

# Your Body's Chemical Messengers

by Sandy Stiefer, *Current Health*, 3/1/2003

*Your body makes chemicals that tell it how to function. Find out what they are saying.*

Mr. Proctor faced the class. "Your body is a chemical factory," he stated simply.

Jane looked over at Jordan. "A chemical factory?" she whispered. "How can that be?" Jordan shrugged his shoulders.

"Without these chemicals, your body cannot function," Mr. Proctor went on.

Jane raised her hand. "Mr. Proctor? My mom uses chemicals to clean house. Dad uses them on the car. They told me chemicals are poison. How can we make chemicals in our bodies and still be healthy?"

Mr. Proctor smiled and nodded his head. "Good question, Jane. We use the word chemical to 'describe matter-stuff. Some chemicals are harmful. But many are not. Water is an example of a harmless chemical. In fact, it's one we can't live without.

"Our bodies make many a useful chemicals. These chemicals are messengers, and they tell every cell in the body what to do."

"Well, that's a relief," Jordan blurted out. "I didn't want to think I had a window-cleaner factory inside of me!"

Everyone laughed. Mr. Proctor laughed too and said, "Let's concentrate on some important chemicals our bodies make."

## What They Are

There are two basic kinds of body chemicals. Some are called hormones. The others are brain chemicals that are called neurotransmitters. Hormones and neurotransmitters are chemical messengers. But their roles aren't that simple.

Eric Chudler, Ph.D., of the University of Washington in Seattle, researches brain chemicals. He says, "Some chemicals can be both neurotransmitters and hormones. The difference is in how they are released and where they go." The brain chemicals affect the

brain in a quick, short-lived way. Hormones are slower to act, but the effect lasts longer.

## The Hormones

Most hormones are made by the glands of the endocrine system. These glands exist throughout the body.

Hormones tell the cells what to do. But they don't just boss any old cell around. Each hormone has target cells somewhere in the body. And each target cell is programmed to receive the message that the hormone carries. If it isn't programmed for that message, it won't receive it or respond. It's kind of like knocking on the front door of a house. If it's a friend's house, he or she recognizes you and opens the door. Then you can go inside. But if you knock on a stranger's door, the person answering the door won't let you in.

How do hormones get around to do their work? And how are they different from brain chemicals? Chudler says, "Hormones are released by glands and enter the blood-stream to affect distant targets."

## The Brain Chemicals

Brain chemicals also have targets. But those targets are only in the brain. They don't circulate throughout the body as the hormones do. Brain chemicals, or neurotransmitters, are made by nerve cells in the brain called neurons. Chudler says, "Neurotransmitters are released by neurons and affect other neurons across a very small space, called a synapse." A synapse is a gap between neurons. The neurotransmitter flows from one neuron, across the gap, to the next neuron. That next neuron either accepts or rejects the chemical. When the neuron accepts the neurotransmitter, think of it as a key fitting into a lock.

The chemical messengers, whether they are hormones or neurotransmitters, do two jobs. Think of them as the green light and red light on a traffic signal. When they get to a cell, they tell it to get busy and do something-green light. When that thing has been done, other chemical messengers switch on the red light. They tell the cells to stop. This way, the functions of the body do not get out of control.

# Your Body's Chemical Messengers

## The Chemical List

Here are just a few chemicals the body makes and some of their jobs.

*Serotonin* (sair-uh-TOE-nun). A brain chemical, or neurotransmitter. It is responsible for your mood. If something goes wrong with the serotonin levels in your brain, you may end up with depression.

*Dopamine* (DOPE-uh-meem). Another brain chemical. It helps to keep your body balanced, moving, and walking normally. People with Parkinson's disease, a nervous system disorder, have lower levels of dopamine than normal in their brains. They may move slowly, and their hands and bodies may shake.

*Epinephrine* (ep-uh-NEF-rin). This is also called adrenaline (uh-DREN-uh-lin). It is a hormone. But it also acts as a neurotransmitter. It's responsible for the "fight or flight" reaction. It stimulates the heart to beat faster and to raise blood pressure. And it tells the liver to release stored sugar for extra energy. Have you ever been so frightened by something that you ran away from it as fast as you could? The burst of energy that made you feel as if you were flying and that pounding heart are both caused by adrenaline.

*Insulin* (IN-suh-lin). If you have diabetes, or know someone who does, you have probably heard of insulin. It is a hormone that helps the cells in your body use glucose (a kind of sugar) that the body makes from the food you eat. If your body does not make enough of this hormone, or if your body doesn't use insulin properly, you have diabetes.

*Thyroxine* (thy-ROCKS-in). This hormone is made by the thyroid gland. It affects your growth and bone development, heartbeat, blood pressure, metabolism, and other body functions. If your thyroid makes too little thyroxine, you may feel tired all of the time. If it makes too much; your heart may beat fast; you may feel jittery; and you may lose weight.

## When Things Go Wrong

Sometimes, though, something goes wrong, and the chemicals don't work the way they should. For example, the start-stop messages may not work properly. Depression and Parkinson's disease are caused by neurotransmitter imbalances. Diabetes and

thyroid trouble are caused by problems concerning certain hormones.

Illnesses related to hormones or neurotransmitters are usually treated with medical drugs.

## What Drug Abuse Does to Your Brain

Now you know that the normal function of neurotransmitters is to help keep the body and brain running smoothly. But what happens to the brain if you abuse drugs? And why are some drugs addictive?

There are several reasons why people become addicted to drugs. One reason is that some drugs give the user a temporary "high." When they come down from a high, or "crash," they may feel depressed, anxious, and very tired. Drug abusers keep taking the drugs to avoid the "downer" that comes after the high. Their bodies also get used to the drug and require it to feel good or even just to function.

Here are some ways that drugs affect the brain:

**Alcohol:** This is a central nervous system depressant. It acts on the neurotransmitters, including dopamine, and upsets the balance needed by the brain and body to function normally.

**Cocaine:** This is a central nervous system stimulant. It is very addictive. It upsets the normal release/uptake of neurotransmitters. (Remember the green-light, red-light action of body chemicals?)

**Amphetamines:** Nervous system stimulants, they also act on the neurotransmitters. They are very addictive. When a person has abuse amphetamines for some time, he or she may have sleep problems, hallucinate (see things that aren't there), act violently, lose weight, and tremble or shake.

## Your Body's Chemical Messengers

Name \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_

---

1. Are all chemicals **harmful**? Explain why or why not.
2. What are the **two basic kinds of chemicals** that the human body makes?
3. Where are **hormones made**?
4. How do **hormones travel** around the body?
5. What do **hormones do**?
6. What is the effect of not having enough **serotonin**?
7. What does **dopamine** do?
8. What is **epinephrine**?
9. What happens if your body doesn't use **insulin** properly?
10. Which hormone affects bone growth and development, heartbeat, blood pressure, and metabolism?
11. Describe how two drugs affect the **central nervous system**.