Antioxidants and Free Radicals

A math and science lesson with a nutrition component

with the help of the Super Crew® and the
California Raisin Marketing Board

Developed in in Partnership with the California Raisin Marketing Board (www.LoveYourRaisins.com)
and SuperKids Nutrition Inc (www.superkidsnutrition.com)

The Super Crew® know that eating a wide variety of colorful healthy foods helps grow a healthy body!

"We each have a favorite color food that fuels our super powers! What's your favorite healthy food? Learn about antioxidants with us so you can be super healthy too!" - the Super Crew

Meet the Super Crew® - We love every color of healthy food!

Kira can camouflage with nature and levitate. "I like brown foods like cinnamon, walnuts, kidney beans and whole grains!"

Abigail has X-ray vision, super-smarts and can fly. "I like every color food, but blue foods, like blueberries and blue corn are my favorite!

Penny moves at super speed. "**Purple** and **black foods**, like raisins, black beans and purple potatoes are the best ever!"

Carlos can create clouds and stink bombs. "Healthy white and beige foods, like garlic and Cannellini beans are topnotch for me!"

Marcus can heal and produce heat. "I love yellow foods, like star fruit, spaghetti squash and pineapple."

Jessie can change the form of objects. "**Green foods** rock! Avocado, green grapes and home made kale chips are foods I eat whenever I can!"

Baby Tom-Tom can move and shape water. "**Red foods** like watermelon and beets taste the greatest! My favorite drink is H_2O!"

Andy is super strong. "**Orange foods** like mango, pumpkin and sweet potato give me energy and keep me fueled right!"

PART 1

"What is an antioxidant?"

-Penny

What is an antioxidant? with Super Crew kid, Penny

- Antioxidants are like "superheroes" who fight off "bad guys" (free radicals) that try to make you sick.
- If you cut an apple, it will turn brown very quickly. This happens because oxygen in the air causes a quick oxidation reaction. While oxidation is a normal part of cells' life and does not affect the properties of an apple, a lot of oxidation can create havoc in our bodies.

- Lemon juice can prevent apple slices from browning because lemons contain the antioxidants vitamin C. In our bodies, antioxidants from foods can also help stop harmful oxidation reactions and fix damage caused by free radicals.
- Vitamin C, E, beta-carotene, and selenium are some of the antioxidants that clean up the damage from free radicals in our body.

-Penny

Free Radicals Explained by Super Crew kid, Jessie?

- Our bodies are made up of tiny atoms. Atoms have electrons on the outside. Electrons are only happy when they are in pairs.
- When you lose one electron in a pair, the atom becomes a **"free radical"**. A free radical looks for another atom to steal an electron from to get a pair again. So now another free radical is born, and the cycle continues. When this cycle is happening, our body is being damaged.
- This damage by free radicals can occur all over our body affecting our:
  - Gums, hair, skin
  - Immunity (ability to protect yourself from getting sick)
  - Energy level
  - Ability to protect ourselves from diseases

What is an oxidation? with Super Crew kid, Jessie

- We all need **oxygen** to live, breathe, and think. However, oxygen can sometimes interact with the body, and causes **oxidation**. Oxidation can make **free radicals**.
- Since we are always using oxygen, free radicals are constantly being made. While free radicals can sometimes be helpful, such as killing germs that enter our bodies, they can also be very dangerous.
- Free radicals can cause a lot of stress and damage to our **cells** and **DNA**. They can also be caused by rays of light, x-rays, smoking, pollution, chemicals found in water, and making too many bad food choices.
- By eating healthy foods and foods full of antioxidants, you can help repair damage by a bad environment.

What is oxidation? with Super Crew kid, Jessie

- Unlike other components of the cell, antioxidants do not become free radicals after they give up electrons. This is because other antioxidants share their electrons with each another. When they share electrons, your body can be kept healthy.
- Eating a well-balanced diet can help make sure that we can have all kinds of antioxidants to work together and slow down oxidation. As you will soon learn, we can keep free radicals from doing damage by providing them electrons from the foods we eat.

Did you know your body makes antioxidants? But it is not enough! Be sure to eat a variety of foods to get more.

