London School of Massage

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Gastrointestinal Tract (G.I.T)

At the end of this section you will understand and appreciate:

- Structure and function of the digestive system
- Process of digestion
- Conditions affecting the digestive system
- How massage affects the digestive system

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The Digestive System

The digestive system (Gastrointestinal Tract) is important in providing energy from the raw food materials which we consume. This energy is then utilised in running other vital body functions.

DEFINITIONS

Metabolism is the sum total of these chemical reactions occurring in the body

Anabolism is the building up of complex molecules

Catabolism is the breakdown of complex molecules

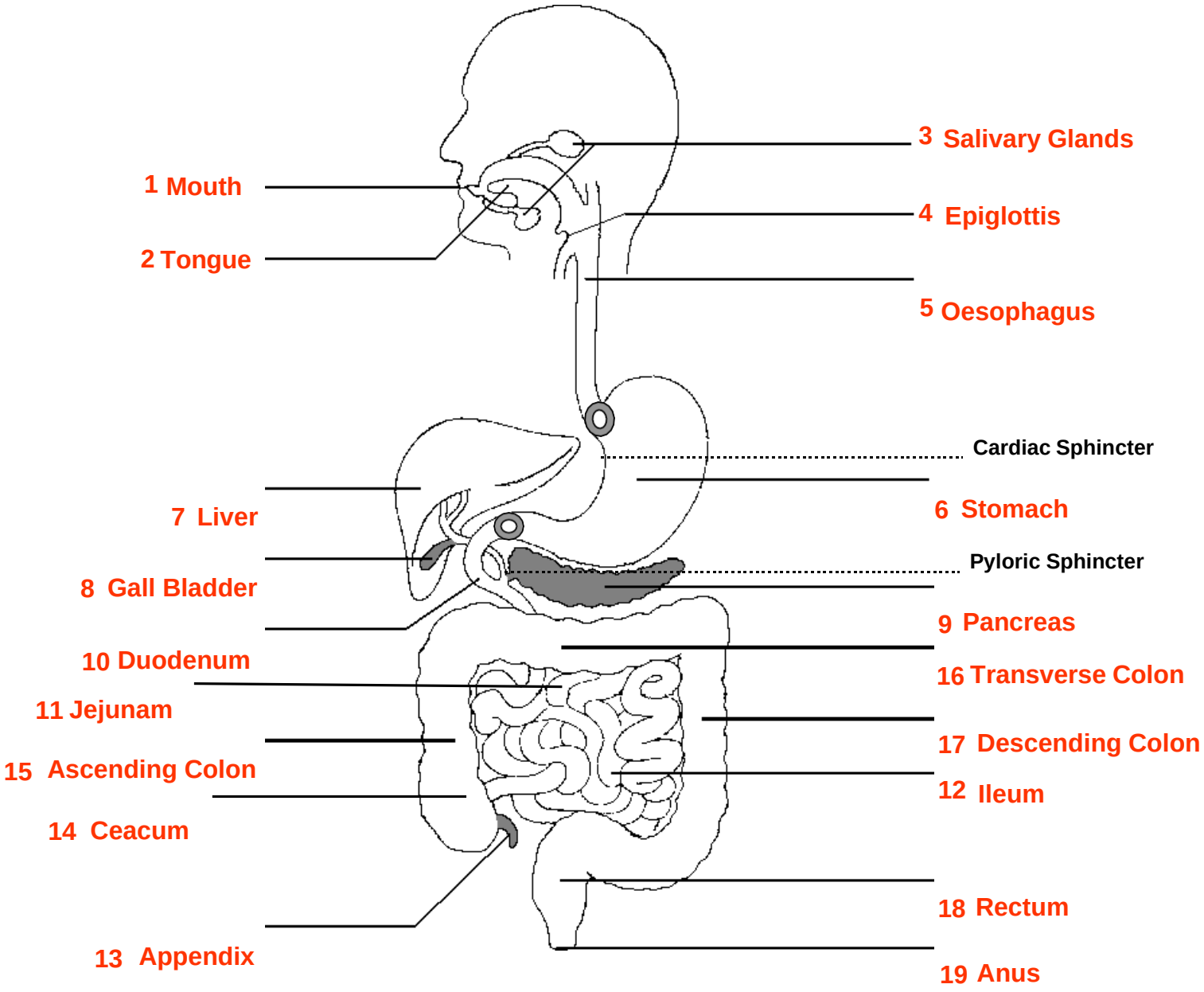


Diagram of the Digestive System

SUMMARY OF CHEMICAL DIGESTION OF FOOD:

PROTEINS (made up of Nitrogen, Carbon, Oxygen and Hydrogen)

Protein = Building Block of Life = Growth

Protein Food (Large Polypeptide Chains)

↓

Smaller Polypeptide Chains (Peptones)

↓

Small Peptides

↓

Amino Acids

FATS (LIPIDS)

Fats = Protection & Insulation

Fat

↓

Fatty Acids + Glycerol

CARBOHYDRATES (made up of Carbon, Hydrogen & Oxygen)

Carbohydrates = Energy Providers

Polysaccharides – complex sugars (starches)

↓

Disaccharides – simple sugars (maltose, lactose, sucrose)

↓

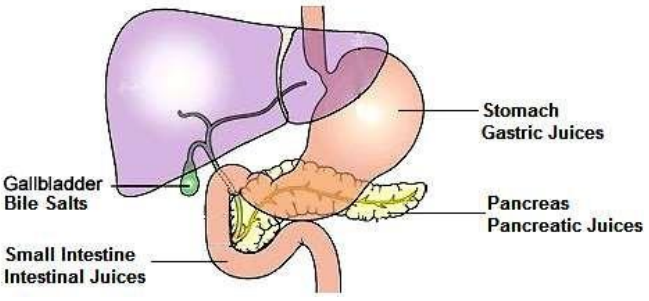
Monosaccharides – single units of sugar (glucose, fructose)

