



UNIT 10: AGRICULTURAL TECHNOLOGY

DNA... It's What's for Dinner!

Grade level: Upper elementary

Student Learning Objectives

After completing this lesson, students will be able to:

1. Define DNA.
2. Isolate DNA from strawberries.

Time: 50 minutes

Tools, Equipment, and Supplies: Writing surface, copies of Activity Sheet 30:1 and Activity Sheet 30:2.

General lab supplies as outlined in Activity Sheet 30:2.

DNA isolation materials:

Extra mild shampoo, salt, rubbing alcohol, measuring cups, blender, clear plastic cups, coffee filters, frozen or fresh strawberries, ice, water, wooden stick

Key Term(s): DNA Biotechnology

Background Information

The agricultural industry has begun to rely more and more on biotechnology and scientific research to develop new crops and products that are immune to pests and disease. Advancements in biotechnology start with the understanding of DNA. DNA serves as a blueprint for life in every living organism. The ability to isolate the DNA in agricultural products has allowed researchers to modify the genetic makeup of crops and animals to create new disaster-resistant strains.

Interest Approach

Use a Descartes e-Moment® to introduce the lesson. Pose the following questions one at a time to focus learners' thinking. Answers will come fast and furious. Be sure to capture answers on a writing surface.

What do you know about DNA?

Use clarifying statements, such as "Are you sure?" and "How do you know that?"



NOTES

What do you think you know about DNA, but are not sure?

Explain that you are asking for things you think you know about DNA, but you just aren't sure.

What don't you know about DNA?—Or what would you like to know about DNA?

Explain that it is OK to not know. Explain that this is the reason we are having this important lesson. Summarize the responses that you captured on the writing surface, being sure to compliment students on their active participation.

Now that we have identified some of the things we know, some of the things we think we know, and some of the things we don't know/would like to know about DNA, we are going to ponder one more very important question. The important question is, "Where is DNA?" As we try to find the answer to this very important question, let's listen carefully to a story about Cob and a girl named Maria.

OBJECTIVE 1: Define DNA.

Read Activity Sheet 30:1 titled "Your Friend, DNA?" to students. Photocopy the sheet for older students so that they can follow along while you read.

Cob didn't realize that DNA was present in many agricultural products. Let's see if we can list some agricultural products that contain DNA. Let's try to make our lists without looking back at the story.

Ask students to name the agricultural products that Cob learned contain DNA. Write their responses on the writing surface.

Cob learned lots of things about DNA from Maggie. What about you? With your own paper and pencil, write down as many things as you can think of that contain DNA.

After one minute, begin calling on different students and asking them to share their lists. Ask them to explain why they believe it contains DNA, if it is not clear.

Great! We have come up with some really good examples of where we can find DNA.

OBJECTIVE 2: Isolate DNA from strawberries.



NOTES

Maggie explained to Cob that strawberries have DNA in them. Let's do our best to find the DNA in the strawberries that are in the front of the classroom. In order for us to locate the DNA we must be very attentive learners. We must carefully follow directions in order to discover the DNA inside of these strawberries.

Use a Go Get It e-Moment® to have the students collect all the needed materials to isolate the DNA in the strawberries. Prior to the arrival of students, place all materials and equipment into groups, in the front of the room, for the students to collect the materials.

In the front of the room are supplies each group will need to isolate the DNA from the strawberries. On the count of three, each group will select a team leader. 1...2...3... Select the leader. If you are a group leader please raise your hand.

Group leaders, when I say GO GET IT, come to the front of the room and gather the materials for your group. What questions are there? GO GET IT!

Allow time for the group leaders to collect all the materials that will be needed to conduct the experiment.

Pass out Activity Sheet 30:2 to all the students. Go over the sheet and begin the lab by giving step-by-step directions throughout the lab.

REVIEW / SUMMARY

Wow, I see a lot of DNA! Congratulations on successfully separating the DNA from the strawberries.

Use the Me You Us e-Moment® to have the students answer the following questions:

REFLECTIVE REVIEW QUESTIONS:

- Where is DNA found?
- What does DNA look like?
- What does DNA control?

Capture the student's answers on the board and review the information with the students.

[illegible]

APPLICATION 1: Try using the DNA isolation process for other fruits and vegetables such as kiwi, bananas, or onions.



