Resources

Essential of Human Anatomy & Physiology
By Elaine Marieb & Suzanne Keller

Atlas of Human Anatomy
By Frank Netter

Gray's Anatomy
By Richard Drake, Wayne Vogl & Adam Mitchell

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Objectives

- List the subdivisions of the nervous system.
- Define the terms: grey matter, white matter, nucleus, ganglion, tract and nerve.
- Define neurons and neuroglia.
- List the parts of the brain.
- Identify the external and internal features of spinal cord.
- Enumerate the cranial nerves.
- Describe the parts and distribution of the spinal nerve.
- Define the term dermatome.
- List the structures protecting the central nervous system.
Introduction

- The **digestive system** (also called the alimentary or gastrointestinal system) consists of a series of hollow organs joined in a tube-like tract starting at the **mouth** and ending at the **anus**.

- The food and drink we consume must be broken down both physically and chemically into nutrients before they can be absorbed into the blood and carried to cells throughout the body, and then the body must excrete waste.

- The organs of the digestive system collectively perform these activities.

- A properly functioning digestive system is essential for the effective interactions of almost all other body systems.

- A problem in the digestive system can cause conditions in other body systems and vice versa.

- Therefore, a healthy, well-balanced diet is important.
Functions

▪ The digestive system consists of a series of organs and glands that work together to process and digest food and to excrete wastes.

▪ Controlled by the intrinsic nervous system, digestion is a complex process of motility, secretion and absorption.

▪ Intrinsic nervous system is one of the main divisions of the autonomic nervous system (ANS) and consists of neurons that governs the function of the gastrointestinal tract.

▪ Most of the digestive system is made up of a long cylindrical tube (known as the alimentary canal or gastrointestinal tract) that moves the food from the mouth to the anus, plus accessory organs that assist with the chemical and mechanical breakdown of food.

▪ The gastrointestinal tract is approximately 9–10 meters in length and food takes between 12 and 48 hours to move from one end to the other.
Basic Processes

1. **Ingestion**: active, voluntary process of eating and drinking.

2. **Propulsion**: moves the food along the digestive tract through a process called peristalsis.

3. **Secretion**: the enzymes helps to process the food into liquid by adjusting the pH of the food and chemically breaking it down.

4. **Mechanical digestion**: occurs when the food is physically broken down into smaller and smaller pieces.

5. **Chemical digestion**: takes place as enzymes in the stomach and small intestine break down the food into simpler molecules.

6. **Absorption**: occurs when these molecules move from the digestive tract to adjacent blood and lymphatic vessels for transport around the body.

7. **Elimination**: occurs when undigested food is defecated from the body through the anus.
Digestive Organs

Upper Gastrointestinal Tract
- Mouth
- Salivary Glands
- Tongue and Teeth
- Pharynx
- Esophagus
- Stomach

Lower Gastrointestinal Tract
- Small Intestine
- Large Intestine
- Rectum
- Anus

Accessory Organs
- Liver
- Pancreas
- Gallbladder
- Sometimes is called buccal cavity.
- The digestive process begins before food is placed in the mouth, as the senses (such as smell) identify the presence of food and alert the other digestive organs to produce various gastric juices in preparation for digestion.
- The salivary glands in the mouth produce saliva which mixes with the food, acting as a lubricant and killing some of the microorganism’s present.
- The major salivary glands are:
  - Parotid
  - Submandibular
  - Sublingual
- The saliva also contains amylase, an enzyme which begins the chemical process to break starches down into sugars.
Tongue & Teeth

- The teeth have a mechanical function, crushing, grinding and tearing the food into smaller sizes and consistency suitable for swallowing.

- There are two types of teeth:
  - incisors at the front of the mouth, which cut and tear food.
  - molars, located in the middle and back of the mouth, which act to crush and grind the food.

- A band of muscle, known as the tongue, is covered with mucous membrane and contains papillae.

- In between these small bumps are the taste buds (sweet, sour, salty, savoury and bitter) that are identified by different parts of the tongue.

- The decision to swallow starts as a voluntary movement, but once swallowing begins the process becomes involuntary, and is controlled by the nervous system.

- The ball of food, once swallowed, is known as a bolus.

Khaleel Alyahya, PhD, MEd
Pharynx

- The **pharynx** is the part of the throat that lies directly behind the mouth.
- The pharynx is divided into three parts known as the **nasopharynx**, **oropharynx** and **laryngopharynx**.
- The nasopharynx lies behind the nose and above the soft palate.
- The mouth leads into the oropharynx.
- The human palatine tonsils and the nasopharyngeal tonsils are both made up of lymphoepithelial tissues and are believed to have a role in defending the body against inhaled or swallowed pathogens.
- The laryngopharynx is the common pathway for both air and food and connects to the esophagus.
Esophagus

- The bolus of food is directed by the pharynx into the esophagus where waves of peristalsis move it down to the stomach.

