



W-F Professional Associates, Inc. 400 Lake Cook Rd., Suite 207 Deerfield, IL 60015 847-945-8050

September 2007 "Nonprescription Antidiarrheal Treatment" 707-000-07-009-H01



THIS MONTH--
"Nonprescription
Antidiarrheals"

RENEWAL STATEMENTS FOR NEXT YEAR HAVE BEEN MAILED. SEND THEM BACK NOW WITH PAYMENT & SAVE.

CONSIDER DOWNLOADING LESSONS EACH MONTH FROM OUR WEBSITE, INSTEAD OF RECEIVING MAILED COPIES, & SAVE MORE.

MISSING A LESSON? IT'S EASY TO GO TO OUR WEBSITE, & DOWNLOAD WHAT YOU NEED. (www.wfprofessional.com)

ALL CREDIT STATEMENTS FOR 2007 WILL BE MAILED NEAR THE END OF THE YEAR. IF YOU HAVE SPECIAL REQUIREMENTS, CONTACT US, & WE WILL ACCOMMODATE YOUR NEEDS.

Many of your requests are for us to present lessons that discuss nonprescription medications. In this lesson we have responded to your suggestions, and we review Nonprescription Antidiarrheal Treatment. This lesson provides 1.25 hours (0.125 CEUs) of credit, and is intended for pharmacists in all practice settings.

The program ID # for this lesson is 707-000-07-009-H01.

Pharmacists completing this lesson by September 30, 2010 may receive full credit.

To obtain continuing education credit for this lesson, you must answer the questions on the quiz (70% correct required), and return the quiz. Should you score less than 70%, you will be asked to repeat the quiz. Computerized records are maintained for each participant.

If you have any comments, suggestions or questions, contact us at the above address, or call toll free 1-800-323-4305. (In Alaska and Hawaii phone 1-847-945-8050). **Please write your ID Number (the number that is on the top of the mailing label) in the indicated space on the quiz page** (for continuous participants only).

The objectives of this lesson are such that upon completion the participant will be able to:

1. Describe the epidemiology associated with diarrhea.
 2. List & define the types of diarrhea.
 3. Discuss the etiology of acute diarrhea.
 4. Comment upon the significance of Traveler's Diarrhea.
 5. Describe the complications associated with diarrhea.
 6. Categorize drugs used in nonprescription antidiarrheal remedies & describe their side effects.
-

All opinions expressed by the author/authors are strictly their own and are not necessarily approved or endorsed by W-F Professional Associates, Inc. Consult full prescribing information on any drugs or devices discussed.

INTRODUCTION

Diarrhea is extremely common and may be encountered by everyone. It is characterized by a significant increase in bowel reactions and liquidity of stool. Numerically, a diarrhea episode is present if a person experiences 3 or more watery stools in 24 hours. Considering that stool consists of 60-90% water, the average amount produced by the healthy adult is 100-300 Gm daily. Stool amount exceeding 300 Gm per day is considered diarrhea.

Diarrhea occurs as a result of an underlying condition, mostly infection, but may be due to certain pathological disorders. Diarrhea is a common cause of death among all age groups in developing countries. It has been estimated that over 200 million cases of acute gastroenteritis occur annually in the US, and over 750,000 people are hospitalized each year. Children are more vulnerable than adults. Even though most children fully recover from diarrhea, 300-400 die annually of gastroenteritis. About 5 million or more fatalities occur annually in developing countries as a result of complications from acute diarrhea. American children encounter diarrhea on an average of 2-2½ times annually. On the other hand, American adults experience an average of 1.5-1.7 incidents per year.

Diarrhea is categorized as chronic and acute.

Chronic diarrhea may be caused by the same factors as those of acute diarrhea, but may occur as a result of serious underlying medical disorders. If it lasts for one month or longer, then it is termed chronic. Infectious agents may be the cause. In fact, many of those agents can cause acute or chronic diarrhea. Bacterial microorganisms, such as *Clostridium difficile*, can cause both types of diarrhea. Giardiasis and amebiasis, two parasitic infections, are often responsible for acute and chronic diarrheas. Dietary factors can also cause chronic diarrhea. Persons who are allergic to certain types of food may experience diarrhea along with abdominal distress, nausea and vomiting. Lactose intolerance is a major cause. Conditions such as Crohn's disease and ulcerative colitis are accompanied by chronic diarrhea, mucus defecation, cramping, urge for defecation and malabsorption. Other diseases associated with chronic diarrhea include cancer of the bowel, AIDS, diabetes mellitus, celiac disease and irritable bowel syndrome. Laxative abuse can play an important role in causing chronic diarrhea.

