

# **The Human Body**

**EMS Continuing Education  
Technician through Technician-Advanced Paramedic**

**Consistent with the  
National Occupational Competency Profiles  
as developed by  
Paramedic Association of Canada  
and  
“An Alternate Route to Maintenance of Licensure”  
as developed by Manitoba Health**

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## Disclaimer

These documents were developed for improved accessibility to standardized continuing education for all paramedics in Manitoba.

This training package is consistent with the National Occupational Competency Profiles and the core competency requirements (both mandatory and optional) as identified in “An Alternative Route to Maintenance of Licensure” (ARML). It is not the intent that this package be used as a stand-alone teaching tool. It is understood that the user has prior learning in this subject area, and that this document is strictly for supplemental continuing medical education. To this end, the Paramedic Association of Manitoba assumes no responsibility for the completeness of information contained within this package.

It is neither the intent of this package to supersede local or provincial protocols, nor to assume responsibility for patient care issues pertaining to the information found herein. Always follow local or provincial guidelines in the care and treatment of any patient.

This package can be used in conjunction with accepted models for education delivery and assessment as outlined in “An Alternative Route to Maintenance of Licensure”. Any individual paramedics wishing to use these continuing education packages to augment their ARML program should contact their local EMS Director.

This document was designed to encompass all licensed training levels in the province (Technician, Technician – Paramedic, Technician – Advanced Paramedic.). Paramedics are encouraged to read beyond their training levels. However, it is suggested that the accompanying written test only be administered at the paramedic’s current level of practice.

This package has been reviewed by the Paramedic Association of Manitoba’s Educational Subcommittee and is subject to review by physician(s) or expert(s) in the field for content.

As the industry of EMS is as dynamic as individual patient care, the profession is constantly evolving to deliver enhanced patient care through education and standards. The Paramedic Association of Manitoba would like to thank those practitioners instrumental in the creation, distribution, and maintenance of these packages. Through your efforts, our patient care improves.

This document will be amended in as timely a manner as possible to reflect changes to the National Occupational Competency Profiles, provincial protocols/Emergency Treatment Guidelines, or the Cognitive Elements outlined in the Alternate Route document.

Any comments, suggestions, errors, omissions, or questions regarding this document may be referred to [info@paramedicsofmanitoba.ca](mailto:info@paramedicsofmanitoba.ca) , attention Director of Education and Standards.

## **The Human Body**

This package has been written to encompass all current training levels in the province. However, paramedics will only be required to take the test that best defines their current license level.

This package is to be used conjunction with the education and delivery models as outlined under “An Alternate Route to Maintenance of Licensure”.

Any comments or suggestions related to this document can be forwarded to the Director of Education and Standards, Paramedic Association of Manitoba, Inc. via e-mail to [info@paramedicsofmanitoba.ca](mailto:info@paramedicsofmanitoba.ca)

### **Conventions Used in this Manual**

The cognitive elements contained in this training module apply to all EMS licensure levels. Therefore no conventions have been used to differentiate between Technician, Technician – Paramedic, Technician – Advanced Paramedic.

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## **The Human Body**

To understand trauma and disease process the paramedic must have a thorough knowledge of the human body. As EMS professionals we must be able to perform organized assessments and communicate effectively with other members of the healthcare team. This section of the ARML Program attempts to review human anatomy, body systems and pathophysiology.

### **Cell Structure and Function**

Knowledge of the structural components and functions of cells is basic to understanding the workings of the human body. The cell is the fundamental unit of life. It is highly organized and contains all the necessary components to turn essential nutrients into energy, remove waste and reproduce itself. There are three main parts of all human cells.

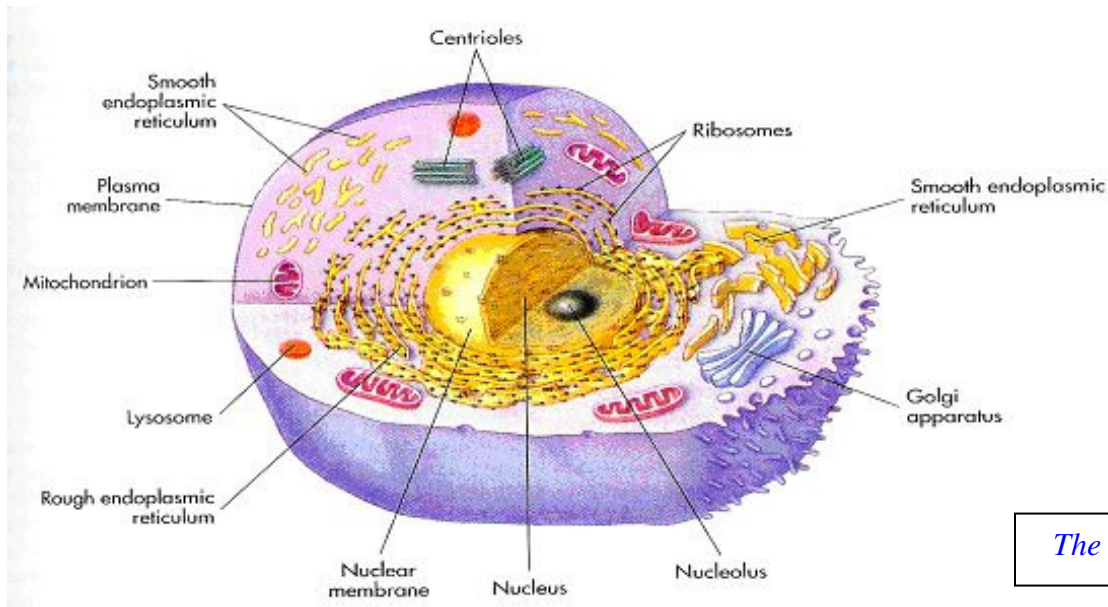
1. Cell Membrane or cytoplasm membrane encircles the cell and protects it from the outer environment. It gives the cell form, supports the cell contents and regulates what moves into and out of the cell.
2. Cytoplasm lies between the cell membrane and the nucleus. Within the cytoplasm, organelles perform functions important to the cell's survival.
3. The Nucleus is a relatively large round or spherical structure generally located in the centre of the cell. The primary function of the nucleus is cell division and control of genetic information. It contains genetic material called DNA and the enzymes and proteins necessary for the replication of DNA.

