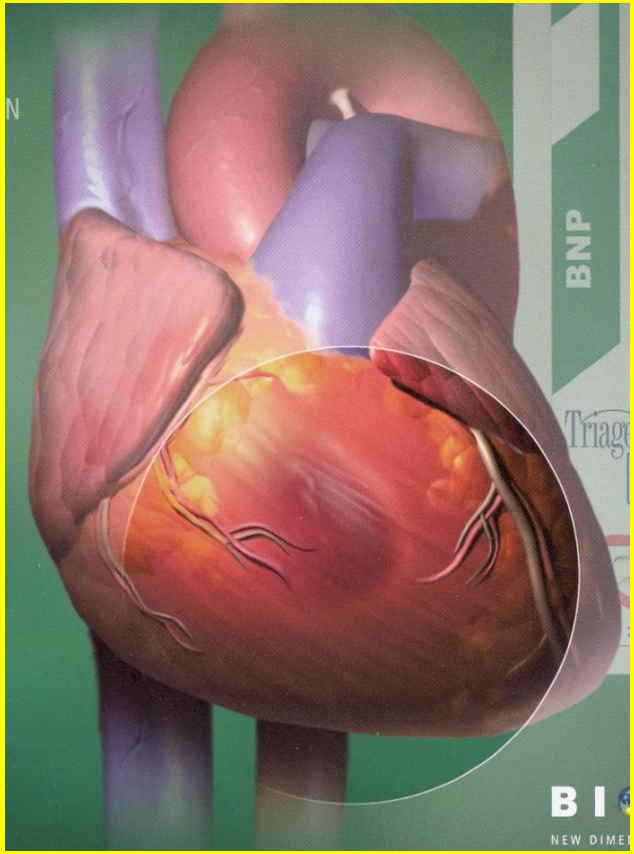
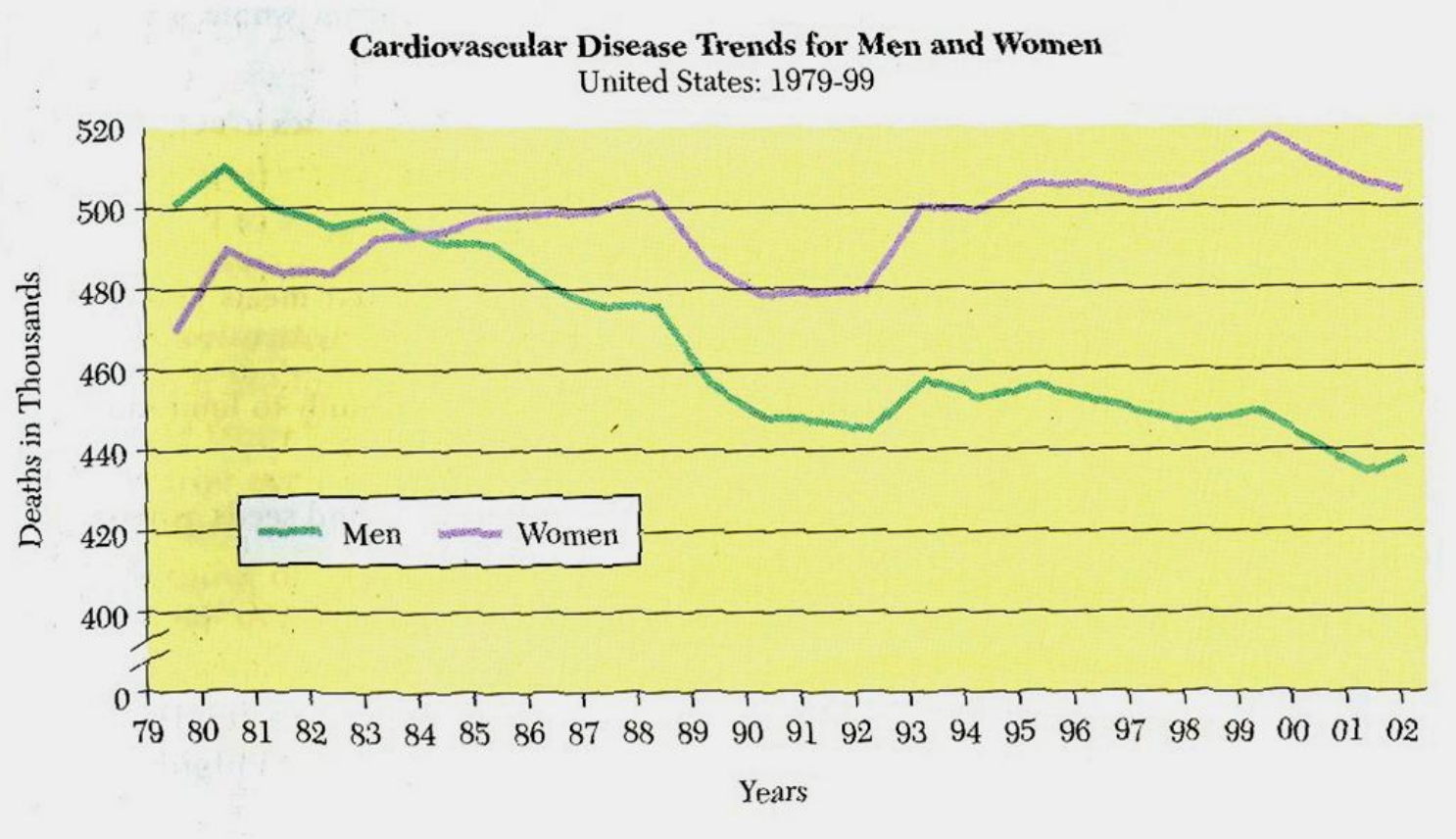
Cardiovascular Disease

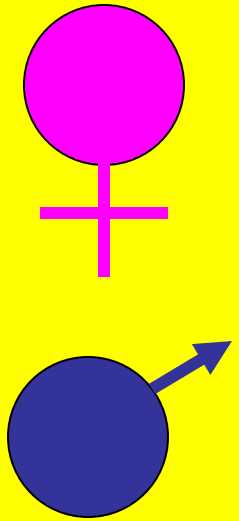


Cardiovascular disease: heart & blood vessels **(vascular)**

1. > 70 million people in US
2. Economic cost: $300 billion (2001)
3. **#1 killer**
4. **451,326** coronary heart disease deaths- 2004 **(1236/day)**
5. Stroke- related vascular disease: **#3 killer**

- Heart disease: a man's disease?
- #1 killer American women: more than men





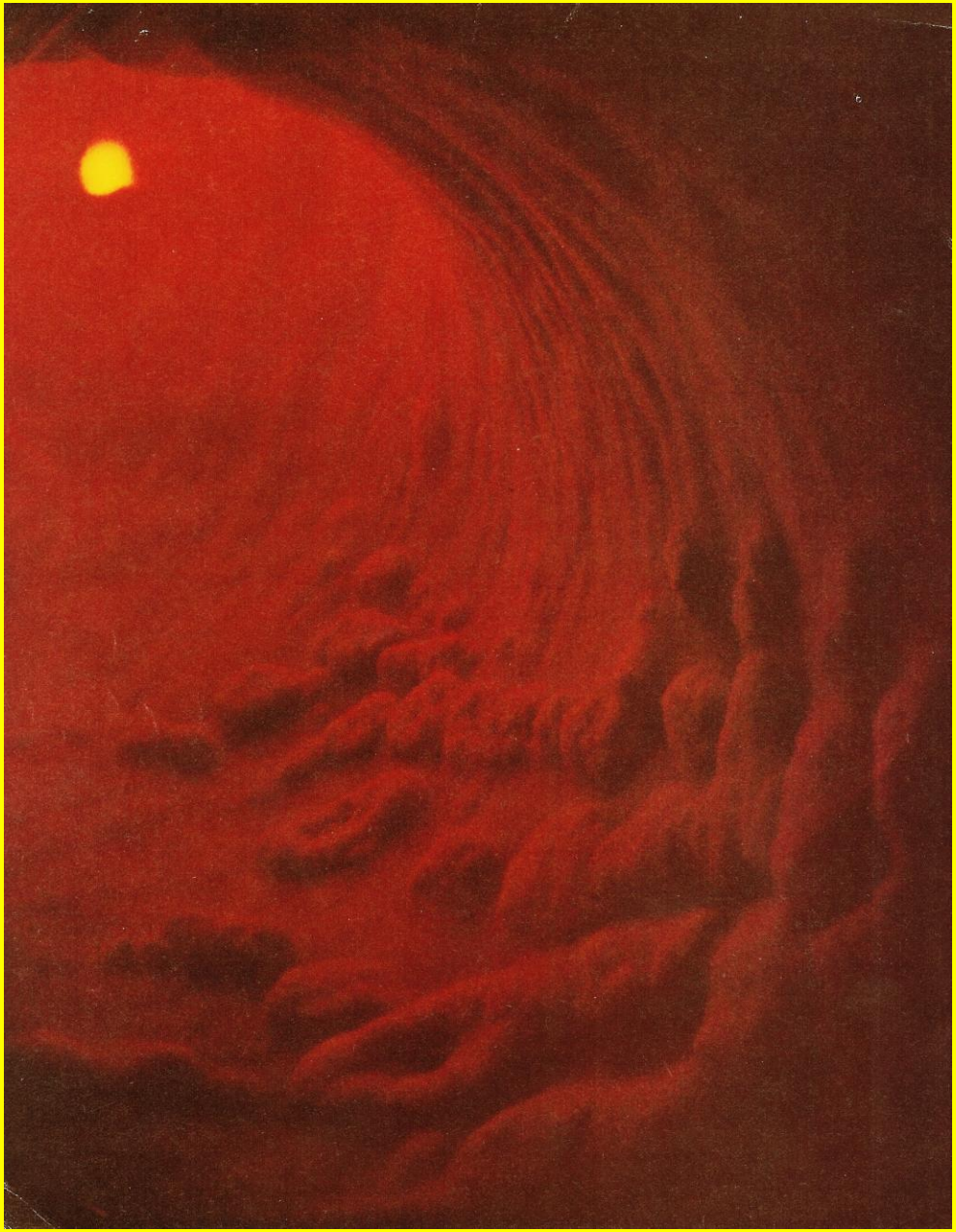
Underlying process:

Athere= porridge (Greek)

Sklerosis= hardness (Greek)

Arteriosclerosis: general- hardening of arteries

Atherosclerosis: arteries narrowed by fatty deposits (plaques)



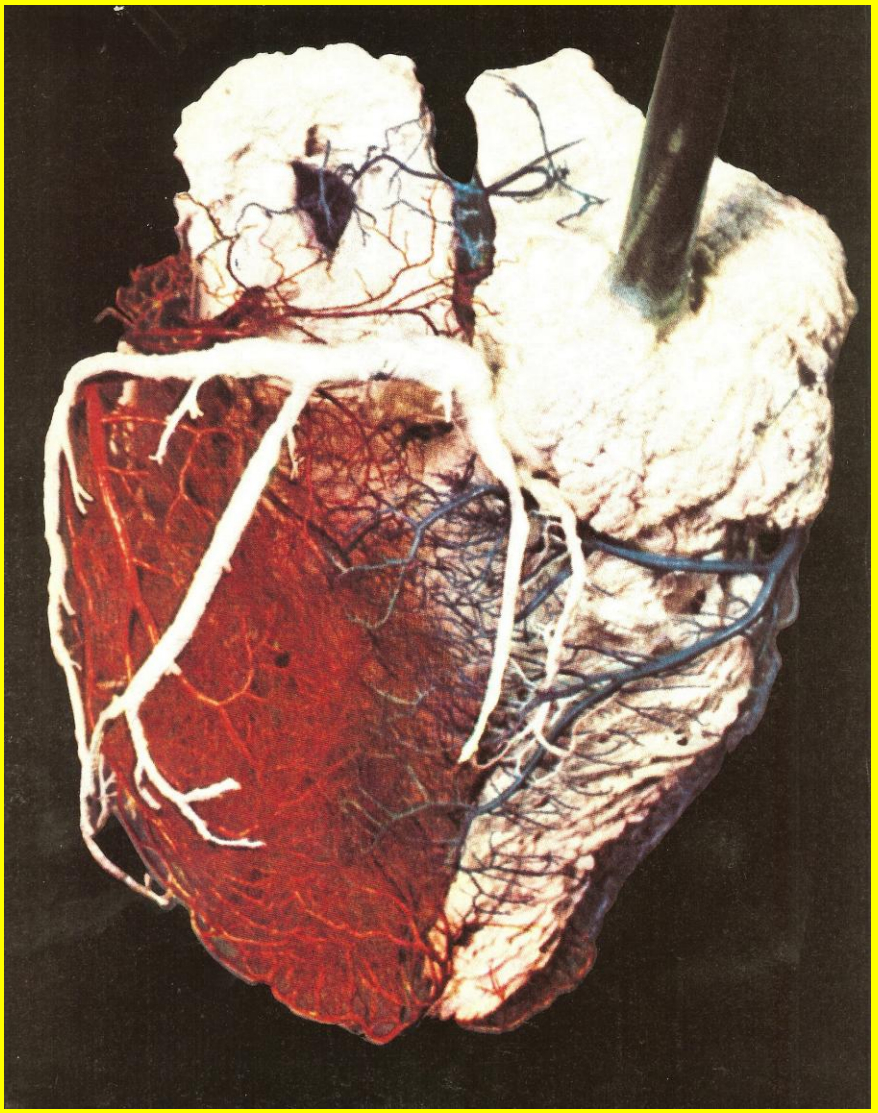
Do you have atherosclerosis? **YES**

- All humans have this disease **(susceptible)**
- Dogs/rats: **resistant**
- Going on slowly, quietly in you **now**
- Deposits throughout your arteries:

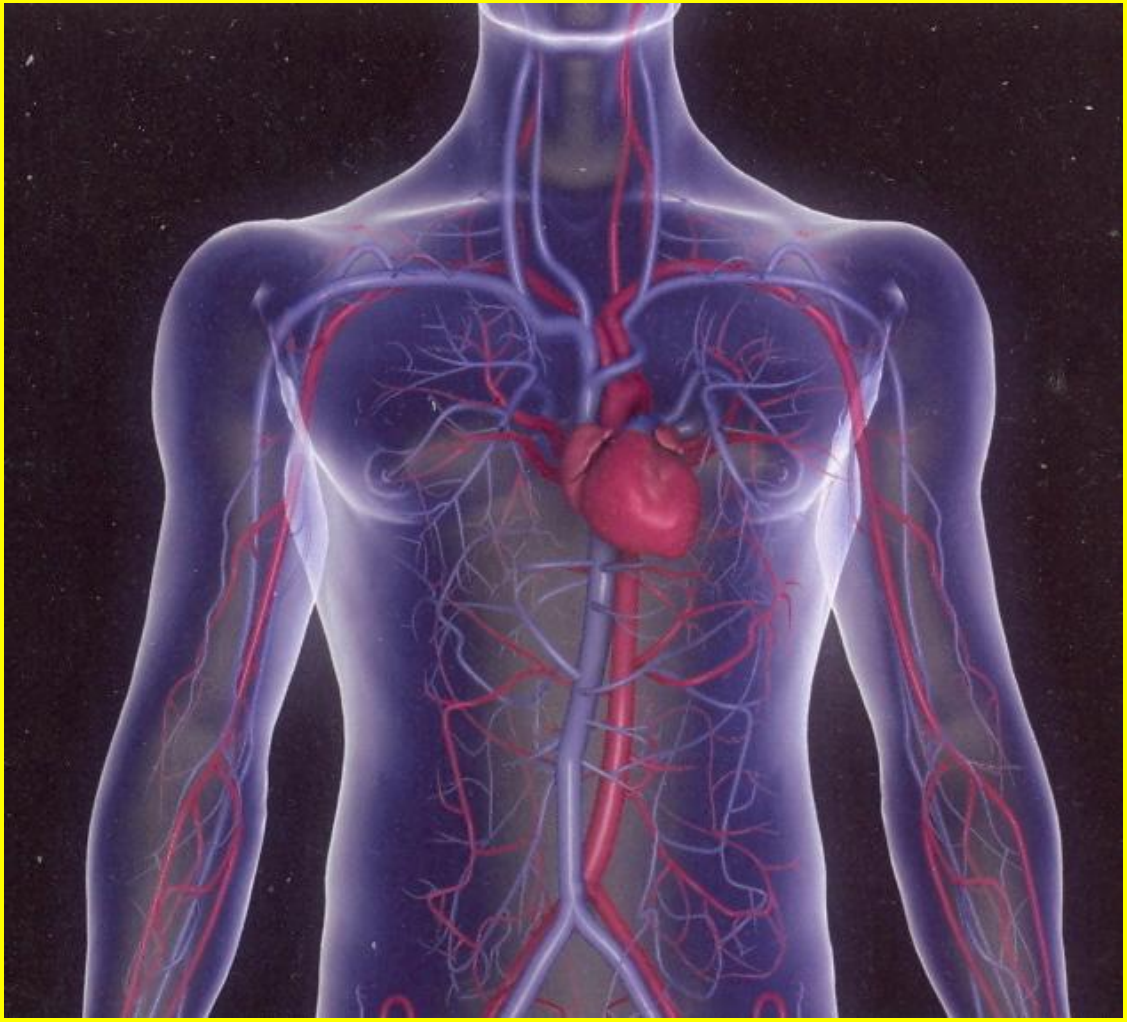
  Heart, brain, neck, arms/legs
- Arms: feel- small hard "pipes"

  (peripheral artery disease)

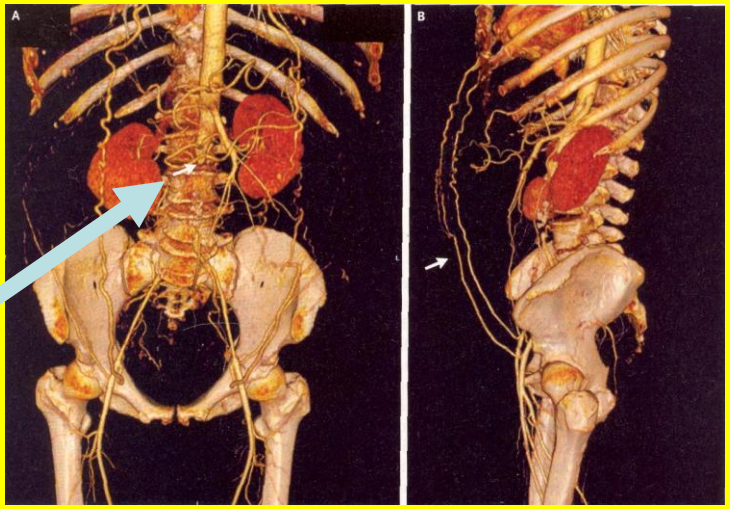
- Coronary= coronarius (Latin): a **crown** or circle
- **Coronary circulation**: encircles heart
- **Coronary Artery Disease**



Peripheral Artery Disease

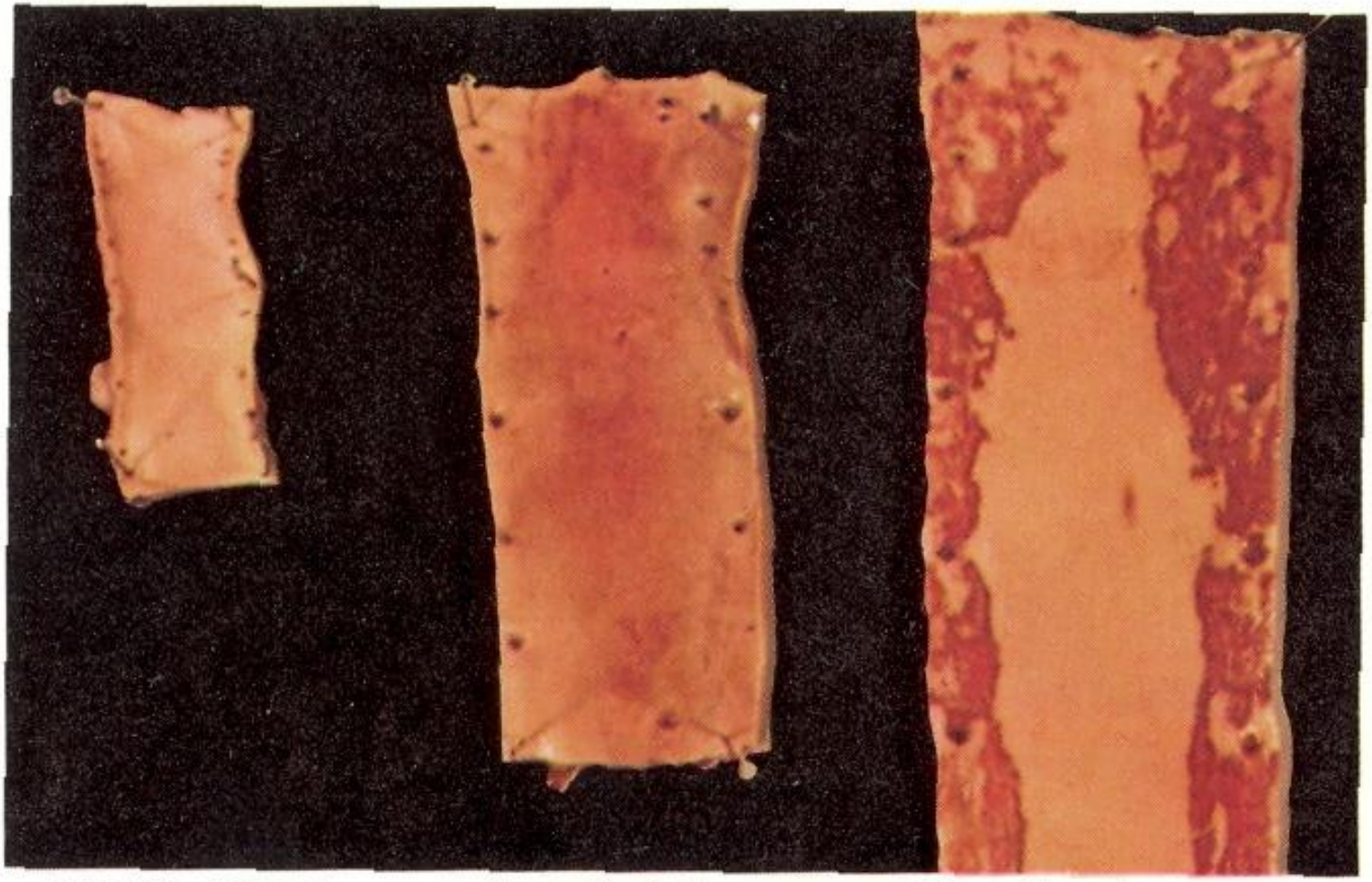


- 55 year old woman
  Awoke: numbness & weakness: both legs
- Smoker, ↑ blood lipids
  Angiogram: **blocked** lower aorta
- Treatment: antiplatelet, statin therapy, stop smoking, exercise
- OK at next hospital visit



When does atherosclerosis start?

