Clayton: Basic Pharmacology for Nurses, 15th Edition

Chapter 2: Principles of Drug Action and Drug Interactions

Answers to Critical Thinking Questions

1. How do drugs interact with receptor sites in the body?
Drugs form chemical bonds with specific sites called receptors in the body. This bond forms only if the drug and its receptor have similar shapes. This relationship is similar to that of a key and a lock—the better the fit between the receptor and the drug molecule, the better the response. The intensity of a drug response is related to how well the drug molecule fits into the receptor and to the number of receptor sites that are occupied.

2. Explain the differences among a drug agonist, partial agonist, and antagonist, and give examples of each.
Agonist: Drugs that interact with a receptor to stimulate a drug response. Epinephrine-like drugs act on the heart to increase the heart rate, and acetylcholine-like drugs act on the heart to slow the heart rate.
Partial agonist: Drugs that interact with a receptor to stimulate a response but inhibit other responses.
Antagonist: Drugs that attach to a receptor but do not stimulate a response.

3. How do you calculate a drug's half-life?
Half-life is a measure of the time required for 50% of the drug to be eliminated from the body. The half-life is determined by an individual's ability to metabolize and excrete a particular drug. The approximate half-lives of most drugs are not known.

4. What stages does a drug go through in the process of pharmacokinetics?
Absorption: The process whereby a drug is transferred from its site of entry into the body to the circulating fluids of the body for distribution.
Distribution: The ways in which drugs are transported by the circulating body fluids to the sites of action (receptors), metabolism, and excretion.
Metabolism: Also called *biotransformation*; the process whereby the body inactivates drugs. The primary site is the liver.
Excretion: Elimination of drug metabolites. Two primary routes are the GI tract to the feces and through the renal tubules into the urine.

5. Discuss the effects of adverse drug reactions (ADRs) on individual patients and on the costs of health care.
Adverse drug reactions can contribute to death, cause admission to hospitals, and increase suffering for the patient, which all lead to excess costs for the patient and the institutions.

6. Investigate mechanisms used at your clinical site to report adverse drug effects.
All hospitals have an internal mechanism for reporting suspected adverse drug reactions, and health professionals should not hesitate to report possible reactions. The FDA's MEDWATCH program is also available for voluntary reporting of adverse events.

7. What effects do body weight, body surface area, metabolic rate, and illness have on drug therapy?

Weight: Overweight patients may require an increase in dosage to attain the same therapeutic response. Patients who are underweight tend to require lower dosages for the same therapeutic response.

Body surface area: Important when calculating chemotherapeutic agents.

Metabolic rate: Patients with a higher than average metabolic rate tend to metabolize drugs more rapidly, thus requiring larger doses or more frequent administration. The opposite is true for those with lower than average metabolic rates.

Illness: Any pathologic condition that could alter the rate of absorption, distribution, metabolism, and excretion (see p. 22).

8. Discuss the difference between bound and unbound drugs and the resultant effects on drug action.

Once a drug is absorbed into the blood, it is usually bound to plasma proteins. A drug that is highly bound (e.g., 90%) to a protein-binding site may be displaced by another drug that has a higher affinity for the binding site. Significant interactions can take place this way because little displacement is required to have a major impact. Only the unbound drug is pharmacologically active. If a drug is 90% bound to a protein, then 10% of the drug is providing the physiologic effect. If another drug is administered with a strong affinity for the protein-binding site and displaces just 5% of the bound drug, there is now 15% unbound for physiologic activity. This is the equivalent of a 50% increase in dosage.