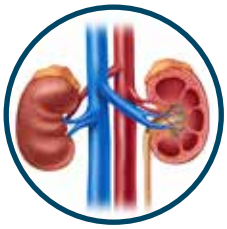
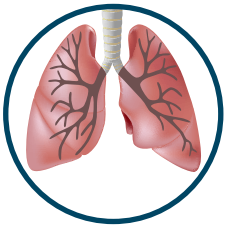
ORGANS & ORGAN SYSTEMS

An organ is a collection of various types of tissues that work together to perform a function. The heart is an organ. The kidney is an organ. A lung is an organ. Each of these organs is designed to do certain things. The heart pumps blood, the kidney rids the body of waste products and extra water, and the lungs get oxygen into the blood and carbon dioxide out. Other organs are the brain, liver, stomach, gall bladder, small intestine, large intestine, pancreas, spleen . . . you get the idea.

Heart

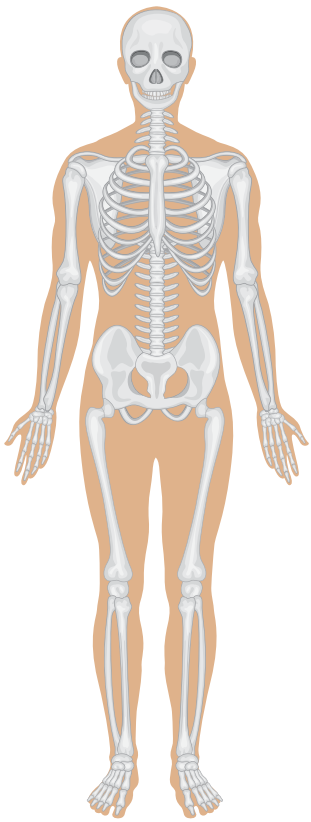


Kidney

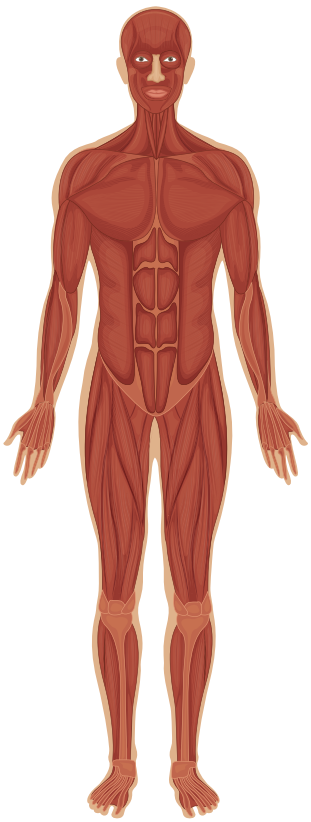


Lung

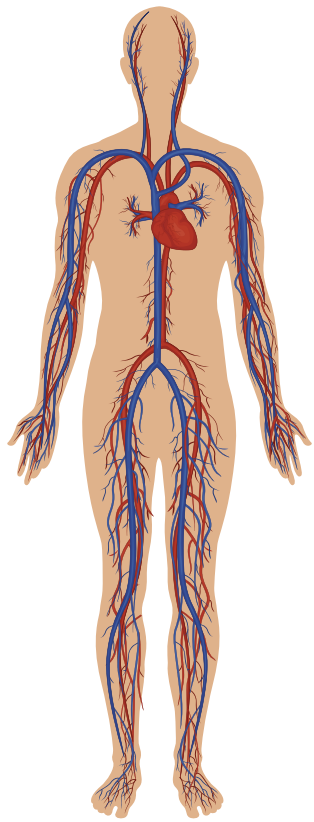
Brain



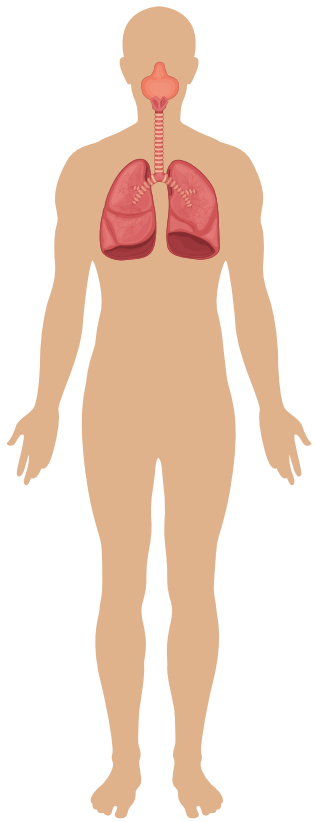
Skeletal System



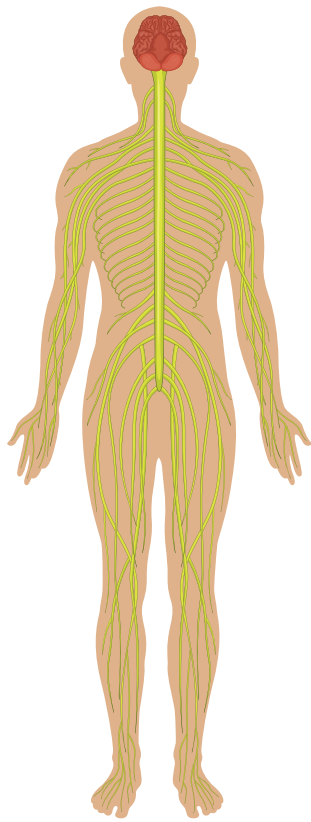
Muscular System



Cardiovascular System



Respiratory System



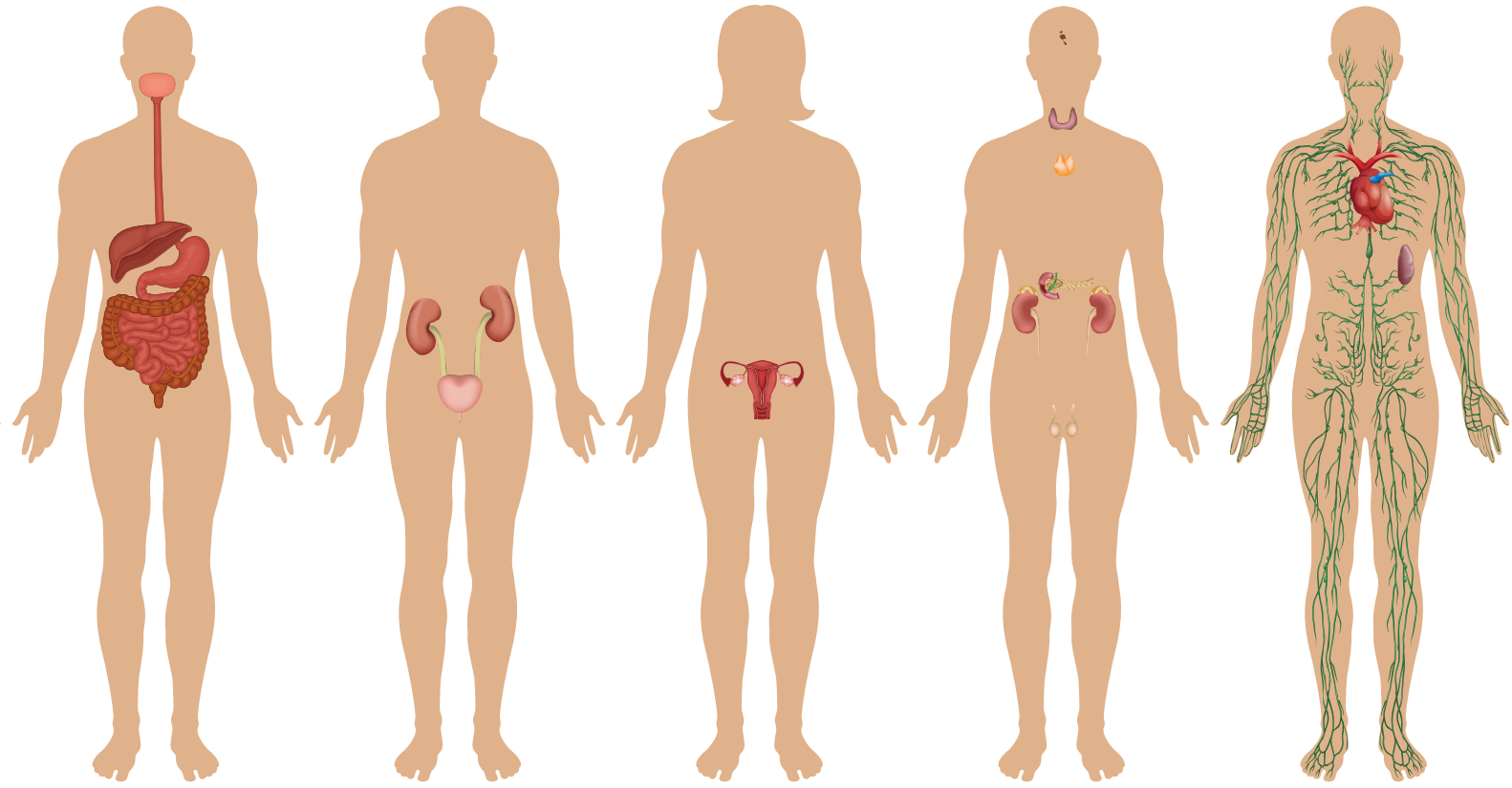
