

MOSBY'S

COMPREHENSIVE REVIEW OF NURSING

NINTH EDITION

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NINTH EDITION



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Preface

The previous material in *Mosby's Comprehensive Review of Nursing* has undergone major revision for this, the ninth edition. The addition of an introduction and the progression of subject matter in each area reflect the consistent approach that has been utilized throughout the book. The information that has been selected for inclusion incorporates the latest knowledge, newest trends, and current practices in the profession of nursing.

The material in the section on supportive areas is specific to nursing and is utilized to develop the scientific foundations of care. Superfluous material has been deleted from all of these sections, and a section on physics has been added. The behavioral science and history and trends sections have been totally revised, and Canadian nursing has been included.

The nursing areas have all been revised, reorganized, and updated, with the sections on psychiatric nursing, medical-surgical nursing, and rehabilitation nursing being rewritten from an entirely different approach. Maternity and pediatrics have been combined with additional material on parent-child health to form the family-centered nursing section.

This edition features a unique approach to the *Comprehensive Review's* long-standing excellence in providing questions for study. Test questions were submitted by the contributing authors as well as by other outstanding educators and practitioners of nursing. Initially, the editorial panel re-

viewed all questions, selecting the most pertinent for inclusion in a mass field-testing project. Graduating students from baccalaureate, associate degree, and diploma nursing programs in various locations in the United States and Canada provided a diverse testing group. The results were statistically analyzed. This analysis was utilized in the selection of questions for inclusion in the book and to provide the reader with a general idea of each question's level of difficulty. Letters indicating the difficulty of the questions appear next to the answers in the answer book. The letter *a* signifies that more than 75% of the students answering the question answered it correctly; *b* signifies that between 50 and 75% of the students answering the question answered it correctly; and *c* signifies that between 25 and 50% of the students answering the question answered it correctly.

We would like to take this opportunity to express our sincere appreciation to Mr. Frank Saxton and the many other people who contributed their time and energies to assist us, especially Mrs. Dianne Caruso and Mrs. Arlene Pelliccia, who, with the assistance of Mrs. Sally Festa and Mrs. Irene Elber, so carefully typed the manuscript; Mrs. Joan Schmidt and Mrs. Nancy Schultz Latterner, who assisted with proofreading; and, last but not least, our families, who supported our efforts.

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PART ONE

SUPPORTIVE AREAS

Anatomy and physiology

Physical science

Microbiology

Nutritional science: community and
clinical nutrition

The behavioral sciences

Pharmacology and drug therapy

History and trends in nursing and
nursing education in the United States
and Canada

CHAPTER 1

Anatomy and physiology

Anatomy and physiology are the study of the components of the human body and their functions. A thorough knowledge of the normal is necessary before there can be an understanding of the pathology associated with disease.

The basic concepts begin at the level of the cell and progress through the tissues, organs, and systems. The systems are discussed as singular entities as well as interrelated components of body functioning.

Structure and function are related to pathologic conditions where possible to demonstrate the application of the biologic sciences to nursing. A brief review of the development of the individual from fertilization to parturition has been included. A summary of the factors in human heredity and the traits associated with the genes is outlined.

This complex material is presented in a simple, concise manner to assist the reader in reviewing the basic information necessary for progression.

CONCEPTS AND DEFINITIONS

Basic concepts

- A. Organization a prime characteristic of both structure and function of the body; because of organization, the body is a structural and functional unit and not merely a chaotic collection of countless smaller units
- B. Four kinds of smaller units organize to form the body
 - 1. Cells—smallest units that can maintain life and reproduce
 - 2. Tissues—organizations of many similar cells with nonliving intercellular substance between them
 - 3. Organs—organizations of several different kinds of tissues so arranged that they can perform more complex functions than any individual tissue
 - 4. Systems—organizations of different kinds of organs so arranged that they can perform more complex functions than any individual organ
- C. Structure determines function
- D. Body structure and function are changed gradually in many ways throughout life

- E. Survival—the body's prime function is survival of the individual and of the species
- F. Each cell performs self-serving functions to maintain its own life and also specializes in some body-serving function to help maintain the body's life
- G. Body functions change in response to changes in the environment; usually the responses are adaptive and they maintain or quickly restore balance

