Antimicrobial Therapy

- A chemotherapeutic agent is a compound that can inhibit the multiplication of an infecting organism at drug concentration that are tolerated by host
- Some of these agents are bacteriostatic (i.e. they reversibly inhibit growth of bacteria) whereas others are bactericidal (i.e. they have an irreversible lethal action on bacteria)

- An antibiotic is a chemical substance derived from or produced by various species of microorganism, which in small concentrations is capable of inhibiting the growth of other microorganisms
- A large number of compounds are discovered every year. Those which are selected for clinical use should have most of the properties of an ideal antibiotic (Table 1)

Properties of antibiotics:

- Selective toxicity; should act on bacteria but not the host
- Bacteriocidal rather than bacteriostatic
- Effective against a wide range of bacteria
- Should not cause allergy
- Should remain active in various body fluids
- Stable and water soluble
- Desired levels in body fluids should be achieved rapidly for long time
- Should not give rise to resistance in bacteria
- Has a long shelf life
- Reasonable in cost

Mechanism of action

- Various antimicrobial agents act on different sites of bacteria and some have more than one site of action or mechanism to destroy the bacteria or fungi
- The classification and examples of various antimicrobial agents according to their mode of action are given in Figure 12.2

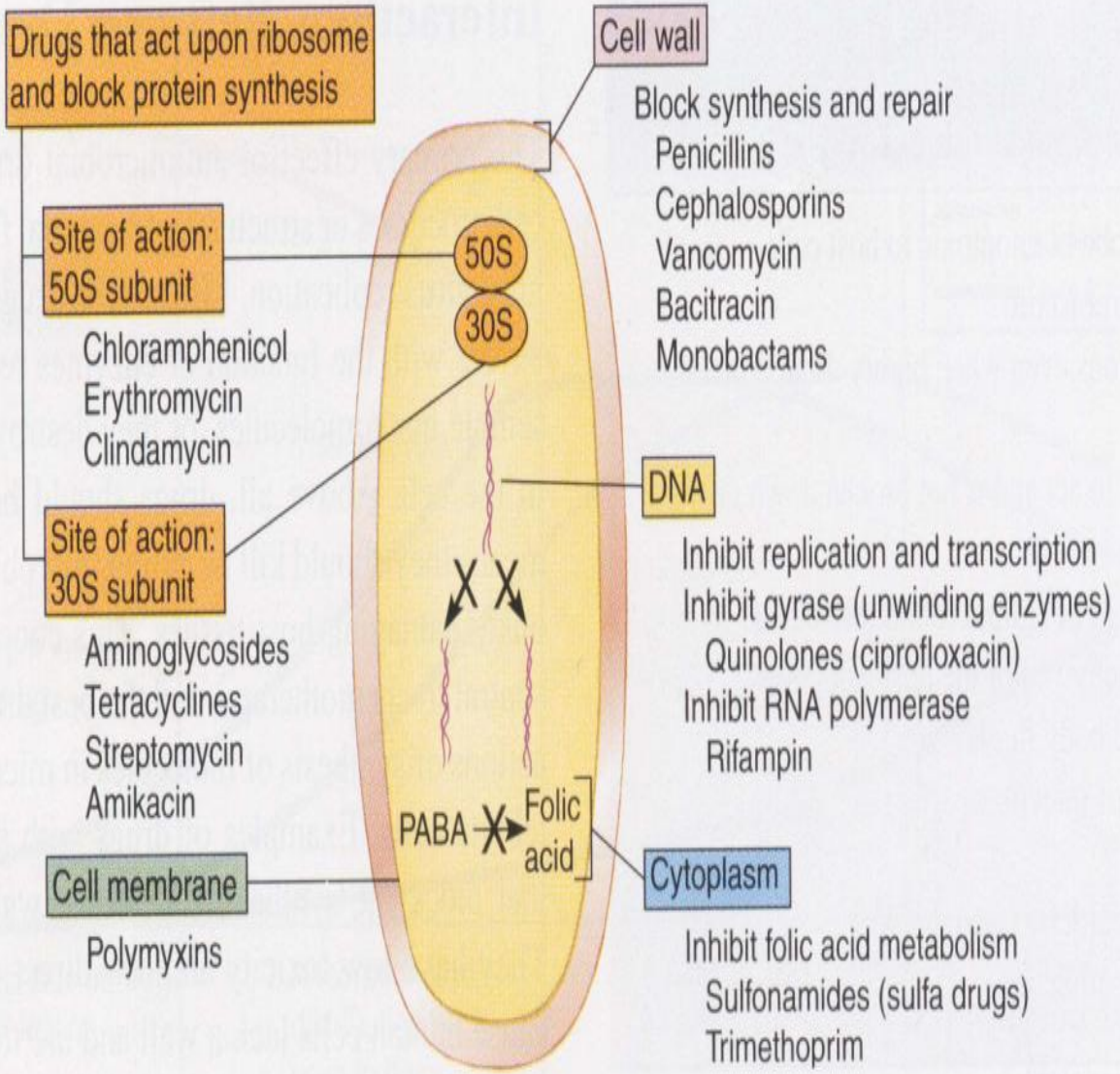

FIGURE 12.2

Primary sites of action of antimicrobic drugs on bacterial cells. See text for more discussion of mechanisms.

Most of the anaerobes are susceptible to benzylpenicillin.

Since 1970s, metronidazole has been considered the most effective drug against all the anaerobic infections.

Spectrum of activity of antimicrobial agents

- Antimicrobial agents can be classified into broad spectrum and narrow spectrum drugs depending on their activity against a range of Gram-positive and Gram- negative bacteria.
- Penicillin is narrow specrum agent with activity limited to Gram-positive organisms and metronidazole is also a narrow spectrum drug because of its activity against strict anaerobes and some protozoa

- Broad-spectrum antimicrobial agents are active against many Gram-positive and Gram-negative bacteria and this group includes tetracycline, erythromycin, cephalosporins, etc. The spectra of some of these drugs are given in Table 2

Table 2:- Spectra of commonly used antimicrobials

Penicillin V	Beta lactamase –ve Staphylococci Pneumococci Lactobacilli Actinomyces Fusebacterium *Vellonella* Bacteroides (most species)
