READING PASSAGE

A Look inside the Lab: Safety Hoods
The Responsibility of Working in a Lab

What do you think these three scenarios demonstrate about the profession of science?

Scenario #1
In the 1950's, Dr. Maurice Hilleman, a scientist at Merck Research Laboratories in Pennsylvania, found that polio vaccines were contaminated with a virus that infects monkeys, called SV40. The contamination resulted because monkey cells were used to grow the polio virus for the vaccines. When Dr. Hilleman shared his findings, scientists were shocked and horrified. They were concerned that even though the virus did not make monkeys sick, it could cause people to get sick. Early studies suggested that SV40 virus may cause cancer. Studies ultimately found that the contaminating virus was unlikely to have increased the risk of cancer in the 100 million people who received the contaminated vaccines. But from then on, vaccine scientists worked tirelessly to make sure any future vaccines were not contaminated with other viruses. How do you think scientists could have limited the likelihood for contamination?

Scenario #2
In 1951, a 30-year-old woman, named Henrietta Lacks, died at Johns Hopkins University in Baltimore. She died from a form of cervical cancer that had spread to other parts of her body. Doctors and scientists used a sample from her biopsy to create the first successful human cell line. A cell line is a group of cells grown from a single cell, so they are genetically the same and can be used for research. The cells were named HeLa, using the first two letters of her first and last name. Since this was the first successfully grown human cell line, many scientists from around the world asked for samples from the lab at Hopkins. (Sharing of unique experimental resources, like cell lines, is common among scientists.)

Over time, many other cell lines were also developed and used in scientific labs. But, about 20 years after the HeLa cell line was established, and scientific techniques used to evaluate cell lines improved, it was realized that HeLa cells were contaminating many other cell lines being used for scientific studies. This meant that scientists may have thought they were performing experiments with cells from a non-diseased kidney, for example, when in fact, they were using the cancer cells from Henrietta Lacks' biopsy. The implications of this were huge because it brought into question the results of many experiments from many labs around the world. The scientific community worked diligently to get rid of cell lines that were contaminated, but it is expected that even today, some impure cell lines may still exist. How do you think scientists could have limited the contamination of cell lines?

Scenario #3
In 2012, a scientist working in a lab at the University of Wisconsin in Madison was doing an experiment with titanium. He was working in a fume hood and using a metal spatula to weigh out a small sample of titanium. Either a static charge or chemical contamination on the spatula caused a reaction with the titanium, resulting in a fire. The researcher quickly dropped the burning chemical container and grabbed the nearest fire extinguisher. Unfortunately, it was the

wrong kind of extinguisher. It contained water instead of the ingredients to put out a chemical fire. So, when he released the contents to put out the fire, he caused a chemical reaction between the burning chemical and the water, resulting in the release of hydrogen gas – a potentially explosive mistake! Luckily, he was using a small amount of the chemical and he quickly found the right kind of extinguisher. He put out the fire and contained the damage. Because the researcher was working in a fume hood and wearing the proper personal protective equipment (PPE), he was not injured. How do you think the fact that this scientist was working in a fume hood helped this situation?

In each of these three scenarios, harm was done even though none was intended. As with almost any career, scientific research comes with great responsibility. In these cases, the harm was, or could have been, to people not involved in the science. It is for this reason that scientists must always consider their responsibility for keeping themselves and others safe when conducting research — even students working in classroom labs. The lab equipment featured in this lesson is safety hoods. As described in the accompanying video, at least three different types of hoods can be found in labs and their purposes differ:

- **Laminar flow hoods** protect samples from getting contaminated. As both scenario #1 and #2 showed, contamination of samples can have far reaching consequences. In scenario #1, the cells were contaminated before the scientists worked with them. But if scientists are not careful when they grow a virus in cells, they can introduce other viral, bacterial, or fungal contaminants. In scenario #2, the contaminant was not a virus, but another cell line. While scientists take many steps to keep samples pure, working in biological cabinets is critical for limiting the potential for contaminants to be introduced.
- **Anaerobic chambers** are designed for working with bacteria and viruses that survive without oxygen, such as those that live in our intestines. Although not related to any of the described scenarios, scientists who study this type of pathogen must find responsible and creative ways to establish an environment in which their pathogen of interest survives. Otherwise, they may end up doing experiments that do not work or which evaluate the wrong agent.
- **Chemical fume hoods** are designed to protect the scientists and those around them as described in scenario #3. The fire in the University of Wisconsin lab could have been much worse had the scientist been working outside of the hood, especially when the hydrogen gas was released.

Every day, millions of scientists throughout the world conduct their work safely. It is with the help of a vast array of equipment and knowledge that these scientists keep themselves, those around them, and everyone throughout the world safe. It is a responsibility that each takes extremely seriously. As described in Hilleman: A Perilous Quest to Save the World's Children, when Dr. Hilleman found that SV40 was contaminating polio vaccines, there was only one thing to do — stop making them, even if that meant his company would lose a lot of money. Safety was always his top priority.