

Physical Activity and The Cardiorespiratory System

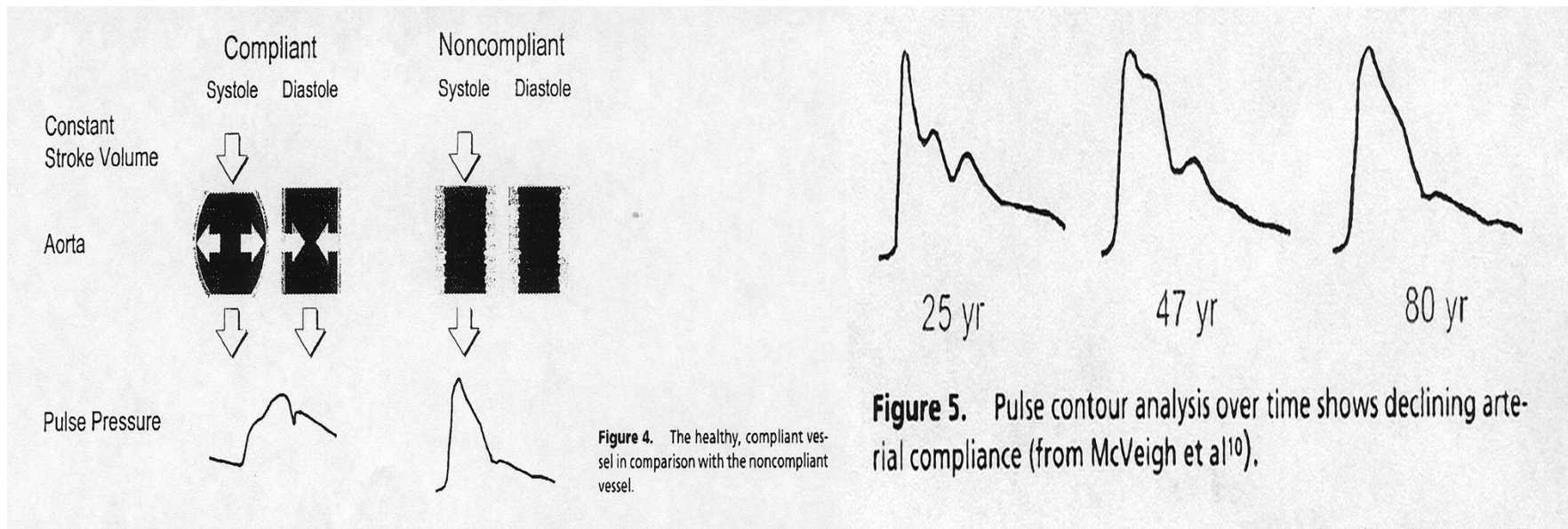
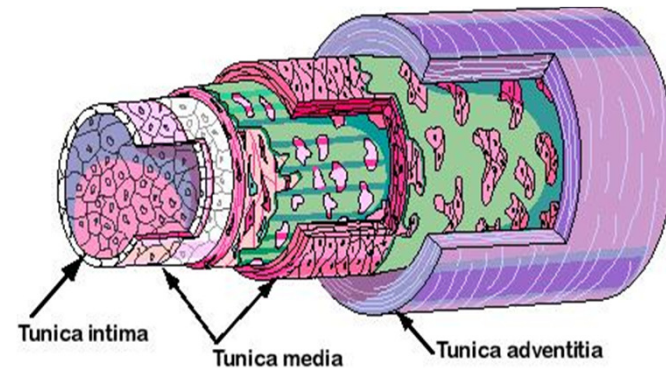
Professor Justin Hall

October 21, 2010

Blood Vessel Compliance Changes With Age

Reduced Arterial Blood Vessel Compliance:

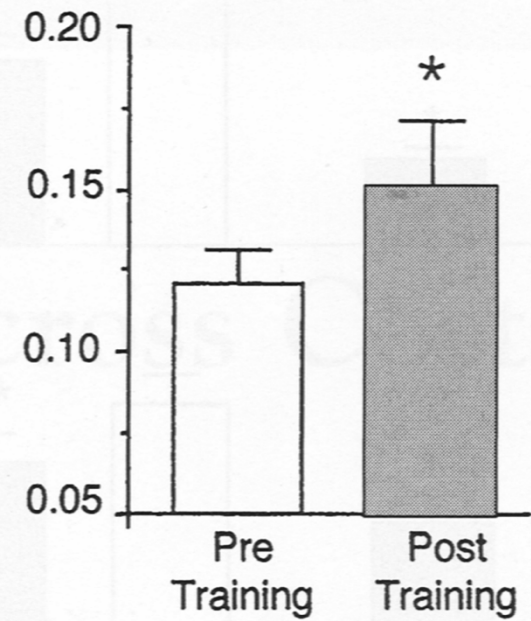
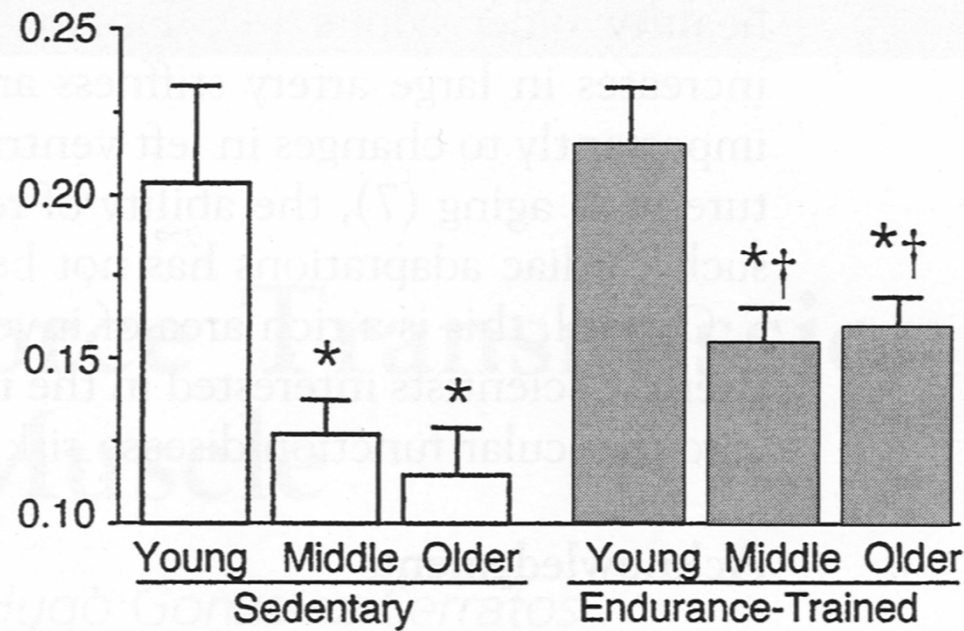
- Smooth muscle hypertrophy
- Stiffening connective tissue
 - Collagen and fibroblasts