Definition of terms

- A. Directional terms for the human body
 - 1. Cranial—toward the head end of the body
 - 2. Caudal—toward the tail end of the body
 - 3. Superior—upper portion or surface
 - 4. Inferior—under portion
 - 5. Anterior or ventral—front of the body
 - 6. Posterior or dorsal—back of the body
 - 7. Medial or mesial—toward the midline of the body
 - 8. Lateral—away from the midline of the body

4 Supportive areas

9. Proximal—toward or nearest the trunk or the point of origin
 10. Distal—away from or farthest from the trunk or the point of origin
- B. Planes of the body
1. Sagittal—a lengthwise plane running from front to back; divides the body or any of its parts
 2. Median—sagittal plane through mid-line
 3. Frontal or coronal—a lengthwise plane running from side to side; divides the body or any of its parts into anterior and posterior portions
 4. Transverse or horizontal—a crosswise plane; divides the body or any of its parts into upper and lower parts

BASIC STRUCTURES OF THE HUMAN BODY

CELLS

Structure

See Fig. 1 and Table 1-1

Functions

- A. Movement of substances through cell membrane, accomplished by physical and physiologic processes; main physical processes are diffusion and osmosis; main physiologic processes are active transport mechanisms, phagocytosis, pinocytosis; energy for physical processes comes from random, never-ceasing movements of atoms, ions, and molecules; energy for physiologic processes comes from chemical reactions of catabolism carried on by living cells
1. Diffusion—movement of solutes and water in all directions within a fluid and in both directions through membrane; net movement of each substance, however, occurs from area where that substance is more concentrated into one in which it is less concentrated; hence, net diffusion of solute across a membrane is from more to less concentrated solution, but net diffusion of water is from less to more concentrated solution (because water molecules are more concentrated in less concentrated solution); tends to equilibrate concentrations of two solutions separated by membrane—e.g., water and oxygen diffuse through cell membranes
2. Osmosis—diffusion of water through a membrane that maintains at least one concentration gradient across the membrane; direction of net osmosis: more water osmoses out of the more dilute solution into the more concentrated one than osmoses in the opposite direction; pressure developed in a solution, a result of net osmosis into it, called osmotic pressure; net osmosis occurs into a hypertonic solution from a solution that is hypotonic to it
- a. Hypertonic solution—has greater potential osmotic pressure because it has higher concentration of solute particles than solution to which it is hypertonic
 - b. Hypotonic solution—has lower potential osmotic pressure and lower solute concentration than solution to which it is hypotonic
 - c. Isotonic solution—has equal concentration of solute particles on each side of a membrane
3. Dialysis—a process of separating small particles (crystalloids) from larger particles (colloids) by the more rapid diffusion of small molecules through a semipermeable membrane; the process of dialysis is used to mechanically remove impurities from the blood during kidney failure
4. Active transport mechanisms (“pumps”)—devices that move ions or molecules through cell membranes against their concentration gradients (i.e., in direction opposite from net diffusion or net osmosis; energy supplied by catabolism of cell)
5. Phagocytosis—the engulfment of bacteria, cells, cell fragments, and foreign particles by white blood cells and phagocytic cells found in various areas of the body
6. Pinocytosis—physiologic process similar to phagocytosis, except that pinocytosis moves fluid into cell whereas phagocytosis moves particles
- B. Cell metabolism—consists of two processes, catabolism and anabolism
1. Catabolism—complex process that releases energy stored in food molecules; part of this energy is released

