



# Messed-Up Messages

Addiction and your brain

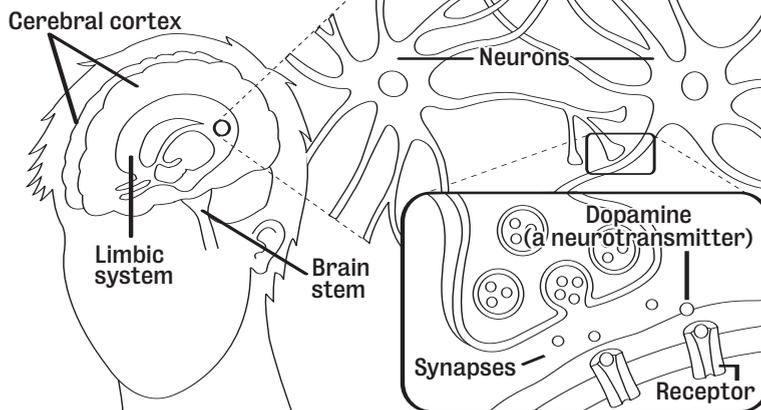
Imagine wanting something more than you long for cold drink on a hot day. Or more than you want to hang with your buddies after a big test. Now, imagine that the thing you desired was expensive, could cause bad breath, pimples, muscle shakes, and even death. Still want it? Some people do. That's how badly people addicted to drugs crave them.

To find out why, you have to look inside the human brain. Drugs change the way your brain works.

To send messages in the brain, your brain cells or **neurons** release chemicals called **neurotransmitters**. Neurons are separated by tiny gaps called **synapses**. The neurotransmitters from one neuron move across the synapse and lock into spaces called **receptors** on other neurons. This starts an electrical impulse in the receiving neuron, which then releases its own neurotransmitter. When you see a friend, recognize her face, remember her name and say, "Hello," you are responding to a series of messages delivered by neurotransmitters.

There are many different neurotransmitters in the brain. The chemical **dopamine**, for example, acts on the brain's **limbic system**. That's where feelings and emotions are processed. Normally, when you eat good food, meet a challenge, or enjoy the company of other people, you feel

## In Your Brain



**Brain cells, or neurons, send messages to other brain cells by releasing chemicals called neurotransmitters. The chemicals fit into receptors, then are released into the gap, or synapse, between neurons and reabsorbed.**

pleasure because your limbic system releases dopamine. Your brain rewards you with pleasure and creates an appetite for those things because they are necessary for life.

Many drugs of abuse invade and manipulate the limbic system, the brain's pleasure pathway. Drugs can do this because, once in the brain, they act similarly to neurotransmitters. Some drugs, such as methamphetamine, cocaine, and even nicotine to a lesser degree, may cause a flood of dopamine. The brain then creates a drive for more drug. An addicted person's drug cravings are so strong that he or she will risk serious consequences to satisfy them.

To make matters worse, drug use

causes changes in the brain. Neurons sense the dopamine flood. In response, they may shut down some dopamine receptors. Or they may produce less dopamine. Now the drug user has lower than normal levels of dopamine, which may cause depression. He or she needs drugs just to feel normal—and needs more and more to produce that dopamine flood or drug "high."

This is why addicted people want drugs, even when they know the drugs are damaging their bodies, emptying their wallets, or replacing their friends. To recover from this brain disease, they must retrain their brains. This requires hard work and often medical and mental-health treatment.

### KNOW YOUR BRAIN GLOSSARY, PART ONE

**Dopamine:** A chemical messenger or neurotransmitter released by neurons in the limbic system

**Limbic System:** The part of the human brain that creates feelings of pleasure when we eat, accomplish things, or enjoy the company of others

**Neurons:** Brain or nerve cells. There are more than 10 billion neurons in the human brain!

**Neurotransmitters:** The chemical messengers in the brain that carry messages between neurons

**Receptors:** Specialized proteins on the ends of neurons into which neurotransmitters fit

**Synapses:** The tiny gaps between neurons

*For more brain terms, see "Drugs Change Your Brain," p. 5.*