# Heart Disease

1.      Introduction (Page 170)

A.      Statistics

http://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_heart_disease.htm

2.      Background

A.      Endothelia and Clotting

http://www.dnatube.com/video/29917/The-Process-of-Blood-Clotting

B.      Arteriosclerosis

i.      General Characteristics

ii.      Results

iii.      Causes

iv.      Symptoms

C.      Atherosclerosis

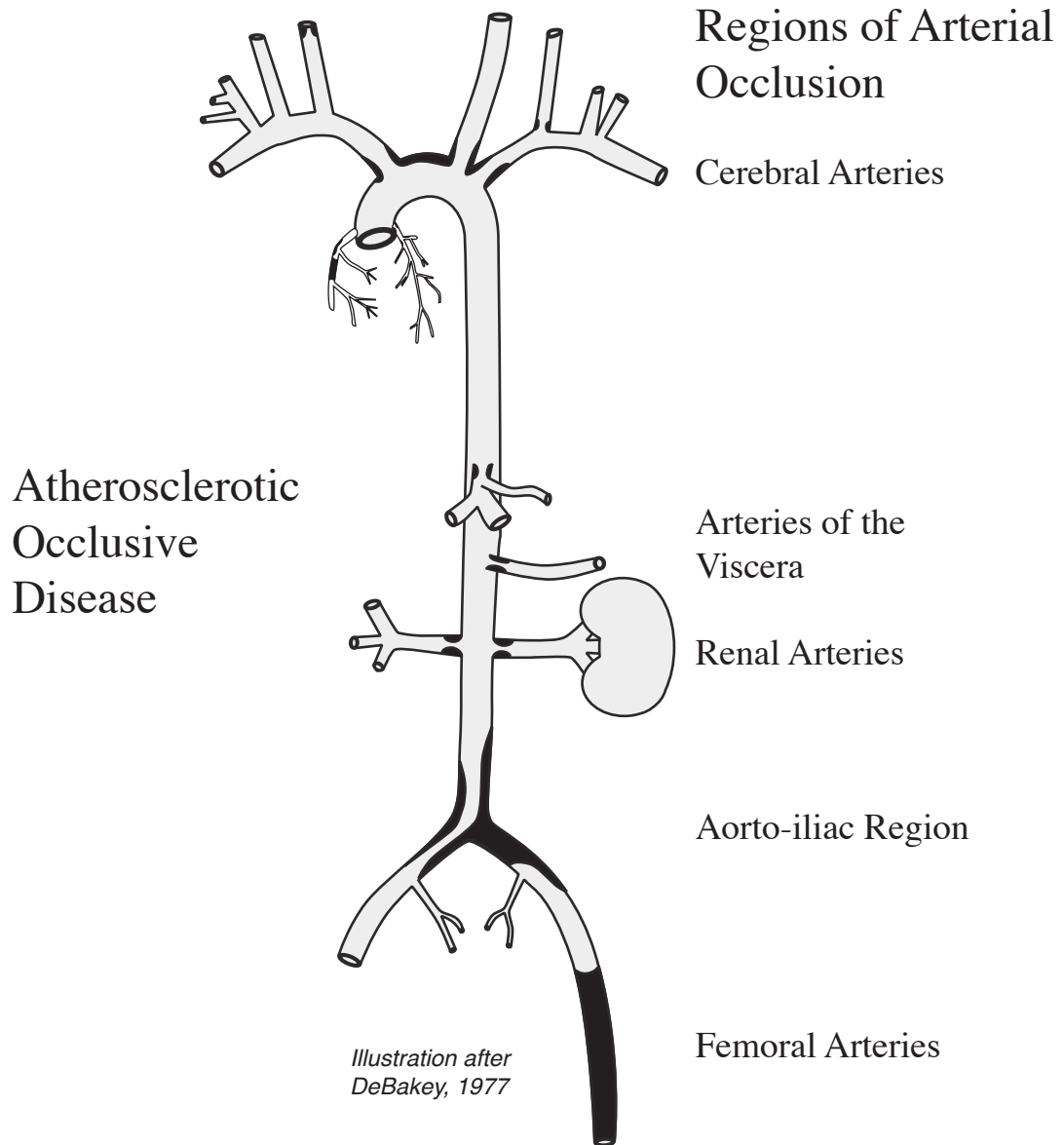http://www.dnatube.com/video/29917/The-Process-of-Blood-Clotting

i.      Development

ii.      Clot Formation

a.      Thrombus

a.      Embolus

D.     Atherosclerotic Occlusive Disease

## Regions of Arterial Occlusion

Cerebral Arteries

## Atherosclerotic Occlusive Disease

Arteries of the Viscera

Renal Arteries

Aorto-iliac Region

Femoral Arteries

*Illustration after DeBakey, 1977*

E.     Disease Outcomes

   i.      Coronary Artery Disease or Myocardial Infarction

   ii.     Stroke

   iii.    Other Blood Supply Related Outcomes

3.     Development of Heart Disease

    A.     General Developmental Phases

        i.     Initiation Phase

        ii.     Progressive Phase

    B.     Detailed Steps of Development

        i.     Damage to the endothelial lining

            •     Characteristics

            •     Progression

        ii.     Focal accumulation of lipids in the inner lining (intima)

