



Secundum Artem

*Current & Practical Compounding
Information for the Pharmacist.*

*An ongoing CE Program provided by a grant
from Paddock Laboratories, Inc.*

COMPOUNDING FOR GASTROINTESTINAL DISORDERS

GOALS AND OBJECTIVES

Goal: To provide pharmacists with background, treatment and compounding options for gastrointestinal disorders.

Objectives: After reading and studying the article, the reader will be able to:

1. Discuss the basic anatomy and physiology of the gastrointestinal tract.
2. List at least five general gastrointestinal tract disorders.
3. Describe general methods of treating gastrointestinal disorders.
4. Discuss active ingredients as well as several compounded formulas used in treating common gastrointestinal disorders.

INTRODUCTION

There are many disorders involving the gastrointestinal (GI) tract, a large and very complex system of organs in the body. Disorders of the GI tract manifest themselves in various ways with different symptoms. In general, they tend to modify our behavior and lifestyle during their occurrence, i.e., nausea, vomiting, diarrhea, heartburn and dyspepsia. There are many treatment options available including many that can be compounded for specific patients. Some effective products have been discontinued over the years but can still be made available through compounding.

ANATOMY AND PHYSIOLOGY

The GI system consists of the alimentary canal and the accessory organs (liver, gall bladder, pancreas, etc.). The GI tract serves two major functions. First is the digestion, or breaking down of food and fluid into simple chemicals that can be absorbed into the bloodstream and transported throughout the body. Second is the elimination of waste products through excretion stool.

The alimentary canal begins at the mouth and extends to the anus; it includes the pharynx, esophagus, stomach, small intestine and large intestine. The mouth is involved with breaking up (chewing) and moistening the food (saliva). The pharynx aids swallowing by grasping food and propelling it toward the esophagus. The stomach, a collapsible, pouchlike structure, serves as a temporary storage for

food, breaks down the food into chyme and moves the gastric contents into the small intestine. The small intestine consists of the duodenum, jejunum and ileum and serves to complete food digestion, absorbs food molecules through its wall into the circulatory system and secretes hormones that help control the secretion of bile, pancreatic fluid and intestinal fluid. Lastly, the large intestine consists of six segments: cecum, ascending colon, transverse colon, descending colon, sigmoid colon and the rectum. It functions to absorb water, secrete mucus and to eliminate digestive wastes.

Drugs, diseases, dysfunctional portions of the alimentary canal or accessory organs may result in GI disorders. These can include constipation, diarrhea, dyspepsia, heartburn, gas, nausea and vomiting.

COMMON GASTROINTESTINAL DISORDERS

Constipation

What is the frequency of "normal" bowel movements? If one listens to the advertorials on radio and television promoting "cleansing the toxins from the body", one is led to believe that at least one bowel movement daily is necessary for good health. In the general population, however, bowel movements range from three to twelve per week. Constipation has been defined as having two or fewer bowel movements per week or when there is excessive difficulty and straining during defecation. Causative factors for constipation include inadequate fiber or fluid intake, poor bowel habits, systemic disease

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(endocrine, metabolic, neurologic), medications (narcotics, diuretics, calcium channel blockers and others), structural abnormalities (anorectal), slow colonic transit, pelvic floor dysfunction and irritable bowel syndrome.¹

Diarrhea

Diarrhea is an abnormally frequent discharge of semisolid or fluid fecal matter from the bowel. Acute onset diarrhea lasting less than 3 weeks is most commonly caused by infectious agents, bacterial toxins or drugs. Chronic diarrhea has been categorized as osmotic, malabsorptive conditions, secretory conditions, inflammatory conditions, motility disorders, irritable bowel, chronic infections and factitious diarrhea. Approximately 10 liters of fluid enter the duodenum daily and all but about 1.5 liters is absorbed by the small intestine; most of the remaining is absorbed in the colon with about 100 mL lost in the stool.¹

