Basic Pharmacology

Unit 4

Chapters 8 & 10
Gastrointestinal Drugs

Chapter 8
Learning Objectives

• Differentiate between the therapeutic effects of antacid drugs, H$_2$ blockers drugs, and proton pump inhibitor drugs in treating peptic ulcer disease
• Describe how anticholinergic drugs relieve gastrointestinal spasms from diseases such as irritable bowel syndrome
• Describe the effect of narcotic drugs that is useful in treating diarrhea
• Name five categories of laxative drugs and describe their differing therapeutic effects.
• Describe the various ways in which antiemetic drugs treat nausea and vomiting caused by different conditions
Learning Objectives

• List four different categories of drugs that are used to treat hemorrhoids
• Describe the differing therapeutic effects of drugs used to treat obesity
• Given the generic and trade names of a gastrointestinal drug, identify what drug category it belongs to or what disease they are used to treat
• Given a gastrointestinal drug category, identify several generic and trade name drugs in that category
Gastrointestinal drugs

These include

- peptic ulcer disease
- *Helicobacter pylori* infection
- gastroesophageal reflux disease
- gastrointestinal spasms
- Diarrhea
- hemorrhoids
- constipation
- ulcerative colitis
- nausea and vomiting
- hepatitis
- gallstones
- obesity

*Figure 8-1  The gastrointestinal system.* The structures of the gastrointestinal system include the mouth and salivary glands (which are discussed in Chapter 19), the esophagus, stomach, small intestine (duodenum, jejunum, and ileum), large intestine (cecum, colon, and rectum), and the accessory organs of the liver and gallbladder, all of which are discussed in this chapter. Each of these structures can be affected by some gastrointestinal condition or disease that is treated with drugs.
Drugs Used to Treat Peptic Ulcer Disease

• Peptic Ulcer
  • caused by irritation of the mucous membranes lining the gastrointestinal tract
    • located anywhere in the
      • esophagus
      • stomach
      • duodenum
  • aspirin, NSAIDs, alcohol, and caffeine also irritate the mucous membranes and can contribute to ulcer formation

• Treatment includes:
  • antacids
  • H2 blockers
  • proton pump inhibitors
Antacid Drugs for Heartburn

• Antacid drugs contain individual or a combination of, as their active ingredient
  • aluminum
  • magnesium
  • calcium
  • sodium

• Antacid drugs are available without a prescription
  • Phillip’s Milk of Magnesia
  • Tums Ultra
  • Maalox
  • Mylanta
H₂ Blocker Drugs for Heartburn and/or Peptic Ulcer Disease

- Histamine
  - a natural chemical produced by the body
  - activates special histamine receptors (H₂ receptors)
    - located in the parietal cells of the stomach
    - causes the release of hydrochloric acid
- Drugs that block these receptors and prevent the release of acid are known as H₂ blocker drugs
- Are prescription drugs, but some are available over-the-counter
  - cimetidine (Tagamet)
  - famotidine (Pepcid)
  - nizatidine (Axid)
  - ranitidine (Zantac)

**Drug Alert!**

All H₂ blocker drugs originally were approved as prescription drugs. Then famotidine became the first to be approved by the FDA for over-the-counter use. Now each of the prescription H₂ blocker drugs has a corresponding over-the-counter version. Over-the-counter H₂ blocker drugs are only approved for preventing and treating heartburn and acid indigestion.