The **main causes of acute diarrhea** are: 1) infection, 2) diet, and 3) medications.

INFECTIOUS DIARRHEA

Infectious diarrheas are the most commonly encountered of the acute type. The main microorganisms that trigger acute diarrhea episodes include viruses, bacteria, and parasites.

Viral Diarrhea

Viral gastroenteritis accounts for about 2/3 of cases of acute gastroenteritis in the US. Viral infection usually occurs in the epithelium of the villi of the small bowel.

Four major viruses are responsible: rotavirus, norovirus (formerly Norwalk virus), astrovirus, and adenovirus. Persons who are immunosuppressed may also become vulnerable to viral infections caused by cytomegalovirus (CMV) and enteroviruses.

Rotavirus is the most important encountered virus-induced diarrhea among children, accounting for 50% of infantile gastroenteritis. The infection can result in severe dehydration. It is contagious, and the infection is transmitted by the fecal and oral routes and by person-to-person contact. Rotavirus infections in adults (12% of all cases) are normally accompanied by mild symptoms. The infection is mostly encountered in late fall to early spring. The incubation period is 1-3 days. Symptoms are characterized by nausea, vomiting, fever and watery stool. The infection is self-limiting.

Norovirus causes gastroenteritis in both children and adults. It is the second leading cause of acute

CE PRN® (ISSN 0199-5006) is owned and published by W-F Professional Associates, Inc. 400 Lake Cook Road, Suite 207, Deerfield, Illinois 60015.

William J. Feinberg, President CE PRN® is published eleven times per year, monthly, January through November. Subscription rate is \$99.00 per year. Second-Class Postage paid at Deerfield, Illinois 60015 and at additional mailing offices. © 2007 by W-F Professional Associates, Inc. All rights reserved. None of the contents of this publication may be reproduced in any form without the written permission of the publisher.

POSTMASTER: Send all address changes to

W-F Professional Associates, Inc., 400 Lake Cook Road, Suite 207, Deerfield, IL 60015.
September 2007

diarrhea among children, and is transmitted via fecal and oral routes. The infection usually lasts from 24 to 30 hours. It is characterized by abdominal distress, low grade fever, nausea, vomiting, and is accompanied by diarrhea. It can occur throughout the year and may result in epidemic viral gastroenteritis. This virus impacts mainly adults. Noroviruses are contagious, and may be transmitted from person to person by contact. Diarrhea and other symptoms occur 24-48 hours following contact, or ingestion of contaminated water or food.

Astroviruses usually affect infants and young children more frequently than adults. They occur mostly in winter. Like other viruses they are transmitted via the fecal and oral routes. Incubation period ranges from 3 to 4 days.

Adenoviruses affect children most often. However, their incidence is less common than the other three viruses mentioned. They occur throughout the year, but more likely during the summer months. Like other viruses, the infection is transmitted through fecal and oral routes. Incubation period ranges from 3 to 10 days.

Bacterial Diarrhea

Bacterial gastroenteritis is responsible for about 30% of cases in the US. Approximately 6 million people in the US experience bacterial gastroenteritis annually. Its incidence is far less than viral gastroenteritis. Infections are usually contracted through ingestion of food-borne bacteria, but could occur via direct oral or fecal transmission. The main organisms involved include: *Vibrio cholerae*, several subtypes of *E. coli*, *Staph. aureus*, *Bacillus cereus*, *Clostridium perfringens*, *Clostridium difficile*, *Shigella*, *Salmonella* and *Campylobacter*. The mechanism by which these organisms cause diarrhea varies. Enterotoxigenic strains of *E. coli* and *V. Cholerae* trigger diarrhea by adhering to the intestinal mucosa without causing damages. However, such organisms are capable of forming enterotoxins that diminish intestinal absorption and at the same time increasing secretion of electrolytes and water. This can cause a watery stool. The increase in water production is due to stimulation of adenylate cyclase. A similar toxin is produced by the overgrowth of *C. difficile* following the intake of antibiotics, especially third generation cephalosporins, ampicillin, amoxicillin and clindamycin. These organisms are the most common cause of antibiotic associated diarrhea. Very often these are hospital acquired. They account for 20-30% of cases of hospital acquired diarrhea. Approximately 15-70% of newborns and 3-8% of healthy adults are asymptomatic carriers of these organisms. Symptoms occur within a few days following intake of the antibiotics. The diarrhea ranges from mild and semi-solid, to frequent and watery. Abdominal cramping, without nausea and vomiting, is usually witnessed.