Dyspepsia and Heartburn

Dyspepsia occurs in about one-fourth of the adult population and accounts for 3% of general medical visits. It has been defined as pain or discomfort centered in the upper abdomen and may be characterized by, or associated with, abdominal fullness, burning, bloating, belching, nausea, retching or vomiting. Heartburn is actually a different disorder with gastroesophageal reflux nearly always present. It can be caused by food or drug intolerance (overeating, eating too quickly, eating high-fat foods, eating when stressed and drinking excessive coffee or alcohol). Heartburn may also be caused by GI tract dysfunction (peptic ulcer disease), *Helicobacter pylori* (*H. pylori*) infection, pancreatic disease, biliary tract disease, and many other conditions, including diabetes and thyroid disease. It is often caused by food poisoning, infectious gastroenteritis or drugs. Acute onset vomiting may be caused by peritoneal irritation, acute gastric or intestinal obstruction or pancreatic-biliary disease. Persistent vomiting may be caused by pregnancy, gastric outlet obstruction, gastroparesis, intestinal dysmotility, psychogenic or CNS system disorders. Vomiting immediately after meals may be a result of bulimia or psychogenic causes.¹

Intestinal Gas

Gas can escape from the GI tract either as belching or flatus. Belching, or eructation, can be either involuntary or voluntary and involves the release of gas from the stomach or esophagus through the oral cavity. Most frequently, it occurs after meals when, due to distention of the stomach, the lower esophageal sphincter is relaxed. Belching is normal and does not usually indicate a GI dysfunction. Flatus is escape of gases from the anus; the rate and volume is highly variable. Flatus results from either swallowed air or bacterial fermentation of undigested carbohydrates. Most of the swallowed air that is not belched, will depart as flatus and may be up to 500 mL per day. Bacterial fermentation leads to the production of gas, especially hydrogen, carbon dioxide and methane. Most of this fermentation occurs in the colon. Certain foods may result in more flatus, including those containing fructose, lactose, sorbitol, trehalose, raffinose, stachyose (legumes, cruciferous vegetables) and others. It is difficult to determine an abnormal from a normal amount of flatus. If a problem, the diet may be altered to eliminate causative foods.¹

Nausea and Vomiting

Nausea is a vague and very disagreeable sensation of queasiness or sickness that may or may not include vomiting. Vomiting sometimes follows, along with retching (spasmodic respiratory and abdominal movements). The medullary vomiting center that causes vomiting can be stimulated by four different sources, including:(1) afferent vagal fibers and splanchnic fibers from the GI viscera; (2) fibers of the

vestibular system, having high concentrations of histamine H₁ and muscarinic cholinergic receptors; (3) higher central nervous system (CNS) centers where certain sights, smells or emotional experiences may trigger vomiting and (4) the chemoreceptor trigger zone, located outside the blood-brain barrier in the area behind the medulla may be stimulated by drugs, chemotherapeutic agents, toxins, hypoxia, uremia, acidosis and radiation therapy.¹

TREATMENT OF GASTROINTESTINAL DISORDERS

Constipation

Treatment often begins with implementing proper dietary fluid and fiber intake. If more serious, stool surfactants (docusate sodium), mineral oil, osmotic or saline laxatives, nonabsorbable carbohydrates (sorbitol 70% or lactulose), polyethylene glycol solution and stimulants (bisacodyl, castor oil). If impacted, enemas (saline, mineral oil) or digital disruption of the material may be used. In any case, long-term management involves maintaining soft stools and regular bowel movements.

Diarrhea

Diarrhea has been treated with diet, rehydration, antidiarrheal agents and antibiotic therapy. Diet involves oral fluids containing carbohydrates and electrolytes, often resting the bowel by avoiding high-fiber foods, fats, milk products, caffeine and alcohol. Encouraged items are fruit drinks, tea, flat carbonated beverages, and soft, easily digested foods, such as soups and crackers. Rehydration with fluids containing glucose, sodium, potassium, chloride and bicarbonate or citrate is used. Included in this would be the commercial products Pedialyte and Gatorade that are readily available. Antidiarrheal agents include loperamide, bismuth subsalicylate and diphenoxylate with atropine. If moderate to severe fever, tenesmus or bloody stools are present, then antibiotic therapy may be indicated. Drugs of choice include the fluoroquinolones (ciprofloxacin, ofloxacin, norfloxacin), trimethoprim-sulfamethoxazole, erythromycin or metronidazole. Treatment of chronic diarrhea is dependent upon the causes.

Dyspepsia and Heartburn

Dyspepsia and heartburn can generally be treated by a reduction in alcohol and caffeine intake, a food diary to determine the offending agents and a number of drugs, including H₂-receptor antagonists (ranitidine, nizatidine, famotidine, cimetidine) or proton pump inhibitors (omeprazole, rabeprazole, lansoprazole, pantoprazole). In some patients, low doses of antidepressants may benefit. A prokinetic agent (metoclopramide) is helpful by improving symptoms in up to 60% of the cases. Finally, anti-*H. pylori* treatment may benefit if the causative factor is *H. pylori*.

