

BLOOD BASICS

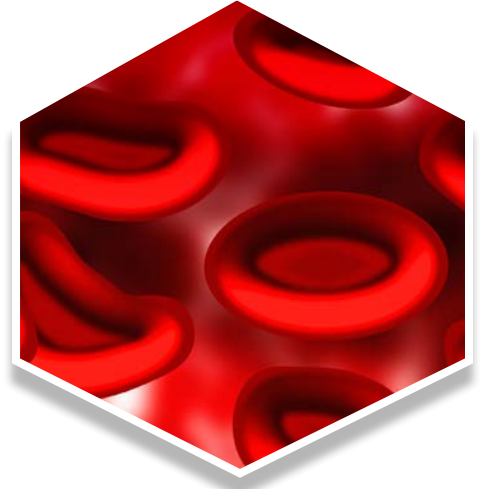
A Science Exploration Project

**Choose
Science!**

What's So Important About Blood?

Blood—we simply can't live without it. It's a key player in keeping us alive and well. Blood helps our bodies maintain good health in many ways, such as supplying us with oxygen and protecting us against germs. Learning about blood may sound kind of gross, but it's actually totally fascinating.

- Blood may look red, but more than half of it is a watery yellow liquid called plasma.
- About 7% to 8% of your total body weight is blood. An average-size adult has eight to ten pints of blood, a 40-pound child has two or three pints of blood, and a newborn baby has about half a pint of blood.
- If your blood did not have special cells called platelets, bleeding from even a small cut could become unstoppable, making it very dangerous.
- Blood is not produced in the bloodstream but in your bone marrow.
- If you like science, consider a career in hematology, the science related to the cause, treatment, and prevention of diseases related to the blood. You could find yourself helping patients with diseases such as leukemia, lymphoma, and sickle cell anemia.



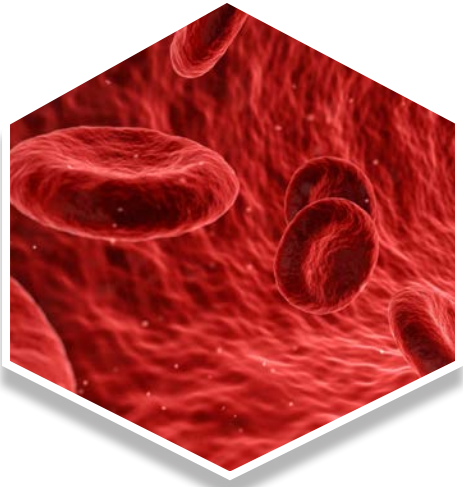
Be a Science Investigator

Take a closer look at your body's blood by completing a project that answers a related question.

Choose a topic: Read the list of research questions below. Then circle one question to research, or come up with one of your own. If you are working with a partner or a group, discuss the questions before selecting a topic.

- **Blood Matters:** Why is blood important to good health?
- **In the Blood:** What are the principle components of blood, and what are the functions of each component?
- **Building Blood:** How is blood made?
- **White Blood Cells Working Together:** What are the main types of white blood cells? How do they work together to fight disease?
- **What Is Leukemia?** How is it diagnosed and treated?
- **What Is Lymphoma?** How is it diagnosed and treated?
- **Hematology News:** What medical advances have been made recently to fight different blood diseases?
- **Career Options:** What careers are available for someone interested in the science of the blood?
- **Other:** _____

List related search terms that will help you locate information on your research topic. _____



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Doubling the Difference She Makes

Dr. Ann Mullally is involved in not one, but two science careers—and she loves them both. As a doctor, she takes care of patients who have blood cancers. As a medical researcher, she runs a laboratory where she and her colleagues study the cells and genes that cause blood cancers. “Really good original ideas have the potential to change the world and to improve the lives of others in the process. What could possibly be cooler than that?” she says.