Microorganisms such as *S. aureus*, *B. cerues*, and *C. perfringens* are capable of producing enterotoxins that contaminate food. Ingestion of the toxins can cause gastroenteritis without infection of the intestinal mucosa. The toxins can result in symptoms such as nausea, vomiting and diarrhea which usually occur within 12 hours. However, the symptoms subside within 36 hours. *Staph. aureus* multiplies quickly in unrefrigerated foods like salad, dairy and poultry products, producing enterotoxins that when ingested result in gastroenteritis accompanied by nausea and vomiting as well as diarrhea. These symptoms occur within 6 hours following the intake of contaminated food. *Salmonella*, which usually thrives on raw food such as eggs, has an incubation period of 12-24 hours. Gastroenteritis caused by *Shigella*, some *E. coli* strains and *Salmonella* is due to direct invasion and destruction of mucosa layers resulting in impairment of the absorption-secretory mechanism of the small intestine. Involvement of the large intestine is indicated by the presence of fever, malaise, muscle aches, epigastric pain and anorexia. Small microscopic ulcerations, diarrhea, bleeding, as well as the presence of pus-like exudates, secretion of electrolytes and water, may also take place. Diarrhea due to these microorganisms usually contains white blood cells and red blood cells.

Salmonella and *Campylobacter* are the most common causes of bacterial diarrhea in the US, followed by *Shigella*. Infections may occur following the intake of contaminated uncooked poultry and eggs, as well as unpasteurized milk. *Campylobacter* may be transmitted via the stool of cats and dogs.

Shigella is normally transmitted from person to person. However, it can be transmitted from *Shigella*-borne food. The onset of *Campylobacter* diarrhea occurs within 2 to 4 days following transmission.

E. coli is capable of producing diarrhea. The clinical symptoms depend on the subtype of the strain. Enterohemorrhagic *E. coli* produces Shiga toxin, which is characterized by bloody diarrhea. The most commonly encountered strain of this subtype is *E. coli* O157:H7. This strain is transmitted via undercooked ground beef, unpasteurized milk, contaminated water and via person-to-person contact. A complication of infection caused by this subtype is Hemolytic Uremic Syndrome. Enterotoxigenic *E. coli* produces two toxins, one of which results

in watery diarrhea. This subtype plays an important role in causing Traveler's Diarrhea. Enteropathogenic *E. coli*, which is not very common, produces watery diarrhea, especially in children. Enteroinvasive *E. coli* is witnessed mostly in developing countries. It may cause bloody diarrhea.

Another bacteria that may result in diarrhea and appendicitis-like symptoms is *Yersinia enterocolitica*. Uncooked meat (particularly pork), unpasteurized milk or juice and contaminated water are possible sources of transmission. *Vibrio parahaemolyticus* may cause diarrhea after ingesting contaminated uncooked seafood.

Clostridium perfringens: Clostridia are found in the GI tract and are considered a member of the gastrointestinal bacterial flora. However, when conditions are favorable, they can cause abdominal infections. *Clostridium perfringens* is abundant in feces, air, soil and water. As a result, it has the capability of contaminating unrefrigerated foods, including meat, causing outbreaks of food poisoning. When contaminated food is ingested, the microorganisms release enterotoxins within the small intestine. The infection is usually mild. The onset of symptoms is within 6-24 hours after ingestion of the infected food. Patients usually experience watery diarrhea and abdominal cramps. Symptoms normally subside within 24 hours.

