

Medical Terminology:

Basics

Before we can start in with some new and interesting medical terms, you need to learn a few fundamentals of how medical terminology is constructed as a language.

There are three basic parts to medical terms:

- a word root (usually the middle of the word and its central meaning),
- a prefix (comes at the beginning and usually identifies some subdivision or part of the central meaning), and
- a suffix (comes at the end and modifies the central meaning as to what or who is interacting with it or what is happening to it). An example may make better sense.

WORD ROOT

therm = heat

hypothermia (less heat), thermometer (measuring heat)

Let's look at a real medical term and take it apart.

Myocarditis

(prefix)

(root)

(suffix)

myo = muscle

card = heart

itis = inflammation

Let's see how prefix and suffix changes can alter the meaning of a term without changing its central meaning by keeping the root the same.

PREFIX CHANGE:

<u>myo</u> carditis	= muscle layer of heart inflamed
<u>Peri</u> carditis	= outer layer of heart inflamed
<u>Endo</u> carditis	= inner layer of heart inflamed

SUFFIX CHANGE:

Cardi <u>ologist</u>	= a physician specializing in the heart
Cardi <u>omyopathy</u>	= damage to heart muscle layer
Cardi <u>omegaly</u>	= enlargement of the heart

Again, we haven't introduced heart terms yet. These basics are just to introduce the parts of medical terms and demonstrate how moving the parts around modifies the central meaning without changing the "root" (cardio).

All these terms are Latin words or in "Greek" and more explanations with examples are in the following:

-itis	= inflammation	tonsillitis, appendicitis
-osis	= abnormal condition	cyanosis (blueness, due to cold or low oxygen)
-ectomy	= to cut out (remove)	appendectomy, tonsillectomy
-otomy	= to cut into	tracheotomy (to cut into the windpipe, temporary opening)

-ostomy	= to make a “mouth”	colostomy (to make a permanent opening in colon)
a/an	= without, none	anemia (literally no blood but means few red cells)
Micro	= small	microstomia (abnormally small mouth, see “stomy” colostomy above?)
Macro	= large	macrostomia (abnormally large mouth)
mega/ -megaly	= enlarged	megacolon (abnormally large colon = large intestine)
-scopy/ -scopic	= to look, observe	colonoscopy (look into colon)

Just a few more that you will see and hear over and over again.

-graphy/ -graph	= recording an image	mammography (imaging the breasts)
-gram	= the image (X-ray)	Mammogram

Whenever you see these endings, -graphy, -graph, -gram, they relate to recording an image such as an X-ray, CT (computed tomography scan) or MRI (magnetic resonance imaging) scan or a written recording with pen and moving paper.

Mammography is the process of recording, i.e. the machine and procedure.
Mammogram is the image itself, the X-ray.

A recording of heart activity is called an electro**cardio**gram (ECG) using an electrocardiograph (machine).

A recording of brain activity is an electro**encephalo**gram and the medical procedure and machine is called electroencephalography (machine).

-ology/ -ologist	= study, specialize in	cardiologist, nephrologist (study the heart, the kidneys)
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To see a lung specialist, you would visit a pulmonologist.

To see a specialist in nerve and brain disease, make an appointment with a neurologist.

If you have a bad eye infection, you may be referred to an ophthalmologist (eye specialist) but the specialist in glasses prescription is called (optometrist).

Your rheumatism is acting up (painful), and then you want to find a physician specializing in rheumatology called Rheumatologist.

Word roots for organs

Before we start learning specific medical terms for various systems of the body, we need to know word roots that identify major organs in the body.

Stomato	= mouth	Stomatitis
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Dento	= teeth	Dentist
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Glosso/linguo	= tongue	glossitis, lingual nerve
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Gingivo	= gums	Gingivitis
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Encephalo	= brain	Encephalitis
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Gastro	= stomach	Gastritis
Entero	= intestine	Gastroenteritis
Colo	= large intestine	colitis, megacolon
Procto	= anus/rectum	proctitis, proctologist
Hepato	= liver	hepatitis, hepatomegaly
Nephro/rene	= kidney	Nephrosis and nephritis , renal artery
Orchido	= testis	orchiditis, orchidectomy
Oophoro	= ovary	Oophorectomy
Hystero/metro	=uterus	hysterectomy, endometritis
Salpingo	= uterine tubes	Hysterosalpingogram
Dermo	= skin	Dermatitis
Masto/mammo	= breast	mammography, mastectomy
Osteo	= bones	Osteoporosis
Cardio	= heart	electrocardiogram (ECG)

Cysto	= bladder	Cystitis
Rhino	= nose	rhinitis (runny nose!)
Phlebo/veno	= veins	phlebitis, phlebotomy
Pneumo/pulmo	= lung	pneumonitis, pulmonologist
Hemo/emia	= blood	hematologist, anemia

Note that some organs have more than one word root. Example: “masto” and “mammo”. Typically, one is derived from the Greek and one from Latin.

The word ending “**-itis**” is going to be used repeatedly. It means **inflammation**, and An infected cut is an inflammation. “Pink eye” is an inflammation. But, four symptoms must be present to define inflammation: pain, redness, heat and swelling (dolor, rubor, calor and tumor in Latin!).

But, inflammation of an internal organ such as the stomach or kidney must be defined by a physician relying on **signs** and **symptoms**, and, possibly, the need for a biopsy (tissue sample) to examine under a microscope by a specialist in identifying the causes of diseased tissues, a pathologist.

Are we learning anything yet? Take the self-assessment quiz on the next page and find out. Before you do, you might want to back up and review, especially, all those organ word roots. You will see them again soon!

A **symptom** is something you observe and complain about to the physician. “Doctor, I have a fever”.

A **sign** is something the physician observes and/or can measure. “Mrs. Smith, you are running a temp of 102”.