- Children: see artery **thickenings** & **"fatty streaks"** (5-12 years)
- Early **lesions** (injury): coronary arteries & aorta: seen sometimes-newborn babies & fetuses
- Suggests: prenatal environment-role in atherosclerosis



Juvenile intimal thickening

Juvenile fatty streaks and diffuse sudanophilia

Transitional fatty streaks in a young adult

A Pediatric Disease

- Many doctors: atherosclerosis is a **"pediatric disease":** begin early **prevention**
- **2008 AHA study: Thickening in arteries: obese 10 year olds= 45 year old adult**
- **"You are as old as you arteries are"**

Evolution of atherosclerosis:

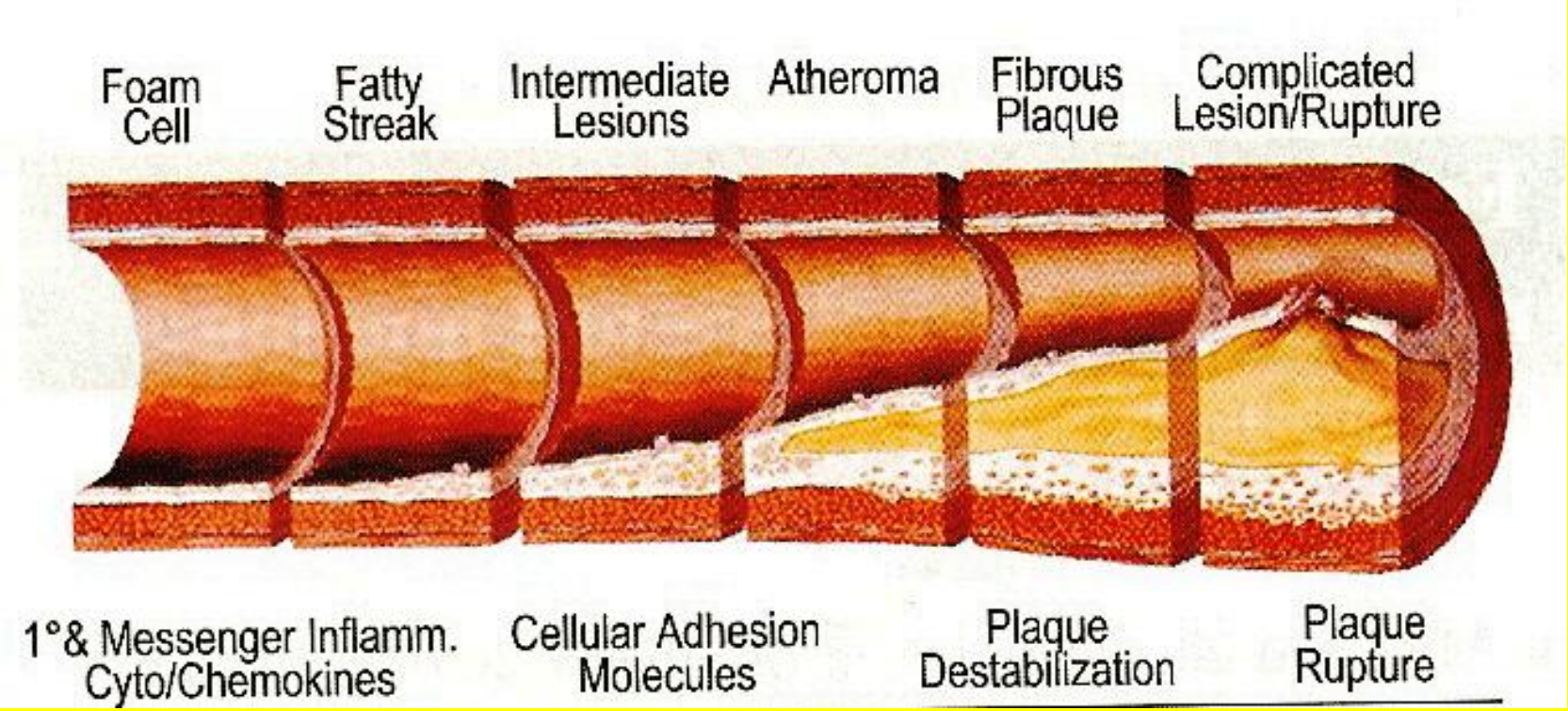
Early **thickenings**

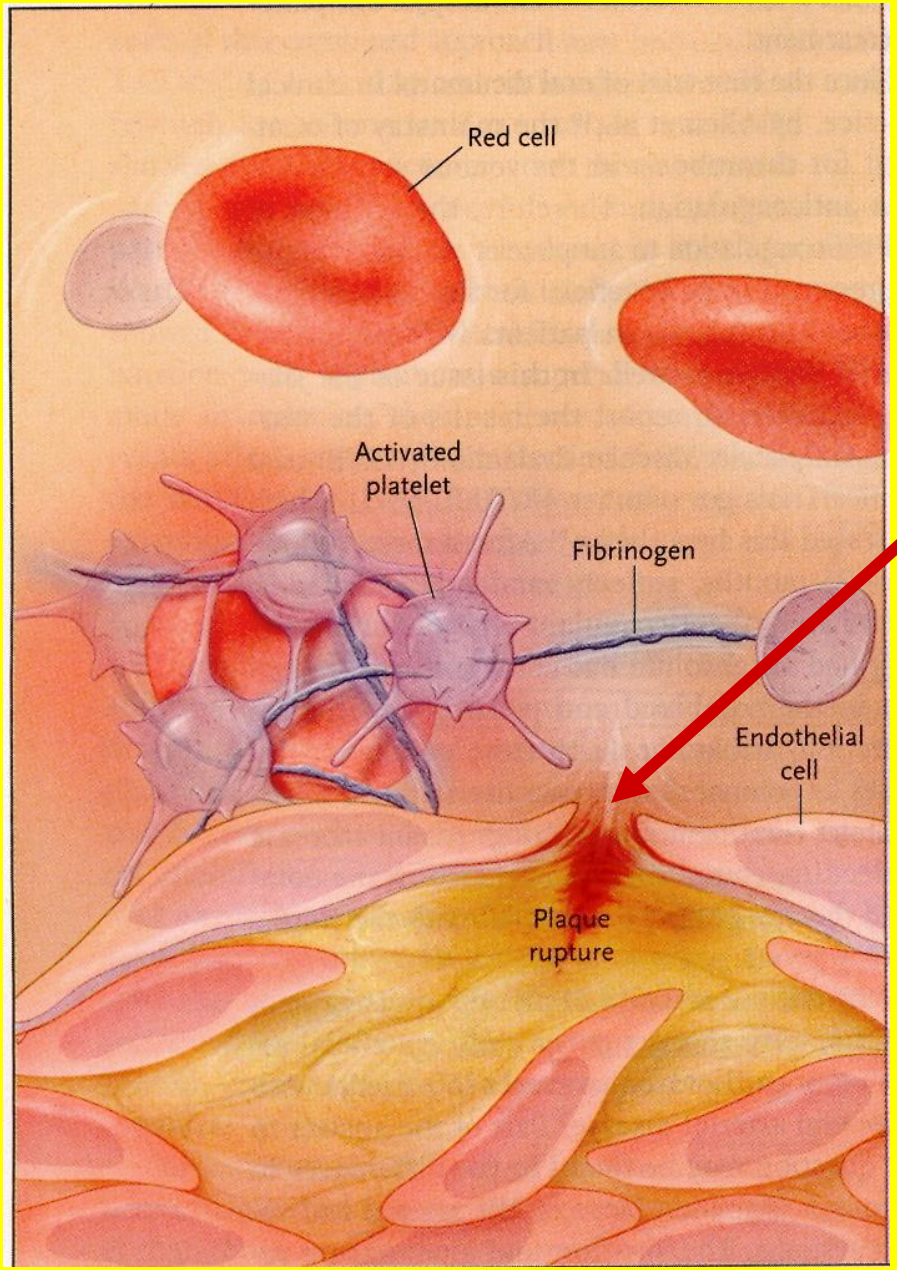
fatty streak

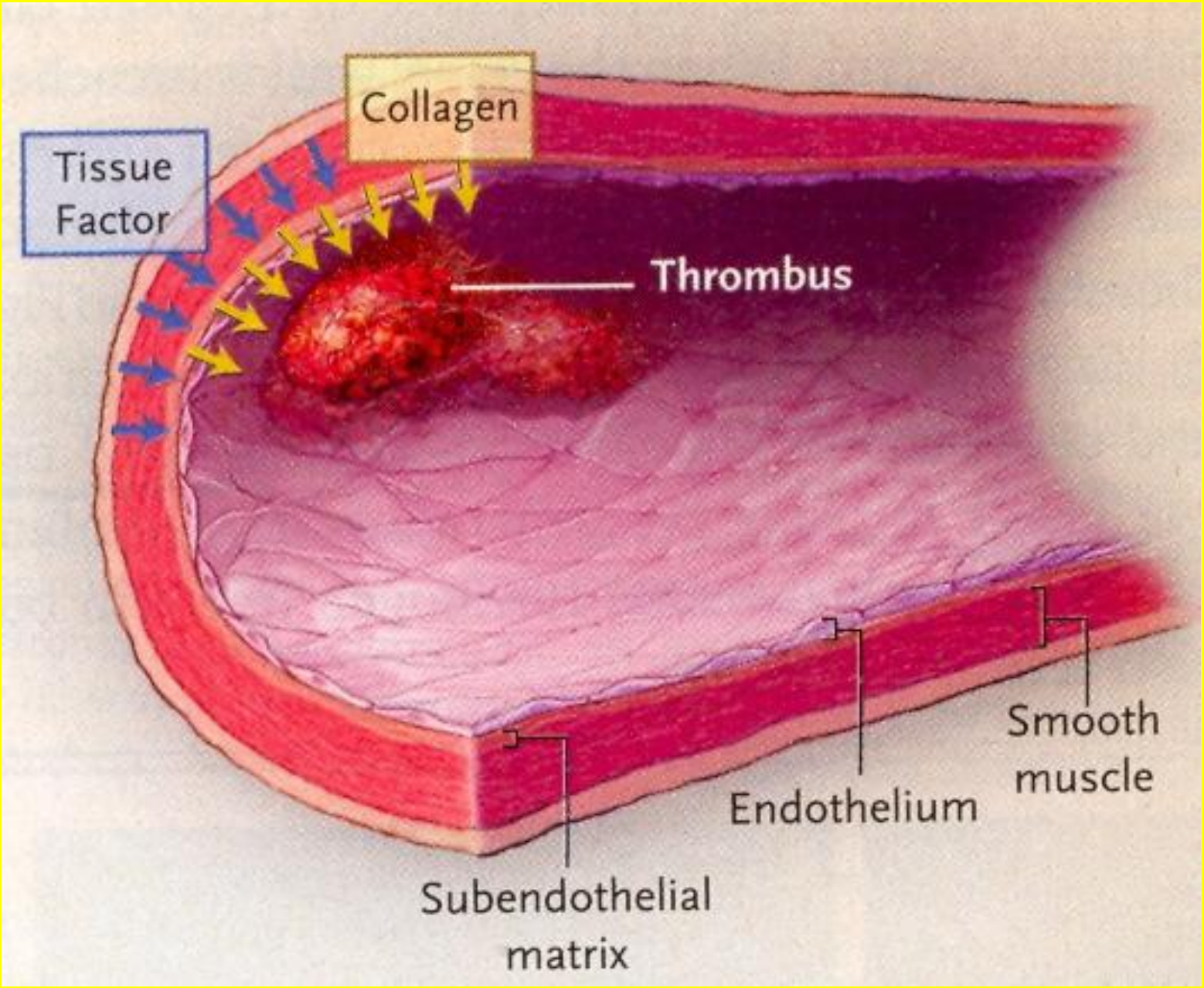
fibrous plaque

advanced, **complicated lesion**

(vulnerable to **burst**)


Foam Cell
Fatty Streak
Intermediate Lesions
Atheroma
Fibrous Plaque
Complicated Lesion/Rupture
1°& Messenger Inflamm. Cyto/Chemokines
Cellular Adhesion Molecules
Plaque Destabilization
Plaque Rupture

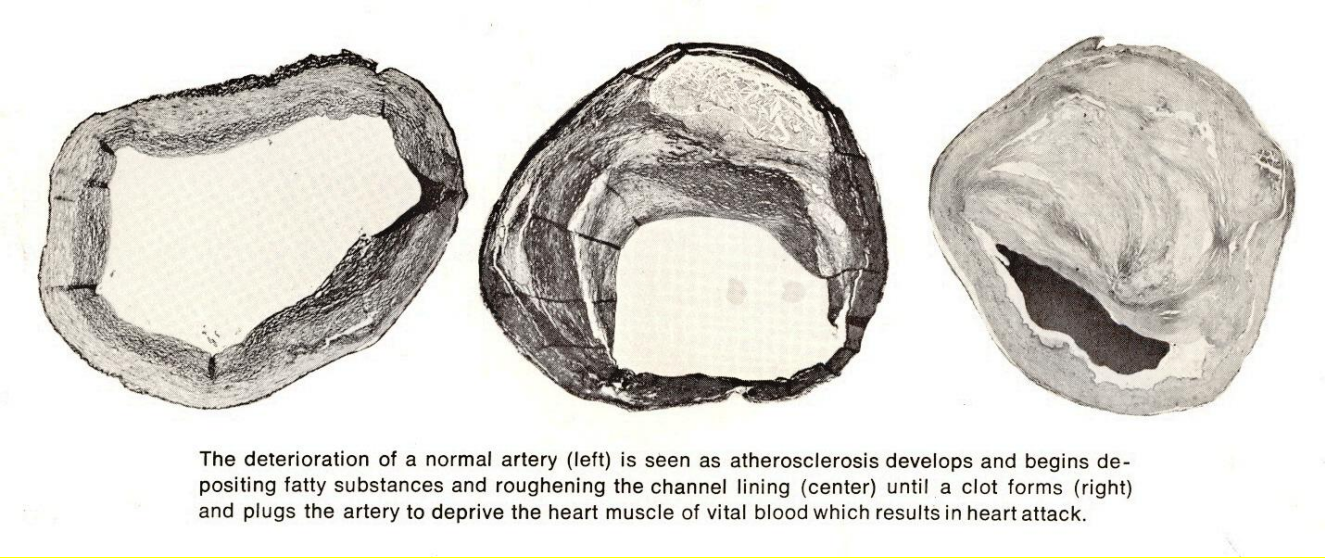

Red cell
Activated platelet
Fibrinogen
Endothelial cell
Plaque rupture


Collagen
Tissue Factor
Thrombus
Smooth muscle
Endothelium
Subendothelial matrix

- American soldiers (19-20) killed:

  Korean War

  Viet Nam War
- Autopsies: extensive atherosclerosis



The deterioration of a normal artery (left) is seen as atherosclerosis develops and begins depositing fatty substances and roughening the channel lining (center) until a clot forms (right) and plugs the artery to deprive the heart muscle of vital blood which results in heart attack.

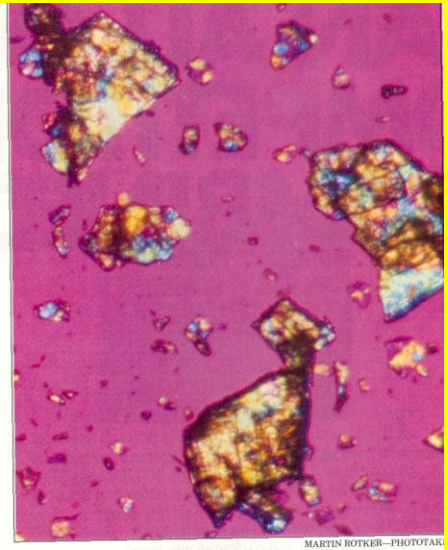
- Thomas Herrion: 23 year old, 6’ 3”, 315 pound lineman: San Francisco 49ers
- 2005: died suddenly after exhibition game
- Significant blockage: right coronary artery
- Enlarged heart; no drug abuse

1984 Stormie Jones: 6 year old girl Texas

- Wartlike bumps: elbows, knuckles, knees, toes: started: age 3 months

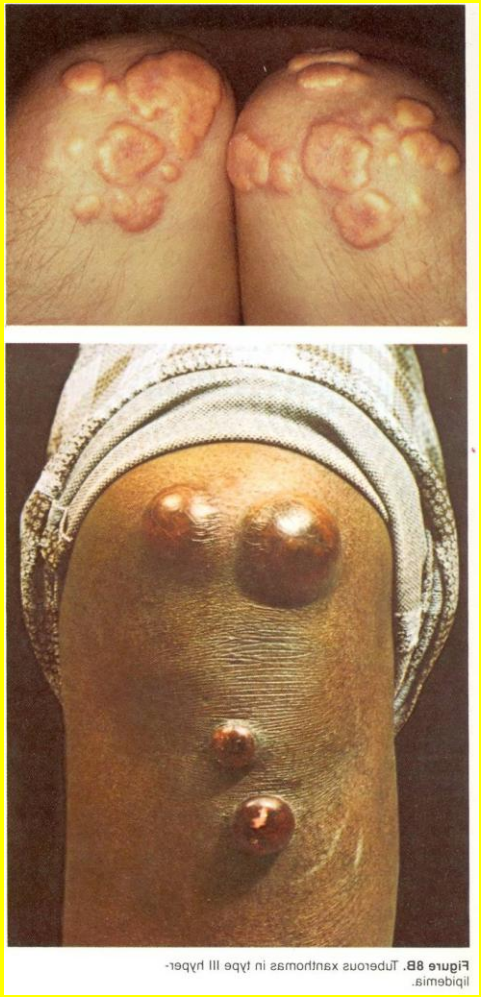
Stormie at Pittsburgh Children's Hospital

- Bumps: cholesterol deposits under skin



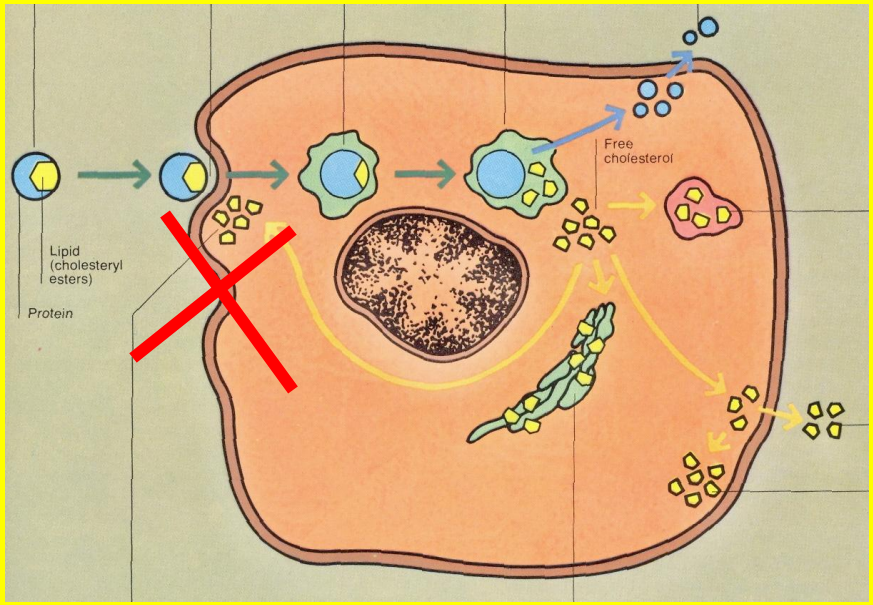
MARTIN ROTKER—PHOTOTAKE

A waxy, fatlike public enemy: *Pure cholesterol crystals*



- Sign of: **Familial Hypercholesterolemia**
- LDL cholesterol: 9X normal
- Genetic defect: 2 **bad** copies of gene → **LDL receptor**
- 1 in million people

- LDL receptors: **membranes** of **liver**/other cells
- Like **"magnets"** pull LDL out of blood
- No receptors: LDL stays in blood



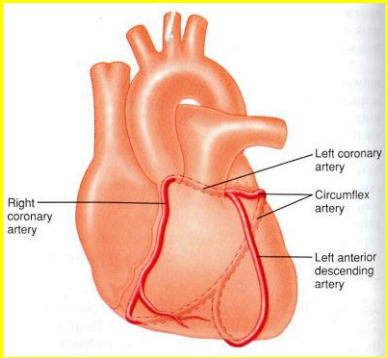
atherosclerosis

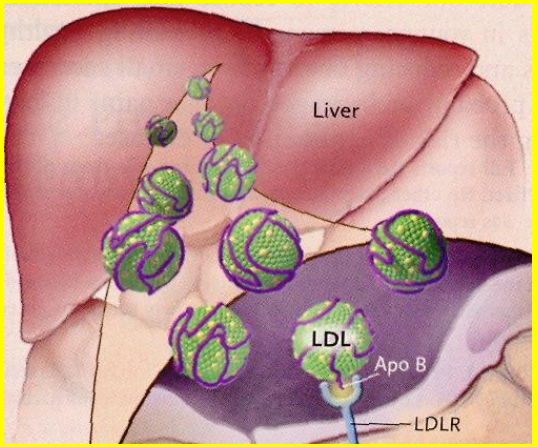
- October 12, 1984: **heart attack**
- Days later: chest pains, 2 bypass operations- no help
- Last ditch effort: 15 hour operation- transplant heart & liver

Stormie at Pittsburgh Children's Hospital

Why double transplant?