            •     Ateromatous Plaques

        iii.     Smooth Muscle Cell and Fibroblast proliferation

            a.     Continued Lesion Development: Fibrous Plaque

            b.     Foam Cells

                •     Fibroblasts

            c.     Fibrous Plaque

                •     "Hardening of the Arteries"

            d.     Dangers

iv.     Cell death and injury

v.     Formation of necrotic lipid rich core

    a.     Cholesterol Core

    b.     Fibrous Cap

C.     Conditions and Secondary Diseases/Symptoms

i.     Angina Pectoris

ii.     Myocardial Infarction

iii.     Stroke

iv.     Thrombus → Embolus

4.     Physiology and the Lipid Profile

A.     See Handout - HDL and LDL Hand out

B.     Relative Risk Factor Statistics

i.     Cholesterol: >200 mg/dl

ii.     LDL: >130 mg/dl – 160 mg/dl

iii.     HDL: <35 mg/dl

iv.     Ratio of Total Cholesterol to HDL: >4:1

5.    Symptoms of a "Heart Attack"

- Myocardial Infarction

- Coronary Thrombus

6.    Risk Factors

A.    Genetic

B.    Lifestyle

    i.    Smoking

    ii.    Hypertension

        a.    Normal Blood Pressure:

            120 mm Hg (Systolic)  /  80 mm Hg (Diastolic)

        b.    Hypertension:

            > 140 mm Hg (Systolic)  /  > 90 mm Hg (Diastolic)

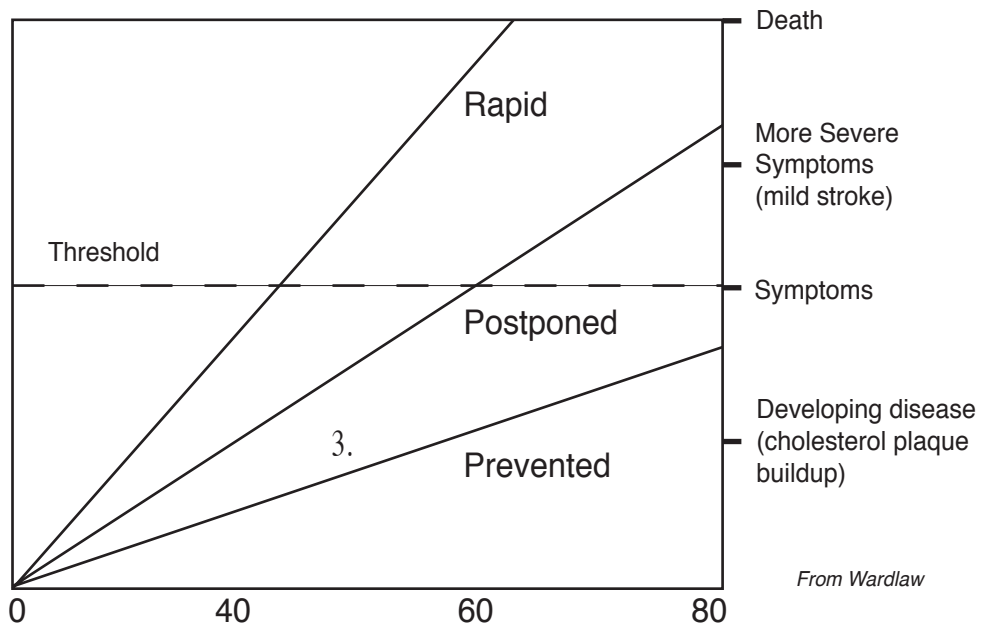C.    Risk Factor Statistics (again)