All human cells reproduce by a process known as Mitosis. In this complicated process cells divide to multiply.

Cells have evolved in specific ways to fulfill unique functions and often work together to perform complex tasks. There are over 200 different specialized cells in the human body.

#### **There are seven chief cellular functions:**

1. Movement (muscle cells)
2. Conductivity (nerve cells)
3. Metabolic absorption (kidney & intestinal cells)
4. Secretion (mucous gland cells)
5. Excretion
6. Respiration
7. Reproduction



## Tissues

Both cell structure and composition are used to classify four types of tissues:

1. Epithelial tissues are cells that are flat and scale like as in a skin cell.
2. Connective tissue is the most abundant tissue in the body, composing fat, tendons, cartilage, bone and even internal organs.
3. Muscle tissue which is responsible for movement is classified as skeletal, cardiac, smooth or visceral according to its location and function.
4. Nervous tissue is composed of complicated groups of nerve cells (Neurons) that have the unique ability to conduct electrical signals.

## Anatomical Terms

It is important to describe a patient's position, direction, and location to other healthcare personnel. Using correct terms will help you communicate the extent of a patient's injury quickly and accurately.

Terms of **position** include the following:

- **Anatomical position.** In this position, a patient's body stands erect with arms down at the sides, palms facing you. "Right" and "left" refer to the patient's right and left.
- **Supine position.** The patient is lying face up on his back.
- **Prone position.** The patient is lying face down on his stomach.

- **Lateral recumbent position.** In this position, the patient is on the left or right side. This is also known as the *recovery position*.
- **Fowler's position** refers to a patient who is sitting up with knees bent.
- **Trendelenburg position** refers to a patient being positioned supine with the head lower than the feet.
- **Shock position** (modified Trendelenburg position) refers to the patient's head and torso being positioned supine, and the lower extremities are elevated 8-12 inches. This helps increase blood flow to the brain.



*Shock position (modified Trendelenburg's position)*

***Anatomic Planes of the body include the following:***

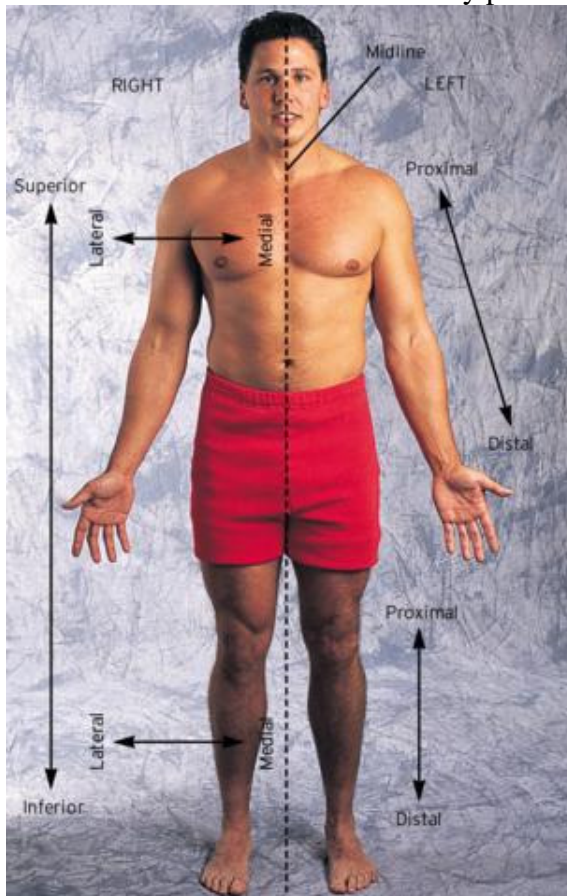
- **Anterior** refers to the front.
- **Posterior** refers to the back.
- **Midline** is an imaginary vertical line drawn from the middle of the forehead through the nose and the umbilicus (navel) to the floor. This imaginary line divides the body into two halves that are mirror images. The nose, chin, umbilicus, and spine are examples of midline structures.
- **Midclavicular line** is an imaginary line drawn vertically through the middle portion of the clavicle and parallel to the midline.
- **Midaxillary line** is an imaginary vertical line drawn through the middle of the axilla (armpit). This line is also in the middle of the anterior and posterior surfaces of body.

***Terms of direction and location are as follows:***

- **Superior** means towards, or closer to, the head. **Inferior** means towards, or closer to, the feet.
- **Anterior** is towards the front. **Posterior** is towards the back.
- **Medial** means towards the midline or centre of the body. **Lateral** refers to the left or right of the midline.
- **Proximal** means close to or near the point of reference. **Distal** is distant or far away from the point of reference. The point of reference is usually the torso. For

example, a wound of the forearm is proximal to the wrist because it is closer to the torso than to the wrist. That same wound is distal to the elbow because it is farther away from the torso than from the elbow.

- **Superficial** is near the surface. **Deep** is remote, or far from the surface.
- **Internal** means inside. **External** means outside.
- **Dorsal** is towards the spine.
- **Ventral** is toward the abdomen.
- **Palmar** refers to the front region of the hand.
- **Plantar** refers to the bottom of the foot.
- **Apex** is the topmost portion of a structure.
- **Bilateral structure** is a body part that occurs on both sides of the midline.