Parasitic Diarrhea

The major organisms responsible for parasite-induced diarrhea are *Giardia lamblia* and *Entamoeba histolytica*. *Giardia lamblia* is a flagellated protozoan that results in Giardiasis, an infection of the small intestine that can be asymptomatic (35-70%). If symptoms arise, they can include: nausea, vomiting, diarrhea and sometimes malaise. The patient may experience flatulence, malabsorption, anorexia and steatorrhea. This protozoan invades the intestinal mucosa and causes inflammation, along with the other symptoms. The infection is encountered throughout the US and worldwide. It is acquired through drinking water contaminated with fecal material that contains the protozoal cyst. Transmission of the infection may occur from person-to-person contact as in day care centers where prevalence ranges from 19-30%. The incubation period is 1-3 weeks.

Entamoeba histolytica (amebiasis) causes intestinal infection that may be symptom free, but usually results in mild to subacute bloody diarrhea. Amebiasis may be transmitted by person-to person contact, or via contaminated water or food. Furthermore, it can be transmitted sexually. When the organism invades the intestinal mucosa, it damages the epithelial cells, and may result in dysentery with bloody mucus.

DIETARY DIARRHEA

Food often plays a role in producing diarrhea. Food allergies can trigger episodes that may be severe. Lactose intolerance, inclusion of unabsorbable dietary components such as carbohydrates, ingestion of excessively fatty or spicy food, intake of salty foods, ingestion of large quantities of sorbitol, mannitol and xylitol, and ingestion of certain fruits, especially those with seeds, may stimulate acute response. Osmotic diarrhea occurs when unabsorbable, water-soluble solutes remain in the intestine and retain water. A carbohydrate diet normally contains disaccharides, lactose and sucrose. Lactase hydrolyzes these sugars. If the patient has a lactase deficiency, then lactose intolerance and accumulation of unhydrolyzed disaccharides in the intestine may result because fluid is drawn into the intestine and causes osmotic diarrhea. Salty foods may cause osmotic diarrhea. Ingestion of vegetables and fruits increase roughage contents. This may, subsequently, increase fluidity of the stool. Sorbitol, mannitol and xylitol are hexitols widely used in sugar-free candy and gum. These chemicals are poorly absorbed. As a result, they pool in the lumen of the intestine and cause osmotic diarrhea. Fruits like prunes contain components that increase intestinal motility. Seed-containing fruits may have similar effects. Spicy foods may act as intestinal stimulants, thereby increasing GI motility. Unabsorbed dietary fat (excessive fatty diet) may trigger secretory diarrhea, which occurs when the intestine secretes more electrolytes and water than it absorbs.

MEDICATION-INDUCED DIARRHEA

The intake of certain medications may result in diarrhea. Approximately 7% of adverse effects caused by medications stem from this. About ¼ of all medication-induced diarrhea is due to the intake of antibacterial agents. Antibiotics such as ampicillin, cephalosporins, clindamycin, erythromycin, tetracyclines and fluoroquinolones may produce diarrhea. The extent to which an antibiotic can cause diarrhea depends in large part on its spectrum of activity as well as the dose. Resulting diarrhea may be due to the imbalance in the intestinal

bacterial flora and the resultant overgrowth of antibiotic-resistant microorganisms such as *C. difficile*. Microorganisms that tend to flourish following the intake of antibiotics include: *Staph. aureus*, *Pseudomonas aeruginosa*, *Strep. faecalis*, and *Candida albicans*.

Antacids that contain magnesium hydroxide may cause diarrhea, especially if taken frequently and in large doses. Prostaglandins and serotonin (humoral agents) may increase motility by stimulating the intestinal smooth muscle. Certain antihypertensive agents that interfere with the autonomic nervous system, like guanethidine, methyldopa and reserpine, may produce diarrhea. Any drug that disrupts the balance of microbial flora can cause cramps and diarrhea. Interference with water absorption as a result of impairment of the GI-sodium-potassium ATPase pumps (such as digoxin, colchicine, and olsalazine) may cause diarrhea. Anticancer drugs are capable of triggering acute diarrhea. Laxatives, especially if used regularly, may cause diarrhea.

