CHAPTER 3

Introduction to Basic Pharmacology and Other Common Therapies

CHAPTER OUTLINE

LEARNING OBJECTIVES

After studying this chapter, the student is expected to:

1. Define common terms used in pharmacology.
2. Differentiate the types of adverse reactions.
3. Explain the factors that determine blood levels of a drug.
4. Compare the methods of drug administration.
5. Describe the role of receptor sites in drug action.
6. Differentiate a generic name from a trade name.
7. Explain the basis for the various legal restrictions on the sale of drugs listed in different schedules.
8. Describe the roles of specified members of the health care team, traditional and alternative.
9. Describe the basic concepts of Asian medicine.

KEY TERMS

acupoints
antagonism
compliance
holistic
idiosyncratic
meridians
parenteral
placebo
potentiation
synergism
synthesized

Pharmacology

Health professionals are required to record and maintain medical profiles for each patient including *all* medications, including over-the-counter drugs. An example of a general/simple medical history can be found in Ready Reference 6 at the back of the book. This chapter provides a brief overview of the basic principles of pharmacology and therapeutics.

Basic Principles

Pharmacology is an integrated medical science involving chemistry, biochemistry, anatomy, physiology, microbiology, and others. Pharmacology is the study of drugs, their actions, dosage, therapeutic uses (indications), and adverse effects. Drug therapy is directly linked to the pathophysiology of a particular disease. It is helpful for students to understand the common terminology and concepts used in drug therapy to enable them to look up and comprehend information on a specific drug. Medications frequently have an impact on patient care and have a part in emergency situations/care. It is important to recognize the difference between expected manifestations of a disease and the effects of a drug.

Drugs may come from natural sources such as plants, animals, and microorganisms such as fungi, or they may be synthesized. Many manufactured drugs originated as plant or animal substances. In time the active ingredient was isolated and refined in a laboratory and finally mass produced as a specific synthesized chemical or biologic compound.

A *drug* is a substance that alters biologic activity in a person. Drugs may be prescribed for many reasons, some of which are:

- To promote healing (e.g., an anti-inflammatory glucocorticoid)
- To cure disease (e.g., an antibacterial drug)
- To control or slow progress of a disease (e.g., cancer chemotherapy)
- To prevent disease (e.g., a vaccine)
- To decrease the risk of complications (e.g., an anticoagulant)
- To increase comfort levels (e.g., an analgesic for pain)
- As replacement therapy (e.g., insulin)
- To reduce excessive activity in the body (e.g., a sedative or antianxiety drug)

Pharmacology is organized into separate disciplines that deal with actions of drugs.

- Pharmacodynamics
  - Drug-induced responses of physiologic and biochemical systems in health and disease
- Pharmacokinetics
  - Drug amounts at different sites after administration
- Pharmacotherapeutics
  - Choice and drug application for disease prevention, treatment, or diagnosis
- Toxicology
  - Study of the body's response to drugs, their harmful effects, mechanisms of actions, symptoms, treatment, and identification
- Pharmacy
  - The preparation, compounding, dispensing, and record keeping of therapeutic drugs

Drug Effects

A drug may exert its *therapeutic* or desired action by stimulating or inhibiting cell function. Some drugs, such as antihistamines, block the effects of biochemical agents (like histamine) in the tissues. Other drugs have a physical or mechanical action; for example, some laxatives that provide bulk and increase movement through the gut. Drugs are classified or grouped by their primary pharmacologic action and effect, such as antimicrobial or anti-inflammatory. The *indications* listed for a specific drug in a drug manual provide the approved uses or diseases for which the drug has been proved effective. Off-label uses are those for which the drug has shown some effectiveness, but not the use for which the drug was approved by regulatory bodies. Listed *contraindications* are circumstances under which the drug usually should not be taken.

Generally drugs possess more than one effect on the body, some of which are undesirable, even at recommended doses. If these unwanted actions are mild, they are termed *side effects*. For example, antihistamines frequently lead to a dry mouth and drowsiness, but these effects are tolerated because the drug reduces the allergic response. On occasion, a side effect is used as the primary goal; for example, promethazine (Phenergan) has been used as an antiemetic or a sedative as well as an antihistamine. When the additional effects are dangerous, cause tissue damage, or are life threatening (e.g., excessive bleeding), they are called *adverse* or *toxic* effects. In such cases, the drug is discontinued or a lower dose ordered. In some cases, such as cancer chemotherapy, a choice about the benefits compared with the risks of the recommended treatment is necessary. Unfortunately, a long period of time may elapse before sufficient reports of toxic effects are compiled to warrant warnings about a specific drug, and in some cases its withdrawal from the marketplace. It is important to realize that undesirable and toxic effects can occur with over-the-counter (OTC) items as well as prescription drugs. For example, megadoses of some vitamins are very toxic, and excessive amounts of acetaminophen can cause kidney and liver damage. In late 2000, some cough and cold preparations as well as appetite suppressants containing phenylpropanolamine (PPA) were removed from the market because of a risk of hemorrhagic strokes in young women. Research continues into the development of "ideal" drugs with improved or more selective therapeutic effect, fewer (or no) side effects, and no toxic effects.

Several specific forms of adverse effects should be noted:

- *Hypersensitivity* or allergic reactions to drugs such as penicillin and local anesthetics are common. The reaction may be mild (e.g., a rash) or can result in anaphylaxis. The patient should stop taking the medication immediately and notify the physician. Generally a person is allergic to other structurally similar drugs and should avoid that group in the future.
- Idiosyncratic (also called paradoxic) reactions are unexpected or unusual responses to drugs; for example, excessive excitement after taking a sedative (sleep-inducing drug). These reactions occur in some elderly individuals. Some idiosyncratic reactions are used therapeutically; stimulants are used in ADHD to reduce distraction and increase concentration.

