Life Science
Internal Balance
Chapter 25

homeostasis - internal balance an organism must maintain
literal meaning "staying the same"

CIRCULATORY SYSTEM

The Heart and Blood Vessels

The human heart pumps an average of 8,000 gallons of blood through 12,000 miles of blood vessels every 24 hours.

cardio - refers to the heart
vascular - refers to blood vessels

Cardiovascular disease is the leading cause of death in the U.S.
Heart disease alone accounts for over 1/3 of all deaths in the U.S. Each year more than 700,000 people die of heart attacks (myocardial infarction) in the U.S. (Almost 2,000 Americans die of heart disease each day. That is one death every 44 seconds.)
Cardiovascular difficulties are often related to (1) diet, (2) exercise, and (3) Stress (major cause).

The Structure of Blood Vessels

Closed Circulatory System - the blood remains in vessels

Three types of blood vessels:
ARTERIES - which carry blood away from the heart; thick muscle layers permit the arteries to constrict, controlling blood pressure
VEINS - carry blood toward the heart; have little to do with blood pressure; thinner and less muscular walls; they have 1-way valves (The veins of the head do not have valves.) - allow blood to go toward the heart but not away from it (venous blood flow depends on skeletal muscle contraction, breathing movements, and constriction of the veins)
CAPILLARIES - tiny vessels connecting arteries and the veins; velocity is slowest here - red blood cells go through single file ; approximately 60,000 miles of capillaries

The Structure of the Heart

heart size - about the size of your fist; approximately 5 inches long, 3.5 inches wide, and 2.5 inches thick
heart weight:
man's heart weighs about 11 ounces
woman's heart weighs about 9 ounces
function: to pump blood
pacemaker: section of tissue inside heart that causes it to beat automatically at your normal resting rate
heart rate - the heart beats at an average rate of 72 times per minute

Parts of the Heart

PERICARDIUM - thin sac completely enclosing the heart; made of tough tissue; protects heart from rubbing against the lungs and the wall of the chest; has a smooth lining that secretes a slippery liquid

SEPTUM - muscular wall dividing the heart lengthwise

CHAMBERS (four of them - two on each side); also called cavities
(1) upper chamber - ATRIUM (Auricle)
collects the blood flowing into the heart
(2) lower chamber - VENTRICLE

pumps the blood into the arteries
right ventricle pumps only to lungs
left ventricle pumps to the entire body (wall 3 times as thick as the right side)

VALVES - controls the flow of blood through the heart (4 of them)
(1) two are ATRIOVENTRICULAR VALVES (AV valves)
between an atrium and a ventricle (controls the flow of blood from an atrium to a ventricle)
TRICUSPID - between the right atrium and right ventricle
MITRAL (bicuspid) - between the left atrium and left ventricle
(2) two are SEMILUNAR VALVES
control the flow of blood from ventricle to arteries (allows the blood to leave a ventricle, but prevents it from returning)
PULMONARY - between the right ventricle and the pulmonary vein
AORTIC - between the left ventricle and the aorta
CORONARY ARTERIES - carry oxygen to heart muscle (nourishes the heart)

Blood from the body flows into right atrium through two large veins; largest veins in the human body:

SUPERIOR VENA CAVA - returns blood from the upper body regions
INFERIOR VENA CAVA - returns blood from the lower body regions
----------**Quiz 25A**

The Path of Blood

SUPERIOR VENA CAVA
INFERIOR VENA CAVA
RIGHT ATRIUM
TRICUSPID VALVE (three little triangular flaps of thin, strong fibrous tissue; AV valve)
RIGHT VENTRICLE
PULMONARY VALVE (semilunar)
PULMONARY ARTERY (deoxygenated blood – low in oxygen content and high in carbon dioxide content)
LUNGS
PULMONARY VEINS (oxygenated blood)
LEFT ATRIUM
MITRAL VALVE (similar to tricuspid - only two flaps of tissue; also called bicuspid; AV valve)
LEFT VENTRICLE
AORTIC VALVE (semilunar valve)
AORTA
BODY

Scientists estimate that one drop of blood may circulate through the body at a rate of once every 23 seconds. Blood that flows through the walls of the intestines or through bones take longer to circulate.