- The entrance to the stomach is guarded by the gastro-esophageal sphincter (also called the cardiac sphincter), a ring-like valve which detects the approach of the bolus, relaxes and opens to allow it into the stomach.

- The sphincter then closes, helping to ensure that the food only moves in one direction.

- The esophagus located posteriorly to the following structures: trachea, left recurrent laryngeal nerve, left principal bronchus, pericardium and left atrium.

- While it located anteriorly to the following structures: bodies of the thoracic vertebrae, thoracic duct, azygos veins, right posterior intercostal arteries and descending thoracic aorta.
Stomach

- Stomach has a C-shaped with 25cm long, and it is the dilated part of the alimentary canal.
- Much of the stomach is protected by the **lower ribs**.
- Located between the **esophagus** and the **small intestine**, and it is hidden by liver & diaphragm.
- Parts of stomach include **cardiac**, **fundus**, **body** and **pyloric** regions.
- Borders of stomach include **lesser** & **greater curvatures**.
- Surfaces of stomach include **anterior** and **posterior** surfaces.
- Two sphincters include lower **esophageal sphincter** and **pyloric sphincter**.
- The stomach has three mechanical processes:
  - **Stores** food and liquid in its upper part or fundus.
  - **Mixes** them up with various digestive juices through the muscular action of the middle-lower stomach or corpus,
  - **Moves** the partially digested mixture into small intestine through pylorus.
- The stomach also has chemical digestive processes which are triggered by the release of **gastrin**, a hormone, in the blood.
Small Intestine

- The small intestine (longest part of intestinal tract,) is consisting of duodenum, jejunum and ileum.
- As the chyme moves through the pyloric sphincter, it enters the first part of the small intestine, the duodenum where alkalis neutralize the acids from the stomach.
- Bile from the gallbladder and enzymes from the pancreas enter the duodenum through ducts and mix with mucus to coat the chyme.
- Most proteins, carbohydrates and fats are absorbed into the bloodstream in the duodenum.
- The second part of the small intestine is the jejunum where it absorbs more carbohydrates and proteins.
- The third part is ileum absorbs vitamin B12 and bile salts as well as any remaining nutrients.
- Peristaltic waves then move waste products through the ileocaecal valve into the large intestine.
The large intestine consists of the **caecum**, **colon** and **rectum**.

- The **caecum** is basically a holding bay between the small intestine and the remainder of the large intestine.
- It is also attached to the **appendix**, a blind-ended structure the principal purpose of which is unknown.
- The middle portion of the large intestine is called the **colon** and has four parts: **ascending**, **transverse**, **descending** and **sigmoid** colon.
- As it moves through these parts, salts, residual vitamins, minerals and water are extracted from the remainder of the ingested materials.
- What is left is now considered waste product.
- This product mixes with mucus and bacteria to become **faeces**.
- In the sigmoid colon, the walls retract forcing the faeces into the rectum where it is stored.
Anus

- The **anus** is a sphincter that relaxes to allow the feces stored in the rectum to be released to the external environment.
- This process is known as **defecation**.
Liver

- It is an accessory organ of the gastrointestinal located in the right upper quadrant of the abdomen.
- It is the largest visceral structure in the abdominal cavity.
- It has a vital role in helping the body to remove toxins, process nutrients and regulate metabolism.
- The posteroinferior surface lies in contact with esophagus, stomach, duodenum, right colic flexure, right kidney, suprarenal gland, and gallbladder.
- It is surrounded by fibrous capsule and partially covered by peritoneum.
- Liver is divided by falciform ligament into large right lobe and small left lobe.
- Functions of liver include:
  - Production and secretion of bile.
  - Metabolism of carbohydrates, lipids and proteins.
  - Filtration of the venous blood from the intestinal tract.
  - Synthesis of heparin.
  - Detoxication.
**Gallbladder**

- The gallbladder is a pear-shaped organ connected to the **liver** and **duodenum** via the hepatic duct and the common bile duct.

- The primary function is to **store** the bile created by the liver and make it more concentrated.