    i.    Cholesterol: <200 mg/dl

    ii.    LDL: <100 mg/dl – 129 mg/dl

    iii.    HDL: >60 mg/dl

    iv.    Ratio of Total Cholesterol to HDL: >4:1

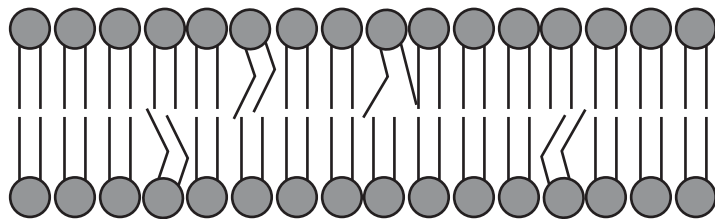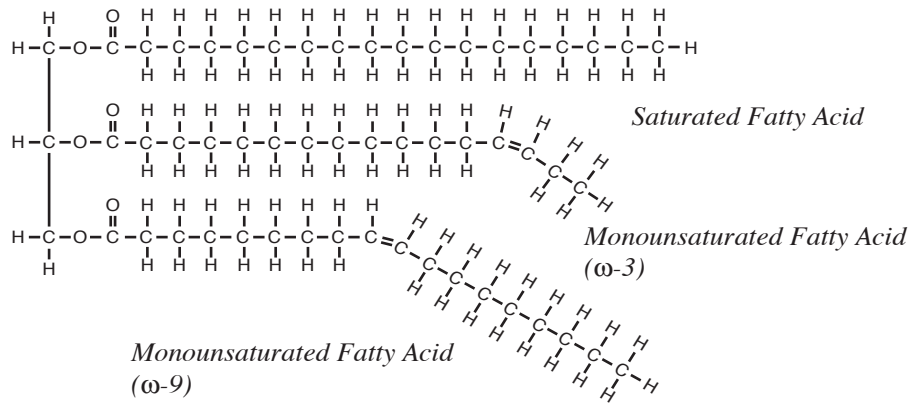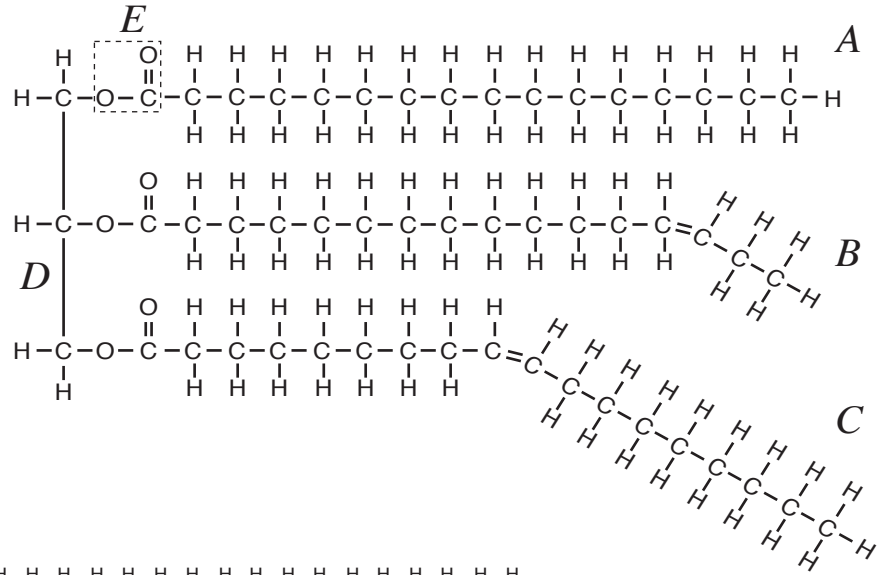7.    Prevention

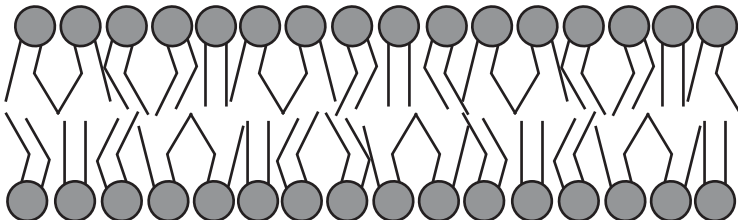A.    Compression of Morbidity



B.    Actions: Start Early

i.    Dietary

a.    Reduction of Saturated Fatty Acid Intake

Saturated Fatty Acid

Monounsaturated Fatty Acid
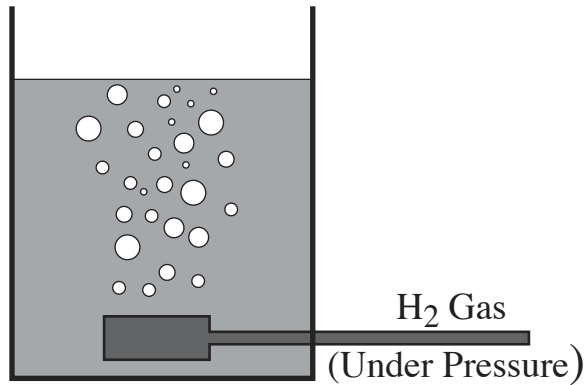(ω-3)

Monounsaturated Fatty Acid
(ω-9)



Hypathetical Cell Membrane with substantial *saturated* fatty acids

Hypathetical Cell Membrane with substantial *unsaturated* fatty acids

b.       Reduction of Trans Fatty Acids



H$_2$ Gas

(Under Pressure)

c.       Increase Monounsaturated (and Polyunsaturated) Fatty

Acids

d.       Lower Triglycerides

e.       Raise HDL

•       Physical Activity

f.       Dietary Fiber

8.    Treatment and Therapy

A.    Primary Prevention

i.    Life Style

a.       Exercise

b.       Diet

    ii.    Medication

        a.    Statins

        b.    Bile Acid Sequestrants

        c.    Triglyceride Reduction

        e.    Estrogen Replacement

        f.    Virtamin E