Directions: Read entire article. Answer all questions that have boxes. Find answers in the text for all highlighted subtitles.

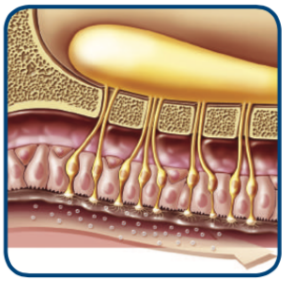
Reading 6.2 – In What Ways Do People Use Detectors?

Getting Ready

Today you used a special kind of paper to test two liquids. When the paper changed color, it meant that something had happened. The paper could be called a detector because it detected a change. List some other types of detectors that you have heard of or that you know about.

How Does Your Nose Work as a Detector?

Imagine breathing in and smelling brownies in the oven. How did you detect the odor? Now that your model represents air and odors as particles, you can use your model to help you explain how people smell odors.



As you breathe in through your nose, you force particles in the air to move through your nostrils. They go past the nasal cavity. You can see the nasal cavity in the diagram. It is the shaded part beneath the brain and behind the nose. The nasal cavity is where humans detect odors.

In the nasal cavity, odor particles match with receptors. Receptors are like the part of a lock into which a key fits. Specific odor particles fit into a specific receptor like a key fits into only a certain lock. When an odor particle matches with a receptor, a signal goes to the brain and tells it that a certain odor is in the air.

Why Do I Only Sometimes Smell Odors?

One reason why your nose may not detect every odor is because there may not be enough of the specific particles in the air. Another reason is that human noses can only detect certain types of particles. The particles of some materials match with receptors in your nose, but particles of other materials do not match any receptors. You may have guessed that odors that do not match with receptors in your nose are called odorless.

In Lesson 1, you learned that natural gas, by itself, is odorless. It is made of particles that your nose cannot detect. A material with particles your nose can detect is added to help you recognize when natural gas is in the air. The particles that make up the rotten egg

odor fit with receptors in your nasal cavity. Those receptors send a signal to your brain that you smell rotten eggs in the air.

Are There Other Odorless Materials?

Another type of odorless gas is carbon monoxide. When cars are turned on, the burning gasoline produces carbon monoxide. Furnaces in your house also make carbon monoxide. Carbon monoxide does not explode like natural gas can, but it is very dangerous in another way.

You already know that people need oxygen to live and that you get oxygen by breathing in air. Usually when you breathe in air, the blood in your body carries the oxygen particles to all areas in your body. When carbon monoxide is in the air, your blood takes the carbon monoxide particles instead of the oxygen particles. Some parts of your body will not get the oxygen they need to keep working. At first, the lack of oxygen might make you feel faint. After awhile, it can kill you. Cars come with books that tell about the dangers of carbon monoxide. The warning you see here is from one of them.

Danger in Real Life

Sometimes people forget to turn cars off in their garages, and the carbon monoxide can build up in the air and move (like odors) into the house. Other times people's furnaces do not work properly, and carbon monoxide can move through the house. Next you will read information that tells about people who were exposed to carbon monoxide because their furnaces were not working properly. As you read, think about these questions.

1. How do carbon monoxide particles travel in the air?

2. Why can't your nose detect carbon monoxide in your house?

One newspaper reported the story of a family that could have died because of carbon monoxide poisoning. The three children had flu symptoms for two days. When they continued to vomit and feel nauseated, the family went to the hospital. Doctors diagnosed the problem as carbon monoxide poisoning. Everyone in the family had to take in fresh oxygen for several hours. As you have learned, their blood was missing the oxygen that all cells of their body needed.

Some amount of carbon monoxide in the air is safe. The safe level is 39 parts per million. When investigators went to the family's home, they found a furnace that needed repair. The carbon monoxide level in the home was 180 parts per million. After the furnace had been repaired, their home was safe again. People use appliances that emit carbon monoxide all the time. As long as ventilation is good and appliances are working properly, this is not a danger. In the winter, when doors and windows are kept closed, the danger can increase.

Symptoms of carbon monoxide poisoning include headaches, shortness of breath, lightheadedness, nausea, and vomiting. As you might know, some of these are also symptoms of flu or food poisoning. There is a way to be alerted when the problem is not just bacteria or virus.

Many stores sell carbon monoxide detectors. They work like smoke alarms. The alarms let out a loud noise when they detect levels of carbon monoxide in the air that are dangerous. They are made to detect a colorless, odorless gas that people cannot detect with their eyes or their nose.

How Important Are Detectors?

It is very important for people to be able to tell when carbon monoxide is present. When a dangerous gas is odorless, then people cannot rely on their nose to warn them. People need other ways to detect odorless gases. For example, carbon monoxide can be present as coal miners dig deep underground. In the past, miners would use small birds called canaries to help them. Canaries are colorful, and they are easy to see in dark areas like mines. Canaries chirp and sing a lot. They are small and have tiny lungs, so canaries are affected by carbon monoxide much sooner than people are. The miners used the canaries as detectors. When the canaries stopped chirping, the miners knew that there was too much carbon monoxide in the air. The miners then left the mine.

Think of another way that people can detect carbon monoxide is in the air. Write your idea in the space below.

The question at the beginning of today's reading is, "In what ways do people use detectors?" Why is it important to understand particles in order to invent detectors?