

THE HEALING POWER OF CHEMISTRY

October 15-21 | 2023 | #NationalChemistryWeek



An Educational Hands-On Demonstration Program
for Groups of 25 Students in Grades 2-6

Prepared by the

National Chemistry Week Planning Committee

of the

American Chemical Society

Cleveland Section

for

National Chemistry Week 2023

Called

The Healing Power of Chemistry

Overview

Note: After Sept. 23, 2023, please see our Cleveland Section web site (p. 3) for an Errata sheet.

Did you realize that chemistry plays many roles with the functioning of our bodies? In the vast majority of times chemistry is beneficial toward keeping our bodies healthy, but there are some instances in which chemistry plays a darker role. In this Program we explore the wide range of the effects of chemistry in our bodies.

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Acknowledgments

The National Chemistry Week (NCW) program of the Cleveland Section of the American Chemical Society (ACS) began in 1994 with an idea to put together a scripted program that could be performed at any local school or library. It is a fun and educational program designed to interest students in grades 2-6 in chemistry and science. This idea has expanded to become the centerpiece of the Cleveland Section's NCW activities. On numerous occasions it has received national recognition from the American Chemical Society, including several ChemLuminary Awards the last of which was in 2012. In 2023 the Cleveland Section's volunteers will perform at least 10 demonstrations at libraries, schools, and other public sites involving up to 250 students.

Our NCW efforts reach many students each year because of various sponsors who have donated money, materials and/or services to the Cleveland Section specifically for National Chemistry Week. We would like to especially thank our partners at the Cuyahoga County Public Library (CCPL) for creating and distributing flyers, registering students, and providing the facilities for this program. We further extend our sincere thanks to John Carroll University for hosting GAK Day (Grand Assembly of Kits Day) and to our Cleveland ACS Section for its financial support.

Last and most importantly, we thank all the volunteers who have donated their time and expertise. This library/school program and other NCW events are the result of the hard work of many dedicated and talented volunteers. It all starts with our local section NCW Planning Committee. The Committee recommends, tests, and reviews activities & experiments, writes this script including a story line intended to hold the attention of children; collects supplies and materials; prepares the kits; recruits sponsors and volunteers; contacts libraries and schools; and schedules demonstrations. Committee members include Katie Arendt, Genevieve Crane, Helen Mayer, Shermila Singham, Susan Wang, Bob Williams, Shaowei Yang and Bob Fowler. Additional credit and thanks are given to the many GAK (Grand Assembly of Kits) Day volunteers including professors and students from Baldwin Wallace, Case Western Reserve, Cleveland State and John Carroll universities who gave up a Saturday in September to help count, measure and assemble all of the necessary materials for our demonstration kits. A final thank you goes out to the dozens of dedicated chemistry professionals and scientists who lead the presentations and activities in schools, libraries, and other public locations. Without them there would be no Cleveland Section NCW program.

Background for the Demonstrator (only)

This year the NCW theme is the *Healing Power of Chemistry*. Note: text in *Italics* is FYI and to be discovered by the students.

Introduction for the Students

Story Line You *might consider reading this page and the next to the students.*

Milli and Avogadro are on a mission. There's been a rash of medical problems in their families lately: Avogadro received a painful sunburn while on a hike with Milli, and his mom got a serious infection resulting from a cut on one of her hands. Milli's grandfather has developed something called a gallstone which is causing him pain and discomfort, especially when he eats his favorite food fried chicken. So Milli and Avogadro decided to consult with their friend Dr. Genevieve Crane at the Cleveland Clinic to find out what was causing these problems and how to heal them. Dr. Crane is a Specialist called a pathologist—a type of doctor who interprets laboratory tests and with whom other doctors often consult to help figure out what is making their patients sick and the best way to help them. Milli and Avogadro learned from Dr. Crane that chemistry has a big role in keeping their bodies functioning normally and in healing their bodies. She gave them tips about using good nutrition and chemistry to help keep their bodies free from these sorts of problems and how some of the body's chemistry works.

Dr. Crane went on to explain that all living beings are made up of cells like the one shown in their packet of diagrams at their (*copy below*). (*Tell the students to pick up that packet and look at the Cell Diagram*). Some living beings like bacteria are made up of only one cell and others have many cells. The average adult human body has around 37.2 trillion cells. Each cell is surrounded by a membrane, which in some ways, as we will see, is similar to a bubble. The membrane regulates what nutrients the cell takes in and out and helps it communicate with the environment. As part of the body's defense, its immune system, some cells can interact with (and eat!) microorganisms such as bacteria to help keep the body safe. These cells are called macrophages.

We'll learn more today about how chemistry affects and heals our bodies as we go through our Program.

