Overview of A&P and Anatomical Terminology

Anatomy – The Study of Structure
• Based on observation
• Gross anatomy is what is visible with naked eye - dissection
• Histology is examination of cell populations (called tissues) using a microscope
• Includes imaging technology

Physiology - The Study of Function
• Based on experiments
• Pathophysiology = study of disease state
• Provides basis for drugs and medical procedures

Anatomy and Physiology are Complementary
• Structure and function are interrelated:
  – The heart has 4 chamber and 4 valves.. how do these function?

Organization of life forms (from simplest to most complicated):
  – atoms (C, H, O, N)
  – molecules (H₂O)
  – cellular organelles or “little organs” (nucleus = DNA)
  – cells (cardiac myocyte)
  – tissues (myocardium)
  – organs (heart)
  – organ systems (cardiovascular/circulatory)
  – organism

There are 11 organ systems
  1) Integumentary (skin)
  2) Skeletal (bones and joints)
  3) Muscular (skeletal muscles)
  4) Nervous (brain, spinal cord and nerves)
  5) Endocrine (glands)
  6) Cardiovascular or Circulatory (Heart and vessels +/- blood)
  7) Lymphatic (lymph nodes, spleen, thymus and lymph ducts)
  8) Respiratory (Larynx, trachea and lungs)
  9) Digestive (esophagus, stomach liver, pancreas, intestines)
  10) Urinary or Excretory (kidneys, ureters, urinary bladder and urethra)
  11) Reproductive (ovaries and uterus or testis and prostate)
Physiology: Major focus on the mechanisms that promote a favorable environment for the growth of delicate cells inside the body…

“Homeostasis” means there is a constant internal environment

“Negative Feedback Loops” are the most common mechanisms in Physiology. They are used to maintain homeostasis. The word “negative” refers to “correction” regardless if a variable is too high or too low.

Example: postural hypotension Change in position causes:

Rapid drop in Blood Pressure (BP) → sensed by → baroreceptors → send signals to → brainstem → sends signals to → heart → increases heart rate → raises BP (correction)

Negative feedback loops have 3 parts:

1) Sensor: detects a change in variable (baroreceptors)
2) Control center: coordinates response (brain stem)
3) Effector: mediates correction (heart)

“Positive Feedback Loops” mediate rapid irreversible events and are rare.

Example: Childbirth

Anatomical Terminology

- Fast-paced anatomical discoveries during the Renaissance resulted in confusion – different countries naming same structures with different names
- To reduce confusion most medical terms are derived from Greek or Latin roots
- Sometimes unusual endings for singular vs. plural. (nucleus vs. nuclei)
- Rational for vocabulary quiz – develop ability to decipher words!
- Eponyms are named after people
  Islets of Langerhans; Bowman’s capsule
  Loop of Henle; Haversian canal

Anatomical Position

- Person stands erect
- Feet flat on floor
- Arms at sides
- Palms, eyes & face facing forward
- Standard frame of reference for anatomical descriptions & dissection
Directional Terms – terms listed in pairs (like E-W; N-S)

“Relative” directions
• Superior/Inferior = above vs. below
• Anterior/Posterior = front vs. back
• Meanings differ between humans and animals – thus are “relative”
  – anterior surface of human is surface of chest & belly
  – anterior in a four-legged animal is the head end
  – posterior surface of human is back side
  – posterior in a four-legged animal is the tail end

“Absolute” directions analogous to anterior/posterior & superior/inferior
• Ventral/Dorsal: belly vs. back
• Cephalic/Caudal: head vs. tail

Other important relative directional terms
• Medial/Intermediate/Lateral = toward midline vs. away from midline
• Superficial/deep = surface vs. down under
• Proximal/Distal – refers specifically to appendages near vs. far
• Meaning differ based on starting point – thus these are also “relative”

Anatomical Terminology: Body Regions

Axial region = head, neck & trunk
• cephalic (head)
  • frontal (forehead)
  • nasal (nose)
  • orbital (eye)
  • oral (mouth)
  • buccal (cheek)
  • occipital (back of head)
  • otic (ear)
  • mental (chin)
• cervical (neck)
• thoracic trunk region above diaphragm & abdominal region below
  • acromial (point of shoulder)
  • sternal (central part of thoracic cage)
  • vertebral (back bone)
  • scapular (shoulder blades)
  • mammary or pectoral (breast)
  • axillary (arm pit)
• pelvic (pelvis)
• coxal (hip)
• umbilical (naval)
• inguinal (groin)
• lumbar (lower back – vertebral column above hips)
• sacral (lower back – below hips)
• gluteal (buttock)
• pubic (external genitals)
• perineal (anal-genital)

Appendicular region = upper and lower limbs
  • Important terms regarding upper limbs
    • brachium (arm)
    • antecubital (front of elbow)
    • olecranon (back of elbow)
    • carpal (wrist)
    • antebrachial (forearm)
    • palmar (palm)
    • digits (fingers)
    • pollex (thumb)
    • manus (hand)
  • Important terms regarding lower limbs
    • femoral (thigh)
    • patellar (front of knee)
    • popliteal (back of knee)
    • fibular or peroneal (side of calf)
    • tarsus (ankle)
    • calcaneal (heel)
    • pedal (foot)
    • digits (toes)

Anatomical Planes

• Planes are imaginary flat surfaces passing through the body
• Two vertical planes and one horizontal plane
  1) Sagittal plane divides body into right and left parts
     – midsagittal plane divides body into equal right and left halves
     – parasagittal plane divides the body into right and left portions
  2) Frontal (coronal) plane divides body into front & back
  3) Transverse (horizontal) divides the body into upper & lower
Body Cavities and Membranes: dorsal and ventral

• dorsal body cavity has two major parts:
  • Cranial cavity – contains brain
  • Vertebral canal – spinal cord
• ventral body cavity also has two parts: diaphragm separates them
  • thoracic cavity
    • Pleural cavity – contains lungs
    • Mediastinum separates left from right pleural cavities
    • Pericardial cavity – contains heart
  • abdominopelvic cavity – peritoneal cavity: contains gastrointestinal and reproductive organs

Thoracic Cavity - contains heart, major blood vessels, esophagus, trachea, & thymus

Abdominopelvic Cavity

• Brim of the pelvis separates abdominal (superior) from pelvic (inferior) cavity
  – Abdominal cavity contains GI tract (stomach, intestines, liver, gallbladder, pancreas, & colon), kidneys & ureters and spleen (functions in immune system)
  – Abdomen divided into 4 quadrants
    • upper left – stomach & lower esophagus
    • upper right – gallbladder
    • lower left – intestines
    • lower right – appendix
  • Pelvic cavity contains rectum, bladder, urethra & some organs for reproduction

Membranes

• All 3 cavities (pleural, pericardial and peritoneal) are lined by serous membranes
  – simple squamous epithelial cells and connective tissue
• These membranes function to secrete fluid for lubrication of organs
• Named based on location – Visceral (organs) vs. Parietal (body wall)
  • visceral and parietal pericardium cover heart & line pericardial sac
  • visceral and parietal pleural cover lungs & line rib cage
  • visceral and parietal peritoneal cover organs and abdominopelvic cavity
  • Inflammation of these membranes causes: pleurisy, pericarditis, and peritonitis (respectively). It is painful to move/breath due to lack of lubricating fluid