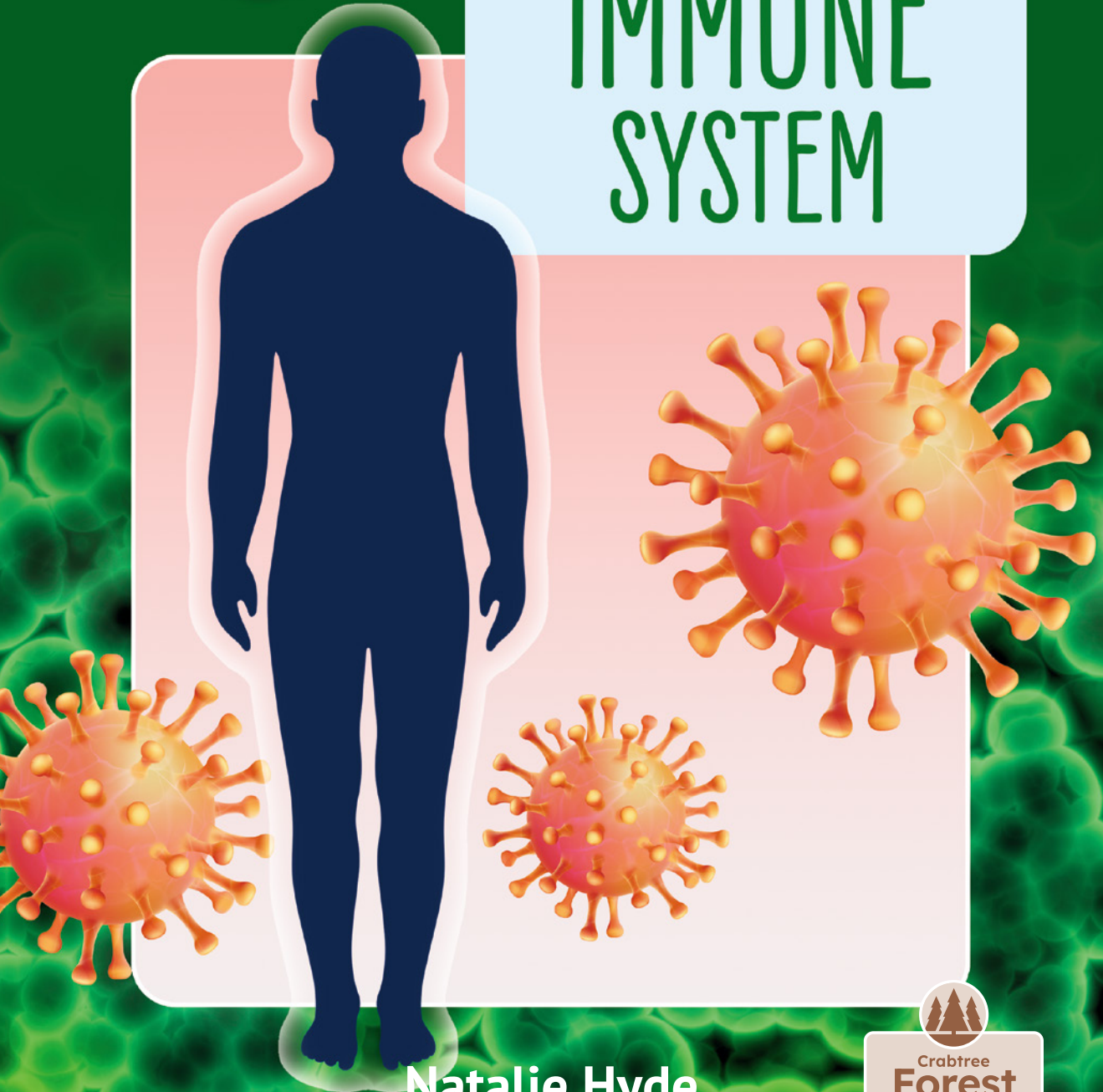


INVESTIGATING
Body Systems

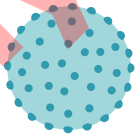
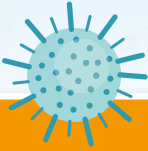
Investigating the IMMUNE SYSTEM



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Crabtree
Forest



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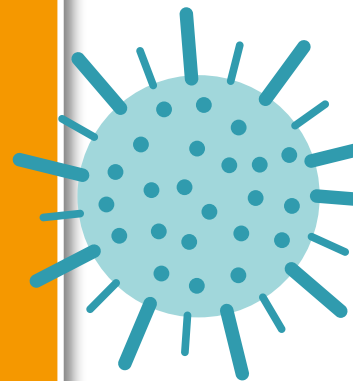
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The Body's Security Alert

Summer is a great time to enjoy a weekend camping trip. Imagine setting up your tent and campfire in the woods. Suddenly, however, you start to see a red, itchy rash on your arms. Poison ivy! But why did that rash appear? And what is its purpose? The swelling, itching, and redness are all signs that one of the most important systems in your body is working—the immune system. Its job is to protect you from harmful invaders to your body.