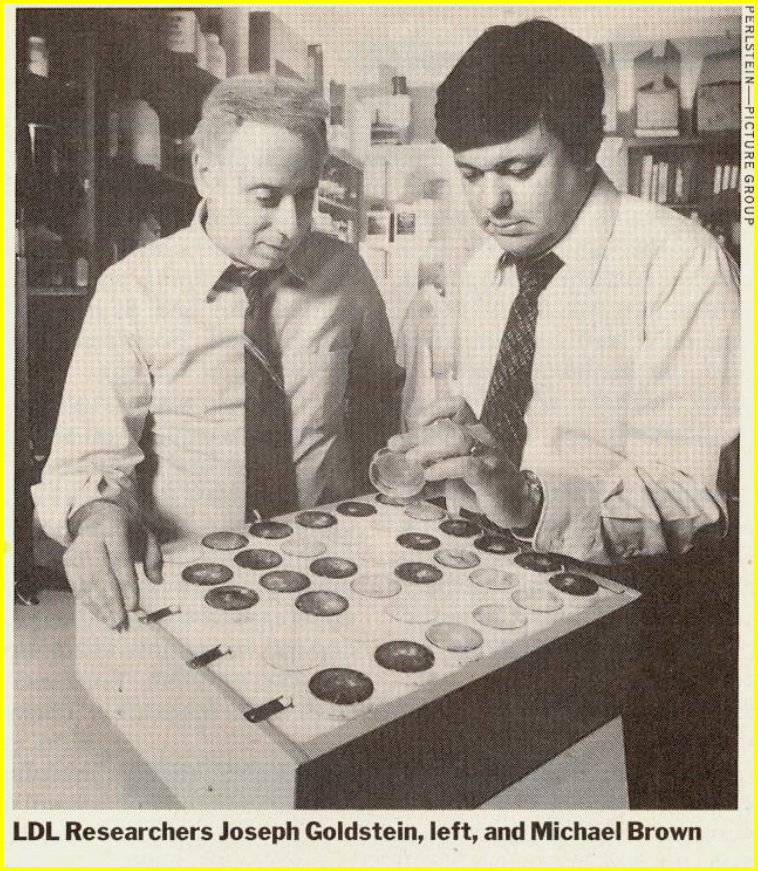
- She received heart without clogged arteries





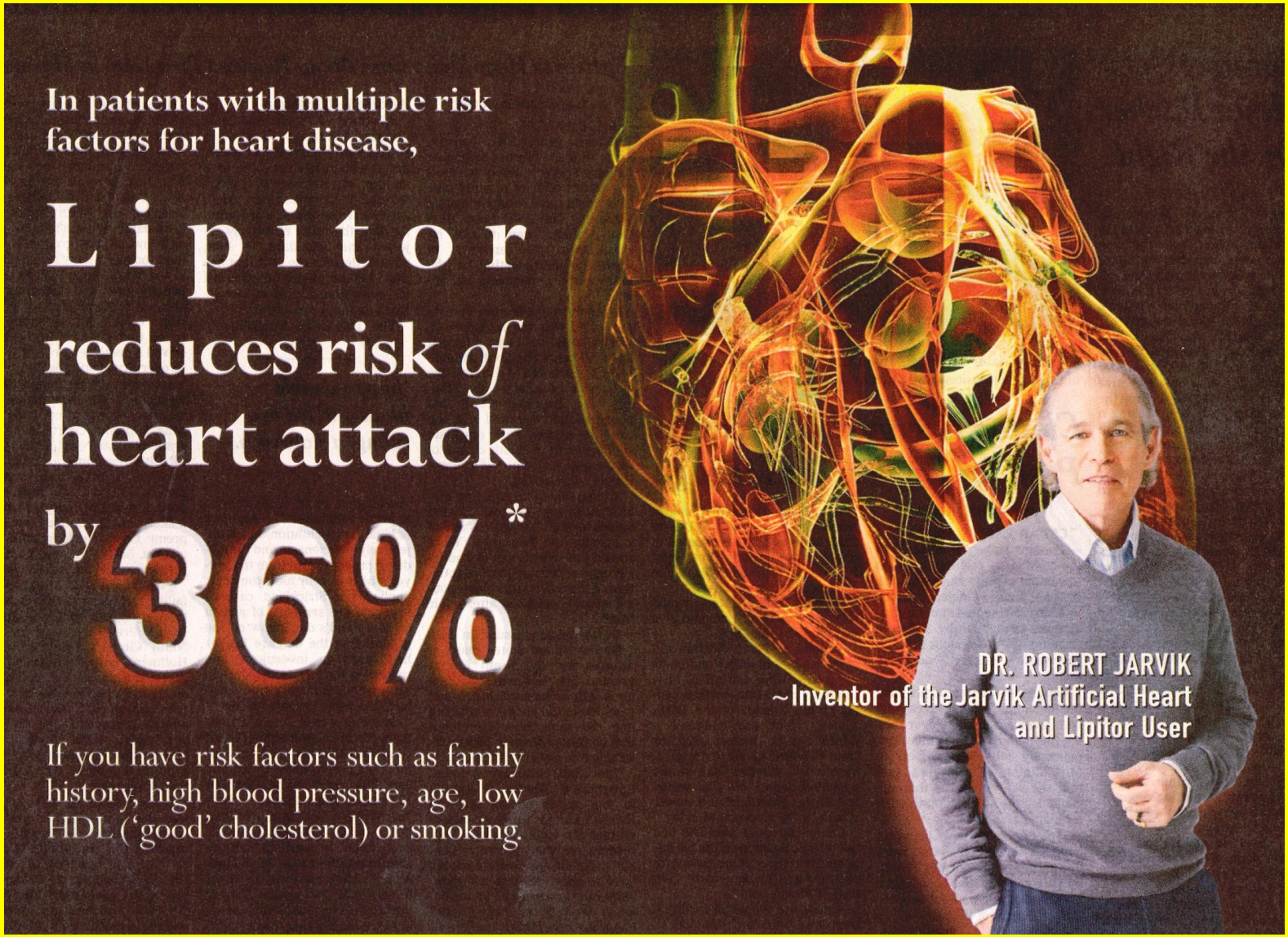
- She received good liver with **active** LDL receptors: help lower blood cholesterol

- Stormie Jones helped Drs. Michael Brown & Joseph Goldstein (UT) discover LDL receptor defect
- Nobel prize 1985

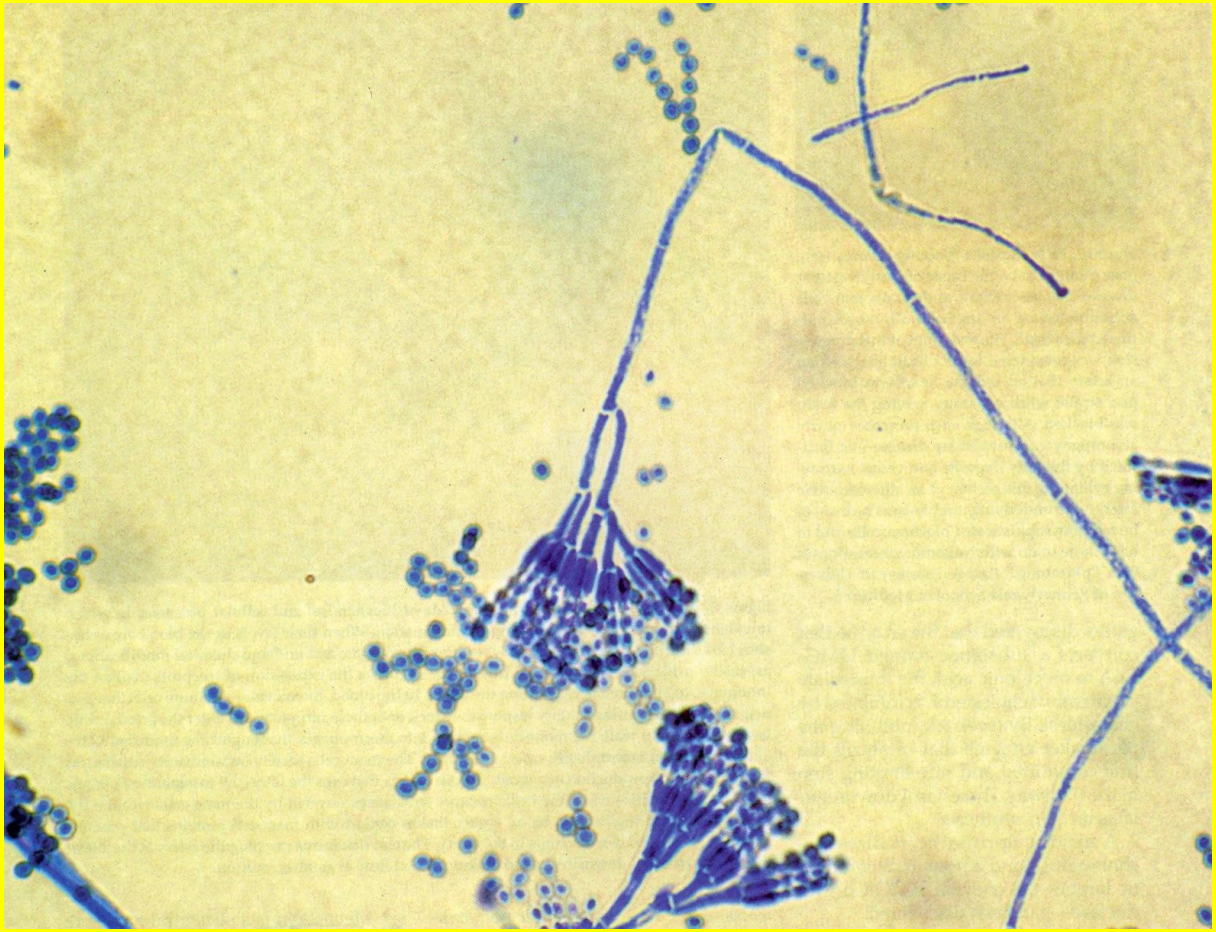


LDL Researchers Joseph Goldstein, left, and Michael Brown

Basis of **statin** therapy (Lipitor)

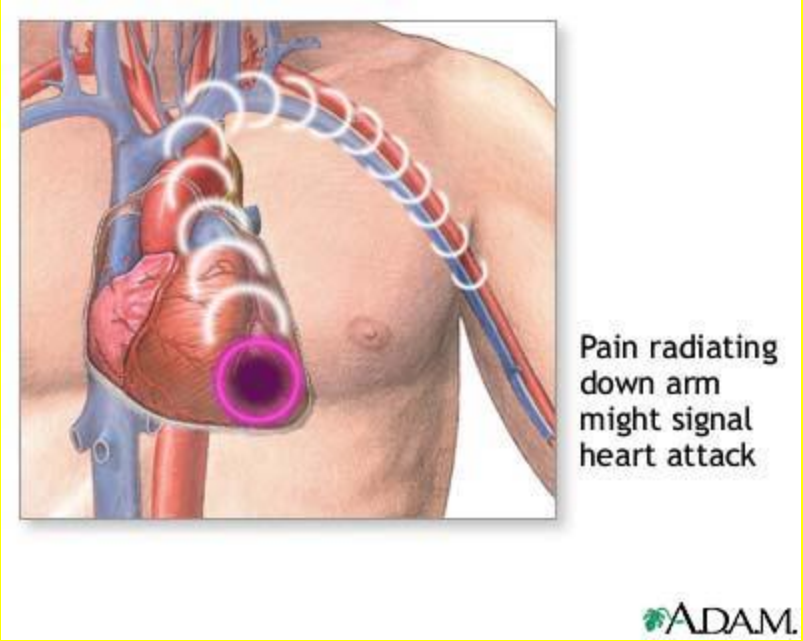


First statin isolated from fungus (*Penicillium citrinum*)



Atherosclerosis: What are its symptoms?

- None: early on
- Later: artery clogged in heart: heart attack



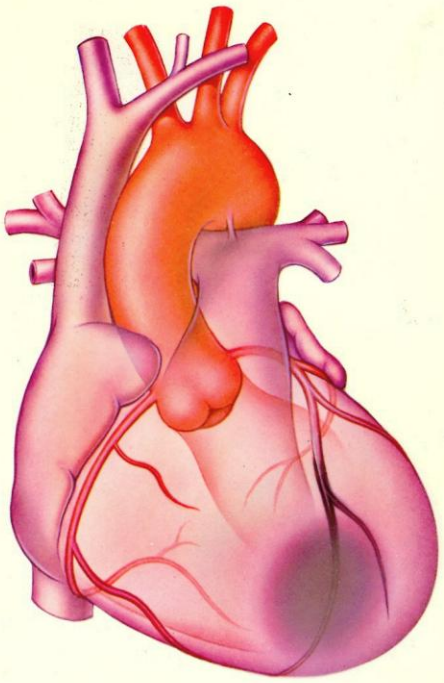
- Myocardium- heart muscle
- Infarct: tissue death/no blood supply
- MI

Uncontrolled high blood pressure increases the risk of…

Heart attack

- One of the arteries supplying the heart with blood can become *completely* blocked.
- The part of the heart muscle that doesn't get blood dies from lack of oxygen. This can be life-threatening.

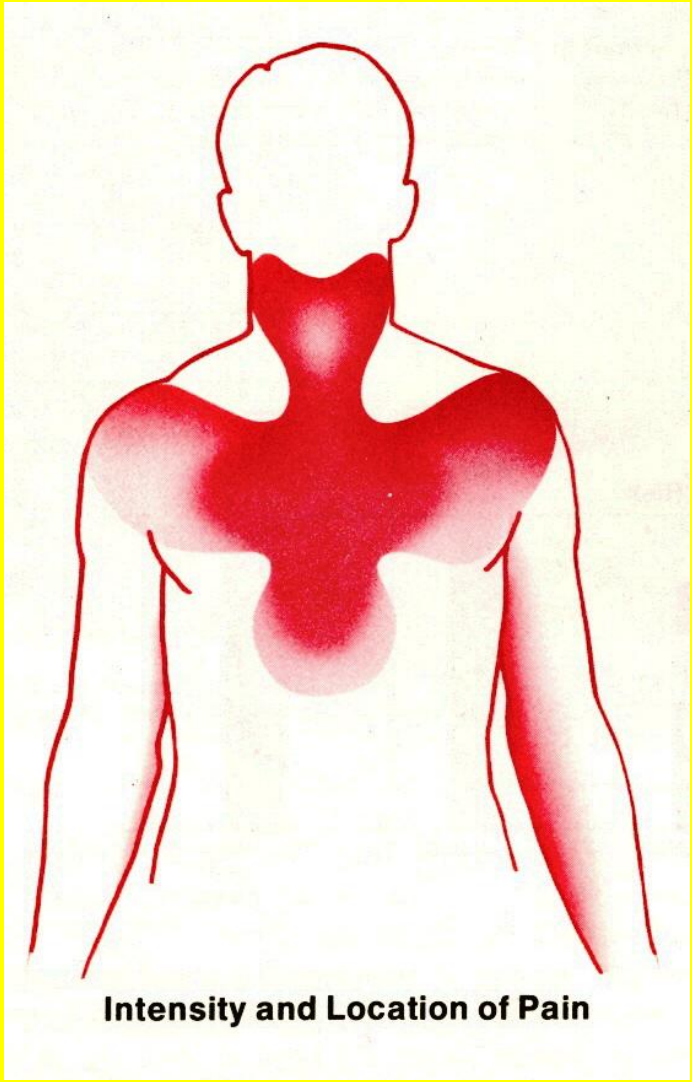
Medical term:
Myocardial infarction (MI)



Heart attack: Warning signs

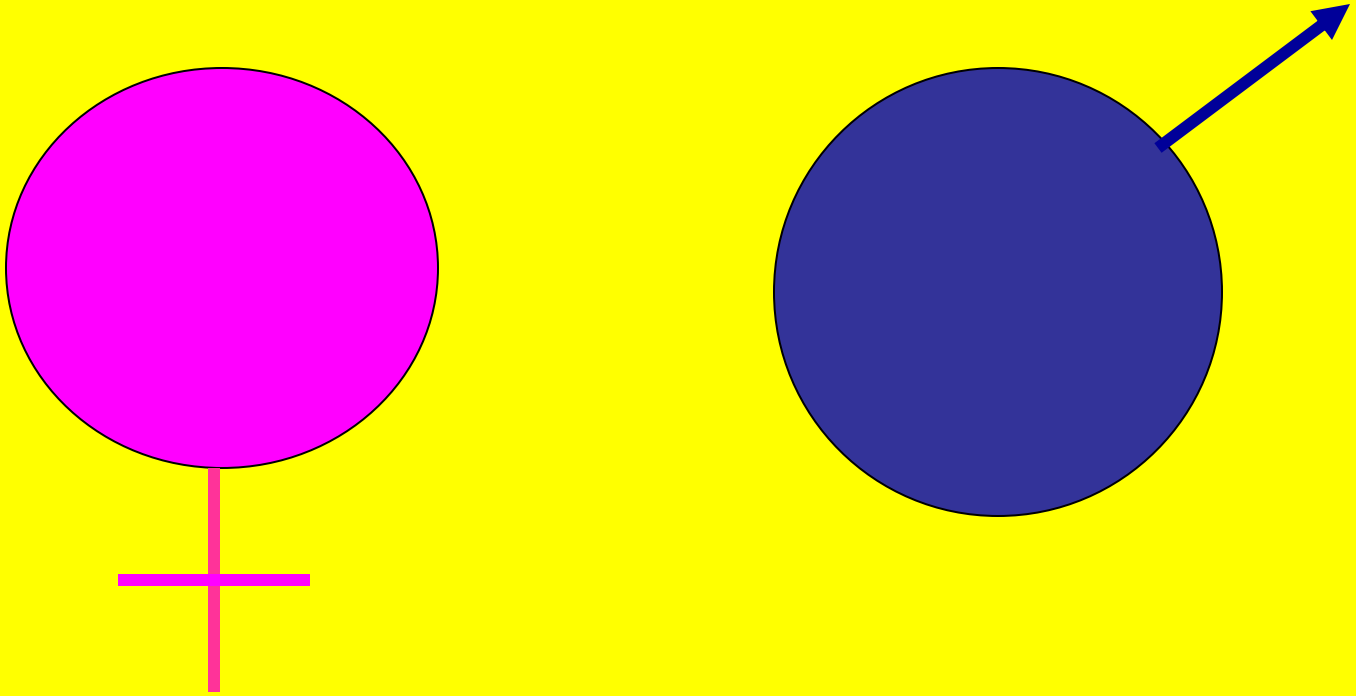
- Heavy pressure, fullness, squeezing pain in center of chest
- Pain may spread: arms, back, neck, jaw, or stomach
- Cold sweat
- Nausea and vomiting
- Lightheadedness

Heart Attack Pain: may spread



Heart Disease: Women vs. Men

- Men affected by heart disease **10** years **earlier** than women



- Until puberty: boys & girls same **HDL levels**
- At puberty: boys ↓ HDL

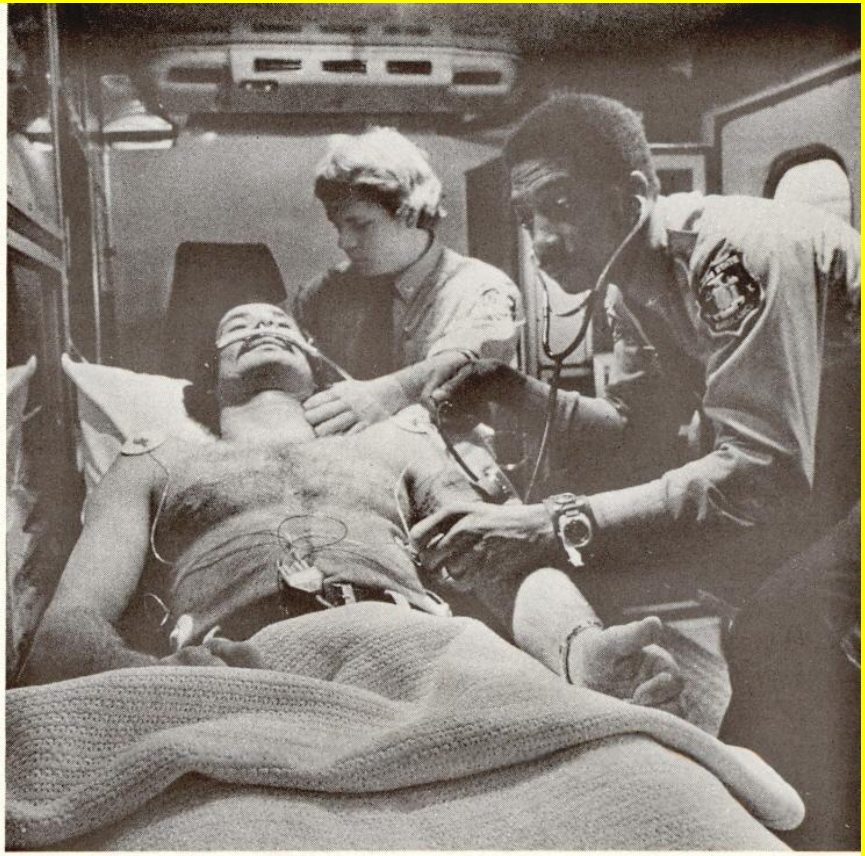
  girls ↑ HDL ↓ LDL

  (estrogen)

