

A CORN THRILLER

Cornberry
Award
Winner

The Mystery of Corn

MYSTERY #1

COULD IT BE CORN?

You finally have a day off from school, practice and work, so you and some friends are going to hang out. On your way to pick up everyone, you notice you need to fill up with fuel. After fueling and picking up your friends, you stop to grab some burgers and fries. Then you all go to a baseball game with a fireworks finale. After you drop off your friends and get home, (by curfew...good job!) you shower and go to bed. As your head hits the pillow, you are completely unaware that most of the food and fun you experienced contained corn to some degree. You may be shocked to read this, but the shock will only grow as you learn what is made from corn.

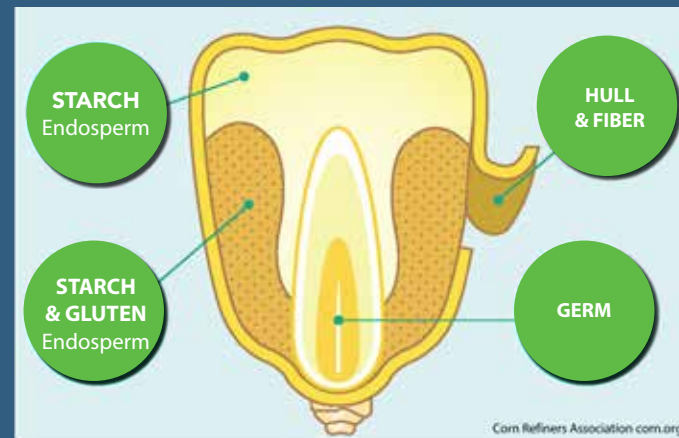
Sam was sitting in the kitchen with his friend Jess, sharing some corn chips and salsa. Suddenly, Sam had a strange feeling.

"I know it sounds weird, but I feel like I'm surrounded by . . . corn," Sam said. "You know I love corn—corn chips, corn flakes, cornbread. But I keep thinking there is . . . more corn . . . all around me."

Jess laughed, thinking of the thousands of uses of corn that she had learned about on a field trip.

"I don't think the corn is stalking you, but your soft drink *is* sweetened with corn. And it goes way beyond that," she said. "Corn plays a part in breads, meats, toothpaste and even the supplies used to build your home. You'd have a tough time finding many things that don't involve corn in some way."

Scan this QR code see the Corn Uses Poster to learn more.



PRODUCTS FROM KERNEL PARTS

STARCH

Corn Syrup
Syrups, candies
Shoe polishes

Corn Sugar

Infant formula
Caramel coloring

Edible starch

Corn starch
Jellies, candies

Dextrin

Food sauces
Glue, fireworks

Industrial starch

Laundry starch
Paper, cosmetics

ENDOSPERM

Gluten
Cattle feed
Corn meal cereals

HULL & FIBER

Bran
Cattle feed

GERM

Crude corn oil
Soap, glycerin

Plastic resin

Bio-plastics
Erasers

Refined corn oil

Salad oils
Cooking oils

One thing that had brought Sam and Jess together as friends was their shared love for science. They often talked about their future STEM careers.

"So, have you ever thought about a career with corn?" Jess asked. "My aunt is a chemist and manages a lab at an ethanol plant."

"Wait, you think I need *more* corn in my life?" Sam laughed and grabbed another handful of corn chips.

He often worked on cars with his dad, and knew ethanol was a high performance fuel that was cleaner than regular gas. But how was it connected to corn? After Jess showed him a list of ethanol careers, they decided to investigate.

Ethanol Careers

Plant Engineer
Process Technician
Plant Technician
Production Manager

Plant Manager
Shipping & Receiving Clerk
Grain Merchandiser
Lab Technician

Careers in Ethanol?

You can easily find a career working with corn because of its many uses. **Ethanol** is an additive to gasoline, and nearly all gasoline in the U.S. contains 10 percent ethanol. Many stations now offer 15 percent ethanol fuel, approved for most vehicles. Higher ethanol blended fuels containing up to 85 percent ethanol can be used in **flex fuel** vehicles that have minor modifications to operate with the higher-octane fuel. Ethanol is a **renewable**, lower carbon, cleaner fuel that is better for air quality.

The production of fuel ethanol involves breaking down the starch present in corn into simple sugars, like glucose, and feeding these sugars to yeast for **fermentation**. The process results in the production of ethanol as well as livestock feed, corn oil, and carbon dioxide.

Ethanol production uses only the starch, which is about 70 percent of the corn kernel. The remaining nutrients: protein, fat, minerals, and vitamins, are concentrated into distillers grains, which is used as feed for livestock. Some ethanol plants also remove the corn oil which has many uses and now is being used to create renewable diesel fuel. About 35% of the United States' corn crop is used to produce ethanol and its coproducts.

Corn is valued for ethanol production because of its large volume starch. Starch can be easily processed to break down into simple sugars, and then fed to yeast to produce ethanol. Modern ethanol plants can produce approximately three gallons of fuel ethanol for every bushel of corn.



Corn Use Comprehensions

Follow the QR code above to the Corn Uses poster. What uses of corn surprised you the most? Why?

How many corn-based products can you find on the front page of this reader?

Read on to learn... What is a bioplastic? ... What is the corn product used as fuel for cars?

Corn On Your Plate (and *in* your plate?)

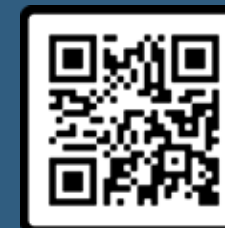
There are many types of corn. The kind of corn you eat off the cob is sweet corn, which is just one percent of the U.S. corn crop. Most of the corn we grow, and most corn-based products, are made from dent corn. Take a look at the dinner plate.



ETHANOL INFO

How Is Ethanol Made?

Follow this QR Code to watch the ethanol production process from start to finish.



Go on a journey to learn more about ethanol!



CORN SCIENCE INVESTIGATION

Renewable Corn-Based Bioplastics

Let's focus on **PLA**, or polylactic acid plastic. PLA is a plastic produced by the fermentation of a renewable carbohydrate source like corn starch, and then polymerization into PLA. One example of the use of PLA plastic is in 3D printing. Two of the most common plastics for printing are PLA, a corn-based plastic, and ABS, a petroleum-based plastic. Another use is for disposable single use plastic items like plastic forks, spoons, and shopping bags.

Corn-based plastics have many of the same characteristics and uses as petroleum-based plastics. However, PLA is made from corn starch, making it biodegradable and renewable. The renewable and biodegradable properties of corn plastic make it a **bioplastic**. Bioplastics can also be derived from agricultural waste and help reduce carbon emissions.

See the process from start to finish in this video provided by BioenterpriseCanada.



TO THE LAB

Have you used a plastic fork recently at your favorite fast food restaurant? Unlike corn-based plastics, petroleum-based plastics are **nonrenewable** and are not biodegradable. According to the U.S. Environmental Protection Agency (EPA), landfills receive over 25 million tons of plastic in a year. Some cities and states are concerned about the pollution caused by plastics and are taking action. For example, the state of Colorado plans to ban single use plastic bags and plastic foam takeout food containers by 2024.

Corn-based PLA bioplastics are:

- Food safe and resistant to food fats and oils
- Products with low flammability
- Products with a high aroma barrier
- Resistant to ultraviolet rays
- Compostable



Your teacher will introduce you to an activity in which you will create biodegradable corn-based plastic. After looking at the complete process from mixtures and molds to the final product and presentation, your team will make conclusions about corn plastics and the potential impact on the environment.



The Mystery of Corn reader series is provided by:

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