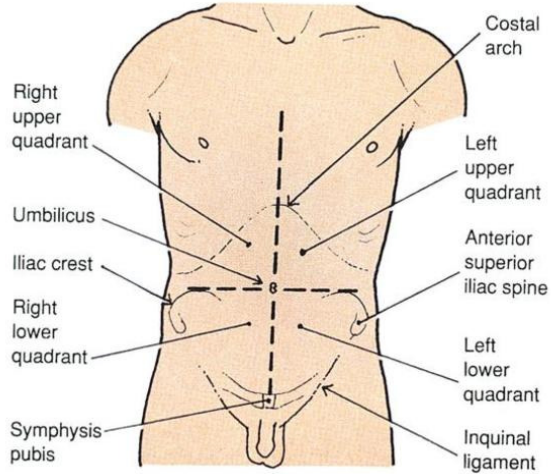
*Directional terms indicate distance and direction from the midline.*

Anatomical regions and topography are the internal and external landmarks of the body. During assessment of a patient, refer to these landmarks. They will help make the description of a patient's condition clear to others, particularly when you use a radio. The organs of the body are located in certain **body cavities**. The main body cavities include the following:

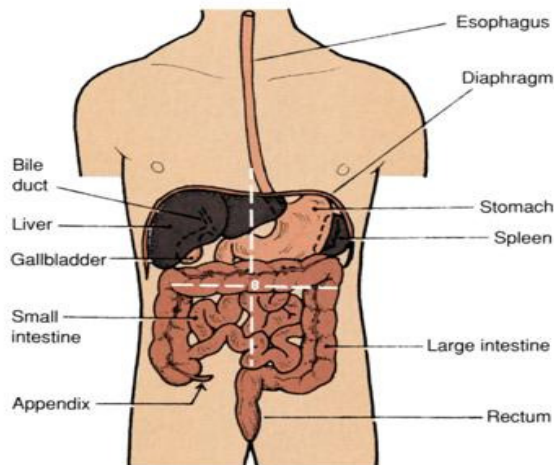
- **Thoracic cavity**. Also called the chest cavity, the lungs and heart are found here. The **diaphragm** – a muscle that moves up and down during respiration – separates this cavity from the abdomen.

- **Abdominal cavity.** It contains organs of digestion and excretion, including the stomach, intestines, liver, gallbladder, spleen, pancreas and kidneys.
- **Pelvic cavity.** It is bound by the lower part of the spine, the hip bones, and the **pubis**. It protects the lower abdomen, including the bladder, rectum, and internal female reproductive organs.

Note that you can think of the abdomen as being divided into four parts or **quadrants**. Health care workers often refer to it that way. The quadrants are formed by imaginary lines. One line is drawn horizontally through the navel, the other is drawn vertically through the midline of the body.



*In the abdomen, quadrants are the easiest system for identifying areas. Major bony landmarks are also shown. Many of the organs in the abdomen lie in more than one quadrant.*



## **Body Systems**

### **The Musculoskeletal System**

The musculoskeletal system is made up of the skeleton and muscles. Each helps give the body shape and protects internal organs. The muscles also provide for movement.

#### ***The Skeleton***

The human body is shaped by its bony framework. Bone is composed of living cells and nonliving matter. The nonliving matter contains calcium compounds that help make bones hard and rigid. Without bones, the body would collapse.

The adult skeleton has 206 bones. It must be strong to support and protect, jointed to permit motion, and flexible to withstand stress. It is held together mainly by **ligaments**, **tendons**, and layers of muscle. (Ligaments connect bone to bone. Tendons connect muscle to bone). Bone ends fit into each other at joints. The three kinds of joints are: immovable (like the skull), slightly movable (like the spine), and freely movable (Like the elbow or knee).

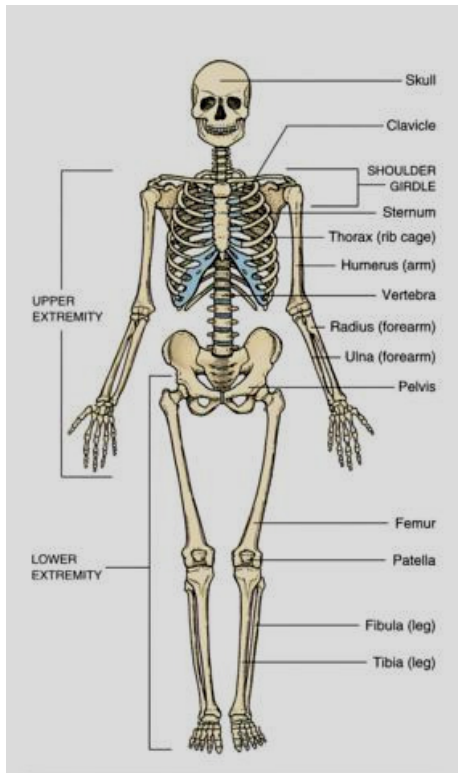
The major areas of the skeleton include the following:

- The **skull** has a number of broad, flat bones that form a hollow shell. The top (including the forehead), back, and sides of the shell make up the **cranium**. It houses and protects the brain. There are several small bones of the face which give shape to the face and permit the jaw to move. The major features of the face are the nose, ears, eyes, cheeks and mouth.
- The **spinal column** houses and protects the **spinal cord**. The spinal column is the central supportive bony structure of the body. It consists of 33 bones known as **vertebrae**. The spine is divided into five sections: the **cervical spine** (the neck, formed by 7 vertebrae) the **thoracic spine** (the upper back, formed by 12 vertebrae), the **lumbar spine** (the lower back, formed by 5 vertebrae), the **sacrum** (the lower part of the spine, formed by 5 fused vertebrae), and the **coccyx** (the tail bone, formed by 4 fused vertebrae).
- The **thorax**, or rib cage, protects the heart and lungs – vital organs of the body. They are enclosed by 12 pairs of ribs that are attached at the back to the spine. The top 10 are also attached in the front to the **sternum**, or breastbone. The lower portion of the sternum is called the xiphoid process.
- The **pelvis**, or hip bones, consists of the ilium, pubis, and ischium. Iliac crests form the “wings” of the pelvis. The pubis is the anterior portion of the pelvis. The ischium is in the posterior portion.
- The **shoulder girdle** consists of the **clavicles** (the collarbone) and the **scapulae** (shoulder blades).
- The upper **extremities** extend from the shoulders to the fingertips. The arm (shoulder to elbow) has one bone known as the **humerus**. The bones in the

forearm are the **radius** and **ulna**. The lower extremities extend from the hips to the toes. The bone in the thigh, or upper leg, is known as the **femur**. The bones in the lower leg are called the **tibia** and **fibula**. The knee cap is called the **patella**.

The skeleton is further divided into the:

- **Axial Skeleton** – The bones of the head, neck and torso.
- **Appendicular Skeleton** – The bones of the upper and lower extremities.