- First, we'll see how we can protect our delicate skin cells from damage by sunburns and how soap works to keep our bodies clean.
- Then we'll go inside our bodies to learn about how crystals can sometimes form and cause problems. Crystals can form in many parts of the body. Gallstones are crystals that form in our gallbladder from a chemical called bile that normally aids in digestion. Kidney stones are crystals that form from materials that the body is trying to excrete. A disease called gout is from crystals that form in our joints. The crystals in gout are so tiny that they have to be seen using a microscope, while the crystals in gallstones and kidney stones are big enough to get stuck.

- Next, we'll see an example of how that chemical called bile (that can cause gallstones and pain) can also be very helpful by aiding in nutrition by breaking down fats so they can pass through cells membranes.
- Then we'll learn a little bit more about how cell membranes work and behave a little like bubbles.
- Finally, we'll learn how cells add things to the membrane so that it is better able to do what the body needs—we'll see how we can change how bubbles work with a few simple additions as well! We will also learn how the membrane can bend and reform, which helps cells divide and make new cells when needed to heal. It also makes it possible for cells to engulf invaders like bacteria that may be in a wound. Finally, at the end of the Program,

So let's go for a wild ride down Healthy Lane that will help us better understand what Milli and Avogadro learned from Dr. Crane and how chemistry can help keep us healthy.

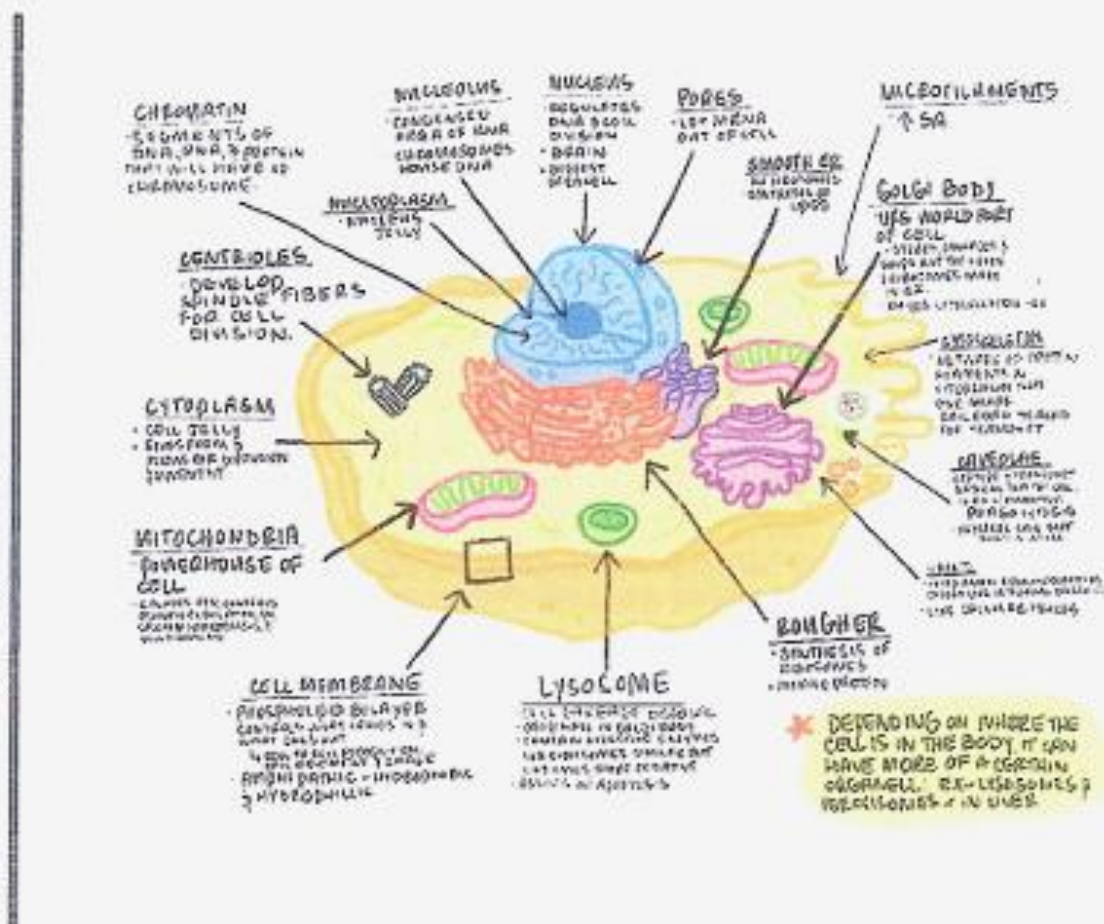


Figure 1. A typical human cell.

Demonstrator: the twin themes of surfactants (soap, bile and phospholipids) and membranes run throughout the Program. You might want to mention them from time to time and show how they tie the elements of this year's NCW Program together.