- *Iatrogenic* refers to a negative effect on the body caused by a medication error, drug overdose, or unusual response.
- *Teratogenic* or harmful effects on the fetus, leading to developmental defects, have been associated with some drugs. Fetal cells are particularly vulnerable in the first 3 months (see discussion of congenital defects in Chapter 21). This is an area in which research cannot be totally effective in screening drugs. It is recommended that pregnant women or those planning pregnancy avoid all medications.
- *Interactions* occur when a drug's effect is modified by combining it with another drug, food, herbal compounds, or other material. Interactions commonly occur with nonprescription drugs such as aspirin, antacids, or herbal compounds, as well as with alcohol. Even a healthy food such as grapefruit juice can cause changes in drug absorption. Interactions are a particular concern for elderly patients, who often take many drugs and consult several physicians.

The effect of the combination may be increased much more than expected (**synergism**) or greatly decreased (**antagonism**). Synergistic action can be life threatening; for example, causing hemorrhage or coma. It has been documented that the majority of drug overdose cases and fatalities in hospital emergency departments result from drug-drug or drug-alcohol combinations.

Alternatively, when synergism is established, it may be used beneficially to reduce the dose of each drug to achieve the same or more beneficial effects with reduced side effects. For example, this is an intentional advantageous action when combining drugs to treat pain.

The presence of an antagonist prevents the patient from receiving the beneficial action of a drug. In a patient with heart disease or a serious infection, this would be hazardous. On the other hand, antagonistic action is effectively used when an antidote is required for an accidental poisoning or overdose.

One other form of interaction involves **potentiation**, whereby one drug enhances the effect of a second drug. For example, the inclusion of epinephrine with local anesthetics is intended to prolong the effects of the local anesthetic, without increasing the dose. It causes vasoconstriction in the area, which decreases blood flow and thereby helps keep the anesthetic in the area longer because it will not be absorbed as quickly.

Administration and Distribution of Drugs

The first consideration with administration is the dosage of the medication. The *dose* of a drug is the amount of drug required to produce the specific desired effect in an adult, usually expressed by a weight or measure and a time factor such as twice a day. A child's dose is best calculated using the child's weight, not age. A proper measuring device should be used when giving medication because general household spoons and cups vary considerably in size.

In some circumstances, a larger dose may be administered initially, or the first dose may be given by injection, to achieve effective drug levels quickly. This "loading dose" principle is frequently applied to antimicrobial drugs, in which case it is desirable to have sufficient drug in the body to begin destruction of the infecting microbes as soon as possible. It is equally important not to increase the prescribed dose over a period of time (the "if one tablet is good, two or three are better" concept), nor to increase the frequency, because these changes could result in toxic blood levels of the drug.

The frequency of dosing is important in maintaining effective blood levels of the drug without toxicity, and directions regarding timing should be carefully followed (Fig. 3-1). Optimum dosing schedules are established for each drug based on factors such as absorption, transport in the blood, half-life of the particular drug, and biotransformation. Drugs usually should be taken at regular intervals over the 24-hour day, such as every 6 hours. Directions regarding timing related to meals or other daily events are intentional and should be observed. For example, insulin intake must match food intake. Sometimes the drug is intended to assist with food intake and digestion and hence should be taken before meals. In other cases, food may inactivate some of the drug or interfere with absorption, reducing the amount reaching the blood; therefore the drug must be taken well before a meal or certain foods must be avoided. Alternatively, it may be best to take the drug with or after the meal to prevent gastric irritation. A sleep-inducing drug is more effective if taken a half-hour before going to bed, rather than when getting into bed with the expectation that one will fall asleep immediately.

Actual blood levels of a drug are also dependent on such factors as the individual's:

- Circulation and cardiovascular function
- Age
- Body weight and proportion of fatty tissue
- Activity level/exercise
- Ability to absorb, metabolize, and excrete drugs (liver and kidney function)
- Food and fluid intake
- Genetic factors
- Health status, or presence of disease—chronic or acute

Therefore drug dosage and administration may have to be modified for some individuals, particularly young children and elderly people. It is sometimes difficult to determine exactly how much drug actually is effective at the site. A laboratory analysis can determine actual blood levels for many drugs. This may be requested if toxicity is suspected.

