

Essentials of Anatomy & Physiology, 7e

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Detailed List of New Features

- Revised all chapter text to focus on healthy conditions rather than “normal” conditions.
- Approximately 70 figures and tables were revised or are completely new.
- Revised descriptive language to improve the overall readability of the text. Terminology and phrasing more commonly used by students outside the classroom have been added where appropriate. By making the text easier to read, students will have an easier time grasping more complex anatomical and physiological content.
- Added more Check My Understanding sections to better assess student learning throughout the chapters.
- The Critical Thinking sections at the end of the chapters have been moved to the Course Guide to consolidate all of the assessment content into one resource, except for the Check My Understanding sections; these remain in the text to offer students opportunities to test their understanding before moving on in the chapter.
- Course Guide figures were updated to align with the figures within the lecture text. Figure labeling activities were also redesigned to provide the students with a more hands-on labeling experience.
- Revised each chapter’s selected Key Terms definitions to better align with the definitions within the chapter text.
- Updated art to create a more vibrant and consistent
- style.
- Updated terminology to align with the Terminologia Anatomica, Terminologia Histologica, and Terminologia Embryologica.
- Revised figure legends to include a descriptive title and separate legend.

Chapter by Chapter Changes

Chapter I

- Updated and simplified regional names. For example, the olecranal and antecubital regions were removed and replaced with the cubital region.
- Removed references to the dorsal cavity and ventral cavity. The body cavity section was rewritten to focus on the cranial cavity, vertebral canal, thoracic cavity, and abdominopelvic cavity.
- Revised figure 1.10 to more concisely illustrate homeostatic normal range and set point.

- Replaced military time in figure 1.13 with time using the 12-hour clock, which is more commonly used by students outside of the classroom.

Chapter 2

- Expanded the description of atom reactivity and valence shells. It is now noted that hydrogen atoms react to fill their valence shells with two electrons, while atoms of other elements normally found in the body react to fill their valence shells with eight electrons.
- Added the mass of an electron to aid in student understanding of why atomic mass is calculated based upon only the number of protons and neutrons.
- Revised the terminology used to describe chemical substances_ The term organic compound was changed to organic molecule to emphasize the fact that the atoms are joined by only covalent bonds.
- Revised figure 2.5 to better demonstrate a triple nonpolar covalent bond.
- Simplified the description of acids and bases to improve student learning.
- Added simple sugar and complex carbohydrates to the carbohydrate discussion. These terms are more commonly known owing to their use in nutritional literature. This addition will help students link the nutritional terms with the specific types of carbohydrates introduced in the chapter.

Chapter 3

- Revised the description of plasma membrane structure to better explain the relationship between its structure and function.
- Revised the membrane protein discussion and figure 3.2 to specifically include channel proteins, carrier proteins, receptor proteins, and cell identity markers.
- Revised figures 3.1, 3.3, and 3.4 to accurately represent the structure of the rough endoplasmic reticulum and nuclear pores.
- Revised table 3.1 to better reflect the functions of the plasma membrane, cytosol, and organelles discussed within the chapter text.
- Simplified mitochondrial structure to promote student learning.
- Revised the discussions of channel and carrier mediated diffusion and carrier-mediated active transport for better clarity.
- Revised figure 3.11 to match the appearance of sugar molecules with those in figure 2.13.
- Revised the discussion of isotonic solutions, hypertonic solutions, and hypotonic solutions for better accuracy and clarity.
- Updated figure 3.12 extensively to better visually demonstrate the effects of isotonic, hypertonic, and hypotonic solutions on red blood cells.
- Updated figure 3.13 to align the sodium-potassium pump style with the style used in figure 8.7.
- Updated figure 3.15 to match the style in figure 7.7.
- Simplified the discussion of mitosis and meiosis by eliminating the terms mitotic cell division and meiotic cell division.