Stethoscope: instrument used to listen to your heart
----------**Path of Blood Quiz (with heart diagram page 434)**

Some Disorders & Diseases of the Circulatory System

ANEMIA: a condition in which there is a decrease in hemoglobin or in the number of erythrocytes
ANEURYSM: a permanent stretching of an artery or heart chamber; caused by the pressure of blood on muscular walls weakened by disease or injury
ARRHYTHMIA: an irregularity of the heartbeat
BRUISE: results from broken blood capillaries in the skin and underlying tissue. The diffusion and breaking down of blood causes the "black and blue" marks.
HEMORRHAGE: a break in a blood vessel resulting in loss of blood it may be due to physical injury or disease

LEUKEMIA: a disease characterized by an increase in the number of leukocytes. It is usually fatal but in some cases has been brought under control.
STROKE: a sudden loss of consciousness caused by a hemorrhage or a blood clot in arteries in or around the brain
VARICOSE VEINS: veins that are distended, swollen, and knotted. They are more common in people who stand for long period of time.

The Blood

The life of an individual depends on a continuous supply of blood to all parts of the body. If this supply should fail the cell dies.
Blood carries food, oxygen, hormones, waste products, and enzymes.

Functions of blood:
- Supply cells with food and oxygen
- Remove waste products
- Fight disease germs

Blood is a liquid tissue.
Adults have 3-5 quarts of blood.
80 pound child has approximately 2.5 quarts
9 pound infant has approximately 10 ounces
high altitudes - has less oxygen - may have up to 2 quarts more blood

blood has 4 main parts:
- plasma
- erythrocytes
- leukocytes
- platelets

ERYTHROCYTES - red blood cells

appear as red, biconcave discs
don't have nuclei
most numerous of all blood cells
can't move by themselves
carry oxygen from lungs to body cells
carry carbon dioxide from body cells to lungs
hemoglobin: iron-containing pigment; gives it its red color
Can carry 4 oxygen molecules (how much oxygen is attached to the hemoglobin determines whether the blood is oxygenated or deoxygentated)
formed primarily by your spleen, liver, and red bone marrow
life span approximately 90-120 days
normal person contain 25 trillion erythrocytes - enough to go around the earth at the equator 4 times
old red blood cells are removed from the blood at a rate of 2 million per second
destroyed mainly in your liver and spleen

LEUKOCYTES - white blood cells

lack hemoglobin
about twice the size of erythrocytes
possess no definite shape
ability to move by themselves
have nuclei
in a healthy person - ratio of leukocytes to erythrocytes is approximately 1:600
some are made in bone marrow and others in spleen, tonsils, and thymus gland

life span is approximately 1 to 12 days
the body needs leukocytes to defend itself from bacteria, viruses, and other harmful substances
there are different types of leukocytes, but all have 1 of 2

functions:
(1) destroying bacteria and other foreign matter (engulf and digest them)
(2) produce antibodies (chemicals that attack invading organisms or poisons)

An infection is the invasion of harmful organisms into the body. When the first leukocytes are not successful in stopping the infection, the invading organisms are free to multiply and injure body cells, which results in a swelling and redness called an inflammation in the infected part of the body. Chemicals that are released from the injured cells cause additional leukocytes to move out of blood vessels in order to engulf and digest, or to kill, the harmful invaders. The leukocytes also digest and remove injured and dead body cells. The accumulation of dead leukocytes, dead organisms, and broken cells forms a thick fluid called pus, which is characteristic of infections.

PLATELETS - very small cell fragments that help in blood clotting

develop from large cells in the red bone marrow
lacks a nucleus
about 1/3 the size of an erythrocyte
life span is approximately 1 week

BLOOD PLASMA - fluid portion of blood
approximately 90% water
remaining 10% is:
(1) substances that are transported by the blood (dissolved foods, wastes, minerals, hormones, and various other substances that cells need or produce)
(2) substances that regulate the blood (proteins and other substances that keep the blood chemicals balanced)
----------Quiz 25B

BLOOD PRESSURE

As your heart beats and the left ventricle forces blood into the aorta, the elastic walls of the arteries expand.
This wave of expansion moves down the aorta and along smaller arteries.
As the wave passes, the elastic walls of the arteries resume their normal size.
This dilation and rebounding of an artery is the **PULSE**.
There is no pulse in a vein because the force of the heart contraction has been absorbed by the blood flowing into the numerous capillaries.
The velocity of blood flow is not uniform throughout the body.
blood pressure: the pressure of blood against the walls of arteries it is the same pressure that causes the pulse
blood pressure can be measured with a **SPHYGMOMANOMETER**.
systolic pressure: blood pressure when the heart is contracting
diastolic pressure: blood pressure while the heart is relaxing
normal blood pressure: 120 (systolicd)
80 (diastolic)
high blood pressure: systolic over 150
diastolic over 90
If the systolic pressure rises to 200 mm Hg or above, there is real danger that an artery may rupture.