Quiz one

1. **If I haven't been brushing my teeth often enough, I may end up with bleeding from my gums, a condition called**
 - hepatitis
 - colitis
 - gingivitis
 - stomatitis
 - proctitis
2. **A patient has had a diagnosis of colon cancer and will need surgical removal of the colon. She will end up with a permanent hole in her abdomen for drainage into a bag. The permanent opening is called a**
 - megacolon
 - colitis
 - colonoscopy
 - colostomy
 - colectomy
3. **You have been having chronic pains in your upper abdomen, and your family physician refers you to a specialist in diseases of the digestive tract called a**
 - cardiologist
 - pulmonologist
 - neurologist
 - gastroenterologist
 - proctologist

4. You have just been diagnosed as having an enlarged liver. The doctor describes it as

- megacolon
- hepatomegaly
- macrostomia
- hepatitis
- gastroenteritis

5. You have taken your friend to the emergency room with severe lower back pain and blood in his urine. After examination and lab tests, the physician reports that your friend has an inflammation of his kidneys and makes a diagnosis of

- hepatitis
- cystitis
- proctitis
- nephritis
- orchiditis

6. Your friend who is a long distance runner is told by his physician that he has an enlarged heart, but that this can be a normal finding in well conditioned athletes. The doctor writes on his chart that your friend has

- hepatomegaly
- cardiomegaly
- megacolon
- macrostomia

- myocarditis

7. Your mother is having her uterus surgically removed along with her ovaries. Removal of ovaries is called

- hysterectomy
- orchidectomy
- appendectomy
- oophorectomy
- gastrectomy

8. A patient has become sterile due to chronic inflammation of her uterine tubes from frequent infection with sexually transmitted diseases. This tubal inflammation is called

- endometritis
- perimetritis
- salpingitis
- hepatitis
- proctitis

9. A patient with epilepsy has had a procedure performed that records brain electrical activity. This procedure is called

- electrocardiography
- electroencephalography
- electromyography
- electrogastrography
- electrophoresis

10. **A female patient has a special X-ray procedure of the breasts performed. The X-ray image is called a**

- mammoplasty
- mammoplasia
- mammography
- mastectomy
- mammogram

Odds and ends

It is advisable to cover a few more items that don't fit into any particular system.

TECHNICOLOR TERMS

Leuk/o	= white	leukemia (overabundance of white blood cells)
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melan/o	= black	melanoma (black tumor of the skin)
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cyan/o	= blue	cyanosis (blueness may be due to cold or not enough oxygen in blood)
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xanth/o	= yellow	xanthoma (yellow tumor)
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TUMOR Terminology

Adding – oma (a swelling) to organ and tissue word roots names tumors.

It is Not all tumors are malignant (cancerous). Many are benign (not life-threatening).

Aden/o	= gland	adenoma
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Lip/o	= fat	lipoma
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My/o	= muscle	myoma
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Lymph/o	= lymph tissue	lymphoma
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Carcin/o	= malignant	carcinoma
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Osteo/o	= bone	osteoma
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DIRECTIONS Terms:

Endo	= within, inside of	endoscopy (to inspect the inside of an organ or space with a li instrument)
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Peri	= around	perianal (around the anus)
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Circum	= around	circumcise (cut around)
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Retro	= behind	retrosternal (behind the breastbone)
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Epi	= upon, on top	epidermis (the top or outermost layer of skin)
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Trans	= through	transurethral (through the urinary exit duct)
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Intra	= within	intravenous (inside the veins, e.g. IV fluids)
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Sub	= below	subclavian (below the clavicle = collar bone)
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In review, the word parts that make up medical terminology are prefixes, suffixes and word roots. The most typical sequence is prefix, word root, suffix with the word root being central but this is not always the case. In the interests of simplification, putting a hyphen in front of a suffix to indicate it is added to the end of a word, example, -itis. Prefixes and word roots which shown as freestanding word parts.

Sometimes it is added a slash and a vowel, example, melan/o. These are called combining forms which make it easier to attach to other word parts, and, hopefully, making them easier to pronounce. Just so you know!

SIGNS AND SYMPTOMS – (EVER WONDER WHAT’S THE DIFFERENCE?)

As it mentioned earlier, symptom is something you observe and complain about to the physician (doctor) such as fever, etching, chest pain, etc....

A sign is something the physician observes (noticeable) and/or can measure like temp above or under 37 C, running nose, bleeding from the nose, blood pressure.

Circulatory system

CIRCULATORY SYSTEM TERMS

Cardi/o	= heart	Endocarditis, myocarditis, pericarditis (inflammation of the lining of the muscle layer, the outer layer of the heart)
Brady/tachy	= slow/fast	Bradycardia (rate<60) tachycardia (rate>100)
Angi/o	= vessel	Angiography, angiogram (X-ray of artery)
Veno/phlebo	= vein	Venogram (X-ray of veins), phlebitis (inflammation of veins)
-stasis	= to stop	Hemostasis (to stop bleeding), hemostat (a clamp-like instrument)
-cyte	= cell	Erythrocytes, leukocytes (red, white blood cells)
Hem/o, -emia	= blood	Hypoxemia (low oxygen), hematosalpinx (blood in the uterine tubes)

Directional Terms:

DIRECTIONAL TERMS

- Explain and locate precisely where the body structure and it's relation to another.

TERM	DEFINITION
Superior (cranial)	Toward head end, above
Inferior (caudal)	Away head end, below
Anterior (ventral)	Front of the body
Posterior (dorsal)	Behind the body
Medial	Midline of the body, inner
Lateral	Away from midline, outer
Intermediate	Between medial and lateral
Proximal	Close to body origin
Distal	Away from body origin
Superficial (external)	Toward body surface
Deep (internal)	Away body surface



Special Terms:

Pre, Ante, Post

Pre.....means something occurs before a process (e.g. prenatal, pre-delivery, pre-surgery, etc....)

Natal:

Natal derived from the verb natus = borne

Pre (Before) + Nat (birth) + Al (Pertaining to) = Prenatal (Before Birth)

Antenatal (adjective) = the period between conception (pregnancy) and birth.

Prenatal = The period during pregnancy before birth (delivery or labour).

labour (labor) = the process of delivering the baby and placenta.

This process includes 3 stages:

1. Birth delivery signs: the period lasts from the onset (beginning) of pains to full contraction of the muscles of the womb (uterus) and wall of the abdomen.
2. Widening (dilatation) of the cervix (neck of the uterus) and delivery (expulsion) of the baby.
3. Delivery of the placenta.

Placenta: is a temporary connecting cord (tube) that joins the mother and fetus, transferring oxygen and nutrients from the mother to the fetus and permitting the release of CO₂ and waste products from the fetus.

Neonate = a newborn child (infant), or one in its first 28 days

Newborn = a recently borne child (infant) or called neonate

Stillbirth: the death of a fetus at any time after the twentieth week of pregnancy.

Postnatal: the period immediately after birth.

A suitable subdivision is: **early postnatal** within 48 hours of birth; **delayed postnatal** 2 to 7 days; **late postnatal**—1 to 4 weeks.

The following are health and medical definitions of terms:

Arms: An appendage in anatomy and in clinical trials.

Bilirubin: A yellow-orange compound that is produced by the breakdown of hemoglobin from red blood cells.

Blood clot: A mass of coagulated blood. A blood clot can block a major blood vessel, causing **heart attack**.