With menopause (35-58):

↓ estrogen ↑ weight ↑ heart risk

- Men more likely: blockages: **big coronary arteries**: crushing chest pains



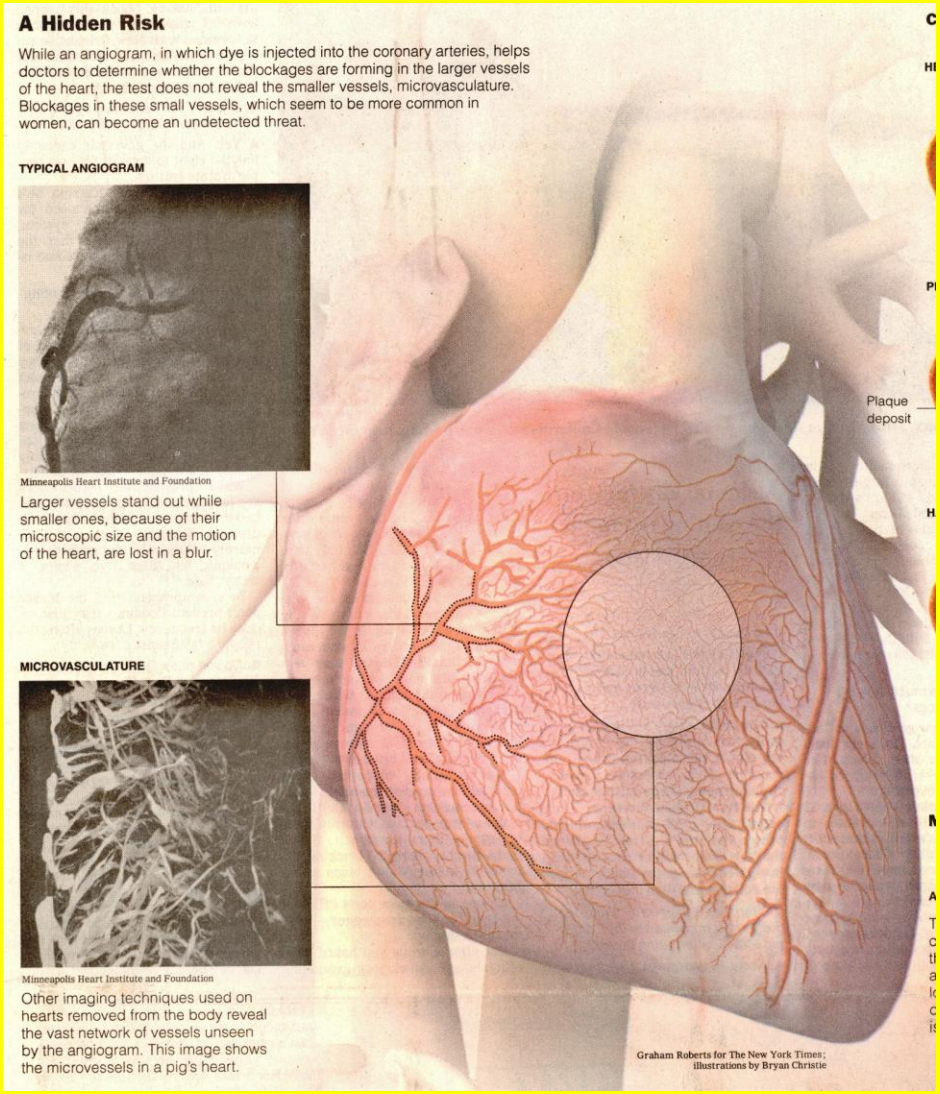
A heart attack victim treated by an emergency rescue service (ERS) has an increased chance of reaching the hospital alive and surviving the ordeal.

Women: more common:

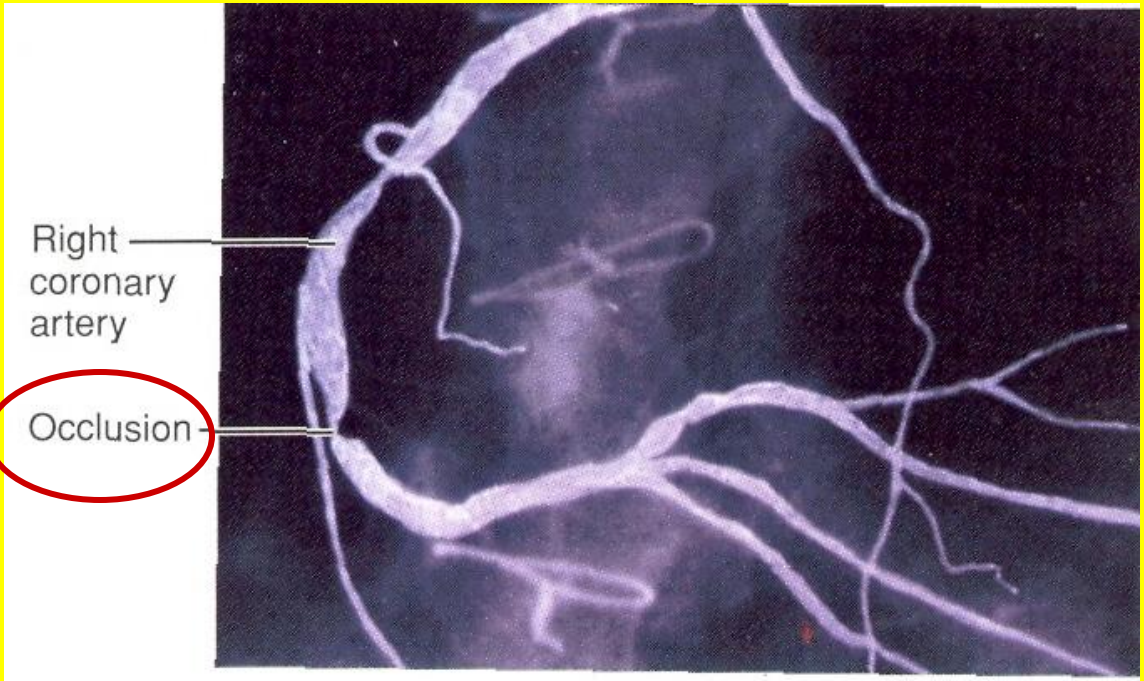
"**microvascular disease**"- thickening, stiffening of smaller arterioles- supply heart

- Don't dilate very well
- Heart muscle-starved O_2
- Chest pains, abnormal stress test

Microvascular Disease



- Standard angiogram: inject dye, X-Ray coronary arteries (big)
- Only **1/3** women show big blockages



Angiogram of a heart showing blockage of the right coronary artery.

- Rest of heart disease: missed in angiograms of women

- 3 million American women- this type of heart disease: "coronary microvascular syndrome"

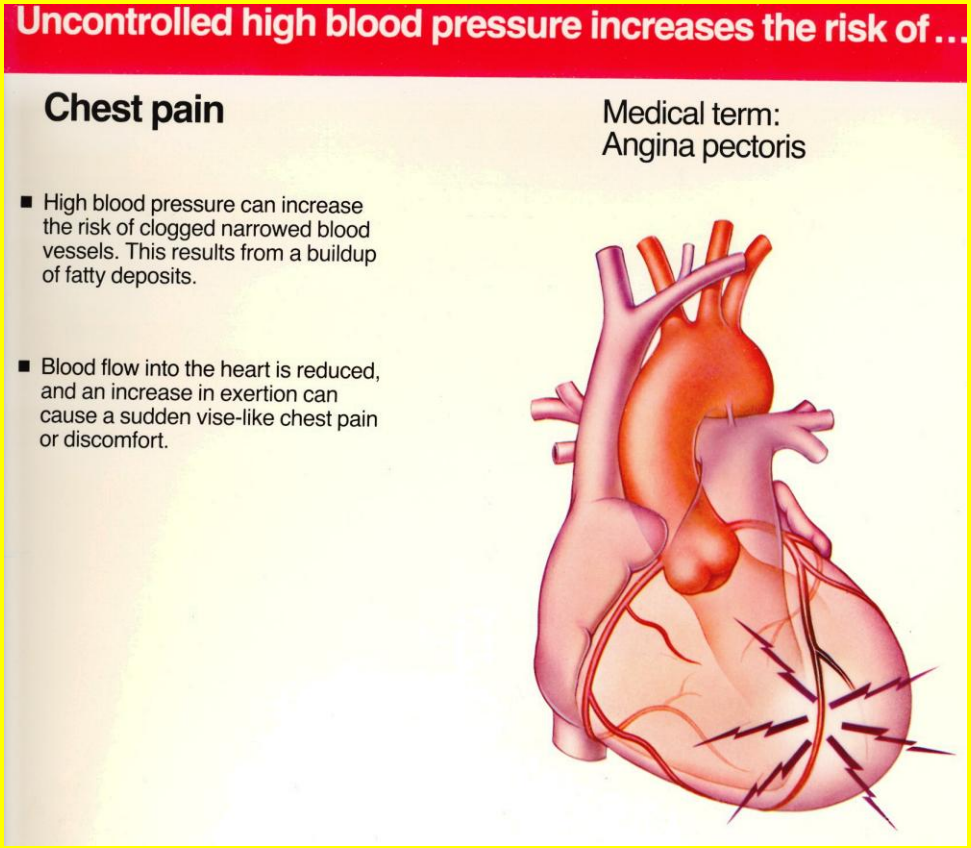
- Further tests: women: arterioles don't dilate, ↓ blood flow

Women's Warning Signs

- Chest discomfort
- Mild/severe pressure, fullness, or pain: center of chest
- Discomfort: arms, back, neck, jaw, stomach
- Shortness breath
- Nausea, light headedness or sudden cold sweat
- Extreme fatigue

Angina: may be warning sign: heart attack on the way

- Angina from "angere" (Latin): **choke**



Angina:

1. Pain: tight, crushing, suffocating, beneath breastbone
2. Heaviness/tightness- chest
3. Occurs: exercise (exertion), emotional stress
4. Lasts: 2-15 minutes- goes away

Angina cause:

1. Spasm- coronary arteries- insufficient blood to heart muscle= myocardial ischemia

2. Result of: atherosclerosis- coronary arteries

Heart disease: Who's at risk?

- Framingham Heart Study (1948): followed participants → today
- Identify **"risk factors"**
- Risk factors:

  Having 1 = **BAD**

  2 = **Worse**

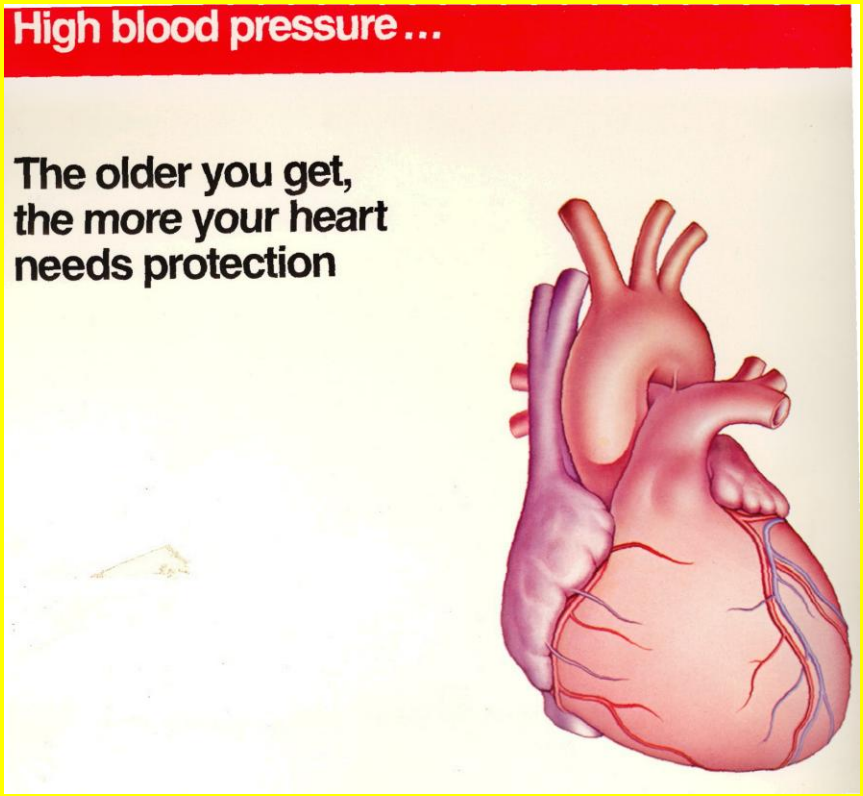
  3 = **Terrible**

Risk Factors: **Uncontrollable**

1. Sex: Increased risk: men $\geq$ 45
   women $\geq$ 55
2. Family history: increased risk if:
   Male relative- heart disease before age **55**
   Female relative- heart disease before age **65**

Risk Factors: **Uncontrollable**

3. ↑ Age ↑ Risk 4/5 people die of heart disease > 65

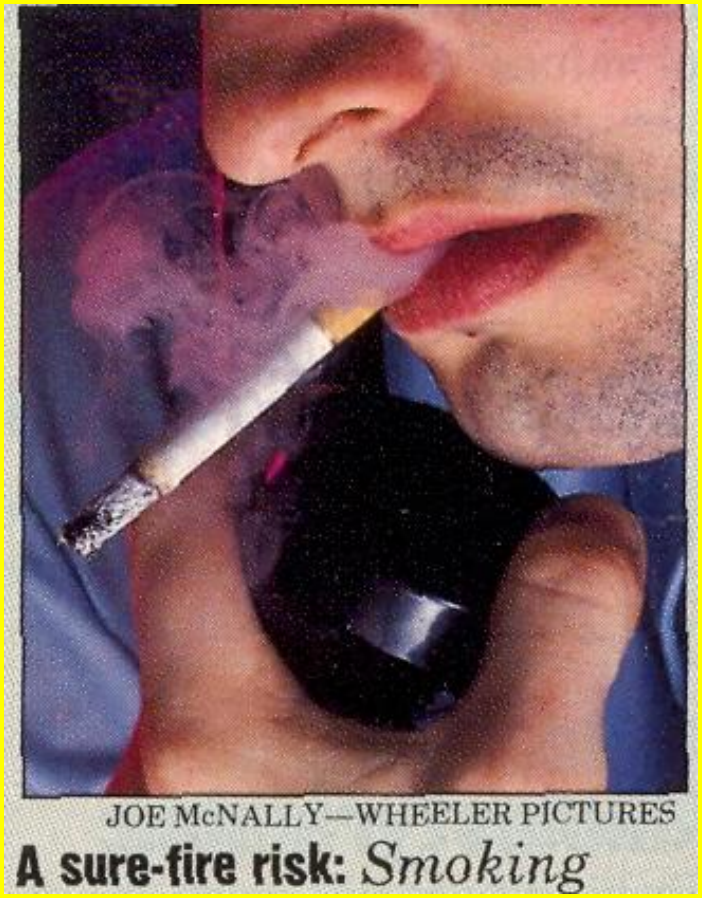


Risk Factors: **Uncontrollable**

4. Genetics ↑ Risk
   A) African Americans **(high blood pressure)**
   B) Mexican Americans, Native Americans, Hawaiians **(diabetes & obesity)**

Risk Factors: **Controllable**

5. Cigarette smoking



JOE McNALLY—WHEELER PICTURES

A sure-fire risk: *Smoking*

Tobacco Smoke

1. ↓ **HDL**
2. **Platelets sticky-** blood clot
3. CO**:** reduce blood oxygen to heart
4. **Nicotine**: arterial cell toxin
5. ↑ adrenaline, heart rate, blood pressure, arrhythmias

Tobacco Smoke

6. Heart works harder but can't get enough oxygen (CO)
7. Mutagens, carcinogens, allergens, **radioactivity**
8. Nicotine: addictive signs- **2** days start smoking: young people

2008 Dutch Study

- Pregnant women who **smoked**
- Their children years later (age 28)
- ↑ Thickness carotid arteries

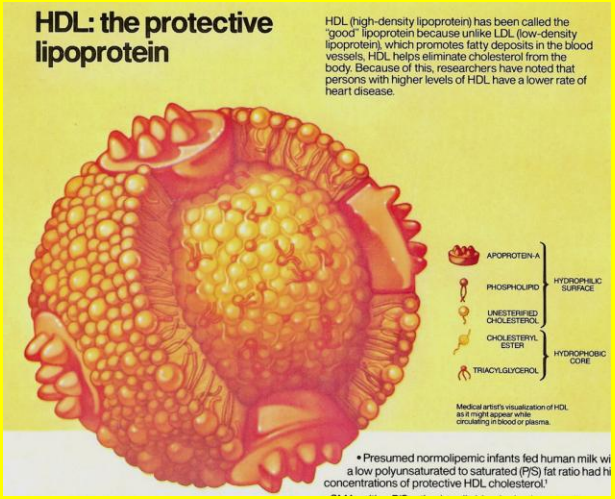
6. Blood fats (increased risk)