Chapter 4

- Updated figure 4.19 by incorporating a higher-quality photomicrograph of the formed elements.
- Added the functions of intercalated discs to the discussion of cardiac muscle tissue.
- Revised figure 4.24. The serous pericardium was added to the human figure showing all of the body membranes. The cutaneous membrane was relabeled to reflect only the types of tissue composing it
- Revised figures 4.11 and 4.18. New inset images were added to help students identify the locations of reticular tissue, compact bone, and spongy bone.

Chapter 5

- Revised temperature regulation discussion to focus on a person's temperature "set point" rather than on a

specific temperature to account for variability in the human population.

- Revised the description of dermal papillae and epidermal ridges for better accuracy. The labeling within figure 5.4 was also updated to align with the new text description.
- Updated the skin cancer Clinical Insight box to directly relate squamous cell carcinoma and basal cell carcinoma with their specific sites of origination within the epidermis.

Chapter 6

- Added common bone names when appropriate to facilitate the learning of the biological bone names.
- Added examples to the section on bone types.
- Updated the pectoral girdle discussion to include the presence of two pectoral girdles.
- Revised figure 6.8 to show correct labeling for the alveolar process on the maxilla and the alveolar arches on the maxillae and mandible.
- Updated to alveoli on the maxillae and mandible to dental alveoli.
- Added the role of the atlas in the ability to nod head.
- Added the sacral promontory to the text and figure 6.18 because of its importance as an obstetric landmark.
- Revised the description of rib to thoracic vertebrae articulations to improve its accuracy.
- Re-created the sternoclavicular joint in figures 6.20 and 6.21 for anatomical accuracy.
- Revised the labeling of the pelvic brim in figure 6.22 for better accuracy.
- Added a new joint section focusing on the structural types of joints.
- Clarified the difference between patellar ligament and patellar tendon in the knee joint discussion.

Chapter 7

- Added the temperature regulation function for the muscular system.
- Revised figure 7.2 for better histological accuracy. The sarcomere in (c) was revised to create appropriate overlap between thin myofilaments and thick myofilaments throughout the entire image. The thick myofilament in (d) was extended to show appropriate overlap with thin myofilaments.
- Revised figure 7.4 for better text alignment and histological accuracy. The terminal boutons were adjusted so that each terminal bouton makes contact with only one muscle fiber. The structure of the terminal bouton was also adjusted to show no internal branching.
- Revised the labeling within figure 7.5 to correlate better with text presentation of excitation- contraction coupling.
- Updated lactic acid to lactate and cellular respiration to aerobic respiration in figure 7.7.
- Updated epicranius to occipitofrontalis in figures 7.12, 7.13, and 7.14.
- Re-created the left forearm in figures 7.12 and 7.13 for better anatomical accuracy.

Chapter 8

- Updated nerve impulse to action potential. This update will help students to more easily distinguish between action potentials in axons and impulses in dendrites and cell bodies.
- Revised the discussion of the functional division of the nervous system. The text now reflects that the functional divisions apply to the peripheral nervous system only. The motor division of the peripheral nervous system consists of a somatic division and an autonomic division, which in turn is divided into a sympathetic part and parasympathetic part.
- Updated the term unipolar neuron to pseudounipolar neuron to align with what is known about the development of these neurons in humans. A better description of the structure of pseudounipolar neurons was also added.
- Revised figure 8.8 with larger, clearer arrows to better illustrate how the sodium-potassium pump is moving ions across the plasma membrane.
- Updated the labels in figure 8.12 to include the subarachnoid space and replace posterior root ganglion with

spinal ganglion.

- Re-created the cross-sectional image of the spinal cord in figures 8.17, 8.20, and 8.21 for better anatomical accuracy. The anterior median fissure was redrawn to be slightly wider than the posterior median sulcus and have a consistent visual appearance in all three figures.
- Color-coded the cranial nerves in figure 8.18 to help students discern what cranial nerves are motor nerves, sensory nerves, and mixed nerves.
- Revised the labels within figure 8.19 to include the lumbar plexus and sacral plexus as components of the lumbosacral plexus.
- Updated figure 8.20 to a more modern style that matches the art within the text. The neurons were also color-coded to make it easier to distinguish the different components of the reflex arc.
- Color-coded the neurons within figure 8.21 to make it easier to distinguish the different components of the neural pathways.
- Re-created the lumbar and sacral splanchnic nerves in figure 8.22 for better anatomical accuracy.
- Updated figure 8.23 to a more modern style that matches the art within the text. The pre- and post- ganglionic connections within the ganglia were also redrawn for better anatomical accuracy.