Blood count: The calculated number of white or red blood cells (WBCs or RBCs) in a cubic millimeter

Brain: The portion of the central nervous system that is located within the skull.

Breastfeeding: Feeding a child human breast milk.

Otherwise formula feeding through prepared milk in a bottle.

Breathing: The process of respiration, during which air is inhaled into the lungs.

Cell: The basic structural and functional unit of any living organism.

Consultant: An individual to whom one refers for expert advice or services.

CPR: Cardiopulmonary resuscitation.

Fever: Although a fever technically is any body temperature above the normal of 98.6 F (37 C)

Heart: The muscle that pumps blood received from veins into arteries throughout the body.

Hemolysis: The destruction of red blood cells which leads to the release of hemoglobin from the blood

Infant: A young baby, from birth to 12 months of age.

Jaundice: Yellow staining of the skin and sclerae (the whites of the eyes) by abnormally high blood levels of the bile pigment bilirubin.

Lactation: The process of milk production. Human milk is secreted by the mammary glands

Kidney: One of a pair of organs located in the right and left side of the abdomen and each a size of a closed fist. The kidneys remove waste products from the blood and produce urine.

The right kidney sits slightly higher than the left one because of the position of the liver. The kidneys are about 4 1/2 inches long and 2 1/2 inches wide.

Function: As blood flows through the kidneys, the kidneys filter waste products, chemicals, and unneeded water from the blood. Urine collects in the middle of each kidney, in an area called the **Renal Pelvis**: is the area (basin) at the center of the kidney. Urine collects in the renal pelvis and is funneled into the ureter.

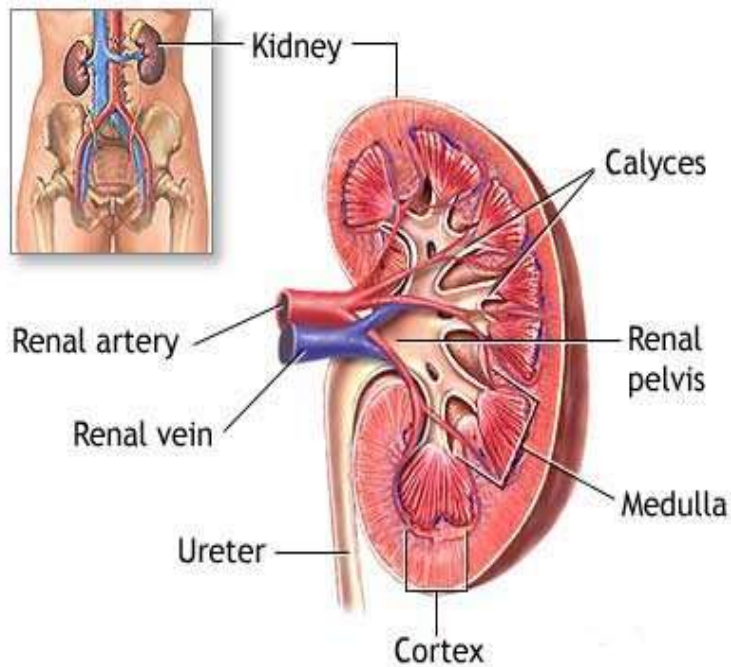
It then drains from the kidney through a long tube, the ureter, to the bladder, where it is stored until elimination. The kidneys also make substances that help control blood pressure and regulate the formation of red blood cells.

The **nephron** is the tiny filtering basic structure in your kidneys. Its chief function is to regulate the [concentration](#) of [water](#) and soluble substances like [sodium salts](#) by filtering the [blood](#). Each of your kidneys contains more than a million tiny filtering nephrons that help clean your blood.

The main parts of the kidney are:

1. Renal Capsule – outer membrane that surrounds the kidney; it is thin but tough and fibrous
2. Renal Internal Structures:
 - a. Medulla (collecting chamber),
 - b. Renal pelvis (Basin to the urter inner region which receives urine through the major calyces from medulla).
 - c. Urter: collects filtrate and urine from renal pelvis and takes it to the bladder for urination
3. Renal Blood Vessels:
 - a. Renal Artery – branches off of the aorta bringing waste-filled blood about 20% into the kidney for filtering in the nephrons;

- b. Renal Vein – removes the filtered blood from the kidneys blood leaves the nephron to join the renal vein when filtration is complete



Liver: The largest solid organ in the body, situated in the upper part of the abdomen on the right side.

Neonatal: Pertaining to the newborn period, specifically the first 4 weeks after birth.

Neonatal jaundice: Yellowish staining of the skin and whites of the newborn's eyes

Otorhinolaryngology: The science studying the ear (oto), nose (rhino) and throat (laryng).

Otorhinolaryngologist: is the physician trained in the medical and surgical management and treatment of patients with diseases and disorders of the ear, nose, throat (ENT), and related structures of the head and neck. They are commonly referred to as ENT physicians.

Ophthalmologist (ahf-thal-MAH-loh-jist). Physician (MD) specializing in diagnosis and treatment of refractive, medical and surgical problems related to eye diseases and disorders.

Optic: issue related to vision.

Outpatient: A patient who is not hospitalized, but instead comes to a physician's office.

Phototherapy: Treatment with light. For example, a newborn with jaundice may be put under sun or room light.

Physiologic: Something that is normal, that is due neither to anything pathologic nor sign of infectious agent.

Polycythemia: Too many red blood cells. The opposite of anemia. polycythemia formally exis...

Prognosis: The forecast (expectation) of the probable outcome or course of a disease development in infected person.

Red blood cell (erthrocytes): The blood cell that carries oxygen. Red cells contain hemoglobin.

Red cells: Short for red blood cells, the oxygen/carbon dioxide carrying cells in blood.

Reticulocyte: A young red blood cell that usually remains in the bone marrow with only a f...

Reticulocyte count: The number of reticulocytes (young red blood cells) circulating in blood stream.

Sclera: The tough white outer coat over the eyeball that covers approximately the posterior of the ball

Serum: The clear liquid that can be separated from clotted blood. Serum differs from plasma.

Syndrome: A combination of symptoms and signs that together represent a disease process.

Transfusion: The transfer of blood or blood products from one person (the donor) to a patient (recipient).

