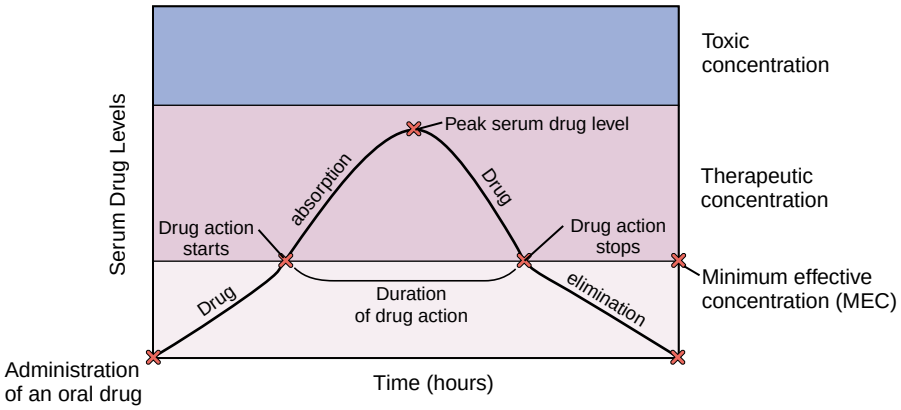
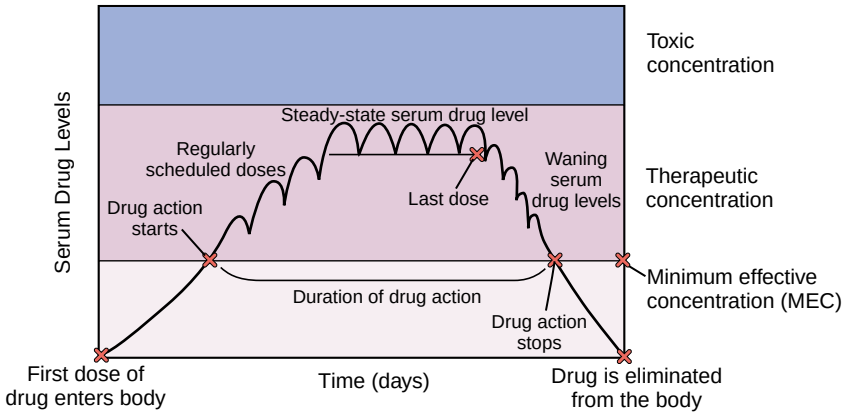


Drug action in relation to serum drug levels and time after a single does.



Drug action in relation to serum drug levels with repeated doses.

Figure 2–5 Serum drug levels with single and multiple oral drug doses. Drug action starts when enough drug is absorbed to reach the minimum effective concentration (MEC), continues as long as the serum level is above the MEC, wanes as drug molecules are metabolized and excreted (if no more doses are given), and stops when the serum level drops below the MEC. The goal of drug therapy is to maintain serum drug levels in the therapeutic range.

tions. Because maximal therapeutic effects do not occur until equilibrium is established, some drugs are not fully effective for days or weeks. To maintain steady-state conditions, the amount of drug given must equal the amount eliminated from the body. When a drug dose is changed, an additional four to five half-lives are required to re-establish equilibrium; when a drug is discontinued, it is eliminated gradually over several half-lives.

PHARMACODYNAMICS

Pharmacodynamics involves drug actions on target cells and the resulting alterations in cellular biochemical reactions and functions (ie, "what the drug does to the body"). As previously stated, all drug actions occur at the cellular level.

Nursing Notes: Apply Your Knowledge

A client has a drug level of 100 units/mL. The drug's half-life is 1 hour. If concentrations above 25 units/mL are toxic and no more drug is given, how long will it take for the blood level to reach the nontoxic range?

Receptor Theory of Drug Action

Like the physiologic substances (eg, hormones and neurotransmitters) that normally regulate cell functions, most drugs exert their effects by chemically binding with receptors at the cellular level (Fig. 2–6). Receptors are mainly proteins located on the surfaces of cell membranes or within cells. Specific receptors include *enzymes* involved in essential metabolic or regulatory processes (eg, dihydrofolate reductase, acetylcholinesterase); *proteins* involved in transport (eg, sodium–potassium adenosine triphosphatase) or structural processes (eg, tubulin); and *nucleic acids* (eg, DNA) involved in cellular protein synthesis, reproduction, and other metabolic activities.

When drug molecules bind with receptor molecules, the resulting drug–receptor complex initiates physiochemical reactions that stimulate or inhibit normal cellular functions. One type of reaction involves activation, inactivation, or other alterations of intracellular enzymes. Because almost all cellular functions are catalyzed by enzymes, drug-induced changes can markedly increase or decrease the rate of cellular metabolism. For example, an epinephrine–receptor complex increases the activity of the intracellular enzyme adenyl cyclase, which then causes the formation of cyclic adenosine