How antioxidants work! with Super Crew kid, Marcus

First, an atom needs electrons in pairs to be happy. When it loses one electron from a pair, it becomes a "free radical".

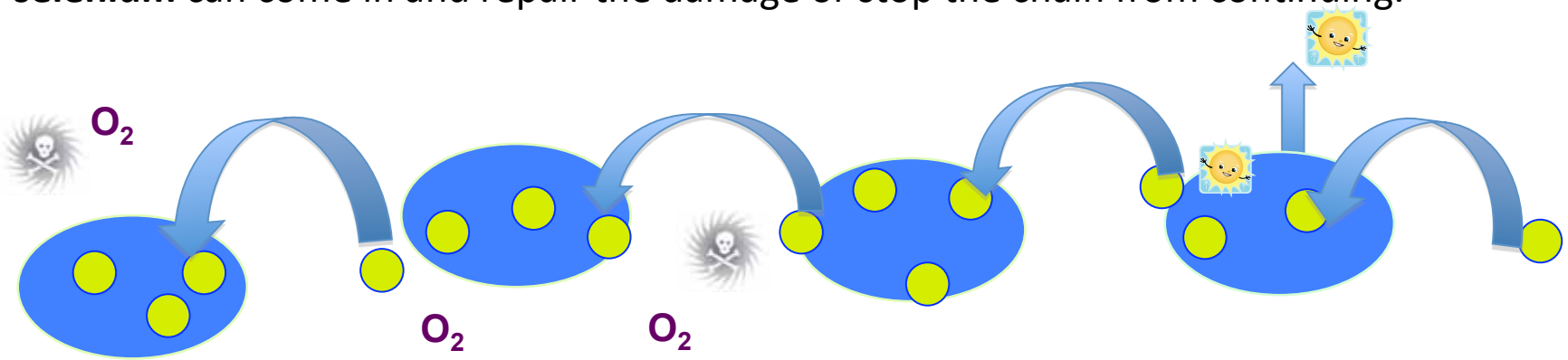
Second, trying to achieve stability so they "feel balanced," free radicals steal electrons from cells within the body, creating a "hole" or cell damage.

Third, cells continue to steal electrons from other cells, creating damage by the domino effect. If enough damage occurs, a person becomes sick.

Lastly, to save the day, antioxidants can give electrons to free radicals to make them happy and stable again.

Antioxidants
Electron
Atom
Bad environment
O_2 Oxygen

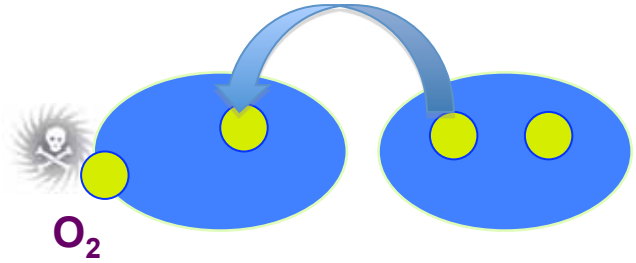
Antioxidants, from foods like **raisins** or foods with **Vitamin C**, **beta carotene** or **selenium** can come in and repair the damage or stop the chain from continuing.



Electrons Habits? with Super Crew kid, Super Baby Abigail

-Abigail

- Electrons like to use a buddy system.
- They always want another electron partner to travel with and they are happiest this way.
- They get "upset" when they lose that partner, and try to find another one.
- They try to steal other electron partners.



What stops the domino effect? with Super Crew kid, Kira

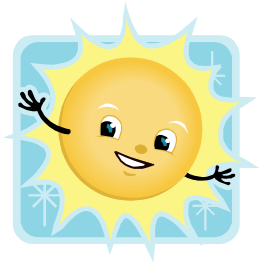
-Kira

- If cells continue to steal electrons from other cells, it's like a domino effect. The first damaged domino makes the next domino fall and so forth and so on.
- But, if you **eat foods high in antioxidants** the "dominos will not fall over," and you can repair the damage in your body or stop the "domino chain" from continuing.