Endocrine Glands:

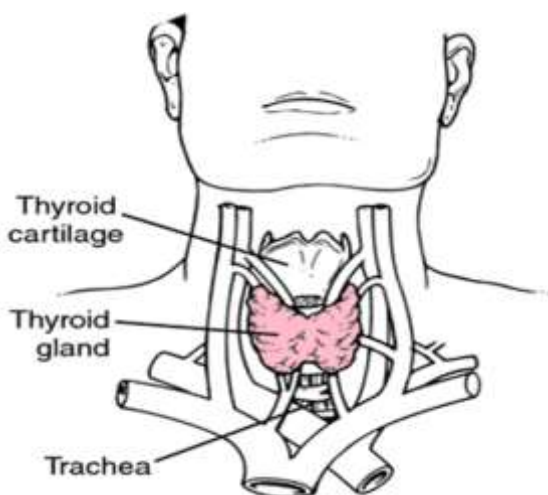
The endocrine system is the collection of glands of an organism that secrete hormones directly into the circulatory system to be carried towards distant target organs.

The major endocrine glands include the pineal gland, pituitary gland, pancreas, ovaries, testes, thyroid gland, parathyroid gland, and adrenal glands.

Thyroid: is one of the endocrine glands located in the lower part of the neck around the trachea (windpipe). It has the shape of a butterfly: two wings (lobes) attached to one another by a middle part called the **isthmus**.

It regulates the speed of metabolic processes by producing a hormone, thyroxine. It is also called

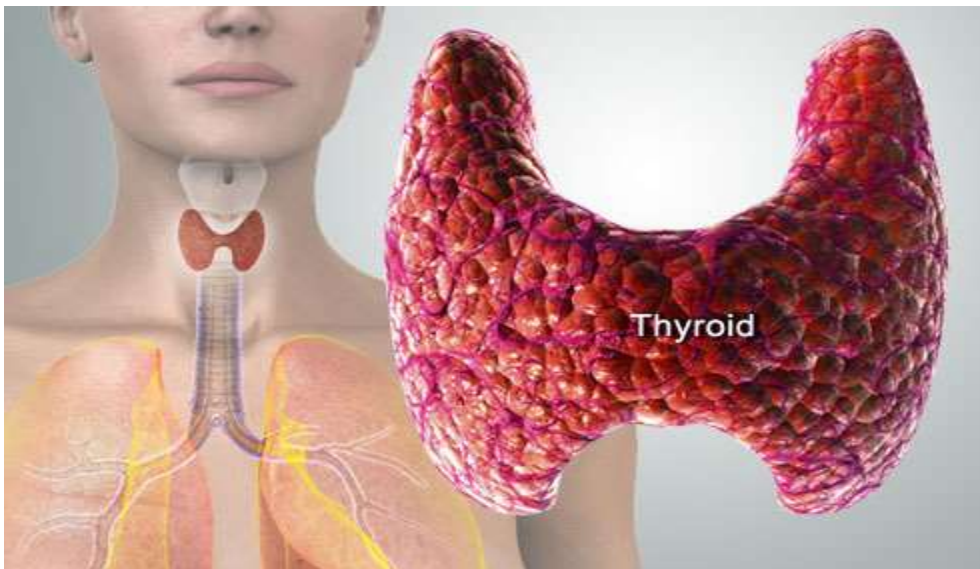
Thyroid gland: A gland that makes and stores hormones that help regulate the heart rate, blood pressure, body temperature and the rate at which food is converted into energy.



Thyroid hormones are essential for the function of every cell in the body. They help regulate growth and the rate of chemical reactions (metabolism) in the body. Thyroid hormones also help children grow and develop.

The thyroid uses iodine, a mineral found in some foods and in iodized salt, to make its hormones. The two most important thyroid hormones are thyroxine (T4) and triiodothyronine (T3). Thyroid stimulating hormone (TSH), which is produced by the pituitary gland, acts to stimulate hormone production by the thyroid gland.

The thyroid gland also makes the hormone calcitonin, which is involved in calcium metabolism and stimulating bone cells to add calcium to bone



Malfunction of Thyroids:

The two most common malfunctions are called:

1. Hypothyroidism: is the low activity of Thyroid causing Weight gain due to low levels of thyroid hormones. In contrast, hyperthyroidism is a condition of thyroid produces more hormones than the body needs, that may causes lose weight unexpectedly.

2. Hyperthyroidism:

Hyperthyroidism is a medical condition that results from an excess of thyroid hormone in the blood. Thyroid hormones control most metabolic processes in the body. In cases of hyperthyroidism, these processes are often sped up causing symptoms of hyperthyroidism, which will be discussed later in this slide show. Thyrotoxicosis is an extreme version of hyperthyroidism that can cause severe or life-threatening symptoms.

What Are Thyroid Hormones?

Thyroid hormones control most metabolic processes in the body. They are produced by the thyroid gland located in the anterior (front) part of the neck. These hormones affect many organs and biochemical systems in your body.

Thyroid Hormone Regulation – The Chain of Command

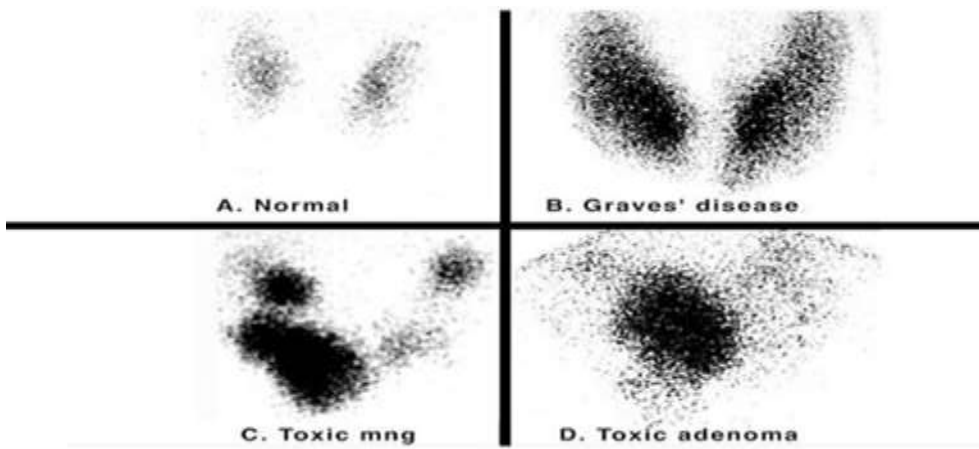
Complex biochemical processes in the body control the thyroid gland's production of thyroid hormones. Two other glands – the hypothalamus and the pituitary gland – both have a biochemical effect on the thyroid. The hypothalamus (the "master gland") releases a hormone called thyrotropin-releasing hormone (TRH), which sends a signal to the pituitary to release thyroid-stimulating hormone (TSH). In turn, TSH sends a signal to the thyroid to release thyroid hormones. A problem with any of these three glands may cause an over-production of thyroid hormone and can cause hyperthyroidism.

What Causes Hyperthyroidism?