*The 206 bones of the skeleton give us our form, protect our vital organs, and allow us to move.*

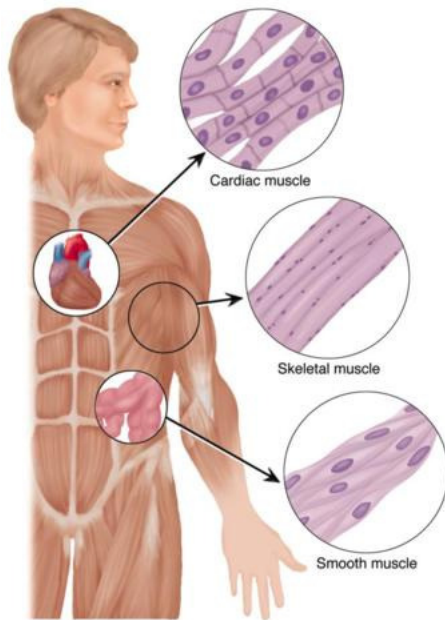
### ***The Muscles***

Movement of the body depends on the work performed by the muscles. Muscles have the ability to contract (become shorter and thicker) when stimulated by a nerve impulse. Each muscle is made up of long threadlike cells called fibres, which are closely packed or bundled. Overlapping bundles are bound by connective tissue.

There are three basic kinds of muscles:

- **Skeletal muscle**, or **voluntary muscle**, makes possible all deliberate acts, such as walking and chewing. It helps shape the body and form its walls. In the trunk, this type of muscle is broad, flat, and expanded. In the extremities, it is long and round.
- **Smooth muscle**, or **involuntary muscle**, is made of longer fibres. It is found in the walls of tubelike organs, ducts, and blood vessels. It also forms much of the intestinal wall. A person has little or no control over this type of muscle.

- **Cardiac muscle** makes up the walls of the heart. It is able to stimulate itself into contraction, even when disconnected from the brain.



*The three types of muscles are skeletal, smooth, and cardiac.*

## **The Respiratory System**

The body may get enough nutrition from food to last several weeks. It can store water to last several days. But it can only store oxygen for a few minutes. The body depends on a constant supply of oxygen. The respiratory system delivers oxygen to the body and also removes carbon dioxide from the body.

The passage of air into and out of the lungs is called **respiration**. Breathing in is called **inspiration**, or inhaling. Breathing out is called **expiration**, or exhaling.

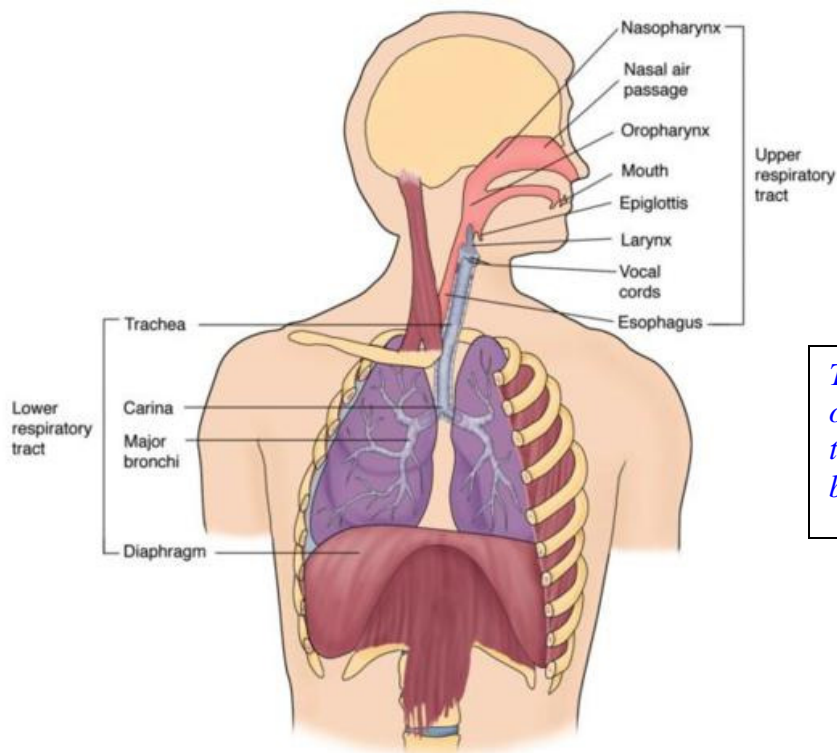
During inspiration, the muscles of the thorax contract, moving the ribs outwards and up. The diaphragm contracts and lowers. These movements expand the chest cavity and cause air to flow into the lungs. During exhalation, the opposite happens. The muscles of the chest relax and cause the ribs to move inwards. The diaphragm relaxes and moves up.

The respiratory system consists of the organs that help us breathe. When air enters the body, it does so through the mouth and nose. The area posterior to the mouth and nose is called the **pharynx**, which is divided into the **oropharynx** and **nasopharynx**. Air then travels down through the **larynx** (voice box) and into the **trachea** (windpipe). The trachea is the air passageway to the lungs. It is made of cartilage rings and is visible in the anterior portion of the neck. The epiglottis is a leaf-shaped structure that prevents foreign objects from entering the trachea during swallowing. The trachea splits into two

**bronchi.** These air passages gradually become smaller and smaller until they reach the **alveoli**, where carbon dioxide and oxygen are exchanged with blood.

It is important to remember that the respiratory structures of infants and children differ from those of adults. While the structures all have the same names, they may be smaller or less developed in infants and children. These differences are very important.

- All structures, including the mouth and nose, are smaller in children. They are more easily obstructed by even small objects, blood, or swelling. Pay extra attention to an infant or child to be sure the airway stays open.
- The tongue of an infant or child takes up proportionally more space in the pharynx than does the tongue of an adult. As a result, it can block the airway more easily.
- The trachea of an infant or child is narrower, softer, and more flexible. Tipping the head too far back or allowing the head to fall forwards can close the trachea. Whenever needed, place a folded towel or similar item under the shoulders to keep the airway aligned and open.
- The primary cause of cardiac arrest in infants and children is an uncorrected respiratory problem. Because the chest wall is softer, infants and children tend to rely more heavily on the diaphragm for breathing. Watch for excessive movement of the diaphragm. It can alert you to respiratory distress in an infant or child.