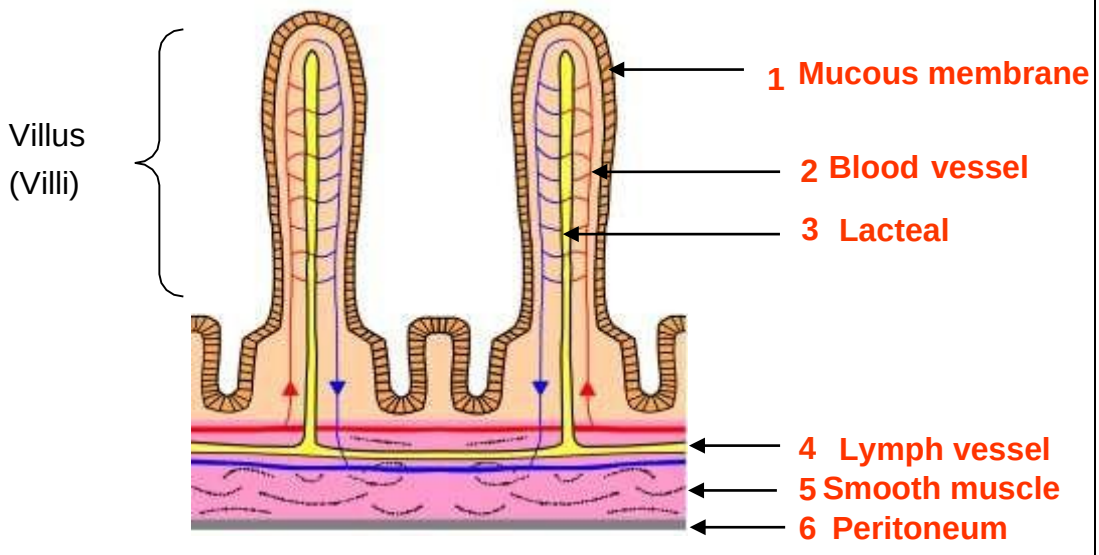
ORGANS OF THE DIGESTIVE SYSTEM

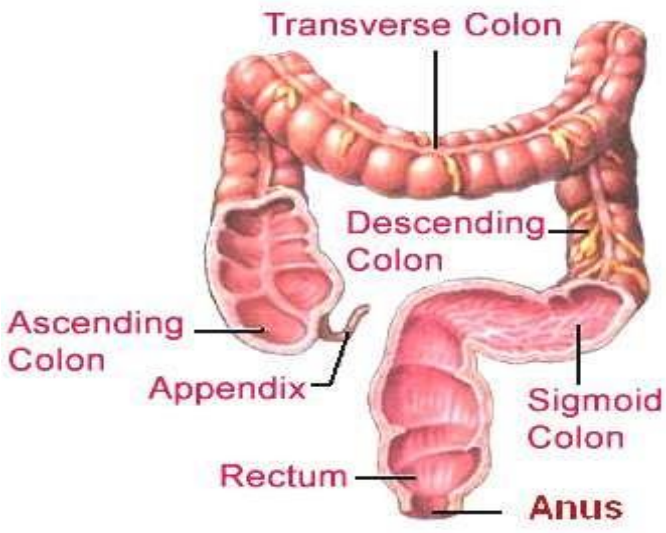
Digestion can be divided into 2 processes:

1. Mechanical digestion – through action of mastication in the mouth and churning in the stomach.

2. Chemical digestion – through the action of enzymes and chemicals secreted by the digestive tract.

Organ	Structure
Teeth	Teeth help to break down food into smaller particles so that we can pass this into the oesophagus. They also help increase the surface area of food thereby speeding up the digestive process. The act of chewing is called **MASTICATION** and taking food into the mouth is called **INGESTION.**
Salivary Glands	Enzymes are **BIOLOGICAL CATALYTS.** Catalysts are substances which help to speed up the breakdown of food so that its parts can be absorbed and used by the body. Saliva is a secretion containing the **ENZYME <u>salivary amylase</u>** There are three pairs of salivary glands. These are: **Parotid Glands** – situated below **<u>ear</u>** **Sublingual Glands** & **Submandibular Glands** - situated below **<u>tongue</u>**
Tongue	This is a muscular organ. It is covered by small projections called **PAPILLAE** which contain taste buds. The tongue helps to roll chewed food into a **BOLUS,** which is easier to swallow.
Epiglottis	This is a small flap of cartilage that covers the larynx when we swallow food so that it travels down into the oesophagus and not into the **<u>trachea</u>**
Oesophagus	This is a muscular tube that leads to the stomach. It is lined by mucus so as to allow smooth passage of food material and to protect the oesophageal tissue from digestion of body acids and enzymes.