TRAVELER'S DIARRHEA (TD)

TD is gastroenteritis that affects travelers, especially to other countries, and is triggered by certain microorganisms that are endemic in the hosting region or place. Several types of bacteria, viruses, or parasites, as well as enterotoxigenic *E. coli*, are present in regions where water supplies are obtained from sources lacking proper sanitary conditions. In many areas of the world, water, fruits and vegetables may be contaminated by diarrhea-producing microorganisms. Enterotoxigenic *E. coli* is responsible for 40% of the TD. Such microorganisms produce toxins that damage the intestinal mucosa. The resultant diarrhea is usually mild and accompanied by vomiting. However, diarrhea caused by other types of *E. coli* such as enteropathogenic, enteroinvasive, and enterohemorrhagic, normally produce severe diarrhea along with intestinal cramps, vomiting, fever and inflammatory exudates. The infection may occur even if the travelers drink bottled water. Brushing teeth with or using ice made with tap water may trigger TD. Properly cooked food may reduce the risk. However, prepared food may be handled by local individuals who do not comply with accepted sanitary standards. Uncooked vegetables, fruits, salads, and undercooked, rare or raw fish and meat should be avoided. Dairy products such as cheese, milk, yogurt, buttermilk and ice cream may be a source of infection as they serve as very good environments for multiplication of microorganism. Canned and packaged foods are low risk.

Symptoms of TD usually occur 12-72 hours after the intake of contaminated food, and may consist of nausea, vomiting, abdominal pain, loose diarrhea, fever, headache, weakness and bloating. Most cases are self-limited. Dehydration is always a risk. The presence of bloody diarrhea and fever suggest the presence of complications that should be diagnosed. TD may be prevented by the intake of prophylactic antibiotics. However, because of the side effects that may be caused by such drugs, their use should be reserved for immunocompromised patients, or individuals with disorders that make them more vulnerable to diarrhea.

COMPLICATIONS OF DIARRHEA

The primary complication and risk associated with diarrhea is fluid and electrolyte loss. Such complications may have serious outcomes in infants, young children and the elderly. Renal failure and circulatory collapse may occur as a result of dehydration. This risk may be increased in patients who are suffering from diabetes, cardiovascular or renal diseases. Symptoms of dehydration include: oliguria, dizziness, thirst, confusion, weakness, rapid pulse, dry mouth and low blood pressure.

TREATMENT

The objectives of treating diarrhea include:

1. Prevention or correction of dehydration
2. Symptomatic relief, and
3. Treatment of the cause.

Mild to moderate diarrhea, which is self-limiting and uncomplicated, may be controlled by fluid replacement and symptomatic relief. Severe diarrhea will need medical attention. Regardless, the following guidelines should be kept in mind:

1. In order to avoid further dehydration, nonprescription drugs must not be used if the episode persists more than two days.
2. Children three years of age and younger must be evaluated by a primary care provider.

3. Do not use nonprescription products in the presence of fever, stools containing blood or mucus.
4. Patients three years of age and older who experienced a diarrhea episode for less than 2 days and who do not experience complications may use nonprescription drugs.

PHARMACOLOGIC THERAPY

Nonprescription medications that are recognized to be safe and effective for self-treating mild uncomplicated cases of diarrhea are loperamide, calcium polycarbophil, and adsorbents such as kaolin, attapulgite and bismuth subsalicylate. Other agents such as lactobacillus or rehydration solutions may also be used.

Loperamide

Loperamide is a symptomatic opioid agonist that stimulates the intestinal circular muscle, thereby reducing intestinal motility and allowing absorption of water and electrolytes. However, by doing so it increases the risk of absorption of bacteria toxin. Loperamide is more potent as an intestinal antimotility agent than morphine and diphenoxylate, but has weak CNS effects. As indicated earlier, loperamide has been recognized as safe and effective in combating all types of diarrhea.

It is available as a liquid (1mg/5mL) and as caplets each containing 2 mg. The recommended initial adult dose is 4 mg followed by 2 mg after each bowel movement. The maximum daily adult dose is 16 mg. The FDA guidelines do not recommend the use of loperamide in children 6 years of age and younger due to the risk of causing ileus and abdominal distension. At the recommended dosage, loperamide has a few mild adverse effects such as nausea and vomiting that actually may be due to the diarrhea. Other side effects include abdominal pain and distension, dry mouth and headache. Because of its antimotility effect, it may worsen diarrhea symptoms caused by enteroinvasive *E. coli*, *Salmonella*, *Shigella*, and *C. difficile*. The drug should be discontinued if any of the side effects occur. This drug should not be used in the presence of fever or bloody watery stool mixed with mucus.

Calcium Polycarbophil

This is a hydrophilic polyacrylic resin that is capable of absorbing 60 times its weight of water. The drug is used to combat both diarrhea and constipation. It acts by binding water from watery stools, thereby increasing its consistency. The drug is available as chewable tablets each containing the equivalent of 500 mg of polycarbophil. The adult dose is two chewable tablets four times daily, and should not exceed eight tablets within 24 hours. Dosage for children between 6-12 years of age is one to two 500 mg chewable tablets three times daily. The daily dose should not exceed three tablets per 24 hour period. Because of the calcium it contains, this drug should not be taken concurrently with tetracycline. The main side effects are bloating and cramps.

Kaolin

Kaolin is a clay whose chemical name is aluminum silicate. It is usually formulated with pectin. In spite of its uses throughout many decades, there is little evidence to indicate effectiveness. Never the less, it is assumed that it acts by adsorbing fluids as well as bacterial toxin. Currently many kaolin preparations have been reformulated to contain attapulgite instead of kaolin.

Attapulgite

This clay possesses adsorptive properties and may adsorb toxins, bacteria, as well as certain concurrently administered drugs, nutrients and digestive enzymes. Dosage of the drug is two, 150 mg caplets of attapulgite after the initial stool, followed by two after every bowel movement, with a maximum of 12 caplets in a 24 hours period. Children from 6-12 years of age should take an initial dose of one caplet, and one after each stool. The daily dose should not exceed six caplets. Pediatric suspensions are designed for children between 3-6 years of age.

Bismuth Subsalsicylate

Bismuth compounds are considered mild astringents. When it is taken, bismuth subsalsicylate reacts with stomach acid and splits into salicylic acid and bismuth oxychloride. Salicylic acid exerts an antisecretory effect that results in minimizing water and electrolyte losses. The bismuth moiety possesses antibacterial activity against enterotoxigenic *E. coli* and other microorganisms that cause TD. This moiety is not absorbed systemi-

cally. Salicylic acid is well absorbed. The action of both moieties results in reduction of secretion of fluid by the gastrointestinal tract, reduction in the liquidity of unformed stools and relief of abdominal cramps, nausea and vomiting. Bismuth subsalicylate is considered by the FDA as safe and effective in treating acute diarrhea, including TD. It is available in caplets, chewable tablets and suspensions. Caplets and chewable tablets contain 262 mg of the drug; whereas, 15 ml of the suspension contain 262 mg. The usual adult dose is 30 ml of the suspension; for children between the ages of 9-11, dose is 15 ml; for children between the ages of 6-9 it is 10 ml; and for children 3-6, dose is 5 ml. The suspension should be taken every 30 to 60 minutes, but no more than 8 doses in 24 hours. Patients taking aspirin should be aware of the risk of reaching toxic levels of salicylates during therapy with bismuth subsalicylate. Patients who are sensitive to aspirin should refrain from using this product. Parents of children should be aware of the risk of aspirin-induced Reye's syndrome. Adverse effects of bismuth subsalicylate include: tinnitus and neurotoxicity such as encephalopathy that is characterized by tremors, confusion and ataxia. Bismuth subsalicylate may cause black stool, which is harmless unlike melena associated with gastrointestinal tract bleeding. Darkening of the tongue may also occur. Due to the formation of bismuth sulfide, which results from the reaction between hydrogen sulfide produced by bacteria in the mouth and bismuth subsalicylate, the drug is contraindicated in pregnant and nursing mothers. Bismuth subsalicylate may interact with drugs that adversely interact with aspirin.

Lactobacillus

Nontoxic strains of *Lactobacillus*, in a culture produced from *Lactobacillus acidophilus* and *L. bulgaricus*, have been used in the treatment of acute uncomplicated diarrhea. *L. acidophilus* is a member of the normal intestinal microbial flora and helps in maintaining a balance by inhibiting bacterial growth. An unwarranted outcome of diarrhea is alteration of this flora. Thus, it has been theorized that by taking *L. acidophilus* or *L. bulgaricus*, suppression of pathogenic microorganisms and restoration of the normal intestinal flora may occur, thereby reducing the duration and intensity of the diarrhea episode. However, this theory has never been shown to change the course of diarrhea or to prevent its occurrence. The FDA does not consider the use of *Lactobacillus* as effective in the management or prevention of diarrhea.

Oral Rehydration Solutions

As stated earlier, dehydration is one of the most serious complications of diarrhea especially in infants, young children and the elderly. Dehydration can be life-threatening. Thus, restoration of fluid loss and electrolyte imbalance is essential. Oral rehydration therapy, that consists of sugar-electrolyte solutions, is useful, since these ingredients are absorbable during diarrhea. Even though oral rehydration solutions contain low concentrations of (2-2.5%) glucose or dextrose, such ingredients promote absorption of sodium and water. It should be kept in mind that oral rehydration solutions do not change the course of diarrhea and have no effect on the volume of stool output in children. Oral rehydration solutions may be used by adults. However, this usefulness is not clear because a healthy adult is capable of maintaining adequate fluid intake. In case of mild self-limiting diarrhea, certain household oral solutions may be used. However, they should be avoided in the presence of moderate to severe diarrhea as the presence of high carbohydrate contents may aggravate the condition. Examples of such household fluids are: colas, apple juice, and sports drinks. Oral rehydration solutions usually contain carbohydrates, sodium, potassium, calcium, magnesium, citrate, chloride, phosphate, sulfate and bicarbonate. Obviously, these solutions do not provide sufficient calories and are devoid of protein. As a result, the patient should receive appropriate nutrition while on oral rehydration solutions. Oral rehydration solutions are contraindicated in the presence of shock, repeated vomiting episodes, failure of the patient to respond to rehydration therapy and in patients who are unable to drink.

In spite of the fact that oral rehydration solutions were not subjected to review by the FDA, the Center for Disease Control and Prevention (CDC) and the American Pediatric Academy published recommendations regarding the management of diarrhea in infants and children. The CDC concluded that many fatalities and hospitalizations due to rotavirus infection could have been prevented, if oral hydration solutions were used at the start of the diarrhea episode.

NONPHARMACOLOGIC THERAPY

Dietary management of diarrhea is important. It may improve the patient's condition and reduce duration

of the diarrhea episode as well as stool output. During acute diarrhea, nutrient absorption continues at about normal level. It has been estimated that 80-95% of carbohydrates, 70% of fat and 75% of nitrogen from protein are all absorbed while diarrhea is in progress. Therefore, feeding is beneficial to the patient and poses no risk to aggravate the condition. Withdrawal of feeding during acute diarrhea has no merit. However, the diet should consist of complex carbohydrates such as bread, cereals, potatoes and rice, as well as yogurt, meat, fruits and vegetables. Fatty foods, simple sugars, spicy food and caffeine-containing foods should be avoided.

PHARMACIST ROLE

When a person suffers from a diarrhea episode, probably the first thing that comes to his/her mind is to visit a pharmacy to obtain a nonprescription drug. The pharmacist needs to assist the self-treating patient. Patients should realize that acute diarrhea, in most cases, is self-limiting and may last up to 48 hours. The importance of avoiding dehydration and maintaining proper diet intake should be explained to the patient or parents of children. The pharmacist can discuss the information on the label. Patients should be reminded to shake containers of suspensions before use. Patients who suffer from fever, bloody stool mixed with mucus, loose stool beyond 48 hours and signs of dehydration must seek medical advice. Likewise, medical referral should be sought by parents of infants and young children, the elderly, and those who are suffering from chronic disease. Travelers to other countries should be advised as to the precaution that they must undertake during their stay.

SUMMARY

Diarrhea is a common occurrence whose causes may range from mild infection to serious underlying disorders. Acute diarrhea occurs abruptly and is usually self-limiting. Diarrhea may be due to viral, bacterial or parasitic infection. Chronic diarrhea is characterized as being persistent, and may be caused by systemic disease. There are medications used in nonprescription products that have been proven to be safe and effective. The main complication of diarrhea is dehydration.