*The respiratory system consists of all the structures of the body that contribute to the process of breathing.*

## The Circulatory System

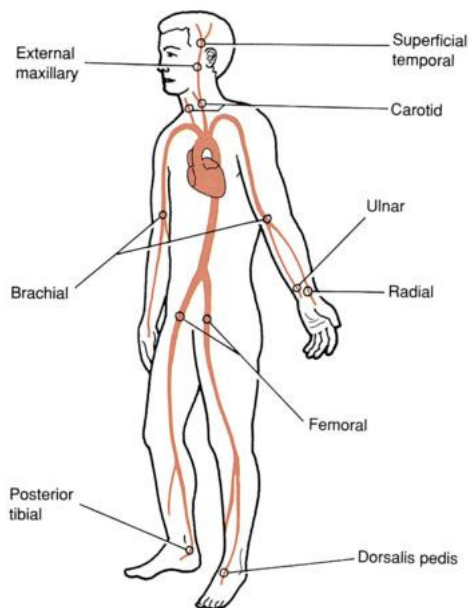
The circulatory system delivers oxygen and nutrients to the body's tissues and removes waste products. It consists of the heart, blood vessels, and blood.

The heart is a muscular organ that is responsible for pumping blood through the body. The adult heart contracts between 60 and 80 times per minute when at rest and faster when under stress. Problems with the heart account for many of the emergencies you will encounter as a Paramedic.

The heart is divided into four chambers. The upper chambers are called **atria**. The lower chambers are called **ventricles**. The heart has left and right sides, each of which has an atrium and a ventricle. The right side of the heart receives deoxygenated blood from the body and pumps it to the lungs. The left side of the heart receives oxygenated blood from the lungs and pumps it to the body.

When the heart pumps blood from the left ventricle, blood enters the arteries. This pumping action causes a wave of pressure that can be felt as a pulse. There are many points where a pulse can be felt in the body. The most common are as follows:

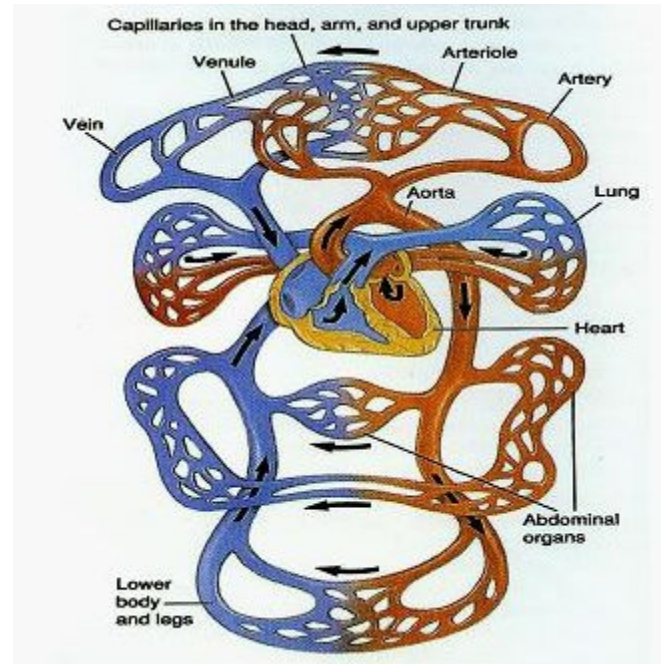
- The **carotid pulse point**, felt on either side of the neck.
- The **brachial pulse point**, felt on the inside of the arm between the elbow and the shoulder.
- The **radial pulse point**, felt on the thumb side of the wrist.
- The **femoral pulse point**, felt in the area of the groin in the crease between the abdomen and thigh.



*The central and peripheral pulses can be felt where the large arteries are near the skin.*

The blood vessels are a closed system of tubes through which blood flows. Arteries and arterioles take blood away from the heart. The capillaries are distributors. They are the smallest vessels through which the exchange of fluid, oxygen, and carbon dioxide takes place between blood and tissue cells. The **venules** and **veins** are collectors. They carry blood back to the heart from the rest of the body.

*The circulatory system includes the heart, arteries, veins, and interconnecting capillaries. The capillaries are the smallest vessels and connect with the venules and arterioles.*



## **Lymphatic System**

The Lymphatic system is also considered part of the circulatory system because it also moves fluid that comes from the body and returns it to the blood. The lymphatic system differs in that it only carries fluid away from the tissues. There are three basic functions of the lymphatic system: to maintain fluid balance in the tissues, absorb fats and other substances from the digestive tract and plays a key role in our immune system.

## **The Nervous System**

The nervous system is the major regulatory and coordinating system of the body. It controls all voluntary and involuntary activities of the body. It has two sub systems: the somatic and the autonomic nervous system.

Somatic Nervous System regulates activities over which there is voluntary control such as walking and talking.

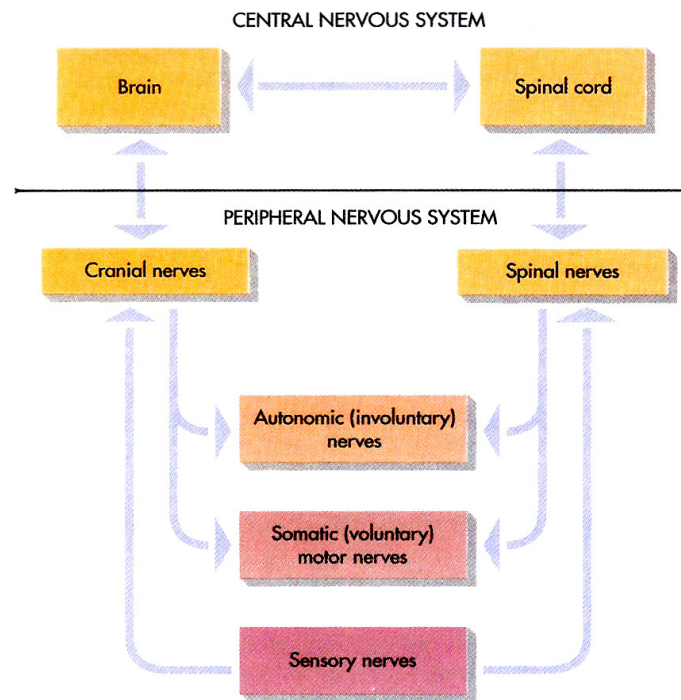
Autonomic Nervous System controls body functions that occur without voluntary control including the breathing and digestion and all other involuntary actions that are necessary for basic body function.

