

# The MYSTERY CLUB



brought to you by *Captain Overalls*, the Safety Crusader

## CAPTAIN SEZ

Follow the directions to find Captain Overalls' secret message.

Write the word "poison."

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Change the P to K.

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Put the last 2 letters before the S.

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Change the N to LL.

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Omit the O's.

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What does Captain say?

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## CHEMICALS: THE GOOD, THE BAD, AND THE DEADLY

### A world of chemicals

Many people think all chemicals are harmful, but everything in this world is made up of chemical elements. The air we breathe is hydrogen and oxygen. We put sodium chloride (salt) on our pretzels. And our bodies contain hundreds of combinations of chemical elements.

Scientists have developed new combinations of chemical elements that interact with other chemicals in our environment. These chemical products have many uses, especially in agriculture. Consider, for example, one of the most common chemical elements on Earth, nitrogen.

Nitrogen is one of the building blocks to make amino acids that are found in the cells of every plant and animal. When added to soil, nitrogen stimulates plant growth and can greatly increase crop production, especially corn. However, very little of the nitrogen that is naturally in the world's atmosphere is in a form that can be used by plants.

In the early 1800s, two German scientists developed a process to make nitrogen from natural gas. The United States improved and expanded the use of that technology during World War II to make nitrogen for ammunition and explosives. After the war, farmers began to use nitrogen to fertilize agricultural crops.

But too much nitrogen fertilizer applied to crops, lawns, and golf courses can get into our water. The nitrogen causes small water

plants, or algae, to bloom and crowd out other plants and organisms. Nitrogen also gets into the atmosphere by burning fossil fuels such as coal, gas, and oil for transportation, heating, and manufacturing. Nitrogen is found in animal and human wastes, too.

To protect the environment, many farmers now test their soil to make sure they're using the right amount of nitrogen fertilizer for their crops. They also are working on other ways to add nutrients, such as rotating between crops that need lots of nitrogen (corn) and crops that have bacteria on their roots to capture nitrogen (soybean and alfalfa).

### The dark side

Nitrogen is just one chemical used in farm operations. Other chemicals are used to manage pests, keep animals healthy, help seeds germinate, and disinfect an area from disease. These chemicals often are very toxic or poisonous, especially if they are in concentrated form.

Some of the most deadly chemicals are those produced as a result of an agricultural activity. Engines produce CO (carbon monoxide gas). Manure pits produce a lethal gas, hydrogen sulfide. Silos can produce several types of poisonous gases.

Chemicals truly can be good, bad and downright deadly. The mystery is understanding which chemicals are dangerous and how to avoid them.

IOWA STATE UNIVERSITY  
University Extension

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## 1 2 3 4 5 6 7 8 9 BY THE NUMBERS

500	Number of poison control centers in the United States.
One-half	Types of pond scum that are toxic.
Millions	Number of people unintentionally poisoned every year.
7,800	Number of gallons of groundwater that can be contaminated by an ounce of some pesticides.

## Farm chemicals: More than pesticides

When people talk about dangerous substances on the farm, they often focus on pesticides. Pesticides are a broad range of chemicals used to manage specific pests on the farm from insects (insecticides), weeds (herbicides), and fungi (fungicides) to rats and rodents (rodenticides). Pesticides also can leave traces (or residue) on protective gloves, goggles, boots, and overalls that are worn while mixing or applying pesticides.

People who use pesticides in agriculture need special education and training. Pesticides are so powerful that the federal government has strict rules about what can be sold, how it is labeled, and who can sell them. People who apply certain types of pesticides must have a license. Pesticide applicators are required to wear protective gear and may need to post signs in fields or areas where pesticides have been used. Empty pesticide containers also must be disposed of safely.

Nitrogen crop fertilizers also are dangerous. The most common yet most hazardous fertilizer is anhydrous ammonia. Anhydrous ammonia is applied as a liquid or gas and is kept in tanks at a very high pressure. It can cause severe burns and blindness, even in a few seconds. Other types of fertilizer that come in solid or pellet form can be toxic.

In addition to fertilizers and pesticides, here are other substances on the farm that are dangerous for kids:

- all types of fuel such as liquid propane, gasoline, kerosene, and diesel;
- seed that has been treated with fungicide or insecticide;
- poisonous plants and berries;
- medicines, antibiotics, and livestock feed with additives;
- disinfectants (especially dairy pipeline cleaner) and other cleaning products such as soap and bleaches;
- paints and related products.

