

TOPIC 6.2: THE BLOOD SYSTEM

Circulation

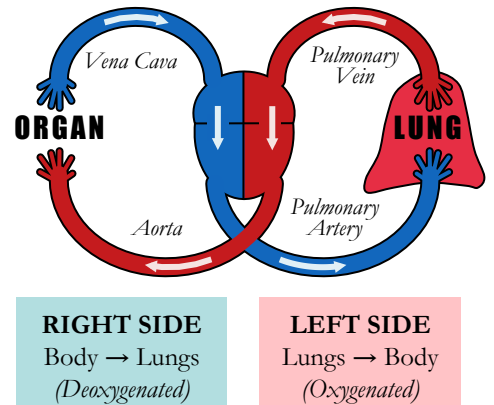
William Harvey proposed the modern understanding of the circulatory system

According to Harvey:

- The major blood vessels (arteries & veins) are connected by a single network
- Blood flow is unidirectional (due to the presence of one-way valves)
- The heart is a central pump (arteries = from heart ; veins = to heart)
- Blood flows continuously and is not consumed by the body

It has further been discovered that:

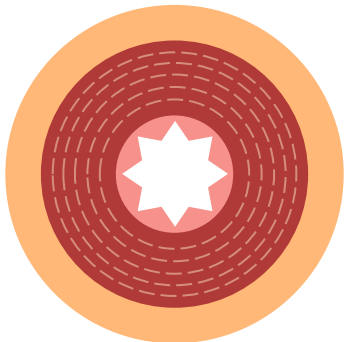
- Arteries and veins are connected by capillaries (via arterioles & venules)
- There is a separate circulation for the lungs (pulmonary versus systemic)



Blood Vessels

Arteries

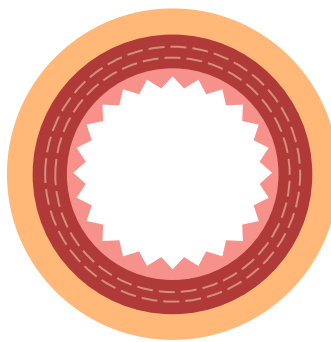
- Transport blood from the heart
- Blood at high pressure (80-120 mmHg)
- Walls are thick (muscle and elastin)
- Walls stretch or contract with pulse



collagen muscle/elastic fibres

Veins

- Transport blood to the heart
- Blood at low pressure (<15 mmHg)
- Walls are thin (with wider lumen)
- Have valves to prevent pooling



collagen muscle/elastic fibres

Capillaries

- Facilitate material exchange
- Blood at low pressure (~10 mmHg)
- Walls made of single layer of cells
- Extremely narrow lumen (~10 μm)

Capillaries may be categorised as:

- Continuous (*intact basement membrane*)
- Fenestrated (*have endothelial pores*)
- Sinusoidal (*discontinuous membrane*)



endothelium (single layer) basement membrane

Blood

Blood contains three main elements:

- Red blood cells (transport oxygen)
- White blood cells (fight infections)
- Platelets (responsible for clotting)

The blood fluid (plasma) transports:

- **N**utrients (e.g. glucose)
- **A**ntibodies
- **C**arbon dioxide
- **H**ormones
- **O**xygen
- **U**rea
- **H**eat



NACHO-UH!

Blood Flow

A heart pumps blood around the body via two distinct circulatory pathways

Right Side (of heart):

- Deoxygenated blood (from tissues) enters right atrium via the vena cava
- Blood in the right ventricle is pumped to lungs via the pulmonary artery
- Gas exchange at the lungs (capillaries ↔ alveoli) oxygenates the blood

Left Side (of heart):

- Oxygenated blood (from lungs) enters left atrium via the pulmonary vein
- Blood in the left ventricle is pumped to the body tissues via the aorta
- Material exchange occurs at the respiring tissue (deoxygenates the blood)

Valves in veins ensure proper circulation by preventing backflow of blood

- Contraction of skeletal muscles may compress veins to aid blood flow