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	Vasoconstriction
👉 Widening → blood flow increase	👉 Narrowing → blood flow decrease

Both Aim To...

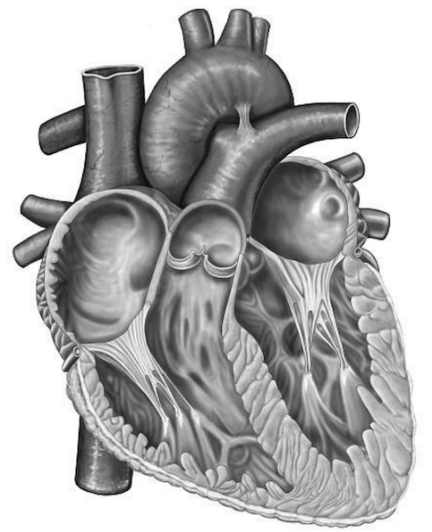
👉 Maintain blood flow

👉 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

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Red & White Blood Cells

Red Blood Cells

- Formation via erythropoiesis
- No organelles
- O_2 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	Lympho-cytes
Eosinophils	Monocytes
Neutrophils	

Never **L**et **M**onkeys **E**at **B**ananas said **GRAN**dpa **BEN**

Haemostasis

- The process of stopping/controlling blood flow

1. Vasoconstriction
2. Platelet Plug Formation
3. Coagulation
4. 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

1. Sinoatrial (SA) Node/Pacemaker
2. Atrial Conducting Fibres & Atrioventricular (AV) Node
3. Bundle Of His
4. 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

$H_2CO_3 \rightleftharpoons HCO_3 + H^+$

- 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

Cardiac Output = Heart Rate x 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'