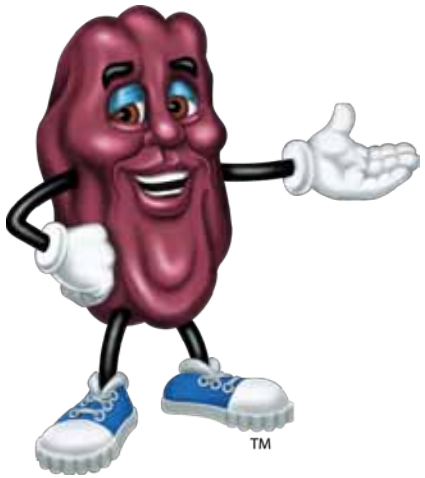
"What will **stop** the destructive chain of dominos from falling?"

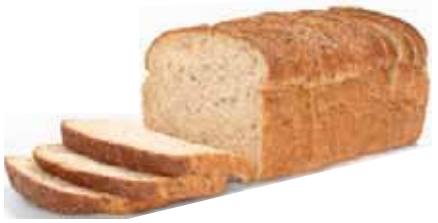
-Kira

Antioxidants!
They like to Share!



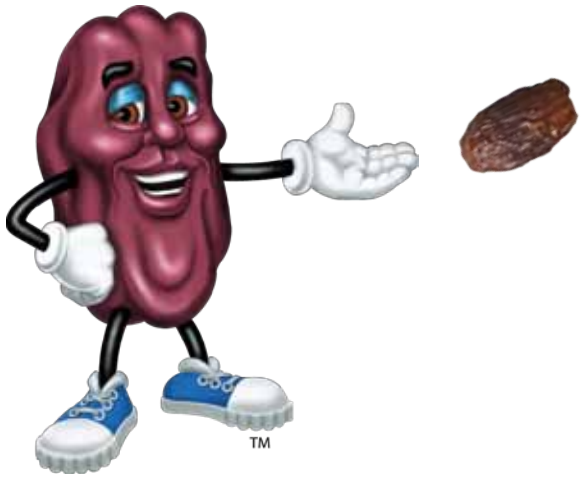
Which food groups (or foods) have antioxidants?





The Antioxidant breakdown with California Raisin

- An antioxidant gives away electrons happily.
- So foods with antioxidants can stop the body from making more and more free radicals.
- This will make all the atoms happy again, and the body happy again!



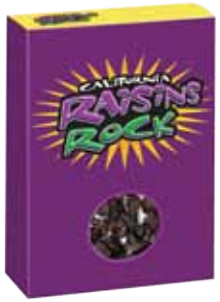
A fruit can supply the antioxidant

Did you know raisins are sun dried grapes?

Atom/Free radical –Antioxidant Classroom Activity

Materials needed: 4 chairs, 1 "free radical" sign, 8 small boxes of California raisins, one large box with smaller boxes of California raisins inside.

1. Place 4 chairs in front of the classroom, and select 4 students to sit in the chairs.
2. Give each student 2 boxes of raisins (representing electrons), one in each hand as they all stay in their seats. These students represent 4 atoms.
3. Then the teacher takes 1 box of raisins out of a student's hand, and gives the student the "free radical" sign.
4. The "free radical" gets up from his/her seat to take a box from another student (of his/her choice), and gives that student the "free radical" sign.
5. The new "free radicals" continue to take a box of raisins from someone else and sits in their seat.
6. The cycle continues until a student "antioxidant" comes in (at the teacher's cue), with a large box of raisins, to give the "free radical" the missing box of raisins and take away the sign, so the "free radical" can once again be a **"happy atom".**



PART 2

"What is ORAC – Oxygen Radical Absorbance Capacity?"

-Andy

"How do we know which foods hit a home-run in antioxidants?"

-Carlos

- One way we can tell is by its ORAC - Oxygen Radical Absorbance Capacity. This **measures** the **power** of the antioxidant.
- The higher the ORAC, the more antioxidants you will get!

Oxygen Radical Absorbance Capacity Chart with the Super Crew

Which food?	How Much?	ORAC (µmol TE/100g)
	100g	2103
	100g	1058
	100g	3406
	100g	795
	100g	870
	100g	475
	100g	2589
	100g	4669

What's ORAC –Oxygen Radical Absorbance Capacity

- What is ORAC?
  - Oxygen Radical Absorbance Capacity (ORAC) measures how much antioxidant activity there is in a food in Trolox equivalents.
- How is ORAC Measured?
  - Trolox equivalent is a **unit of measurement** for antioxidants. The higher the ORAC value in Trolox equivalents, the higher or more powerful the antioxidant activity of a food.