Some common causes of hyperthyroidism that will be covered in the following slides include:

- Graves' Disease
- Functioning adenoma ("hot nodule") and Toxic Multinodular Goiter (TMNG)
- Excessive intake of thyroid hormones

- Abnormal secretion of TSH
- Thyroiditis (inflammation of the thyroid gland)
- Excessive iodine intake



Graves' Disease

The most common cause of hyperthyroidism is Graves' disease. The thyroid gland itself over-produces thyroid hormone and is no longer able to respond to the pituitary and hypothalamus. Graves' disease is five times more common in women and runs in families. Risk factors for Graves' disease include smoking, viral illnesses, radiation to the neck, and medications. The condition is associated with an eye disease called Graves' ophthalmopathy and skin lesions called dermopathy.

Diagnosis of Graves' disease is made by blood tests, and a nuclear medicine thyroid scan.



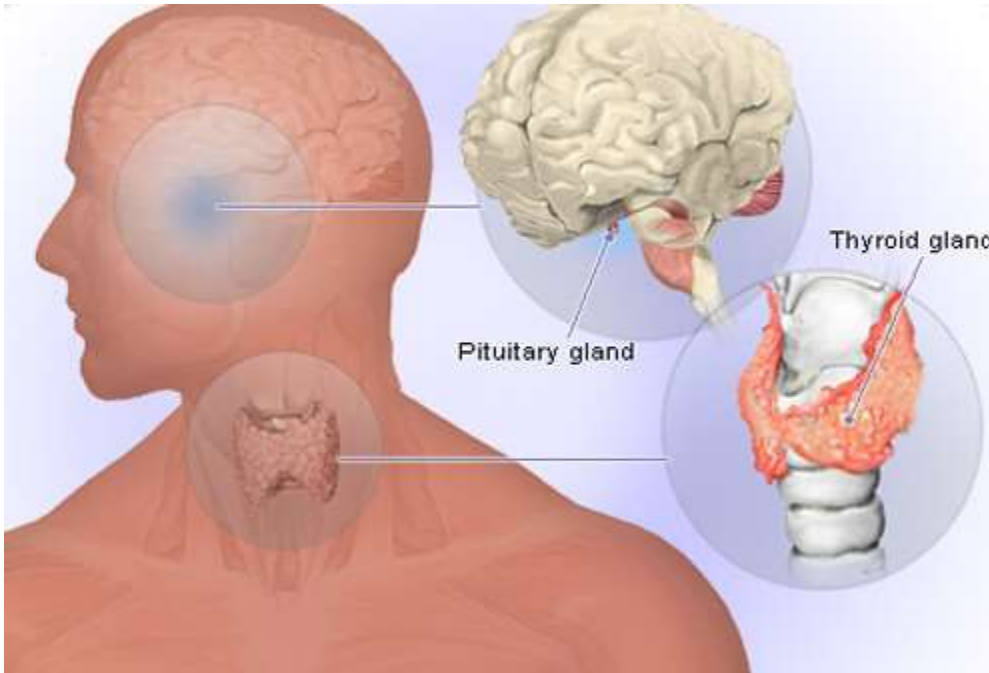
Functioning Adenoma and Toxic Multinodular Goiter

When the thyroid gland tissue overgrows, either in individual nodules (the functioning adenoma) or in multiple clusters (multinodular goiter), it is generally termed a "goiter." Goiters appear as large, swollen areas in the front of the neck near the Adam's apple. These goiters may over-produce thyroid hormone, causing symptoms of hyperthyroidism.



Excessive Intake of Thyroid Hormones

Hyperthyroidism may be caused by the intake of too much thyroid medication. Supplemental thyroid medication is given to patients who have low thyroid hormone, or hypothyroidism. If the dose is not correct or the patient takes too much of the medication, hypothyroidism may occur. Some people may abuse thyroid hormone medications in an attempt to lose weight. Taking thyroid hormones the body does not need may result in hyperthyroidism.



Abnormal Secretion of TSH

Thyroid-stimulating hormone (TSH) is secreted by the pituitary gland and causes the thyroid gland to produce thyroid hormone. A tumor or problem with the pituitary gland can cause an excess of TSH to affect the thyroid, and can result in hyperthyroidism.

Hyperthyroidism Symptoms and Treatment



Thyroiditis (Inflammation of the Thyroid)

Thyroiditis is inflammation of the thyroid. It is usually caused by a viral illness. The patient may have generalized neck pain, sore throat, fever, chills, and a tender thyroid. The inflammation of the thyroid causes an increased amount of thyroid hormone to be secreted into the body, causing hyperthyroidism. After pregnancy, some women – up to 8% - may develop a condition called lymphocytic thyroiditis where white blood cells called lymphocytes accumulate in the glandular tissue. Thyroiditis can be diagnosed with blood tests and a thyroid scan.

Hyperthyroidism Symptoms and Treatment

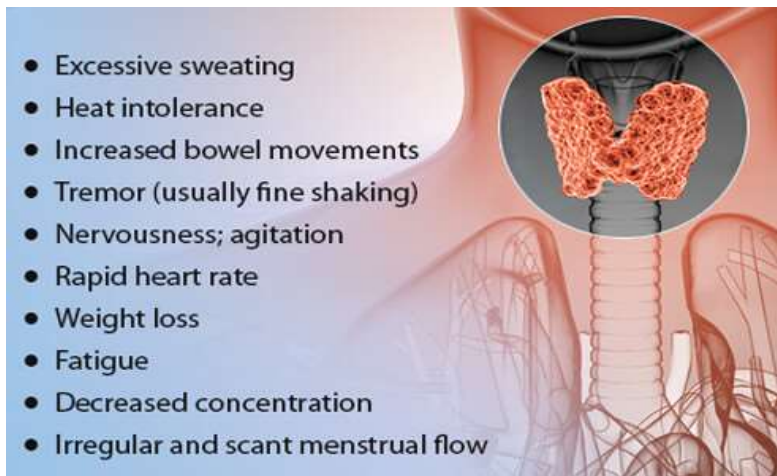


Excessive Iodine Intake

An important component of thyroid hormone is iodine. If an excess of iodine is ingested the thyroid may over-produce thyroid hormone and cause hyperthyroidism. Some medications such as such as the anti-arrhythmic drug

amiodarone (Cordarone) contain large amounts of iodine and can induce thyroid dysfunction.

Hyperthyroidism Symptoms and Treatment



What Are the Symptoms of Hyperthyroidism?

When hyperthyroidism is mild, patients may not experience any symptoms. This may also occur in patients age 70 years and older.

