

Circulation

Biology 20

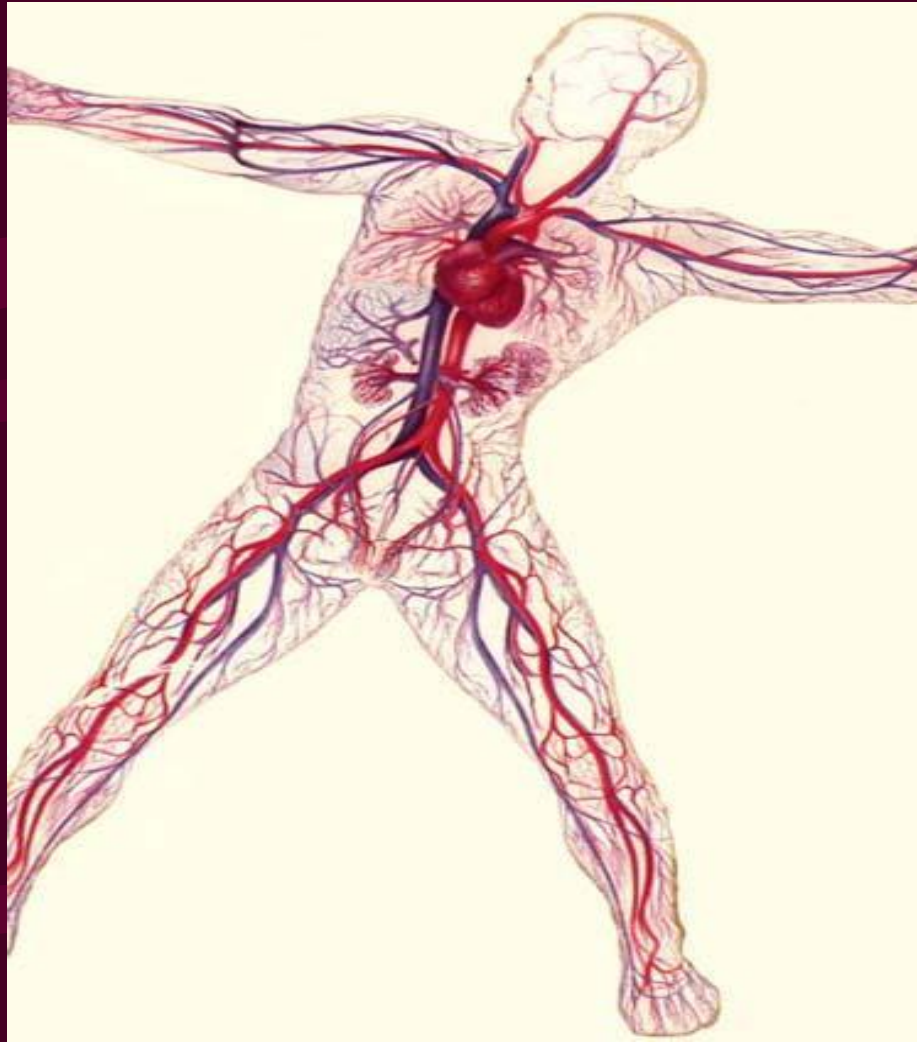
IN THE BEGINNING...

- For single celled organisms nutrients, gases, & wastes can enter/leave by simple means:
 - **diffusion** / **osmosis** / **active transport**
- Our bodies have **60 trillion cells!**
- To cope we need a blood vessel no more than 2 cells away! **WHY?**
- **TO DELIVER OXYGEN!!!!**

7 JOBS OF THE CIRCULATORY SYSTEM!

- 1) Delivery of **gases**: O_2 in CO_2 out
- 2) Delivers **nutrients** from Digestive system to tissues
- 3) Delivers **wastes** to the kidney → for removal
- 4) Delivers **WBC's** to site of injury
- 5) Able to **close wounds** (clots)
- 6) Delivers **heat** from core to surface
- 7) Delivers **hormones** throughout the body to certain targets.

History of the Circulatory System?



