TUSPM Physiology Exam 3, Gastrointestinal Physiology, Dr. Ryan
November 2, 2010

1. As member of a drug development team you recently synthesized a compound that has the following physiological effects:

   - Inhibition of the gastric emptying of liquids
   - Stimulation of pancreatic bicarbonate secretion
   - Inhibition of the gastric emptying of solids
   - Stimulation of hepatic bicarbonate secretion

   The biological actions of the drug are similar to the physiological effects of

   A. gastrin
   B. histamine
   C. secretin
   D. acetylcholine

2. A newly developed drug is shown to decrease gastric acid secretion in response to ingestion of a meal or in response to stimulation with acetylcholine, histamine, or gastrin. The drug is believed to block receptors normally stimulated by

   A. histamine.
   B. somatostatin.
   C. acetylcholine.
   D. gastrin.

3. Which one of the following statements best describes water and electrolyte absorption from the GI tract?

   A. Most water and electrolytes absorbed from the GI tract come from ingested fluids.
   B. The small intestine and colon have similar daily absorptive capacities
   C. The majority of absorption occurs in the ileum.
   D. Water absorption is closely coupled to sodium transport.

4. Which one of the following solutions would empty the slowest from the stomach?

Choice	Solution	Caloric Density	Meal Make Up
A	Isotonic	50 Kcal/Kg	carbohydrates
B	Isotonic	50 Kcal/Kg	lipids
C	Isotonic	50 Kcal/Kg	proteins
D	Isotonic	50 Kcal/Kg	Proteins plus carbohydrates

5. The accommodation reflex is activated by distension of the

   A. smooth muscle region of the esophageal body.
   B. orad stomach.
   C. caudad stomach.
   D. small intestine.

6. You are investigating an area of the GI tract that is characterized by a contractile frequency of 5-6 contractions per minute and the absorption of intrinsic factor. You are studying the physiology of the

   A. duodenum.
   B. jejunum.
   C. ileum.
   D. colon.

7. Which one of the following statements about the stomach is correct?

   A. Undigested food residue empties from the stomach during the digestive period
   B. Acid secretion decreases as the pH of the stomach goes below 3.
   C. Intrinsic factor is secreted by the Chief cells.
   D. Removal of the pyloric sphincter leads to a decrease in gastric emptying of liquids.

8. Despite warnings to avoid drinking water from contaminated sources while visiting Mexico, a student on spring break became acutely ill after becoming infected with a strain of *Escherichia coli* that causes secretory diarrhea. After experiencing the loss of 10 liters of isotonic watery stool over a 48 hour period, the student went to a local health clinic where it was determined that his blood pressure was 80 mm Hg /40 mm Hg, his heart rate was 120 beats per minute, and his serum potassium was 2.3 mEq/L (below normal). After treatment with an antibiotic, antidiarraheal medication, and an oral rehydration solution **(sugar, electrolytes and water**), the student's diarrhea subsided and his lab values returned to normal.

   The improvement in the patient's condition upon administration of an oral hydration solution can be attributed to the fact that the solution promotes an increase in small intestinal

   A. electrogenic sodium absorption
   B. sodium-glucose transport
   C. sodium-hydrogen exchange
   D. electroneutral sodium transport

9. The *E. coli* mediated diarrhea (see above question) is the result of a decrease in the small intestinal

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   B. sodium-glucose transport
   C. sodium-hydrogen exchange
   D. electroneutral sodium transport

10. As a result of the diarrhea (above question), the patient experiences muscle weakness and irritability due to decreased serum potassium levels, 2.3 mEq/L (normal: 3.5 to 5.5 mEq/L). The hypokalemia developed as the result of increased secretion of potassium from the

    A. duodenum
    B. jejunum
    C. ileum
    D. colon

11. Primary esophageal peristalsis

    A. occurs in response to distension of the smooth muscle portion of the esophagus.
    B. requires activation of the medullary swallowing center.
    C. involves only the skeletal muscle portion of the esophagus.
    D. can only be initiated voluntarily

12. The primary stimulus for the release of cholecystokinin (CCK) from the small intestine is

    A. acid in the small intestine.
    B. osmoles in the small intestine.
    C. partially digested fats/proteins in the small intestine.
    D. distension of the small intestine.