Early symptoms may include:

- Tremors
- Excessive sweating
- Smooth velvety skin
- Fine hair
- Rapid heart rate
- Enlarged thyroid gland
- Puffiness around the eyes
- A characteristic 'stare' due to the elevation of the upper eyelids

As the disease progresses, symptoms of hyperthyroidism are all related to an increased metabolic rate and may include:

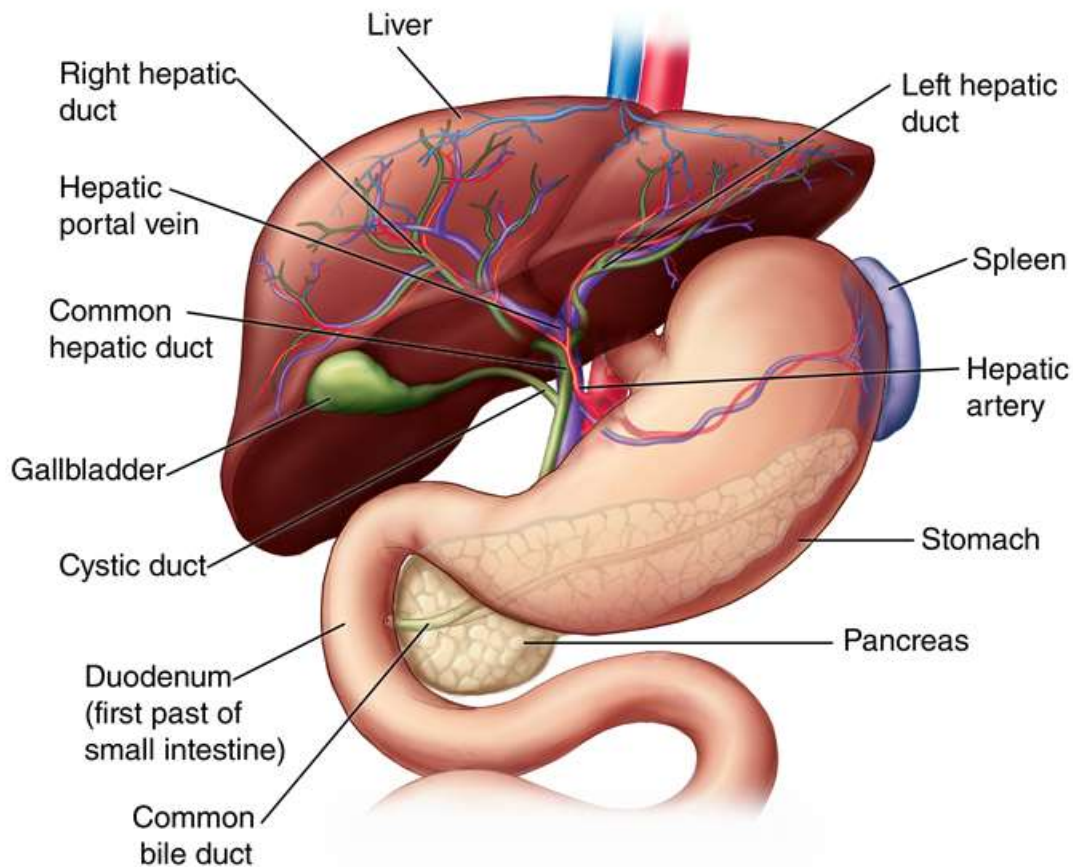
- Irregular heart rhythms and heart failure
- "Thyroid storm" - high blood pressure, fever, and heart failure
- Mental changes, such as confusion and delirium



How Is Hyperthyroidism Diagnosed?

If hyperthyroidism is suspected, diagnosis is made through a blood test to measure TSH levels in the blood. To further delineate what the specific cause of the hyperthyroidism would be, tests such as antibody screenings, nuclear thyroid scans, and the use of radioactively labeled iodine can help pinpoint the cause. Testing of the hypothalamus and pituitary may also be necessary.

Liver: is an accessory organ of the gastrointestinal tract. It is a **peritoneal** organ, positioned in the **right upper quadrant** of the abdomen, and is the largest visceral structure in the abdominal cavity.



Functions: The liver performs a wide range of functions, including synthesis of bile, glycogen storage and clotting factor production.

Structural Anatomy of liver:

The structure of the liver can be considered both macroscopically and microscopically.

Macroscopic

The entire liver is covered by a fibrous layer, known as **Glisson's capsule**. The ligaments and surface depressions of the liver divide it into four lobes.

- Right lobe and

- Left lobe by the attachment of the **falciform ligament** (a fold of peritoneum that attaches the liver to the anterior abdominal wall).
- There are two further 'accessory' lobes that arise from the right lobe, and are located on the visceral surface of liver:
 - The **caudate lobe** is located on the upper aspect of the visceral surface. It lies between the inferior vena cava and a fossa produced by the ligamentum venosum (a remnant of the fetal ductus venosus).
 - The **quadrate lobe** is located on the lower aspect of the visceral surface. It lies between the gallbladder and a fossa produced by the ligamentum teres (a remnant of the fetal umbilical vein).

Between the caudate and quadrate lobes is a deep fissure, known as the **porta hepatis**. It transmits all the vessels, nerves and ducts entering or leaving the liver.