	3 Organs produce secretions: 1. Stomach – Gastric Juices 2. Pancreas – Pancreatic Juices 3. Intestine – Intestinal Juices 

Stomach	The stomach is a muscular sac and has the primary function of churning ingested food material. Its openings are guarded by circular bands of muscle - the **Cardiac sphincter** and the **Pyloric sphincter**. The stomach is made up of several layers. The Inner layer is covered by a mucous membrane and has many folds called **RUGAE.** This is lined with glands which produce **GASTRIC JUICES**. This contains ***1. Pepsin (protein digestion – proteins to polypeptides)*** ***2. Rennin (curdling of milk – only found in infants)*** ***3. Hydrochloric acid (neutralises bacteria and activates pepsin)***
Small Intestine	This is 7m long and divided into 3 different parts: **1. DUODENUM** **2. JEJUNUM** **3. ILEUM** There structure is as follows:  **Function**: completes **chemical digestion** of food and **absorption** of nutrients through the **Villi** into the blood and lymph vessels. Peristaltic movements mix food with **Gastric Juices**, **Pancreatic Juices**, **Intestinal Juices** and **Bile**. In the small intestine the following digestion occurs: 1. **MALTOSE**, **LACTOSE** and **SUCROSE** (**Disaccharides**) are converted into **Monosaccharides** (glucose & fructose) 2. **ENTEROKINASE** activates **TRYPSIN (**in Pancreatic Juice) **3. PEPTIDASES** splits **POLYPEPTIDES** into **AMINO ACIDS** Digested food is **absorbed** through the walls of the **Villi**