All plants and animals have some form of immune system. The ability to survive against the attack of harmful **organisms** or elements is something all living things need. Without an immune system, the human body would be easily damaged by infection and disease. Our life spans would be short. Humans might not even exist as a **species**.

There are many individual viruses and **bacteria** around us every day. You cannot avoid coming into contact with them. There are about 100 million of them for every star in the universe. They are in the air, in water, and in the soil. Luckily, most of them are not a threat to humans, but the ones that are pose a great risk to our health.



What Does Contagious Mean?

A disease that can be passed on from one person to another is called contagious. Contagious diseases are spread when the **germs** from an infected person are transferred. This can be on surfaces that someone else touches, in the air where an infected person has coughed or sneezed, or in body fluids. That is why people have been advised to wear masks and wash their hands more often during the COVID-19 **pandemic**.



A rash is the body's reaction to the oily resin on poison ivy leaves that a person may brush against while hiking.



Cell Network

The immune system is not just found in one part of the body. It is a large network of cells, tissue, and organs that work together. You can think of it like a fort with guards. Organs such as the skin, as well as tissue and **mucus**, work like the stone walls and moat. They keep risky viruses and bacteria from entering the body. If invaders make it into the body, an alarm system activates the cells that kill and destroy the invaders.

Not all organisms that make it into the body are dangerous. In order to work well, the immune system has to be able to tell the difference between **beneficial** bacteria, such as the probiotics often found in yogurt, and threats such as Group A Streptococcus—which we know as strep throat. Guards on duty at a fort would shout “Friend or foe?” when someone new came to their gates.

Cells traveling through the bloodstream do the same thing. They inspect any outsiders and decide whether to arrest and detain them or let them go free.

It is not just infections and disease that are tackled by the immune system. It also deals with things such as **allergies** and **intolerances**. Intolerances are substances that our body might struggle to break down and absorb. Some people are intolerant to milk proteins, for example.

So how do you know that your immune system is at work? If you experience things such as chills, a runny nose, or a cough, you can be sure that your immune system is on duty. Fever and swelling are often the first signs the system has been **activated**.

The stone walls of a fort help keep invaders out. The body's walls are its skin and tissue.





Key Figures

Brigitte Alice Askonas is known as the “Grand Dame of Immunology.” This is a term used to note a woman of great ability and respect. Askonas was a biochemist who worked at the National Institute for Medical Research in London, U.K. She became head of the immunology department, studying specialized immune cells called B cells to determine their role in the immune system. Askonas won several scientific prizes for her work.



B cells are a type of white blood cell that makes **antibodies**. They are part of the immune system.

How Do We Know?

Originally people believed that sickness was a punishment for being bad or not following religious laws. Sickness was often treated by healers or shamans who used spells and charms to get rid of bad spirits.

In Greece around 480 B.C.E., a Greek physician named Hippocrates began to question this idea. He thought that diseases had a natural or physical cause. He believed there were four fluids in the body, called humors, that needed to be kept in balance. Too much or too little of any of the fluids would make a person ill. Hippocrates thought doctors should be neat, calm, and honest with their patients. He even insisted they trim their fingernails and wash their hands. This was a new idea, as no one had thought about cleanliness having an effect on disease. Without knowing it, Hippocrates had come across one of the most important rules of preventing illness.

The worst diseases gave researchers insight into the body's own defense systems. During a **plague** in Greece in the 400s B.C.E., historian Thucydides wrote about people who recovered and were "immune" from getting it again. This was the first time the work of the immune system was recognized.

Hand, foot, and mouth disease is an infection caused by a virus. It leads to fevers and sores on hands, feet, and in the mouth.





Healers in the Middle Ages (500–1500 C.E.) did not know what doctors know today. Still, they developed treatments and early forms of vaccinations.



Smallpox was a disease that could be traced as far back as ancient Egypt. It was the next disease to point to the existence of the immune system. Smallpox spread through China in the 900s C.E. as a result of trade and exploration.

As it spread, people noticed that there were two variants, or forms, of the disease. One was more deadly than the other. The Chinese were the first people known to have tried “variolation.” This was a process where scabs from someone suffering from the milder version were rubbed either on open sores or in the noses of healthy people. Variolation would give the healthy person a milder version of the disease and help them avoid death from the more severe version.