BONE BASICS

A Science Exploration Project

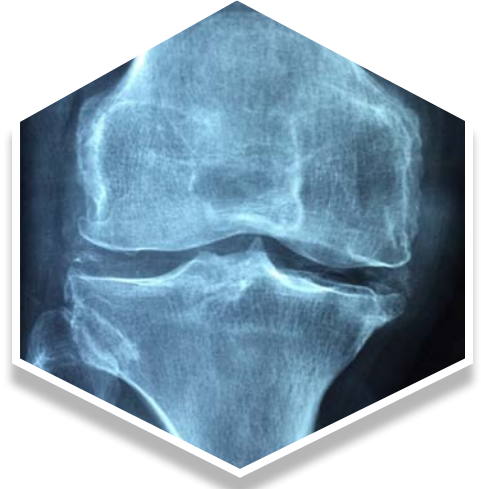


Choose
Science!

What's So Important About Our Bones?

A body without bones? That would be like a tent without a frame to hold it up! Our bones are amazing structures that do more than just give our bodies their shape, though. They protect vital organs, store minerals for the body, and make blood cells. Who knew bones were so unbelievably cool?

- A human bone contains both the hardest tissue in the body and a substance that looks like jelly.
- There are 206 bones in the human body. Your skull is made of 22 bones, and you have 27 bones in each hand. But you only have three bones in your ear and only one in your throat.
- Most blood cancers, like leukemia, start in the bone marrow where blood is produced.
- When you're born, all of your bone marrow makes blood cells. After you become an adult, only certain bones in your body have active marrow.
- If you like science, consider a career in osteology, a branch of anatomy dealing with the bones. You could find yourself doing research on bones or even analyzing bones at an archaeological site or a crime scene.



Be a Science Investigator

Take a closer look at your body's bones by completing a project that answers a bone-related question.

Choose a topic: Read the list of research questions below. Then circle one question to research, or come up with one of your own. If you are working with a partner or a group, discuss the questions before selecting a topic.

- **Inside and Out:** What functions do bones have in the human body? What are the major bones?
- **Exceptional Bones:** What makes the bones of the skull, ribs, and spine so special?
- **Marrow Matters:** How is bone marrow used to treat diseases such as leukemia and lymphoma? What is involved in a bone marrow transplant?
- **Your Changing Bones:** How do bones change as a person ages?
- **Bone Breaks:** How might a doctor treat a patient with a broken bone? How do broken bones heal?
- **A Baffling Bone Disease:** What is Paget's disease? What are its causes and symptoms, and how is it treated?
- **Career Options:** What careers are available for someone interested in osteology?
- **Other:** _____

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From *Star Trek* to Scientist

Dr. Katherine Borden is a research scientist who studies cancer. She works with a team of scientists to better understand the biochemistry of leukemia cells. As a child, Dr. Borden was inspired to become a scientist when she watched Mr. Spock on the original *Star Trek* television series use science to save the universe. Today, Dr. Borden explains that she gets a charge out of “having the opportunity to make a positive impact on patients’ lives.”

THE CIRCULATORY SYSTEM STORY

A Science Exploration Project



Choose
Science!

What's So Important About Our Circulatory System?

The three parts of your body's circulatory system—the blood, the heart, and blood vessels—could be called “The Thriving Three.” That's because without them, you couldn't survive. Together they get nutrients and oxygen to all the cells in your body. They are also responsible for carrying carbon dioxide and waste away from the cells. The circulatory system is the right-on-time delivery service of a healthy body!

- Your heart pumps about 1,800 gallons of blood through your body each day.
- Blood vessels are your blood's “highways.” These tubes move blood through the body. If your blood vessels were stretched out in a line, they would cover more than 60,000 miles. That is long enough to circle the earth almost two times.
- The smallest blood vessels are capillaries. These tiny vessels are only about 1/3,000 of an inch in diameter. That's about 1/10 the diameter of a human hair.
- The most common blood test (called a “complete blood count” or CBC) measures the number of red blood cells, white blood cells, and platelets in your blood.
- If you like science, consider a career in cardiology, a medical specialty that involves diagnosing and treating problems with the heart and circulatory system. You could become a cardiology doctor, researcher, or nurse. You could even be a technologist who operates machines that take images used to see inside a patient's body or a perfusionist who operates a heart-lung machine.