Blood Grouping (Blood Types)

Determined by the presence or absence of certain molecules in the membranes of the erythrocytes.
These molecules, called antigens, stimulate the production of antibodies.
Specialized blood cells produce these antibodies, which are located in the blood plasma.
Important in blood transfusion (the giving of blood):
donor - person who gives blood
recipient - person who receives blood
The two blood type classifications:
(that are most important in blood transfusion)
(1) ABO group
(2) Rh system

ABO blood group

discovered in 1901 by Karl Landsteiner
determined by the presence or absence of two antigens A and B
blood types:
A - has antigen A
B - has antigen B
AB - has both antigens A and B
O - has neither antigen

Blood type	Antigen (in red blood cell membrane)	Antibody (in blood plasma)
A	A	anti-B
B	B	anti-A
AB	A & B	none
O	none	anti-A and anti-B

most common - type O
rare - type AB

Blood Transfusion

Recipients' blood type	preferred type for transfusion	other types used in emergencies
A	A	O
B	B	O
AB	AB	A, B, or O
O	O	none

universal recipient: type AB
universal donor: type O

The first recorded blood transfusion was in England in 1666 (from one dog to another).
First recorded human-to-human blood transfusion was in 1818: by London physician, James Blundell.

The Rh System
Named after the rhesus monkey from which the Rh antigen was first isolated.
It too is based on the presence or absence of an antigen in the red blood cell's membrane.
Rh types:
Rh+ (have the Rh antigen; 85% of population)
Rh- (does not have the Rh antigen; 15% of population)

----------**Quiz 25C**

The Immune System

Barriers that keep pathogens out:

- Skin
- Breathing passages
- Mouth and stomach

The inflammatory response:
- White blood cells
- Inflammation
- Fever

The immune system:
- T Cells
- B Cells

Pathogen: Organism that causes a disease

The term *pathogen* is derived from the Greek "that which produces suffering."

Kinds of pathogens:

Bacteria
- strep throat
- tetanus

Viruses
- colds
- flu
- AIDS

Fungi
- ringworm
- athlete's foot
- Protists: malaria, African sleeping sickness

Lines of Defense
•Your body has many ways to defend itself.
•Its first-line defenses work against harmful substances and all types of disease-causing organisms, called pathogens.
•Your second –line defenses are specific and work against specific pathogens.
•This complex group of defenses is called your immune system.

First-Line Defenses
•Your skin and respiratory, digestive, and circulatory systems are first-line defenses against pathogens.
•The skin is a barrier that prevents many pathogens from entering your body.
•Although most pathogens can't get through unbroken skin, they can get into your body easily through a cut or through your mouth and the membranes in your nose and eyes.
•The conditions on the skin can affect pathogens.
•Perspiration contains substances that can slow the growth of some pathogens.
•At times, secretions from the skin's oil glands and perspiration are acidic.
•Some pathogens cannot grow in this acidic environment.

Internal First-Line Defenses
•Your respiratory system traps pathogens with hairlike structures, called cilia, and mucus.
•Mucus contains an enzyme that weakens the cell walls of some pathogens.
•When you cough or sneeze, you get rid of some of these trapped pathogens.
•Your digestive system has several defenses against pathogens—saliva, enzymes, hydrochloric acid, and mucus
•Saliva in your mouth contains substances that kill bacteria.
•Enzymes in your stomach, pancreas, and liver help destroy pathogens.
•Hydrochloric acid in your stomach kills some bacteria and stops the activity of some viruses that enter your body on food.
•The mucus found on the walls of your digestive tract contains a chemical that coats bacteria and prevents them from binding to the inner lining of your digestive organs.

The Inflammatory Response
•When body cells are damaged, they release chemicals that trigger the inflammatory response.

•All leukocytes are disease fighters.
• There are different types. The type involved in the inflammatory response are the phagocytes.
•A phagocyte (**macrophage)** is a white blood cell that engulfs pathogens and destroys them by breaking them down.
•If the white blood cells cannot destroy the bacteria fast enough, you might develop a fever.

During the inflammatory response, blood vessels widen in the area affected by the pathogens. This enlargement increases blood flow to the area. As a result, more disease-fighting leukocytes are delivered to the area. The enlarged blood vessels, and the fluid that leaks out of them, make the affected area red and swollen. If you touch the swollen area, it will feel slightly warmer than normal.

