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**Learning Guide:**

**Digestive System**

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# See3D logo depicting the word “See3D,” in blue, being 3D printed. Above the freshly-printed characters, a black print head hanging from a grey bar extrudes blue filament that snakes down to the top of the letter “D,” the last character to be printed.

# **Connecting the Model:**



# Locate the two parts of the model; one part has a long tube and the other part has multiple coils. On the part with the tube, place the flat and smooth side of the part on a surface, and the other side should face towards you. Next, the second piece of the model will have an overall spherical curve shape. Place this model on a surface so that the part curves away from you, similar to how you would put a bowl on a surface. At the inferior (bottom) end of the first piece and superior (top) end of the second piece, there will be a tube that connects the two models together.

# **Walkthrough:**



1. Feel the long, thin cylinder. This is the top of the model and the part that represents the esophagus. After someone swallows food, it travels through the esophagus. In the esophagus, the process of peristalsis occurs, which is when the layer of muscle lining the esophagus allows its walls to move and push food and liquids down to the stomach.
2. Keep moving your hand down the esophagus until the cylinder meets the flat part of the model. Below the cylinder, feel for a rounded, hook shaped organ. This is the stomach and it is responsible for receiving food from the esophagus and mixing it with digestive juices (fluids that break down food) like rennin, pepsin and hydrochloric acid.
3. Feel the bottom of the hook shape where the stomach is located. The middle of this area contains the pancreas. The digestive juices made in the pancreas contain enzymes that break down food, especially carbohydrates, fats and proteins. These juices are delivered to the small intestine through ducts. The pancreas is also responsible for producing insulin, a hormone that reduces glucose in the blood. For people with type 1 diabetes, their pancreas produces little to no insulin and they require insulin medications that regulate their blood sugar levels. A complication with type 1 diabetes is diabetic retinopathy. This can result in mild symptoms like blurriness or permanent vision loss.
4. To the right and lateral side of the stomach, feel for a “half-moon” shape that is rounded at the top and is a straight diagonal at the bottom. This is the liver and its function is to create bile, a digestive juice, that helps break down vitamins and fats. Bile is stored in the gallbladder or sent to the small intestine to be used for digestion.
5. Orient the model so the esophagus is away from you and the smooth, rounded, part of the liver is facing you. This is the ventral/front side. At the bottom left of the liver (caudal lobe), you can find the gallbladder where the stomach and liver meet. It feels like a small bump, like a bean. The gallbladder stores the bile produced by the liver.
6. Move your hand down to the second piece of the model. You will feel the large intestine which is shaped like a square with 3 sides and has multiple folds throughout the tube. Next, feel inside the “square” of the large intestine to find a series of folded and coiled tubes. These tubes are the small intestine, which is responsible for digesting and breaking down food. The pancreatic juices, bile and digestive juices mix together within the small intestine to completely break down the food. There are also healthy bacteria in the small intestine that also aid in digesting carbohydrates. In the process, a large amount of water and other nutrients are absorbed by the small intestine.
7. The large intestine moves water from the Gastrointestinal Tract into the bloodstream and its bacteria break down any nutrients that still remain. The waste products of the digestion process and any food particles that are too large to break down become stool within the large intestine. Then, through peristalsis, the large intestine pushes the waste material to the rectum.
8. Below the large intestine, at the most inferior point of the model, you will feel a slightly curved and rounded cylinder. This is the rectum, which is an eight inch(twenty cm) chamber that receives and holds stool.

# **Citations:**



Fong, D., Aiello, L., Gardner, T., King, G., Blankenship, G., Cavallerano, J., Klein, R. (2004, January 01). Retinopathy in Diabetes. Retrieved October 2, 2020, from <https://care.diabetesjournals.org/content/27/suppl_1/s84>

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