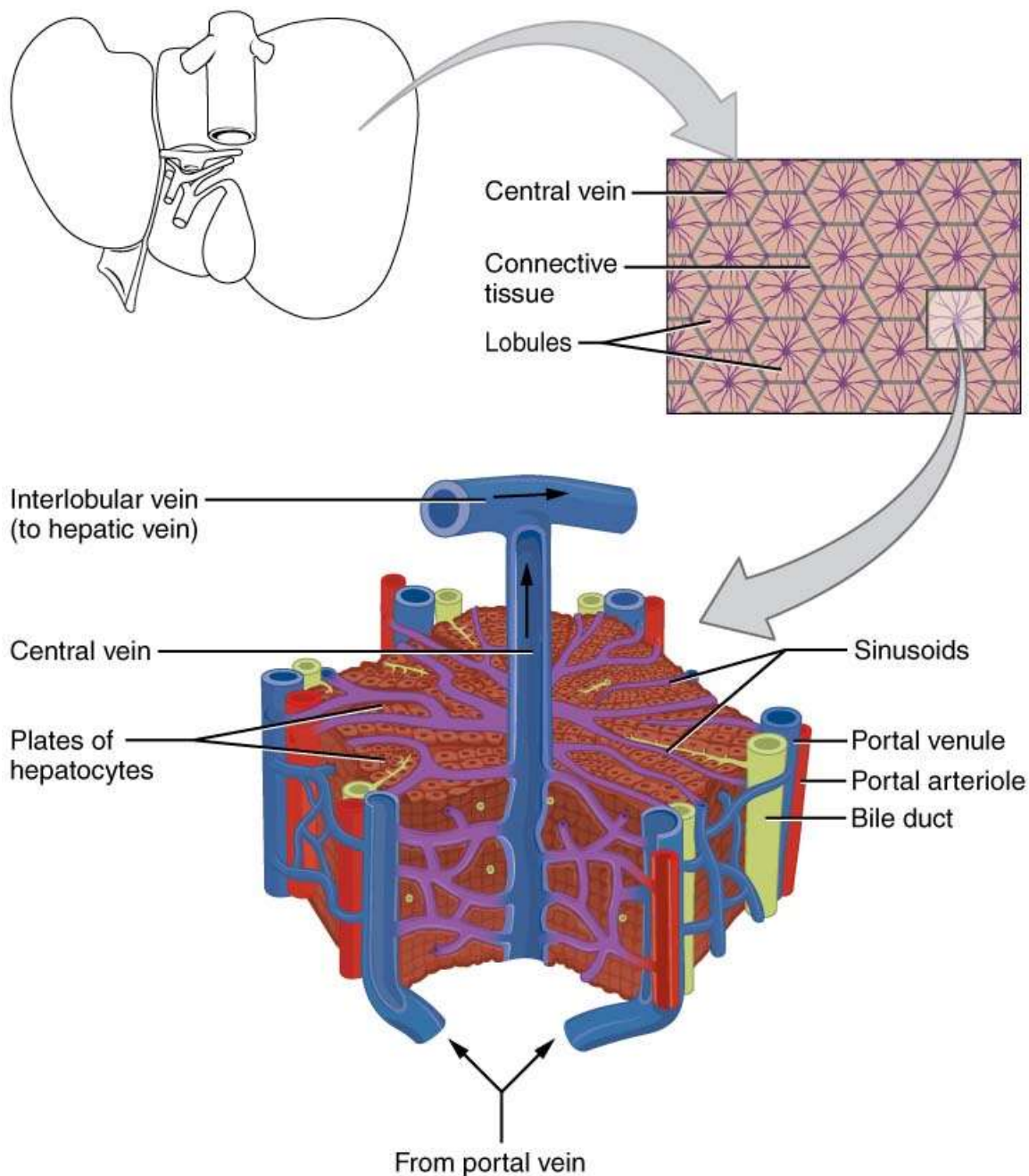
Microscopic

Under the microscope, the cells of the liver (known as hepatocytes) are arranged into **lobules**. These are the structural units of the liver.

Each lobule is hexagonal-shaped, and is drained by a venule in its center, called a **central vein**. At the periphery of the hexagon are three structures collectively known as the portal triad:

- **Arteriole** – a branch of the hepatic artery entering the liver.
- **Venule** – a branch of the hepatic portal vein entering the liver.
- **Duct** – branch of the bile duct leaving the liver.

The portal triad also contains **lymphatic vessels** and **vagus nerve** (parasympathetic) fibres.



Clinical Relevance: Percutaneous Liver Biopsy

A percutaneous liver biopsy is a procedure used to obtain a sample of liver tissue. A needle is inserted through the skin to access the liver.

The biopsy is required in several clinical scenarios:

- Abnormal LFTs of unknown cause.
- Hepatitis C – Assessment for severity of liver fibrosis and disease progression.

- Other liver conditions (such as Hereditary Haemochromatosis and Autoimmune Hepatitis).
- Following liver transplantation.

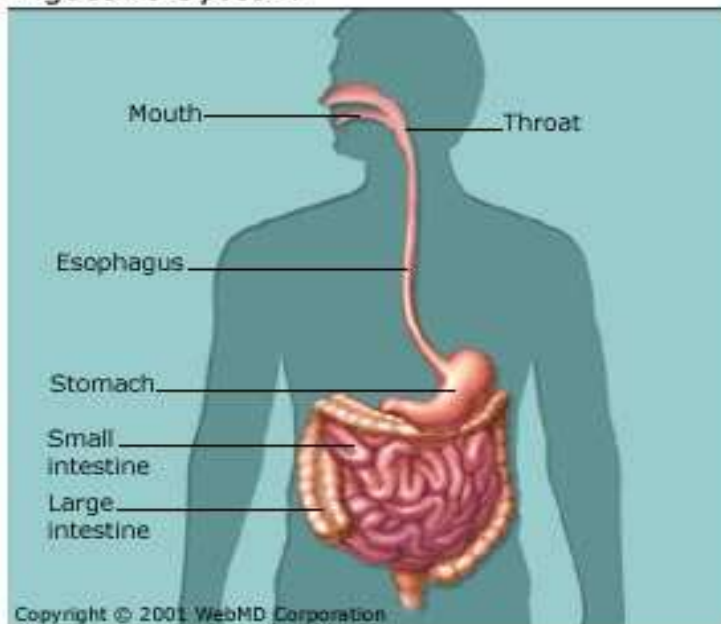
During the procedure, the liver is located via ultrasound. Local anaesthetic is injected on the **mid-axillary line**, where on percussion there is dullness. The patient is asked to deeply expire (avoiding damage to the lungs), and the needle biopsy is taken during held expiration.

If a patient has abnormal clotting (a contraindication for the procedure), a **transvenous liver biopsy** can be attempted. This involves cannulating the internal jugular vein, and passing the biopsy needle through to the hepatic veins, allowing for a biopsy sample to be taken.

Digestive System:

is the system designed to turn the food you eat into nutrients which the body uses for energy, growth and cell repair. Here's how it works.

