

Appendix B: Glossary **B**

Active Efflux: a major mechanism of bacterial resistance in which an antibiotic is pumped out of the bacterial cell.

Active Immunization: the process of administering specific microbial antigens that stimulate the host's immune system to produce protective antibodies, "vaccination."

Agar Dilution Test: one of four diagnostic methods currently used to determine the antibiotic susceptibility or resistance of bacteria. See also *agar gradient test*, *broth dilution test*, and *disk diffusion test*.

Agar Gradient Test: one of four diagnostic methods currently used to determine the antibiotic susceptibility or resistance of bacteria. See also *agar dilution test*, *broth dilution test*, and *disk diffusion test*.

Aminoglycosides: a family of bactericidal antibiotics that block bacterial protein synthesis by binding to the small subunit of the bacterial ribosome; examples are streptomycin, kanamycin, neomycin, gentamicin, amikacin, and tobramycin.

Amoxicillin: a broad-spectrum β -lactam antibiotic drug.

Antibacterial: a drug that kills or inhibits the growth of bacteria.

Antibiogram: a guide produced by a microbiology laboratory for physicians' use that profiles the susceptibility of commonly encountered bacteria to various antibiotics.

Antibiotics: a class of substances that can kill or inhibit the growth of some groups of microorganisms. Used in this report to refer to chemicals active against bacteria. Examples are penicillin, tetracycline, erythromycin, and cephalosporins. Originally antibiotics were derived from natural sources, e.g., penicillin from molds, but many currently used antibiotics are semi-synthetic and modified with additions of man-made chemical components. See *antimicrobials*.

Antibiotic Resistance: a property of bacteria that confers the capacity to inactivate or exclude antibiotics or a mechanism that blocks the inhibitory or killing effects of antibiotics.

Antibiotic Susceptibility: the opposite of resistance and applies to bacteria that are killed or inhibited by an antibiotic. Susceptibility to a particular antibiotic does not mean that the bacteria are susceptible to all antibiotics.

Antigen: a chemical structure on or in a cell that is recognized by the immune system. The

immune system produces antibodies that react with the antigens.

Antigen Test: a diagnostic method for detecting the presence of a specific chemical structure. As used here, it is a test for detecting the presence of specific bacteria.

Antimicrobials: a class of substances that can destroy or inhibit the growth of bacteria; examples are sulfonamides. See *antibiotics*.

Anti-Sense: DNA is a helical molecule with two strands. One strand, the “sense” strand, is used in the synthesis of RNA and protein; the other strand, the “anti-sense” strand, serves a structural purpose in DNA but not in RNA synthesis.

Anti-Sense Oligonucleotide: a length of the anti-sense strand of DNA prepared to bind specifically to a target stretch of DNA.

Bacteremia: a pathologic state characterized by the presence of bacteria in the blood.

Bacteria: microscopic, single-celled organisms that have some biochemical and structural features different from animal and plant cells.

Bactericidal: a term for agents that kill bacteria.

Bacteriophage: see *phage*.

Bacteriostatic: a term for agents that inhibit bacterial growth.

Beta-Lactam Antibiotics: the most widely used class of antibiotics which includes penicillins, cephalosporins including ceftriaxone and ceftazidime, carbapenems, monobactams, and imipenem. β -lactam antibiotics act by inhibiting the synthesis of peptidoglycan—the major component of a bacterial cell wall.

Beta-Lactamase: an enzyme produced by some bacteria that degrades beta-lactam antibiotics. See *penicillinase*.

Breakpoint: a concentration of antibiotic that marks the division either between the resistant and intermediate response or between the intermediate and susceptible response using antibiotic susceptibility tests.

Broad-Spectrum Antibiotic: an antibiotic effective against a large number of bacterial species; generally describes antibiotics

effective against both Gram-positive and Gram-negative bacteria.

Broth: a sterile nutrient growth medium used to grow bacteria.

Broth Dilution Test: one of four diagnostic methods currently used to determine the antibiotic susceptibility or resistance of bacteria. See also *agar dilution test*, *agar gradient test*, and *disk diffusion test*.

Broth Microdilution Test: a miniaturized version of the broth dilution test that uses a test plate with small-sized wells that hold a small volume (about 0.1 milliliters) of broth.

Cecropin: a peptide from the North American silk moth *Hyalophora cecropia* that increases bacterial permeability and can cause bacterial death.

Cell Culture: propagation of cells in a laboratory environment.

Chromosome: used in this report to refer to the circular DNA that contains the genes for the functioning of a bacterium.

Clinical Trial: used in this report to refer to research to establish the safety and efficacy of a drug such as an antibiotic.

Colonization: capacity of a bacterium to remain at a particular site and multiply there.