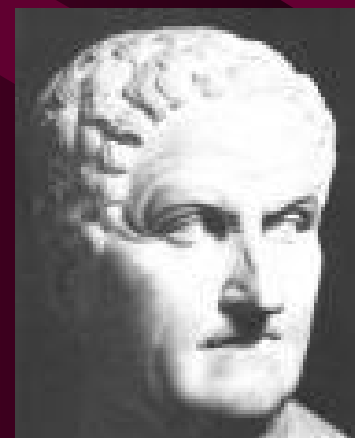
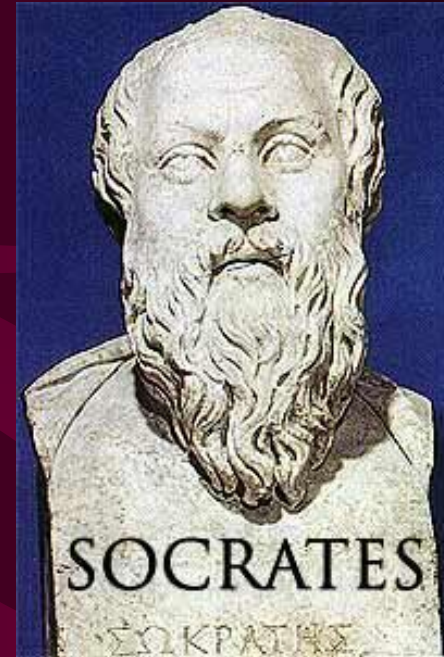
EARLY THEORIES (NO NEED TO WRITE DOWN)

• Greeks

- believed the heart was the center of human intelligence
- an “innate heart” that generated four humors
- black and yellow bile, phlegm and blood

• Galen (Roman)

- believed that blood did not circulate
- Thought our body was a sack filled with blood.
- WHY NOT think this way?



EARLY THEORIES...

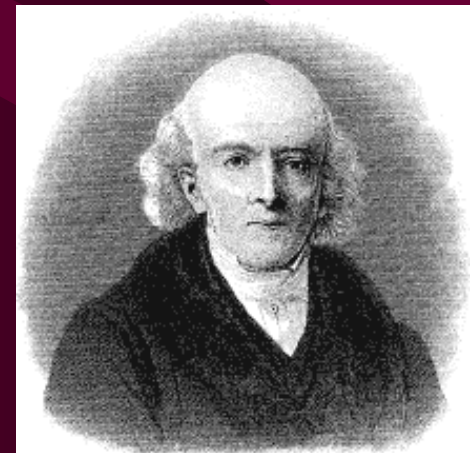
- William Harvey

- questioned Galen
- reasoned that blood must circulate in tubes
- dissected cadavers and examined blood vessels
- tried to estimate the amount of blood and how much the heart could pump



- Marcelo Malpighi

- used a microscope to examine capillaries
- He confirmed that circulation existed



Samuel Pepys Engraving

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CIRCULATORY TRIVIA!

1) What is blushing?

- When blood vessels under skin dilate & increase blood flow

2) What is bruising?