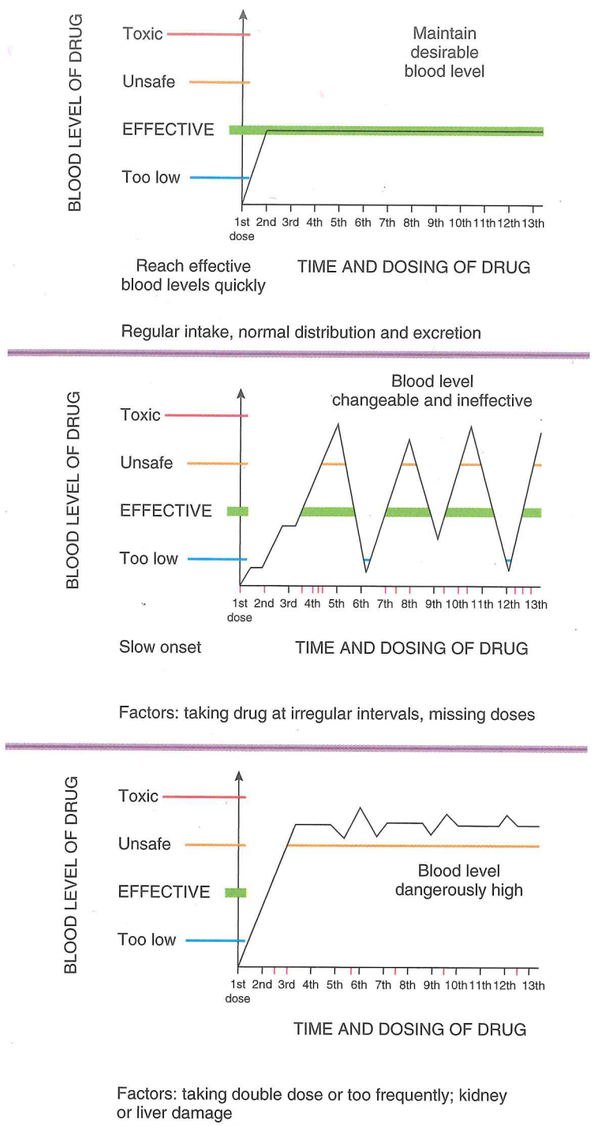

FIGURE 3-1 Factors affecting blood levels of drugs—amount of drug taken into the body, frequency of intake, and amount of drug excreted.

A drug enters the body by a chosen route, travels in the blood around the body, and eventually arrives at the site of action (e.g., the heart), exerts its effect, and then is metabolized and excreted from the body. For example, a drug taken orally is broken down and absorbed from the gastrointestinal tract into the blood (rather like ingesting food and drink!). Sometimes a drug is administered directly into an organ or tissue where it is expected to act. Another exception is the application of creams on skin lesions, where minimal absorption is expected.

Drugs can be administered for acting locally or having a systemic action:

- Local administration includes: skin, mucous membranes, orally; that is, antacids, inhalation for selected respiratory conditions, iontophoretically

- Systemic administration: transdermal therapeutic systems, orally, sublingual, rectal, inhalation, subcutaneous, intramuscular, intravenous intrathecal

The major routes for administration of drugs are oral and parenteral (injection). Table 3-1 provides a comparison of some common routes, with regard to convenience, approximate time required to reach the blood and the site of action, and the amount of drug lost. The common abbreviations for various routes may be found in Ready Reference 4. Drugs may also be administered by inhalation into the lungs (either for local effect, e.g., a bronchodilator, or for absorption into blood, e.g., an anesthetic), topical application through the skin or mucous membranes, and rectally, using a suppository for local effect or absorption into the blood. The transdermal (patch) method provides for long-term continuous absorption of drugs such as nicotine, hormones, or nitroglycerin through the skin into the blood. Variations on these methods are possible, particularly for oral medications. Time-release or long-acting forms are available (e.g., for cough and cold medications), which may contain three doses to be released over a 12-hour period. Less frequent administration may be more efficient and increase patient compliance (adherence to directions) because of the convenience. Enteric-coated tablets (a special coating that prevents breakdown until the tablet is in the intestine) are prepared for drugs such as aspirin to prevent gastric ulcers or bleeding in persons who take large doses of this anti-inflammatory drug over prolonged periods of time.

Some drugs can only be taken by one route. However, insulin, which had to be injected in the past, can be given orally now (Generex Oral-lyn). A few drugs, such as glucocorticoids (e.g., cortisol or prednisone), can be administered in many ways, such as oral tablets, various types of injection, skin creams, and eye drops.

Oral medications are absorbed from the stomach or intestine, transported to the liver, and then released into the general circulation. This process takes time, and considerable drug may be lost in transit through the digestive tract and liver. Drugs injected intramuscularly are gradually absorbed into the blood, depending on the status of the circulation. For example, absorption could be delayed for a person in shock, but occur more rapidly if the person is exercising.

TABLE 3-1 Various Routes for Drug Administration

Route	Characteristics	Time to Onset and Drug Loss	Advantages	Disadvantages
Oral tablet, capsule, liquid ingested	Simple administration, easily portable	Long time to onset, e.g., 30-60 min More loss in digestive system	Tablets stable, cost varies, safe	Taste and swallowing problems; gastric irritation; uncertain absorption
Sublingual (e.g., nitroglycerin)	Very simple to use, portable	Immediate, directly into blood, little loss of drug	Convenient, rapid action	Tablets soft and unstable
Subcutaneous Injection (e.g., insulin)	Requires syringe, self-administer, portable	Slow absorption into blood Some loss of drug	Simplest injection Only small doses can be given	Requires asepsis and equipment Can be irritating
Intramuscular Injection (e.g., penicillin)	Requires syringe and technique (deltoid or gluteal muscle)	Good absorption into blood Some time lag and drug loss until absorption	Use when patient unconscious or nauseated Rapid, prolonged effect	Requires asepsis and equipment Short shelf-life Discomfort, especially for elderly
Intravenous Injection	Requires equipment and technique (directly into vein)	Immediate onset and no drug loss	Immediate effect, predictable drug level Use when patient unconscious	Costly, skill required No recovery of drug Irritation at site
Inhalation (into respiratory tract)	Portable inhaler (puffer) or machine and technique required	Rapid onset, little loss of drug.	Local effect or absorb into alveolar capillaries Rapid effect Good for anesthesia	Requires effective technique
Topical (skin or mucous membranes) gel, cream, ointment, patch, spray, liquid, or suppository	Local application, portable Also eye, ear, vaginal, rectal application	Onset rapid Some loss Absorption varies	Easy to apply Few systemic effects Useful local anesthetic	Can be messy Sometimes difficult application, e.g., eye
Intraperitoneal pump	Requires surgery	Excellent control of blood glucose levels	Immediate onset	Costly and may become infected