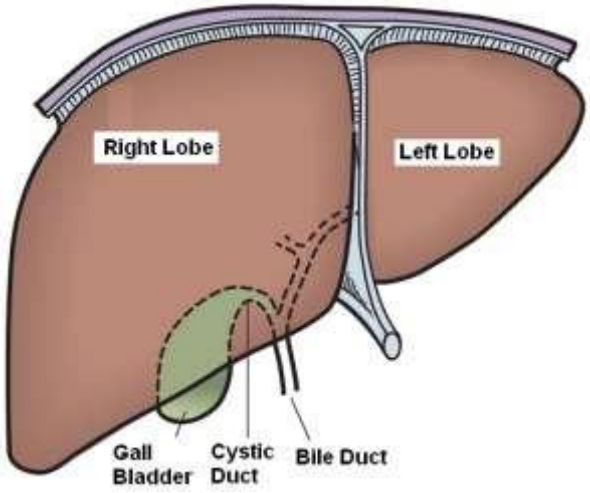
	Fats are passed into the **LACTEALS** (lymphatic capillaries) and into the blood via the lymphatic system. The **small intestine** is the only section of the digestive system to have a link with the **<u>lymphatic</u> SYSTEM.**
Large Intestine (Colon)	It is 1.5m long and divided into 3 parts: **1. ASCENDING COLON** **2. TRANSVERSE COLON** **3. DESCENDING COLON**  It deals with **<u>waste</u>** products of digestion **Function**: To absorb any remaining **<u>water</u>** and **<u>nutrients</u>** from digested waste matter. The waste matter left is called **FAECES**. Faeces contain unwanted leftovers, combined with **cellulose**, **dead blood cells, bacteria, fatty acids** and **mucus.** **Note: NO DIGESTION, ONLY ABSORBTION & EXCRETION**
Appendix (part of colon)	Narrow tube attached to the **LARGE INTESTINE** It is about 9 cm long.
Rectum (part of colon)	About 12 cm long. Passes from the colon to the anal canal and anus.
Anus	Opening with two sphincter muscles.

(part of colon)	This is the last part of the colon.

ACCESSORY ORGANS OF DIGESTION

There are three other organs involved in the digestive process. They are termed "**Accessory**" because although food does not pass through them directly, they help the digestive process

Liver	Lies under the diaphragm on the right hand side. The liver is the largest gland in the body. It is divided into two lobes - large right lobe and smaller left lobe **Functions**: The functions of the liver are: ***1.*** **Removes:** o Toxins from chemical and harmful substances (drugs, alcohol etc.) o Nitrogen from amino acids (proteins) ***2.*** **Stores:** o Vitamin A, B^{12}, D, E, K **(not Vitamin B^{6})** o Glycogen (compound that stores carbohydrates) o Iron from breakdown of Red Blood Cells and food o Fats ***3.*** **Produces:** o Heat (produces more than any other organ in body) o Vitamin A and D o Heparin (anticoagulant – stops blood from clotting) o Plasma Protein (albumin, globulin, prothrombin, fibrinogen) o Bile – a thick liquid produced in the liver as a result of the breakdown of red blood cells. It contains salts, bile pigments, acids and water. o Uric Acid and Urea from breakdown of Red Blood Cells and amino acids ***4.*** **Converts:** o Stored (unsaturated) fats into other fat products e.g. Cholesterol o **Glucose** back to glycogen in presence of **INSULIN**

