Candy Translation	Grades 11 and 12

Lesson Plan

Description

You can model transcription of DNA and translation of RNA using candy (or other non-food items). This is a quick and fun way to see how our cells take the code of DNA and change it into protein molecules. Proteins are extremely important to the proper functioning of our bodies. They also play key roles in our immune systems and how they react to pathogens.

Learning Outcomes	Specific Expectations
Students will learn the difference between transcription of DNA and translation of RNA. Students can relate protein synthesis in cells to how viruses replicate using cell organelles. Students will learn how the mRNA vaccines use our ribosomes to synthesize the spike protein ourselves.	Gr. 11 University B3.2 compare and contrast the structure and function of different types of prokaryotes, eukaryotes, and viruses (e.g., compare and contrast genetic material, metabolism, organelles, and other cell parts) Gr. 11 College C1.2 analyse ethical issues related to the use of microorganisms in biotechnology. Genetically modified microorganisms are used in many biotechnological applications that benefit humans, in areas such as vaccines. C3.1 describe the anatomy and morphology of various groups of microorganisms (e.g., eukaryotes, prokaryotes, viruses) C3.4 explain the different methods of reproduction in various types of bacteria, viruses, and fungi C3.5 describe how different viruses, bacteria, and fungi can affect host organisms, and how those effects are normally treated or prevented (e.g., hepatitis viruses can damage the liver, but vaccinations can prevent infections) Grade 12 University D3.1 explain the current model of DNA replication, and describe the different repair mechanisms that can correct mistakes in DNA sequencing D3.2 compare the structures and functions of RNA and DNA, and explain their roles in the process of protein synthesis

With funding from:
Agence de la santé publique du Canada | Public Health Agency of Canada
The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada

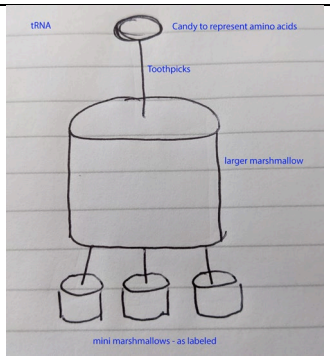
Materials

- Red string licorice – DNA backbone
- Black string licorice – RNA backbone
- Mini marshmallows (four colours and white) – nucleotides (A, C, T, G and U)
- Regular marshmallows – tRNA
- Smaller squishy candies – Amino acids
- Toothpicks – bonds
  OR:
- Paperclips (four colours and white) – nucleotides (A, C, T, G and U)
- Pipe cleaners – DNA backbone and RNA backbone (pick different colours)
- Beads – sugars (deoxyribose and ribose)
- Sticky notes – amino acids

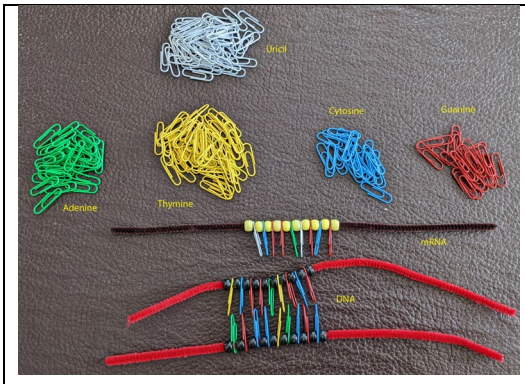
Action

Use the provided materials to make models of DNA and RNA (mRNA and tRNA) to help show how transcription of DNA molecules and translation of mRNA molecules happen in the cell.

Example of candy models:



Examples of non-candy models:



With funding from:
Agence de la santé publique du Canada | Public Health Agency of Canada
The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada

Use the codon wheel or table to create a polypeptide chain. The start codon (AUG on RNA and TAC on DNA) always codes for methionine in eukaryotes. The stop codon can be UAA, UAG or UGA

How is RNA different from DNA?

RNA has some key differences from DNA. List them below and make a key for the 4 RNA nucleotides and the 4 DNA nucleotides.

Consolidation/Extension

Questions:

What is the Central Dogma of molecular biology?

Where does transcription take place?

What is the product of transcription?

Where does translation take place?

What is the product of translation?

What are the different types of RNA?

Extension: use this activity to show how mRNA vaccines can take advantage of the cell's ability to make proteins from its own DNA. The vaccines use the cell's organelle to make special spike proteins the immune system will react to.

Accommodations/Modifications

This can be done with pasta, fishing line and pipe cleaners. You can also do this with a paper model.

Assessment

Use the answers to the above questions, as well as the students' ability to create polypeptide chains with the model to assess their understanding of transcription and translation.

Additional Resources

Codon wheel Handout – see website

https://www.nature.com/scitable/topicpage/translation-dna-to-mrna-to-protein-393/

https://teach.genetics.utah.edu/content/dna/tx-tl_student_instructions.pdf

With funding from:
Agence de la santé publique du Canada | Public Health Agency of Canada
The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada