CHAPTER 11
CARDIOVASCULAR SYSTEM

PRACTICAL APPLICATIONS, p. 418-9

ABBREVIATIONS
BP
CABG
CCU
CHF
ECG/EKG

HDL
LDL

MI
MVP

SOB

EXERCISES:  D, E, F,  G, H, O and Q
CHAPTER 12
RESPIRATORY SYSTEM

EXERCISES: E, F, I, K, and L
Practical Applications, p. 466 and Necropsy Report and Questions p. 467

Tuberculosis:
Once thought to be headed for eradication, TB is making a tremendous comeback. Some possible reasons for the resurgence:

1. Increase of homeless people or people living in shelters;
2. Immigration from countries where tuberculosis is still prevalent;
3. Alcohol abuse, malnutrition or sickness weaken the immune system and allow the bacteria to become active;
4. People infected with the AIDS virus are particularly susceptible since their weakened immune systems leave them with little or no defense against opportunistic infections;
5. Increase of strains of TB resistant to standard drug therapy; patients remain infectious for weeks instead of days.

Active TB cases are infectious. The disease usually attacks the lungs and spreads through the air. Symptoms include a persistent cough, weight loss, fever, fatigue and night sweats. When someone with active TB coughs or sneezes, tiny airborne droplets containing mycobacterium tuberculosis are released. Despite this, TB is not an easy disease to contract. It usually takes prolonged, repeated exposure to someone with active TB to become infected with the bacteria.

TB skin test
The TB skin test is quick and simple way of determining infection. A small amount of protein from the tuberculosis bacterium is injected just under the skin of the forearm. Infection shows up as a swelling or redness in an area larger than 10 mm (about half an inch) at the site of injection 48 hours later.

Treatment usually consists of two antibiotics in combination. People with additional risk factors or those who live in areas of high incidence may receive additional antibiotics. Medication must be taken daily, usually for six to nine months. Failure to do so can result in drug-resident TB, which can require up to two years of medication. The disease's return is occurring at the same time public resources are dwindling. The infrastructure of public health is in danger of falling apart, which threatens the ability to adequately respond to TB and other outbreaks.
CHAPTER 13
BLOOD SYSTEM

EXERCISES: H, I, J, K AND M

ANEMIA

Anemia: deficiency of erythrocytes (rbc's) or hemoglobin (iron bearing rbc's).
The most common type of anemia is iron deficiency anemia, prevalent in your women.

aplastic anemia: "a" without and "plast" formation. In this type of anemia, there is
failure of blood cell production. Cause of aplastic anemia is unknown in most cases, but
some have been traced to environmental factors (benzene exposure) or antibiotics such as
chloramphenicol.

hemolytic anemia: (from lysis meaning to break down or destroy) excessive destruction
of rbc's causes overall reduction in rbc's. Removal of the spleen sometimes produces
helpful results.

pernicious anemia: pernicious means hurtful or ruinous. Vitamin B12 cannot be
absorbed into the bloodstream without the presence of a substance called intrinsic factor
(normally found in gastric juices). RBC's fail to mature and are poorly functioning.
Treatment is administration of Vitamin B12 for life.

sickle cell anemia: hereditary condition characterized by abnormal shape of rbc's and by
hemolysis. The rbc's are poorly functioning. This condition is found predominantly in
blacks and the severity of the disease depends on the presence of one or two inherited
genres for the trait.

thalassemia: thalassa is a Greek word for sea. This type of anemia is predominantly
found in peoples of Mediterranean background, and is an inherited defect in the ability to
produce hemoglobin.

hemochromatosis\(^1\): once thought to be a relatively rare disease, now more prevalent
because of our adherence to using iron supplements and reinforcing our food with iron.
In this hereditary disorder, there are excessive deposits of iron throughout the body
because the intestine absorbs excess iron. Normally healthy people absorb about 10% of
the iron in the foods they eat; carriers can absorb anywhere from 15-20%. Since the body
has no way to rid itself of the excess iron, it gets dumped into tissues and organs,
especially the liver, heart, and pancreas. The disease initially has no symptoms;
eventually though the excessive iron deposits turn the skin a coppery, bronze or grayish
color and the deposits clogging organs and tissues cause arthritis and other more severe
health problems.

\(^1\)Abstracted from Health, Mar/Apr 1996.
Only 6% of Americans (almost exclusively infants, children, adolescents, and women of childbearing age) need iron supplements. While iron deficiency anemia is the most common cause of anemia, it is not the only cause.

**Leukemia**: like other forms of cancer, leukemia involves **uncontrolled** cell growth; in this case the growth occurs in immature abnormal white blood cells.

(Remember: a slight increase in white blood cells is called leukocytosis; a decrease in red blood cells is called anemia).

What causes leukemia? Dr. Robert Geller of Winship Cancer Center at Emory University in Atlanta suggests that a person has a **predisposition** and then encounters some sort of **trigger**. The disease initially seems to arise from a genetic mutation in an immature blood cell, or stem cell, in the bone marrow.

**Triggers** include such **environmental factors** as tobacco smoke, industrial chemicals (such as benzene -- used in drycleaning), radiation, and possibly an unknown virus or viruses.

**Symptoms**: Fever, chills and other flu-like symptoms; weakness and fatigue; frequent infections; loss of appetite and/or weight; swollen or tender lymph nodes, liver and spleen; easy bleeding or bruising; tiny, red spots under the skin (petechiae); swollen or bleeding gums; sweating, especially at night; bone or joint pain

There are several forms of leukemia but two types account for 90% of all cases:  
* **acute myelogenous leukemia** primarily occurs in **adults** and accounts for 45% of all cases (myelo - bone marrow; genous - arising from)  
* **acute lymphocytic leukemia** is the most common kind of childhood leukemia, and also accounts for 45% of all cases (lympho - lymph; cyt - cell; ic - pertaining to)

As late as the 1960's, there were no effective treatments for leukemia; most people died shortly after diagnosis. Between 1960 and 1990, the **five-year survival rate for acute childhood lymphocytic leukemia went from 4 to 72%**; but the cure rates for other patient groups and other types of leukemia are not nearly as high, generally around 30%. Today most leukemia patients achieve **remission** with an initial round of anticancer drugs. But the cancer usually returns without further treatment and a bone marrow transplant.  
**Remember: remission means "without signs or symptoms"; relapse means "a return of the signs and symptoms of the disease".**

The goal of leukemia treatment is to wipe out the patient's malignant blood cells, using drugs that target immature and dividing cells. Since aggressive chemotherapy also destroys normal blood cells, treatment may be followed by a bone marrow transplant. The bone marrow may consist of bone marrow previously taken from the patient and treated outside the body to destroy leukemic

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cells (allogenic transplant). Or the bone marrow may come from a carefully matched donor, preferably a close relative (donor transplant). Transplants can be quite successful, but they introduce considerable risk by introducing foreign tissue that can trigger a severe, sometimes deadly, immune response called graft-versus-host disease, in which white cells in the donor marrow attack the tissue of the recipient, which they consider foreign. A recent alcohol study found a strong link between alcohol during pregnancy and babies developing leukemia during infancy. The statistically higher risk was for maternal drinking in the six months before birth. Infant leukemia is extremely rare: only about 3 babies per 100,000 develop leukemia before the age of 18 months. Among drinking mothers, the rate was 32 babies per 100,000.

**ANTIGEN/ANTIBODY**

anti - against  
gen - producing; forming  

antigen - foreign substance that stimulates the formation of antibodies  
anti body - protein substances produced by WBCs in response to the presence of a foreign antibody  
The antigen/antibody reaction is called the immune response  
The RH condition is an example of an antigen/antibody reaction.

A person who is RH+ has a protein coating (antigen) on his/her RBCs. The antigen factor is something the person is born with so is normal. A person who is RH- has normal RBCs but they do not carry the RH factor antigen.

If a RH- woman and a RH+ man conceive, the embryo may be RH- or RH+. The condition is only dangerous when the embryo is RH+. During delivery of the first pregnancy, some of the baby's blood cells containing antigens escape into the mother's bloodstream. The mother's cells then produce antibodies against these antigens. Because this occurs at delivery, the first baby isn't affected.

In a second RH+ pregnancy, however, the mother's antibodies will enter the baby's bloodstream and attack the infant's RBCs. The infant tries to compensate for the loss of RBCs by manufacturing new immature RBCs (called erythroblasts). The infant is born with a condition called erythroblastosis fetalis or hemolytic disease of the newborn. The baby will be jaundiced because of the bilirubin accumulating in the blood.

