

Anaerobic Digestion- Anaerobic Food Web

INTRODUCTION

Some naturally occurring habitats set anaerobic conditions. In these areas, anaerobic bacteria can thrive through anaerobic or fermentation reactions. These reactions release soluble organic compounds. As these are being released by some bacteria, other bacteria are quick acting to consume them. This creates the anaerobic food chain. In this case rather than predation, we see one organism consuming the waste products of another. For example, the carbon dioxide produced by some organisms is degraded by others to form methane. In order to degrade the organic waste products, such as methanol, formate, acetate, and methylamine, methanogenic bacteria use them as a substrate in methane production.

This concept is important in understanding the process used in anaerobic digestion. As food and fish wastes are being decomposed, those waste products are even further degraded into methane. More complex molecules must be broken down before methane-producing bacteria can use them as substrates.

Note: This lesson is meant to follow an introduction to food web lessons involving terrestrial, aquatic, or marine biota and fauna. A basic pre-understanding of food web and energy concepts is required.

TASK(S)

Activity 1 (30 minutes)

Create a model

Activity 2 (30 minutes)

Written assignment

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ACTIVITY/PROCESS

Activity 1: Create a model showing how the anaerobic food chain acts within an anaerobic digester.

- Models should be created in Microsoft Powerpoint and should include:
 - Each stage of anaerobic digestion
 - Examples of waste inputs and outputs
 - Specific substrates and/or molecules required in a given stage (where applicable)

Activity 2: Choose one type of waste food stock (food, fish, etc) for which to “walk through” the anaerobic digestion process. What will it be degraded to during each stage of digestion? Note: one waste food stock should be degraded into multiple products to be further degraded, until methanogenesis is reached.

RESOURCES

Excerpt from The Microbiology of Anaerobic Digesters. Gerardi, M. John Wiley & Sons, Inc. Canada (2003). Chapter 5: Anaerobic Food Chain pp39-41

ASSESSMENT

- Relate food chain concepts on a microbial scale
- Identify chemical processes and molecular changes
- Discuss relationships between biochemical processes and alternative energy