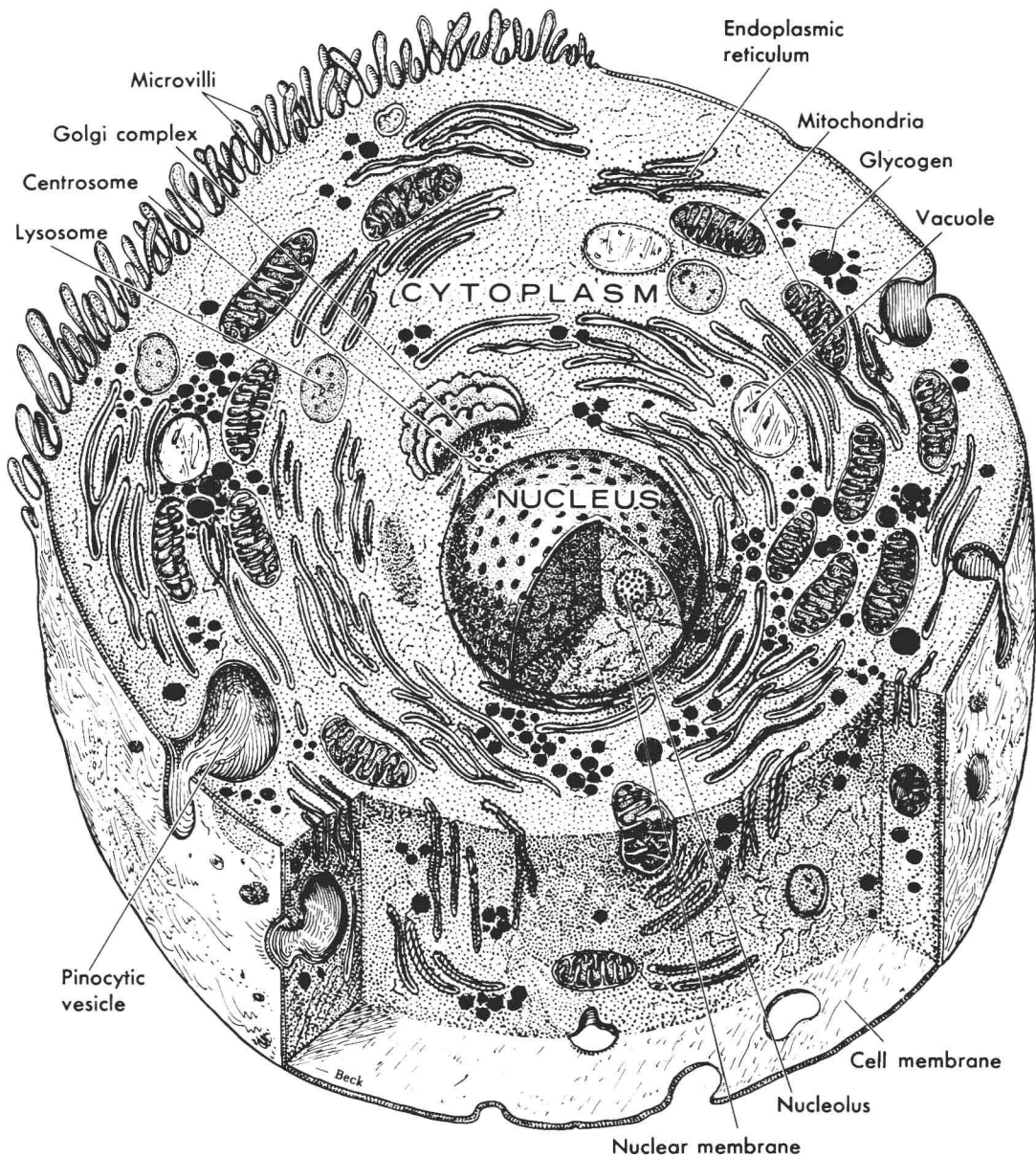


Fig. 1. Modern diagram of a generalized cell, based on what is seen under an electron microscope. The mitochondria are the sites of the oxidative reactions that provide the cell with energy. The dots that line the endoplasmic reticulum are ribosomes, the sites of protein synthesis. (From Anthony, C. P., and Kolthoff, N. J.: Textbook of anatomy and physiology, ed. 9, St. Louis, 1975, The C. V. Mosby Co.)