ACTIVITY SHEET 30:1

Your Friend, DNA

NOTES

Cob was relaxing in the back yard, stretched out in the warm, cozy light of a sunbeam. He'd just finished a late-afternoon snack, which of course was very nutritious! His friend, Maria, walked out onto the back porch and looked down at her friend and wondered aloud, "Where did he learn so much about agriculture? I wonder what makes Cob, Cob?"

"Always thinking about agriculture," thought Cob. "There must be more to life than this, but I hope not." Soon, Cob was drifting off for an afternoon nap.

"Hi, there! I'm here to explain to you what makes YOU, YOU!" said Maggie, who was an owl that perched in the tree above Cob's hammock.

"Whaaaaaat??? I must be dreaming. A talking owl, that's crazy."

"Crazy or not, this is your dream, and I'm going to tell you about DNA," said Maggie pulling on her scholarly looking glasses.

Maggie proceeded, "You see Cob, Maria was wondering why you think about agriculture all the time, but you can't help it! It's in your DNA. You see, your DNA is a nucleic acid inside your body that contains instructions about you, about what you look like and how you behave. Your DNA tells everything about you."

"I've always liked DNA," dreamed Cob.

"Basically, your DNA is a building block of life that contains all the information that living things need to function correctly. There is DNA in you, in me, even in a strawberry!" exclaimed Maggie, pulling a basket of plump red strawberries out of mid-air. In fact, there's DNA in all living things. "Do you know why a strawberry is red and has little seeds all over it? It's in its DNA! Do you know why corn, such as yourself, is yellow and grows in little rows around your cob? It's DNA. Something in the DNA tells the strawberry to be red and corn to be yellow. It's what they call genetic information."

"Wow!" thought Cob. "Wait right here, while I go and get Maria. She will be so excited to speak with you too!"

"I am sorry," said Maggie. "But I will quietly sneak off as soon as you open your eyes. That's what's in my DNA!"



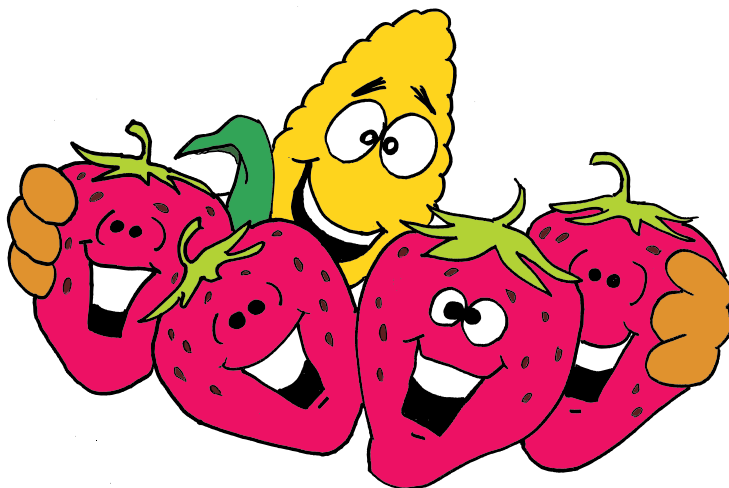
ACTIVITY SHEET 30:2

Isolation of DNA from Strawberries

NOTES

Materials Needed:

Extra mild shampoo
Salt
Rubbing alcohol
Measuring cups
Blender
Clear plastic cups
Coffee filters
Frozen or fresh strawberries
Ice water
Wooden stick



Directions:

1. Collect all materials.
2. Place a cup of strawberries, a pinch of salt, and 1 cup of ice cold water in the blender.
3. Blend on high for 15 seconds.
4. Pour the blended strawberries into a coffee filter over a plastic cup.
5. Add two tablespoons of the shampoo into the filtered strawberries.
6. Swirl to mix the ingredients and let the mixture sit for 5-10 minutes.
7. Pour the mixture into another plastic cup, about 1/3 full.
8. Add a pinch of salt to the cup.
9. Gently stir the mixture.
10. Tilt the plastic cup and slowly pour the rubbing alcohol down the side of the cup. Pour until you have about the same amount of alcohol in the cup as the strawberry mixture. This will allow the alcohol to form a layer on top of the mixture.
11. Use a wooden stick to gently pull the DNA up into the alcohol layer.
12. You will know that you have DNA if you are able to see a whitish film start to form around the end of the wooden stick.