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Digestive System LAB Report

Introduction Paragraph

This lab report covers the structures and functions of the mouth, esophagus, stomach, small and large intestines, liver, pancreas, and gallbladder. Part one of this lab report is about the experiments we conducted based on the structures of the mouth. The structures of the mouth contains three primary parts. The mouth, salivary glands, and saliva, and the teeth. The mouth is the beginning of the digestive tract. In fact, digestion starts here when taking the first bite of food. Chewing breaks the food into pieces that are more easily digested, while saliva mixes with food to begin the process of breaking it down into a form your body can absorb and use.The mouth is an important part of the digestive system, because without the oral cavity we would have to find other means to intake foods, so the digestive system can break down what we eat obtain energy and vital vitamins and nutrients for our bodies. Salivary glands are exocrine glands, glands with ducts, that produce saliva. They also secrete amylase, a digestive enzyme that breaks down starch into maltose and glucose. (refer to figure 1). Which is what we tested in our lab experiment part one. The mouth also functions as an organ of speech and sensory reception. It is surrounded by the lips, cheeks, tongue, and palate and includes a chamber between the palate and tongue called the oral cavity, as well as a narrow space between the teeth, cheeks, and lips called the vestibule. The tongue is a thick, muscular organ that occupies the floor of the mouth and nearly fills the oral cavity when the mouth is closed. Mucous membrane covers the tongue. Muscular action mixes food particles with saliva during chewing and moves food toward the pharynx during swallowing. The tongue also helps move food underneath the teeth for chewing. The surface of the tongue has rough projections, called papillae. Some of these provide friction, which helps handle food. Other papillae contain most of the taste buds. Taste buds are sensory organs that are found on your tongue and allow you to experience tastes that are sweet, salty, sour, and bitter,(Refer to figure 2). Taste buds are found on the papillae. Taste buds have very sensitive microscopic hairs called microvilli. Those tiny hairs send messages to the brain about how something tastes, so you know if it's sweet, sour, bitter, or salty. Teeth are accessory organs of the human digestive system. They are located in the buccal cavity. Teeth are the organs of chewing, which is also known as mastication. Teeth cut, tear and grind food in the mouth, enabling it to be mixed with saliva. The actions of the teeth, include cutting, tearing and grinding, (refer to figure 3). These actions increase the surface area of the food in the mouth. This enables the digestive enzymes greater access to the food material and so assists their role in the digestive process.

Part I Structures of the Mouth

Salivary Glands:

The Effects of Salivary Amylase on Starch

In theory, All living beings need energy to survive. It is from the food eat is how we get our energy. Through the process of digestion that breaks down the complex substance of starch into simpler molecules of glucose, is how we get our energy. The digestion of the food starts as soon as we put food in our mouth. Our teeth cut the food into small pieces and the salivary glands secrete saliva that mixes with these food materials. The saliva contains an enzyme called salivary amylase which hydrolyses starch into maltose. The different salivary glands have varying proportions of two types of secretory cells, serous cells and mucous cells. Serous cells produce a watery fluid that contains a digestive enzyme, salivary amylase. This enzyme splits starch and glycogen molecules into disaccharides, starting the chemical digestion of carbohydrates.

Question: How long does it take for salivary amylase to break down starch into a disaccharide.

The Effects of Salivary Amylase on Starch

	Experimental		**Control**	
	Day One	Day Two	Day One	Day Two
Iodine Test	Starch exposed to Hydrochloric Acid, iodine	Can see slight remnants left of the cracker	Starch exposed to control solution	Seems just soggy and withering away
Notes				

Figure 1: We used a saltine cracker as our starch. The experiment was to test how my salivary amylase breaks down the complex substance of starch into simpler molecules of glucose. Without an environmental change the starch slowly dissipated into the saliva.