•Many pathogens are sensitive to temperature
•A slight increase in body temperature slows their growth and activity but speeds up your body's defenses.

If a pathogen infection is severe enough to cause a fever, it triggers the body's third line of defense – the immune response.
The white blood cells used by the immune system are called lymphocytes.

Two Major Kinds of Lymphocytes:
T Cells
B Cells

Specific Immunity
•Molecules that are foreign to your body are called antigens.
•Antigens can be separate molecules or they can be found on the surface of a pathogen.
•When your immune system recognizes molecules as being foreign to your body, special lymphocytes called T cells respond.
•The primary job of T cells is to recognize antigens.

T cells differentiate into 4 different types:
•Helper T cells
•Killer (cytotoxic) T cells
•Memory T cells
•Suppressor T cells

T Cells
•One type of T cells, called killer T cells, releases enzymes that help destroy invading foreign matter.
•Another type of T cells, called helper T cells, turns on the immune system.
•They stimulate other lymphocytes, known as B cells, to form antibodies.
•Memory T cells remember the antigen and provide immunity.
•Suppressor T cells turn off the immune response once the foreign invaders have been destroyed.

Antibodies
•An **antibody** is a protein made in response to a specific antigen.
•The antibodies destroy the pathogen or inactivate it so that other cells can destroy it.
• The antibody attaches to the antigen and makes it useless.
•The pathogen might not be able to stay attached to a cell or might be changed in such a way that a killer T cell can capture it more easily.

Two types of B cells:
•Plasma cells which are the antibody-producing B cells.
•Memory B cells which provide immunity

Memory B Cells
•Another type of lymphocyte, called memory B cells, also has antibodies for the specific pathogen.
•Memory B cells remain in the blood ready to defend against an invasion by that same pathogen another time.

Immunity
The body's ability to remember a specific antigen and respond to it is called immunity.
•In active immunity your body makes its own antibodies in response to an antigen.
•Passive immunity results when antibodies that have been produced in another animal are introduced into your body.

Active Immunity
•When a pathogen invades your body and quickly multiplies, you get sick.
•Your body immediately starts to make antibodies to attack the pathogen.
•After enough antibodies form, you usually get better.
•Some antibodies stay on duty in your blood, and more are produced rapidly if the pathogen enters your body again.

Vaccination
•A vaccine contains a weakened form of the virus or bacterium that still contains the antigens.
•The process of giving a vaccine by injection or by mouth is called vaccination.
•If a specific vaccine is injected into your body, your body forms antibodies against that pathogen.
•If you later encounter the same pathogen, your bloodstream already has antibodies that are needed to fight and destroy it.

Passive Immunity
•Passive immunity does not last as long as active immunity does.
•For example, you were born with all the antibodies that your mother had in her blood.
•However, these antibodies stayed with you for only a few months.
•Because newborn babies lose their passive immunity in a few months; they need to be vaccinated to develop their own immunity.

Disease Organisms
•Many diseases are caused by bacteria, certain viruses, protists, or fungi.
•Bacteria cause tetanus, tuberculosis, strep throat, and bacterial pneumonia.
•Malaria and sleeping sickness are caused by protists.
•Fungi are the pathogens for athlete's foot and ringworm.
•Viruses are the cause of colds, influenza, AIDS, measles, mumps, smallpox, and SARS.
•A **virus** is a minute piece of genetic material surrounded by a protein coating that infects and multiplies in host cells.
•The host cells die when the viruses break out of them.
•These new viruses infect other cells, leading to the destruction of tissues or the interruption of vital body activities.
•Pathogenic protists, such as the organisms that cause malaria, can destroy tissues and blood cells or interfere with normal body functions.
•In a similar manner, fungus infections can cause athlete's foot, nonhealing wounds, chronic lung disease, or inflammation of the membranes of the brain.

How Diseases Are Spread
•A disease that is caused by a virus, bacterium, protest, or fungus and is spread from an infected organism or the environment to another organism is called an infectious disease.
•Infectious diseases are spread by direct contact with the infected organism, through water and air, on food, by contact with contaminated objects, and by disease-carrying organisms called biological vectors.
•People can also be carriers of disease.
•When you have influenza and sneeze, you expel thousands of virus particles into the air.
•Colds and many other diseases are spread through contact.
•The Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, monitors the spread of diseases throughout the United States.

HIV and Your Immune System
•Human immunodeficiency virus (HIV) can exist in blood and body fluids.
•This virus can hide in body cells, sometimes for years.
•You can become infected with HIV by having sex with an HIV-infected person or by reusing

an HIV-contaminated hypodermic needle for an injection.