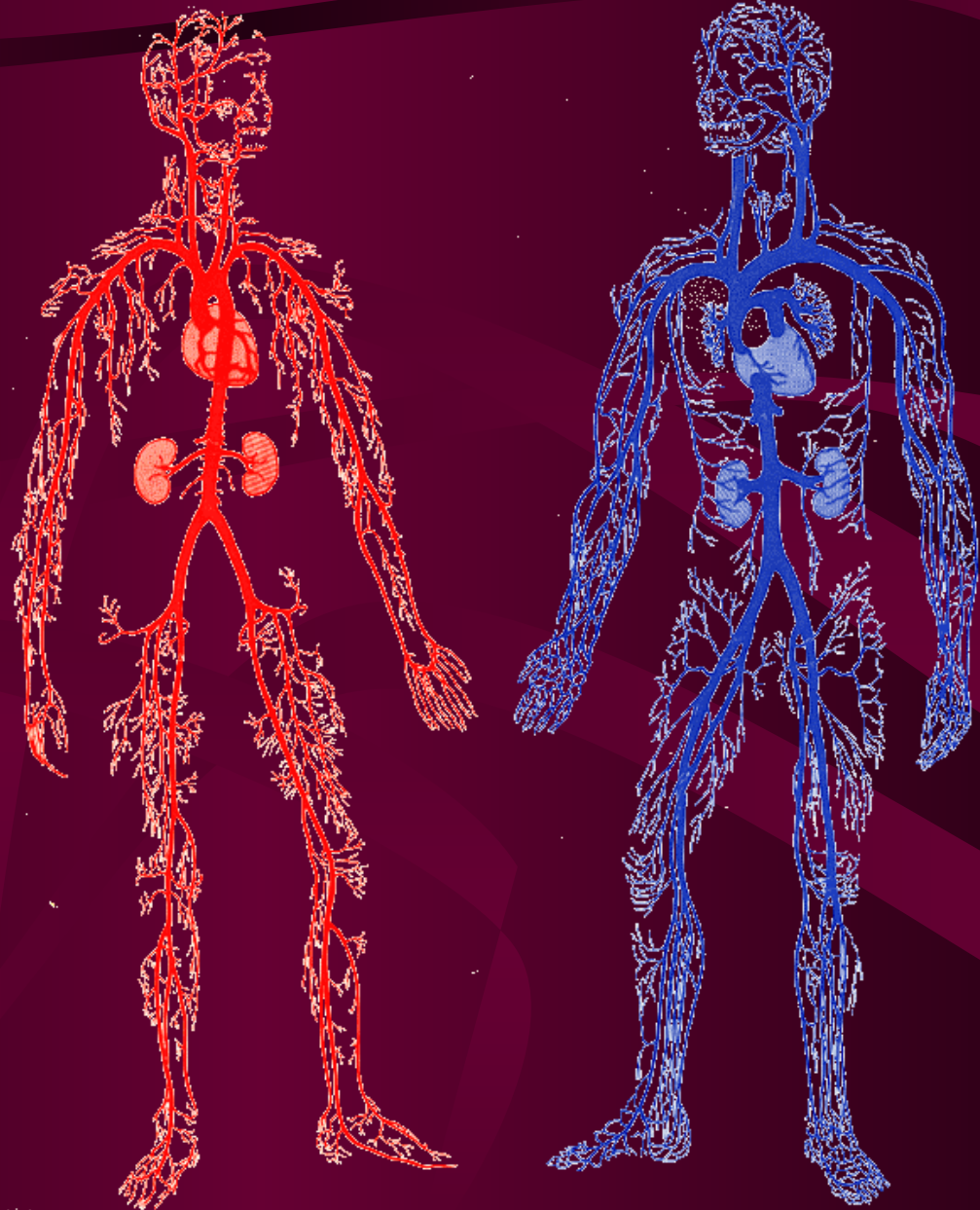
- Blood gushes from broken capillaries under skin

3) What is a hickey?

- A Yucky & Ugly souvenir (same as above)