LDL cholesterol > 100 mg

HDL cholesterol < 40 mg

Total cholesterol ≥ 200 mg

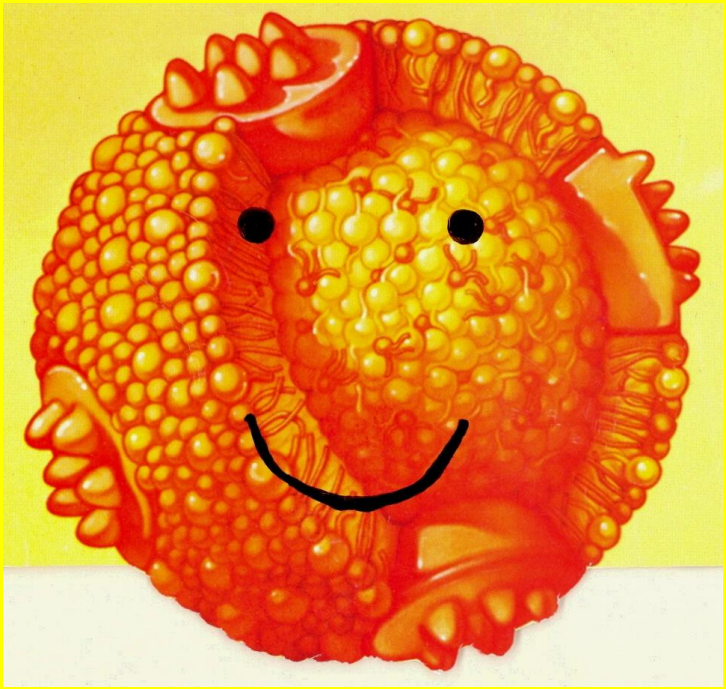
Triglycerides: ≥ 150 mg

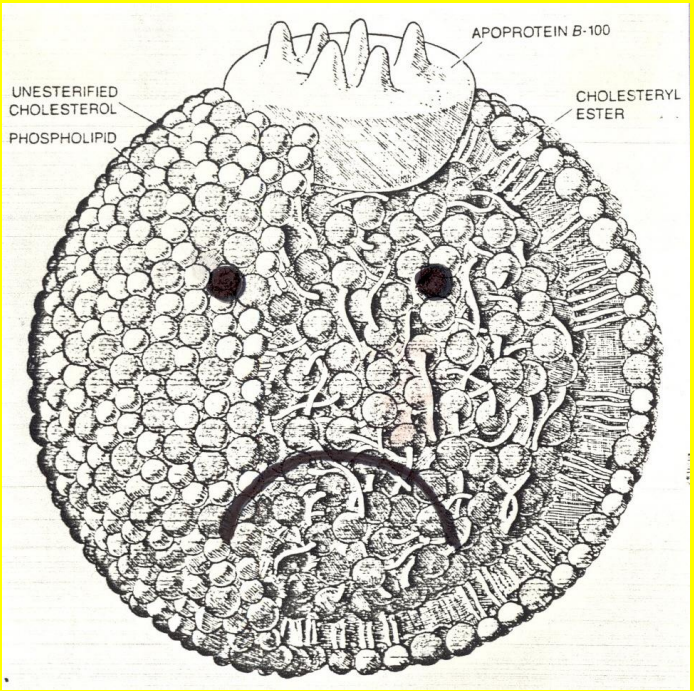


Cholesterol

The Good and The Bad

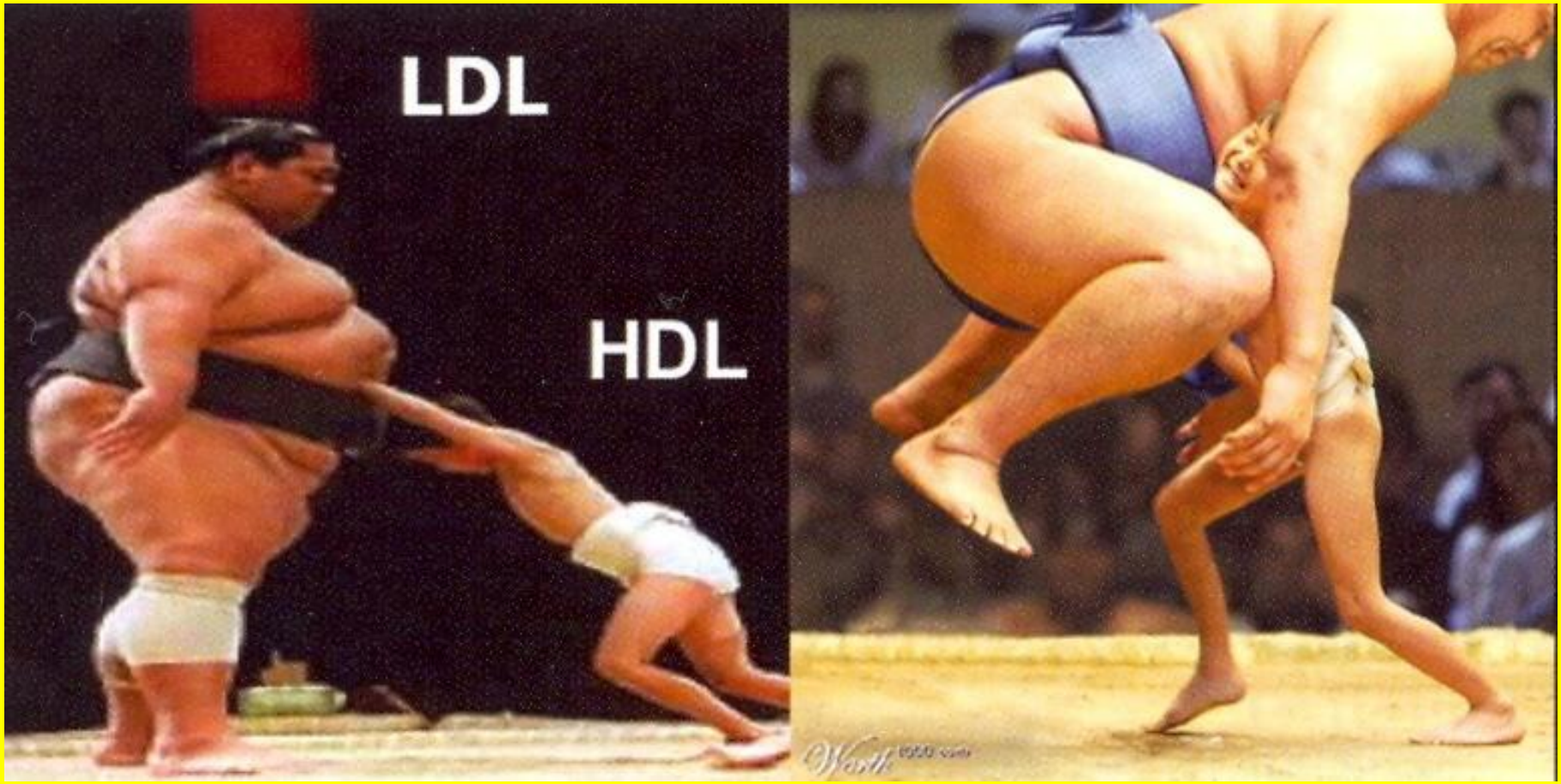
HDL **LDL**





- Newborn babies: LDL 40-50 mg
- Populations: low risk, low fat diets: LDL < 100 mg throughout life
- Brown/Goldstein: "keep LDL as low as possible beginning as child"

LDL vs. HDL: Balance is important



Bottom line:
Keep **LDL low** and **HDL high**

7. High Blood Pressure: ≥ 140/90

NUTRITION ACTION HEALTH LETTER

CENTER FOR SCIENCE IN THE PUBLIC INTEREST Volume 22/Number 6

One Nation, Under Pressure

BY BONNIE LIEBMAN

High blood pressure. The words don't exactly strike fear into most Americans' hearts. After all, it's not painful, like cancer. It doesn't sound deadly, like a heart attack. And besides, *you* probably don't have it.

But you probably will.

By about age 60, six out of ten Americans have blood pressure that's high enough to treat with drugs. Millions more have pressure that's high enough to raise their risk of a heart attack or stroke.

"We're talking about a problem where, if you live long enough, only a minority of Americans escape," says Jeffrey Cutler, an epidemiologist at the National Heart, Lung and Blood Institute in Bethesda, Maryland. "All families will be touched by it. If it's not me, it's my spouse."

But it's not inevitable.

"Among the risk factors for stroke and heart disease, one of the most preventable is high blood pressure," says Paul Whelton, director of the Welch Center for Prevention, Epidemiology, and Clinical Research at The Johns Hopkins Medical Institutions in Baltimore.

How to prevent it? Researchers know…but the public doesn't.

CONTINUED ON PAGE 6

8. Diabetes: fasting blood sugar:

≥ 126 milligrams

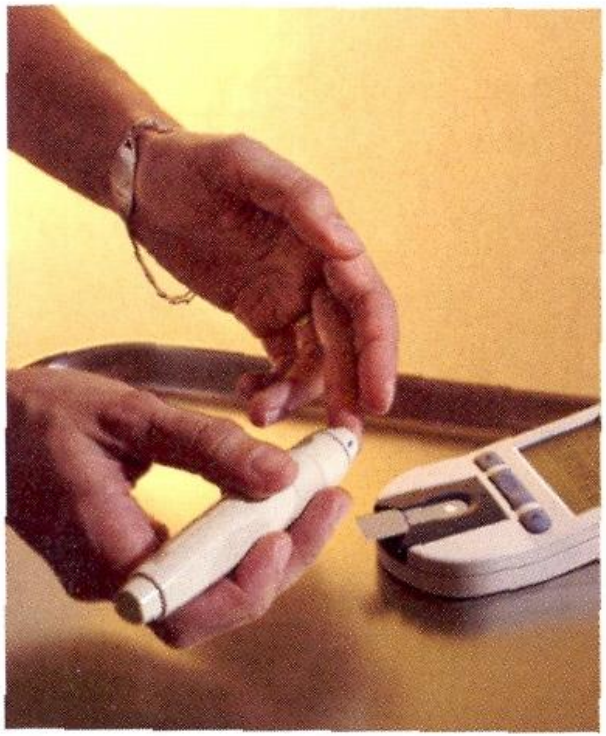


Figure 4.16 *Monitoring blood glucose requires pricking the fingers each day and measuring the blood using a glucometer.*

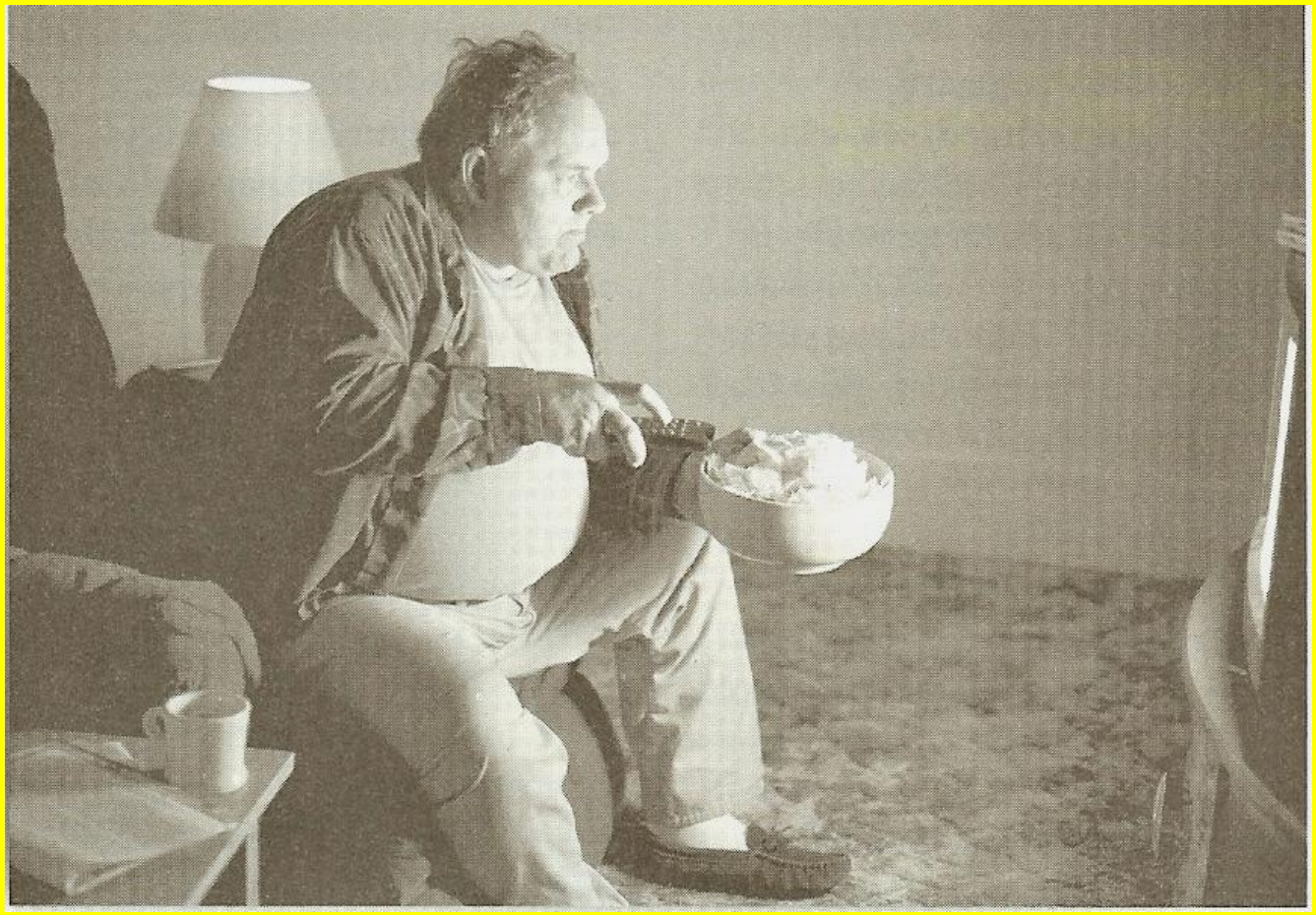
9. Obesity
Overweight

BMI > 25

and

waist circumference:
> 35 inches- women
> 40 inches- men

10. Sedentary Lifestyle (inactivity)



Boston Irish Brothers Study

- Large study: 1 brother immigrated to Boston, other stayed Ireland
- Ireland brother ate ¼ more food/day but weighed 10 pounds less
- Ireland brothers: less heart disease
- Ireland brothers: more exercise/physical activity- compensated for excess food

11. Diet & Coronary Risk

↑ Saturated fat, trans fat, cholesterol

↓ Fiber, fruits, vegetables

Whole fruits and vegetables can reduce your risk for cardiovascular disease.

Other risk factors

- ↑ C Reactive Protein ↑ Risk

  Indication of **inflammation** in body (arteries)

- ↑ Blood homocysteine ↑ Risk

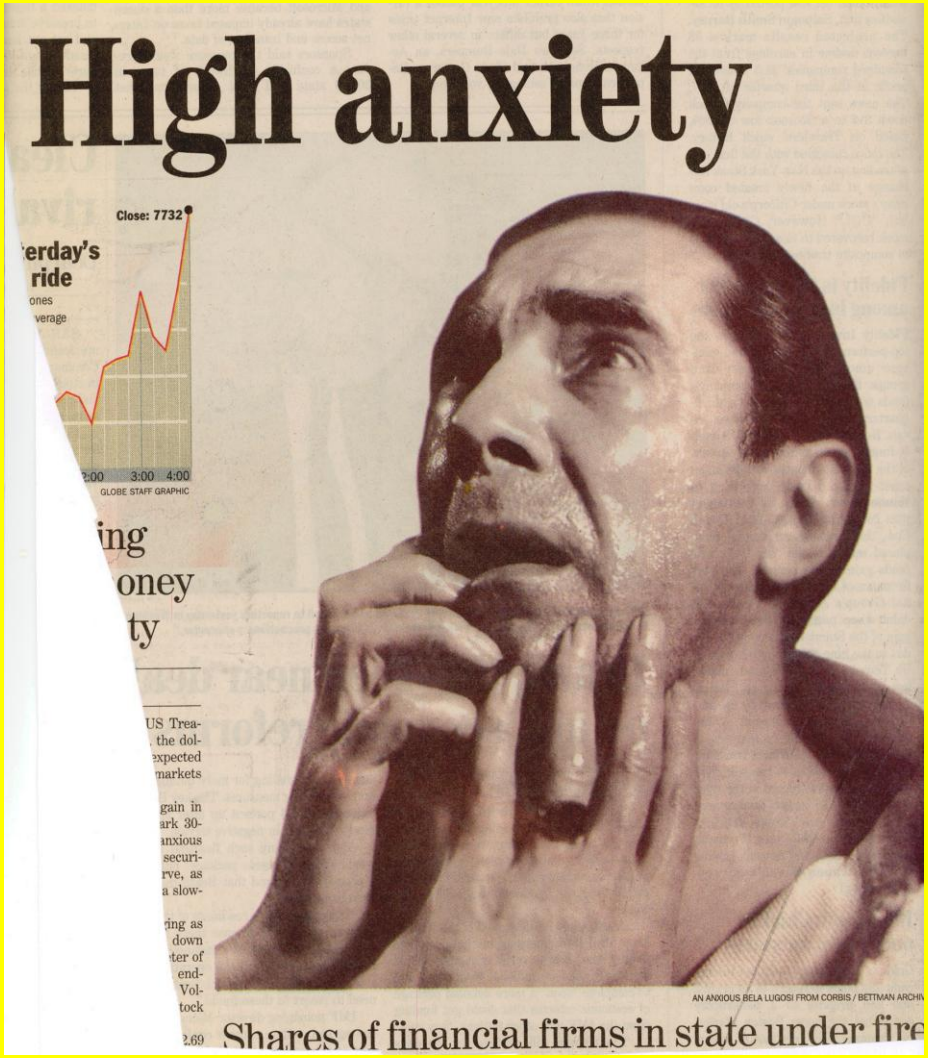
  (amino acid)

  Vitamins B6, B12, folic acid lower homocysteine

  Foods: fortified grains (cereals, breads), fruits, veggies

Other risk factors

Stress



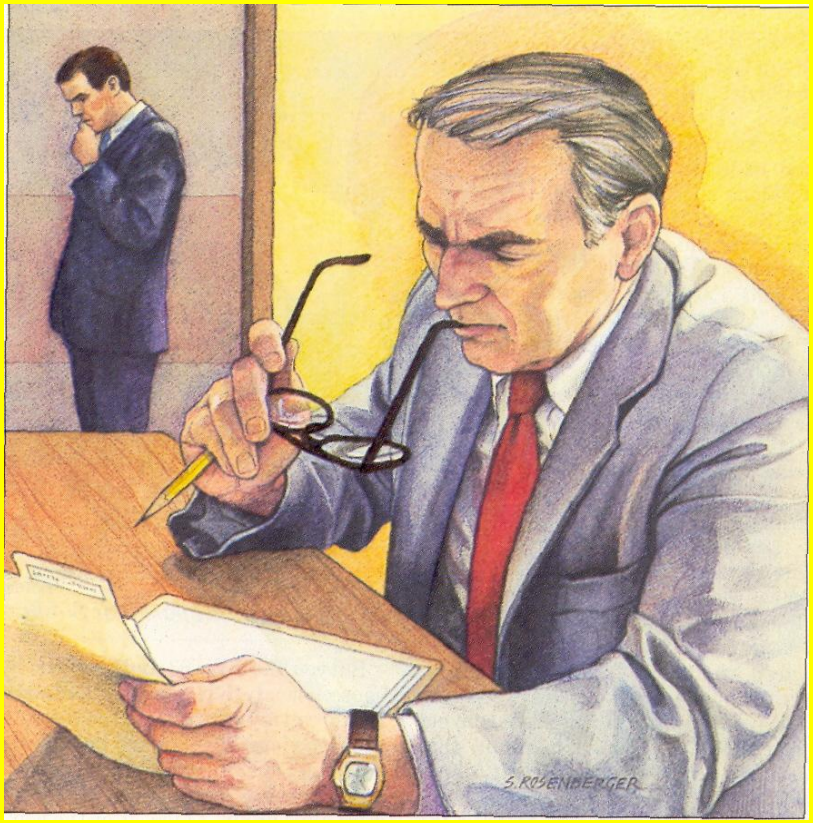
Stress: Job, society, school, peers

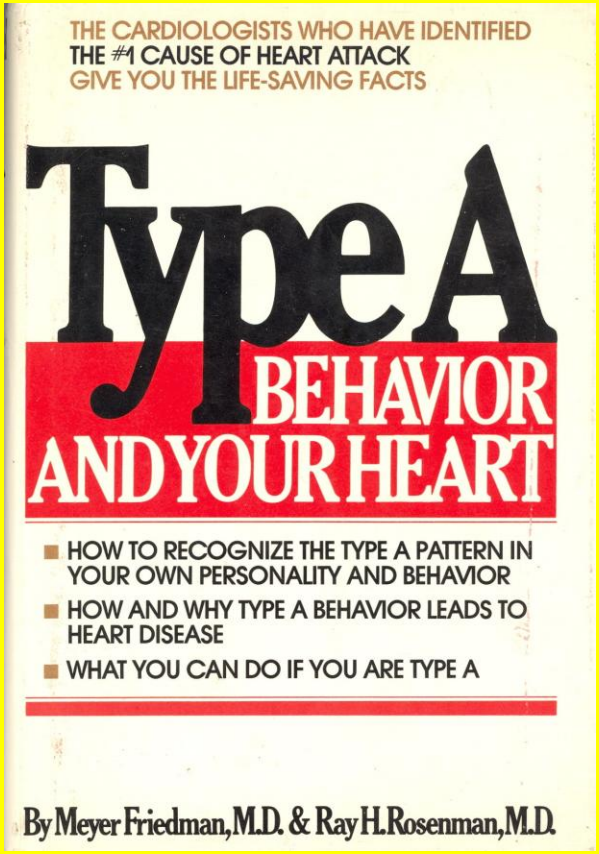
↑ Stress ↑ Angina & MI

1. Some people: prone to emotional stress- worsen blood pressure, angina
2. Long-term ↑ adrenaline: heart rate, blood pressure, blood glucose
3. Stress & overeating, smoking

Personality Type

- Type A: **Coronary prone**





Type A:

Time urgency, impatient, competitive, aggressive

Subtype: hostile, cynical, increased adrenaline stress response: ↑risk

Type B: more relaxed, less time conscious: ↓ risk

2006 Dutch "Outlook on life" study:

men 64-84 followed for 15 years

"I still expect much from life"

"I am still full of plans"

50% lower risk dying heart disease

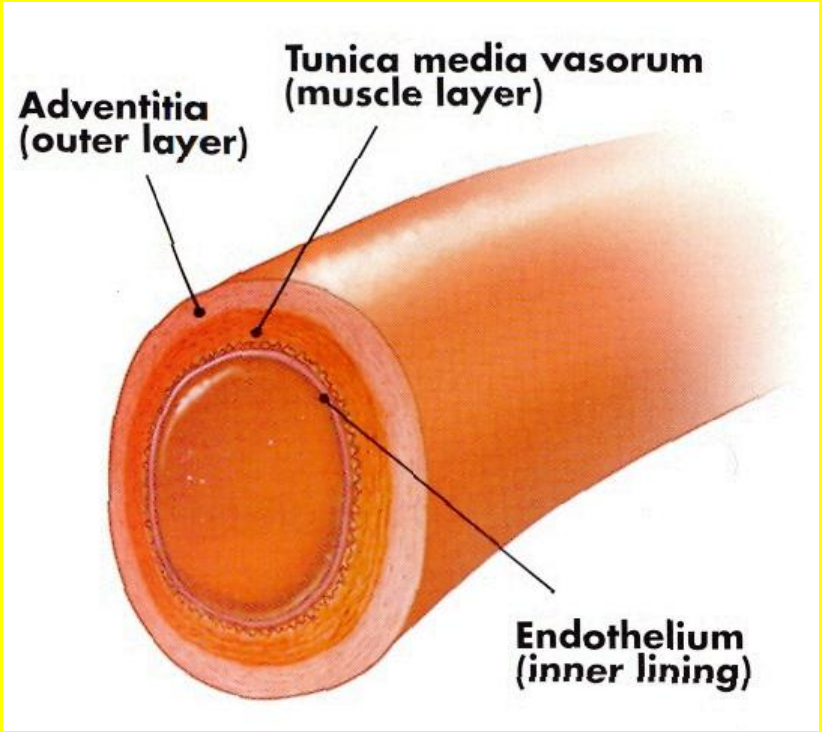
How does atherosclerosis begin?