Taste Buds:

The Contribution of Smell and Texture to Taste

The taste buds are embedded in the epithelium of the tongue and make contact with the outside environment through a taste pore. Slender processes (microvilli) extend from the outer ends of the receptor cells through the taste pore, where the processes are covered by the mucus that lines the oral cavity. At their inner ends the taste receptor cells synapse, or connect, with afferent sensory neurons, nerve cells that conduct information to the brain. Each receptor cell synapses with several afferent sensory neurons, and each afferent neuron branches to several taste papillae, where each branch makes contact with many receptor cells.

Is Taste 80% Smell?

Food	Placed on Tongue (5 Seconds)	Chew (5 Seconds)	Unplug Nose & Chew (5 Seconds)
Apple Slice		X	
Carrot		X	
Cheese		X	
Banana		X	
Potato			X

Figure 2: X, is used to symbolize when the individual was able to identify the food inside their mouth, while blind folded, and nose plugged with cotton balls.

Question: Is taste 80% smell?

Hypothesis: Taste is 80% smell, due to the evidence, it was harder for the individual to identify what they were consuming just by placing the food in their tongue. All the mechanics of the buccal cavity come into play, including smell and texture.

Mammal Teeth Structure:

Mastication Tools

Mastication is the process of chewing food, which involves movements of the jaws and teeth. Mastication breaks up the food into small particles, which provides a greater surface area for digestion and enables the formation of a bolus, which is small enough to pass through the esophagus. Each type of tooth has a slightly different shape and performs a different job. Types of teeth include: Incisors, which are the eight teeth in the front and center of your mouth (four on top and four on bottom). These are the teeth that you use to take bites of your food. You also have four canines, which are the next type of teeth to develop. These are your sharpest teeth and are used for ripping and tearing food apart. Premolars, or bicuspids, are used for chewing and grinding food. You have four premolars on each side of your mouth, two on the upper and two on the lower jaw. Molars, are also used for chewing and grinding food.

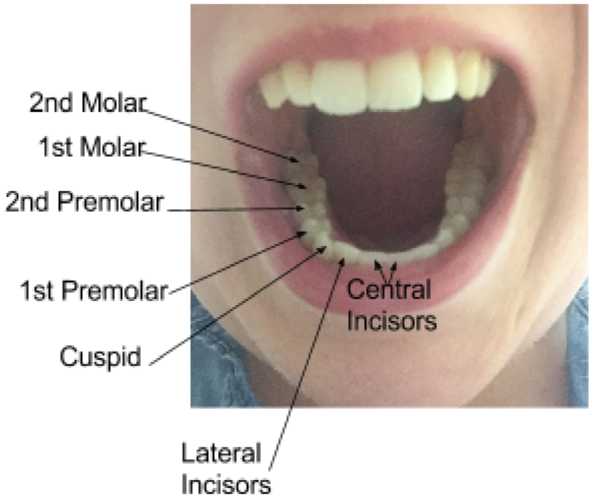

Figure 3:
Shows the structure and arrangement of the teeth in the mouth.

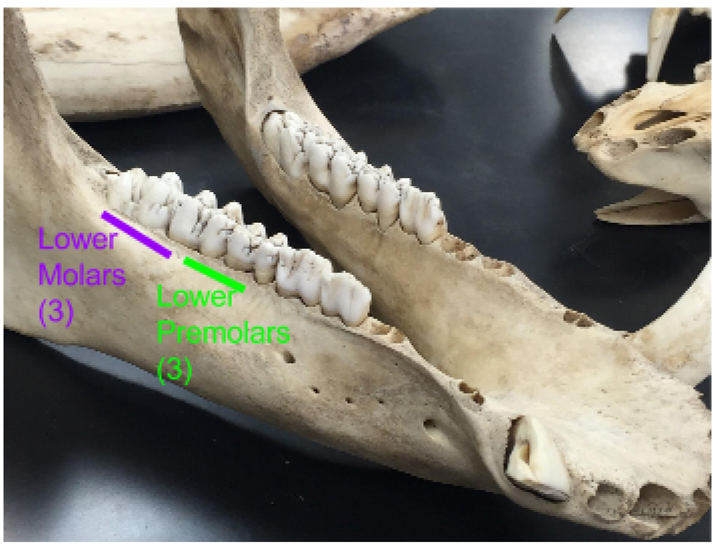

Figure 4:
Shows the Lower molars and premolars in a hog buccal cavity.

