

The digestion of a chicken sandwich biology essay



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Throughout this essay the digestion of a chicken sandwich will be explained with reference to five different points; the need for digestion, physical digestion with regards to muscular and nervous involvement and chemical involvement, hormone and enzyme action, how each enzyme acts on each part of the sandwich, the tissues and lining of the digestive tract and, finally, how each part of the chicken sandwich is digested and absorbed. The third and fifth point will be combined and explained together as the essay takes a journey through the digestive system.

The need for digestion is vital to the human body's survival. When food first enters the body it is a solid form that cannot be digested, so the mouth begins the digestion process by releasing digestive juices and using teeth to chew and break down the food into a more liquid based form. As it moves down the digestive tract it is broken down even more into molecules that can be absorbed and taken to cells around the body for energy, reproduction and to strengthen them.

There are many features of digestion and these are split into two categories; physical digestion and chemical digestion. In physical digestion there are two factors that contribute to the digestion of food; muscular and nervous involvement. The muscular involvement begins in the mouth, more specifically with the tongue, which assists in the chewing of food and eventually forces food down into the oesophagus. Along with the oesophagus, the other organ in the digestive tract have a muscle layer underneath them which makes their walls to move which in turn forces the food down with a wave like action. This wave like action is called 'peristalsis'(Potter, S. 2008. AQA Biology, Phillip Alans Updates). This forces

the food won the tract and through the digestive organs by the muscles contracting which makes a narrow section, as the muscle keeps contracting it forced the food in a propelling fashion downwards towards its next destination; the stomach. When the food has almost reach the stomach, the ring like muscle called the 'gastroesophageal sphincter'(Jim Swan, 2006., The Digestive Sytsem) which opens and lets food through then closes behind it to stop too much food entering the stomach, almost like a door. Once the food has entered the stomach the stomach muscles mix the partially digested food and the juices the stomach has produced. The stomach also uses its upper muscles to store food and also helps to empty the stomach into the small intestine. Once in the small intestine the food, which is now in a small enough form, is absorbed into its walls and is taken and distributed around the body. The waste products of the food are then forced into the colon where they wait until they can be pushed out of the body as faeces.

Nerves are what makes the muscles contract and force the food through the digestive tract. There are two different types; extrinsic and intrinsic. The extrinsic nerves are the outside nerves; these nerves control the muscles in the organs in the digestive tract. They are produced by the brain and spinal cord and they let out two chemicals; acetylcholine and adrenaline. The acetylcholine is the chemical that causes the muscles to contract and the adrenaline makes them relax and eventually stop the process of digestion. The intrinsic nerves are the inside nerves and these lie in the walls of the organs of the digestive tract. Their main function is to release substances that start, control the speed and stop the production of enzymes that digest food.

In chemical digestion there are also two factors that contribute; hormones and enzyme action. There is a layer in the stomach and small intestine called the mucosa, in this layer are cells which produce and then release hormones which also, along with muscles and nerves, control digestion. There are five different hormones, all of which have their own unique jobs within the process of digestion; Gastrin makes the stomach produce acid for the digestion of food and for dissolving them, CCK allows the pancreas to make pancreatic juice which holds enzymes that help break down molecules, and Secretin, this is the hormone has the most tasks of all three, its first job is to make the pancreas produce a juice that is full of bicarbonate which will neutralize the stomach acid, its second job is to make the stomach produce pepsin which digests protein and finally its third job is to make the liver produce bile. The other hormones are slightly different, they stimulate and regulate appetite; Ghrelin stimulates appetite and is made in the stomach and upper intestine which is regulated by the absence of food, and Peptide YY is the response produced by a meal in the system and inhibits appetite.

The action of an enzyme is to break down molecules so they can be dissolved and carried through the body. Each enzyme is specifically designed for only one substrate. The enzyme and the substrate fit together, like and lock and key, and the enzyme alters the substrate into products which are then released to be absorbed into the blood stream, after this the enzyme can react again but only with the same type of substrate.

When the chicken salad sandwich first enters the mouth the salivary glands produce a digestive juice called salivary amylase which begins to break down or hydrolyse the starch which is in the bread of the chicken salad sandwich.

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Amylase breaks down carbohydrates, more specifically the starch in the carbohydrates and changes it into maltose; this is a more acceptable form that the body can absorb. As the chicken salad sandwich continues its journey it enters the stomach where it is stored. In the stomach the acid denatures the amylase enzyme which stops it from working. Once the food has moved from the stomach to the small intestine, the pancreatic amylase, which is produced in the pancreatic juices, continues the breakdown of the starch in the bread of the sandwich to a substance called maltose. As the food is further pushed along the small intestine it produces maltase which breaks down the maltose into an even smaller molecule called glucose. The chicken in the sandwich starts to be broken down in the mouth where it is chewed to make smaller pieces. When it reaches the stomach it begins the hydrolysis process, the stomach produces an enzyme called pepsin, and this partially breaks down the proteins into amino acid. This then travels to the small intestine where the chicken is further broken down by an enzyme called trypsin which continues the breakdown of proteins to amino acids. The butter in the chicken salad sandwich is solely broken down in the small intestine into emulsified fats and fatty acids by enzymes produced in the liver and pancreas called bile and lipase. The lettuce in the chicken salad sandwich cannot be broken down as it is a fibre, so it passes through the system by being chewed into smaller parts and the water is absorbed through the intestinal walls, and ends its journey by leaving the body in the faeces, along with all the other waste products from the chicken sandwich. The end products of the chicken sandwich, sucrose, amino acids, emulsified fats and glycerol/fatty acids are absorbed through the intestinal wall. There is a layer of mucosa that lines the wall that consists of folds which are full of

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villi which are then covered with microvilli which increases the surface area dramatically. It is through this surface area that the nutrients are absorbed and because of this the amount and rate of absorption is increased.

The organs of the digestive system are the mouth, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and the anus. There are three main parts of the mouth, the lips which are made out of 'stratified squamous keratinized epithelium, stratified squamous non keratinized epithelium, skeletal muscle, and fibroelastic connective tissue'(http://lifesci.rutgers.edu/~babiarz/digest.htm). The tongue is made out of 'skeletal muscle, glands, lymphatic tissue and epithelial tissue'(http://lifesci.rutgers.edu/~babiarz/digest.htm), and the teeth are made primarily out of 'calcified connective tissue'. There are three tissues that make up the oesophagus; skeletal tissue, stratified squamous non keratinized epithelium and smooth muscle. Moving down to the stomach, it is apparent that it is also made of three types of tissue, these are smooth muscle, glands and epithelium. After the stomach comes the small and large intestine which are made up of simple columnar epithelium, which is the tissue that makes up the villi and the micro villi, and the large intestine is made out of epithelial tissue. Finally, comes the rectum and the anus, the rectum contains simple columnar epithelium and the anus is made with stratified squamous epithelium.

The digestive system is a vital part of everyday life for the human body, it breaks down food to a form that can be absorbed by the body which gives us energy and everything we need. It works in such a way that it pulls all the vital nutrients from the food, absorbs them and then transports them around their body. Enzymes like protease and amylase play a major part in the

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digestion of food and are the juices that hydrolyse the food we eat. There are many other factors that work alongside the enzymes that all play a significant role in the digestion of food; muscular and hormone involvement, and nerves, and they all work together so that we as human being can survive, and play this roll in such a way that it is an unconscious act that we very rarely need to think about.