HIV and Your Immune System
•The risk of getting HIV through blood transfusion is small because all donated blood is tested for the presence of HIV.
•A pregnant female with HIV can infect her child when the virus passes through the placenta.
•The child also may become infected from contacts with blood during the birth process or when nursing after birth.

AIDS
•An HIV infection can lead to Acquired Immune Deficiency Syndrome (AIDS), which is a disease that attacks the body's immune system.
•HIV attacks the helper T cells in the immune system.
•The virus enters the T cell and multiplies.
•When the infected cell bursts open, it releases more HIV.
•Soon, so many T cells are destroyed that not enough B cells are stimulated to produce antibodies.
•The body no longer has an effective way to fight invading antigens.
•When people with AIDS die it is from other diseases such as tuberculosis, pneumonia, or cancer.
•From 1981-2001, more than 816,000 cases of AIDS were documented in the United States.
•At this time the disease has no known cure.
•One group of medicines to help treat AIDS interferes with the way that the virus multiplies in the host cell.
•Another group of medicines blocks the entrance of HIV in the host cell.

Autoimmune disease
•The immune system is unable to tell the difference between pathogens and some of its normal cells.
•The immune system attacks the pathogen and the normal cells
•Examples: rheumatoid arthritis (RA); lupus; and multiple sclerosis.

Fighting Disease
•Washing a small wound with soap and water is the first stop in preventing an infection.
•Cleaning the wound with an antiseptic and covering it with a bandage are other steps.
•Washing your body removes and destroys some surface microorganisms.
•In your mouth, microorganisms are responsible for mouth odor and tooth decay.
•Using dental floss and routine tooth brushing keep these organisms under control.
•Exercise and good nutrition help the circulatory and respiratory systems work more efficiently.
•Keeping up with recommended immunizations and having annual health checkups also can help you stay healthy.

Chronic Disease
•Not all diseases are caused by pathogens.
•Diseases and disorders such as diabetes, allergies, asthma, cancer, and heart disease are noninfectious diseases.
•They are not spread from one person to another.
•Many are chronic, which means that they can last for a long time.
•Some infectious diseases can be chronic if not treated.

Allergies
•An allergy is an overly strong reaction of the immune system to a foreign substance.
•Many people have allergic reactions to cosmetics, shellfish, strawberries, peanuts, and insect stings.

Allergens
•Substances that cause an allergic response are called allergens.
•Some chemicals, certain foods, pollen, molds, some antibiotics, and dust are allergens for some people.
•Some foods cause hives or stomach cramps and diarrhea.
•Pollen can cause a stuffy nose, breathing difficulties, watery eyes, and a tired feeling in some people.
•Dust can contain cat and dog dander and dust mites.
•Asthma is a lung disorder that is associated with reactions to allergens.
•A person with asthma can have shortness of breath, wheezing, and coughing when he or she comes into contact with something they are allergic to.
•When you come in contact with an allergen, your immune system usually forms antibodies.

•Your body reacts by releasing chemicals called histamines that promote red, swollen tissues.
•Antihistamines are medications that can be used to treat allergic reactions and asthma.

Diabetes
•A chronic disease associated with the levels of insulin produced by the pancreas is diabetes.
•Insulin is a hormone that enables glucose to pass from the bloodstream into your cells.
•Doctors recognize two types of diabetes.
•Type 1 diabetes is the result of too little or no insulin production.
•Type 2 diabetes, your body cannot properly process the insulin.
•Symptoms of diabetes include fatigue, excessive thirst, frequent urination, and tingling sensations in the hands and feet.
•Patients with Type 1 diabetes must monitor their intake of sugars and usually require daily injections of insulin.
•Careful monitoring of diet and weight usually are enough to control Type 2 diabetes.
•Although the cause of diabetes is unknown, scientists have discovered that Type 2 diabetes is more common in people who are overweight and that it might be inherited.

Chemicals and Disease
•Of the thousands of chemical substances used by consumers, less than two percent are harmful.
•Those chemicals that are harmful to living things are called toxins.
•Toxins can cause birth defects, cell mutations, cancers, tissue damage, chronic diseases, and death.