See p. 112-113 for a diagram of the antigen/antibody response

anemia lack of rbcs or reduction of hemoglobin  
leukemia excessive increase of abnormal wbc's  

differentiation/specialization: think of how each individual has unique characteristics; kids want to be like each other, but as we mature we want to be different. Blood cells as they mature become specialized or different from each other

blast - immature - remember the antigen/antibody response in the RH- Mom carrying a second RH+ baby. As the baby's RBCs are destroyed, its body makes immature or blast cells leading to a condition called erythroblastosis fetalis. Think of bud blast
any abnormal or pathological blood condition is called a blood **DYSCRASIA**

**DYS** - bad, painful, difficult  
**CRAS** – mixture

**agglutination** - think of glue - clumping or sticking together

**polycythemia vera** - poly means many; cyt is cell; emia is blood - see p. 445

**hemostasis** - think of metastasis which means beyond stopping; hemostasis is stopping blood (usually by mechanical means)  
**hemolysis** - lysis means breakdown - again think of the antigen/antibody response to the RH+ newborn

**prothrombin time** - test of the ability of blood to clot (used on patients taking blood thinners so think of the th in thinner and thrombin - remember thrombo)  
**coagulation** time - also called clotting time; (think of the two "c"s) time taken for venous blood to clot in a test tube  
**bleeding time** - how long does it take a small puncture wound to stop bleeding  
**partial thromboplastin time** - thrombo (clot); plast (formation) - measures presence of factors that act at markers on the coagulation pathway

**hematocrit** - test measures the % of erythrocytes in a volume of blood  
**hemoglobin** - measures the amount of hemoglobin (iron) in blood

**Blood types**

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<th>antigen</th>
<th>antibody</th>
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<td>anti-B</td>
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<td>B</td>
<td>B</td>
<td>anti-A</td>
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<tr>
<td>AB</td>
<td>A &amp; B</td>
<td>neither anti-A nor Anti-B (universal recipient)</td>
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<tr>
<td>O</td>
<td></td>
<td>anti-A and anti-B (universal donor)</td>
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CHAPTER 14
LYMPHTHATIC AND IMMUNE SYSTEMS

Abbreviations
AIDS
HIV

Exercises: G, H, I and J

Immune System Glossary

The immune system is the body's monitor, police force, and protector. Immune cells stand guard against invaders like bacteria, viruses, cancer cells, or any other organism that threatens. These cells fight the invaders, repair the damage, and clean up the remains.

*Antibodies:* Protein molecules that are the first line of defense. Produced by B-cells latch onto molecules of invaders called antigens.

*allergen/allergy*
allergen is a sensitizing agent that causes an allergy
allergy - sensitivity to an allergen
anaphylaxis - is an extreme reaction to an allergen (shock, hypotension, respiratory distress, and edema of the larynx)

*Helper T-cells:* once these recognize viruses and bacteria, they communicate with other immune cells and orchestrate the response. T cells are called helper cells since they aid B cells in recognizing antigens

*Killer T-cells:* these have receptors on their surfaces that recognize invaders. Latching onto an invader, they inject a load of toxic chemicals, killing the invader. (think of Mr. T of the A Team)

*B cells* - lymphocytes that secrete antibodies (named after bursa where they were first noted)

*Natural killer (NK) cells:* NK cells don't require signals from other cells; they recognize and kill invaders on their own.

*Phagocytes:* These white blood cells engulf invaders and help rid our bodies of cancer cells. Known as the "garbage collectors" of the immune system, phagocytes clean up after an immune attack.

*Suppressor T-cells:* these critical cells dampen immune reactions before they get out of control. When our immune systems overreact, we become susceptible to autoimmune diseases such as arthritis, lupus, and multiple sclerosis. Suppressor T-cells maintain our system's balance.

*Messenger molecules:* immune cells secrete various substances that carry "messages" to other cells during a coordinated attack. Molecules such as interferon, interleukin-2, and tumor-necrosis factor stimulate antiviral and anticancer reactions.

*mononucleosis* - characterized by Epstein-Barr virus; lymphadenopathy, fatigue, sore throat, and enlarged tender cervical lymph nodes - highly infective disease (called kissing disease). In approximately 25% of cases, mono is accompanied by hepatitis
**AIDS - Acquired Immunodeficiency Syndrome**

Endemic in part of Southwest and West Africa (Zaire, Mozambique, Angola and Uganda) at least since the 1970's. Transmitted through heterosexual contact between truck drivers and prostitutes, passed on to fetuses.