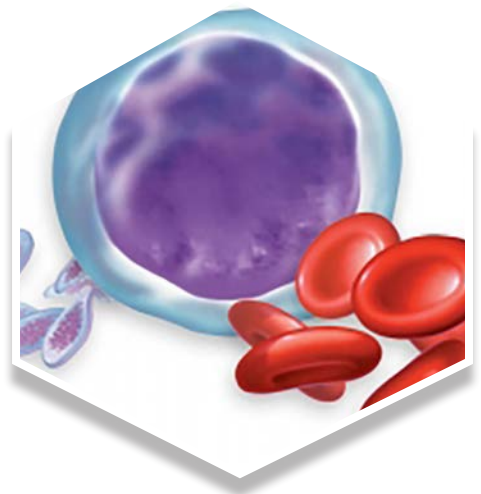
Be a Science Investigator

Take a closer look at your body's circulatory system by completing a project that answers a related question.

Choose a topic: Read the list of research questions below. Then circle one question to research, or come up with one of your own. If you are working with a partner or a group, discuss the questions before selecting a topic.

- **Blood Movers:** How does the circulatory system move nutrients, oxygen, wastes, and carbon dioxide to and from your cells?
- **Vessel Variety:** What are the different types of blood vessels in your body, and what role does each type play in the circulatory system?
- **Heart Attack Basics:** What is a heart attack? What are the warning signs of a heart attack? What is a pacemaker, and how does it relate to heart attacks?
- **Hematology Helper:** What is hematology? What does a hematology oncologist do?
- **Test Time:** What are some different types of blood tests a doctor might have you take, and why is each one given?
- **Blood Cancers:** What is leukemia? What is lymphoma? What are each disease's symptoms? How are doctors fighting these diseases today?
- **Career Options:** What careers are available for someone interested in cardiology?
- **Other:** _____

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A Cancer Researcher and More

Dr. Catriona Jamieson is a hematologist who does research on cancer stem cells. She credits much of her career success to the people who mentored her, particularly a graduate school advisor who encouraged her to pursue difficult scientific questions. Today, Dr. Jamieson mentors others, including the staff and 20 scientists who work with her in her lab. The idea that she can make new discoveries about cancer stem cells is what makes her excited about the work she is doing.

CELL SCIENCE

A Science Exploration Project

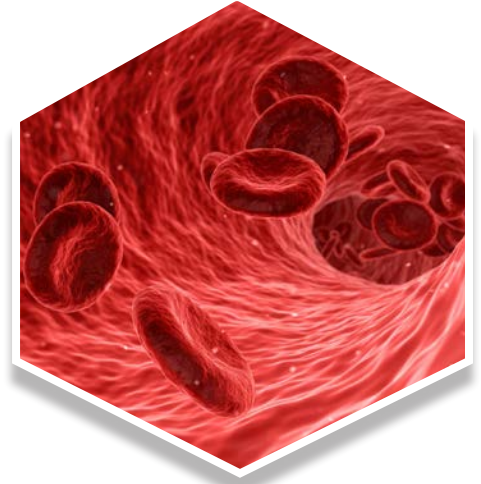


Choose
Science!

What's So Important About Our Cells?

You may have heard the saying, “Good things come in small packages.” That’s certainly true when talking about the tiny cells that make up the human body. Cells are the basic units of structure and function in all living things. There are about 200 different types of cells in your body. All of them are unique, specialized, and totally fascinating to learn about.

- According to recent research, there are about 37 trillion cells in the human body.
- Red blood cells are shaped a little like a doughnut. This helps them easily change shape so they can fit through the smallest blood vessels.
- According to one scientific estimate, about 300 million cells die every minute in our bodies. (Don’t worry: your body will replace them!)
- Cancer happens when abnormal cells grow out of control and don’t die when they’re supposed to. The tumors these cells create can kill normal cells and damage the body.
- If you like science, consider a career in cytology, a branch of biology that deals with the structure, function, reproduction, pathology, and life history of cells. With all the different cells in the body, the career options are plenty. For example, you could be a microbiologist who studies how abnormal cells cause diseases like cancer. You could also work as a pharmacologist who develops and tests new drugs.



Be a Science Investigator

Take a closer look at your body’s cells by completing a project that answers a related question.

Choose a topic: Read the list of research questions below. Then circle one question to research, or come up with one of your own. If you are working with a partner or a group, discuss the questions before selecting a topic.