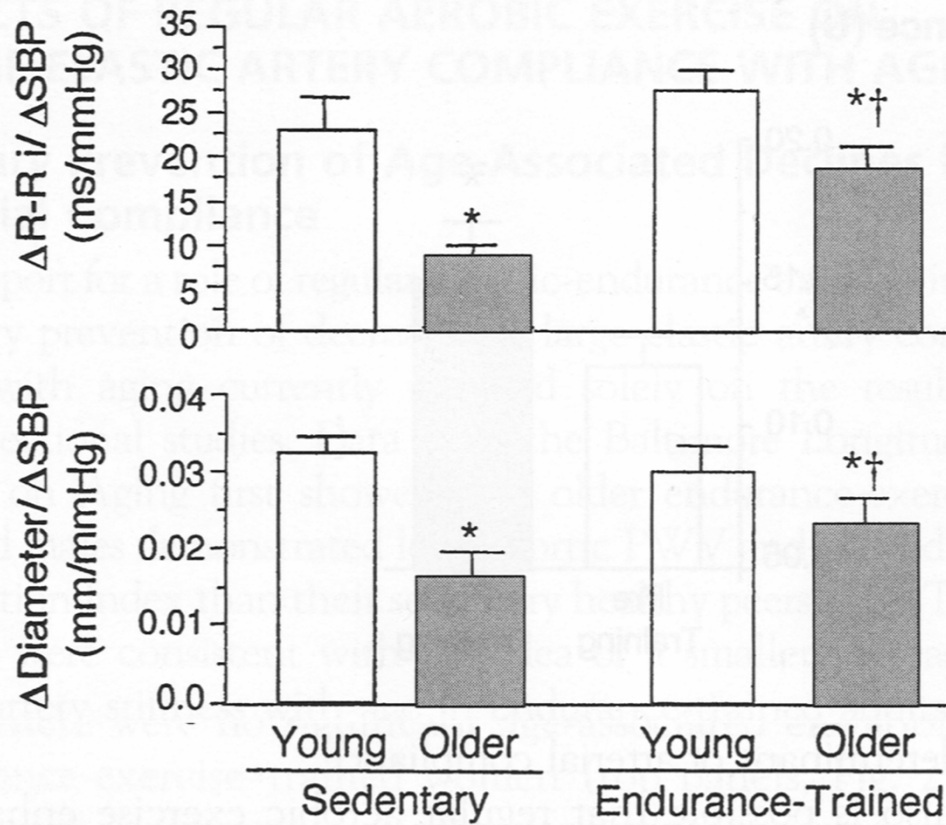
Implication: Elevated Pulse Pressure → substantial increased risk for cardiovascular disease and cardiac event

Blood Vessel Compliance: Physical Activity Effect

Carotid Artery Compliance (U)



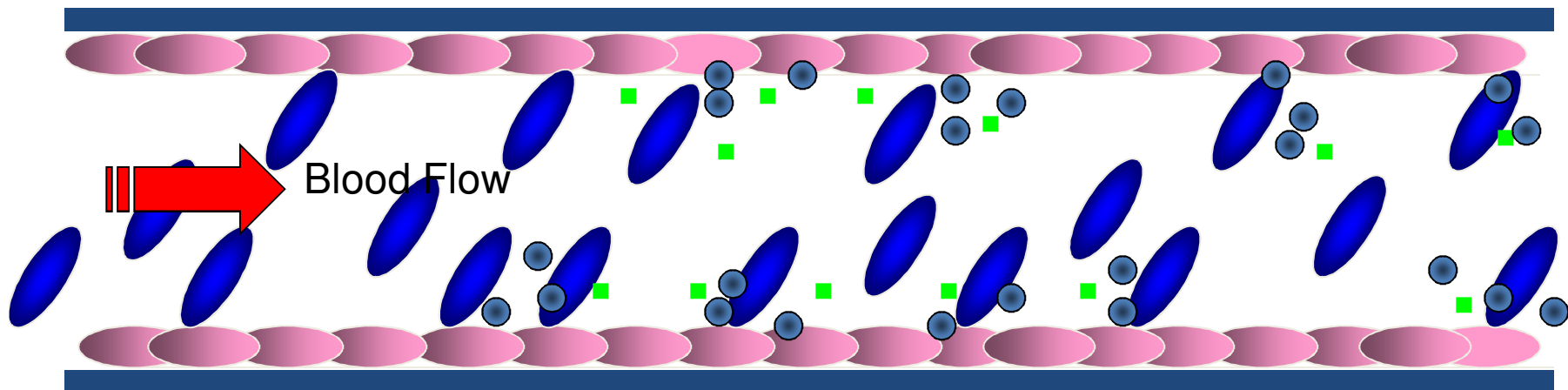
Blood Vessel Compliance: Physical Activity Effect



