KEY TERMS

Absorption
Adverse reaction
Agonist
Antagonist
Bioavailability
Biotransformation/Metabolism
Distribution
Excretion
Half-life
Idiosyncratic
Pharmacokinetics
Receptors
Side effects
Synergism
Teratogenic
Toxic

WHAT IS PHARMACOLOGY?

What is pharmacology, and why is it studied? Pharmacology is the exploration of substances that are used to heal and comfort the sick and in other ways help us to live longer and healthier lives. Do you ever wonder who first thought that placing maggots on a black necrotic wound was a good idea and would lead to healthy, clean tissue, or who decided that brewing a tea out of the beautiful, but poisonous foxglove plant should be used to help with heart failure? These pioneering individuals were extremely brave because they would likely have been banished or killed if they had guessed wrong. They were the first pharmacologists. These courageous men and women and their followers began the journey that led to the wonderful discoveries of the modern era. The advances have enabled us to increase life expectancy by eradicating most childhood illnesses and by producing antibiotics to cure many infections. The science of pharmacology has allowed us to research and produce potential medications while minimizing danger to the patient in the process.

THE DRUG CYCLE

When a medication is ingested, applied, or injected, it enters the bloodstream and begins the drug cycle. This cycle has four main phases: absorption (how the medication enters our bloodstream), distribution (how the medication travels to the appropriate site), metabolism or biotransformation (how our body breaks the medication down into usable components and waste products), and excretion (how our body eliminates the extra medication and waste products) (Fig. 2-1).

Factors influencing the time it takes to complete the drug cycle include the drug itself, the route of administration, and the health of the patient's organs. For example, medication given by mouth takes much longer to enter the bloodstream and to reach the site where it is needed than does medication given directly into the circulatory system. Some medications take longer to break down than others, and the effects of these drugs are prolonged. The estimated time for the cycle to be completed ranges from 15 minutes to days.

Absorption

Absorption is the process by which a substance moves into the bloodstream from the site where it was administered. A drug can be administered in one of two ways: (1) enterally, which means the drug is given directly into the gastrointestinal (GI) system orally, rectally, or through a tube entering this system; or (2) parenterally, by all other routes that do not touch the GI system.

How quickly a medication is absorbed depends on how it is administered and whether it is topical or systemic. **Topical drugs act locally; systemic drugs act on one or more body systems.**

A topical medication is applied directly to the site of concern and can work quickly. Examples include Desitin and Balmex to treat diaper rash. Another example is EMLA cream, which is applied as a local anesthetic prior to blood draws or IV insertions in small children to numb the area prior to the needlestick. Lidocaine can be injected into an area of tissue to provide numbing prior to placement of sutures after an injury. Systemic medications are taken by mouth or are administered intravenously, intramuscularly, or as a patch applied to the skin, to circulate throughout the body. A medication the patient takes by mouth must be transferred through the stomach or intestinal mucosa into the circulating blood. Liquid medications act faster than pills because pills must first be broken down to be