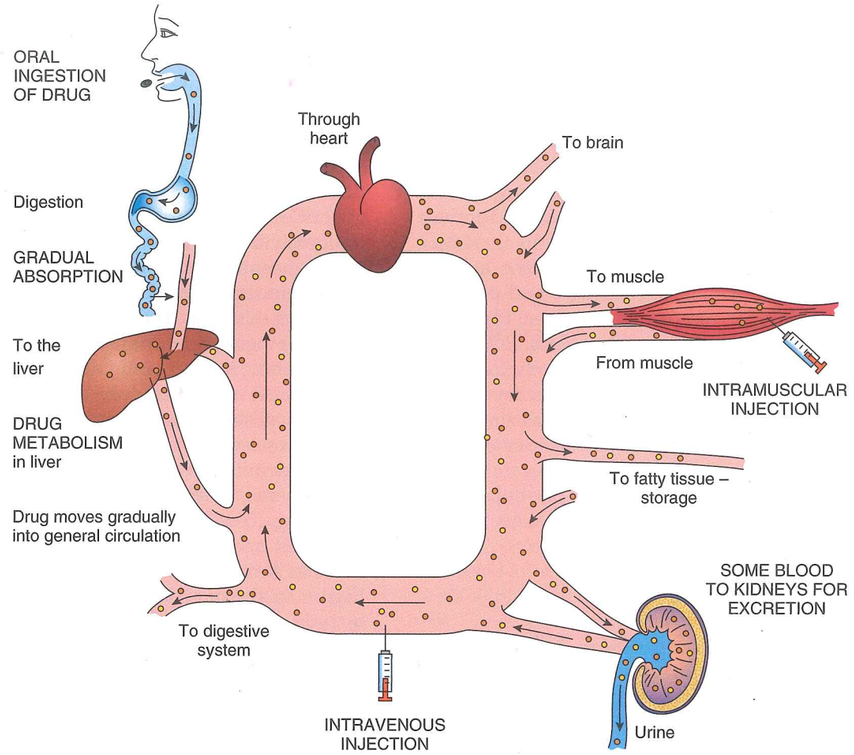

FIGURE 3-2 Drug absorption, distribution, and excretion.

The circulating blood picks up drugs and transports them, often bound to plasma proteins. Some of the drug may follow different pathways, branching off into different organs or tissues (Fig. 3-2). Depending on the specific characteristics of a drug, some may be lost temporarily in storage areas such as fatty tissue (e.g., anesthetics) or may be quickly metabolized. At some point during this movement through the body, the drug reaches the tissue or organ where it acts, passes into the interstitial fluid, and exerts its effect. Most drugs are gradually metabolized and inactivated in the liver and then excreted by the kidneys. A few drugs are excreted in bile or feces. Some anesthetics are expired through the lungs.

Some barriers to drug passage exist. Many drugs cannot pass the blood-brain barrier, a protection provided by tight junctions between cells surrounding the brain. However, at times, drugs are required in the brain, for example, anesthetics or antimicrobial drugs, and only a select few are able to pass through the blood-brain barrier. Likewise, the placental barrier protects the fetus.

THINK ABOUT 3-1

a. Explain why sublingual administration is faster than oral administration.
b. How would severe kidney or liver damage affect blood levels of a drug?
c. Describe three types of adverse reactions.

Drug Mechanisms and Receptors

Drugs possess different mechanisms for their actions. A common pharmacologic action is the drug-receptor interaction. Numerous receptors are present on or within cells in the body, responding to natural substances such as enzymes, natural hormones (e.g., estrogen), neurotransmitters (e.g., acetylcholine, norepinephrine, or GABA), or electrolytes (e.g., calcium ions). The drug classification may be named as such; for example, calcium-blocking drugs. Many medications act at these distinct receptor sites in cells or on cell membranes, either stimulating the receptor directly or blocking normal stimulating chemicals in the body (Fig. 3-3).

Depending on the uniqueness of the receptors, some drugs have very specific effects; others have a broad range of activity. The drug binds to one type of receptor and stimulates the same activity as the natural substance (an agonist). A different drug may bind to the same receptor, not stimulate it, but block entry of a natural substance and thus prevent the normal stimulus and inhibit the activity (an antagonist or blocking agent). For example, beta-adrenergic blocking agents bind to beta receptors (sympathetic nervous system) in the heart, preventing epinephrine from stimulating the heart to contract at a faster rate and increasing blood pressure. Similarly as different receptors have been identified, many drugs have been designed to stimulate or block certain activities in diverse areas of the body, including the brain and digestive tract. Research is focused on identifying particular receptors and synthesizing drugs that act only at those specific receptors in order to reduce the risk of side effects.

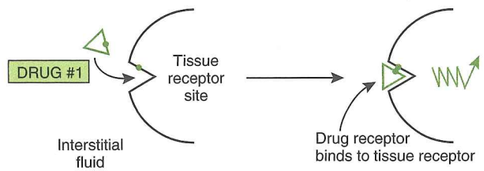

FIGURE 3-3 Receptors and drug action. Drugs may stimulate natural receptors, increasing activity, or may block receptors, decreasing activity.

Drug Classifications and Prescriptions

A prescription is a signed legal document that must include the patient's name and address and age if significant (e.g., the patient is a child); the prescriber's name, address, and identification; the date; the name and amount of the drug; the dosage, route, and directions for taking the drug; and permission for additional quantities. Abbreviations, taken from Latin words, are frequently used on prescriptions and physicians' orders in the hospital. Lists of common abbreviations and equivalent measures are found in Ready Reference 3 at the end of this book. The apothecary system of measurement (e.g., grains or drams) has largely been replaced by the metric system of mg and mL.

