GIT II - DIGESTION

**Laboratory exercise and seminar in medical physiology**

Home preparation, study materials and learning objectives

**Learning objectives – what you should learn?**

* The student is able to explain the regulatory mechanisms (hormonal, etc.) of secretion of all digestive fluids (saliva, gastric, pancreatic and intestinal juices, and bile)
* The student will know the composition of digestive juices and the effects of each component
* The student will be able to describe and explain the protective mechanism of the stomach
* The student will be able to describe the process of digestion and absorption of the different components of food (sugars, fats, proteins, water, vitamins and minerals)

**Study materials**

* Lectures Digestion I and II

(<https://www.youtube.com/watch?v=1GJM82KWjDQ&ab_channel=%C3%9Astavfyziologie-P%C5%99edn%C3%A1%C5%A1ky> a <https://www.youtube.com/watch?v=lGObeOtNVf4&ab_channel=%C3%9Astavfyziologie-P%C5%99edn%C3%A1%C5%A1ky> )

* Textbook L. Constanzo - Physiology, 6th or 7th edition, chapter 8 (pp.345-398)

**Home preparation**

1) **Where and how is water absorbed in the digestive tract ?**

- Na+ and Ca++ ?

- Vitamin C ?

- Vitamin D ?

- Vitamin K ?

- Bile acids?

2) **Doplňte tabulku**

|  |  |  |
| --- | --- | --- |
| **Lipid soluble vitamins** | | |
| **Vitamin** | **Source** | **Function** |
| **Retinol, v. A** |  |  |
| **Calciferon, v. D** |  |  |
| **α-tocopherol, v. E** |  |  |
| **Fylochinon, v. K** |  |  |
| **Water soluble vitamins** | | |
| **Vitamin** | **Source** | **Function** |
| **Thiamin, v. B1** |  |  |
| **Riboflavin, v. B2** |  |  |
| **Niacin, v. B3** |  |  |
| **Pantothenic acid, B5** |  |  |
| **Pyrixidal, v. B6** |  |  |
| **Biotin, v. B7 (v. H)** |  |  |
| **Folic acid, v. B9** |  |  |
| **Cyanocobalamin, v. B12** |  |  |
| **Ascorbic acid, v. C** |  |  |
| **Mineral substances** | | |
| **Element** | **Source** | **Function** |
| **Ca,** calcium |  |  |
| **Cl,** clorine |  |  |
| **Cu,** copper |  |  |
| **F,** fluorine |  |  |
| **I,** iodine |  |  |
| **Fe,** iron |  |  |
| **Mg,** magnesium |  |  |
| **Mn,** manganese |  |  |
| **P,** phosphorus |  |  |
| **K,** potassium |  |  |
| **Na,** sodium |  |  |
| **S,** sulfur |  |  |
| **Zn,** zinc |  |  |

**3) Case report - Pathologically increased gastrin production**

Pathological increased gastrin production (increased HCl production, which directly damages the duodenum and stimulates pepsinogen production - duodenal ulcer)

Patient 25 years old, persistent diarrhea (+ steatorrhea) and abdominal pain, little relief with food.

* + X-ray of upper GIT + endoscopy: duodenal ulcer.
  + Basal gastric HCL secretion 12 mmol/hr (normal 1-5),
* reduced below normal by H2 receptor blocker (cimetidine), but only with large and frequent doses,
* this effect potentiated by a cholinergic antagonist.
* Inhibition of H/K ATPase (omeprazole) at normal doses reduced HCl production below normal levels.
  + Serum gastrin concentration 1145 pg/ml (normal 50-150),
* did not increase significantly after the test meal (approximately doubles transiently in healthy subjects).
  + Draining gastric juice with a probe after 24 h fixed the diarrhea.
  + Endoscopic biopsy of the gastric fundus mucosa: multiplied gastric glands + greater parietal cell density.

**Answer the Questions:**

* + Why might he have increased gastric HCl production?
  + What would you expect pepsinogen production to be?
  + Why does he have a duodenal ulcer?
  + Why does he not have a gastric ulcer?
  + What could be causing the increased gastrin?
  + Why does he have steatorrhea?
  + Why does he have diarrhea?
  + Why does he have increased densities of parietal cells in the mucosal fundus?
  + Why hasn't her gastrin increased after eating?
  + Why does cimetidine work for her? And why only in such high doses?
  + Why was the effect of cimetidine on HCl potentiated by a cholinergic antagonist?
  + How does omeprazole reduce HCl production? Why is a nominal dosage sufficient?

**Topics of student’s presentations**

**8.1 List and explain the function of the protective and aggressive factors that influence the state of of the gastric mucosa**

**8.2 Describe the principle the function and importance of bile acids in digestion**