

GRADE 4: LESSON PLAN 1

ANATOMY: WHAT ARE CORONARY ARTERIES?

Goals

- Students will understand the basic function of the heart.
- Students will identify good and bad health behaviors and explain how they affect the heart.

Instructional objectives

Students will be able to

1. Identify the blood vessels of the heart. 1
2. Describe the basic function of the coronary arteries.
3. Discuss how the coronary arteries help to keep the heart healthy.

Background information

The walls of the heart are made of a thick, special kind of muscle called cardiac muscle. The muscle squeezes (or contracts) and pushes oxygen-rich blood out of the heart and through the arteries to the organs, tissues, and cells of our bodies. The heart muscle—like every other organ or tissue in the body—needs oxygen- and nutrient-rich blood to function. Blood is supplied to the heart by its own delivery or vascular system, called coronary circulation. Because the heart is cardiac muscle that constantly contracts and relaxes, it depends on the coronary arteries for a continuous supply of oxygen and nutrition.

Materials

1. Chart paper and markers
2. Illustration: Oak Tree (Activity 4–A)
3. Illustration: Coronary Artery Tree (Activity 4–B)
4. Worksheet: “How to Feed a Tree” (Activity 4–C)
5. Worksheet: “How to Feed a Heart” (Activity 4–D)
6. Black-and-White Guide: “How to Feed a Heart” (Activity 4–D)
7. Color Guide: “How to Feed a Heart” (Activity 4–D)
8. Optional: Classroom computer with Internet access
9. Optional: Overhead projector for illustrations

Introduction

Place the illustration of the Oak tree (Activity 4–A) and the coronary artery tree (Activity 4–B) at the front of the room. If you have Internet access, display *Blood Vessels of the Heart: Coronary Arteries (Flash)* found under the Circulatory System tab of the Project Heart website.

Ask students if they have ever noticed that the branches of a tree are thickest near the trunk and become thinner as the branches grow towards the leaves. Begin a discussion about how the tree gets its nutrition, what keeps the tree healthy, and why the branches of the tree become thinner as they get closer to the leaves.

Discussion points

- What does the tree use for fuel?
- What keeps the tree healthy?
- Why do the tree branches get thinner?

Ask students to compare the illustration of the coronary arteries to the branching tree. Lead a discussion of how the heart muscle gets its nutrition, how it stays strong and

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healthy, and why the coronary arteries become thinner as they branch.

Lesson procedures/activities

1. Explain to the students how the tree trunk directs nutrients from the ground up to the large branches, and the large branches direct the nutrients out to the thinner branches, and finally to the leaves. Use a drawing of a tree to follow the path of the nutrients from the ground, up the trunk, and out the branches to the leaves.
2. Have the students draw, color and label the parts of a tree on the worksheet “How to Feed a Tree” (Activity 4–C). Ask students to trace the path of the nutrients from the tree roots to the leaves.
3. While referring to the illustration of the coronary artery tree (Activity 4-B), remind students that the heart muscle—like every other organ or tissue in the body—needs oxygen- and nutrient-rich blood (fuel) to function. Because the heart is composed primarily of cardiac muscle that constantly contracts and relaxes, the heart muscle needs a continuous supply of fuel.

Blood is supplied to the heart by its own vascular system, called coronary circulation. The aorta, which carries blood from the left ventricle, supplies blood to the coronary arteries (blood vessels). The word coronary means crown, and like a crown, the coronary arteries encircle the surface of the heart. There are two main coronary arteries: the right coronary artery, which supplies blood mainly to the right side of the heart; and the left coronary artery, which supplies blood mainly to the left side of the heart. The coronary arteries divide into smaller artery branches called arterioles and finally into the smallest vessels called capillaries. The larger arteries travel along the outside surface of the heart and the smaller arterioles and capillaries travel inside the heart muscle to reach the individual cells where they deliver oxygen and nutrients. The capillaries are so tiny the blood cells must move through single file. (It may be fun to relate this to students lining up single file in the cafeteria lunch line to receive their nutrition.)