- Bile is used by the small intestine to **digest** fats and neutralize some acids so that they are easier to digest.
Pancreas

- The pancreas is a small glandular organ located behind the stomach and attached to the duodenum via the pancreatic duct.
- It has two major functions and is considered both an endocrine and exocrine gland.
- Its exocrine function is to produce digestive enzymes which pass through the pancreatic duct into the small intestine to help in the breaking down of fats, carbohydrates and proteins and in the neutralization of stomach acids.
- The important endocrine function of the pancreas is the production of insulin which regulates the levels of sugars in the blood.
- Insulin is produced by the islets of Langerhans, a small clump of cells in the pancreas.
- The pancreas also produces glucagon which helps with blood sugar regulation.
- It divided to head, neck, body and tail.
Blood Supply

- **Thoracic Aorta**
  - Esophageal branches

- **Thyrocerval Trunk**
  - Inferior Thyroid Artery

- **Celiac Trunk**
  - Common hepatic
    - Right gastric
  - Left gastric
  - Splenic

- **Superior mesenteric Artery**
  - Right colic
  - Middle colic
  - Ileecolic
  - Ileal and jejunal branches

- **Inferior mesenteric Artery**
  - Left colic
  - Sigmoid
  - Superior rectal

- **Internal iliac**
  - Middle rectal artery
Blood Drainage

- Brachiocephalic Trunk
  - Inferior Thyroid Vein
- Azygous Vein
- Hemiazygous Vein
- Splenic Vein
  - the short gastric
  - left gastroepiploic
  - inferior mediastinal and
  - pancreatic veins
- Superior Mesenteric Vein
  - the jejunal and ileal
  - ileocolic
  - right colic
  - middle colic
  - inferior pancreaticoduodenal
  - right gastroepiploic veins
- Inferior Mesenteric Vein
  - the superior rectal veins
  - the sigmoid veins
  - the left colic veins
- Internal iliac Vein
  - Middle rectal vein
  - Inferior rectal vein
Stomatitis

- Stomatitis is an inflammation of the mucous membrane lining of the mouth including the cheeks, gums, lips, tongue and palate.

- It can be caused by injury such as burns from hot food or drinks, poorly fitting oral appliances, cheek biting, mouth breathing and poor oral hygiene.
Barrett’s Oesophagus

- **Barrett’s oesophagus** is a pre-malignant condition in which the tissue lining the oesophagus is replaced by tissue that is similar to the lining of the intestine.
- The Barrett’s lining always begins at the bottom of the oesophagus and extends upward towards the mouth for varying distances.
- It is commonly found in people with gastro esophageal reflux disease (GORD).
- It can progress to adenocarcinoma of the oesophagus.
Gastric Carcinoma

- Gastric carcinoma is also called **stomach cancer**.
- Most gastric cancers are **adenocarcinomas**.
- The risk factors for developing stomach cancer are *Helicobacter pylori* (H. pylori) infection, cigarette smoking, excessive consumption of alcohol and a diet that is high in foods and beverages that contain nitrates and nitrites such as smoked and salted fish and meats and pickled vegetables.
- Symptoms may include anorexia, dysphagia, indigestion, bloating, nausea and haematemesis.
- Treatment for gastric cancer includes surgery, radiotherapy and chemotherapy.
Gastritis

- **Gastritis** is a condition in which there is an abnormal inflammation of the mucous lining of the stomach.
- Symptoms may include *dyspepsia*, *nausea* or *vomiting*.
- There are many causes of gastritis.
- One of the most common causes is infection by the **bacteria** *Helicobacter pylori*.
- Treating *H. pylori* infection is important as it may lead to gastric ulcer disease or cancer.
- Other causes of gastritis include prolonged use of alcohol or NSAIDs (*Nonsteroidal anti-inflammatory drugs*) such as aspirin, iron supplements and chemotherapy.
Gastro-Esophageal Reflux Disease (GORD) is a form of chronic heartburn caused by the **backflow** (reflux) of acidic stomach contents into the oesophagus.

This is often due to incompetence of the cardiac sphincter between the stomach and oesophagus.

It results in a severe burning pain in the oesophagus and can lead to **oesophagitis** or **ulceration**.
Cirrhosis

- **Cirrhosis** is a chronic disease in which the liver slowly deteriorates, with scar tissue replacing healthy liver tissue and partially blocking the flow of blood through the liver.

- This reduced blood flow affects the way the liver performs its functions.

- Excessive alcohol consumption and chronic **hepatitis B** and **C** are the most common causes of cirrhosis.

- Other conditions such as fatty liver disease associated with obesity, blocked bile ducts and haemochromatosis also cause cirrhosis.

- **Cirrhosis** cannot be cured so treatment aims to prevent the disease from progressing.

- Treatment will include avoidance of alcohol and other drugs, nutrition therapy and medications to treat specific complications or causes of the disease.

- If the cirrhosis progresses and the liver fails, a liver transplant may be required.
Hepatitis

- Hepatitis is an inflammation of the liver that can result in damage to the cells in the liver.
- It can lead to cirrhosis or cancer of the liver.
- Patients with hepatitis will have symptoms that include hepatomegaly, jaundice, clay-colored faeces, dark urine, abnormal liver function tests and generalised malaise.
- There are at least five viruses that cause different types of hepatitis.
- They are called hepatitis A, B, C, D and E.
- They all result in similar symptoms but differ in the way in which they are transmitted.
Questions?

alkhaleel@ksu.edu.sa