Intestinal Gas

Flatus has been treated by altering the diet, including eliminating beans, peas, lentils, broccoli, Brussels sprouts, cauliflower, cabbage, parsnips, onions, beer and coffee. Foul odor flatus may be caused by garlic, onion, eggplant, mushrooms and certain herbs and spices. Alpha-D-galactosidase, an enzyme, is available as a nonprescription agent (Beano) that will reduce gas caused by foods containing raffinose and stachyose (cruciferous vegetables, legumes, nuts and some cereals). Activated charcoal and simethicone have also been used.

Nausea and Vomiting

Most cases of acute vomiting are mild, self-limited and really require no specific treatment. Clear liquids are recommended as are small quantities of dry foods (crackers). For severe acute vomiting, hospitalization may be required. Antiemetic medications include the serotonin

5-HT₃ receptor antagonists such as ondansetron, granisetron and dolasetron. Dopamine antagonists such as the phenothiazines (prochlorperazine, promethazine), butyrophenones and substituted benzamides have antiemetic properties, as do antihistamines and anticholinergics (meclizine, dimenhydrinate, transdermal scopolamine), sedatives (benzodiazepines), and corticosteroids (dexamethasone, methylprednisolone).

DOSAGE FORMS USED IN TREATING GASTROINTESTINAL DISORDERS

Dosage forms commonly used in the treatment of GI disorders include oral solids, oral liquids, suppositories and even nasal sprays. Dosage forms for constipation include oral solids, oral liquids, suppositories and enemas; for diarrhea usually include oral solids and oral liquids; for dyspepsia and heartburn generally include oral solids and liquids; for flatulence include oral solids and liquids; and, for nausea and vomiting include oral solids, oral liquids, topicals, nasal sprays and injections.

QUALITY CONTROL

The compounding pharmacist should follow standard quality control procedures. These include checking the volume/weight, pH, viscosity, appearance and odor of these compounded preparations.²

STABILITY AND BEYOND-USE DATES FOR GASTROINTESTINAL DISORDERS

The following beyond-use recommendations can be exceeded if there is valid scientific information to support the stability of the product. Beyond-use dates for water-containing formulations are no later than 14 days, when stored at cold temperatures, for products prepared from ingredients in solid form. If nonaqueous liquids are prepared, the beyond-use date recommendation is no later than 25% of the time remaining on the product's expiration date (if a commercial product is the source of the active drug) or six months, whichever is earlier and six months if prepared from ingredients with a USP-NF monograph. For all other products, the beyond-use recommendation is the intended duration of therapy or 30 days, whichever is earlier.²

FORMULATIONS FOR TREATING GASTROINTESTINAL DISORDERS

Formulations for Treating Constipation

Rx Bisacodyl 10 mg Suppositories (#12)

Bisacodyl	120 mg
Polybase	qs

It is necessary to calibrate the mold being used to determine the quantity of Polybase to be used for this formulation. Melt the Polybase to about 60-70° C. Incorporate the bisacodyl and mix well. Begin cooling and pour into molds. Cool, trim if necessary, package and label.

Rx Glycerin Suppositories (#100)

Glycerin	180 g
Sodium stearate	17.8 g
Purified water	9 mL

This is for a 2.077 g suppository. Heat the glycerin to 120° C. Slowly incorporate the sodium stearate and mix until complete solubilization and uniformity is achieved. Cool to 105° C and slowly add the purified water. Mix for 20 minutes then pour into suppository molds. Package and label.

Formulations for Treating Diarrhea

Rx Bismuth Subsalicylate 87.5 mg/5 mL

Bismuth subsalicylate		1.75 g
Ora Plus		50 mL
Ora-Sweet or Ora-Sweet SF	qs	100 mL

Add the bismuth subsalicylate to the Ora Plus and mix well. Add sufficient Ora Sweet or Ora-Sweet SF to volume and mix well. Package and label.

Rx Loperamide Hydrochloride 1 mg/5 mL Oral Liquid

Loperamide hydrochloride		20 mg
Ora-Sweet or Ora-Sweet SF	qs	100 mL

Dissolve the loperamide hydrochloride powder in sufficient Ora-Sweet or Ora Sweet SF to volume and mix well. Package and label.