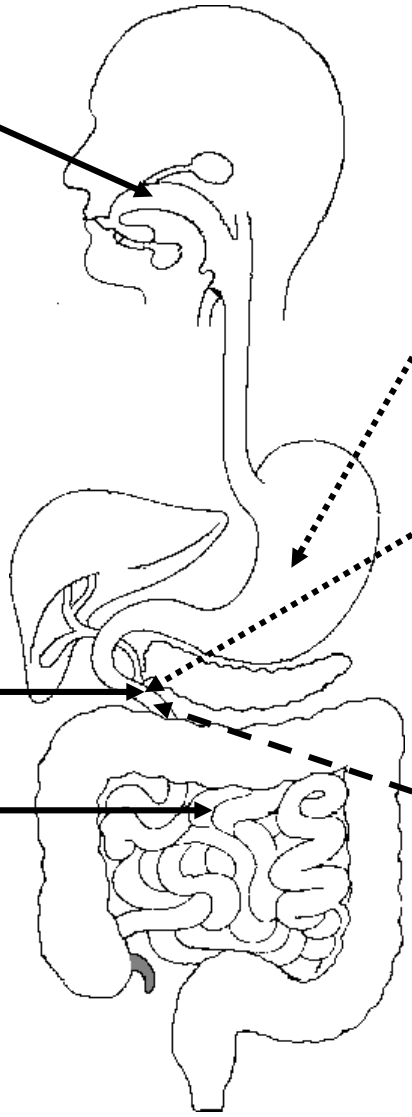
Gall Bladder	Is a pear shaped sac attached by the **cystic** and **bile** ducts to the **liver**. Bile is produced by the **liver**, but stored by the **Gall Bladder**. Bile helps **emulsify** fats (emulsify = make into a liquid). Bile is thick liquid produced in the liver as a result of the breakdown of red blood cells. It contains salts, bile pigments, acids and water. **Functions**: ○ Reservoir for excess bile ○ Secretes mucus to add to bile ○ **Absorbs water from bile making it more concentrated** ○ Contract in order to empty into duodenum 
Pancreas	This is a **gland** which is attached to the duodenum through the **pancreatic duct**. It secretes **pancreatic juices**. The pancreas has **2** types of cells: **1.** Islets of Langerhans which secrete **insulin** **2.** Network of sacs which produce **enzymes** **Functions** The Pancreas works with both the **digestive** system and the **endocrine** system producing enzymes to break down food and the hormone insulin which regulates blood sugar. Pancreatic Juices contain ○ **Lipase** (fat digestion) ○ **Amylase** (starch digestion) ○ **Trypsin** (protein digestion)

Digestion of Food (at different stages of its passage) – Picture Form

Carbohydrates
Polysaccharides ➔
Smaller Polysaccharides

Enzyme: Salivary Amylase

Proteins
Protein ➔ Peptones
Enzyme: Pepsin
GASTRIC JUICE



Proteins
Peptones ➔
(Smaller) Polypeptides
Enzymes:
Trypsin, Chymotrypsin

Smaller Polypeptides ➔
Amino Acids
Enzyme:
Peptidase
(Digestion in Small Intestine)

Carbohydrates
Polysaccharides ➔
Disaccharides
Enzyme: Amylase
PANCREATIC JUICE

Carbohydrates
Disaccharides ➔
Monosaccharides

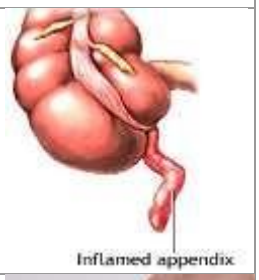
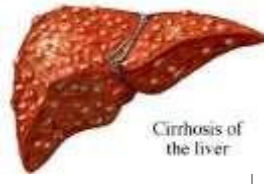
Enzyme:
Maltase, Lactase, Sucrase
INTESTINAL JUICE