Chemical names for drugs tend to be very complex and difficult to remember and are therefore limited primarily to scientific or manufacturing groups. Each drug can be identified by two additional names. One is the *generic* name, a unique, official, simple name for a specific drug. This name is considered easy to remember accurately and is used in many circumstances. The other name is the trade, proprietary, or brand name, a trademark name assigned by a single manufacturer, and to be used only by that manufacturer. Many trade names may apply to one generic name, and they are considered equivalent. With the increase in new drugs some trade names sound very similar and this can lead to drug error. See Table 3-2 for examples of drug trade names.

Often members of a family of drugs with similar actions can be identified by the similarities in their generic names. For example, drugs classified as benzodiazepines, used as antianxiety agents, include diazepam, clonazepam, lorazepam, and oxazepam.

Trade names are always used for combinations of drugs in a single tablet or liquid. An exception to this pattern occurs with a few drugs that have been identified for many years by a common name, such as aspirin.

Many drug names are very similar in appearance and sound. This can lead to serious errors. It is important to match the drug name and its action with the patient's disease to prevent errors.

Legally, the Food and Drug Administration in the United States regulates the production, labeling, distribution, and other aspects of drug control. Similar agencies assume responsibility in other countries. Some

TABLE 3-2 Examples of Drug Nomenclature

Generic Name (Nonproprietary)	Trade Name (Proprietary)	Chemical Name
Diazepam	Valium, Vivol, Apo-Diazepam, Diastat	7-chloro-1,3-dihydro-1-methyl-5-phenyl-2H-1,4-benzodiazepin-2-one
Ibuprofen	Advil, Motrin, Ibren	2-(*p*-isobutyl phenyl)propionic acid
Hydrochlorothiazide	Hydro DIURIL, Esidrix, Hydro-Par, Oretic	6-chloro-3,4-dihydro-2H-1,2,4-benzothiadiazine-7-sulfonamide 1,1-dioxide

drugs are available without a prescription; termed *over-the-counter* or *OTC* items, such as aspirin, acetaminophen, antacids, and some cold medications, they are considered safe for open sale. When taking a drug history, it is wise to ask the patient specifically about OTC medications and any herbal products because individuals may feel they are not significant and not volunteer this information. However, for example, a drug such as aspirin may be important because it is likely to cause excessive bleeding. To prevent possible complications, it is recommended that a health professional *avoid* giving a patient any OTC drug for any reason, unless a physician or dentist so directs.

Other drugs, considered a greater risk, are classified in official schedules, according to their effects and potential for adverse effects, abuse, or dependency. Their sale is restricted, and prescription requirements are set accordingly. For example, certain narcotics such as morphine are under tighter control, requiring a written, signed prescription (not by telephone) without refill privileges. Another schedule contains drugs requiring prescription but that could be ordered by telephone. One schedule is very limited, listing drugs that can only be used for research. Drugs may be added or moved between schedules at any time. The Centers for Disease Control and Prevention (CDC) maintains a stock of drugs for rare infections. These drugs can only be obtained through consultation with the CDC.

Clinical research or trials of promising new drugs may be encountered in practice. The clinical research phase follows preliminary studies into efficacy and safety. Rules for this research have been established by government agencies, and committees oversee projects. Trials encompass a prolonged period of time. It usually takes a total of 10 to 15 years for the development of a new drug. Early trials involve a few selected patients; if successful, the trial group is greatly expanded. Researchers form a hypothesis and develop questions for their study based on the particular drug and trial requirements. A project design frequently involves dividing the patients randomly and anonymously into two groups, one to receive the standard drug therapy, the other group to receive the new therapy, in an effort to assess the effectiveness and safety of the new drug. On occasion, one group is given a **placebo**, a "sugar" pill lacking any active ingredient, to form a comparison for the new drug. A placebo may also be used for its psychological impact on certain patients.

THINK ABOUT 3-2

a. Explain why drugs are classified legally into different schedules.
b. What is the effect on patients when a breakthrough in scientific research is announced in the media?

Traditional Forms of Therapy

Many health professionals may be involved either directly or indirectly in the team approach to care of a patient who may be a hospital inpatient, an outpatient, or someone in the community. A few examples have been selected here to clarify roles and illustrate the multidisciplinary approach to providing therapeutic intervention. Therapies must address the pathophysiologic changes if a return to health is to result or function is to improve with minimal complications.

Physiotherapy

A physiotherapist assesses physical function and works to restore any deficit and prevent further physical dysfunction. Physiotherapy involves individualized treatment and rehabilitation as well as reduction in pain resulting from disease, surgery, or injury. Physiotherapy may include appropriate exercises, and use of ultrasound, transcutaneous electrical nerve stimulation (TENS), or other methods to alleviate pain and gain increased joint flexibility and mobility. Physiotherapists work with patients with acute neurologic, musculoskeletal, and cardiopulmonary disorders. Appropriate therapy is invaluable in preventing complications; for example, after a stroke. Infants with congenital defects or children with injuries affecting mobility require therapy as soon as possible to promote maximum development.