Formulations for Treating Dyspepsia and Heartburn

Rx Aluminum Hydroxide and Magnesium Hydroxide Suspension

Aluminum hydroxide gel		36 g
Magnesium hydroxide		32 g
Bentonite		0.5 g
Xanthan gum		200 mg
Sorbitol 70%		20 g
Methylparaben		50 mg
Propylparaben		20 mg
Flavor	qs	
Purified water	qs	100 mL

Heat about 50 mL of purified water to about 80° C. Add the methylparaben and propylparaben and mix until dissolved. Slowly, sprinkle on the bentonite and xanthan gum and mix until uniform and smooth. Remove from heat. Add the aluminum hydroxide gel, magnesium hydroxide and sorbitol and mix well. After cooling, add the flavor and sufficient purified water to volume and mix well.

Rx Calcium Carbonate Suspension

Calcium carbonate		8 g
Ora Plus		35 mL
Ora-Sweet or Ora-Sweet SF	qs	100 mL

Mix the calcium carbonate with the Ora Plus until smooth and uniform. Incorporate the Ora-Sweet or Ora-Sweet SF to volume and mix well. Package and label.

Rx Lansoprazole 10 mg Chewable Tablets

Lansoprazole		1 g
Calcium lactate		17.5 g
Calcium glycerophosphate		17.5 g
Sodium bicarbonate		25 g
Aspartame calcium		50 mg
Silicon dioxide colloidal		1.2 g
Starch		1.5 g
Croscarmellose sodium		1.2 g
Dextrose, anhydrous		1 g
Peppermint flavor		0.3 mL
Maltodextrin		300 mg
Mannitol		300 mg
Pregelatinized starch		300 mg

Blend the powders and flavor together and pass through a 60 mesh sieve. Compress into 672 mg tablets using a 15 mm punch and die. Package and label.

Rx Metoclopramide Hydrochloride 4 mg/mL Oral Solution

Metoclopramide	400 mg
Saccharin sodium	75 mg
Sorbic acid	100 mg
Sodium metabisulfite	150 mg
Polyoxyl 35 castor oil	10 mg
Sodium citrate	50 mg
Citric acid monohydrate	85 mg
Purified water	qs 100 mL

Heat 80 mL of purified water to 90 to 95° C. Add saccharin sodium and sorbic acid with stirring until clear. Cool to room temperature. Add the polyoxyl 35 castor oil (Cremophor EL) and stir until dissolved. Add the sodium metabisulfite, sodium citrate and citric acid and stir until dissolved. Add the metoclopramide hydrochloride and stir until dissolved. Adjust pH to 3.5 to 3.6 using 5% aqueous citric acid or sodium citrate. Add sufficient purified water to volume and mix well. Package and label.

Formulations for Treating Intestinal Gas

Rx Simethicone Drops

Simethicone emulsion 30%	14.4 g
Polyethylene glycol 6000	6 g
Xanthan gum	150 mg
Methylcellulose 4000	150 mg
Potassium sorbate	150 mg
Methylparaben	120 mg
Propylparaben	20 mg
Saccharin sodium	150 mg
Banana (banana green) flavor	qs
Citric acid monohydrate	100 mg
Sodium citrate	25 mg
Purified water	qs 100 mL

Heat 25 mL of purified water to 90° C in a beaker. Add the methylparaben and propylparaben and stir until dissolved. Add the polyethylene glycol 6000 and mix until a clear solution is obtained; then cool to room temperature and add the sodium citrate and citric acid monohydrate and stir until dissolved. In a separate container, place about 52 mL of purified water and heat to 65-70° C. Remove half the hot water and place in a second container. To one, disperse the xanthan gum and mix until uniform. In the second container of hot purified water, sprinkle the methylcellulose 4000. To the methylcellulose dispersion, add the parabens and polyethylene glycol mixture followed by the xanthan gum mixture and mix until uniform. Dissolve the potassium sorbate and saccharin sodium in about 2 mL of purified water and add to the mixture. Add the simethicone emulsion 30% and mix well. Add the flavor and mix well. Adjust the pH to between 4.4 and 4.6 using citric acid or sodium citrate 5% solutions. Add sufficient purified water to volume and mix well. Package and label.