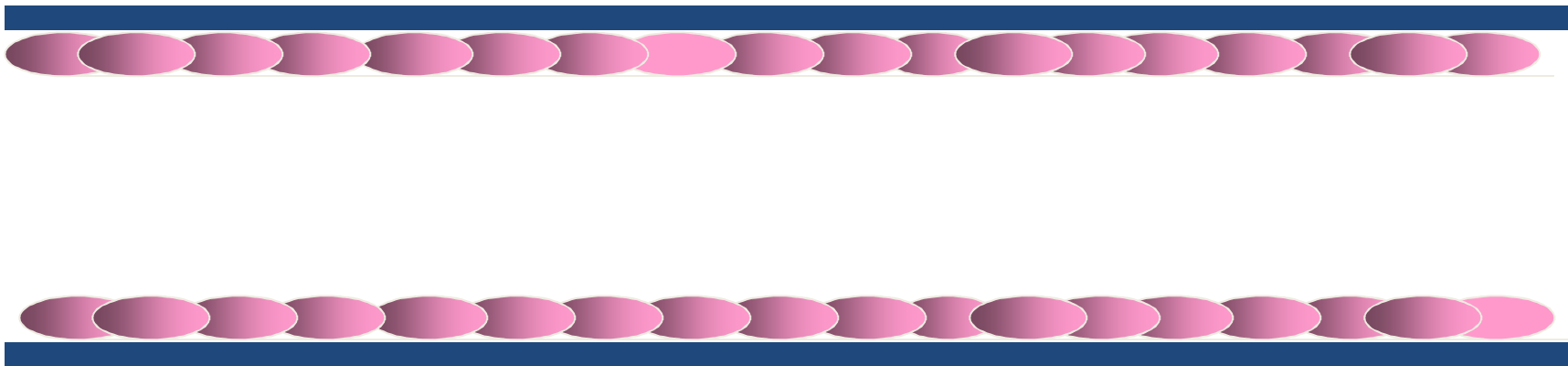
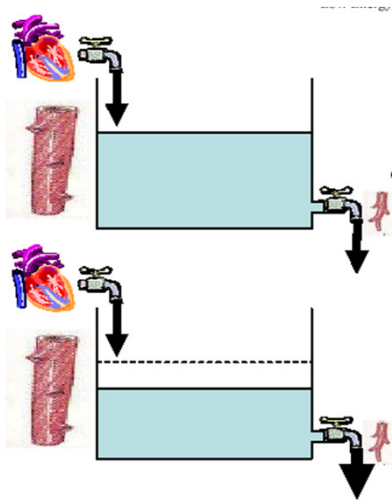
Blood Vessel Endothelium: What Does it Do?

- **Endothelial Dependent Flow Mediated Dilation (EDFMD), release of vasoprotective factors**