- **Cell Structures:** What are the parts of a human cell, and what function does each part have?
- **Diffusion Confusion:** What is diffusion, and how does it relate to cells and your health?
- **Cells, Cells, and More Cells:** How do cells reproduce, and why is this important to health and body function?
- **Blood Cell Basics:** What are the different functions of red blood cells, white blood cells, and platelets? How does their structure and shape support their functions?
- **Out of Control and Dangerous:** What happens to the blood cells of patients with blood cancers like leukemia and lymphoma? How do these cancer cells differ from normal cells?
- **An Incredible Cell Story:** Who was Henrietta Lacks, and why is she important to the study of cells today?
- **Career Options:** What careers are available for someone interested in cytology?
- **Other:** _____

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A True Science Rock Star

Dr. Janet Davison Rowley had a burning question: did cancer cause damage to a cell’s chromosomes or—as she hypothesized—were people with cancer actually born with damaged chromosomes that caused the disease? Her research led to new and better drugs for treating blood cancers like lymphoma and leukemia. What drove this scientist to prove her theory? She explained, “The exhilaration that one gets in making new discoveries is beyond description.”

THE SKINNY ON THE IMMUNE SYSTEM

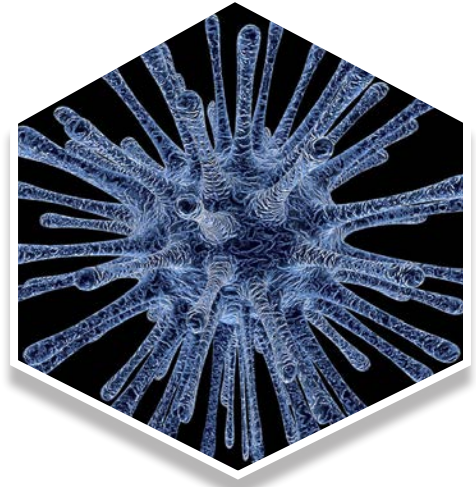
A Science Exploration Project



Choose
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What's So Important About Our Immune System?

Famous celebrities often need bodyguards to protect them from overly eager fans. Did you know you have your own built-in bodyguard? It's called the immune system. The cells, tissue, and organs in this system work together to fight off sickness. Just like a good bodyguard recognizes potential danger, your body can recognize invaders like bacteria and viruses as being different from the body's normal, healthy tissues. Once an invader has been identified, your immune system goes into attack mode to keep you safe.



- Your skin has special cells that warn the body about incoming germs.
- Among the stars of the immune system are your white blood cells, your body's germ fighters. There are about 50 billion white blood cells in your bloodstream.
- Because your immune system produces so many different types of white blood cells, your body can recognize almost any invading bacteria, virus, or other organism that has caused an infection.
- Researchers are developing new drugs that help a patient's own immune system destroy cancer cells.
- If you like science, consider a career in immunology, a science that deals with the immune system. As an immunologist, you might be a research scientist who works in a lab studying how the immune system works. You could also be a doctor who treats problems that involve the immune system, such as allergies, asthma, and eczema.

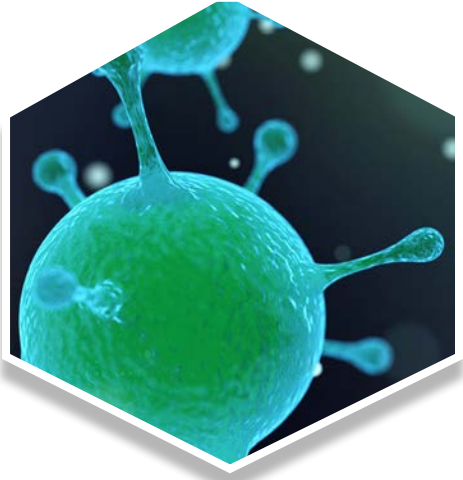
Be a Science Investigator

Take a closer look at your body's immune system by completing a project that answers a related question.

Choose a topic: Read the list of research questions below. Then circle one question to research, or come up with one of your own. If you are working with a partner or a group, discuss the questions before selecting a topic.