Formulations for Treating Nausea and Vomiting

Rx Metoclopramide Hydrochloride 25 mg Suppositories #12

Metoclopramide hydrochloride	300 mg
Fattibase	qs

Calibrate the mold to be used to determine the quantity of Fattibase required. Using low heat, melt the Fattibase and incorporate the metoclopramide hydrochloride and mix well. Remove from heat and allow to cool slightly. Pour into the molds, allow to cool and trim if necessary. Package and label.

Rx Metoclopramide, Dimenhydrinate and Dexamethasone Suppository #12

Metoclopramide hydrochloride	240 mg
Dimenhydrinate	300 mg
Dexamethasone	120 mg
Fattibase	qs

Calibrate the mold to be used to determine the quantity required. Using low heat, melt the Fattibase and incorporate the metoclopramide hydrochloride, dimenhydrinate and dexamethasone and mix well. Remove from heat and allow to cool slightly. Pour into the molds, allow to cool and trim if necessary. Package and label.

Rx Metoclopramide Hydrochloride 1 mg/mL Oral Liquid

Metoclopramide hydrochloride	100 mg
Ora-Sweet or Ora-Sweet SF	qs 100 mL

Dissolve the metoclopramide hydrochloride powder in sufficient Ora-Sweet or Ora-Sweet SF to volume and mix well. Package and label.

Rx Metoclopramide Hydrochloride 100 mg/mL Nasal Solution

Metoclopramide hydrochloride	10 g
Hydrochloric acid or sodium hydroxide	qs pH 6-7
Methylparaben	50 mg
Propylparaben	20 mg
Sterile water for injection	qs 100 mL

Note: This is a high risk preparation and should be compounded in compliance with US Pharmacopeia Chapter <797>.

Heat about 90 mL of sterile water for injection to about 80° C and dissolve the methylparaben and propylparaben, followed by cooling to room temperature. Dissolve the metoclopramide hydrochloride and adjust the pH using either hydrochloric acid 10% solution or sodium hydroxide 10% solution. Add sufficient sterile water for injection to volume and mix well. Sterile filter into sterile containers. Package and label.

Rx Promethazine Hydrochloride 125 mg/mL Nasal Spray

Promethazine hydrochloride	12.5 g
Disodium edetate	10 g
Calcium chloride	4 mg
Sodium metabisulfite	25 mg
Phenol	500 mg
Acetic acid:sodium acetate buffer	qs pH 4 to 5.5
Sterile water for injection	qs 100 mL

Note: This is a high risk preparation and should be compounded in compliance with US Pharmacopeia Chapter <797>.

Dissolve the ingredients in about 85 mL of sterile water for injection. Adjust the pH as needed using the acetic acid:sodium acetate buffer to a pH of 4 to 5.5. Add sufficient sterile water for injection and mix well. Sterile filter into sterile containers. Package and label.

Table 1: Drugs Commonly Used in Treating Gastrointestinal Disorders

Constipation

Bisacodyl
 Carboxymethyl cellulose sodium
 Castor oil
 Docusate calcium
 Docusate sodium
 Glycerin
 Lactulose
 Magnesium citrate
 Magnesium hydroxide
 Magnesium sulfate
 Malt soup extract
 Methycellulose
 Mineral oil
 Polycarbophil
 Plantago seeds
 Sodium phosphate, Dibasic
 Sodium phosphate, Monobasic
 Sorbitol
 Polyethylene glycol 3350 solution

Diarrhea

Bismuth subsalicylate
 Digestive enzymes
 Diphenoxylate with atropine
 Loperamide

Dyspepsia and Heartburn

Aluminum hydroxide
 Calcium carbonate
 Cimetidine
 Famotidine
 Lansoprazole
 Magaldrate
 Magnesium oxide/hydroxide
 Metoclopramide
 Nizatidine
 Omeprazole
 Pantoprazole
 Rabeprazole
 Ranitidine
 Sodium bicarbonate

Intestinal Gas

Alpha-D-Galactosidase
 Charcoal, Activated
 Lactase
 Simethicone

Nausea and Vomiting

Benzodiazepines
 Cyclizine
 Dexamethasone
 Dimenhydrinate
 Meclizine HCl
 Methylprednisolone
 Phosphoric acid/dextrose/fructose
 Prochlorperazine
 Promethazine
 Scopolamine

Rx Promethazine Hydrochloride 12.5 mg/0.1 mL in Pluronic Lecithin Organogel

Promethazine hydrochloride	12.5 g
Propylene glycol	15 mL
Lecithin:Isopropyl palmitate solution	22 mL
Pluronic F127 20% Gel	qs 100 mL

Mix the promethazine hydrochloride with the propylene glycol to a smooth paste. Add the lecithin:isopropyl palmitate solution and mix well. Add the Pluronic F127 to volume and mix using a shearing action mixing method. Package and label.