Nervous System

However, even as important and complex as each organ is, none can do their job alone. They require other organs and structures to assist them. The heart cannot function without the veins and arteries. The kidney cannot function without the ureters and the bladder. The lungs would be useless without the nose, the trachea, and the bronchial tubes to bring air to them and the diaphragm to help the chest cavity to expand and draw air in. No part of the digestive tract would do you any good if the other parts weren't there for food to travel through as it gets digested.

These collections of organs and structures are called organ systems. The heart, veins, and arteries, for instance, are parts of the circulatory system. The kidneys, ureters (tubes that drain the kidneys), and the bladder are the urinary (or excretory) system. The lungs are part of the respiratory system. It is logical

Programmed Cell Death

Did you know that some cells are designed to self-destruct? This process is called *programmed cell death*. Our Creator designed this process to eliminate worn out cells, but that's not all! Programmed cell death also makes it possible to shape a developing baby's delicate body parts. For instance, long before birth, a baby's fingers are webbed. Once the fingers reach a certain stage of growth, the cells in the webs die away and leave the individual fingers. In an adult, programmed cell death serves to keep the right number of healthy cells in many tissues and organs so that they maintain the correct shape and don't grow too large. When a cell receives a self-destruct signal, enzymes that chop its largest molecules into pieces are activated. The cell shrinks, becomes a misshapen blob, and disintegrates.



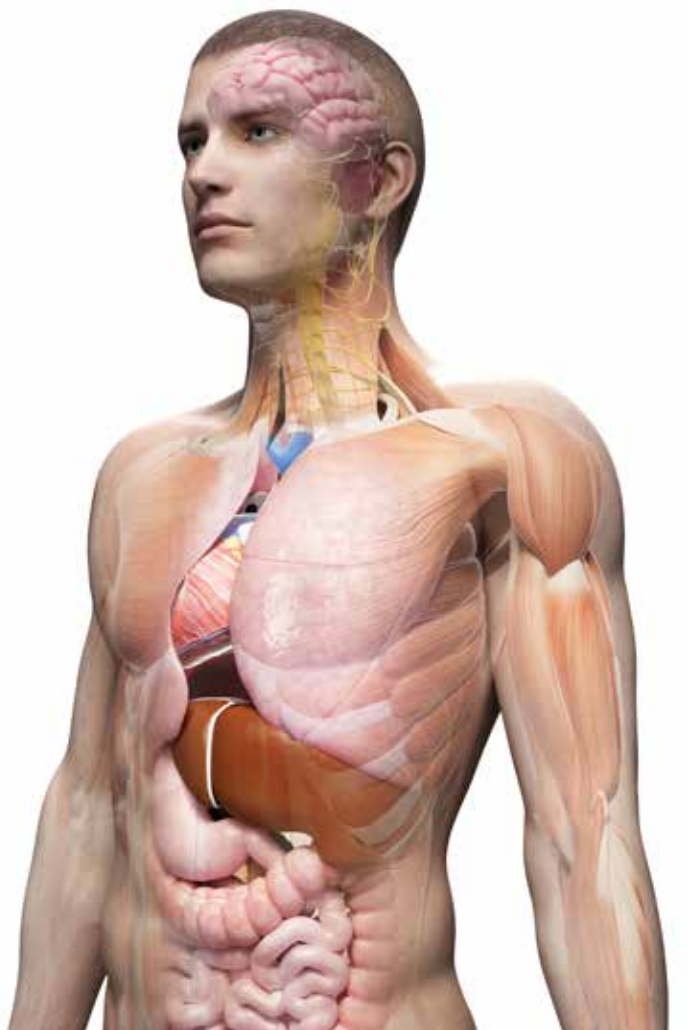
Digestive System | Urinary System | Reproductive (female) System | Endocrine (male) System | Lymphatic System

