

Purpose

In this lesson, students will learn how saliva can be a mirror to your health. Students will learn about saliva and how it is used in different types of health testing to understand the overall health of a person.

Online Activities Link

Saliva Tests

Exhibit Link

Saliva: A Remarkable Fluid

The Saliva exhibit investigates how saliva is used in various health tests. Since it is more patient/health professional friendly than traditional blood testing, researchers are looking into how saliva can be used in more health tests in the future. The current saliva tests help indicate clues about a person's oral and overall health.

Background

Our saliva is a good source of DNA because it contains many mouth and cheek cells. There are many different ways to get saliva for DNA testing. Saliva can be found on a phone after a conversation, on licked envelopes, toothbrushes, and anything else that may come in daily contact with your saliva and/or mouth.

There are many reasons why scientists use DNA to conduct research. It allows them to locate specific genes that cause diseases and learn how our body works and functions based on our genetic makeup. Gene therapy is a new technique used to replace "bad" genes with "good" genes to find cures for inherited diseases. Additionally, DNA research is looking for ways to improve our oral and overall health.

In addition to DNA testing, saliva can be used for various health tests as well. Saliva tests can tell if a person has HIV, has used illegal drugs, is prone to cavities, and many other clues into a person's overall health.

Changes in your saliva can help indicate temporary illnesses or more serious conditions. Soon health care professionals will be able to tell as much about your health from saliva as they can from blood. Saliva testing is less painful and more patient/health professional friendly than traditional blood testing.

Key Point

Saliva is a mirror to your health and can be tested to find clues to a person's overall health.

Materials

Saliva Test Module
Saliva and Your Health Worksheet
Saliva Testing Worksheet
Exhibit Text Sheet

Procedure

1. Discuss with students what they know about saliva (what it is made of, what it is used for, how much you produce, etc.).
2. Have students work in small groups to look up information about saliva using the Saliva Exhibit Text Sheet. Allow them to collect information on the Saliva and Your Health Worksheet.
3. Once they have finished researching about saliva, ask them how saliva would be beneficial to health testing (easier to get a sample, less messy than blood, less painful, etc.)
4. As a class, complete the Saliva Test Module found on the YSI website (**INSERT LINK**). As the class goes through the tests, talk about the benefits of health testing and how saliva plays an important role in these tests.
5. Have students work in their small groups to complete the Saliva and Your Health Worksheet by looking at the Saliva Exhibit Text Sheet to see how many tests can be performed with saliva.
6. Gather the class back together to talk about their findings. List the various tests that can be performed using saliva.
7. Have students think about health testing and come up with ways that saliva could be beneficial for future types of testing. Have each group brainstorm their ideas and then write a proposal for a new type of testing using saliva. Have them complete the Saliva Testing Worksheet to write their proposal.
8. Allow students time to research their ideas and then report back to the class.

Questions

1. What is your saliva made of?
2. What is saliva used for?
3. How much saliva do you produce?
4. How can saliva help in health testing?
5. What other illnesses could saliva help detect?

Name _____ Date _____

Saliva and Your Health

Directions: Using the text from the Saliva section of the Your Spitting Image Exhibit, answer the questions below.

1. How much saliva do you produce every day? _____
2. What makes up saliva? _____
3. What is your saliva used for? _____

Write three facts about saliva:

1. _____
2. _____
3. _____

What health tests can be performed using saliva?

How is saliva beneficial to health testing? Why might it be a better choice than blood?

How is your saliva a mirror to your health?

Name _____ Date _____

Saliva Testing

Directions: As a group, develop a new way saliva can be used to test for an illness. Research how testing for the illness is currently conducted and what the benefits of using saliva might be.

Illness: _____

How is this illness tested for currently?

How may saliva be beneficial in testing for this illness?

Are there any negatives in using saliva to test for this illness?

How do you think using saliva would change how health testing is performed around the world?

Saliva: A Remarkable Fluid

Take an interactive odyssey through your mouth to discover that oft-ignored, but oh-so-essential liquid that protects your teeth, aids in digestion and improves your sense of taste.

- Saliva is made in your mouth 24 hours a day, every day.
- Saliva is produced by a series of major and minor glands located throughout your mouth.
- The average person creates approximately 600mL of saliva daily, enough to fill a vending machine soft-drink bottle (20oz.).
- Teeth would decay much more quickly without the remarkable 1% of saliva that contains enzymes and proteins.
- Tasting sweet, salty, bitter and sour foods would be much more difficult without saliva.
- The mere mention of food is enough to increase the flow of saliva.
- Children produce almost as much saliva as adults.
- The pH of saliva is between 6.0 and 7.0, making it slightly acidic.