Chapter 9

- Revised the image labeling within figure 9.1 for better visual flow.
- Revised the highlights for the external ear, middle ear, and internal ear in figure 9.6 to better match the text description of these ear parts.
- Revised the description of tympanic membrane structure for better histological accuracy.
- Added the cranial nerve innervations of extrinsic eye muscles to help students see the correlation with table 8.3 in chapter 8.
- Re-created the anterior portion of the retina and the labeling bracket for the iris in figure 9.15 for better anatomical accuracy.

Chapter 10

- Added the eicosanoid discussion to the paracrine signaling discussion.
- Revised the color of the hormones in figure 10.1 to match the color scheme used in the other chapter figures.
- Added a new figure 10.2 showing the locations of the endocrine glands and the hormones produced by each gland. The hormone names are also color-coded to help students visually distinguish between nonsteroid hormones and steroid hormones.
- Added the effects of thyroid hormones on mitochondria to the discussion of steroid hormones.
- Emphasized the hormonal control, neural control, and humoral control of hormone secretion throughout the chapter.
- Revised figure 10.6 to match the style in figure 7.7.
- Revised the arrows in figure 10.7 to match the style in figure 7.7.
- Revised the ACTH negative-feedback mechanism for better physiological accuracy.
- Added a figure to the Clinical Insight box on stress to illustrate the role of cortisol in stress management.

Chapter 11

- Updated figure 11.1 by incorporating a new photo- micrograph of formed elements.
- Added a new paragraph describing what is transported in blood.
- Updated figure 11.5 by incorporating new photo- micrographs of white blood cells.
- Added reasons for why females have lower hematocrits than males.
- Updated hemoglobin percentage to hemoglobin concentration and the healthy values for hemoglobin concentration.
- Created a new introduction for the hemostasis section that included descriptions of procoagulants and anticoagulants.

- Revised the discussion of anti-Rh antibodies for better clarity and accuracy.
- Expanded the discussion on causes of polycythemia.

Chapter 12

- Revised the description of epicardium for simplicity and easier understanding.
- Updated the terms for the components of the conducting system of the heart within the text, as well as in figure 12.9, to align with the Terminologia Histologica.
- Revised figure 12.11 to better illustrate the limbic system input, to update the sympathetic chain to the sympathetic trunk, and to emphasize the type of stimulus detected by the carotid bodies and carotid sinuses.
- Updated the location of the carotid bodies.
- Moved the first two paragraphs in the “Exchange of Materials” section to immediately follow the histological description of the capillary wall.
- Added a definition of peripheral resistance and a discussion of how the cross-sectional diameter of a vessel impacts peripheral resistance. The changes in peripheral resistance were then correlated to changes in blood velocity.
- Added definitions of venoconstriction and vasoconstriction.
- Expanded table 12.5 to include all of the lower limb arteries and revised what the arteries supply to match the text.
- Revised table 12.6 to match what the veins drain with the text.
- Expanded table 12.7 to include all of the lower limb and hepatic portal veins and revised what the veins drain to match the text.

Chapter 13

- Identified each lymphoid organ as either a primary or secondary lymphoid organ.
- Moved the description of the role of mucus in nonspecific defense from the chemical barrier section to immediately follow mucous membranes in the mechanical barrier section.
- Added the skin to the chemical barriers, owing to its acidic pH.
- Added a new natural killer cell section to the nonspecific resistance section.
- Revised the description of antigen.
- Expanded the description of what is attacked by T cells to include transplanted cells.
- Added a new Clinical Insight box on cancer immunotherapy for cancer treatment.
- Expanded the description of allergies to include those caused by environmental factors rather than by identified antigens.

