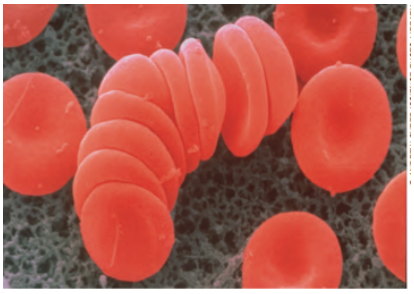
Blood: Life's liquid

If you drained out all your blood (yuk!), you could fill a 3-liter bucket. Adults have even more blood than young persons do. An adult man of average size (around 70 kilograms) has about 5 liters of blood in his body; a grown woman who weighs around 50 kilograms has about 3.5 liters of blood.

Every cell in your body depends on blood to deliver food and oxygen and to carry away wastes. Blood is the key to keeping all the cells of your body alive.

Although it may look like a plain red fluid, blood is a complex blend of liquid and solids. What's in this complicated mix? Only about 55 percent of blood is liquid. This liquid part is called plasma. It is a pale yellow fluid that is 95 percent water. The rest of the plasma is a mixture of dissolved materials, such as sugar, protein, minerals, and wastes that are being transported to and from your body's cells.

The solid parts of blood are trillions of red cells, white cells, and platelets. They ride along in the plasma and are responsible for feeding and protecting the body.



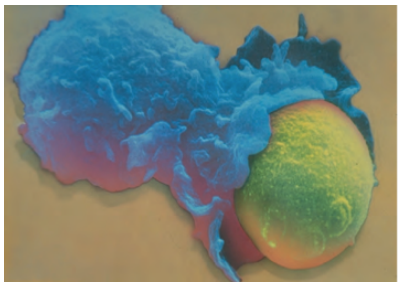
Red Cells—Blood's Work Force

Oxygen is one of the most important substances in the blood. The cells that transport oxygen are called red blood cells (erythrocytes). An adult man has about 25 trillion red blood cells. The bright-red color of these cells develops when oxygen combines with hemoglobin inside the red blood cells. Hemoglobin contains iron, and it attracts oxygen like a mag- net. Red blood cells are shaped like disks that have been squeezed in the center. Each red blood cell can carry almost a billion oxy- gen atoms!

As the blood travels through your body, it delivers oxygen and nutrients to the cells. Blood that has traded its oxygen for carbon dioxide is not bright red anymore. It's dark red or purple. That's one reason why the veins near the surface of your skin look so dark. At any one moment, you have enough oxygen

in your red blood cells to keep you alive for only about 5 minutes. Red blood cells work nonstop—to keep oxygen moving from the air you breathe to the cells that need oxygen and nutrients. It's hard work. About 2 million of a person's red blood cells die every second. But don't worry. Your body is constantly making new ones in the marrow (the soft center) of flat bones such as the hips, ribs, and skull.

White Cells: The Warriors



White blood cells (leukocytes) are your body's warriors. They're part of your immune system. White cells are bigger than red cells, but red cells outnumber white cells by about 650 to 1. White cells can change shape and squeeze between other cells to patrol your whole body, looking for invaders such as bacteria or viruses.

When the white blood cells find an invader, they attack. Some white cells surround and digest the microbes. Others produce chemicals that kill or cripple the enemy. The white blood cells also produce chemicals that act like an alarm signal and cause your body to send more germ-fighting cells to the battlefield.

Many white cells die in their war against bacteria. The sticky pus that collects around an infection is a pool of dead white blood cells and bacteria. But again, there's no cause for concern. Your body is always producing more white blood cells. In fact, if there are more germs than usual in your body, it produces extra white cells.

Sometimes the body produces too many white cells. A kind of cancer called leukemia causes the body to produce so many white cells that they can outnumber the red cells.

Platelets: The Repair Crew

Because blood is so important, your body has a way to patch holes in the blood vessel walls so blood doesn't leak out. This activity, called clot- ting, is done in part by platelets. When your skin is cut, the platelets are exposed to air and they begin to fall apart. This releases chemicals that react with a series of compounds in the blood (one of which is fibrinogen) to start forming a web of tiny threads. These threads twist together to form a web that traps red blood cells. The blood cells dry out and form a scab.

Clots can form inside your body, too. The black-and-blue marks that you call bruises are really clots underneath your skin. Your body needs calcium and vitamin K to help form some of the chemicals that help control clot formation. If you don't have enough of these nutrients, it will take a long time for your blood to clot.

Some people are born with a disease called hemophilia that prevents clots from forming at all. For them, even a small scratch can be dangerous, because they might lose a great deal of blood.

Blood Types: Not All Blood Is the Same

If you lose a lot of blood because you've been in an accident or had an operation, you may need a transfusion. This means that blood is transferred into you through a thin tube that has been inserted into one of your veins. But it has to be the right type of blood.

There are four main types of human blood. An Austrian scientist named Karl Landsteiner discovered the different blood types in 1901. Dr. Landsteiner named the four blood types A, B, AB, and O. The letters tell what kind of chemical markers are found on the surface of red blood cells. Type A blood has one kind of marker; type B has another. People with type AB blood have both markers. Type O blood has neither A nor B markers.

Dr. Landsteiner also discovered another blood type called the "Rh factor." It was named after the rhesus monkey in which it was first found. People whose blood has the Rh factor are referred to as "Rh positive." Those who lack this factor are "Rh negative." People inherit this blood type independently of the other types; therefore, we usually describe a person's blood type by including both the type and the factor (for example, "O positive" or "AB negative"). In their plasma, people have antibodies against the red blood cell markers that they *do not* have. If someone receives a transfusion of a blood type that contains markers other than their own, anti- bodies will attack the foreign red blood cells and cause them to stick together. This can result in serious damage, or even death, because the clumps of cells can clog small vessels.