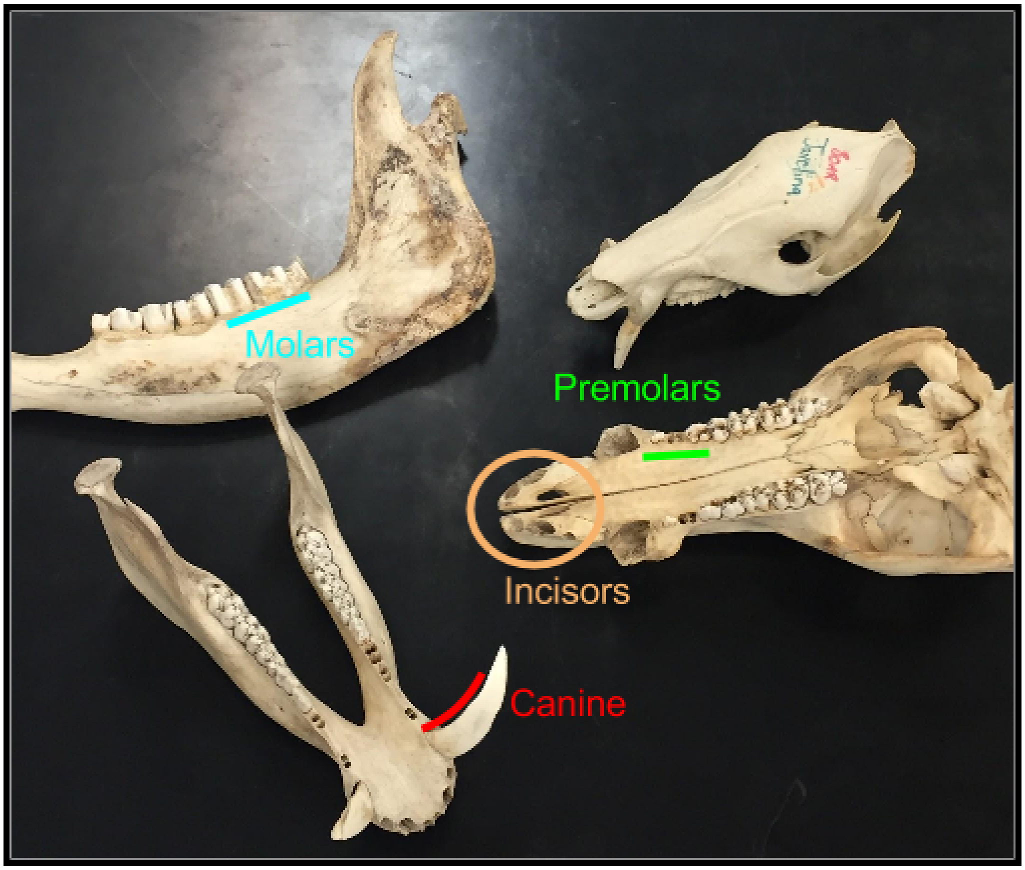

Figure 5:
Shows mammal skulls and their teeth structure.

Part II Esophagus and Stomach

Protein Digestion
The Effects of pH on Protein digestion
Components in saliva help keep the pH in your mouth between 6.5 and 7 so that the enzyme salivary amylase can start to break down carbohydrates. The enzymes that help digest food in the stomach, such as pepsin, work best at a pH around 2, while those that function in the intestines, including peptidases and maltase, work best at a pH around 7.5.

Question: How long does it take for pH to break down protein?