Blood vessels throughout the body that take oxygen-poor blood back to the heart are called veins. In coronary circulation, oxygen-poor blood is carried away from the heart

muscle via blood vessels called coronary veins. They collect the oxygen-poor blood from the heart muscle (wall) and empty it back into the right atrium by way of the coronary sinus, which is a small opening in the right atrium wall.

Students can think of the coronary system as being like a tree: the aorta is the trunk; the two coronary arteries are the main branches that divide into thinner vessels (like tree branches); and the capillaries that deliver nutrients to the body's tissue are like the tiniest branches that distribute nutrients to the tree's leaves.

4. Lead a discussion with students comparing the drawing of the Oak tree to the drawing of the heart and its coronary arteries. (Turn the tree illustration upside-down and observe how they resemble each other.)
5. Describe for students the path of a blood cell through the body to the heart muscle. The path a blood cell takes is more complicated than the path water and nutrients take moving through tree limbs. Look at a blood cell's journey beginning in the right atrium. The blood cell moves from the right atrium into the right ventricle and then into the lungs, where it absorbs oxygen. It travels through the pulmonary vein (another blood vessel) to the left atrium, then on to the left ventricle and out the aorta. The blood cell moves to either the right or left coronary artery, branches off to an arteriole, and finally through a capillary where it gives its oxygen to a muscle cell. When the blood cell delivers its oxygen to the muscle cell, it absorbs carbon dioxide (CO₂) from the muscle cell, and returns to the right atrium where it is pumped into the lungs to give off the CO₂ and absorb more oxygen. Using the guide from Activity 4–D, have the students color and label the vascular system of the heart on the worksheet “How to Feed a Heart” (Activity 4–D).

Guided Practice

If you have a computer with Internet access, go to the Texas Heart Institute's Project Heart website (www.texasheart.org/ProjectHeart) and give students the opportunity to view illustrations and animations of the heart and coronary arteries (in the *Look* section).

For added interest, discuss how trees, like all plants, need CO₂ (for photosynthesis, the process of turning sunlight into fuel)

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and breathe off oxygen, just the opposite of humans, who need oxygen and breathe off CO₂. Refer to the worksheets “How to Feed a Tree” (Activity 4–C) and “How to Feed a Heart” (Activity 4–D). Discuss with students whether they think it is healthier to live in an environment with or without plants.

Independent practice

- Have students develop an annotated glossary of terms from this lesson. Allow students to choose which terms are important for their glossary. Each entry should include the term, its definition, and why it is important or what it does.
- Have students draw a road map or trail guide and write detailed directions for a blood cell’s journey. Label the parts of the anatomy it travels through and describe how it delivers oxygen and nutrients along the way.

Adaptations

Students who have difficulty with writing may have their assignments adapted by allowing them to verbalize, demonstrate, or illustrate their responses.

Assessment

You may use observations of students during class activities and responses for written activities to determine their understanding of the lesson objectives.

Objective	Demonstrated lesson objective	Partially demonstrated lesson objective	Did not demonstrate understanding of the objective
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- Identify the blood vessels of the heart.
- Describe the basic function of the coronary arteries.
- Discuss how the coronary arteries help to keep the heart healthy.

Extension

Have students research the process of photosynthesis in plants and prepare a report about how it compares to blood cells delivering oxygen and nutrition to the heart.

Introduction to the next lessons

Before closing the anatomy lesson, provide a quick preview of lessons 2 and 3, which pertain to nutrition and exercise. The following topics are covered:

- Exercise (30-60 minutes on most days of the week) makes the heart work harder and burn fuel (oxygen) more efficiently, so the cardiac muscle stays strong. Exercise also strengthens bones, burns calories, helps us think better, and increases self-esteem, which makes us feel better, both physically and mentally.
- Healthy foods provide important nutrients for all of the cells in the body, leading to strong bones and muscles. They also provide energy for growth and exercise. The nutrition lesson pays particular attention to feeding the cardiac muscle, coronary arteries, and blood cells just discussed.