**Routes of Transmission from Africa**

Many Haitians worked in West Africa during the 1970's; it is generally hypothesized that these workers brought the HIV with them when they returned to Haiti. Those parts of Africa were travelled frequently by Europeans, particularly French and Germans, who then returned to Europe. At the 1976 bicentennial, one hypothesis is that Europeans attending the celebrations in New York City might have brought the virus with them. Another theory is called Patient Zero (a homosexual flight attendant for Air Canada who frequently traveled to Europe and the United States, particularly San Francisco and New York). Infected early in the 1980's, he remained sexually active until the mid-1980's. Several initial AIDS victims in the New York and San Francisco area have been directly linked to him.

**Part of the problem in the early 1980's had several aspects:**

- a reluctance on the part of African governments to even admit there was an epidemic coupled with a reluctance on the part of the U.S. government to put much funding into prevention and research;
- the disease was labeled early on in the U.S. as a "gay" disease since the earliest patients were homosexual; it wasn't until the blood supply in the U.S. was tainted and hemophiliacs and heterosexuals became infected that this label was recognized as inaccurate. By then the disease was present in most countries of the world and in every U.S. state.
- the homosexual community refused to close the bathhouses and adamantly refused to listen to any of their members who even raised the issue, labeling them "sexual nazis". The bathhouses finally closed because of lack of business, not because of any ethical concerns on the part of the owners (who were in the forefront of backing "gay" causes).
- the media showed a definite lack of interest in AIDS until Rock Hudson died. The only time AIDS was reported was when a child, heterosexual adult, or hemophiliac became infected.
- the Haitian community in the U.S. refused to accept the viral cause and instead spent resources having a mosquito cause investigated; the Haitian reluctance stemmed from the "homosexual" label though the spread in the Haitian community was clearly through heterosexual promiscuity and shared needles.
- The conservative U.S. government refused to put out a clear cut educational program even though the Surgeon-General (Koop) himself distributed brochures (these were withdrawn because of protests from the religious right).

As a result, a few isolated cases in the early 1980's became an epidemic. The largest increase in AIDS patients is occurring in women of color (who are infected by a bisexual partner or who share needles with infected partners). The number of children infected has drastically increased particularly among minority children. The number of cases in the homosexual community and among hemophiliacs has drastically declined.

**Modes of transmission:**

- sexual contact with an infected partner
- sharing IV drug needles
- blood from infected donors (all blood and blood products are now tested for the AIDS antibodies)

**Early Symptoms**

- Fever and chills; night sweats; general fatigue; loss of libido; diarrhea; rapid weight loss; swollen lymph glands; multiple skin lesions; mental and neurological problems; impaired speech; breathlessness; tremors and seizures
Treatment
No known cure. A combination of drugs has proved to be promising, but for many Third World countries, the drugs are too expensive to be put into wide use. Western AIDS patients are now living beyond the 5-year projected life span.

HIV’S DEVASTATING EFFECTS: *42 million worldwide 2003 estimates
Sub-Saharan Africa 3.8 million 25 – 28 million
*South & Southeast Asia 2.3 million 4.6-8.2
*Latin America & Caribbean 1.9 million 1.34-2.5
*Eastern Europe & Central Asia 200,000 1.2-1.8
North America 44,000) 0.8-1.2
Western Europe 30,000) 0.5-0.7
North Africa & the Middle East 19,000 0.5-0.7
Australia & New Zealand 500 0.01-0.02

The number of expected AIDS deaths in 1999, 2.6 million, is the highest number since the late 1970’s.

Children 10%
Females 40%
Males 50%

HIV is increasing among women and subsequently children, especially women of color. In sub-Sahara Africa and some Caribbean countries, most reported cases are in heterosexual contact; male-to-female ratio is 1:1. Worldwide, 70% of HIV infection is through heterosexual transmission. **2002 Update:** for the first time, women account for half of all people infected with HIV. This increase has been driven by an increase in heterosexual transmission.
Hodgkin’s Lymphoma

A rare type of lymphoma, a cancer characterized by abnormal cells in the lymphatic system.

Hodgkin’s comprises less than 1% of all new U.S. cancer cases, but most people who develop it are ages 15-34 or over the age of 55.

The disease can show the same symptoms as leukemia, as well as itchy skin and painless swelling of the lymph nodes in the neck, armpit, or groin.

Prompt medical attention can improve survival odds.

An x-ray, CAT scan and/or MRI as well as a lymph node biopsy may be required for diagnosis. Hodgkin’s is often treated with chemotherapy for four to six months, and sometimes is followed with radiation as well.

Survival rate: The 10-year survival rate is more than 70%.

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3 Shape, April 2004