Other major areas for physiotherapy are rehabilitation and long-term care, in which the focus is on maximizing mobility and functional independence. Rehabilitation and long-term care involve working with amputees and those with acquired brain injury, spinal cord injuries, or strokes, as well as with group cardiac and respiratory rehabilitation programs. Cardiac rehabilitation programs have been quite successful following heart attack. Pulmonary rehabilitation has benefited many patients, enabling them to increase walking time without pain and maintain better oxygen levels. Chest therapy to mobilize excess secretions and aid lung function is useful for postoperative patients or those with chronic obstructive pulmonary disease (COPD) or bronchiectasis and cystic fibrosis. The benefits of appropriate physiotherapy to cancer patients undergoing chemotherapy and radiation are now being appreciated. Educating patients and families to assist with and maintain their individual programs is an important aspect of treatment. Physiotherapy aides or assistants may take on some responsibilities under supervision of a registered physiotherapist.

Occupational Therapy

Occupational therapists (OTs) provide a functional assessment of patient capabilities related to normal

activities of daily living (ADLs). This assessment includes an evaluation of motor, cognitive, and visual-spatial ability. Guidance and practical assistance to maximize function and maintain independence are provided. Whereas the physiotherapist focuses on functional mobility and relief of pain, the occupational therapist integrates remediation of motor control, cognition, and visual-spatial perception, which is essential for client safety and productivity. Integration of functional activities is essential to continued independence and health.

In addition to remediation of functional capacities, the OT has expertise in teaching the client to use adaptations in meeting his or her needs. This includes assessment of technologies available in the marketplace, their effective use, and appropriateness for the particular client. In many cases, OTs work directly with technicians in the production of aids such as wheelchairs or walkers, as well as adaptive devices for food preparation, feeding, and personal hygiene. In the workplace setting, OTs work along with occupational health personnel to assess the workplace and essential tasks, identify appropriate accommodation, and instruct clients in the effective and safe use of supportive technologies.

OTs work in all health care settings within both institutions and the community. They may be observed working with children with developmental delays, seniors adapting to the challenges of aging and common disorders such as osteoarthritis, mentally ill clients, and recently disabled workers in the workplace.

Speech/Language Pathology

The speech/language pathologist is a specialist in the assessment and treatment of those with communication or swallowing problems. The patient could be an infant with swallowing and feeding problems, a child with a hearing deficit who is mute, an adult with aphasia after a stroke, or someone requiring a hearing assessment.

Nutrition/Diet

As an expert in foods and the nutritional needs of the body in health and illness, a nutritionist or dietitian offers advice to individuals or groups on the nutritional demands and food management best suited to a specific diagnosis; for example, diabetes. Dietitians supervise food services in hospitals and other health care institutions. They may be consulted regarding the dangers of extreme diets or eating disorders such as anorexia nervosa.

Registered Massage Therapy

Registered massage therapists (RMTs) use a variety of techniques to increase circulation, reduce pain, and increase flexibility for clients experiencing join pain or problems with body alignment. Registered massage therapists may also use soothing aromatics, acupuncture, or other modalities during therapy.

Osteopathy

Osteopaths are medical doctors who use all the traditional treatment methods such as surgery and drugs, but in addition, promote the body's natural healing processes by incorporating manipulations of the musculoskeletal system, both in diagnosis and treatment.

Chiropractic

Chiropractic medicine is based on the concept that one's health status is dependent on the state of the nervous system, which regulates all body functions to maintain homeostasis. Practice frequently involves manipulation of the vertebral column. Radiology may be used for diagnosis. Although no drugs or surgery are included in chiropractic therapy, acupuncture may be used.

Complementary or Alternative Therapies

Alternative therapies are those therapeutic practices considered to be outside the range of traditional Western medicine that also focus on alleviating disease and suffering. Included on the list of alternative therapies are acupuncture, aromatherapy, *shiatsu*, reflexology, and herbal medicine. Many of these therapies have roots in Asia, where more emphasis is placed on preserving a healthy lifestyle. The approach to disease and healing is generally **holistic**, a more comprehensive approach, recognizing the interrelationships of body, mind, and spirit, and the impact of pathophysiologic changes on all aspects of the individual, and treating the whole person.

Until recently, these therapies were viewed by some in the Western world to be "quackery" and by others simply to have a placebo effect, or at times even to be dangerous. Now they are accepted by more individuals and are termed *complementary*, to be used in conjunction with Western medical therapy. A few people have turned to one or more of the alternatives as a substitute for Western medical care. In some cases, alternative therapies have become a focus of last resort for individuals when traditional medicine could not achieve a cure. Current statistics show that almost half of the population uses some form of alternative therapy, and future trend predictions estimate this figure will continue to rise. Chinese medicine is now considered to be an independent system of thought and practice, including clinical observation, testing, and diagnosis.

Practitioners in these areas have varying degrees of training and professional regulation. As with traditional medicine, a patient should investigate the therapy and the individual practitioner to ensure safety and consistency with other treatment modalities. A few examples are described here.

Noncontact Therapeutic Touch

Many nurses, as well as other professionals, have trained in therapeutic touch since the 1970s. Energy is exchanged between people for relief of pain and anxiety and to promote healing. The first step in delivering touch therapy is to consciously form a positive *intent to heal*, a mindset both before and during the session. The practitioner is able to locate problem areas in the body by first scanning the body with the hands. Healing is promoted by lightly touching the skin or moving the hands just above the body surface. Imagery, light, or colors may be incorporated as a means of transferring healing energy to the patient, bringing comfort.

Naturopathy

Naturopathic treatment is based on promoting natural foods, massage, exercise, and fresh air as a way of life, thus enhancing health and preventing disease. Acupuncture, herbal medicines, nutrition, massage, and physical manipulations all have roles. Many alternative therapies are age-old home remedies that have stood the test of time to bring relief from human health complaints or promote good health. Naturopaths do not recommend any traditional drugs.