The Effects of pH on Protein digestion

	Control	Experimental
Day 0	Light, Transparent, Thin egg white	Light, Transparent, Thin egg white
Day 1	No color change, egg white = no visible change	No color change, egg white weathering away
Day 2	No physical change	Cloudy Liquid, small slivers of egg white presence
Day 3	Liquid color change, murky	Murky liquid, no sign of egg white
Day 4	Egg white clearly dissolving now	Murky liquid
Day 5	No change	No change

Figure 6: Data collected during the protein digestion lab, which is examined over a period of time. We tested how long it would take for an egg white to dissipate with the additive pepsin and hydrochloric acid. A lot of variables were in consideration such as how,It depended on how big or small your chunks of egg white (protein) were, and temperature. For example, if we applied heat or friction it would cause a speed up in the digestion.

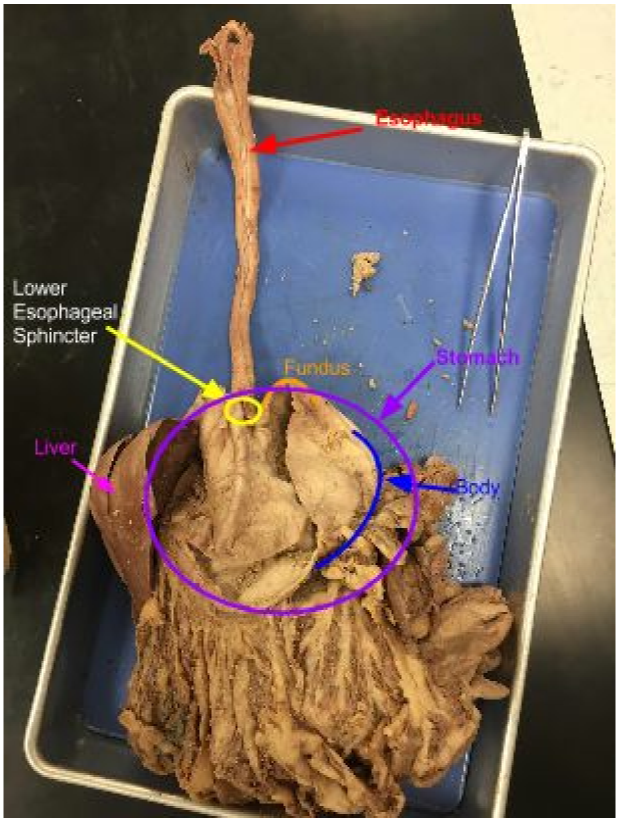

Figure 9: Shows different parts of the stomach identified in the digestive system.

Part III Small and Large Intestines

Question: How do hormones affect the gastrointestinal tract.

Intestinal Lab Data Analysis
Experimental data from the "Virtual Rats"

Experimental DATA	Control	Unknown				
		1	2	3	4	5
Drops of fluid From salivary Duct, min -1	10	10	10	70	12	9
pH of the stomach	2	1.9	1.8	1	1	4
Drops of fluid from	8	77	30	9.5	9	7

pancreatic duct, min -1						
pH of fluid from a main pancreatic duct	7	7.2	10	7.6	7.2	7
Drops of fluid from common bile duct, min-1	2	64	2	2.3	2.4	2.4
Motility of stomach, no. of contractions/ min	3	3.6	3	15	3.4	1.0
Motility of small intestine, no. of contractions/ min.	15	17	18	30	17	13
Blood Glucose level, mg/dl	100	101	100	104	102	60
Strength of contraction, mmHg	10	12	12	50	12	7

Figure 10: Shows the results from the experimental data on the virtual rats, after the hormones and ACh was introduced to the test subjects.

The results of the effects on the unknown agents on the virtual rats

Experimental DATA	Unknown				
	1	2	3	4	5
Drops of fluid from salivary duct	-	-	↑	-	-
pH of stomach	-	-	↓	↓	↑

Drops of fluid from pancreatic duct	↑	↑	-	-	-
pH of fluid from the main pancreatic duct	-	↑	-	-	-
Drops of fluid from common bile duct	↑	-	-	-	-
Motility of stomach	-	-	-	-	↓
Motility of small intestine	-	-	↑	-	-
Blood glucose level	-	-	-	-	↓
Strength of contraction	-	-	↑	-	-

Figure 11: Shows the comparison of the effects of the unknown agents on the different functions occurring within the virtual rat. The ↑, tells us there was an increase compared to the control. The ↓, tells us there was a decrease, and a - tells us there was no change.