- **Skin, Spit, and Snot:** What roles do the skin, saliva, and mucus play in keeping pathogens from making you sick?
- **The Inner Fighters:** What are macrophages, neutrophils, T cells, B cells, and NK cells? How do they protect your body against disease?
- **Bacteria or a Virus?:** What is the difference between a bacterial infection and a viral infection? How are the treatments for these infections different?
- **A Little-Known System:** What is your body's lymphatic system, and what does it do?
- **Harnessing the Immune System:** What is immunotherapy, and how is it helping patients with cancers like leukemia and lymphoma?
- **Immune System Problems:** What major diseases and disorders do doctors of immunology diagnose and treat? How is the immune system affected in each disorder?
- **Career Options:** What careers are available for someone interested in immunology?
- **Other:** _____

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Determined to Find a Cure

Scientist, researcher, and doctor—these terms all describe oncologist Dr. Rayne H. Rouce. She not only helps infants and children who are facing cancer, but she also works to find new ways to use the body’s immune system to target and kill a patient’s own cancerous tumors. She says, “I will never get tired of offering a chance for a cure for patients who have been told they are out of options.”

CAREERS IN SCIENCE

A Science Exploration Project



Choose
Science!

Why Should You Consider a Science-Related Career?

What does a scientist look like? You might think it's someone wearing a lab coat, surrounded by beakers, and stuck in a noise-free lab for hours a day. But that image just isn't accurate. A scientist can look like anyone—including you. As a scientist, you can send people into space, deep-sea dive to study sharks, develop virtual reality-based video games, create a one-of-a-kind robot, or find a cure for cancer. A career in science can give you the chance to make a difference in the world—and have fun while you're doing it.



- There are literally thousands of science careers available today. Love the ocean? There's a science career for that. Is the kitchen your happy place? Then consider becoming a food scientist. If you have a passion for something, there's a science career related to it.
- The medical field is full of science career options. For example, medical researchers who are funded by The Leukemia & Lymphoma Society have learned how to use a patient's lymphoma cells to make a personalized vaccine. They hope that adding this vaccine to other treatments will keep the disease from coming back.
- Do you love the idea of teaching others about science? Today's schools need talented teachers who are passionate about science. As a science teacher, you may be the one who encourages a student who will later make an amazing scientific discovery.
- It's not too early to start considering a career in science. The more you learn about science careers, the more exciting possibilities you'll see!

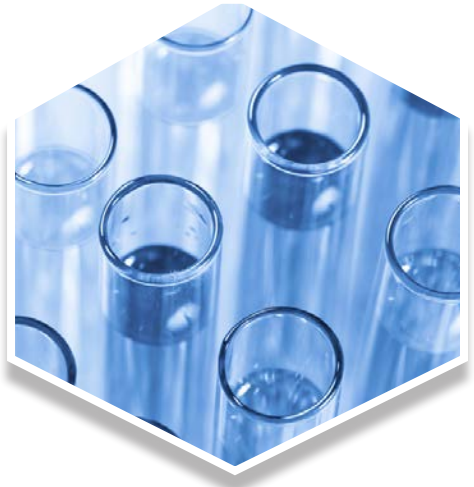
Be a Science Investigator

Take a closer look at careers in science by completing a project that answers a related question.

Choose a topic: Read the list of research questions below. Then circle one question to research, or come up with one of your own. If you are working with a partner or a group, discuss the questions before selecting a topic.

- **Why Science?** What are the benefits of pursuing a career in science? What are some of the most exciting career options out there today?
- **Hit the Books:** What are the educational requirements for three different careers in science? How can someone prepare to pursue each of these careers?
- **What Makes a Scientist?** Study three different scientists to determine the traits they have in common. From your study, what do you think are some of the characteristics of a good scientist?
- **Career Spotlight:** What science career do you think is really cool? What does a person with this career do? How could this career impact the world today and in the future?
- **In Demand:** Why are workers with skills in science, technology, engineering, and math in such high demand today? What science-related skills are today's employers looking for?
- **Girl Power:** Choose a female scientist. What impact has she made on the world? What did she do, and how did she become interested in science? Tell her story.
- **Other:** _____

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Combining Science with Care

When did Dr. Irene Ghobrial first know she wanted to become a scientist? It happened the moment she realized her interest in science could be used to make a difference in the lives of people with cancer. Today she treats cancer patients and also works in a lab to better understand the disease. What would she tell students to encourage them to consider a career in science? “Science is about discovering new things and having fun in understanding why certain things happen in nature or in our body.”