Commensals: bacteria that live on the skin, in body orifices, or the intestines, and do not usually cause disease, and may be beneficial to the host organism.

Conjugation: the process by which DNA is transferred from one bacterium to another that involves cell-to-cell contact.

Defensin: a peptide from mammalian cells including epithelial cells lining the human small intestine that increases bacterial permeability and can cause bacterial death.

Deletion Mutation: a mutation that results in loss of a length of DNA from the chromosome.

Disk Diffusion Test: one of four diagnostic methods currently used to determine the antibiotic susceptibility or resistance of bacteria. See also *agar dilution test*, *agar gradient test*, and *broth dilution test*.

DNA (deoxyribonucleic acid): the substance of heredity; a nucleic acid that is found in the cell nucleus that carries the genetic information necessary for all cellular functions.

DNA Probe Assay: a new diagnostic method for identifying the presence of bacteria by using fragments of DNA or RNA (probes) that bind to target bacterial or resistance gene DNA or RNA sequences.

Efficacy: used in this report to refer to the probability of benefit to individuals in a defined population from a medical technology applied for a given medical problem under defined conditions of use.

Empiric Therapy: used in this report to describe antibiotic treatment based on signs and symptoms of disease and in absence of knowledge of the causative agent of infection.

Enterococcus: bacteria normally found in the intestinal tract and genitourinary tract. Some strains are pathogenic and a few are resistant to all available antibiotics, including vancomycin.

Enzymatic Test: a diagnostic method of testing for antibiotic resistance that directly measures the presence of an enzyme that confers resistance in a bacterium.

Escherichia coli: a commensal bacterium that lives in the intestine, a workhorse of biotechnology, and sometimes a cause of opportunistic infections.

Eukaryote: a cell or organism with membrane-bound, structurally discrete nuclei, and well-developed cell organelles. Eukaryotes include all plants, animals, and fungi. Compare *prokaryote*.

Expression: functioning of a gene, generally measured by the amount of gene product (usually a protein or nucleic acid) made by the cell. See *gene expression*.

Flora: the populations of commensal bacteria normally present in the intestine, body orifices, and on the skin.

Fluorometer: an optical device more sensitive than the human eye to detect the presence or

absence of growth of bacteria in microdilution tubes. See *broth microdilution test*.

Formularies: a listing of approved drugs for various medical indications originally created as a cost-controlling measure, but used more recently to guide use of antibiotics based on information about resistance patterns.

Fungus: member of a class of relatively primitive organisms; includes mushrooms, yeasts, rusts, molds, and smuts.

Gene: a unit of heredity; a segment of the DNA molecule that carries the directions for the structure of a given protein.

Gene Expression: activity of a gene measured by the amount of gene product (usually a protein or nucleic acid) made by the cell.

Genetic Recombination: the process by which separate lengths of DNA from different sources are chemically joined to produce new genetic combinations.

Glycopeptides: compounds made up of amino acids and sugars that may have antibacterial activity; vancomycin and teichoplanin are glycopeptide antibiotics.

Gram's Stain: a bacteriological stain used to determine a major division between bacterial species; the reaction depends on the complexity of the cell wall. Bacteria that retain the gram stain (blue) are Gram-positive; bacteria that lose the gram stain but stain with a counterstain (red) are Gram-negative.

Haemophilus influenzae: a commensal bacterium commonly found in the upper respiratory tract capable of causing infections such as otitis media, sinusitis, conjunctivitis, bronchopneumonia and type b meningitis.

Immunosuppression: inhibition or suppression of the normal immune response, as a result of giving drugs to prevent transplant rejection, of irradiation or chemotherapy, or of some infections as in AIDS.

Incidence: the frequency of new occurrences of disease within a defined time interval. Incidence rate is the number of new cases of a specified disease divided by the number of

people in a population over a specified period of time, usually one year.

Infection: successful colonization on a site of the body by a microorganism capable of causing damage to the body.

Insertion Mutation: a mutation that adds a length of DNA to an existing DNA molecule.

Integron: DNA segment that can carry multiple antibiotic resistance genes and that can insert in plasmid and chromosomal locations.

Intermediate Resistance: In some cases, resistance to an antibiotic emerges in incremental steps, so some bacteria have “intermediate” resistance and can survive and grow in low concentrations but not higher concentrations of an antibiotic.

Invasive: of a bacterium, (1) capable of penetrating the host’s defenses; (2) capable of entering host cells or passing through mucosal surfaces and spreading in the body.

In-vitro Tests: techniques that use cells, tissues, or explants grown in a nutritive medium rather than using living animals or human subjects.

In-vivo Expression Technology (IVET): techniques that identify bacterial genes that are expressed only when the bacteria are in the host.

