

Blood Vessels

Types

- 👉 **Arteries:** Away from heart, oxygenated (except pulmonary artery)
- 👉 **Veins:** Towards heart, deoxygenated (except pulmonary vein)
- 👉 **Capillaries:** Tiny, exchanges gases

Basic Structure

Arteries & Veins

- 👉 Tunica intima
- 👉 Tunica media
- 👉 Tunica externa
- 👉 Endothelial cells
- 👉 Basement membrane
- 👉 Collagen fibres
- 👉 **Veins also have valves**

Capillaries

- 👉 1 cell thick endothelial layer

Vasodilation Vs Vasoconstriction

Vasodilation

- 👉 Widening → blood flow increase

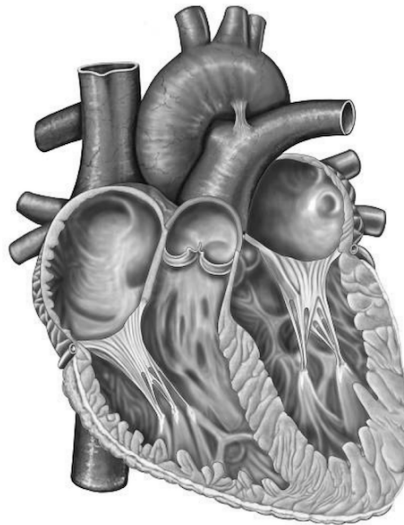
Vasoconstriction

- 👉 Narrowing → blood flow decrease

Both Aim To...

- 👉 Maintain blood flow
- 👉 Move blood
- 👉 Control temperature
- 👉 Transport WBCs & platelets

Basic Heart Diagram



Blood Flow Through The Heart

Deoxygenated Side

1. Superior & inferior vena cava
2. Right atrium
3. Tricuspid valve
4. Right ventricle
5. Pulmonary/semi-lunar valve
6. Pulmonary artery

Oxygenated Side

7. Pulmonary vein
8. Left atrium
9. Bicuspid valve
10. Left ventricle
11. Aortic/left semi-lunar valve
12. Aorta

Venous Return Methods

Skeletal Muscle Action

- 👉 Skeletal muscle squeezes veins while walking
- 👉 Valves prevent back flow

Respiratory Movement

- 👉 Breathing in causes diaphragm to move down:
 - ↑ pressure abdominal cavity
 - ↓ pressure thoracic cavity
- 👉 Blood moves upwards to heart from abdomen to thoracic cavity

Venoconstriction

- 👉 Wave-like motion of veins propels blood

Age-Related Changes

Includes...

- 👉 Stiffer & less elastic arteries
- 👉 Loss of blood pressure control
- 👉 Increased likelihood of hypertension & hypotension
- 👉 Increased risk of lifestyle diseases

Pulse & Blood Pressure Indications

- 👉 As part of vital signs
- 👉 To establish a baseline of normal vital signs
- 👉 To monitor/check health status
- 👉 To determine blood flow

C

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Red & White Blood Cells

Red Blood Cells

- Formation via erythropoiesis
- No organelles
- O₂ binds to Hb's Haem group
- Eliminated in spleen or liver

White Blood Cells

- Forms in red blood marrow
- Destroys infections
- Only in blood for 10-12 hours before moving into tissues

Granulocytes: Agranulocytes

- | | |
|-------------|-------------|
| Basophils | Lymphocytes |
| Eosinophils | Monocytes |
| Neutrophils | |

Never Let Monkeys Eat Bananas said
GRANdpA BEN

Haemostasis

- The process of stopping/controlling blood flow

- Vasoconstriction
- Platelet Plug Formation
- Coagulation
- Fibrinolysis

Cardiac Conduction System

- Heart beat via electrical impulses
- Heart is auto-arrhythmic, though can be influenced by brain
- Heart has neuromuscular cells

Heart Rate: Cardiac impulse made by SA node. 60-100 times/min

Process

- Sinoatrial (SA) Node/Pacemaker
- Atrial Conducting Fibres & Atrioventricular (AV) Node
- Bundle Of His
- Purkinje Fibres

Cardio-Vascular Related Conditions

Heart Attack/Myocardial Infarction (MI)

- Blocked blood supply kills myocardial tissue, preventing contraction
- Can be caused by atherosclerosis

Cardiac Arrest

- SA Node stops firing
- Caused by: haemorrhage, MI or SA Node problem

Major Pulse Sites

Common

- Carotid
- Radial
- Brachial

Less Common

- Temporal

Major Pulse Sites (cont)

- Apical
- Femoral
- Popliteal
- Pedal

Blood Pressure

- The pressure that blood flow puts on an artery wall
- Occurs during heart contraction & relaxation
- Unit mmHg

Pressure Types

- | | |
|-----------------------------|----------------------------|
| Systolic (^) | Diastolic (v) |
| Pressure during contraction | Pressure during relaxation |

Blood Pressure When It's...

- | | |
|-------------------------|-----------------------|
| Normal (At Rest) | Abnormal |
| Systolic: 100-120 mmHg | Hypertension: High BP |
| Diastolic: 60-80 mmHg | Hypotension: Low BP |

Blood

Components

- Erythrocytes
- Leukocytes
- Thrombocytes
- Plasma

Functions

- To transport



Blood (cont)

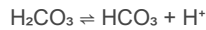
- ☞ To protect
- ☞ To regulate electrolyte & fluid balance

pH Of Blood

- ☞ 7.35-7.45 pH

pH Buffer

- ☞ To maintain blood pH



- ☞ H_2CO_3 formation increases alkalinity
- ☞ HCO_3 formation increases acidity

Heart

- ☞ One way circulatory system

Layers

- ☞ Pericardium
- ☞ Myocardium
- ☞ Endocardium

Coronary Arteries

Main

- ☞ Left Anterior Descending (LAD) Coronary Artery
- ☞ Circumflex Coronary Artery
- ☞ Right Coronary Artery

Diastole: Coronary arteries filling when heart is relaxing

Cardiac Output

- ☞ Total blood amount pumped through heart in 1 minute

Total Blood Volume...

- ☞ On average: = 5 L
- ☞ In men: 5-6 L
- ☞ In women: 4-5 L

Cardiac Output Formula

$$\text{Cardiac Output} = \text{Heart Rate} \times \text{Stroke Volume}$$

- ☞ Heart Rate: Amount of beats per minute
- ☞ Stroke Volume: Amount of blood pushed out of ventricles

Factors Affecting...

- ☞ Heart Rate: Exercise, drugs, hormones, stress, individual's size
- ☞ Stroke Volume: Ventricle strength

Pulse

Rate

- ☞ No. of bpm

Normal (At Rest)	Abnormal
-------------------------	-----------------

- | | |
|------------------------|-----------------------------|
| ☞ Adults: 60-100 bpm | ☞ Tachycardia: Above normal |
| ☞ Children: 90-120 bpm | ☞ Bradycardia: Below normal |
| ☞ Infants: 120-140 bpm | |

Rhythm

- ☞ Pulse regularity

Normal (At Rest)	Abnormal
-------------------------	-----------------

Pulse (cont)

- | | |
|---|---|
| ☞ Sinus Rhythm: 'Regular'/even spaces between beats | ☞ Arrhythmia: 'Irregular'/uneven spaces between beats |
|---|---|

Volume

- ☞ Strength of beat

Strong	Normal	Weak
☞ 'Full & bounding'	☞ 'Normal' strength	☞ 'Weak & thready'