Atherosclerosis: accumulation: lipids, protein, calcium, **scar tissue** in arteries: atherosclerotic plaque

Artery: ↓ elastic (hardened), blood flow eventually **blocked**

Atherosclerosis Sequence

1. **Injury** (insult) to inner lining of artery wall



Injury: Different factors ↑

- LDL (oxidized)
- Glucose
- Homocysteine
- Blood pressure
- Free radicals- cigarette smoke
- Diabetes
- Infection- virus: Herpes virus
  detected in atherosclerotic plaque

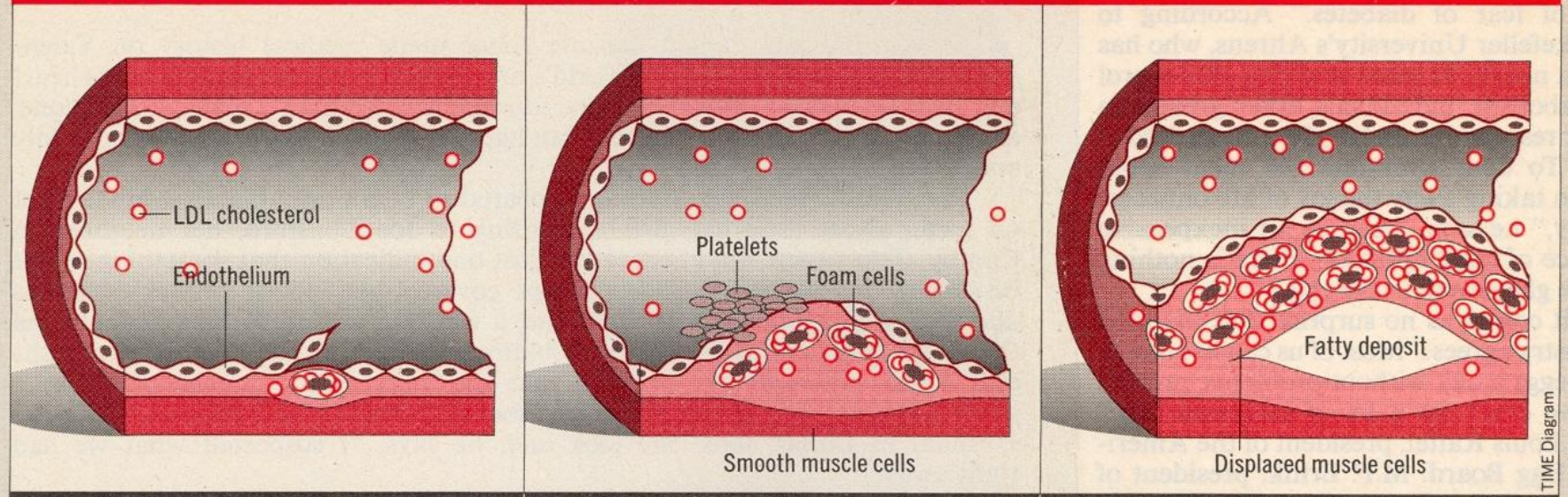
2. Inner lining: develops openings

- LDL moves in from blood

- Platelets attach to injured lining: release growth factors

- Smooth muscle cells → divide: thickening (like **cancer**)

HOW CHOLESTEROL CAN CLOG YOUR ARTERIES



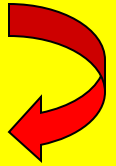
1 Atherosclerosis is believed to begin when the lining of an artery, the endothelium, is damaged by factors including high blood pressure, elevated cholesterol levels or infection.

2 Two forms of blood cells accumulate in the damaged vessel wall: platelets and macrophages. The latter become foam cells as they gorge on cholesterol. When they burst, a fatty deposit forms.

3 Smooth muscle cells migrate from the layer below the endothelium and multiply wildly. Over a period of years, this proliferating jumble blocks the flow of blood, leading to a heart attack or stroke.

3. LDL inside artery- **oxidized:** dangerous

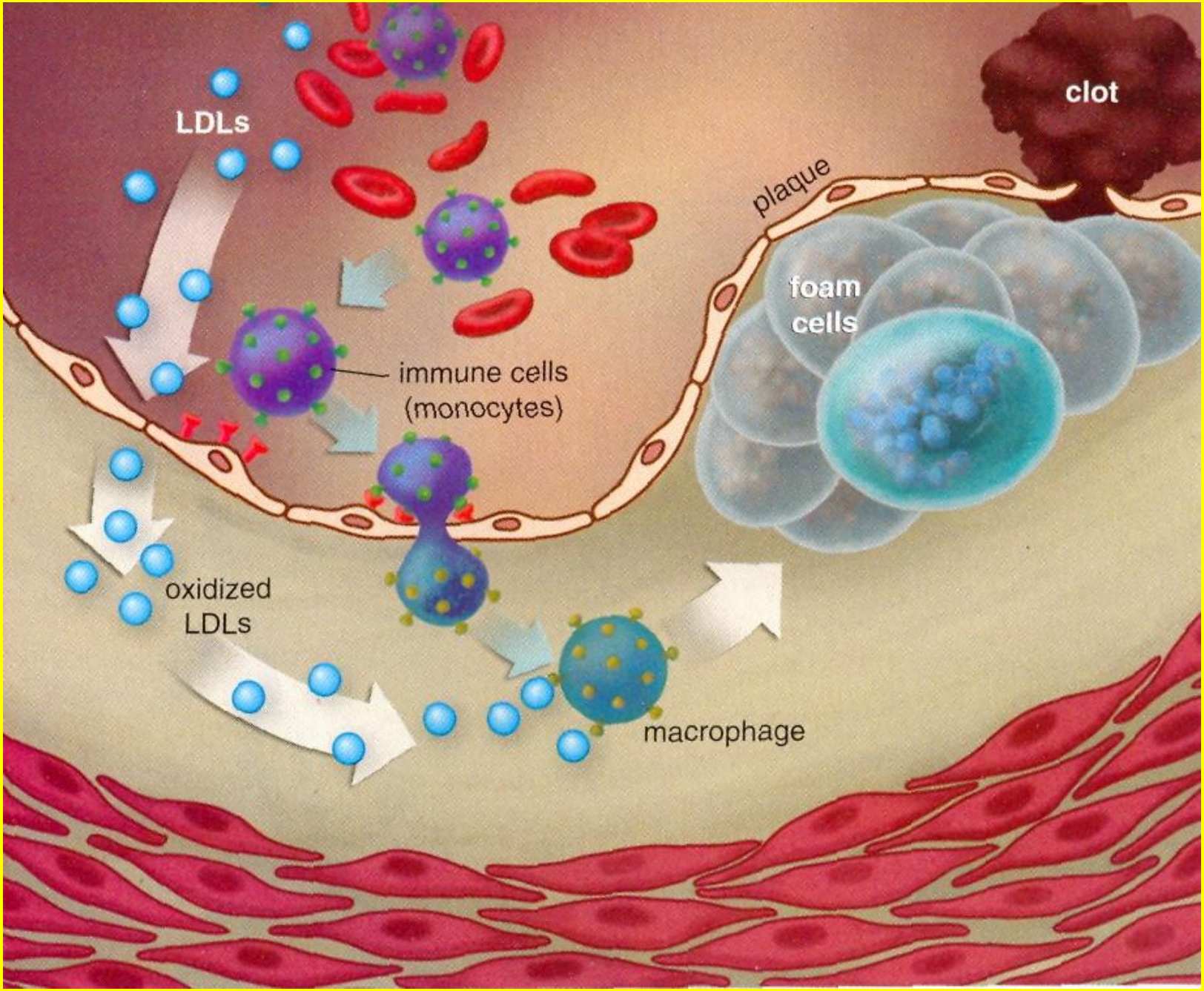
- Triggers **inflammation**
- White cells in blood → artery wall



macrophages →

- Gobble up oxidized LDL bag of fat: **foam cells**
- Foam cells burst: release fat

fatty streak

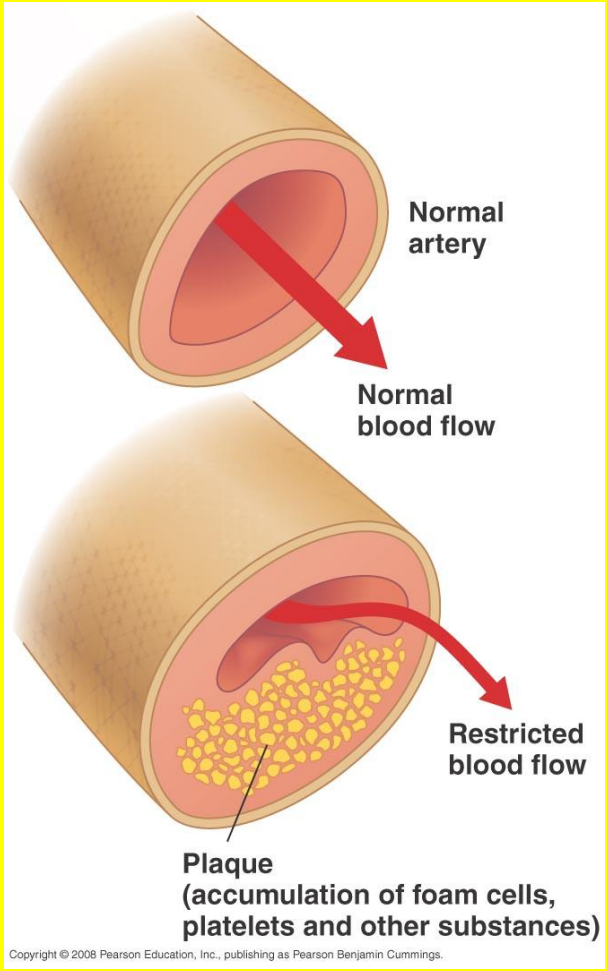

LDLs
clot
plaque
foam
cells
immune cells
(monocytes)
oxidized
LDLs
macrophage

4. Injury (lesion) grows → plaque

- Cap (cover) of protein forms:

  fibrous plaque

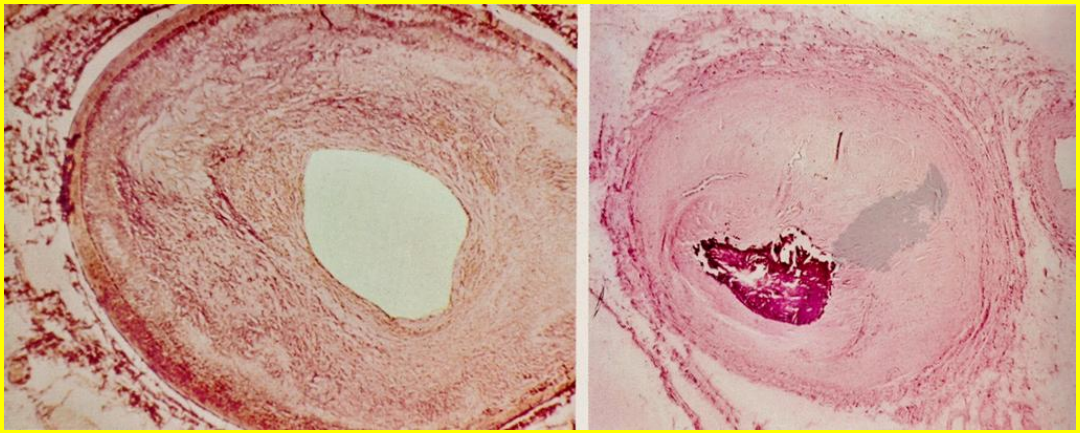
- Attempt to "wall off" damaged artery
- Immune cells in plaque break down **cap: ruptures**



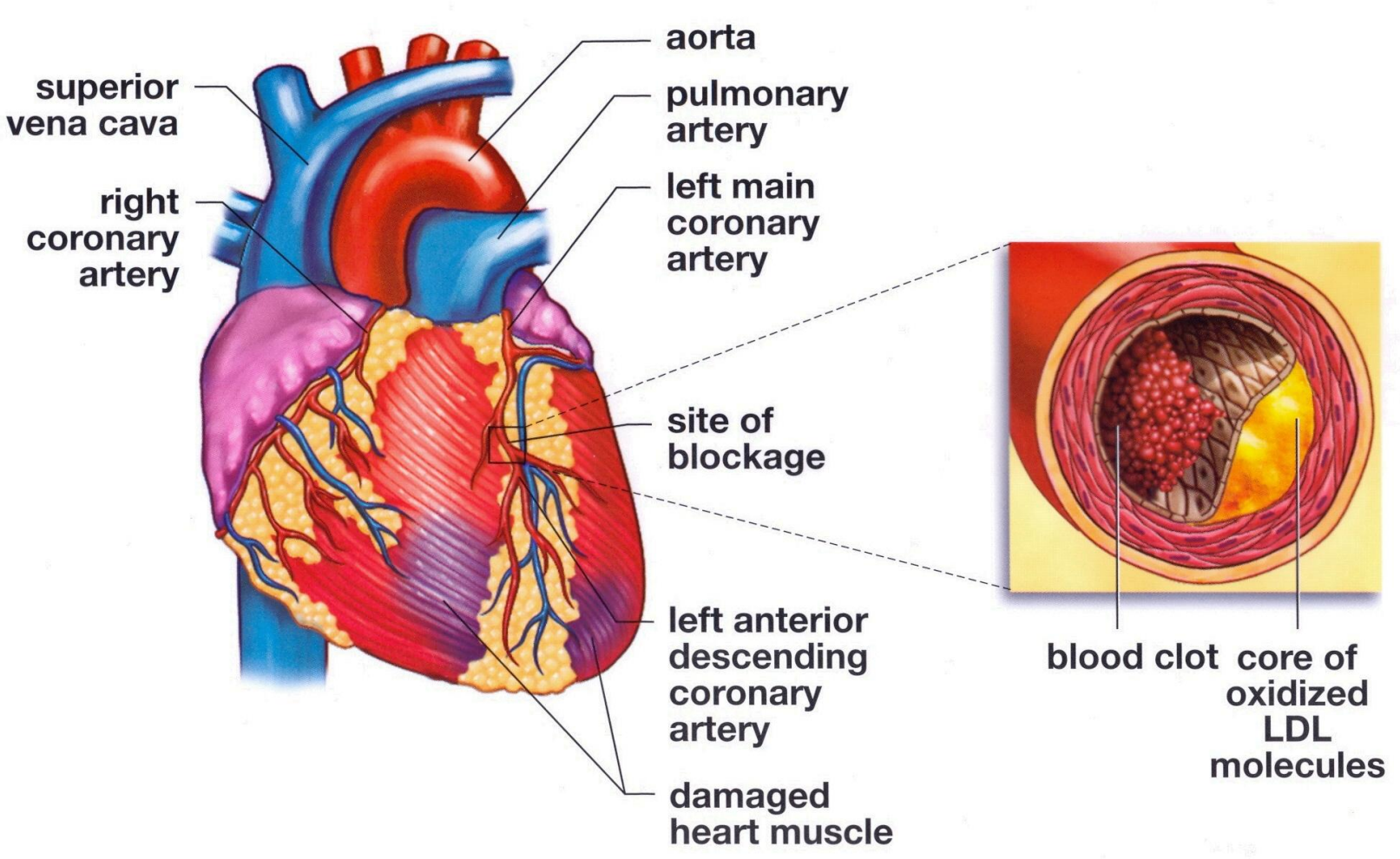
5. Clot forms on roughened surface

- **Thrombosis (thrombus)**
- Partially blocked artery → completely blocked
- Heart attack:

  myocardial infarction



Heart attacks: more common morning, on birthdays



6. Damage to heart muscle triggers: abnormal heart rhythms (cardiac arrhythmias)

- Most dangerous: **ventricular fibrillation**
- Heart quivers, stops pumping
- **"Bag of worms"**
- Blood  brain, other organs

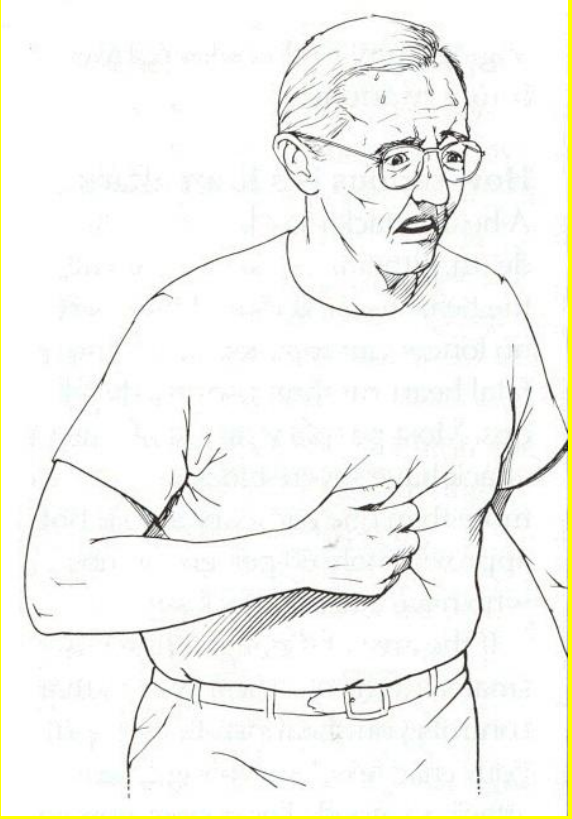
Ventricular fibrillation- loss of consciousness, death quickly

A. Do **CPR**

B. Shock heart back into normal rhythm: **defibrillator** (paddles)-airplanes, airports

Heart Attack

Classic "Hollywood heart attack"- person clutching chest



Heart Attack

- Not always true
- Sometimes-less distinct symptoms (women & elderly)
- Discomfort/pressure- chest
- Exhaustion: just walking across room
- Break out: cold sweat
- Diabetics: sudden extreme fatigue: **"silent heart attacks"** (scar tissue)

- Heart attack may last 4-6 hours
- With each passing minute: heart tissue → no O2 → dies
- If conscious: suggestion- "chew" on aspirin- prevent further clotting/help blood flow

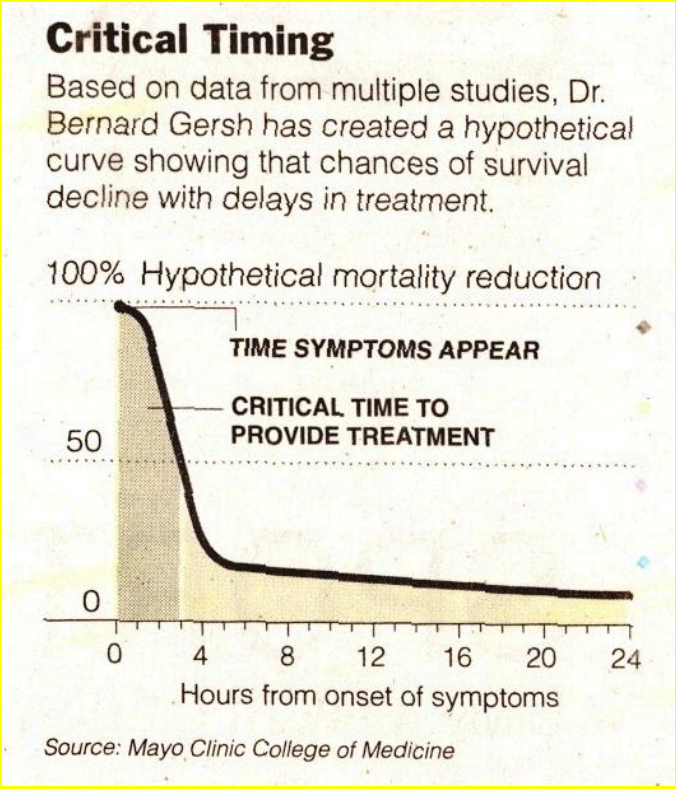
Regardless of type:

- **Every minute counts**
- "Golden hour": "Time is muscle"
- **~ 1 hour**:

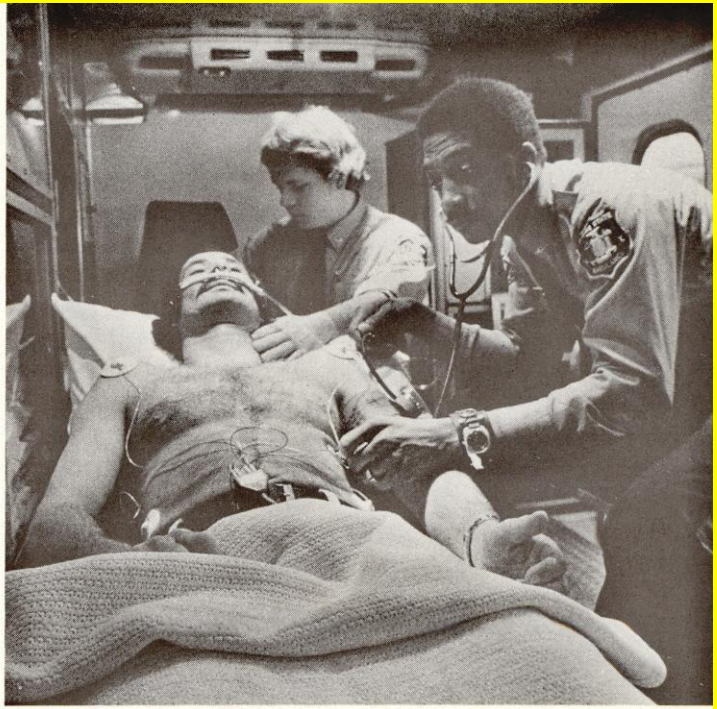
  get arteries open-

  prevent permanent

  heart damage



- Problem: ½ people with heart attacks don't call ambulance



A heart attack victim treated by an emergency rescue service (ERS) has an increased chance of reaching the hospital alive and surviving the ordeal.