The central nervous system (CNS) is made up of the brain and spinal cord, this part of the nervous system is covered and protected by the bones.

The major regions of the brain are the brain stem, the cerebrum, and the cerebellum. Each region is further divided and will be further discussed in another package.

The spinal cord is the other major division of the central nervous system. The major portion of the spinal cord is made up of nerve fibers that extend from the brain, down the spine to the peripheral nervous system. Its principal function is to transmit messages by means of electrical impulses between the brain and the body.

The three major types of nerves are sensory nerves, which carry information from the body to the CNS, motor nerves carry information from the CNS to the muscles and connecting nerves connect the sensory and motor nerves together.



## The Integumentary System

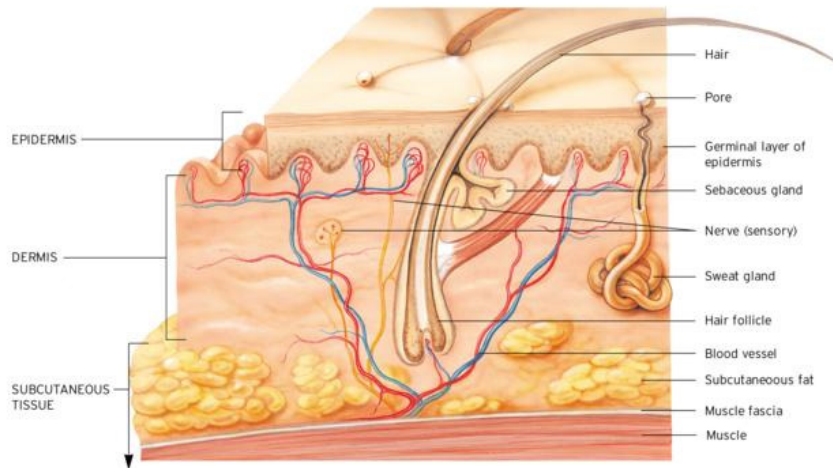
The integumentary system is the largest organ system of the body, consisting of the skin, hair, and nails.

The skin separates the human body from the outside world. It protects the deep tissues from injury, drying out, and invasion by bacteria and other foreign bodies. The skin helps regulate body temperature. It aids in getting rid of water and various salts and helps prevent dehydration. It acts as the receptor organ for sensations of touch, pain, heat, and cold.

The skin is divided into two parts; the epidermis and the dermis. The epidermis is the outermost layer of skin and is constantly being rubbed away and replaced by new skin cells. It varies in thickness in different areas of the body and provides a watertight seal to protect against the invasion of bacteria and other organisms.

The dermis contains sweat glands, oil glands, hair follicles, blood vessels and specialized nerve endings.

Beneath the dermis lies subcutaneous tissue, this is composed largely of fat that serves as an insulator for the body and as a reservoir to store energy.



*The skin has two principal layers: the epidermis and the dermis. Below the skin is a layer of subcutaneous fat.*

## **The Digestive System**

### ***The Abdomen:***

The abdomen is divided from the thorax by the diaphragm. Thick muscles create abdominal walls, which are the boundaries of the abdomen. It contains the major organs of digestion and excretion. It is divided into four quadrants by means of an imaginary line that runs horizontally and vertically through the umbilicus: The right upper (RUQ), right lower (RLQ), and left upper (LUQ) and left lower (LLQ).

The Right Upper Quadrant (RUQ) contains the liver, gall bladder, and head of the pancreas.

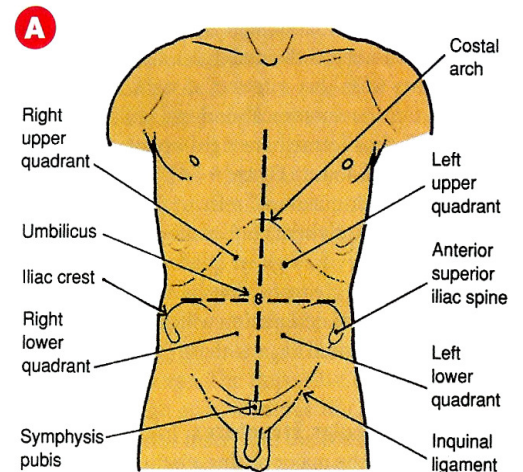
The Left Upper Quadrant (LUQ) contains the stomach, spleen, pancreas and a portion of the colon.

The Right Lower Quadrant (RLQ) contains the portions of the small intestine, ascending colon and the appendix.

The Left Lower Quadrant (LLQ) contains the descending colon and the small intestine.

The large intestine winds its way through the abdomen beginning in the RLQ and ends in the LLQ as it passes through all four quadrants.

The kidneys lie behind the abdominal cavity above the level of the umbilicus in the retro peritoneal region. The urinary bladder lies just behind the pubic symphysis in the middle of the abdomen.



The digestive system is a specialized process that provides the body with water, electrolytes, and the nutrients needed to sustain life. When we take a bite of food the process begins.

Our mouth (oral cavity) with lips, cheeks, gums, teeth, tongue, soft and hard palate and muscle is designed to hold food, chew it, mix it with saliva and swallow it.

When we swallow food it passes through the pharynx into the esophagus.

The automatic movement of the pharynx during swallowing causes the epiglottis to close over the trachea so it is sealed and no foreign matter can enter in the airway.