to explore the enormous complexity of the human body by breaking it down into the various organ systems.

Body System	Organs Included
Skeletal System	Bones and joints
Muscular System	Muscles
Cardiovascular System	Heart and blood vessels
Respiratory System	Upper airway (nose, pharynx, larynx), trachea, and lungs
Nervous System	Brain, spinal cord, and nerves
Digestive System	Mouth, esophagus, stomach, intestines, liver, gall bladder, and pancreas
Urinary System	Kidneys, ureters, and bladder
Reproductive System	(Male) Testes, genital ducts, and prostate (Female) Ovaries, uterus, fallopian tubes, and breasts
Integumentary System	Skin, nails, and hair
Endocrine System	Pituitary gland, hypothalamus, thyroid gland, parathyroid glands, pancreas, adrenal glands, testes (male), and ovaries (female)
Lymphatic System	Lymph nodes, lymph vessels, thymus, tonsils, and spleen

But They Are Not Really Separate

Even though we will be examining each organ system separately, they are not really separate or independent. Each one requires one or more of the others to function correctly.



For example, the bones in the skeleton cannot function without the vitamin D that is provided when the skin (integumentary system) produces vitamin D in response to sunshine. If the digestive system did not break down food to get energy, then no other system could operate. The same could be said of the circulatory system that provides oxygen to tissues and removes carbon dioxide. And, of course, the circulatory system could not deliver oxygen to the rest of the body if the respiratory system didn't bring oxygen into contact with blood pumped to the lungs by the heart. *Hormones* secreted by the endocrine system help regulate the action of the kidneys. The muscles in the legs (muscular system) compress

veins and help return blood to the heart (circulatory system). The list could go on and on.

Directions on the Map of Your Body

A very important aspect of the study of anatomy is knowing where certain things are in relation to other things. That being the case, there are special terms that anatomists use to help navigate around the body. This all begins with a reference point known as the *anatomical position*.

The anatomical position is defined as the body in an upright posture with the feet spread slightly apart. The arms are down to each side with the palms of the hands turned forward with the thumbs pointing away from the body. This is the starting point from which we describe where one part is in relation to another.

The most common terms used to describe the location or position of body parts are as follows:

Anterior and *posterior* — These describe structures at the front (anterior) or the back (posterior) of the body. If an organ is closer to the front of the body than another, it is said to be anterior to the other organ. Your belly button is anterior to your backbone.

Proximal and *distal* — These describe whether something is closer (proximal) or farther away (distal) from the middle of the body. For example, the knee is proximal to the foot, and the hand is distal to the elbow.