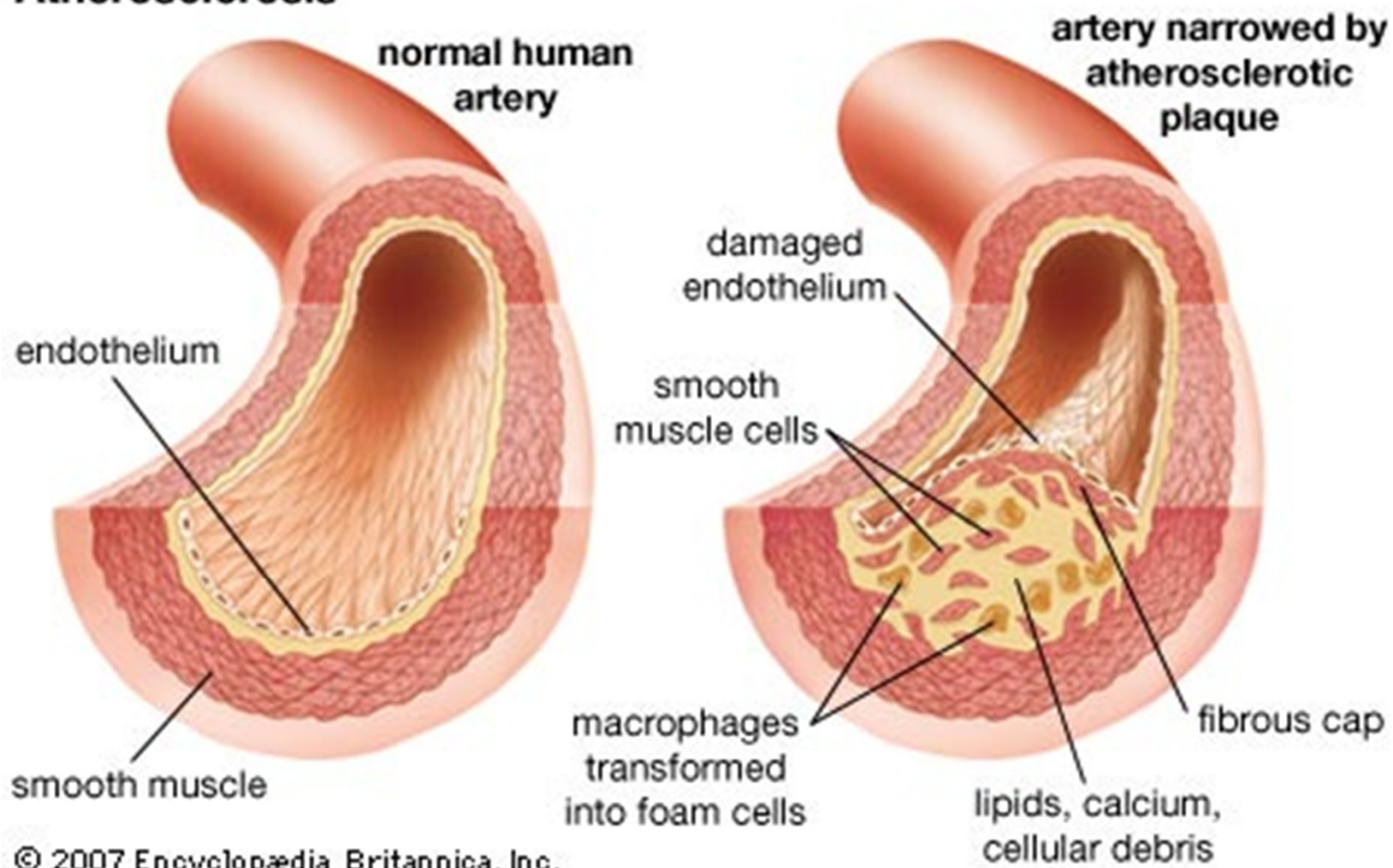
● = Nitric Oxide ■ = PGI₂



Endothelium Dependent Vasodilation

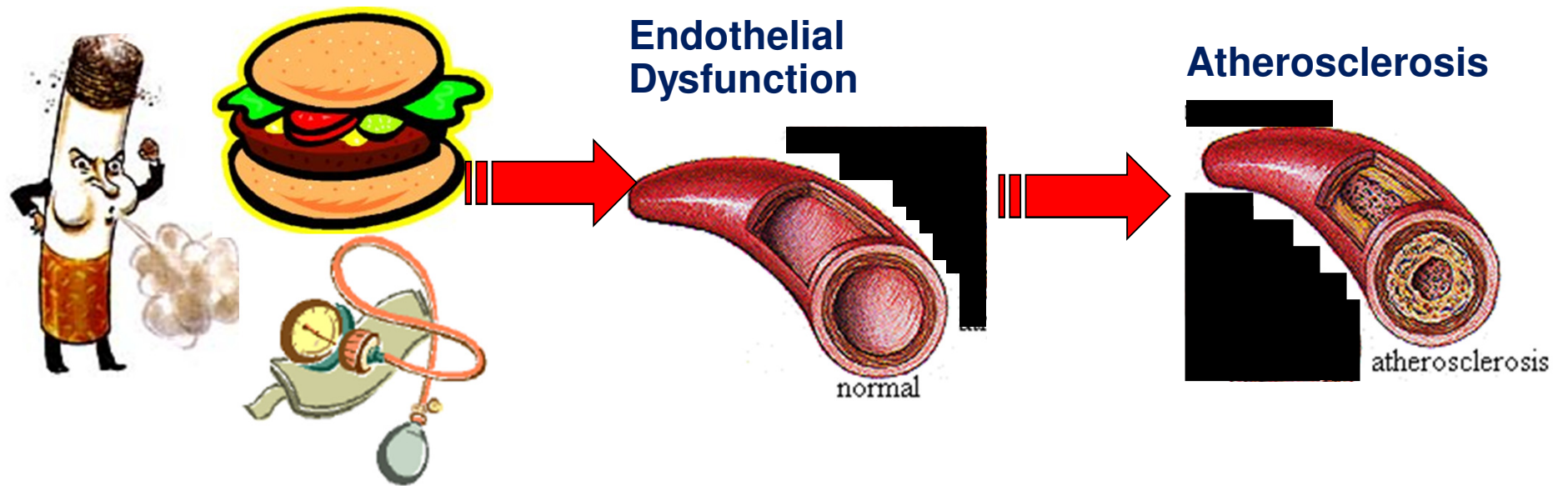


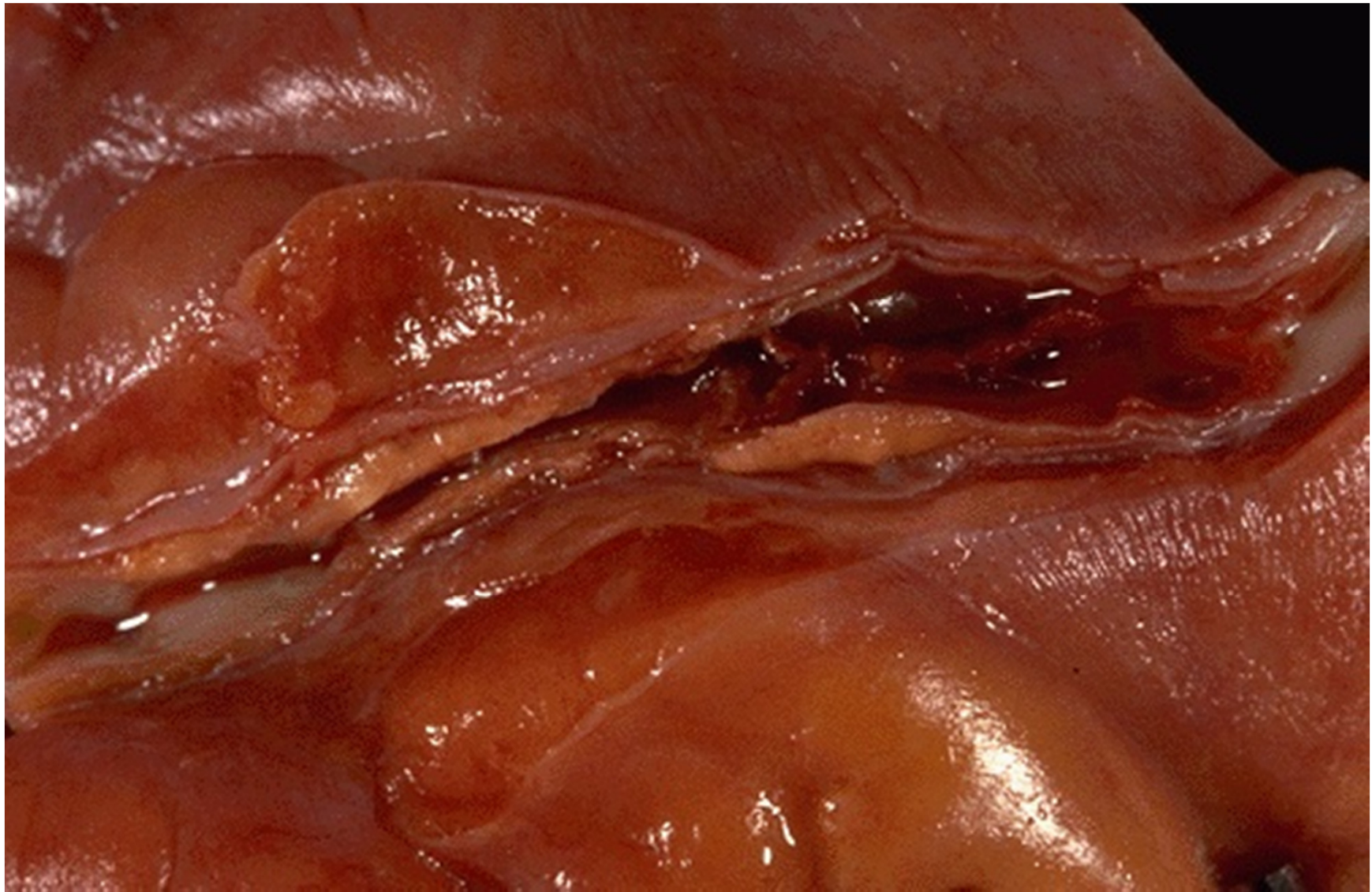
Atherosclerosis