Isolate: to establish a pure culture of a microorganism.

Lactoferrin: the second most abundant protein in human milk; found to have antibacterial activity.

Macrolides: a family of bacteriostatic antibiotics that inhibit protein synthesis by binding to the large subunit of the bacterial ribosome; include erythromycin, clindamycin, chloramphenicol (rarely used because of adverse side effects), and the new drugs clarithromycin and azithromycin.

Magainins: short peptides, taken from the skin cells of frogs, that increase bacterial permeability by inserting into the bacterial cell membrane that can lead to death of the bacterial cells.

MDR-TB: multi-drug-resistant tuberculosis.

Methicillin-Resistant *Staphylococcus aureus* (MRSA): strictly speaking, a bacterial strain resistant to methicillin. In practice, MRSA are generally resistant to many antibiotics and some are resistant to all but vancomycin.

Microorganism: minute, microscopic or submicroscopic living organisms; includes bacteria, fungi, and protozoa. Viruses are often included in this category, but they are incapable of growth and reproduction outside of host cells, and some experts insist they should not be classified as organisms.

Minimum Inhibitory Concentration (MIC): the lowest concentration of antibiotic that prevents growth of a bacterium.

MRSA: See methicillin-resistant *Staphylococcus aureus*.

Multiple Resistance or Multiple Drug Resistance: applies to bacteria that are resistant to more than one antibiotic.

Mutation: a genetic change; can occur either randomly or at an accelerated rate through exposure to radiation or certain chemicals (mutagens); may lead to a change in the structure of the protein coded by the mutated gene.

Mycobacteria: bacteria that have cell wall structures different from other bacteria. *Mycobacterium tuberculosis* is the cause of tuberculosis.

Narrow-Spectrum Antibiotic: an antibiotic effective against a limited number of microorganisms; often applied to an antibiotic active against either Gram-positive or Gram-negative bacteria.

Natural Selection: process by which ancestral species of animals and plants evolve into new species.

Nosocomial Infection: infection acquired during hospitalization that is neither present nor incubating at the time of hospital admission unless related to prior hospitalization and that may become clinically manifest after discharge from the hospital.

Notifiable Disease: a disease that physicians are required to report to State health departments.

- Oligosaccharides:** (“oligo,” a few; “saccharides,” sugars). Specific oligosaccharides are present on the surfaces of cells in different organs and tissues.
- Opportunistic Infection:** an infection caused by an organism that does not usually trouble people, such as a commensal bacterium.
- Oxacillin:** a semi-synthetic penicillin similar to methicillin.
- Parasite:** an organism living in or on an organism of another species (its host), obtaining part or all of its subsistence from it without rendering any service in return.
- Pathogen:** an organism that is capable of causing disease.
- Pathogenicity:** capacity to cause disease.
- Penicillin:** the first true antibiotic.
- Penicillinase:** an enzyme which degrades penicillin so that it has no effect on bacteria. See *beta-lactamase*.
- Peptides:** small protein molecules. Most of interest in this report are peptides from bacteria and from human, frog, shark, rabbit, and moth cells that have been shown to inhibit the growth of or kill some bacteria by breaking down their permeability barriers to the entry of antibiotics. See *magainins*, *cecropin*, and *defensin*.
- Peptidoglycan:** a complex polymer of sugars and amino acids that form the major component of the bacterial cell wall.
- Phage:** a virus that infects bacteria.
- Phage Therapy:** the use of viruses that attack bacteria to treat disease; an “old” and currently unused therapy.
- Plasmid:** a circular piece of DNA not associated with the chromosome found in the cytoplasm and capable of replicating and segregating independently. Many plasmids can be spread through bacterial populations by conjugation, and many of the antibiotic-resistance genes of clinical significance are carried by plasmids.
- Point Mutation:** a “single letter” mutation consisting of an alteration in a single nucleotide in DNA.
- Polymerase Chain Reaction (PCR):** a laboratory procedure that produces millions of copies of DNA from one or a few molecules.
- Preclinical Test:** animal studies of drugs before they are tested in human beings.
- Prevalence:** refers to the total number of cases (new as well as previous cases) of a disease during a designated time period.
- Prokaryote:** an organism lacking cell organelles and whose DNA is not enclosed within a membrane-bound, structurally discrete nucleus. Bacteria and blue-green algae are prokaryotes. (Some experts consider “blue-green algae” to be better classified as “blue-green bacteria.”) Compare *eukaryote*.
- Prophylactic Antibiotic Therapy:** the administration of antibiotics before evidence of infection and intended to ward off disease.
- Protozoa:** single-celled animals with membrane-bound organelles.
- Quinolones:** a class of purely synthetic antibiotics that inhibit the replication of bacterial DNA; includes ciprofloxacin and fluoroquinolone.
- Resistance:** see *antibiotic resistance*.
- Rifampin:** an antibiotic that blocks transcription, e.g. synthesis of RNA; its principal use is in treatment of tuberculosis.
- Selective Pressure:** used in this report to refer to the selection of antibiotic-resistant bacteria through the use of antibiotics. Susceptible bacteria are killed or inhibited, and resistant ones are selected.
- Self-Limiting:** of an infection, one that proceeds to a point and no further.
- Semi-Synthetic Antibiotics:** antibiotics derived in part from natural products produced by an organism and in part from synthetic components. Examples are methicillin, nafcillin and cloxacillin.
- Sepsis:** a state characterized by the presence of pathogenic microorganisms and their products into the bloodstream.
- Serum Therapy:** the use of fractions of blood from infected animals to treat human disease; an “old” therapy with limited use. Cur-