Beta lactamase resistant penicillin's	All above Beta lactamase producing staphylococci
Ampecillin	All above *H. influenzae*
Cephalosporins	All above Coliforms
Erythromycin	Gram-positive bacteria
Tetracycline	Broad-spectrum (Gram-positive as well as Gram-negative)
Metronidazole	All strict anaerobes
Co-trimoxazole	Broad spectrum

Combination therapy

- This is recommended in only those cases where there is a necessity of achieving a high bactericidal level, e.g. patients with infective endocarditis; to prevent emergence of drug resistance, e.g. tuberculosis and in extremely sick patients

Antifungal agents

- Four antifungal agents are commonly used. These belong to two groups:
- Polynes such as Nystatin and amphotericin B
- Imidazole such as Miconazole and fluconazole (or ketoconazole)

Antiviral agents

- In contrast to the multiplicity of antibacterial agents available today, few antiviral drugs have been developed.
- Idoxuridine and acyclovir are commonly prescribed for herpetic infections of the oral and perioral regions.

Drug resistance

- The drug resistance can arise by random mutation and when drug is given to the patients, the resistant stains persist and multiply. This resistance is called chromosomal resistance which is mediated by plasmids.
- The plasmid mediated drug resistance is also called as infectious drug resistance since it can be transmitted from one bacterium to another either by conjugation or translocation

Cross-resistance: is resistance against two or more similar antimicrobial agents

Drug resistance can be minimized by:

1. **Continuing treatment** with an appropriate antibiotics dosage level until all disease-causing organisms are destroyed
2. **Using two antibiotics** that exert synergism, an additive effect
3. Using antibiotics only when absolutely necessary

- **Drug combinations:** a combination of two antimicrobial agents may produce the following responses:

1. **Synergism:** where combined effect may be greater than that of either agent alone

   e.g. Clavulanic acid + amoxycillin (augmentin)

2- Antagonism: the overall effect may be reduced i.e. there is a lesser effect of both antibiotics than that alone e.g. Tetracycline and chloramphenicol

Development of drug resistance:

The emergence of resistant mutants is encouraged by:

A. Inadequate dosage
B. Long treatment
C. Closed focus of infection
D. Abuse of antibiotics without in-vitro testing

Drug toxicity

The side effects of many drugs are due to;

A. Over dosage
B. Prolonged use

THANK YOU