Cat Intestines, pancreas, liver

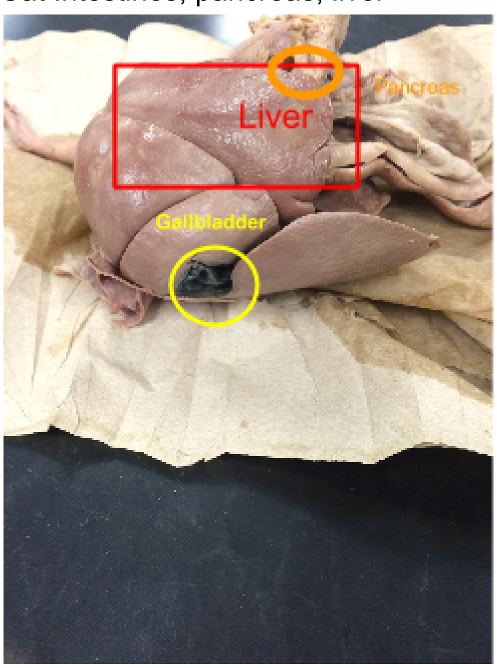

Figure 10: Shows the gallbladder with its neighbor the liver in the digestive system, and the pancreas.

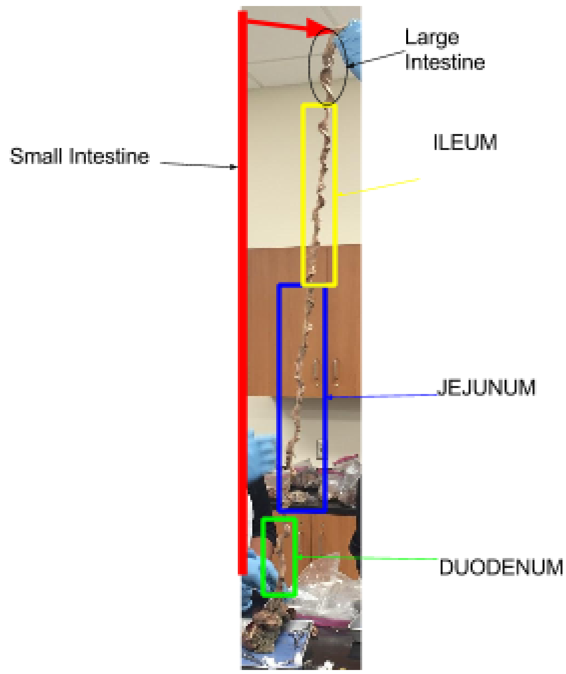

Figure 8: Cat small intestine, showing the regional terms for the small intestine.The reason of the scrunchy, curviness of the small intestine is to allow more surface area. It is called the plica circulares.

Conclusion

When you're eating, your nose and tongue work closely together. Sometimes it's difficult to tell which one is smelling or tasting a substance. Like in figure 2, it shows how it was difficult to tell what food was just placed on your tongue, but after chewing and even after removing the cotton balls from your nose we were quickly able to tell what we were eating. Since the mouth and the nose cavities are open to each other, it is possible that particles in the food derived from the food with in the mouth. This also causes the smell of the food to ascend to the nose and it may stimulate the receptors. It's much faster than stimulating taste buds. In these cases, taste sensation is actually coming from nose sensation. In this digestion system adventure, we barely scratched the surface covering amylase and pepsin with the enzyme chemical digestion. The saliva contains an enzyme called salivary amylase, this starts the process of digestion. In figure 1, we tested the time it took for for the salivary amylase to breakdown the starch. To wrap up the gastrointestinal tract, we touched how hormones affect the gi tract. In figures 10 & 11, displays the data collected by Advances in Physiology Education, on virtual rats.