Endothelial Dysfunction

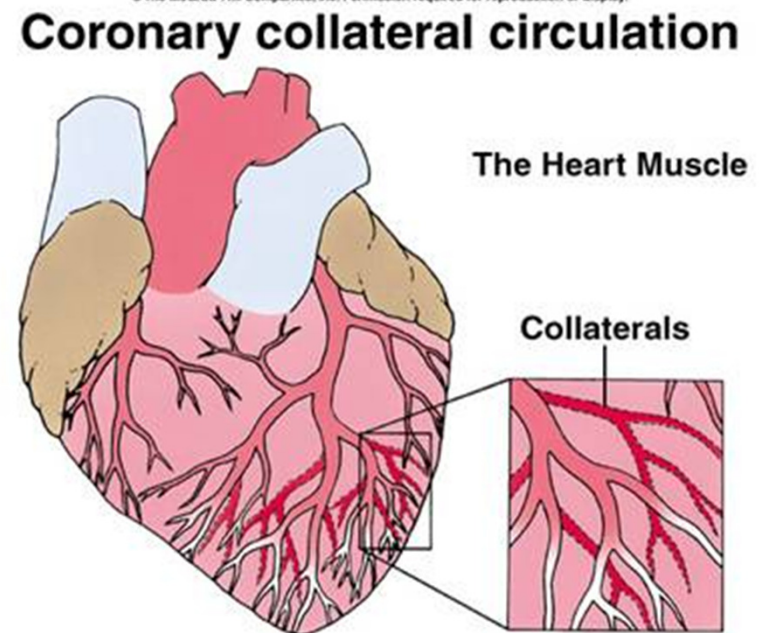
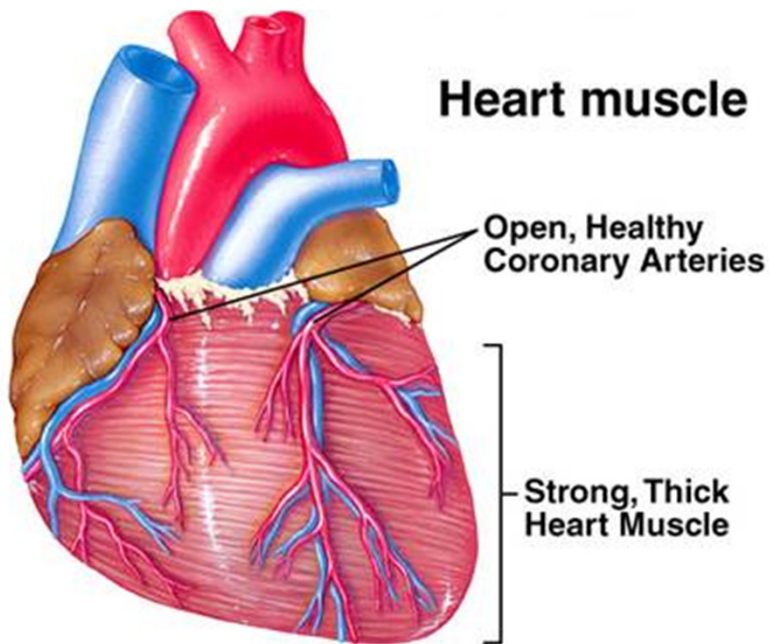
- **Endothelial Dysfunction:** Impaired ability to dilate in response to a blood flow stimulus or acetylcholine