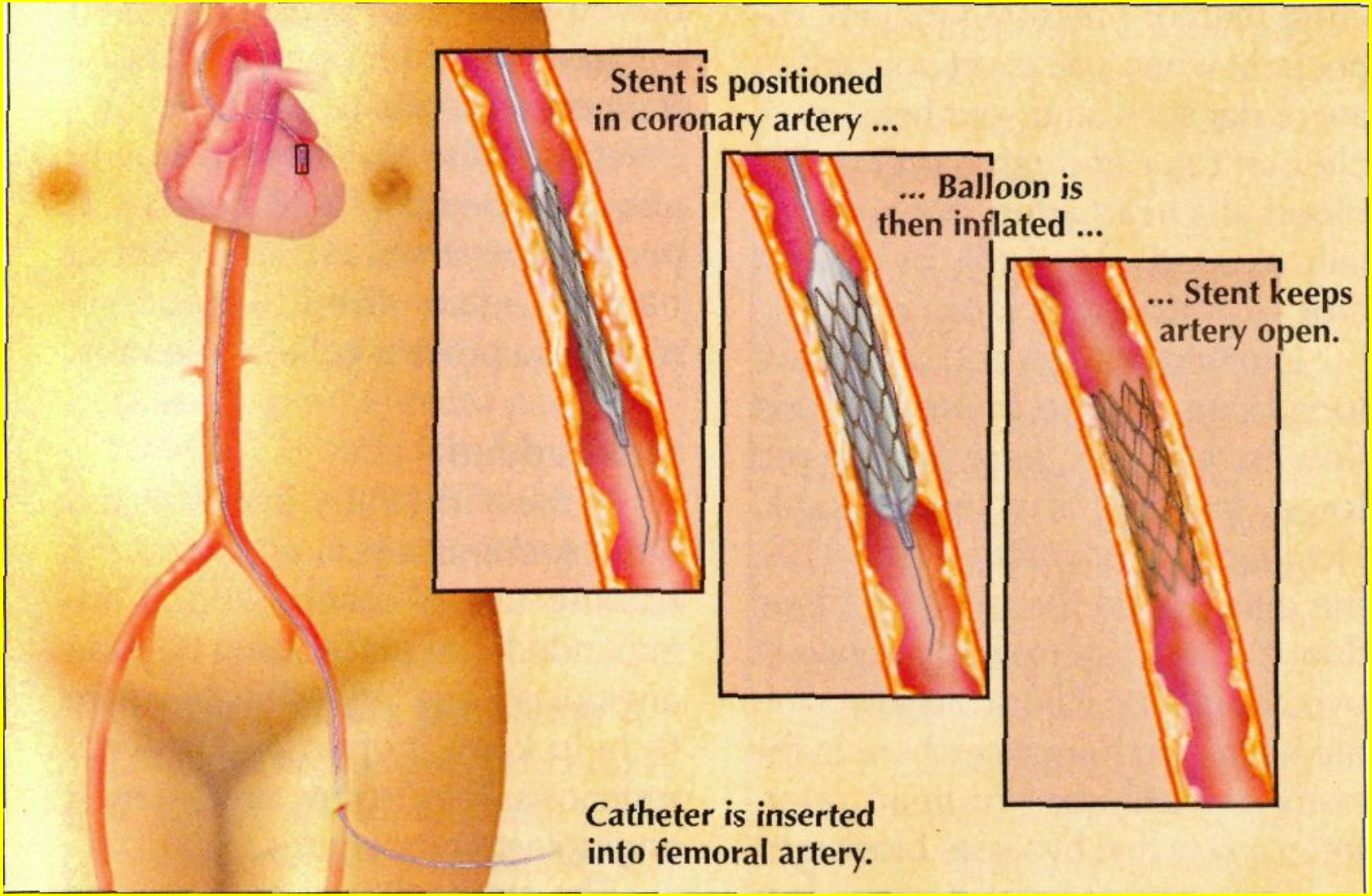
ALON REININGER—CONTACT

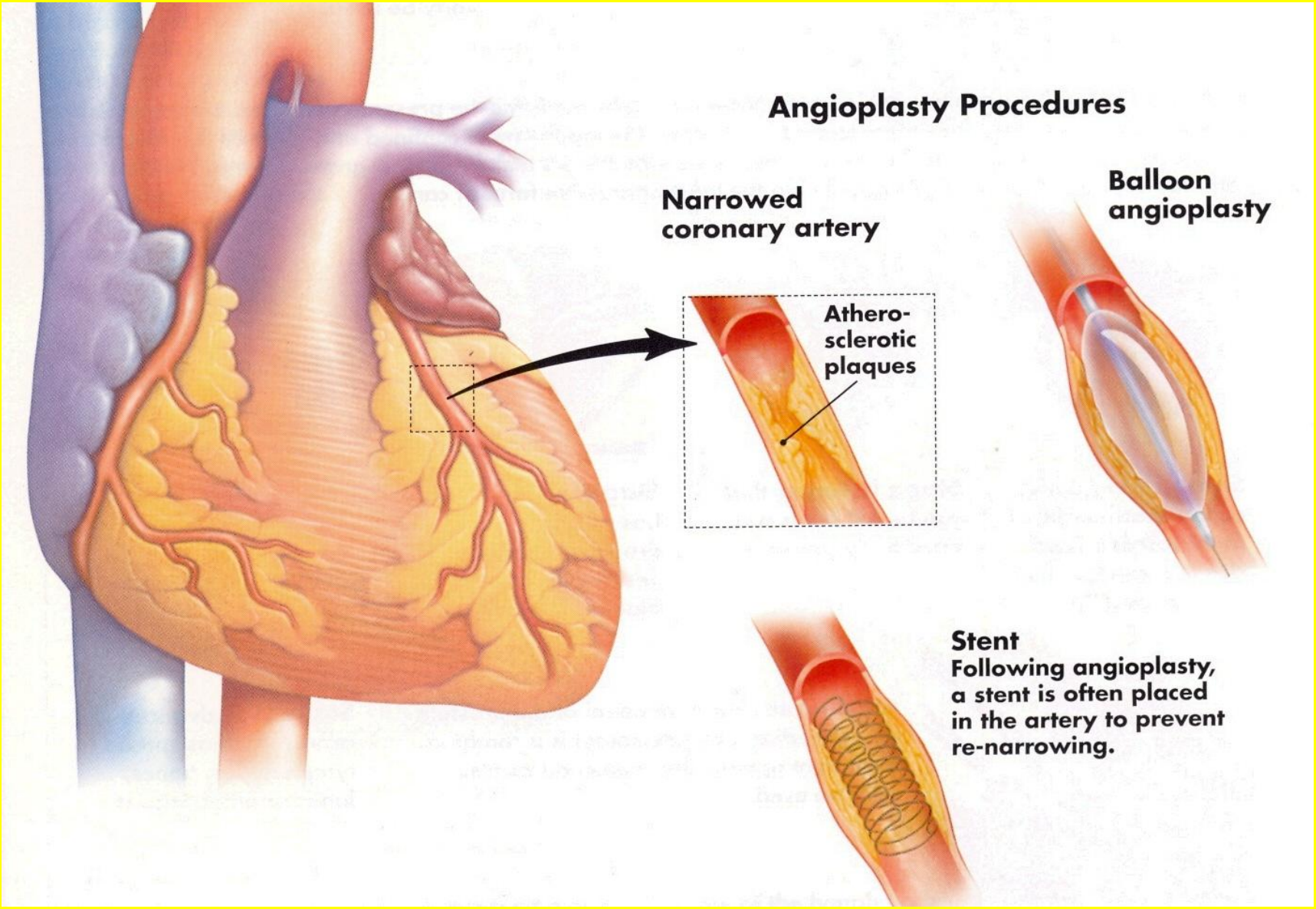
To save a life, time is of the essence: *Emergency personnel race a heart-attack victim to the coronary-care unit*

MI: 2 treatments at hospital

1. Clot buster: **tissue plasminogen activator (tpa):** not perfect- only opens 60-70% blockages
2. **Balloon angioplasty + stent** (stainless steel mesh)- keeps artery open

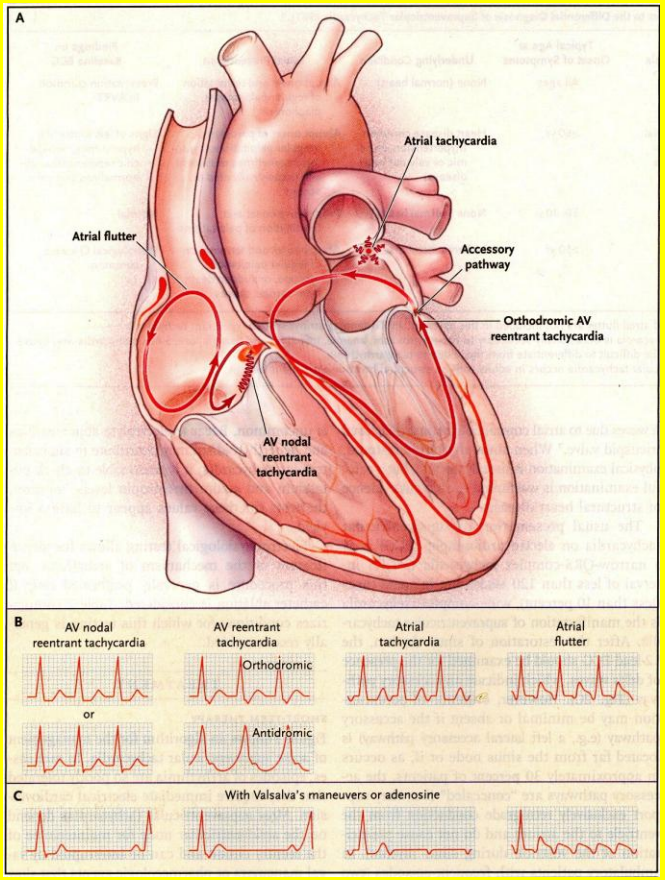
Stents


Stent is positioned in coronary artery ...
... Balloon is then inflated ...
... Stent keeps artery open.
Catheter is inserted into femoral artery.

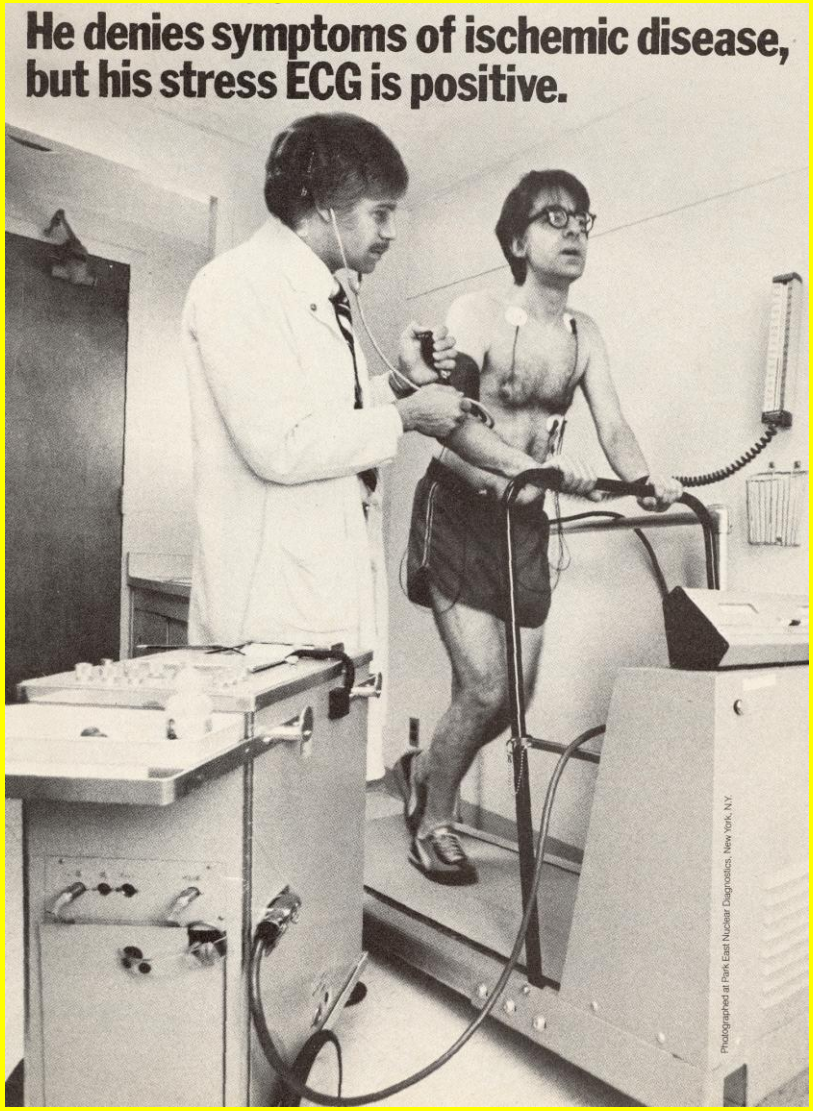

Angioplasty Procedures
Narrowed coronary artery
Athero-sclerotic plaques
Balloon angioplasty
Stent
Following angioplasty, a stent is often placed in the artery to prevent re-narrowing.

Heart Disease: How do you detect it?

- Electrocardiogram (ECG): look for abnormal rhythms



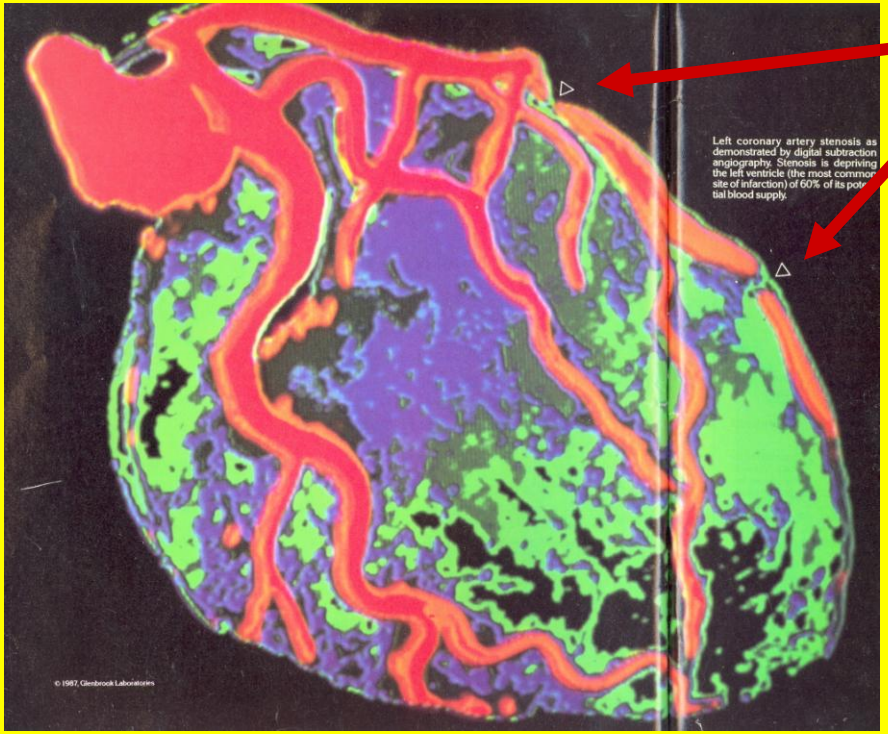
- Cardiac stress test: treadmill + ECG



- **Coronary angiography**: gold standard

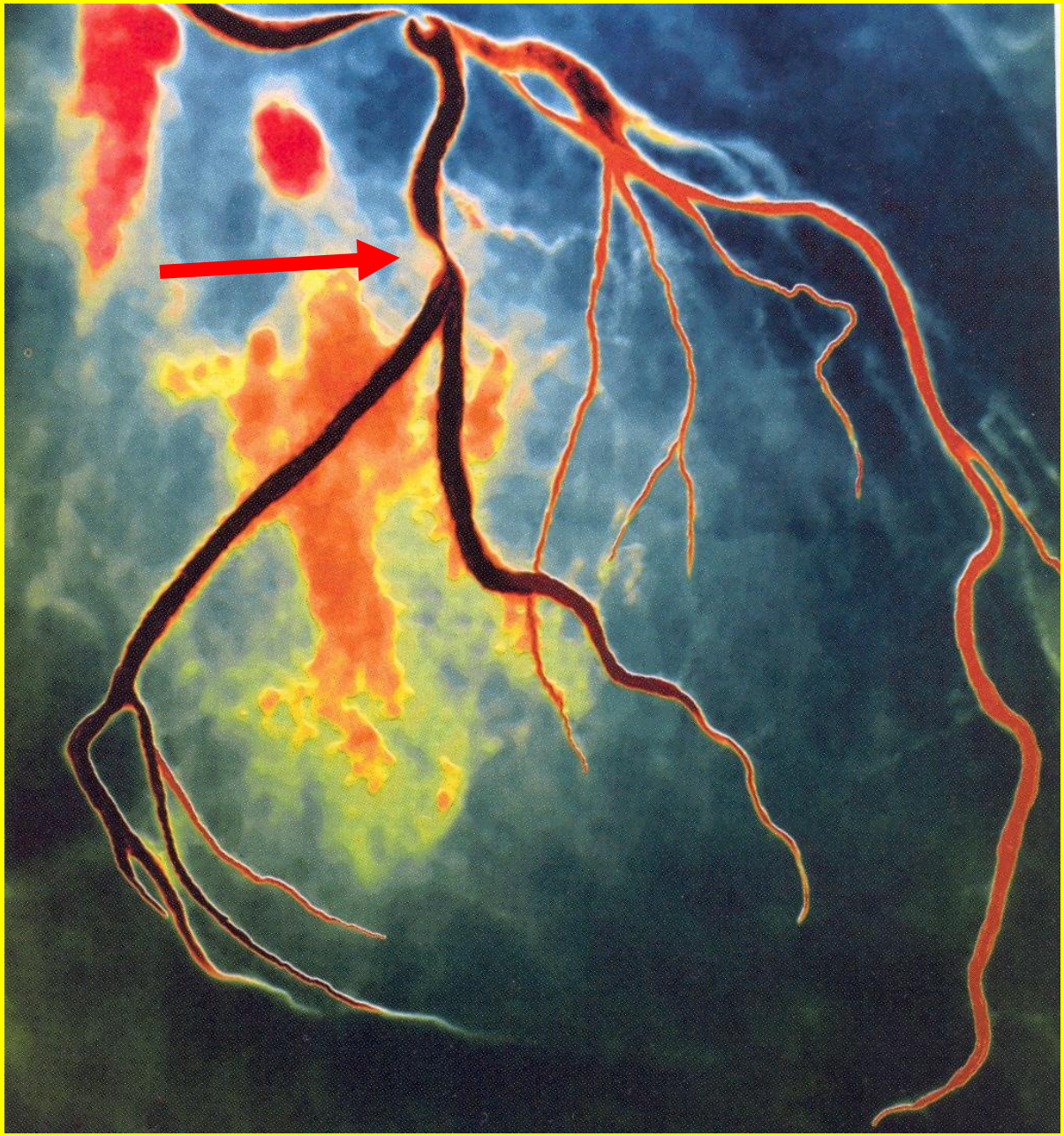
Catheter → coronary arteries ↘

blockages ←X-Ray movies ← dye



Coronary Angiogram 53 year old man

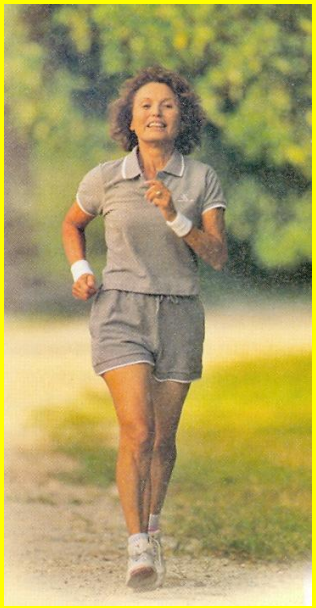
Severe blockage

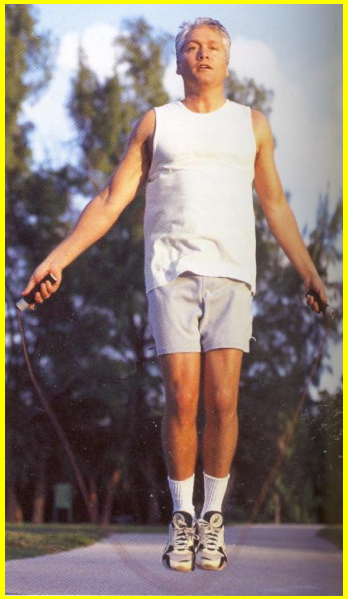


How do you treat heart disease?

1. Healthy diet
2. Exercise
3. Stop smoking

Whole fruits and vegetables can reduce your risk for cardiovascular disease.