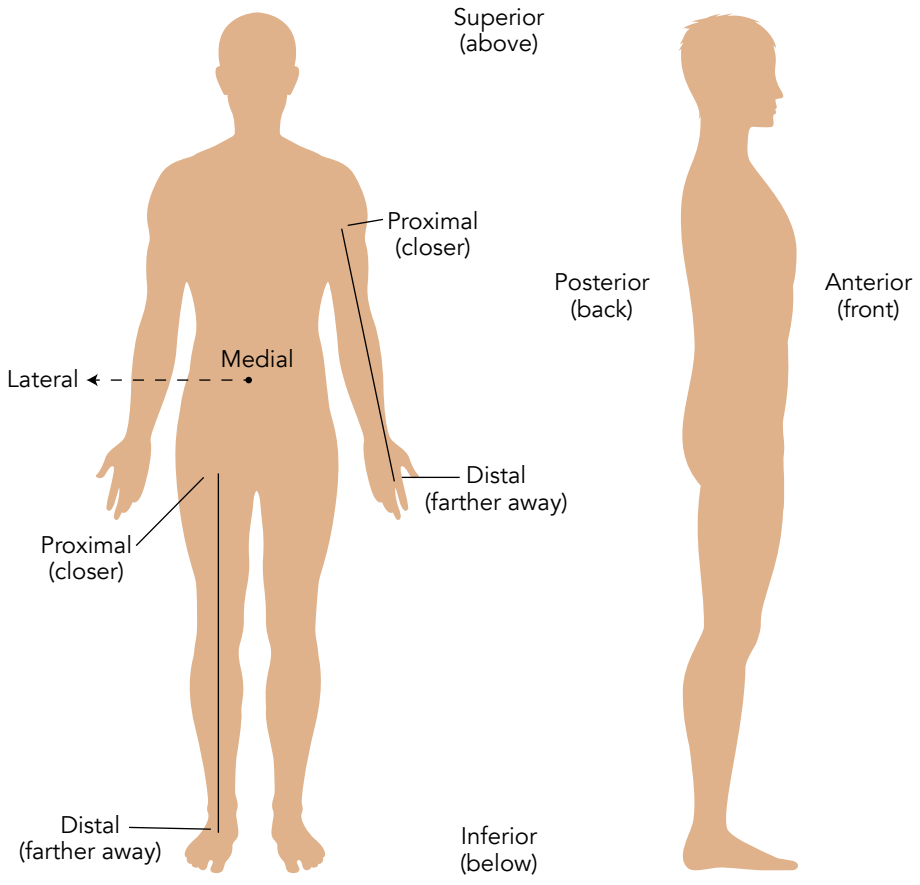
Medial and *lateral* — These describe whether something is closer (medial) or farther away (lateral) from the midline, or center line, of the body. For example, the ears are lateral to the eyes.

Superior and *inferior* — These describe whether something is above (superior) or below (inferior) something else. For example, the knee is inferior to the hip.

There are, of course, many other anatomic terms. We will occasionally be introducing these through this series.

TAKING A CLOSER LOOK

Anatomical Position



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HOMEOSTASIS

Before we proceed further there is a basic concept in physiology that you need to understand. That concept is called homeostasis. This means the body has many mechanisms to help maintain a balance or "equilibrium" among its many systems. The body functions best within certain limits. You need to have plenty of water in your body, but not too much. Body temperature can vary a little, but it normally stays not too high and not too low. The minerals in your body are very important, but it is also important that you have neither too much nor too little of them circulating in your bloodstream.

