

pathogens and cellular debris. The immune system produces lymphocytes and antibodies (see Chap. 42). The inflammatory process is the body's response to injury by microorganisms, foreign particles, chemical agents, or physical irritation of tissues. Inflammation localizes, destroys, dilutes, or removes the injurious agent so tissue healing can occur.

Many factors impair host defense mechanisms and predispose to infection by disease-producing microorganisms:

- Breaks in the skin and mucous membranes related to trauma, inflammation, open lesions, or insertion of prosthetic devices, tubes, and catheters for diagnostic or therapeutic purposes
- Impaired blood supply
- Neutropenia and other blood disorders
- Malnutrition
- Poor personal hygiene
- Suppression of normal bacterial flora by antimicrobial drugs
- Suppression of the immune system and the inflammatory response by immunosuppressive drugs, cytotoxic antineoplastic drugs, and adrenal corticosteroids
- Diabetes mellitus and other chronic diseases
- Advanced age

## CHARACTERISTICS OF ANTI-INFECTIVE DRUGS

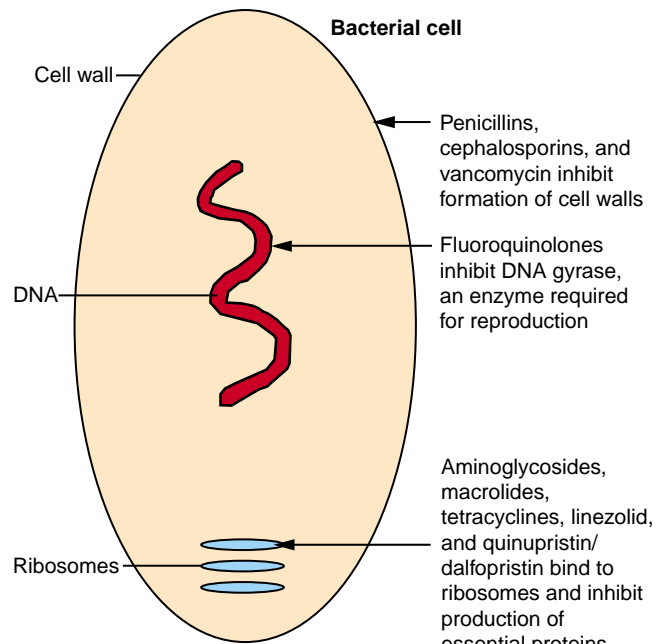
### Terms and Concepts

Several terms are used to describe these drugs. *Anti-infective* and *antimicrobial* include antibacterial, antiviral, and antifungal drugs; *antibacterial* and *antibiotic* usually refer only to drugs used in bacterial infections. Most of the drugs in this section are antibacterials. Antiviral and antifungal drugs are discussed in Chapters 39 and 40, respectively.

Additional terms for antibacterial drugs include *broad spectrum*, for those effective against several groups of microorganisms, and *narrow spectrum*, for those effective against a few groups. The action of an antibacterial drug is usually described as *bactericidal* (kills the microorganism) or *bacteriostatic* (inhibits growth of the microorganism). Whether a drug is bactericidal or bacteriostatic often depends on its concentration at the infection site and the susceptibility of the microorganism to the drug. Successful treatment with bacteriostatic antibiotics depends on the ability of the host's immune system to eliminate the inhibited bacteria and an adequate duration of drug therapy. Stopping an antibiotic prematurely can result in rapid resumption of bacterial growth. Bactericidal drugs are preferred in serious infections, especially in people with impaired immune function.

### Mechanisms of Action

Most antibiotics act on a specific target in the bacterial cell (Fig. 33–1). Almost any structure unique to bacteria, such as



**Figure 33–1** Actions of antibacterial drugs on bacterial cells.

proteins or nucleic acids, can be a target for antibiotics. Specific mechanisms include the following:

1. Inhibition of bacterial cell wall synthesis or activation of enzymes that disrupt bacterial cell walls (eg, penicillins, cephalosporins, vancomycin)
2. Inhibition of protein synthesis by bacteria or production of abnormal bacterial proteins (eg, aminoglycosides, clindamycin, erythromycin, tetracyclines). These drugs bind irreversibly to bacterial ribosomes, intracellular structures that synthesize proteins. When antimicrobial drugs are bound to the ribosomes, bacteria cannot synthesize the proteins necessary for cell walls and other structures.
3. Disruption of microbial cell membranes (eg, antifungals)
4. Inhibition of organism reproduction by interfering with nucleic acid synthesis (eg, fluoroquinolones, rifampin, anti-acquired immunodeficiency syndrome antivirals)
5. Inhibition of cell metabolism and growth (eg, sulfonamides, trimethoprim)

### Indications for Use

Antimicrobial drugs are used to treat and prevent infections. Because laboratory tests (except Gram's stain and a rapid test for group A streptococci) to identify causative organisms usually take 24 hours or longer, empiric therapy against the most likely pathogens is often begun. Once organisms are identified, more specific therapy is instituted. Prophylactic therapy is recommended to prevent:

1. Group A streptococcal infections and possibly rheumatic fever, rheumatic heart disease, and glomerulonephritis. Penicillin is commonly used.