*Note: the suffix –tidine is common to generic H₂ blocker drugs*
Proton Pump Inhibitor Drugs for Peptic Ulcer Disease/GERD

• Decrease gastric acid by blocking the final step of acid production within the gastric parietal cell
• Involves an enzyme system known as the proton pump
• Used to treat heartburn and peptic ulcers/GERD
  • GERD-occurs when stomach acid refluxes back into the esophagus causing irritation, inflammation and pain
• esomeprazole (Nexium)
• lansoprazole (Prevacid)
• omeprazole (Prilosec)
• pantoprazole (Protonix)
• rabeprazole (AcipHex)

Note: the suffix –prazole is common to generic proton pump inhibitor drugs
Drugs Used to Treat Gastrointestinal Spasm

• Treat intestinal conditions causing abdominal pain due to spasms of GI tract
  • Irritable bowel syndrome
  • Spastic colon
  • Diverticulitis
  • Peptic ulcers
• Antispasmodic drugs/anticholinergic drugs
  • atropine (Sal-Tropine)
  • dicyclomine (Bentyl, Di-Spaz)
  • glycopyrrolate (Robinul)
  • L-hyoscyamine (Levbic, Levsin)
  • propantheline (Pro-Banthine)
Drugs Used to Treat Diarrhea

• Antidiarrheal drugs produce a therapeutic effect by
  • slowing peristalsis in the intestinal tract (anticholinergic
    drugs), or
  • by absorbing extra water from diarrhea stools (absorbent
    drugs)
• When diarrhea is caused by an infection in the GI tract, antibiotic or anti-infective drugs are given
Drugs Used to Treat Diarrhea

• These over-the-counter drugs decrease the rate of peristalsis in the GI tract
  • loperamide (Imodium A-D, K-Pek II)

• These over-the-counter drugs contain attapulgite, an absorbent drug to absorb excess water from diarrhea stools
  • Kaopectate Maximum Strength

• These drugs are used to treat infections associated with bacterial, viral, or protozoal diarrhea and traveler’s diarrhea
  • bismuth (Kaopectate, Pepto-Bismol)
  • ciprofloxacin (Cipro)
  • doxycycline (Vibramycin, Vibra-Tabs)
  • trimethoprim/sulfamethoxazole (Bactrim, Septra)

• Combination drugs
  • Lomotil (atropine & diphenoxylate)
Laxative Drugs

- Used for short-term treatment of constipation
- With attention also given to
  - adequate water intake
  - dietary fiber/bulk
  - other measures to promote bowel regularity
- **Osmotic Laxative Drugs**
  - Use osmosis and osmotic pressure
    - to attract water from the blood into the intestines
    - to soften the stool
  - Over-the-counter medications
    - epsom salt
    - glycerin (Colace Suppository, Fleet Babylax)
    - milk of magnesia (MOM, Phillips’ Milk of Magnesia)
  - Prescription only
    - lactulose (Cephulac)
Laxative Drugs

• Bulk forming laxative drugs
  • Contain indigestible dietary fiber and other substances that absorb and hold water in the intestines to soften the stool
  • Most natural and safest of all the laxative drugs
  • methylcellulose (Citrucel)
  • polycarbophil (FiberCon)
  • psyllium (Fiberall, Metamucil, Perdiem)
• Stool Softener Laxative drugs
  • Emulsifiers that allow fat in the stool to mix with water to soften stool
    • docusate (Colace, ex-lax Stool Softener, Surfak)
• Chloride Channel Laxative Drugs
  • Stimulate chloride channels in the mucosa of the intestinal wall
  • Causes fluid to flow into the intestines to soften the stool
  • lubiprostone (Amitiza)
Laxative Drugs

• Irritant/Stimulant laxative drugs
  • Act directly on the intestinal mucosa to stimulate peristalsis
  • **bisacodyl** (*Correctol, Dulcolax, Feen-a-mint*)
  • cascara
  • sennosides (*Maximum Relief ex-lax, Fletcher’s Castoria, Senokot*)

• Bowel Evacuants/Enemas
  • These laxative drugs are given orally to evacuate the colon prior to surgery or endoscopic procedures
  • Most come as kits that also include a suppository or enema
  • The use of bowel evacuation along with an enema is referred to as a *bowel prep*
  • **Fleet Prep Kit**
  • **GoLYTELY**
  • polyethylene glycol (*PEG, MiraLax*)
Drugs Used to Treat Ulcerative Colitis or Crohn’s Disease