Ideally, all pesticides and harmful chemicals need to be kept in a locked storage shed. Adults are reminded to always use these substances in a safe way, keeping the products in their original container and in areas where they cannot leak, freeze, or be opened by livestock, pets, rodents, or insects.

### What you can do

It's an adult's job to use chemicals responsibly and keep them away from kids. It's a kid's job to stay away from chemicals – even when adults fail to do their job.



The sting or bite of some flying insects, spiders, fire ants, and snakes is poisonous. The sting or bite pumps venom into the body, much like a doctor's shot, except that a bite damages not heals the body.

Stinging insects include bees, wasps, yellow jackets, and hornets. Although wasps, yellow jackets, and hornets look nasty, bees are far more dangerous. Bee stings contain more venom than the other insects and bees are more likely to sting. A person is 42 times more likely to die from a bee sting than a poisonous snake bite. Usually bee stings only cause death if the person is stung repeatedly in a short time, or the person is allergic to the venom.

Two poisonous spiders live in the United States – the black widow, identified by a red hourglass on its abdomen, and the brown recluse, which has a "violin" on its back. Both types of poisonous spiders are reluctant to bite, and the amount of venom in each bite varies. However, the venom produced by these spiders is very powerful and can be deadly.

Snakes are the most famous poisonous creatures. About 7,000 to 10,000 people are bitten every year by poisonous snakes, but only 12 to 15 people die from the bite. Most poisonous snake bites in the United States are from rattlesnakes, copperheads, and water moccasins (also known as cotton mouth). They are found in every state except Alaska and Hawaii. Poisonous snakes usually only bite when they are handled or stepped on. But once a person is bitten, it is a true medical emergency.



1. Fainting or feeling dizzy
2. Skin rash or sores
3. A purple tongue (just kidding – that is from blueberry snowcones)
4. Itching, either in one spot or all over your body
5. Bumps or swelling on your skin
6. Tossing your cookies (not the chocolate chip kind)
7. A stubborn or sudden headache
8. Green slime in your nose – NOT!
9. Coughing, gasping, or having a hard time getting your breath
10. Tears or watery eyes (and you are not sad)

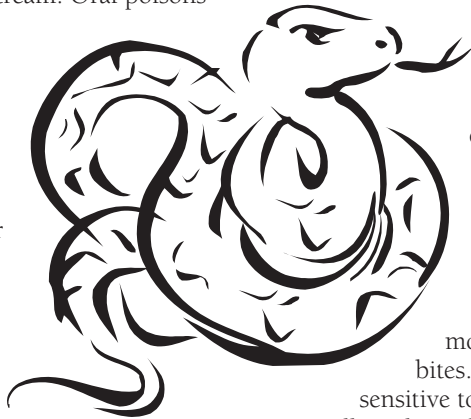
*\* Always tell an adult if you or someone around you shows any sign of poisoning.*

# Wacky Science



All poisons stink, look yucky, and are something you swallow – WRONG! The fact is, poisons are tricky to spot and enter the body in different ways. Here is one way scientists classify poisons.

- **Oral.** These poisons enter the body by being eaten or swallowed. Some oral poisons dissolve or burn skin tissue, while others are a problem only after they get to the stomach and the rest of the body through the bloodstream. Oral poisons include pesticides, some medicines, vitamins, and plants. With many oral poisons, a few drops can be fatal. Adults have died after drinking water they mistakenly poured into an empty cup that had been used for drain cleaner.



- **Dermal.** These poisons enter the body through the skin. They may injure the skin, tissue under the skin, and get into the bloodstream and cause other damage. Many oral poisons also are dermal poisons. For example, anhydrous ammonia, a common crop fertilizer, burns the skin, eye, and lungs within a few seconds. Some plants contain dermal poison and are very common, such as poison ivy. Other dermal poisons can be found on equipment and protective clothing used around pesticides. Touching these hoses, gloves, boots, and overalls is considered an exposure to the chemical.