References

1. Larson, SC, "Traveler's Diarrhea" Emerg. Med. Clin. North Am., 15, 179 (1997)
2. Farthing, MJG, "Novel Target for the Pharmacotherapy of Diarrhea: A Review for the Millenium" J. Gastroenterol Hepatol., 15 (G38)
3. Chassany, O, Michanix, A, Bergmann, J.F, "Drug-induced Diarrhea. Drug safety, 22, 53 (2000)
4. Mylonakis, E. Ryan, E.T., Calderwood, S.B. "*Clostridium difficile* – associated Diarrhea." Arch. Intern. Med. 161(525) 2001

Fill in the information below, answer questions and return **Quiz Only** for certification of participation to:
 CE PRN®, 400 Lake Cook Road, Suite 207, Deerfield, IL 60015.

NAME _____ (ID # 1st line on label) _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

CHECK IF NEW ADDRESS **ARE YOU LICENSED IN FLORIDA? IF YES FL LIC** _____

EMAIL Address (we need this) _____

LESSON EVALUATION

Please fill out this section as a means of evaluating this lesson. The information will aid us in improving future efforts. Either circle the appropriate evaluation answer, or rate the item from 1 to 7 (1 is the lowest rating; 7 is the highest).

1. Does the program meet the learning objectives?

Epidemiology associated with diarrhea	Yes	No
Define types of diarrhea	Yes	No
Etiology of acute diarrhea	Yes	No
Significance of Traveler's Diarrhea	Yes	No
Complications associated with diarrhea	Yes	No
Drugs used in nonprescription antidiarrheal remedies & their side effects	Yes	No

2. Was the program independent & non-commercial	Yes	No
	Poor	Average
	1 2 3	4 5 6 7
3. Relevance of topic		Excellent

4. What did you like most about this lesson? _____

5. What did you like least about this lesson? _____

Please Select the Most Correct Answer

- | | |
|--|--|
| <p>1. What is FALSE about chronic diarrhea?
 A. Lasts for one month or more
 B. Dietary factors play important role
 C. Never caused by bacteria
 D. May be an indication to serious underlying disease</p> <p>2. Which of these is NOT a cause of acute diarrhea?
 A. Diet
 B. Viral infection
 C. Medications
 D. Increased absorption from GI tract</p> <p>3. Which of these is responsible for 40% of TD?
 A. Enterotoxigenic E. coli
 B. Entamoeba histolytica
 C. Salmonella
 D. Yersinia enterocolitica</p> <p>4. Shiga toxin is characterized by:
 A. High fever
 B. Bloody diarrhea
 C. Violent vomiting
 D. Transmission via cat & dog stool</p> <p>5. Which of these organisms is responsible for parasitic diarrhea?
 A. Giardia lamblia
 B. Vibrio cholerae
 C. Clostridium perfringens
 D. Staph. aureus</p> | <p>6. Which of these is used in sugar-free products & could cause diarrhea if taken in large amounts?
 A. Dextrose
 B. Lactose
 C. Mannitol
 D. Sucralose</p> <p>7. Incidents of bacterial gastroenteritis are more than viral gastroenteritis.
 A. True
 B. False</p> <p>8. The main complication of acute diarrhea is:
 A. Pneumonia
 B. Appendicitis
 C. Ulcerative colitis
 D. Fluid & electrolyte loss</p> <p>9. Which of these is (are) FALSE about loperamide?
 A. Increases risk of bacteria toxin absorption
 B. It is stronger than morphine as an intestinal antiperistalsis drug
 C. Considered effective but not safe
 D. None are FALSE</p> <p>10. Bismuth subsalicylate's antidiarrheal activity is due only to astringent properties.
 A. True B. False</p> |
|--|--|

Contributing Author

Farid Sadik, Dean Emeritus
University of South Carolina
College of Pharmacy
Columbia, SC

Executive Editor

William J. Feinberg,
BS Pharm, MBA



CE PRN[®] is a publication of W-F Professional Associates, Inc. This program is in printed format.

W-F Professional Associates, Inc. is approved by the Accreditation Council for Pharmaceutical Education (ACPE) as a provider of continuing pharmaceutical education.

Providers who are approved by ACPE are recognized by the following states: Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Puerto Rico, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming.

Pharmacists completing this course by September 30, 2010 may receive full credit. This program has been approved by the State Boards of Pharmacy in Alabama and Oklahoma.

This lesson furnishes 1.25 hours (0.125 CEUs) of credit.

Program ID #707-000-07-009-H01.

CE Provider Registered # with CE Broker.com is 50-3170