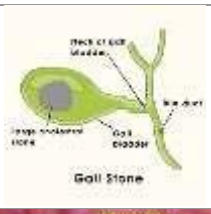
Fats
Fats ➔Emulsified Fats
Bile Salts

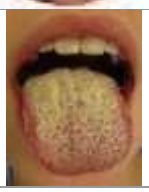
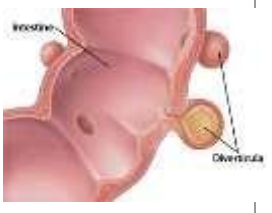
Emulsified Fats ➔ Fatty Acids + Glycerol
Enzyme: Lipase
PANCREATIC JUICE

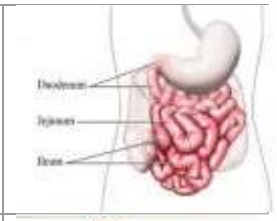
Organ	Enzyme	Action
Mouth (Salivary Glands)	Salivary Amylase	Converts starch into shorter chain polysaccharides
Stomach	Gastric Juice ▪ Renin ▪ Pepsin ▪ Hydrochloric Acid	 Coagulates milk into curds (infants) Converts proteins into peptones Neutralises bacteria and activates pepsin
Duodenum	1. Pancreatic Juice ▪ Trypsin ▪ Lipase ▪ Amylase 2. Bile	 Converts peptones into shorter chain polypeptides Converts fats into fatty acids and glycerol Converts polysaccharides to disaccharides Emulsifies fats
Small Intestine (Villi)	Intestinal Juice ▪ Maltase ▪ Sucrase ▪ Lactase ▪ Enterokinase ▪ Peptidases	 Converts disaccharides to monosaccharides Converts disaccharides to monosaccharides Converts disaccharides to monosaccharides Activates trypsin in pancreatic juice Converts polypeptides into amino acids

DISORDER AND DISEASES OF THE DIGESTIVE SYSTEM

Condition	Description	Picture
Anorexia Nervosa	Anorexia is a loss of appetite. Anorexia nervosa is a psychological condition which often affects teenage girls and young women. The sufferers have a fear of gaining weight or being fat and refuse to eat very much or stop eating altogether. It can be severely debilitating and sometimes fatal.	
Appendicitis	Acute inflammation of the appendix, usually treated by removal of the organ.	
Bulimia Nervosa	Bulimia is an insatiable hunger during binging episodes coupled with compensatory evacuation methods such as self-induced vomiting and excessive use of laxatives. Bulimia nervosa is a psychological condition which often affects teenage girls and young women, and increasingly young men	
Cirrhosis of the Liver	Chronic damage to an organ causing hardening. Several types of cirrhosis exist but the most common is cirrhosis of the liver, which is frequently caused by excessive alcohol consumption.	
Constipation	Infrequent or uncomfortable bowel movements, causing hard faeces to block the rectum. Caused by lack of fibre in the diet, lack of fluids and lack of exercise. Sometimes caused by stress.	
Coeliac' s Disease	Celiac disease is a digestive disease that damages the small intestine and interferes with absorption of nutrients from food. People who have celiac disease cannot tolerate gluten, a protein in wheat, rye, and barley.	
Diarrhoea	Diarrhoea is the condition of having frequent loose or liquid bowel movements. Acute diarrhoea is a common cause of death in developing countries and the second most common cause of infant deaths worldwide.	