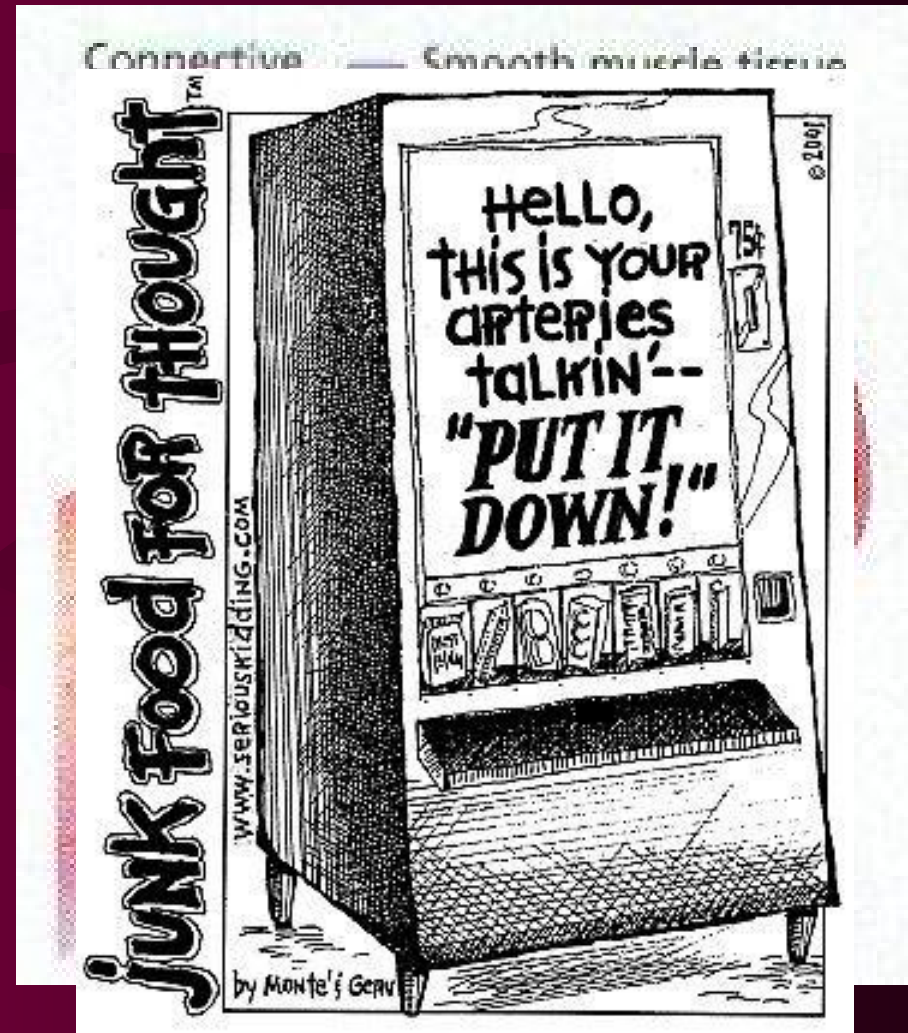
Blood Vessels

Arteries,
Capillaries
&
Veins



I Arteries

- Carry blood **AWAY** from the heart!!
- Located **DEEP** in the tissue! WHY?
- **3 Layers**: Inner and outer are rigid
- Middle layer – muscular and elastic (**contractile**)
- **Under high pressure!**



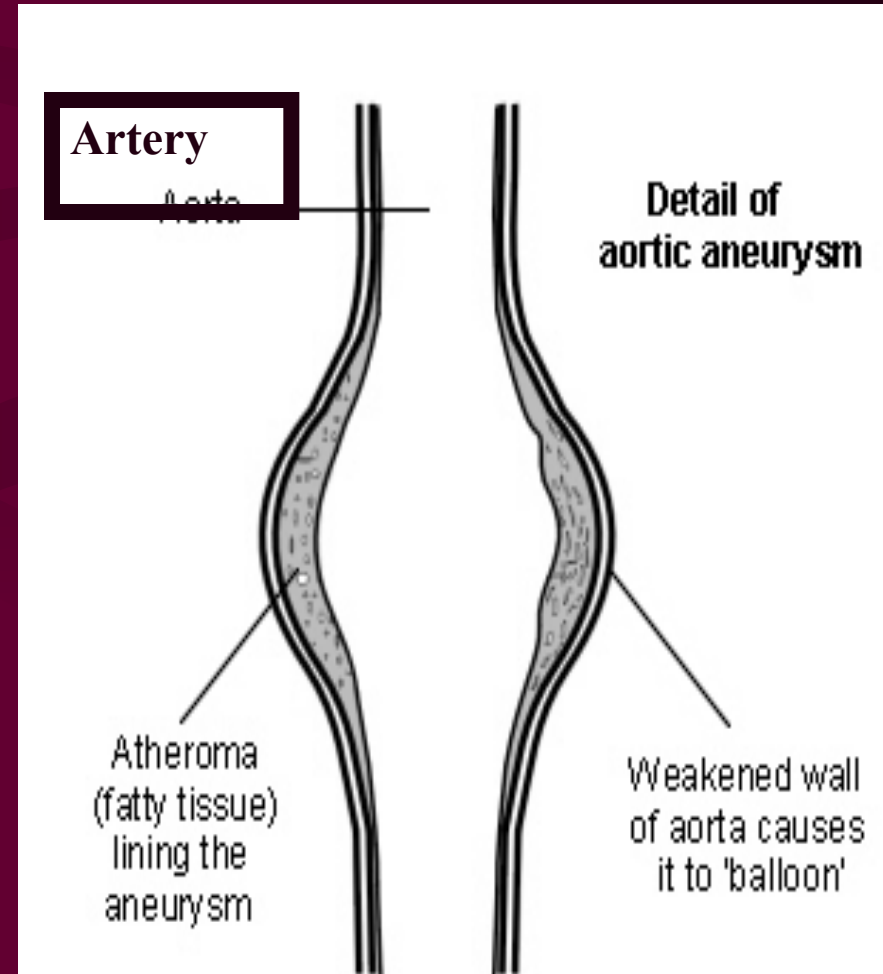
ARTERIES CONT . . .