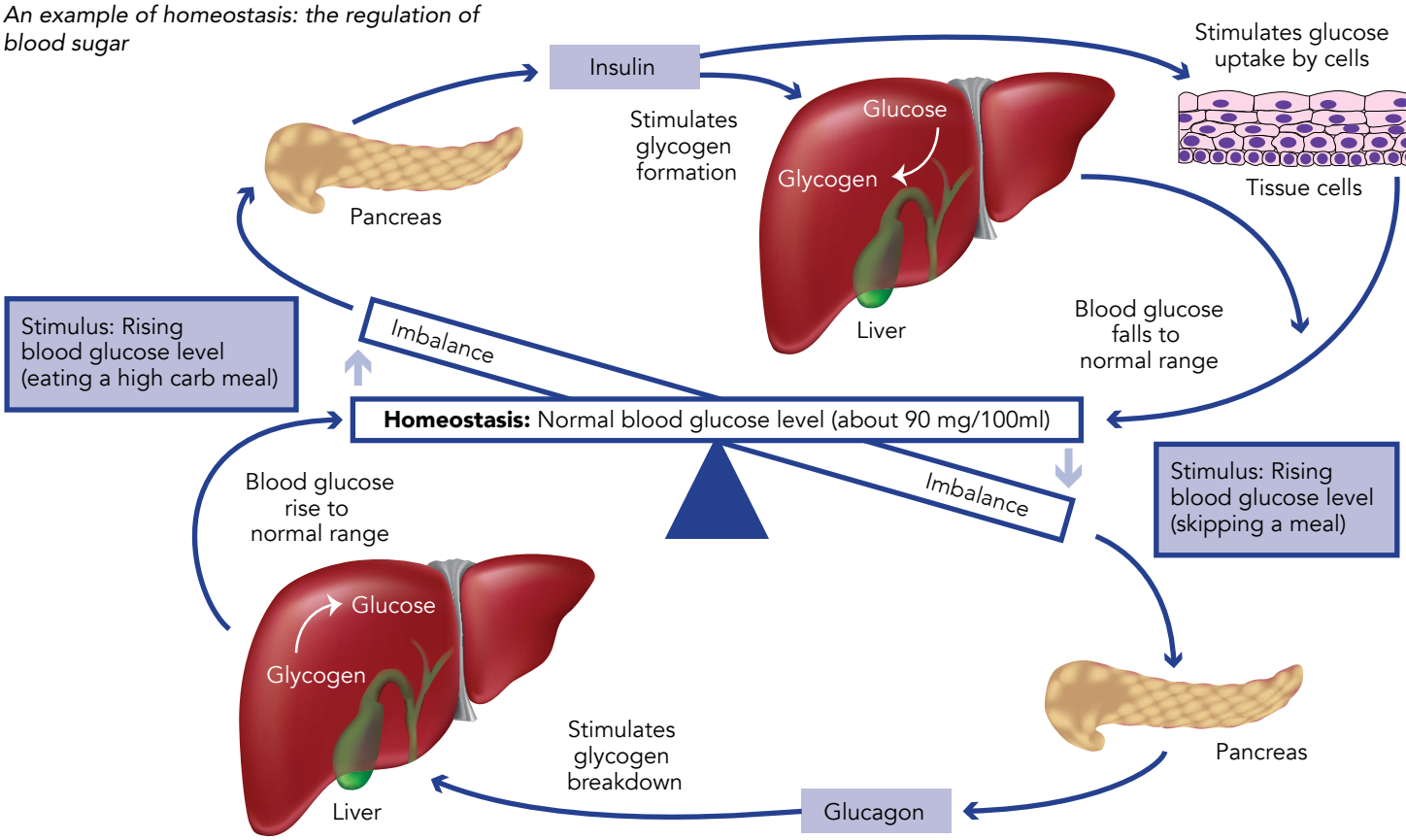
Body Temperature

Minerals

Water

Sugar (glucose)

An example of homeostasis: the regulation of blood sugar



There are trillions of cells, multiple types of tissues, and many organs and organ systems in our bodies. All try to continue functioning as they were designed. All the cells, tissues, and organs must work together to achieve this goal.

However, the internal environment of the body must be kept within strict ranges in order for these systems to operate correctly. There are many, many control systems in our bodies designed to help maintain the necessary balance.

For example, our body temperature must be kept within a very narrow range. If our body temperature gets too high or too low, cells cannot work properly. You will see that there are control systems to monitor and help maintain correct body temperature.

The amount of sugar in our blood must be kept within certain limits. You will see that multiple systems play a role in controlling our blood sugar. The same could be said about the amount of calcium or potassium in our blood, the volume of fluid in our blood vessels, or the level of acids in our body.

Even though the human body contains countless little factories in about a dozen organ systems working simultaneously day and night, drawing on resources and producing waste products like acids, carbon dioxide, and excess heat, the human body is designed to maintain homeostasis, a constant set of conditions under which all the tissues work best. We will examine many of the feedback systems that help achieve this balance, and we will also see instances of what happens when things go wrong.

Is It All an Accident?

The number of intricate relationships that exist between organ systems is truly mind-boggling. Amazingly, many people think that all these organs and systems and the manner in which they interact is merely a cosmic accident, a product of time and chance. They attribute all this to chemicals banging together over millions of years. Their view is that given enough time, anything can happen.

As we proceed, it will be apparent that the human body is not just an accident. Nothing this complex can happen by chance. Many of the body's systems cannot work unless others are already in place and working properly. This "irreducible complexity" leaves no wiggle room for the random processes of evolution. There is a design and a purpose to how the body works. We are truly "fearfully and wonderfully made." The human body is a testament to the power and majesty of our Creator God.