

LESSON 16: FISH METABOLISM

TEACHER GUIDE

BACKGROUND INFORMATION

- Metabolism is the process of consuming, using and excreting nutrients consumed. It is the process by which organisms get their energy.
- Energy is simply the body's cells having the materials necessary to perform their unique functions.
- Every living thing needs energy to survive. Energy is required for all functioning. For example, energy is needed to breath, keep a heart beating, move, think, grow, repair wounds and process information.
- Living things get their energy from a variety of resources. Plants are able to undergo photosynthesis; they turn sunlight into sugars which they use for food (energy). Animals, on the other hand, generally consume their energy in the form of food.
- Animals need a variety of nutrients to survive and remain in good health. Humans, for example, require fats, carbohydrates, sugars, proteins, calcium, iron, vitamin D etcetera.
- Humans, optimally, have a diverse diet so as to obtain all of the necessary nutrients.
- The fish in the aquaponics system get their diversity of nutrients from the fish food.

- Different nutrients are required for different functions within the body. The body's cells need a variety of nutrients in order to perform their unique functions.
- The body breaks nutrients down into their smallest parts. For example, proteins are broken down into amino acids; this makes them available for use by the cells. Amino acids are most notably used in muscle tissue development and repair.
- Food which is unusable to the body is excreted in the form of feces. Feces are a

collection of unusable nutrients plus some water.

- The feces fish excrete are actually usable to plants.

LESSON OBJECTIVES

- To understand that all living things need energy to do everything they do.
- To understand that living things can get energy from a variety of sources.
- To understand that animals, namely fish and humans, need a variety of nutrients for good health.
- To understand why the fish in the aquaponics system need the food they are given in order to survive and be healthy.
- To understand that animal bodies are capable of breaking down food in order to extract the necessary nutrients.
- To understand that animal bodies excrete unnecessary food in the form of poop.
- To learn about some of the forms that necessary nutrients take (such as in meat and oils).

LESSON MATERIALS

- A container of fish food.
- A writing utensil for each student.
- A worksheet for each student.
 - Work sheets should consist of 6-15 ingredients from the fish food used for the aquaponics fish typed up. Choose ingredients that are recognizable to students. For example, “shrimp meal” would be a better choice than “zinc sulfate monohydrate”. Make sure each of the three main nutrient groups is represented

in your choices, ideally more than once. The three main nutrient groups are proteins, fats and carbohydrates.

- Copies of the assessment.

ASSESSMENT ANSWER KEY

- 1) Metabolism means how living things use their food. (B)
- 2) Living things need energy for growing, fixing wounds, eating and breathing. (E)
- 3) Fish get their energy from food. (C)
- 4) Fish could not survive solely off of protein. Fish need a variety of nutrients in their diet. If a fish only ate protein, it would be deficient in fats and carbohydrates, among other minerals and vitamins.
- 5) Poop is the excretion of unneeded food by an animal's body.

STUDENT GUIDE – WHAT HAPPENS WHEN WE GIVE FISH FOOD?

VOCABULARY

Metabolism – how living things use their food.

Survive – to live.

Nutrient – food.

Function – a job.

Feces – poop.

LECTURE AND DISCUSSION

- Ask the class: do all living things need energy?
 - All living things do need energy.
- Ask the class: what do living things need energy for?
 - Living things need energy for everything they do! This includes: breathing, moving, growing, repairing injuries, making noise and so many more!
- Ask the class: how do living things get their energy?
 - Plants get their energy from the sunlight, and animals get their energy from the food they eat.
- Ask the class: why do we feed the fish in our aquaponics system?
 - Fish need food in order to survive. If they did not get food they would have energy to breathe, to make their hearts beat, to keep warm etcetera.
- A fish's body needs a variety of nutrients in order to survive. Every nutrient does a different thing to keep the fish alive.
- Humans work the same way! We need a lot of different nutrients in order to be healthy.
- Ask the class: what are some nutrients you need to eat?
 - Students might come up with answers such as: fats, oils, carbohydrates, vitamin A, vitamin C, vitamin D, iron, calcium etcetera.
- Fish need a variety of nutrients as well.
- Fish actually have similar nutrient needs to humans. For example, fish need protein, calcium and vitamin A in order to be healthy.
- The fish food used to feed the fish in the aquaponics system is made up of all the nutrients fish need to survive and be healthy.
- Fish eat the food given to them. Their bodies then break the food apart, and only use the nutrients that they need.
- Anything that the fish does not need is sent through the fish's body and comes out as

feces (poop)!

- These fish feces, while not useful to the fish, are very useful to the plants. This is how the fish are able to feed the plants!
- Animals, including fish, eat food in order to get the nutrients that they need to survive and be healthy. Their bodies use the nutrients in this food to get energy!

ACTIVITY

- Copy some or all of the ingredients of your fish food onto the board so the students can easily read it.
- Explain to the students that there are three main groups of nutrients fish need to survive and be healthy: proteins, fats and carbohydrates.
 - Proteins are likely found in meat and/or beans in fish food.
 - Fats are likely found in oils in fish food.
 - Carbohydrates are likely found in whole grains in fish food.
- Go over some of the ingredients listed on the board, explaining to students what nutrient they are. Consider letting the students guess which category they fall under before telling them. Try to avoid going over the ingredients listed on the worksheet.
- Provide each student with a copy of the worksheet described in the lesson materials section.
- Have each student indicate which of the three categories each of the listed foods falls under. Consider letting the students use a computer to research each of the foods.

CONCLUSION

- Go over the answers to the activity. Make sure the students understand why each of the foods is categorized as it is.
- All living things need energy in order to survive. Energy is essential to body functions such as breathing, growing and repairing wounds.
- Living things need a variety of nutrients; each nutrient performs a different function within the body.
- Fish and humans actually need a lot of the same nutrients.
- Once an animal has consumed food that animal's body will break down the food and only use what it needs.
- Any nutrients the body does not need, it will get rid of in the form of feces.

EXTENSION

- *Science* – this lesson introduces the idea of a necessity of a variety of nutrients. A good extension to this idea is researching what a deficiency in these nutrients actually does. For example, not getting enough protein can lead to problems with growth. Also, the students could research what nutrients they need for a healthy diet. They could also research good sources of these nutrients, and create a mock meal plan which includes all of the important nutrients. They could then present their meal plans to the class, and maybe to their parents!
- *Social Studies* – many countries are struggling with poor diets due to various nutrient deficiencies. The students could do a research project surrounding these problems.