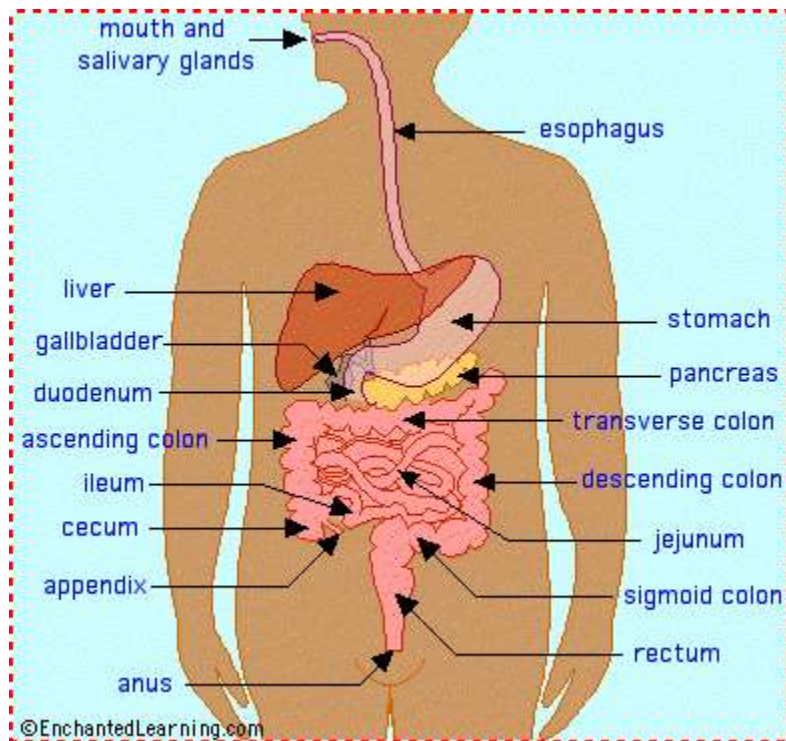
Digestive System



The major parts of the DS

Mouth

The [mouth](#) is the beginning of the digestive tract. In fact, digestion starts here as soon as you take the first bite of a meal. Chewing breaks the food into pieces that are more easily digested, while [saliva](#) mixes with food to begin the process of breaking it down into a form your body can absorb and use.



Throat

Also called the pharynx, the throat is the next destination for food you've eaten. From here, food travels to the [esophagus](#) or swallowing tube.

Esophagus

The esophagus is a muscular tube extending from the pharynx to the [stomach](#). By means of a series of [contractions](#), called peristalsis, the esophagus delivers food to the [stomach](#). Just before the connection to the stomach there is a "zone of high pressure," called the lower esophageal sphincter; this is a "valve" meant to keep food from passing backwards into the esophagus.

Stomach

The stomach is a sac-like organ with strong muscular walls. In addition to holding the food, it's also a mixer and grinder. The stomach secretes acid and powerful enzymes that continue the process of breaking down the food. When it leaves the stomach, food is the consistency of a liquid or paste. From there the food moves to the small intestine.

Small Intestine

Made up of three segments, the duodenum, jejunum, and ileum, the small intestine is a long tube loosely coiled in the [abdomen](#) (spread out, it would be more than 20 feet long). The small intestine continues the process of breaking down food by using enzymes released by the [pancreas](#) and bile from the [liver](#). Bile is a compound that aids in the digestion of fat and eliminates waste products from the [blood](#). Peristalsis (contractions) is also at work in this organ, moving food through and mixing it up with digestive secretions. The duodenum is largely responsible for continuing the process of breaking down food, with the jejunum and ileum being mainly responsible for the absorption of nutrients into the bloodstream.

Three organs play a pivotal role in helping the stomach and small intestine digest food:

[Pancreas](#)

Among other functions, the oblong pancreas secretes enzymes into the small intestine. These enzymes break down protein, fat, and carbohydrates from the food we eat.

[Liver](#)

The [liver](#) has many functions, but two of its main functions within the [digestive system](#) are to make and secrete bile, and to cleanse and purify the [blood](#) coming from the small intestine containing the nutrients just absorbed.

Gallbladder

The gallbladder is a pear-shaped reservoir that sits just under the liver and stores bile. Bile is made in the liver then if it needs to be stored travels to the gallbladder through a channel called the cystic duct. During a meal, the gallbladder contracts, sending bile to the small intestine.

Once the nutrients have been absorbed and the leftover liquid has passed through the small intestine, what is left of the food you ate is handed over to the large intestine, or [colon](#).

Colon (Large Intestine)

The colon is a 5- to 6-foot-long muscular tube that connects the cecum (the first part of the large intestine to the rectum (the last part of the large intestine). It is made up of the cecum, the ascending (right) colon, the transverse (across) colon, the descending (left) colon, and the sigmoid colon (so-called for its "S" shape; the Greek letter for S is called the sigma), which connects to the rectum.

Stool, or waste left over from the digestive process, is passed through the colon by means of peristalsis (contractions), first in a liquid state and ultimately in solid form as the water is removed from the stool. A stool is stored in the sigmoid colon until a "mass movement" empties it into the rectum once or twice a day. It normally takes about 36 hours for stool to get through the colon. The stool itself is mostly food debris and bacteria. These bacteria perform several useful functions, such as synthesizing various [vitamins](#), processing waste products and food particles, and protecting against harmful bacteria. When the descending colon becomes full of stool, or feces, it empties its contents into the rectum to begin the process of elimination.

Rectum

The rectum (Latin for "straight") is an 8-inch chamber that connects the colon to the [anus](#). It is the rectum's job to receive stool from the colon, to let you know

there is stool to be evacuated, and to hold the stool until evacuation happens. When anything (gas or stool) comes into the rectum, sensors send a message to the [brain](#). The [brain](#) then decides if the rectal contents can be released or not. If they can, the sphincters (muscles) relax and the rectum contracts, expelling its contents. If the contents cannot be expelled, the sphincters contract and the rectum accommodates, so that the sensation temporarily goes away.

Anus

The anus is the last part of the digestive tract. It consists of the pelvic floor muscles and the two anal sphincters (internal and external muscles). The lining of the upper anus is specialized to detect rectal contents. It lets us know whether the contents are liquid, gas, or solid. The pelvic floor muscle creates an angle between the rectum and the anus that stops stool from coming out when it is not supposed to. The anal sphincters provide fine control of stool. The internal sphincter keeps us from going to the bathroom when we are asleep, or otherwise unaware of the presence of stool. When we get an urge to go to the bathroom, we rely on our external sphincter to keep the stool in until we can get to the toilet.

Stomach Acidity:

A typical adult human stomach will secrete about 1.5 liters of gastric acid daily.

There are three phases in the secretion of gastric acid which increase the secretion rate in order to digest a meal:^[3]

1. The cephalic phase: Thirty percent of the total gastric acid secretions to be produced is stimulated by anticipation of eating and the smell or taste of food. This signalling occurs from higher centres in the brain through the [vagus nerve \(Cranial Nerve X\)](#). It activates [parietal cells](#) to release acid and [ECL cells](#) to release [histamine](#). The vagus nerve (CN X) also releases [gastrin releasing peptide](#) onto [G cells](#). Finally, it also inhibits [somatostatin](#) release from [D cells](#).^[6]

2. The gastric phase: About fifty percent of the total acid for a meal is secreted in this phase. Acid secretion is stimulated by distension of the stomach and by [amino acids](#) present in the food.
3. The intestinal phase: The remaining 10% of acid is secreted when [chyme](#) enters the small intestine, and is stimulated by small intestine distension and by [amino acids](#). The duodenal cells release [entero-oxyntin](#) which acts on parietal cells without affecting gastrin