- to articulate the problem of antibiotic resistance;
- to explain the structure and functions of amino acids;
- to recall the classification of amino acids;
- to explain the structure of proteins;
- to integrate the knowledge about amino acids and proteins with the application of this knowledge to tackle the problem of drug resistance.

Following the completion of the crossword, the students will be able to:

- to recall some of the names of 20 common amino acids;
- to describe biological functions of some of 20 common amino acids.

Following the completion of the game, the students will be able to:

- to reproduce some of the names and 1-letter codes of 20 standard amino-acids;
- to explain the modularity of lantibiotics synthesis;
- to assess their “first-hand” experience in the synthesis of biologically active molecules with real-life outcomes;
- to name the most dangerous multidrug-resistant bacteria and antibiotics that can destroy them.

Prerequisites:

1. Basic knowledge about bacteria, viruses and antibiotics.
2. Each student should have a mobile device with Android/iOS (or one device for two students)

Materials:

Provided:

1. Class presentation
2. Teacher’s guide (additional theoretical materials)
3. Crossword with solutions (optional)
4. Link to download the game

Not provided:

1. Mobile devices with Android/iOS to play the game

Lesson structure:

Duration, min (approximate)	Activity
25	Teacher’s presentation of the information. In the end of the presentation the students are asked to download the game.
15	Game play*
10	Debriefing using the questions provided in the presentation and/or the questions asked by the students*
	* If the presentation will take longer than planned, the game can be given as a homework task. In this case the debriefing can take place in the beginning of the next lesson.