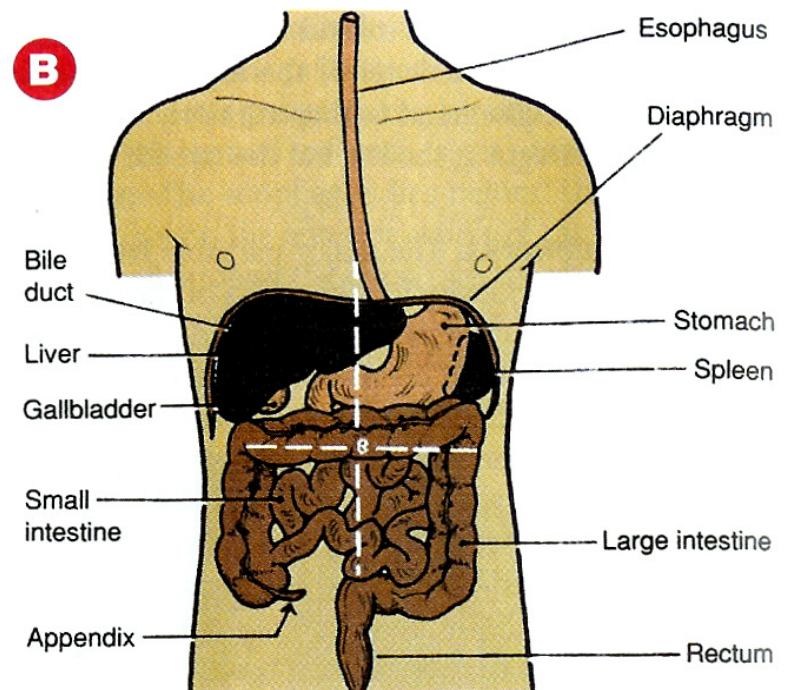
Food is propelled through the esophagus to the stomach where various small glands secrete acids and enzymes to assist with digestion. The stomach contracts and mixes 1.5L of gastric juice daily with food and propels it to the small intestine.

The pancreas aids in digestion by producing pancreatic juice containing many enzymes that aid in digestion; it is directly connected to the duodenum. It also produces Insulin that regulates glucose in the blood.

The Liver is the largest solid organ in the abdomen and aids in iron metabolism, plasma-protein productions, detoxification and numerous other biochemical activities. It creates about one liter of bile daily, which is stored in the gallbladder. Bile dilutes stomach acid and emulsifies fats. The Liver aids in metabolism and helps maintain normal blood glucose levels. Blood proteins such as clotting factors are produced and released into the circulation by the liver.

The gallbladder & bile ducts together have only one function and that is to concentrate and store bile created by the liver and then delivers it to the small intestine.

The small intestine (where the majority of absorption of foods occurs) is further divided into three distinct sections; the duodenum, the jejunum, and the ileum. It takes 3-5 hours to move our food on to the large intestine. The large intestine's major function is to absorb water, salts and to convert undigested food into feces. It is also divided into three distinct sections, the cecum, the colon and the rectum. It takes 18-24 hours for digested food to exit the body thru the rectum.

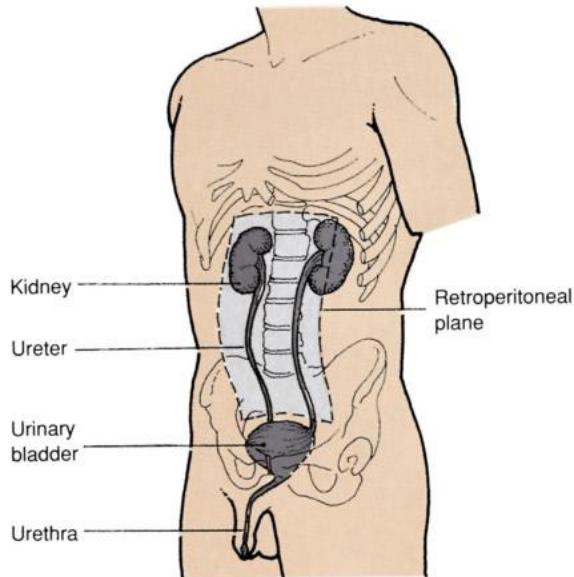


### ***The Urinary System***

The urinary system works with other body systems to maintain homeostasis by removing waste from the blood and helps to maintain fluid balance and composition.

The Kidneys rid the blood of toxic waste products and control the balance of sodium and water. Nearly 20% of the hearts output of blood goes to the kidneys. 1500 L of blood circulates through the kidneys daily and waste products and water are filtered from the blood in the form of urine.

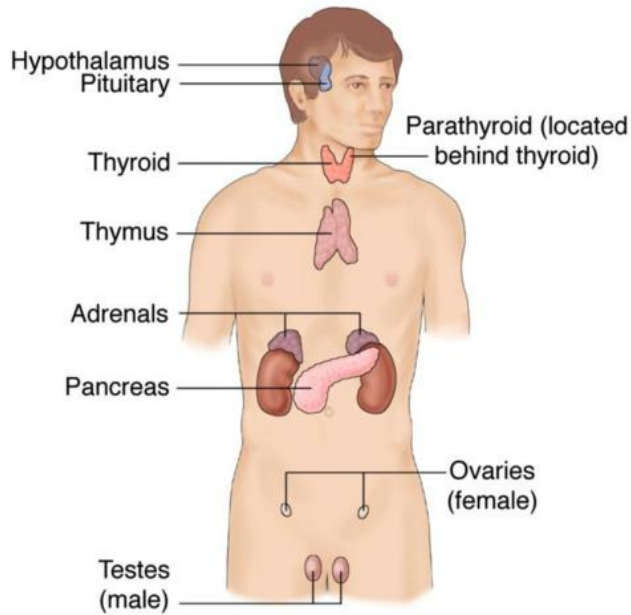
Each kidney drains its urine into a ureter thru which urine passes to the bladder. The two ureters move urine to the bladder where it is stored until it empties outside the body through the urethra. Normal adults form 1.5 to 2L of urine daily.



*The urinary system lies in the retroperitoneal space behind the organs of the digestive system. The kidneys are solid organs; the ureter, bladder, and urethra are hollow organs*

## **The Endocrine System**

The endocrine glands regulate the body by secreting hormones directly into the bloodstream. They affect physical strength, mental ability, stature, reproduction, hair growth, voice pitch and behavior. How people think, act, and feel depends largely on these tiny secretions. Each gland produces one or more hormones. The glands include the thyroid, parathyroid, adrenals, ovaries, testes, islets of Langerhans, and the pituitary.