- **Inhalant.** These poisons enter the body through the mouth or nose when a breath is taken. Inhalant poisons often do not seem dangerous. Many do not smell bad, and some have no odor or color. Carbon monoxide—the exhaust from engines—is poisonous, especially in indoor areas. Manure pits often contain poisonous gases. Breathing this air makes people faint and fall into the pit. Unfortunately, some people expose themselves to other types of inhalant poisons because they like how they feel when sniffing or smelling them. They may not realize that the poison could leave lasting damage, especially to their brain and nervous system, or could be fatal.

- **Injection.** These poisons enter the body most often through stings and bites. Some people are very sensitive to bee stings, which causes swelling throughout the body and airways (and death by suffocation in serious cases). Most snake and spider bites are not poisonous but a few are, and they tend to be very toxic, often fatal.

## The bottom line

Scientists are just beginning to understand all the types of poisons and how they can hurt us. But one thing is for sure about poisons: They are not something to mess with!

**What is H<sub>2</sub>O?** *Water.*  
**What is H<sub>2</sub>O<sub>4</sub>?** *Drinking.*

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**Cheers** – to the brother and sister who do not go inside the fence that is around the manure lagoon.



**Jeers** – to the 10-year-old girl who ate a handful of green berries she found on a bush.



**Cheers** – to the farmer who ordered the right amount of herbicide so he would not have leftovers to store.



**Jeers** – to the farmer who tosses an empty pesticide container in the garage.

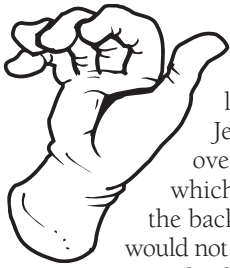


**Cheers** – to the 12-year-old boy who stayed out of the field where pesticide signs were posted.



**Jeers** – to the cousin who poked the beehive with a stick.

# The **Mystery** of the "One Rubber Glove"



Chelsea was determined to fix her little brother's bicycle. Jeremiah had ridden over a piece of twine, which was twisted around the back wheel. The wheel would not turn and now Jeremiah was mad! Chelsea headed to the workshop to find the snippers.

She looked in the drawer with the garden tools. Not there. She looked on the shelf next to the bird seed. Not there. On the bench Chelsea spotted something green—almost the same color as the snippers. It was a glove.

"What is that doing there?" Chelsea wondered. "I will help and put it away," she thought as she reached for the glove. Then she stopped. There was only one glove and it was rubber, not cloth. Chelsea knew this was not an ordinary garden glove. It was the kind her mother wore when she sprayed tomatoes. She went straight to the house and told her mom what she had seen.

"Thanks for finding my glove," Chelsea's mother said. "It's a good thing you did not touch it. I wore the gloves this morning and probably dropped that glove before I rinsed it. I will take care of that right away."

## Your Challenge:

What danger did Chelsea avoid by not picking up the rubber glove?

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What did she do instead?

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What other places on your farm might have chemicals that you should stay away from?

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## Word Code



Can you help Captain Overalls decode the Magic code words?

Fill in the blanks with the words or phrases that can be poisons. Write the letters above each number on the blanks at the bottom to read the magic code.

6	_____
4	_____3
1	_____
5	_____
2	_____
7	_____
8	_____

- FERTILIZERS
- PESTICIDE
- SPRAYED VEGETATION
- TREATED SEED
- UNKNOWN CONTAINER

Magic code:

1	2	7	4	5	6	7	4	3	7	8	3
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Lou, Sally, and Lee from the Mystery Club each heard about a recent poisoning. They were surprised that each poisoning was caused in a different way and that each victim had a different reaction. Using the chart below, can you find out what poisoning story each kid heard? (No one heard the same story.)

HINT: When you put a \* in a box, put a "0" in the other boxes in that column and row.

1. Neither Lou nor Lee heard about someone inhaling poisonous gas.
2. Lou heard about someone getting stung by a bee.
3. The bee sting did not cause anyone to faint.
4. One of the stories was about someone with a burned mouth after drinking from a cup that had been used for pesticides.

Who?	What poison was involved?			What was the reaction?		
	Inhaled gas	Stung by a bee	Drank pesticide residue	Burned mouth	Problems breathing	Fainted
Lou						
Sally						
Lee						

ANSWERS: Lou heard about someone having breathing problems after being stung by a bee. Sally heard about someone who fainted after inhaling gas from a manure pit. Lee heard about someone with a burned mouth after drinking from a cup that had been used for pesticides.