Homeopathy

Homeopathy has the goal of stimulating the immune system and natural healing power in the body through the use of plant, animal, and mineral products. A toxin or offending substance is identified for each disease state and following dilution by several thousand-fold, the toxin is administered to treat the problem.

Herbal Medicine

Medicinal herbs were first documented in ancient Egypt. Numerous groups throughout the world use herbs and plants for medicinal purposes. They are now freely available in many stores. There has been much publicity about the benefits of garlic in cardiovascular disease and other conditions. Echinacea is found in many cold remedies and used for prophylaxis. St. John's Wort contains compounds similar to standard antidepressant medications. Efforts are now being focused on providing standardized content, proving efficacy, and improving purity of herbal compounds. As with other medications, it is important to consult with a knowledgeable professional about safe dosage, interactions with other medications, and untoward effects with specific diseases.

Aromatherapy

Aromatherapy is enjoying increased popularity. Here essential oils that have therapeutic effects when rubbed on the skin and/or inhaled are extracted from plants. One oil can contain many substances. Oils may be absorbed through the skin into the general circulation, when bathing or with a massage, to exert a systemic effect. When inhaled, the essence influences physiologic functions through the olfactory system. For example, chamomile is used for its calming and sleep-inducing effect, lavender and peppermint oil soothe headache, and rosemary relieves muscle and joint disorders.

Asian Concepts of Disease and Healing

Asian therapies are based on the balance or imbalance of life energy called *qi* in Chinese medicine (also called ch'*i* or *chi*, pronounced *chee*) or *ki* in Japanese medicine. Disease is caused by a deficit or excess of *qi*, whereas healing restores the energy balance. *Qi* is derived from three sources: inherited or ancestral factors, the food ingested, and air breathed in. Imbalance or disharmony between *yin* (lack of *qi* or cold) and *yang* (excess of *qi* or heat) may be caused by changes in diet, stress, metabolism, activity, or environment, leading to disease.

In the body, the life force, *qi*, flows along specific channels called **meridians**, which join all organs and body parts together. Meridians are not to be confused with anatomic nerves or blood vessels. Each meridian has a name and function, and may be located some distance from the organ for which it is named. For example, the large intestine meridian begins on the surface of the index finger, travels past the wrist and shoulder, up the neck, and across the upper lip to the nose. Then the meridian goes internally to the lung, and finally to the large intestine. All meridians are bilateral except for one midline anterior (the conception vessel) and one midline posterior (the governor vessel). Along the meridians *qi* flows, and this flow may be accessed or altered at particular **acupoints**, or *tsubo* (Japanese). Each acupoint has very specific actions or properties, such as moving the *qi* or blood, pain reduction, heating, cooling, drying, or calming the emotions. A pattern of disharmony may involve a number of acupoints and meridians. The goal is to connect with the points that will normalize the flow of *qi* and restore the balance of *yin* and *yang*.

Acupuncture

Acupuncture is a Chinese therapeutic discipline over 3000 years old that involves inserting very fine needles into the various meridian acupoints that have potential to balance the body energy. There are classically 365 acupoints, or *tsubo* (Japanese), but today the commonly used points number only 150. Each point has a specific and a more generalized therapeutic action, and the points are often used in combinations. Acupuncture may be performed on extra points not related to meridians, and also on *ashi* or "ouch points" anywhere. Acupuncture deals with pain relief and also with balancing

energy to restore health by using superficial meridian acupoints. Current theory suggests that acupuncture works to decrease pain because it causes the release of endorphins in the brain.

An acupuncture treatment on average uses 5 to 15 needles, which should be sterile, stainless steel, and disposable. The needles may be rotated or connected to low-level electric current or laser for a period of 30 to 45 minutes. The needle may only be laid on the acupoint on the surface of the skin without actually being inserted, but most often the needles are inserted into the skin to depths ranging from 1 to 2 mm on the face and ears to up to 3 inches in the heavily muscled buttocks. Instead of needles, ultrasonic waves or laser may be used over acupoints.

Moxibustion is a form of acupuncture that specifically treats cold or deficiency patterns by burning moxa to produce pure *yang* energy that penetrates deeply into the body tissues to bring about relief. The heating medium is *Artemisia vulgaris*, or common mugwort, whose dried and purified leaves produce moxa wool. The benefit of moxa is that when it is burned in a cone shape, the heat produced penetrates the body much the same way as a laser concentrates light to a concentrated beam of light energy.

Recently medical schools have begun to offer continuing education in acupuncture for health care professionals. The curricula include both traditional Chinese medicine theories and practice, as well as acupuncture based on allopathic knowledge of pain pathways. Such practice is often termed *medical acupuncture* and is offered by a variety of regulated practitioners.

Shiatsu

Shiatsu (Japanese: finger pressure) is the Japanese refined version of Chinese *anma* massage, or acupuncture without needles. There are two main forms of *shiatsu*, one using only thumbs, and the Zen *shiatsu*, the more traditional form that uses fingers, thumbs, palms, elbows, and knees to deliver slow, deep, but gentle pressure by a relaxed therapist to access the *tsubo*, or acupoints. The patient remains clothed, usually supine on a mat on the floor. This therapy provides a whole-body treatment in which all meridians are treated, from their beginning to their end, followed by the area of complaint, taking approximately 1 hour. Initially assessment is performed by palpating the meridians and the *hara*, the area below the ribs and above the pubic bone. *Shiatsu* therapists give clients exercises or other techniques that are self-administered at home between treatment sessions.

Shiatsu is recommended for stress-related illness and back pain because it provides relaxation. Zen *shiatsu* puts an emphasis upon the psychologic/emotional causes of disharmony. The therapist also adopts the "intent to heal" attitude before and during the treatment, using the power of touch.