The Effects
•The amount of a chemical that is taken into your body and how long your body is in contact with it determine how it affects you.
•Low levels of a toxin might cause cardiac or respiratory problems. However, higher levels of the same toxin might cause death.
•Some chemicals, such as the asbestos can be inhaled over a long period of time.
•Eventually, the asbestos can cause chronic diseases of the lungs.
•Pollution, caused by harmful chemicals, sometimes produces chronic diseases in humans.
•Long-term exposure to carbon monoxide, sulfur oxides, and nitrogen oxides might cause bronchitis, emphysema, and lung cancer.

Cancer
•Cancer is the name given to a group of closely related diseases that result from uncontrolled cell growth.
•It is a complicated disease, and no one fully understands how cancers form.
•Certain regulatory molecules in the body control the beginning and ending of cell division.
•If this control is lost, a mass of cells called a tumor results from this abnormal growth.
•Tumors can occur anywhere in your body.
•Cancerous cells can leave a tumor, spread throughout the body via blood and lymph vessels, and then invade other tissues.

Treatment
•Surgery to remove cancerous tissue, radiation with X rays to kill cancer cells, and chemotherapy are some treatments for cancer.
•**Chemotherapy** is the use of chemicals to destroy cancer cells.
•Early detection of cancer is the key to any successful treatment.
•Research in the science of immune processes, called immunology, has led to some new approaches for treating cancer.
•Specialized antibodies produced in the laboratory are being tested as anticancer agents.
•These antibodies are used as carriers to deliver medicines and radioactive substances directly to cancer cells.

Prevention
•Knowing some causes of cancer might help you prevent it.
•The first step is to know the early warning signs.
•Medical attention and treatments such as chemotherapy or surgery in the early stages of some cancers can cure or keep them inactive.
•Choosing not to use tobacco and alcohol products can help prevent mouth and lung cancers.

•Selecting a healthy diet without many foods that are high in fats, salts, and sugar also might reduce your chances of developing cancer.
•Using sunscreen lotions and limiting the amount you expose your skin to direct sunlight can prevent skin cancer.
•Inhaling certain air pollutants such as carbon monoxide, sulfur dioxide, and asbestos fibers is dangerous to your health.
•To keep the air cleaner, the U.S. Government has regulations such as the Clean Air Act.
•These laws are intended to reduce the amount of these substances that are released into the air.

The Excretory System

Primary functions:
the removal of wastes and foreign substances from the blood
the removal of excess substances from the blood
the temporary collection and storage of these substances
the elimination of these substances from the body
Organs of the excretory system:
(1) kidneys
(2) ureters
(3) urinary bladder
(4) urethra

Kidney

resemble 2 large, purplish-brown beans
function - filter wastes from the blood and excretes them in a liquid called urine
main components of urine:
urea (protein digestion produces ammonia as a waste product and then ammonia is changed to urea by the liver)
2) uric acid
3) water (95%)

Abnormal Colors of Urine

color	cause or disorder
Black	cancer or carbolic acid poisoning
Greenish	jaundice
Milky	infection producing pus
Red, Reddish brown, Orange system	infection and hemorrhage in urinary
Cloudy	bacteria in urine, as in an infection

Abnormal Components of Urine

component	cause
Glucose	diabetes mellitus
Proteins	kidney disease or heart disease
Acetone	diabetes mellitus, starvation
Erythrocytes	infections in urinary system
Leukocytes	large numbers indicate an infection in the urinary system
Casts (deposits of epithelial cells, fat, pus, or blood)	lesions (sores) in kidney
Amino Acid Crystals	severe liver disease
Uric Acid Crystals	gout

healthy kidneys produce from 1-2 quarts of urine daily.

Blood flows into the kidney by way of the renal artery.
two healthy kidneys filter about 50 gallons of blood daily.

nephron: the unit in the kidney that filters the blood
ureters - tubes that carry the wastes to the urinary bladder
urinary bladder - muscular bag that temporarily stores urine
urethra - tube that leads from the bladder to the outside of the body
dialysis machine - often called an artificial kidney

Disorders and Diseases of the Excretory System

KIDNEY FAILURE - abnormal condition in which the kidneys fail to form urine.
This disorder may be caused by physical injury, bacterial infections, or exposure to toxic chemicals.
KIDNEY STONES - accumulations of various mineral crystals in the area of the kidney where the urine collects before going into the ureter. Pain is caused as the stone blocks the ureter, stopping urine from passing to the urinary bladder. Drinking sufficient amounts of water may possible prevent kidney stones.
FLOATING KIDNEY - a kidney that has been jarred from it usual location and has become movable; caused by a severe injury or blow to the lower back; can occur after a very overweight person reduces body fat.
----------Quiz 25D