Chapter 14

- Revised the description of the glottis for better anatomical accuracy.
- Updated cellular respiration to aerobic respiration as appropriate.
- Refined the locations of the respiratory mucosae.
- Updated quiet breathing to resting breathing.
- Revised figure 14.4. The radiographic image was vertically flipped to show the correct clinical orientation.
- Updated the color of the smooth muscle on the bronchi in figure 14.5 to the standard red color used in the text for muscle tissue.
- Replaced mm Hg with cm of H₂O when describing the changes in intra-alveolar and intrapleural pressure during breathing for better physiological accuracy. Figure 14.7 was updated to match this change in the text.

Chapter 15

- Revised the description of digestion and absorption in the chapter introductory paragraph.
- Emphasized the role of chemical digestion in breaking large, non-absorbable nutrients to small, absorbable nutrients.

- Highlighted the boxes in figure 15.1 to visually separate the structures of alimentary canal and accessory organs.
- Revised the text to consistently use italics to highlight the substrates and products associated with each digestive enzyme.
- Adjusted the pharynx outline in figure 15.4 to include the entire laryngopharynx.
- Created a new stomach inset image for figure 15.9 using the stomach image in figure 15.8.
- Divided the description of the liver into separate structure and function sections for better readability.
- Revised figure 15.17 for better clarity. The image was substantially enlarged. Only the names of the lipids and lipid-soluble vitamins were used when illustrating their absorption and incorporation into a chylomicron for better clarity.
- Updated cellular respiration to aerobic respiration where appropriate for more specificity.
- Expanded the definitions of anaerobic respiration and aerobic respiration.
- Updated figure 15.20 to match the style in figure 7.7. The different organic molecules were color-coded to visually separate them. Anaerobic respiration and aerobic respiration were also color-coded for easier discernment of the two processes.

Chapter 16

- Revised the description of nephron components to include the collecting duct.
- Expanded the water conservation process to involve both the distal convoluted tubules and the collecting ducts.
- Added the papillary ducts to the microscopic anatomy of the kidney.
- Added a specific explanation for why dilating the afferent glomerular arteriole increases glomerular blood pressure.
- Added a detailed explanation of the role of the juxtaglomerular complex in adjusting the glomerular filtration rate during renal autoregulation.
- Updated atrial natriuretic peptide to natriuretic peptides.
- Revised targets of aldosterone to include both the distal convoluted tubules and the collecting ducts. Figure 16.9 labeling was updated to match this revision.
- Added factors contributing to the movement of urine from the renal pelvis to the bladder.
- Updated the text and figure 16.10 to reflect the lack of an internal urethral sphincter in females.

Chapter 17

- Revised sperm description to include the function of the neck, principal piece, and end piece.
- Revised figure 17.12 extensively for physiological accuracy. The y-axis was relabeled in 2-day increments allowing the entirety of day 14 to represent ovulation. The changes in follicle-stimulating hormone, luteinizing hormone, estrogens, and progesterone concentrations align with the corresponding text descriptions.
- Revised phrasing within the ovarian cycle text to account for varying cycle lengths between females.
- Updated mammary gland structure.
- Revised the image order in figure 17.15 to match the text flow.

Chapter 18

- Revised the definitions of an embryo, fetus, and pre-embryo to reflect that they are names given to the developing offspring and not the names of developmental stages.
- Added the length of time of pre-embryonic development.
- Updated figures 18.4 and 18.5 to a more modern style that matches the art within the text.
- Revised the changes in HCG concentration in figure 18.9 to align with the text description.
- Explained the relationship between weeks of development and weeks of pregnancy.
- Updated figure 18.13 to match the more modern style of figure 18.12. The internal iliac arteries were also added to make the identification of the superior vesical arteries easier.

- Updated the text discussion of the regulation of both prolactin secretion and action on the mammary glands for better physiological accuracy.
- Used attached versus unattached earlobes as the genetic example for introducing dominant and recessive inheritance.

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