"What are some example of units of measurements?"

-Andy

What are some example of units of measurements?

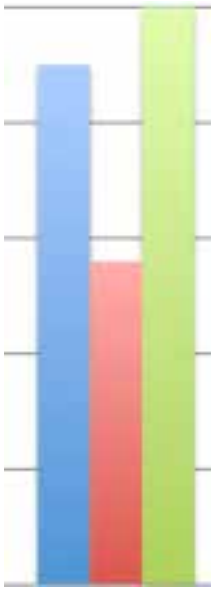
What do you use to measure?

In ancient times, people used parts of their body such as finger or forearm to measure length. For example, a unit of measurement "foot" was based on the length of a foot of an adult male.

-Jessie

What's ORAC –Oxygen Radical Absorbance Capacity Chart

Do you know what kind of graph would best represent the ORAC Capacity Chart in the past slide?



"A bar graph!"

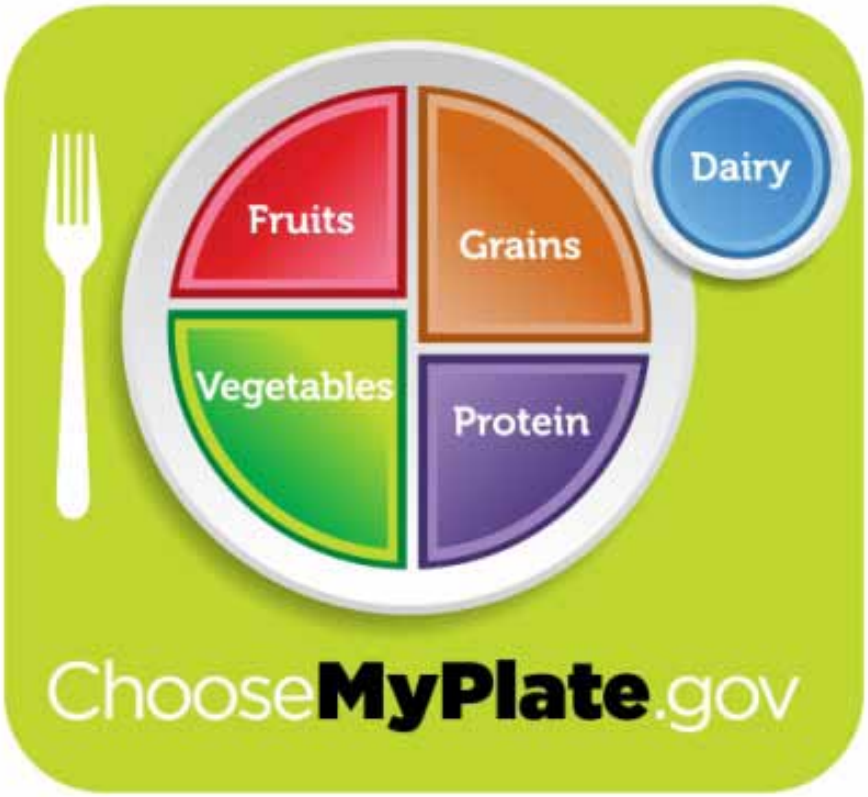
-Jessie

Now let's chart a bar graph together. Get your graph paper ready.

What's the best ways to get antioxidants in our body…

- Real foods, for example fresh, frozen, or dried fruit are better than processed foods like a fruit roll-up or foods "made with fruit."
- Berries, raisins, fruits, leafy vegetables, beans, whole grains, nuts, seeds, spices and herbs are good sources of antioxidants!
- These foods help you feel, think, move and be your best!

Guess which food groups on MyPlate contain antioxidants?



"Do foods highest in antioxidants make up most of MyPlate?"

-Kira

How are you going to eat more antioxidants?

Start

Stop

Keep

Let's set some health goals together!

-Andy