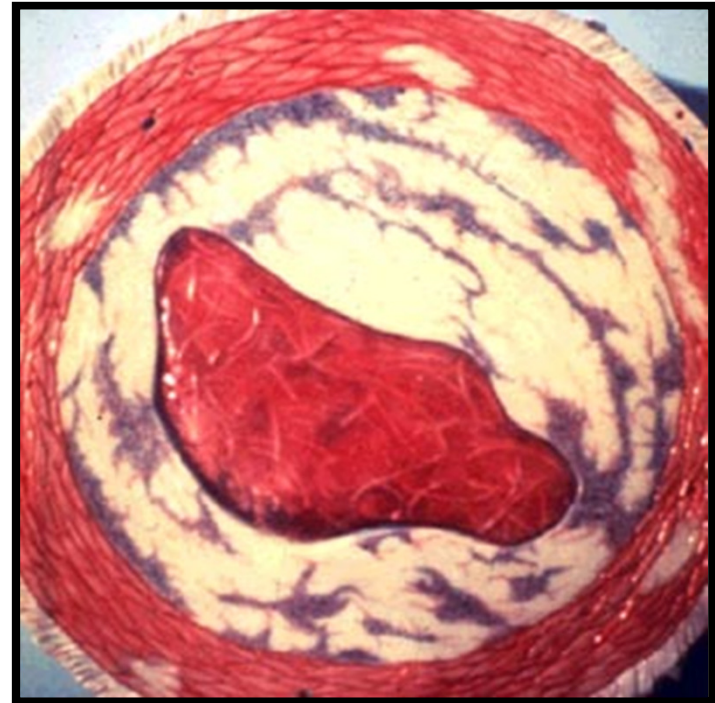
Physical Activity and the Healthy Heart

- Produces a strong heart muscle
- Promotes good collateral circulation

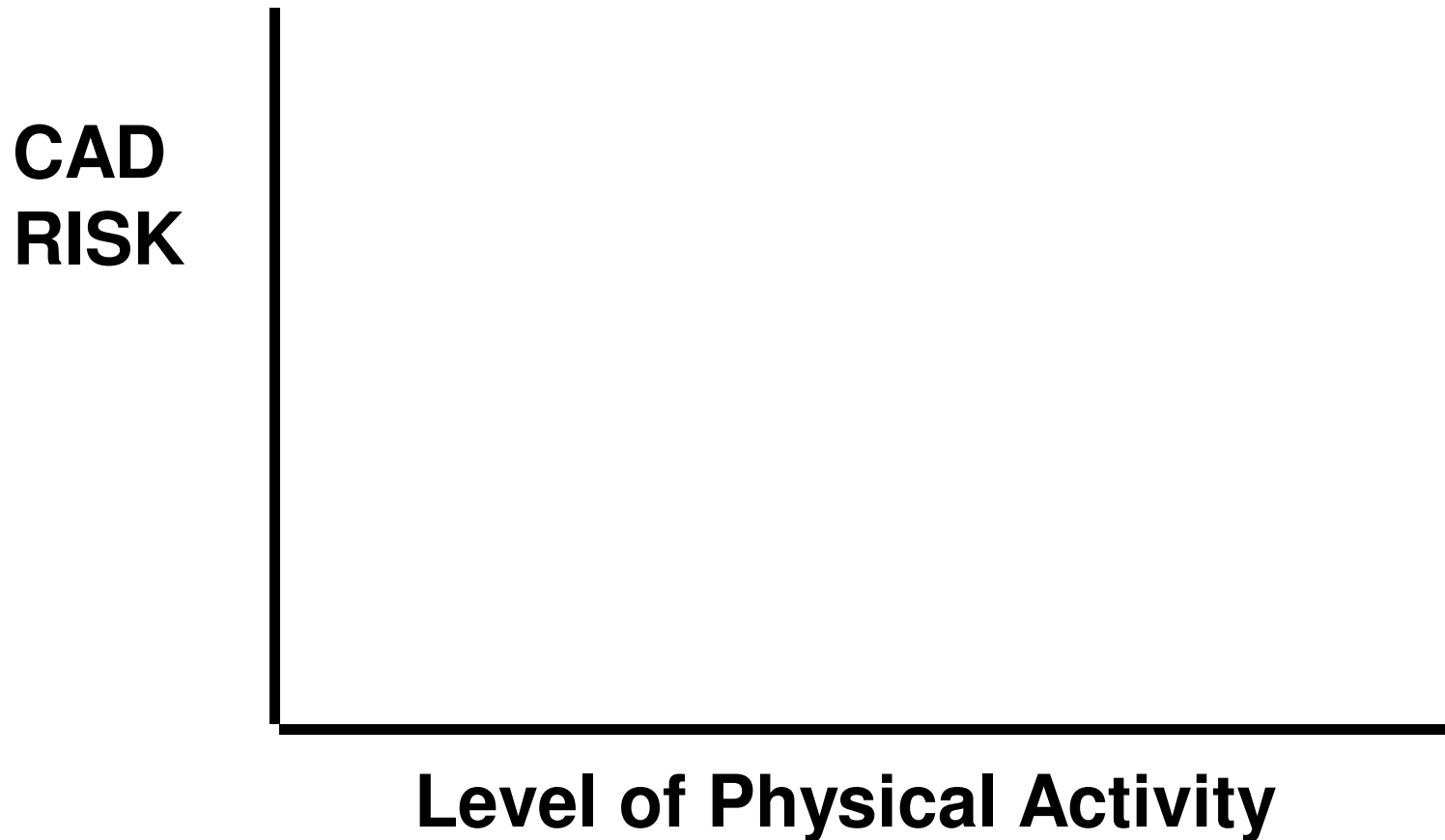


Physical Activity and Atherosclerosis

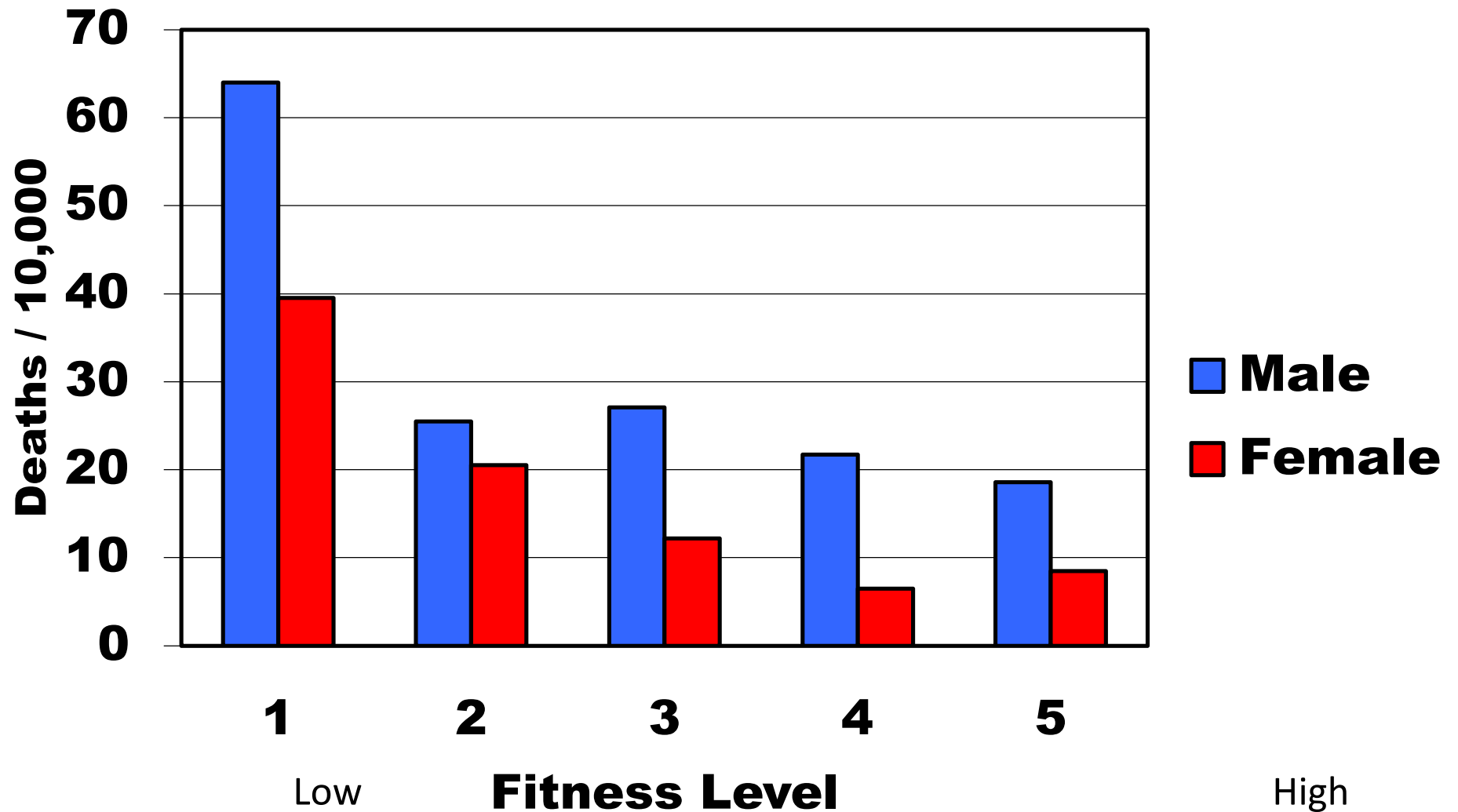
- Lowers blood lipid levels
- Increases HDL cholesterol (the “good” cholesterol)
- Reduces fibrin deposits (blood coagulation and adhesion of fat molecules to walls of vessels)



Activity Reduces Coronary Artery Disease Risk



CAD Death Rates and Fitness Levels



Physical activity and CAD

- Exercise protects against CAD by:
 - Normalizing blood lipid profile
 - Lowered blood pressure and resting heart rate
 - Improved myocardial circulation and metabolism (protects heart during hypoxic stress)
 - Reduces stress and tension

Physical Activity and Cardiovascular Diseases

Metabolic Syndrome

- Clustering of individual conditions or risk factors leading to negative metabolic profile
- Presence of **3 or more** of the following conditions:
 - High fasting blood glucose levels (5.6 mmol/L or higher)
 - High blood pressure (130/85 mmHg or higher)
 - High level of triglycerides (1.7 mmol/L or higher)
 - Low levels of HDL, the “good” blood cholesterol (lower than 1.0 mmol/L in men or 1.3 mmol/L in women)
 - Abdominal obesity [a waist circumference of greater than 102 cm (40 inches) in men and greater than 88 cm (35 inches) in women]