Gall Stones	Stones formed from residues of bile pigments, cholesterol and calcium salts, found in the gall bladder.	
Gingivitis	Inflammation of the gums.	
Heartburn - Reflux Oseophagitis	Burning sensation in oesophagus or throat, caused by back flow and regurgitation of acidic stomach contents.	
Hepatitis A, B & C	**Hepatitis A** is the most common of the seven known types of viral hepatitis. Infection with the hepatitis A virus leads to inflammation of the liver, but complications are rarely serious. **Hepatitis B** is similar to hepatitis A in its symptoms, but is more likely to cause chronic long-term illness and permanent damage to the liver if not treated. **Hepatitis C**, like other forms of hepatitis, causes inflammation of the liver. The hepatitis C virus is transferred primarily through blood, and is more persistent than hepatitis A or B.	
Hernia - Abdominal, Hiatus	A rupture, in which an organ pushes through the surface of the structures which normally hold it in.	
Indigestion (Dyspepsia)	Indigestion is just another name for an upset stomach. Indigestion usually happens when people eat too much or too fast, or certain foods don't agree with them.	
Irritable Bowel Syndrome (IBS)	No exact cause is yet known for irritable bowel syndrome (sometimes referred to as IBS), though stress and low-fibre, high fat diets are said to contribute. Symptoms include stomach and bowel pain and alternate bouts of diarrhoea and constipation.	
Jaundice	Excessive levels of bile pigments in the blood cause skin to turn yellow. Caused by malfunctioning gall bladder or obstructed flow of bile.	

Nausea	Is the sensation of unease and discomfort in the stomach with an urge to vomit.	
Obesity	Is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy.	
Stress	The most common effect of stress on the digestive system is ulcers. Anxiety and lack of relaxation cause overproduction of gastric juices and if they have nothing to work on they will start to attack the lining of the stomach or other structures. In short, the stomach starts digesting itself	
Ulcer (Duodenal, Peptic)	Erosion in the walls of the digestive system, often caused by too much acid	
Candida	A fungus, called candida albicans, which causes yeast infections like thrush in the mouth, throat, intestines and other parts of the body.	
Colitis	An inflammation of the large intestine (the colon).	
Ulcerative Colitis	Is a form of inflammatory bowel disease. It is a form of colitis, disease of the intestine, specifically the large intestine, which includes characteristic ulcers, or open sores in the colon.	
Crohn's Disease	A disease of the small intestine that often spreads to the colon. Crohn's disease is characterised by diarrhoea, cramping and loss of appetite and weight, with local abscesses and scarring.	
Diverticulitis	An inflammation of a diverticulum in the digestive tract (especially the colon); characterised by painful abdominal cramping, fever and constipation.	
Diverticulosis	A condition on the large intestine characterised by the development of weakness in the intestinal wall that permits herniation or outpouching of the intestinal lining. Diverticulosis usually develops as a result of inadequate dietary fibre.	

Enteritis	An inflammation of the intestine (especially the small intestine) usually characterised by diarrhoea.	
Gastritis	An inflammation of the lining of the stomach which is characterised by nausea, loss of appetite and discomfort after eating.	
Pernicious Anaemia	A chronic progressive anaemia of older adults, thought to be caused by impaired absorption of vitamin B^{12} due to the absence of intrinsic factor.	

INTERRELATIONSHIP OF DIGESTIVE SYSTEM WITH OTHER BODY SYSTEMS

All the systems	Provides nutrition to the whole body.
Circulatory	The circulatory system transports nutrients from the digestive system to every system of the body.
Lymphatic	Lymphatic vessels are found in the lacteals of the villi in the small intestine and help the absorption of fats.
Endocrine	The endocrine system secretes certain hormones, which helped metabolism.
Muscular	The digestive system supplies glucose for energy to the muscular system: sphincter muscles contract along the alimentary canal to push food along - known as peristalsis.
Nervous	All the organs of the digestive system are stimulated by nerve impulses.

EFFECTS OF MASSAGE ON THE DIGESTIVE SYSTEM

1. Increase peristalsis (contraction of smooth muscle in gut lining which helps move food along).
2. Helps prevent constipation and thereby assist in waste removal from the body

SYMPTOMS OF THE DIGESTIVE SYSTEM

- Over eating / lack of appetite
- Nausea / Vomiting
- Constipation / Diarrhoea
- Change in the colour of stools – presence of fresh blood or dark stools (bleeding higher up?)