- when your heart pumps, blood surges into arteries and **stretches** them
- when your heart relaxes, the **arteries contract** the blood forward
- the surge can be felt in places in your **PULSE!**



Arteries cont ...

- **What is an aneurysm?**
- When the inner walls of arteries bulge
- Can be **inherited** or caused by an **injury**
- The wall weakens over time!
- May burst (**stroke**), and oxygen delivery stops!



ARTERIES CONT ...

- **ARTERIOLES**

- Small branches off arteries

- **VASOCONSTRICTION**

- nerves stimulate arterioles to reduce their diameter – decrease blood flow to tissue

- ex.

- **VASODILATION** when you are frightened or nauseated

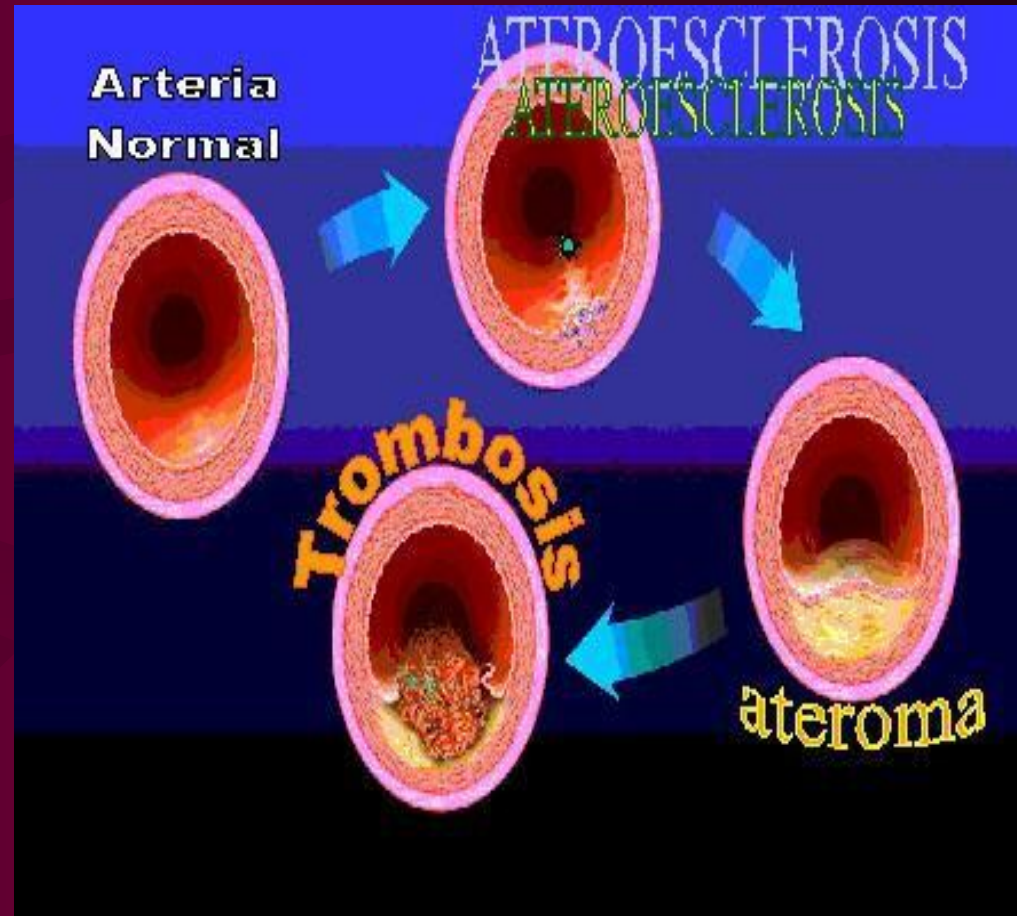
- increase blood flow to tissue

- ex

Blushing, during strenuous exercise

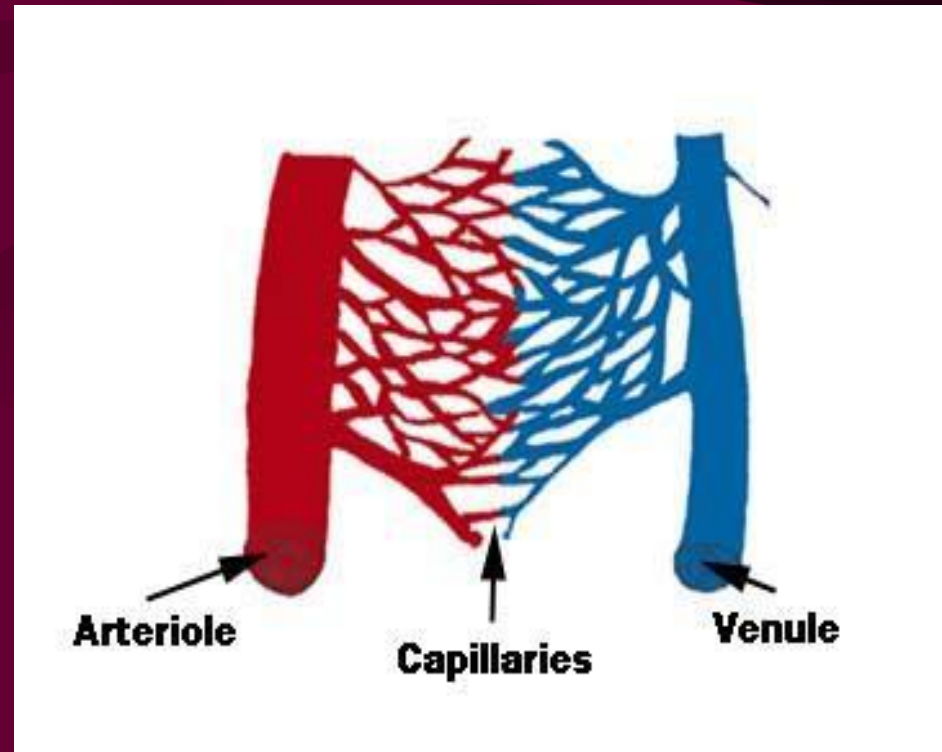
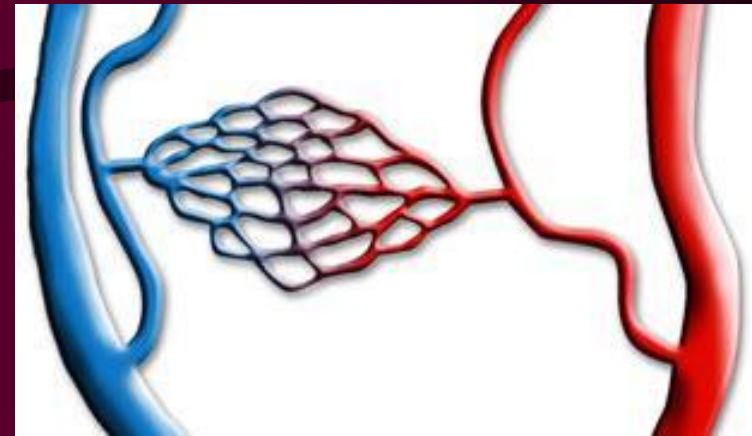
Arteries cont ...