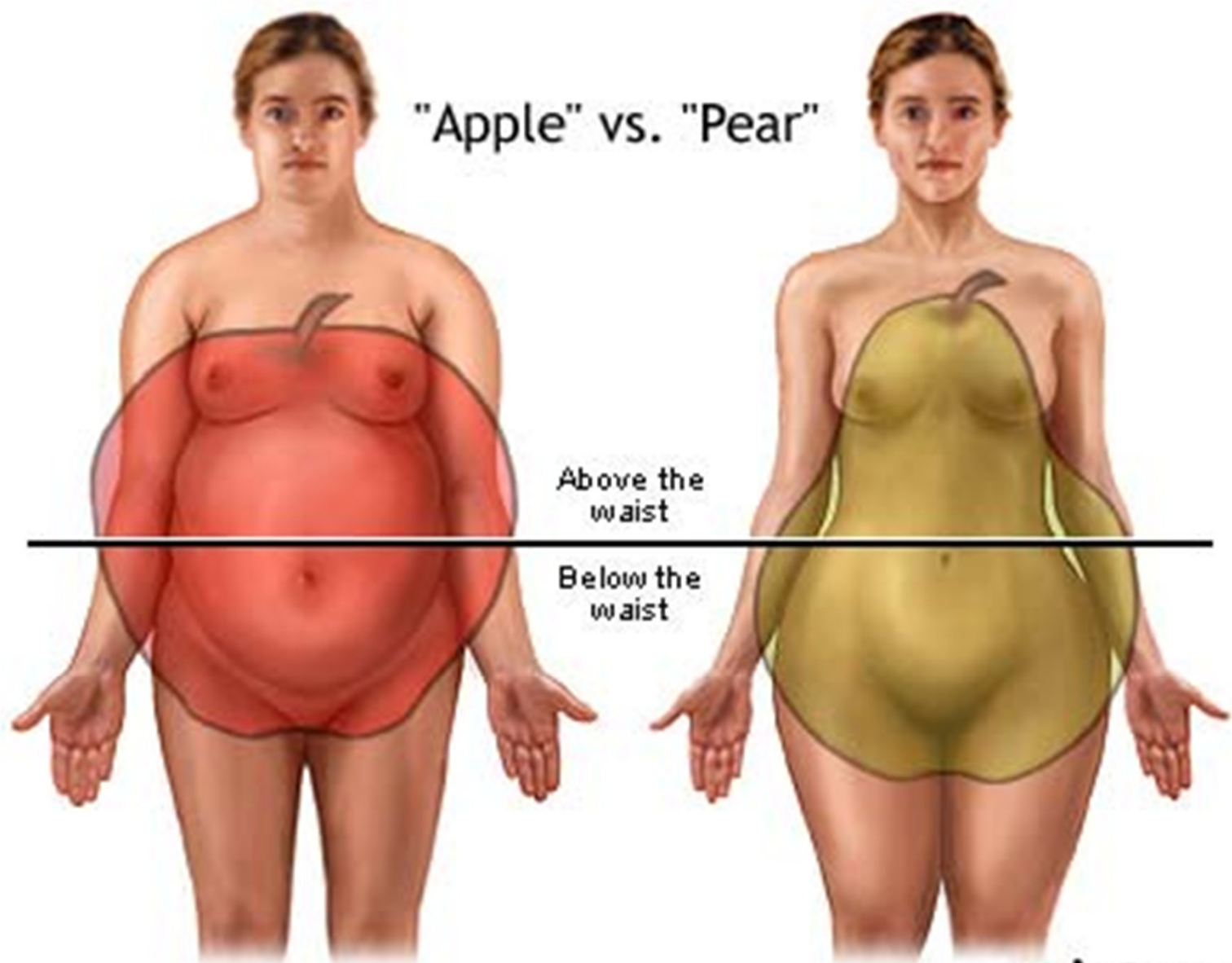
Prevalence

- Affects approximately one in four Canadians
- Varies significantly among ethnic groups; particularly high in Aboriginals
- Due to a steady rise in obesity and an aging population, frequency of metabolic syndrome is expected to increase significantly
- Observed in children and adolescents as well as adults

Complications and Treatment

- May serve as early warning sign for future health problems
- Target and treat individual risk factors to bring them to healthy ranges
- Recommend Weight Reduction and Lifestyle Changes
- No one medication in Canada is indicated to treat the metabolic syndrome

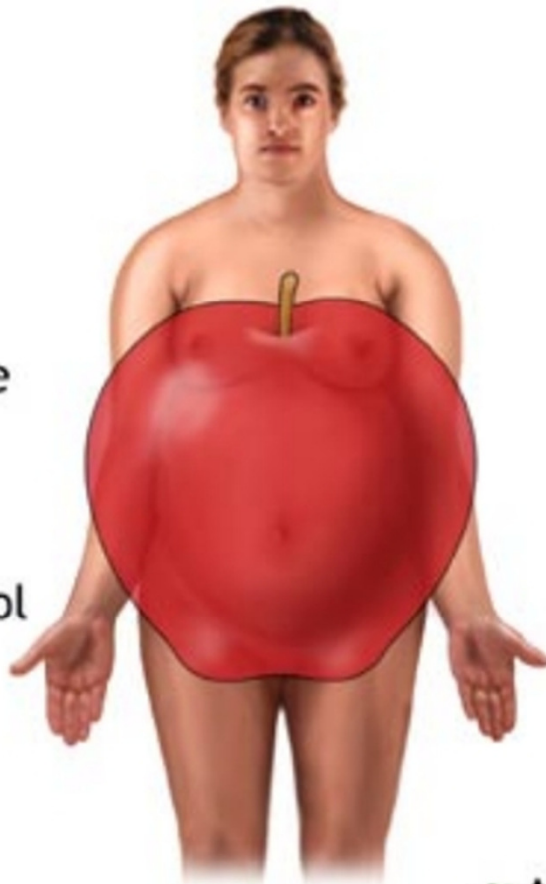
"Apple" vs. "Pear"



Metabolic Syndrome Summary

Metabolic syndrome
(Syndrome X)

- Central obesity
- High blood pressure
- High triglycerides
- Low HDL-cholesterol
- Insulin resistance



ADAM.