13. Which one of the following substances is an example of a paracrine secretion?

    A. histamine.
    B. intrinsic factor.
    C. acetylcholine.
    D. gastrin.

14. Inflammation or surgical removal of the distal ileum will have the greatest inhibitory effect on the small intestine absorption of

    A. iron.
    B. vitamin B_{12}.
    C. calcium.
    D. glucose.

15. The principal absorptive process for salt and water in the colon is

    A. electroneutral sodium absorption.
    B. electrogenic sodium absorption.
    C. sodium-nutrient coupled absorption.
    D. Na^+/H^+ exchange mediated sodium absorption.

16. Which one of the following is identified as an anatomical sphincter? The

    A. lower esophageal sphincter.
    B. pyloric sphincter.
    C. sphincter of Oddi.
    D. upper esophageal sphincter.

17. Your patient, who is being treated with a macrolide antibiotic (erythromycin), experiences severe abdominal cramping within one hour of taking the medication. The symptoms suggest the initiation of migrating motor complexes. Under normal physiological conditions, the migrating complexes are associated with a rise in the circulating levels of

    A. motilin
    B. gastrin
    C. secretin
    D. cholecystokinin

18. Cutting the vagus nerve that innervates the antral region of the stomach will result in

    A. a decrease in maximal acid secretion.
    B. an increase in the gastric emptying of solids.
    C. a decrease in the gastric emptying of liquids.
    D. an increase in the circulating levels of gastrin.

19. Which one of the following is principally responsible for the generation of high pressure at the lower esophageal sphincter?

    A. Tonic excitatory input from the sympathetic nervous system.
    B. Circulating gastrin levels.
    C. Tonic excitatory input from the parasympathetic nervous system.
    D. The myogenic properties of the LES smooth muscle.

20. Small intestine absorption of bicarbonate is facilitated by

    A. Na/H exchange.
    B. electrogenic sodium absorption.
    C. electroneutral sodium absorption.
    D. sodium-nutrient coupled absorption

21. Which one of the following can produce gastric ulcers?

    A. Excess ingestion of aspirin.
    B. Chronic alcoholism.
    C. Excessive reflux of bile from the intestine into the stomach.
    D. Each one of the above situations can produce an ulcer.

22. Which one of the following principally occurs in the duodenum?

    A. Vitamin B_{12} absorption.
    B. Bicarbonate absorption.
    C. Calcium absorption.
    D. Bile salt absorption.

23. Which one of the following treatments would result in an increased maximal acid output in response to ingestion of a meal?

    A. Acidification of the gastric antrum to a pH below 3.
    B. Administration of an H2 receptor antagonist.
    C. Vagotomy to the parietal cell area of the stomach.
    D. Administration of a somatostatin antagonist.

24. The major inhibitory neurotransmitter released from enteric neurons is

    A. somatostatin.
    B. gastrin releasing peptide.
    C. vasoactive intestinal peptide.
    D. enterogastrone.

25. Which one of the following will be increased in a patient with duodenal ulcer disease (inflammation of the duodenal mucosal lining) as compared to normal following the ingestion of a mixed meal?

    A. The gastric emptying of liquids
    B. The gastric emptying of solids
    C. The maximal acid output of the stomach
    D. All of the above will be increased

Answer Key:

1 = C	6 = C	11 = B	16 = D	21 = D
2 = A	7 = B	12 = C	17 = A	22 = C
3 = D	8 = B	13 = A	18 = A	23 = D
4 = B	9 = D	14 = B	19 = D	24 = C
5 = B	10 = D	15 = B	20 = A	25 = D