6 Supportive areas

Table 1-1. Cell structures and functions

<i>Name of structure</i>	<i>Description</i>	<i>Function</i>
1. Cell membrane	<ol style="list-style-type: none"> About 3/10,000,000 inch thick Consists, according to triple-layer hypothesis, of inner and outer layers of protein molecules with double layer of lipid molecules between them Few tiny pores or openings in membrane 	<ol style="list-style-type: none"> Maintains cell's wholeness and organization Determines what substances can enter and leave cell
2. Cytoplasm	<ol style="list-style-type: none"> Body of cell, exclusive of nucleus Contains thousands of organelles ("little organs") <ol style="list-style-type: none"> Membranous organelles: endoplasmic reticulum, Golgi apparatus, mitochondria, lysosomes Nonmembranous organelles: ribosomes, centrosome 	
3. Cytoplasmic organelles		
a. Endoplasmic reticulum (ER)	Complicated network of canals, extending through cytoplasm and opening at cell's surface	Serves as cell's circulatory system, in that some substances are transported through ER
b. Golgi apparatus	Membranous vesicles near nucleus	Synthesizes large carbohydrate molecules, combines them with proteins, secretes products
c. Mitochondria	Sacs whose walls consist of outer and inner membranes separated by fluid; enzyme molecules attach to these membranes	Serve as cell's "powerhouses"; enzymes of mitochondria catalyze series of chemical reactions known as the citric acid cycle and these reactions provide about 95% of cell's energy supply
d. Lysosomes	Membranous sacs; contain enzymes	Enzymes in lysosomes digest substances that enter them; under some conditions, digest and thereby destroy cells
e. Ribosomes	Tiny granules, large numbers of which dot surfaces of endoplasmic reticulum; others scattered through cytoplasm	Cell's "protein factories"; ribosomes attached to ER synthesize proteins, which move through ER to Golgi apparatus and then are secreted by cell; ribosomes lying free in cytoplasm synthesize proteins for cell's own use (its enzymes and structural proteins)
f. Centrosome (centrosphere)	Spherical body near center of cell (i.e., the nucleus)	Plays part in formation of spindle fibers during cell reproduction (mitosis)
4. Nucleus	Spherical body in center of cell; enclosed by pore-containing membrane; contains <i>chromosomes</i> and <i>nucleoli</i> ; segments of DNA molecule called <i>genes</i> ; chromosomes composed mainly of DNA molecules; genes are segments of DNA molecules; nucleoli composed mainly of RNA	Genes determine heredity by complex mechanism that transcribes DNA into RNA and then translates RNA into proteins; each of thousands of kinds of proteins synthesized performs specific function

as heat but a little more than half of it is immediately put back in storage in unstable, high-energy bonds of ATP molecules; as cells need energy, the bonds break down rapidly, supplying the energy that does all kinds of cellular work; consists of two series of chemical reactions—glycolysis and the citric acid cycle

- a. Glycolysis—anaerobic (nonoxygen-utilizing) reactions that convert 1 glucose molecule to 2 pyruvic acid molecules and yield a small amount of ATP and heat
 - b. Citric acid cycle—series of aerobic reactions that use oxygen to oxidize 2 pyruvic acid molecules to 6 carbon dioxide molecules and 6 water molecules and yield about 95% of the ATP and heat formed during catabolism
2. Anabolism—series of chemical reactions by which cell synthesizes complex chemical compounds (enzymes, structural proteins, secretions); anabolism is one kind of cellular work for which catabolism supplies energy via ATP
- C. Cell reproduction—accomplished by mitosis, process in which chromosomes (DNA molecules) duplicate themselves before cell divides to form 2 new cells, each of which receives a full set of chromosomes; 46 chromosomes in normal human cells other than mature ova and sperm, which contain 23 chromosomes
- D. Malignant cells—when cell growth and differentiation are no longer regulated, a malignant cell results that may be differentiated from normal cells in several ways
1. Slides of malignant cells show many more mitotic figures than normal tissue cells; in addition, there are many abnormal mitotic figures
 2. Malignant cells have enlarged nuclei and an increased amount of chromatin material within the nucleus
 3. Malignant cells have a rapid growth rate
 4. Tissue cultures of malignant cells from the liver and kidney lack selective “stickiness” in contrast to normal cells, which have a tendency to group into specific tissue

5. Tissue cultures of malignant cells from the liver and kidney lack contact inhibition; this feature of normal cells limits their growth

TISSUES

See Table 1-2 for names of 4 main kinds of tissues, some subtypes of each, and examples of location and function

SKELETAL SYSTEM

Functions

- A. Furnishes supporting framework
- B. Affords protection for viscera, brain, etc.
- C. Provides levers for muscles to pull on to produce movements
- D. Hemopoiesis by red bone marrow—formation of all kinds of blood cells except lymphocytes and monocytes

Structure of long bones

See Fig. 2

Names and numbers of bones

See Table 1-3

Differences between male and female skeletons

- A. Male skeleton larger and heavier than that of female
- B. Male pelvis deep and funnel-shaped with narrow pubic arch; female pelvis shallow, broad, and flaring with wider pubic arch

Age changes in skeleton

- A. From infancy to adulthood, not only do bones grow, but also their relative sizes change; head becomes proportionately smaller, pelvis relatively larger, legs proportionately longer, etc.
- B. From young adulthood to old age, bone margins and projections change gradually; bone piles up along them (marginal lipping and spurs), thereby restricting movement

Joints

- A. Types
 1. Diarthroses (freely movable joints)—most joints of body are of this type; many subtypes; e.g., ball-and-socket, hinge, pivot