Rx Scopolamine 0.25 mg/0.1 mL in Pluronic Lecithin Organogel

Scopolamine hydrobromide	250 mg
Purified water	5 mL
Lecithin:Isopropyl palmitate solution	22 mL
Pluronic F127 20% Gel	qs 100 mL

Dissolve the scopolamine hydrobromide in the purified water and add to about 50 mL of the Pluronic F127 gel and mix well. Incorporate the lecithin:isopropyl palmitate solution and mix well. Add sufficient Pluronic F127 to volume and mix using a shearing action mixing method. Package and label.

Rx Scopolamine Hydrobromide (200 mcg/100 mg) Medication Stick

Scopolamine hydrobromide	200 mg
White wax	30 g
Cetyl esters wax	30 g
Mineral oil	40 g

Melt the white wax and cetyl esters wax in a beaker. Stir in the mineral oil and mix well. Remove from heat and stir in the scopolamine hydrobromide and mix well. Allow to cool until it starts to thicken then pour into medication stick molds/containers. Package and label.

REFERENCES

1. McQuaid KR. Alimentary Tract. In Tierney LM Jr, McPhee SJ, Papadakis MA. Current Medical Diagnosis & Treatment 2003, 42nd Ed. New York: Lange Medical Books/McGraw-Hill,2002, pp 522-582.
2. US Pharmacopeial Convention, Inc. *United States Pharmacopeia 27/National Formulary 22*. Rockville, MD:US Pharmacopeial Convention, Inc; 2004; 2345-2349.

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Please circle the most appropriate answer for each of the following questions. There is only ONE correct answer per question.

1. The gastrointestinal system consists of the:
 - a. alimentary canal
 - b. liver
 - c. gall bladder
 - d. pancreas
 - e. all the above
2. The purpose of the gastrointestinal system is to:
 - I. digest food II. expel food waste III. eliminate excess water
 - a. I only
 - b. III only
 - c. I and II only
 - d. II and III only
 - e. I, II and III
3. The function of the large intestine is to:
 - I. absorb water II. secrete mucus III. eliminate digestive waste
 - a. I only
 - b. III only
 - c. I and II only
 - d. II and III only
 - e. I, II and III
4. If one has _____ bowel movements _____, he/she may be experiencing constipation.
 - I. two or fewer; per week II. straining or difficult; anytime
 - III. only 1; per day
 - a. I only
 - b. III only
 - c. I and II only
 - d. II and III only
 - e. I, II and III
5. Approximately how many liters of fluid enter the duodenum daily?
 - a. 1-2
 - b. 3-5
 - c. 6
 - d. 10
 - e. 15
6. Components of intestinal gas may include:
 - a. swallowed air
 - b. methane
 - c. carbon dioxide
 - d. all of the above
 - e. none of the above
7. A commonly used drug to treat dyspepsia and heartburn includes:
 - a. bisacodyl
 - b. plantago seeds
 - c. ranitidine
 - d. alpha-d-galactosidase
 - e. dimenhydrinate
8. Treatment of constipation may involve:
 - I. dietary fluid and fiber intake II. docusate sodium III. sorbitol
 - a. I only
 - b. III only
 - c. I and II only
 - d. II and III only
 - e. I, II and III
9. The feeling of nausea can arise from which of the following area(s) of the body?
 - a. GI tract
 - b. vestibular system
 - c. central nervous system
 - d. chemoreceptor trigger zone
 - e. all the above
10. Agents used to treat diarrhea include all but which of the following?
 - a. bismuth subsalicylate
 - b. diphenoxylate with atropine
 - c. loperamide
 - d. metoclopramide
 - e. rehydration fluids
11. My practice setting is:
 - a. Community-based c. Hospital-based
 - b. Managed care-based d. Consultant and other
12. The quality of the information presented in this article was:
 - a. Excellent b. Good c. Fair d. Poor
13. The test questions correspond well with the information presented.
 - a. Yes b. No
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