*The endocrine system controls the release of hormones in the body.*

## The Reproductive System

### Male

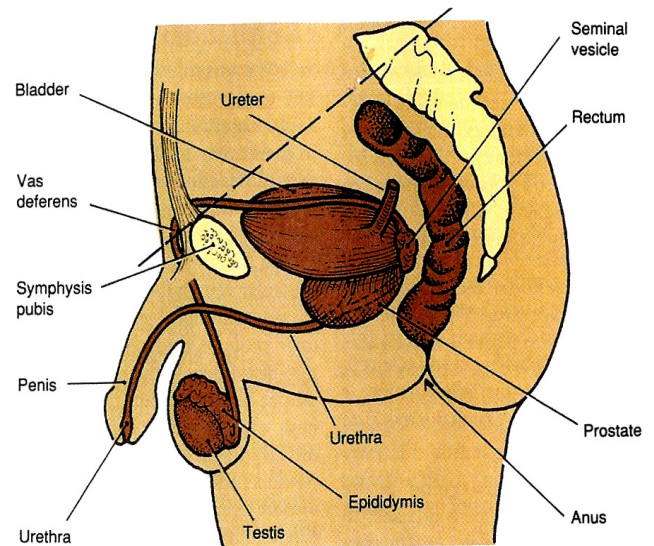
The male's reproductive system consists of testes, which are located within the scrotum. Each testicle contains specialized cells that produce hormones and sperm.

The Vas deferens is the passageway from each testicle that carries sperm from the testicle to the base of the urethra where it is stored. Seminal Vesicles are small storage sacs for sperm and seminal fluid that empty into the ejaculatory duct.

Semen contains sperm cells mixed with fluid from the seminal vesicle.

The prostate gland surrounds the urethra as it emerges from the bladder. It is about the size of a walnut and consists of glandular and muscular tissue.

The penis consists of three columns of erectile tissue that becomes erect when engorged with blood. The penis's main function is to transfer spermatozoa to the female's reproductive site.



## **Female**

The female's ovaries function like the male testes in that they produce hormones along with ovum (egg cell). The ovaries produce eggs and release one mature egg every 28 days.

The egg will travel thru the fallopian tubes that connect with the uterus.

The vagina receives the penis during sexual intercourse. It is a muscular tube that connects the uterus with the vulva (external genitalia).

Fertilization occurs when the sperm enters the egg and is completed with fusion of the male and female pronuclei. The uterus is a pear shaped hollow organ with muscular walls.

It contains and nourishes the embryo from the time the fertilized egg is implanted to the time the fetus is born.

The fetus will be expelled from the uterus and travel through the cervix and the vagina and be born.

Mammary glands located within the female's breasts are the organs of milk production.

## **Special Senses**

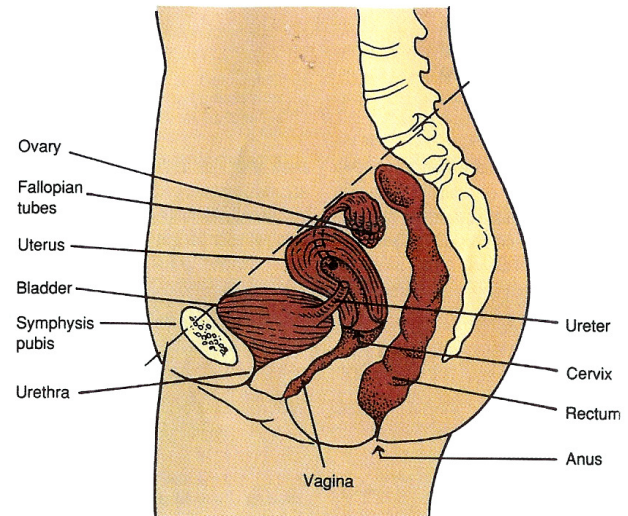
Generally speaking our sense of smell, hearing, touch, taste, and vision provide our brain with information about our world.

Our sense of smell is located in the upper part of the nasal cavity. Olfactory receptors are extremely sensitive and when stimulated by airborne molecules, nerve impulses travel through the olfactory tract to the olfactory centers of the brain where the impulses are interpreted as odors. It is believed that the variety of detectable smells is actually combinations of seven primary odors.

Camphoraceous, musk, floral, peppermint, ethereal, pungent and putrid.

Our taste buds are located on areas of the tongue, palate, lips and throat. There are four basic types of flavor: bitter, sour, salty, and sweet. Taste sensations result from taste bud and olfactory receptor stimulation.

The visual system includes the eyes, lids, brows, lashes, tear ducts and optic nerves. The optic nerve conducts impulses from the eye to the brain where we process images. The oculomotor nerve conducts impulses from the brain to the muscles of the eye, which moves it to the direction we want it to go. The delicate anatomy & physiology of the eye is complicated and should be discussed at length another time.



The anatomy of the ear is divided into three portions; external, middle and inner. The external and middle ear are involved in hearing and the inner ear functions in hearing and balance.

Sound waves from the environment enter the external canal to the tympanic membrane (ear drum), making it vibrate. The vibrations are transmitted to the middle ear ossicles, (small bones) the malleus, incus, and stapes. Then to the perilymph and endolymph fluid in the inner ear's membranous labyrinth.

The inner ear is separated into the vestibule and semicircular canals which are involved in balance and the cochlea is involved in hearing.

The hearing sense lies inside the cochlea and is called the organ of Corti, It transmits impulses by the cochlear branch of the cranial nerve to the auditory sensors of the brain.

## **Reference**

“An Alternative Route to Maintenance of Licensure”, Manitoba Health Emergency Services, Revised March 14, 2001

Brady Emergency Medical Responder A Skills Approach, Canadian Edition, Keith J. Karren, Brent Q. Hafen, Daniel Limmer, John Mackay, Michelle Mackay Prentice Hall, Inc., 1998

National Occupational Competency Profiles and Curriculum Blueprints, June 29, 2001, Paramedic Association of Canada

AAOS Emergency Care and Transport of the Sick and Injured, Seventh Edition, 1999, Jones and Bartlett.

Manitoba Health Emergency Treatment Guidelines, Manitoba Emergency Services, Revised August 2002

Mosby’s Paramedic Textbook, Revised Second Edition, Mike Sanders, Mosby, Inc. 2001