Yoga

Yoga is an ancient Indian discipline of various forms that combines physical activity in the form of body stretching postures (*asanas*) with meditation. Practice with stretching, meditation, and special breathing techniques serves to improve the flow of *prana*, the Indian equivalent to Chinese *qi*. *Prana* circulates through the body via channels or *nadis* to connect to seven *chakras* or energy centers running up the midline. Regular practice opens these *chakras*, improves flexibility, muscle tone, endurance, and overall health, and reduces stress. Often a diet of simple (unrefined), pure food, possibly vegetarian in nature, is recommended. The practice relieves pain and anxiety in some individuals with chronic disease.

Reflexology

Reflexology, a therapy from ancient China and Egypt, relates points on the feet (mainly) and the hands to 10 longitudinal zones in the body. When the foot is stimulated with massage, this can elicit changes in distant organs or structures in the body through meridians similar to those of acupuncture. For example, areas of the great toe represent head and brain activities, and the medial arch (bilaterally) influences the vertebral column.

The practitioner applies varying degrees of pressure to the standard rotating thumb massage technique and may include slight vibration directed to various foot reflex areas. The session may conclude with essential oils being massaged into the feet. This relieves stress and muscle tension.

Craniosacral Therapy

Craniosacral therapy was first published as a scientific research paper by Dr. W. Sutherland, an osteopathic physician, in the 1930s. This system is used by a wide variety of health care practitioners: physiotherapists, occupational therapists, acupuncturists, chiropractors, medical doctors, osteopathic physicians, and dentists. The therapy deals with the characteristic ebb and flow pulsing rhythm of the meninges and cerebrospinal fluid around the brain and spinal cord. Gentle palpation and manipulation of the skull bones and vertebrae are thought to rebalance the system.

Ayurveda

This system of medicine originated in India and is still practiced today. Its goal is to balance body *dosas* or factors so that a healthy mind and body result. Special dietary plans, yoga, and herbal remedies are commonly used in Ayurvedic medicine.

THINK ABOUT 3-3

Describe three ways in which Asian medicine differs from the Western medical practices.

Emergency Assessment and Aid

Emergency care can be provided by any member of the health care team within the standards and scope of practice in their profession. Regardless of the circumstances and the responder's background, a simple assessment is the first step in any emergency situation. The format used by different groups may vary somewhat, but the same principles apply. The effectiveness of emergency response depends on the initial assessment. Using an organized checklist and keeping accurate notes of observations and care are critical elements in emergency care.

CASE STUDY A

Therapies for Pain

Where possible, the following case study should be considered from the professional standards of your studies.

While taking her health history, Ms. Z. reports severe pain in her lower back.

1. What questions would you include in your history taking for Ms. Z.? Provide a rationale for each question.
   Ms. Z. reports using herbal remedies to help her sleep, and herbal compresses during the day to reduce pain. Her doctor has prescribed acetaminophen with codeine to relieve pain. She thinks that she usually takes two "extra-strong" acetaminophen tablets every 4 hours and a Tylenol 3 tablet whenever the pain is severe.
2. What sources would you use to find information on herbal compounds and drugs?
3. What should Ms. Z. understand about the dosage of acetaminophen she is taking?
4. How can Tylenol 3 tablets assist Ms. Z to fall asleep?
5. How may the Tylenol 3 tablets interfere with sleep in some individuals?
6. What other measures can Ms. Z. use to control her pain and reduce her need for acetaminophen?
7. What therapeutic help can you provide Ms. Z. in controlling her pain? Does this therapy affect drug action?

CHAPTER SUMMARY

Drug therapy as well as other therapeutic modalities may have an impact on the course of a disease, patient well-being, or patient care by any member of the health care team.

- Drugs may have mild side effects, such as nausea, or serious toxic effects, such as bone marrow depression, in the body in addition to the beneficial or therapeutic effect. Other potential unwanted outcomes of drug treatment include hypersensitivity reaction, idiosyncratic response, or teratogenic effects.
- The route of administration, dosing schedule, distribution in the individual's body, and timing of elimination of the drug determine the effective blood level of the drug.
- Drugs may be used to stimulate or block specific natural receptor sites in the body so as to alter certain activities, such as heart rate.
- Drug interactions with other drugs, foods, or alcohol may result in synergistic or antagonistic effects.
- Physiotherapists assess physical functions and select therapy to improve mobility and/or relieve pain. Occupational therapists assist patients with ADLs, maximizing independent function.
- Alternative or complementary therapies may be provided by alternative practitioners such as osteopaths, naturopaths, and homeopaths. Treatments may be offered as replacement or in conjunction with traditional medicine.
- Asian healing is based on restoring the balance of life energy in the body (*qi* in Chinese medicine or *ki* in Japanese therapy) using specific points or meridians in the body. Therapeutic measures include acupuncture, shiatsu, and reflexology.
- The first steps in a general emergency assessment include evaluation of level of consciousness, airway function, breathing pattern, and circulatory status.

STUDY QUESTIONS

1. Compare a generic name with a trade name.
2. Explain why one drug is taken every 3 hours, but another drug is taken once daily.
3. Compare the advantages and disadvantages of:
   a. oral administration
   b. intravenous administration
4. Explain how synergism can be:
   a. dangerous
   b. beneficial
5. Explain why some drug is lost following administration and not used in the body.
6. Which group of therapists could best:
   a. assist with fitting a wheelchair?
   b. assist a young child with a swallowing problem?
7. Compare the therapies used by osteopathic physicians and chiropractors.
8. Compare the similarities and differences between acupuncture and *shiatsu*.