- **Arteriosclerosis**
- Build up of fat in arteries
- Calcium and other minerals deposit on top of the fat – **PLAQUE**
- Causes high blood pressure and possibly cardiac arrest (**heart attack**)

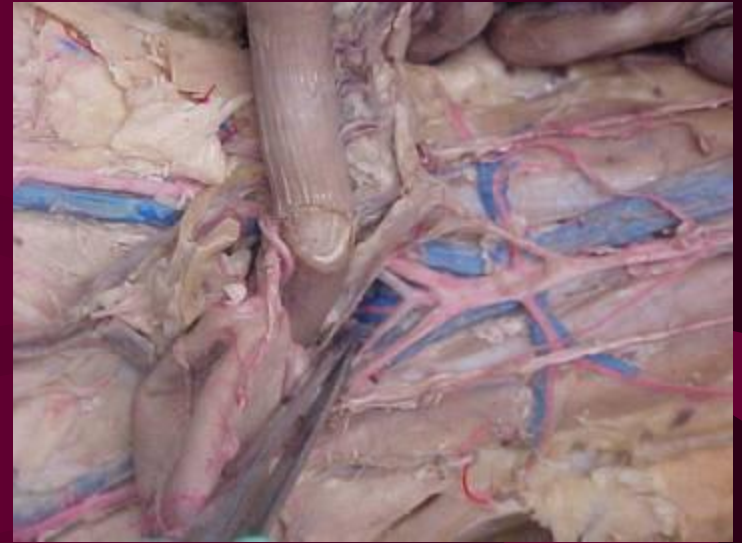


II Capillaries

- ***Smallest*** blood vessels
- *Connect* arteries to veins
- ***Site of*** nutrient, waste & gas exchange with cells
- ***Very small*** – red blood cells travel through single file
- ***Rupture Easily!***

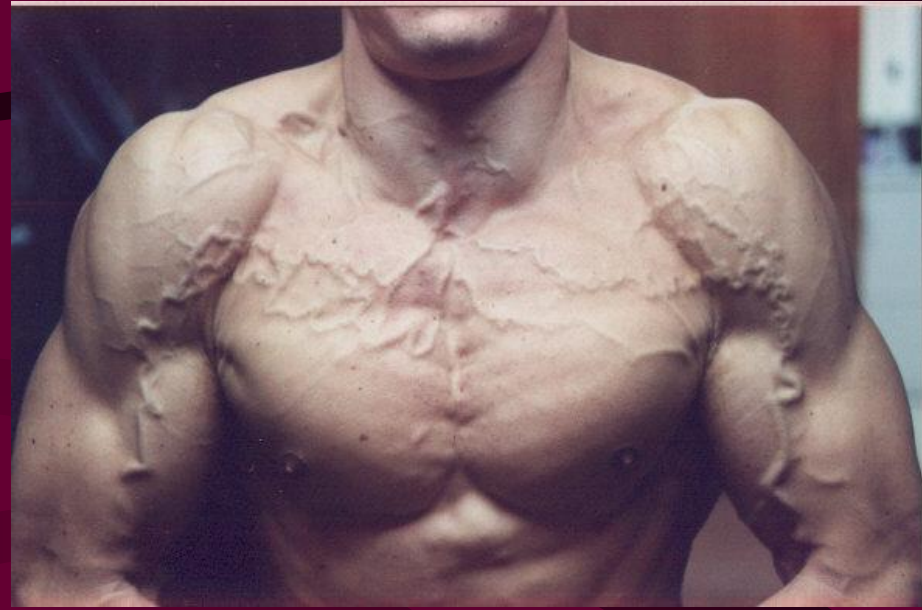


Arteries and Veins



III Veins

- Carry blood **TO** the heart
- Located **near surface** of the skin
- Stiff walled
- **Venules** – smaller veins which connect to capillaries
- **Under low pressure!**



Before



After

How blood moves in Veins!

- **Valves** – keep blood flowing in 1 direction
- **Skeletal muscles** help the blood move by squeezing the veins – “massaging action”
- **Like toothpaste in a tube!**
- **Varicose Veins** – weakened veins can have blood pooled in them which stretches the valves apart



WHAT NEXT?

- Video: Circulation & Respiration
- Blood Travel Worksheet
- HW
 - Read p. 244-250
 - Do Q's 1-9 on p. 250