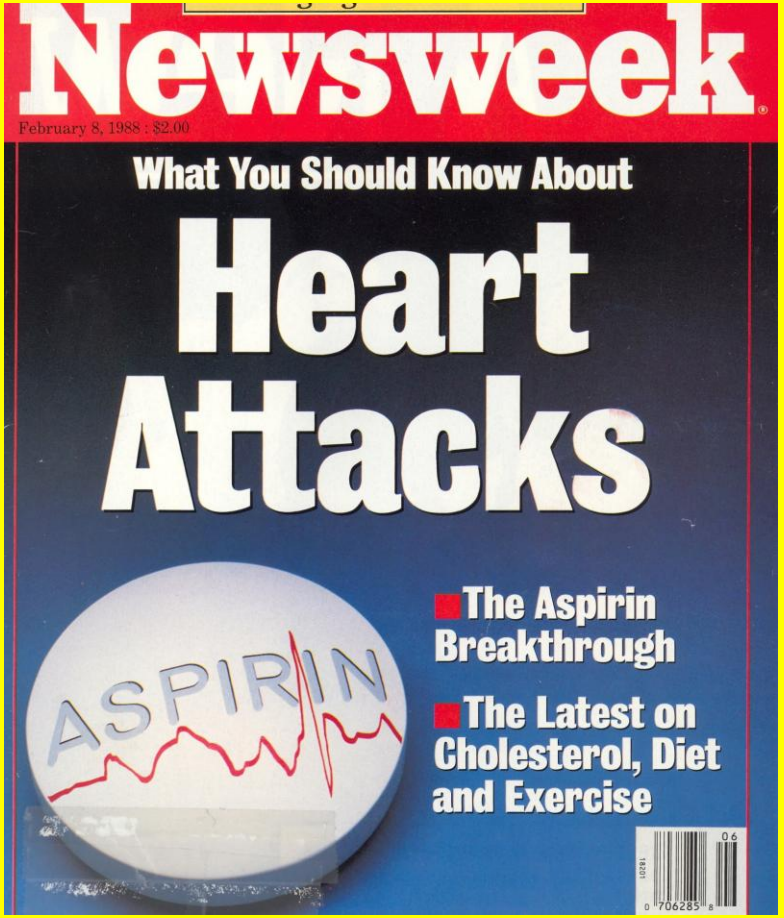
4. Medications:
   A) Statins
   B) Bile acid-binding resins (sequestrants)

Both deplete liver- cholesterol

↑ Liver LDL receptors ↓ blood LDL

C) Aspirin- baby aspirin (81 mg): may prevent clots, protect against heart attack/stroke

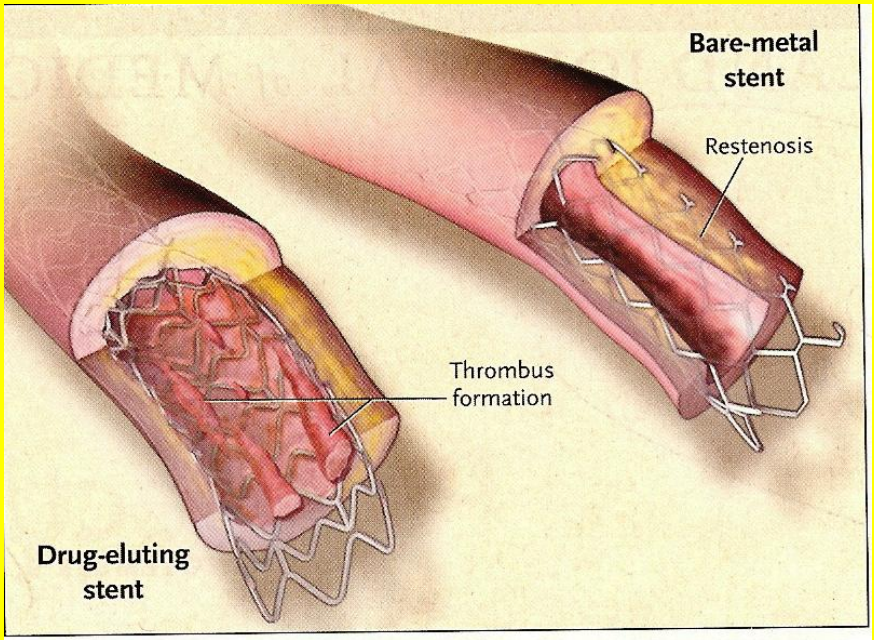
Higher dose- may be harmful: GI bleeding



D) Niacin- B vitamin: ↓ LDL

↑ HDL

5. Coronary angioplasty + stent

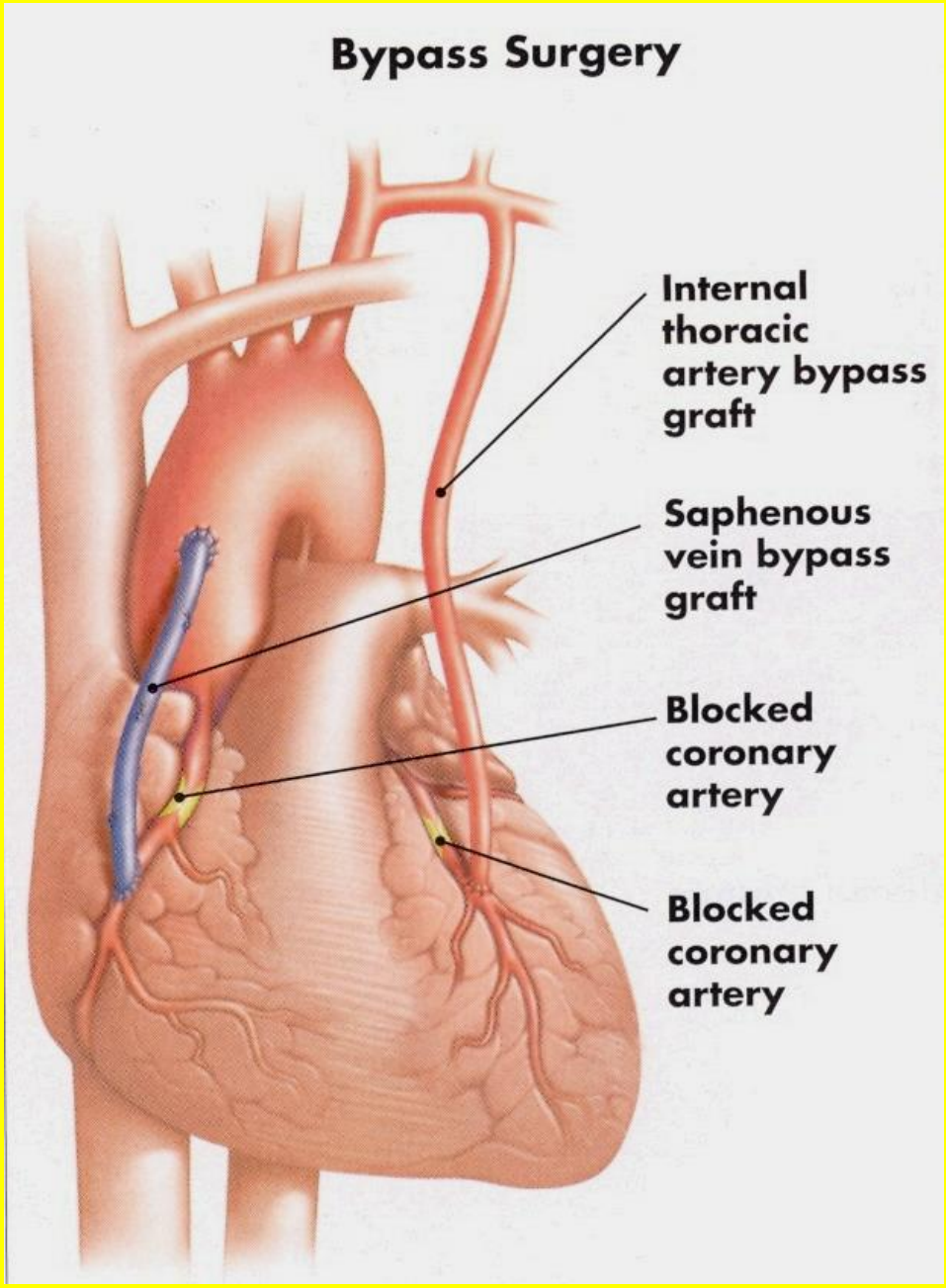


Contrasting Mechanisms of Obstruction of Bare-Metal Stents and Drug-Eluting Stents.
Bare-metal stents may be narrowed or obstructed by ingrowth of tissue. With drug-eluting stents, this process is inhibited, but since the struts remain uncovered, they may be prone to thrombosis after antiplatelet therapy is discontinued.

6. **Coronary Artery Bypass Graft** (CABG): improve blood flow

A) Use vein from leg/arm or
B) Mammary artery grafted around blocked artery

- President Clinton: multiple bypasses


Bypass Surgery
Internal thoracic artery bypass graft
Saphenous vein bypass graft
Blocked coronary artery
Blocked coronary artery

Dietary Factors: to reduce progression of atherosclerosis

1. ↑ **Whole grains** ↓ **Heart risk**

   Contain: fiber, vitamins, minerals, antioxidants (LDL), phytochemicals

Also control blood glucose, blood pressure, prevent obesity

2. ↑ **Simple sugars**

↑ **Blood triglycerides**

↑ **Heart risk**

Limit: cookies, high sugar drinks, snacks, candy

3. ↑ **Soluble fiber** ↓ **Heart Risk**

↓ cholesterol & bile acid absorption- intestine: ↓ LDL

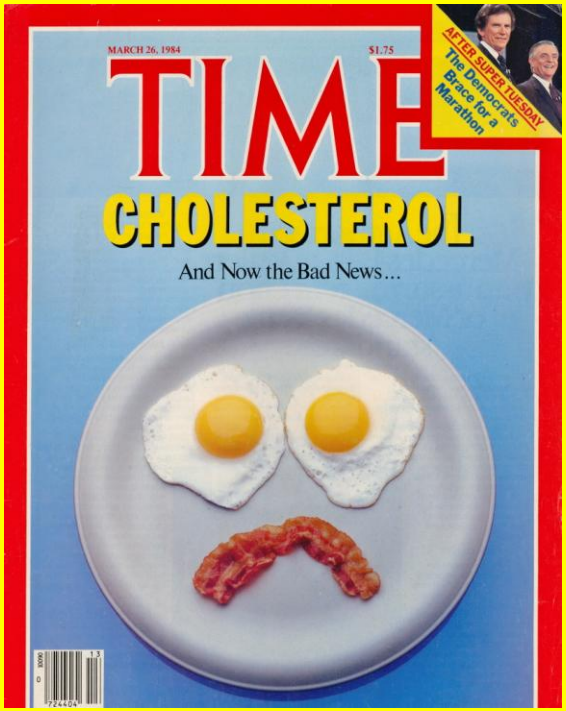
Soluble fiber sources:

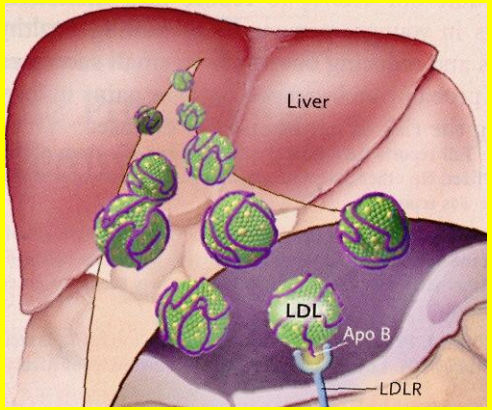
Oat bran, oats, oatmeal, peas, beans, apples, flaxseed, psyllium (Metamucil), pears, peaches, plums, oranges, broccoli, Brussels sprouts

4. ↑ Cholesterol ↑ Heart Risk

20% cholesterol= food

80% cholesterol= made in your body (liver)





5. ↑ **Total Fat** ↑ **Heart Risk**

Exceptions:

A) **Greenland Inuits**:

↑ omega 3 fats (fish)

↓ **heart disease**

B) **Mediterranean diet**: high monounsaturated fats, whole grains, fruits/veggies, wine, low animal foods ↓ **heart disease**

6. **↑Saturated fat ↑ Heart risk**

Meats, dairy products (whole milk, cheese, ice cream), prepared (frozen) foods

↓ LDL receptors- liver ↑LDL

Limit: 20 grams/day (< 10% calories)

Where the saturated fat is at

- **Animal fat**:
  Beef: 50%
  Chicken: 30%
  Pork: 39%

Tropical oils
Coconut: 87%
Palm oil: 49%
Palm kernel oil: 82%

Low saturated fat:

- **Vegetable oils**

  Canola: 6%
  Corn: 13%
  Cottonseed: 26%
  Olive: 13%
  Peanut: 17%
  Safflower: 9%
  Sesame: 14%
  Soybean: 15%
  Sunflower: 10%

7. ↑ **Trans fat** ↑ **Heart risk**

("partially hydrogenated")

↑ LDL ↓ HDL

Keep as low as possible in diet

8. ↑ **Polyunsaturated fat**

↓ **Heart risk**

Veggies, nuts, corn, soybean, safflower, sunflower oils, soft/liquid margarines

↓ **LDL** but also slight ↓ **HDL**

9. ↑ **Omega 3 fats**

↓ **Heart risk**

Fish, fish oil, flaxseed, soybean oil, canola oil, walnuts

Eat fish: **2-3** times/week

↓ Triglycerides ↓ LDL ↑ HDL

Good heart rhythms

10. ↑ **Monounsaturated fat**

↓ **Heart risk**

Olive oil, canola oil, high "oleic" safflower & sunflower oils, nuts

↓ Blood pressure, ↓ LDL ↓ LDL oxidation

Polys + monos = **45** grams/day

11. ↑ B Vitamins ↓ Heart Risk

Vitamins B6, B12 & folic acid

Keep **homocysteine** low

↑ homocysteine ↑ atherosclerosis

Sources: enriched grains, fruits, veggies

12. ↑ **Moderate alcohol**

↓ **Heart risk**

↑ HDL ↓ Blood clotting

Ethanol: wine, beer, mixed drinks

Red wine: polyphenols

(phytochemicals): ↓ LDL oxidation

Moderate limit: 2 drinks/day men

1 drink/day women

13. **Soy products**

Soy protein, phytoestrogens

↓ **LDL** may be ↑ **HDL**

Cholesterol-lowering effect- not as dramatic as once thought

14. **↑ Plant sterols/stanols**

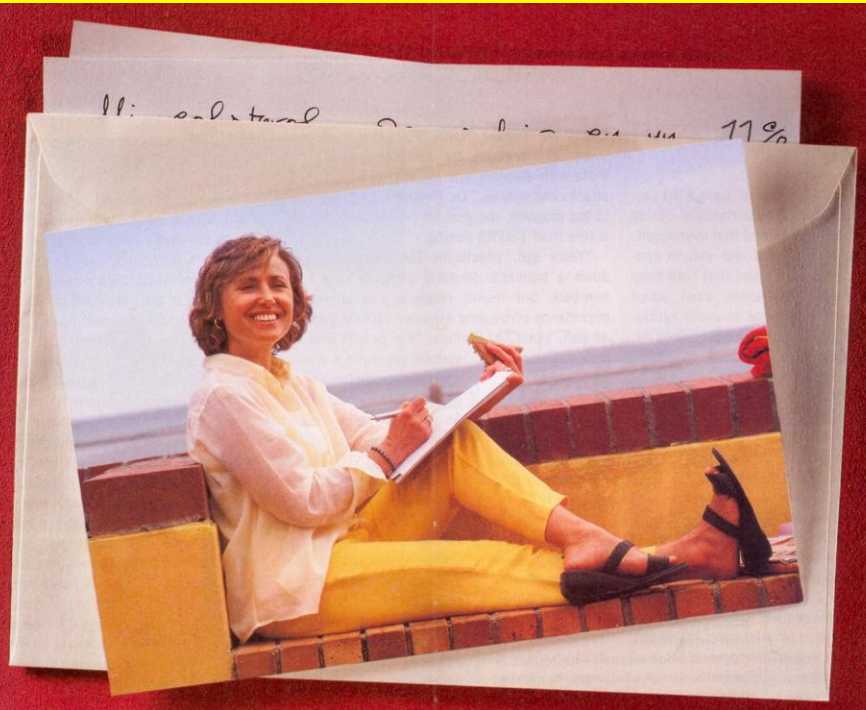
↓ Heart risk

Reduce cholesterol absorption-intestine

↓ LDL

Small amounts: fruits, veggies, nuts, seeds, cereals, peas, beans, vegetable oils

Now added to: salad dressings, OJ, **margarines** (Benecol, Take Control)



"I just lowered my cholesterol by 11%.* Now I'm sittin' pretty."

Maria Angeles, mother of 3

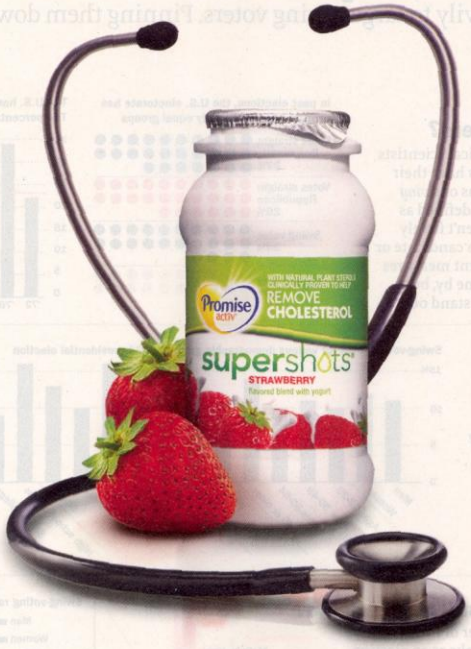
aria Angeles not only significantly lowered her cholesterol just three weeks—she did it the natural way.

very day she used delicious Take Control spread. It contains natural soybean extract clinically proven to help your body educe LDL or "bad" cholesterol.

fact, a recent study showed that enjoying Take Control vice a day, plus changing to a diet low in cholesterol and turated fat, can lower LDL by 17%.* That's why no other pread is more effective at lowering "bad" cholesterol. And his may actually reduce the risk of heart disease.**

's only natural that Maria Angeles got such spectacular results.

REMOVES CHOLESTEROL



In a national survey of 310 cardiologists, 4 out of 5 endorsed **Promise® SuperShots®** for cholesterol, based on nutritional information.

These delicious fruit and yogurt-flavored blends contain natural plant sterols, ingredients clinically proven to help remove cholesterol from your body.

Enjoy daily with meals as part of a diet low in saturated fat and cholesterol, and you could see reduced cholesterol levels.

For more information on plant sterols, go to WebMD.

Plant Sterols WebMD

supershots

TRY ALL FOUR FRUIT FLAVORS!
Strawberry, Peach, Raspberry, Blueberry

Foods containing at least 0.4 grams per serving of plant sterols, eaten twice a day with meals for a daily total intake of at least 0.8 grams, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. A serving of this product provides 2 grams of plant sterols. ©2008 Unilever

15. **Caffeinated beverages**

Elderly ↑ caffeinated drinks

↓ heart disease death risk

But people with MI in hospitals

High coffee intake: risk ventricular arrhythmias

16. **DASH Diet** ↓ **Blood pressure**

↓ **Heart risk**

Eat more: Fruits, veggies, whole grains, low-fat dairy products, poultry, fish, nuts

Eat less: Total fat, red meat, sweets, sugary drinks

17. **Meal frequency**

NIH High Blood Pressure in Adults Expert Panel

- Eat throughout day
- **Smaller** meals & snacks (healthy, low calorie)
- Instead of: 1 large meal in evening, before bed

18. **Activity/exercise**

- Be active most days of week:
  30-60 minutes
- Maintain healthy body weight
- 2007 study: people use **pedometers**: more motivated
- ↓ BMI ↓ Blood Pressure
- **+2000 steps/day = 1 mile**

19. **Antioxidants**

- **Inconsistent results**
- Some studies: ↑ fruits/veggies ↓ heart disease
- ↑ Vitamin E- smokers ↓ coronary deaths
- Other studies: Vitamin E: people at risk heart attack/stroke: **No effect;** ditto: Vitamin C, Beta carotene

Do Hershey's Kisses lower blood pressure?

- German study 2007:
- People- blood pressure: **147/86**
- Ate: 6 grams white or dark chocolate (equal in amount to **1.5 Hershey's Kisses** per day)
- **Dark** chocolate from cocoa- rich in **flavonoids**
- After 18 weeks: systolic ↓ 3 points (dark) diastolic ↓ 2 points

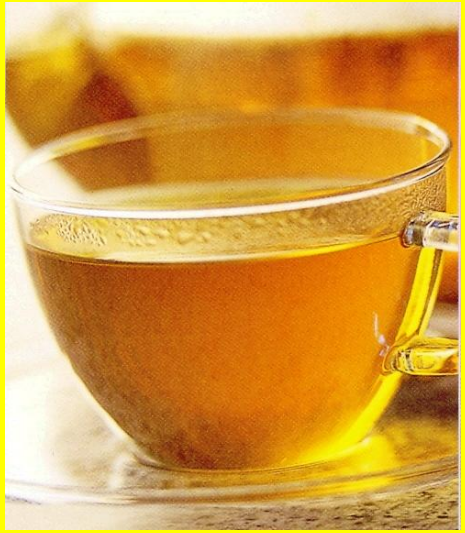
Flavonoids:

1. Decrease LDL oxidation
2. Lower LDL, raise HDL
3. Vasodilation
4. Decrease inflammation
5. Decrease blood pressure
6. Decrease platelet clumping
7. Increase insulin sensitivity

Flavonoids in black tea

- Netherlands study
- > 3 cups black tea/day
- ↓ heart attack rate

  Green Tea (catechins)
- ↓ CRP (inflammation)
- Antioxidant abilities



Flavonoids -other sources:

Green/black tea, cherries, purple grapes, blackberries, raspberries, blueberries, cranberries, plums, bran, red apples, pears, red wine, strawberries, grapefruit, prunes

*Organic tomatoes higher in flavonoids

- Problems: Current way manufacturers make cocoa & chocolate: destroys most **flavonoids**
- Chocolate: high in **calories & fat**