More Cheese, Please

Middle School, Life Science

Task Overview

In this task, students use models and data to explain why lactose intolerant people experience lots of gas, bloating and diarrhea when they eat certain dairy products. Students explore models of lactose-tolerant and lactose-intolerant people to see how the inputs, outputs, and processes of each person's digestive systems affect how they function to process dairy products. They then develop their own comparative model to explain why only lactose intolerant people experience these painful symptoms. At the end of the task, students examine new data to recommend what types of dairy products lactose intolerant people might eat to cause less painful symptoms.

Next Generation Science Standards

Three-Dimensional Claim

Use models and data to explain how parts of a body subsystem interact, including inputs, processes, and outputs, to contribute to a particular body function within the human body.

This task is intended to elicit student learning of the following **NGSS elements** for each of the three dimensions:

Disciplinary Core Ideas

LS1.A: Structure & Function (MS)

- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs* that are specialized for particular body functions.

**Please note that for the authenticity of this task, students are exploring the interaction between organs, rather than full sub-systems, which still allows them to see groups of cells working together for particular body functions.*

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Science and Engineering Practices

Developing and Using Models (MS)

- Develop and use a model to describe phenomena.

Analyzing and Interpreting Data (MS)

- Analyze and interpret data to provide evidence for phenomena.

Crosscutting Concepts

Systems and System Models (MS)

- Models can be used to represent systems and their interactions - such as inputs, processes and outputs

Helpful Prior Knowledge

The human body is a system made of many smaller systems. Those smaller systems are made of multiple parts (organs) that are made of tissues. Those tissues are made of cells with specialized functions. The digestive system has cells with specific digestion-related functions. One of the key functions of the cells in the digestive system is the production of different enzymes. Those enzymes help break down (digest) foods into nutrients that can be absorbed. The structure of an enzyme is specific, and it determines the substrate type it can break down in the process of digestion.

In a digestive system, cells in the small intestine produce the enzyme lactase that digests lactose into two smaller units, glucose and galactose. These smaller products can be absorbed by the small intestine. Some individuals have a natural difference in their digestive processes, including decreased amounts of the enzyme, lactase. This is often referred to as lactose intolerance. Because of this decreased amount of lactase, more lactose passes from the small intestine into the large intestine without being broken down into glucose and galactose. Excess lactose in the large intestine can lead to uncomfortable digestive symptoms, such as gas, bloating, and diarrhea. These symptoms happen more often when eating dairy products that have a higher lactose content, like milk.

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Collaborations

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