



Experiment

The students check what happens to their saliva when they eat a sour jelly.

Saliva consists of water (99%) and mineral salts, mucin (which is responsible for foaming, viscosity and spinnability), and lysozyme (which kills bacteria), as well as bacteria and food particles.

The main function of saliva is to wet and agglutinate food, which then facilitates crumbling, swallowing and forming a globular bite of it, which makes the very process of swallowing easier. Apart from that, saliva is a source of some digestive enzymes, including amylase in the first place. It is an enzyme that begins the process of digestion of sugars right in the mouth. Among other things, it is the presence of that enzyme in our saliva that is the reason why we all have a sweet tooth. It is simple: sugars contained in candies are being digested right away in the mouth, which makes the food we are eating seem even sweeter to us.



Experiment

The students check how much saliva humans secrete.

How much saliva does a human secrete?

On average, the basic secretion of saliva amounts to 0.33–0.5 cc/min., but it can increase to 1.5–2.3 cc/min. after a strong stimulation (such as smell, taste, or the food being eaten). During sleep, the speed of saliva secretion drops below 0.25 ml/min., but it can reach as high as 10 cl/min. when we are talking or chewing. Under the influence of the speed of saliva secretion, its composition changes as well. A human typically secretes about 50 fl oz of saliva per day.



Experiment

The students look at the photos of selected animals and wonder what they can possibly use their saliva for.

Secretion and composition of saliva vary between particular species of animals. The differences in question are also related to age, sex and health of the animals.

Marine animals do not have salivary glands because their food is already hydrated enough.

Properties and functions of saliva in various animals – description for the slides

Ruminants (slide 2) are herbivores that first swallow roughly chewed feed, only to chew the cud afterwards, when the animals are not grazing. The feed the animal has eaten goes to one of the four compartments of its stomach, called the rumen, which is located before the stomach proper. The feed is being broken down in the rumen by bacteria and protozoa and, from time to time, it is regurgitated back to the mouth cavity, where it is being chewed on again. After the preliminary digestion, the feed goes back to another compartment of the stomach, where it undergoes the digestion proper. The salivary glands are located in the mouth. They produce two types of saliva:

1. watery saliva, the task of which is to wet and dissolve dry feed;
2. mucoid saliva (rich in mucoproteid), which helps to form bites of feed and acts as a sliding agent for the feed during swallowing.

Another task of saliva is to cleanse and protect the mouth cavity against drying, as well as to wet the tongue, so as to prevent it from sticking to the palate.

Glossy swiftlet (slide 3-4) is a variety of the swift species, which can be found in South-East Asia. These birds build their nests using their saliva and algae. The Chinese believe those nests contain a lot of minerals since they are washed by seawater, and such nests are considered a delicacy in China – a very expensive delicacy in fact, as one kilogram of dried nests can cost as much as 10,000 US dollars. They are used for many culinary purposes, including soups.

https://www.youtube.com/watch?v=wj5_p4oY1jI

Llamas (slide 5) are mammals that live in South America: Peru, Bolivia, and Argentina. Their distinctive feature is a peculiar defense behavior: they spit on their opponents with their saliva mixed with gastric contents and gastric juice.

Mosquitoes (slide 6) are insects that can be found from the Arctic to the intertropical belt. After piercing through the skin using its mouthpart, the mosquito injects a droplet of its saliva underneath, which is to prevent the blood of the host from clotting while the mosquito is feeding itself. The saliva of mosquitoes contains several dozen proteins, some of which have been identified as allergens. It is those allergens that cause a release of histamine and an allergic reaction in our bodies, which results in the occurrence of a blister, redness, and bothersome itching.

<https://www.youtube.com/watch?v=CjHm2zKiTs0>

Leeches (slide 7) are found all over the world except Antarctica; in the majority of cases, they are aquatic animals. Their saliva contains hirudin (a protein that prevents blood from clotting), which is used in non-conventional medicine to bleed the patients (get rid of their “bad” blood). Owing to the presence of hirudin, leeches are able to “feed for the future” – the blood ingested into their digestive tracts does not clot. That is why it is enough for medicinal leeches to attack their hosts only twice a year.

Vipers (slide 8) can be found almost all over the world. They produce venom which is dangerous to humans. In most cases, they flee their attackers – but they can attack when they feel embattled. Before that, however, they usually make a loud hiss – their bites are relatively infrequent incidents.

<https://www.youtube.com/watch?v=4CQKLiWQCIs>

Bees (slide 9) are insects found almost all over the world (except Antarctica and the Arctic). The saliva of bees allows them to convert the syrup secreted by plants from nectar into honey – this is because an important component of their saliva is invertase which breaks down sucrose (saccharose) into simple sugars. Moreover, bees collect pollen from flowers and mix it with a tiny amount of honey, nectar of

saliva to form small pellets – pollen loads, which are then transferred to the beehive inside special small baskets located on their hind legs. Pollen in the form of pollen loads is called bee pollen. The pollen brought into the beehive is used to satisfy current feeding needs of the bees. Apart from that, bees also stockpile pollen for the fall/winter season.

<https://www.youtube.com/watch?v=YZXcksB-lks>

Spiders (slide 10) – some spiders use their saliva to produce gossamer, which is then used to build spiderwebs. Their saliva solidifies in contact with air. Gossamer is flexible, does not dissolve in water, and is several dozen times thinner than a human hair. It can increase its length by 40% without tearing apart. It is marked by high mechanical strength, which is the highest among all natural fibers. In the majority of spiders, the distinctive feature of their gossamer is its overall strength which is twice as high as it would have been if it was made of steel of the same cross-section.

<https://www.youtube.com/watch?v=Y8v6LDOYOs8>

Silkworms (slide 11) – when building their cocoons, silkworm larvae start producing a semiliquid substance in their spinnerets, which solidifies and hardens in contact with air. By moving their heads in various directions (the spinneret is located at the bottom of the larva's head), they spin the thread around them, thus creating a cocoon. After about 400 thousand head movements, the cocoon is ready and it looks like a shiny, white egg.

One cocoon is made of a single silk thread which is about one mile long.

<https://youtu.be/77ktNSPFbwQ>



Experiment

The students examine how viper venom works.

Each cell that builds the organisms of animals, including humans, is composed of proteins. Under the action of acids, bases and alcohol as well as poisons (in this case, it is "viper venom"), the proteins are subjected to the process of denaturation (destruction of their spatial structure as well as their biological, physical and chemical properties). One of the principal components of milk is protein and that is why it coagulates under the action of poisons. A bite from a viper leads to the coagulation of proteins in the victim's cells and to swelling around the bite, which causes pain. Sometimes the swelling is so large that it can lead to death.