Saliva: A Mouthwatering Recipe for Health

Like the individual elements in your favorite recipe, your saliva contains essential ingredients for your health and wellness. From a sprinkle of proteins that protect your immunity, to a dash of buffers that restore the pH balance on your teeth, every ingredient is crucial. Just add water (99 parts) and bake at 98.6 degrees, 24 hours a day, and you'll always be ready with your own recipe for health.

Supporting Immunity

- **Proteins**
 - **Antibodies** – Immunoglobulin proteins responsible for the body's immunity. Saliva contains secretory Immunoglobulin A (IgA).
 - **Enzymes** - Reusable proteins that speed up or slow down chemical reactions/
 - **Lysozyme** – An enzyme found in saliva, sweat and tears that destroys the cell walls of certain bacteria.
 - **Cytokines** – Any group of immunoregulatory proteins that are secreted by cells of the immune system that help regulate immune response.
 - **“Slippy”** – SLPI, secretory leukocyte protease inhibitor – prevents HIV from binding to cells and helps heal wounds.
 - **Lactoferrin** – A minor protein that has anti-viral, anti-bacterial, anti-cancer and other immune enhance effects.
 - **Histatin** – A protein that has anti-bacterial properties.
 - Others neutralize viruses.

Protecting Teeth

- **Buffers** – Substances that counter the addition of acid or base to a solution in order to maintain a neutral pH.
- **Proteins**

- **Mucins (glycoproteins)** – Long sticky proteins covered in carbohydrates that give saliva its stinginess allowing it to coat the teeth and gums. They also stick to the bacteria that cause cavities and gum disease, hindering their ability to clump together, helping our immune system to attack them.
- Others enable saliva to be super saturated with calcium and phosphorous ions.
- **Minerals** – Naturally occurring inorganic substances.

Supporting Overall Health

- **Electrolytes** – Salts of acids and bases whose ions are capable of conducting an electric current in solution.
- **Enzyme Inhibitors** – Prevent enzymes from affecting chemical reactions.
- **Proteins**
 - **Enzymes** – Reusable proteins that speed up or slow down chemical reactions.
 - **Peroxidase** – A group of enzymes that remove hydrogen peroxide from the cell by turning it into water.
 - **Growth Factors** – Proteins that stimulate cell differentiation, division and growth.

Saliva: Mirror to Your Health

As a mirror reveals your unique traits, your saliva mirrors your health. Changes in your saliva can help indicate temporary illnesses or more serious conditions. Soon health care professionals will be able to tell as much about your health from saliva as they can from blood. This less painful, more patient and health professional friendly testing option is within spitting distance!

What can saliva be used for?

- Fertility testing
- Nutritional deficiencies in the elderly
- Monitoring prescribed drug use for treatment compliance
- Detecting illegal drug use
- Monitoring alcohol intoxication levels
- Identifying local and systemic diseases such as Alzheimer's and Sjögren's syndrome
- Monitoring chronic diseases
- Diagnosing infections – influenza, measles, mumps, rubella, herpes, hepatitis A, B, and C, HIV, and others
- Testing a person's susceptibility to getting cavities
- Assessing contamination from lead and other poisons
- Determining the genetic make-up of an individual (genotyping)
- Other genetic tests including forensic testing
- Testing for an increased concentration of the protein that could indicate breast cancer

How Dry is Dry?

- Your whole mouth feels like it is sticking together as you stand before a crowd, preparing to give a speech.
- Your lips get chapped and your tongue gets inflamed as your body adjusts to a new medication.
- You spend every day sipping water, sucking sugar-free lozenges, chewing sugar-free gum and waiting for a cure that has yet to be discovered.

In every case, you have a form of dry mouth.

Major Causes of Chronic Dry Mouth

- Medications – especially anti-depressants and diuretic blood pressure medications
- Systemic diseases – especially Sjögren's syndrome
- Radiation therapy (X-rays) to treat mouth, neck and head cancers

Problems Resulting from Dry Mouth

- Increased number of cavities
- Inflamed tongue
- Fissured tongue
- Oral yeast infections
- Difficulty speaking
- Difficulty eating
- Difficulty swallowing

Treatments

- Over-the-Counter
 - Artificial salivas
 - Mouth sprays
 - Mouth washes
 - Moisturizing gels
 - Swabs
 - Sugar-free lozenges
 - Sugar-free chewing gums
- Prescription
 - Pilocarpine hydrochloride
 - Cevimeline

Sjögren's Syndrome

Sjögren's syndrome is, one of the most prevalent autoimmune disorders, in which the body's immune system mistakenly attacks its own moisture-producing glands. One condition of the syndrome is chronic dry mouth.

- Symptoms vary widely from mild inconveniences to debilitating conditions affecting quality of life
- Strikes approximately 4 million Americans
- 9 of 10 are women
- Average age of onset: late 40s but can occur at any age