- Ulcerative colitis and Crohn’s disease are characterized by:
  - diarrhea
  - abdominal pain
  - inflammation
  - ulcers
- Treated with antispasmodics and drugs to decrease inflammation
- Aminosalicylic Acid Drugs for Ulcerative Colitis
  - Decreases intestinal inflammation by blocking the production of prostaglandins
  - Drugs contain 4-ASA or 5-ASA as the active ingredient, or ingredient metabolized by 5-ASA by colon bacteria
  - mesalamine (5-ASA, Asacol, Pentasa, Rowasa)
  - sulfasalazine (Azulfidine)
Drugs Used to Treat Ulcerative Colitis or Crohn’s Disease

• Topical Corticosteroid drugs for ulcerative colitis
• Exert a more powerful anti-inflammatory effect than aminosalicylic acid
• Administered as an aerosol foam that is placed into the rectum
• hydrocortisone (Cortifoam)
Antiemetic Drugs

- Used to control nausea and vomiting
- Associated with many different diseases
  - Bacterial or viral illnesses
    - can directly irritate the intestinal mucosa
    - cause nausea and vomiting
  - Irritation of the intestinal mucosa
    - Chemotherapy
    - Radiation
  - Surgery (especially abdominal surgery)
    - can temporarily stop peristalsis
    - fluids accumulate in the GI tract
      - can cause distention
      - trigger postoperative nausea and vomiting
- prochlorperazine (Compazine)
- promethazine (Phenergan)
- trimethobenzamide (Tigan)
Antiemetic Drugs for Motion Sickness or Vertigo

• Motion sickness
  • occurs when repetitive but varying motions of a car, boat, or airplane overstimulate the inner ear
  • activates the vomiting center in the brain

• Vertigo
  • sensation of lightheadedness, dizziness, and whirling
  • caused by irritation or infection in the inner ear
  • upsets the balance and stimulates the vomiting center

• Given orally
  • dimenhydrinate (Dramamine)
  • diphenhydramine (Benadryl)
  • meclizine (Antivert)
  • promethazine (Phenergan)

• Transdermal patch worn behind the ear
  • scopolamine (Transderm-Scop)
Drugs Used to Treat Obesity

- Drugs used to treat obesity act in one of two ways
  - they keep dietary fat from being absorbed in the intestines
  - they suppress the appetite to decrease the total amount of food being eaten
- Lipase inhibitor drugs for obesity
  - Chemically bond to the enzyme lipase
    - cannot break down dietary fat in the intestines
    - fat is excreted rather than absorbed
  - orlistat (Alli, Xenical)
- Appetite suppressant drugs for obesity (anorexiant drugs)
  - Similar in chemistry to amphetamines, but less addictive properties
  - Suppress the appetite by affecting dopamine or serotonin levels in the satiety center of the brain
  - phentermine (Pro-Fast, Fastin)
  - sibutramine (Meridia)
Pulmonary Drugs

Chapter 10
Learning Objectives

• Compare and contrast the differing therapeutic effects of bronchodilator drugs and corticosteroid drugs.
• Name several types of inhaler devices and describe how they work.
• Describe the therapeutic effects of leukotriene receptor blocker drugs, monoclonal antibody drugs, and mast cell stabilizer drugs.
• Explain why tuberculosis must be treated with several different antitubercular drugs at the same time.
• Describe the therapeutic effects of expectorant drugs.
• Describe the differing therapeutic effects of drugs to help a person stop smoking.
• Given the generic and trade names of a pulmonary drug, identify what drug category it belongs to or what disease it used to treat.
• Given a pulmonary drug category, identify several generic and trade name drugs in that category.
Introduction

Pulmonary Drugs
Diseases include

- asthma (reversible obstructive airway disease)
- bronchitis
- chronic obstructive pulmonary disease (COPD)
- bacterial and viral infections of the lung
Bronchodilator Drugs

- Used to prevent or treat
  - asthma
  - bronchospasm
  - exercise-induced bronchospasm
  - chronic obstructive pulmonary disease (COPD)
  - emphysema