rently used for the treatment of tetanus and botulism (and snakebites).

Service Laboratory: a commercial microbiology laboratory to which physicians send clinical specimens for analysis.

Squalamine: a steroid compound, closely related to cholesterol, with antibacterial activity. Testing of squalamine is at the pre-clinical stage.

***Staphylococcus aureus*:** Normally commensal bacteria on the skin that can cause nosocomial infections when they penetrate into body tissues and organs as a result of wounds and surgery. See *MRSA*.

Steroids: natural compounds; the best known is cholesterol. Some steroids isolated from various organs of sharks have been shown to have antibacterial characteristics.

***Streptococcus pneumoniae* or “Pneumococcus” bacteria:** the most common cause of bacterial infection in the United States.

Streptogramin: a new antibiotic, now in phase III clinical trials, effective against some antibiotic-resistant bacteria, including some strains of VRE.

Structure-Based Drug Design: a method of antibiotic research that focuses on an understanding of the ligand:receptor interaction that occurs at the “active site” where the “ligand,” in this case the antibiotic, binds to some structure, the “receptor” in the bacteria. Research tools such as X-ray crystallography, nuclear magnetic resonance spectroscopy, and supercomputer combinatorial chemistry are used to design new compounds that will bind more tightly to the “active site.”

Sulfa Drugs: a group of synthetic chemicals that inhibit bacterial growth and metabolism. See *sulfonamide*.

Sulfonamide: the first antibacterial drug that was not overly toxic to humans. It is a synthetic, antimicrobial (rather than antibiotic) drug.

Surveillance Systems: used in this report to refer to data collection and record keeping to track the emergence and spread of disease-

causing organisms such as antibiotic-resistant bacteria.

Susceptibility Test: any of a large number of tests used to determine if bacteria are susceptible or resistant to an antibiotic.

Systemic: pertaining to or affecting the body as a whole; frequently applied to bloodstream infections.

Target Amplification Method: methods to increase the number of target DNA sequences through such methods as polymerase chain reaction (PCR). See *polymerase chain reaction*.

Tetracyclines: a family of broad-spectrum antibiotics used in the therapy of infections caused by Gram-positive and Gram-negative bacteria.

Toxicity: the quality of being poisonous. Referring to antibiotics, the degree to which they produce unwanted, adverse effects.

Transcription: synthesis of RNA from a DNA template.

Transduction: transfer of bacterial genes from one bacterium to another by a bacterial virus (called a phage).

Transformation: uptake by a bacterium of DNA from a ruptured cell and incorporation of genes from the DNA into the bacterial chromosome.

Transposons: small, mobile DNA sequences that can move around chromosomes and plasmids. Often they carry genes specifying antibiotic resistance.

***Treponema pallidum*:** bacteria that cause syphilis.

Trimethoprim: an antibiotic administered in combination with a sulfonamide in the treatment of urinary tract infections.

Vaccine: a preparation of living, attenuated, or killed bacteria or viruses, fractions thereof, or synthesized antigens identical or similar to those found in the disease-causing organisms, that is administered to raise immunity to a particular microorganism.

Vancomycin: a widely used glycopeptide antibiotic, particularly important for treatment of infections caused by strains of *Staphylococ-*

cus aureus some of which are resistant to all other antibiotics.

Vancomycin-Resistant Enterococcus (VRE): a bacterial strain. Some VREs are resistant to all commercially available antibiotics.

Virulence: a measure of the degree and severity of pathogenicity of a disease-causing organism.

Virus: submicroscopic pieces of genetic material (RNA or DNA) enclosed in a protein coat that cause infectious disease. Viruses are obligate parasites that can reproduce only in living cells.

Zone of Inhibition: area of no bacterial growth around a disk containing antibiotic; used to measure the antibiotic susceptibility or resistance of bacteria. See *disk diffusion test*.