- Work by
  - relaxing the smooth muscle the surrounds the bronchioles
  - allowing the bronchioles to dilate
  - increases air flow

- albuterol (ProAir HFA, Proventil HFA, Ventolin HFA)
- epinephrine (Primatene Mist)
- levalbuterol (Xopenex HFA)
- tiotropium (Spiriva)

*Note: the suffixes –terol and –phylline are common to generic bronchodilator drugs*
Corticosteroid Drugs

- Hormones secreted naturally by the adrenal gland
- Suppress the inflammatory response of the immune system
- Reduce
  - inflammation
  - tissue edema (associated with)
    - asthma
    - other chronic lung diseases
- Prevent acute attacks-Cannot be used to treat acute attacks-must also take a bronchodilator drug
- budesonide (Pulmicort)
- fluticasone (Flovent)
- methylprednisolone (Depo-Medrol)
- prednisolone (Orapred, Pediapred)
- triamcinolone (Azmacort)
Combination Drugs

- bronchodilator drugs
  - albuterol
  - dyphylline
  - ephedrine
  - formoterol
  - ipratropium
  - salmeterol
  - theophylline

- corticosteroid drugs
  - budesonide
  - fluticasone

- expectorant drugs
  - guaifenesin
  - potassium iodide

- antihistamine drugs
  - hydroxyzine

- sedative drugs
  - phenobarbital

Advair (salmeterol, fluticasone)
Combivent (albuterol, ipratropium)
Leukotriene Receptor Blocker Drugs

• Leukotriene
  • a substance that is produced by the body in response to inhaled antigens-causing inflammation, airway edema, bronchospasm

• Leukotriene receptor blocker drugs
  • block the action of leukotriene at the receptor level
  • used to treat asthma

• montelukast (Singulair)

Figure 10-7 Montelukast (Singular) drug label. This leukotriene receptor blocker drug is used to prevent and treat asthma. It is given orally as a tablet. The label for the product Singulair 10mg is reproduced with permission of Merck & Co., Inc., copyright owner.
Drugs Used to Treat Tuberculosis

• Tuberculosis
  • caused by the bacterium *Mycobacterium tuberculosis*, a gram-positive bacterium
  • spread by airborne droplets expelled by coughing
  • if immune system is strong, the infection can remain dormant for several years without causing symptoms

• Treatment accomplished with
  • a combination (not just one) of the following special antitubercular drugs
    • ethambutol (Myambutol)
    • isoniazid (INH, Nydrazid)
    • rifampin (Rifadin, Rimactane)
    • streptomycin
  • over a period of 9 months
Expectorant Drugs

- Expectorant drugs
  - reduce the viscosity or thickness of mucus (sputum) in the lungs; patients can more easily cough it up
  - guaifenesin (Humibid, Mucinex, Naldecon, Robitussin)
  - acetylcysteine (Mucomyst)

Did you know?

Acetylcysteine (Mucomyst) is also used as an antidote for acetaminophen (Tylenol) overdose.
Nicotine Drugs

• Provide a gradual withdrawal from nicotine
  • diminishes the craving
  • helps the person to successfully stop
  • supplies a decreasing amount of nicotine in various forms:
    • chewing gum - Nicorette
    • nasal spray - Nicotrol
    • transdermal patch – Nicoderm CQ
Nicotine Antagonist Drugs

• Drugs bind to nicotine receptors
  • block them from being activated by inhaled nicotine
  • varenicline (Chantix)
Other Drugs for Smoking Cessation

- clonidine (Catapres TTS-1)
  - adrenergic blocker drug
  - used to treat
    - hypertension
    - excessive sweating
    - alcohol withdrawal
    - restless legs syndrome

- bupropion (Zyban)
  - an antidepressant drug
  - topiramate (Topamax)
  - anticonvulsant drug
  - used to treat dependence behaviors
    - alcohol use
    - cocaine use
    - binge eating