

8: TRANSPORT IN HUMANS(1)

體內物質的轉運(1)

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1. material exchange? 物質交換？

1. Why: transportation of O₂, nutrition, waste, hormone, etc
為何: 運輸 (氧氣, 養分, 廢物, 賀爾蒙等。)
2. How: unicellular organism → cell diffusion
multicellular organism → may develop specialized system
(breathing sys. + transport sys.)
如何: 小型/單細胞生物 → 細胞的擴散作用
大型生物 → 或形成特化系統
(呼吸系統+運送系統)

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2: transportation sytem of human 人體運送系統

- circulatory system 循環系統
 - Blood 血液, blood vessel 血管, heart 心臟
- lymphatic system 淋巴系統
 - Lymph 淋巴, lymph vessel 淋巴管, lymph node 淋巴結

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3: Composition of blood 血液成分

Plasma 血漿

- Water 水分
- Nutrients 養分
- Wastes 廢物 (CO₂, urea 尿素)
- Hormones 荷爾蒙
- Antibodies 抗體

Blood cells 血細胞

- RBC 紅血細胞
- WBC 白血細胞
- Platelets 血小板

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	Red blood cell 紅血細胞	White blood cell 白血細胞	Blood platelets 血小板
Color and Shape 顏色及形狀	Red Biconcave disc 紅色雙凹圓盤狀	Colorless irregular 無色不規則	Colorless Irregular cell fragments 無色不規則細胞碎片
Diameter 直徑	8µm 2µm thickness 厚度	Phagocyte:10-20µm 吞噬細胞 Lymphocyte:6-10µm 淋巴細胞	2-3µm
Nucleus 細胞核	X (matured) (成熟時)	V (round or loped) (圓形 或 分成數節)	X
Number (per ml of blood) 數量 (每毫升血液)	5000000	7000	250000
Life span 壽命	120 days	A few days	A few days

4: Comparison of blood cells
血細胞比較

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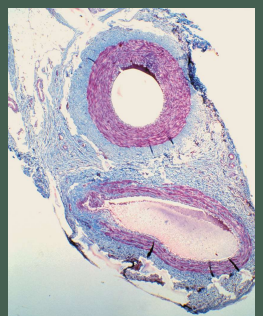
	Red blood cell 紅血細胞	White blood cell 白血細胞	Blood platelets 血小板
Function 功能	Carry oxygen 攜帶氧氣 (haemoglobin) (血紅蛋白)	Body defense 身體免疫	Blood clotting 血液凝固
Site of production 製造部位	Bone marrow 骨髓	Bone marrow and spleen 骨髓及脾臟	Bone marrow 骨髓
Site of destruction 分解部位	Liver and spleen 肝臟及脾臟 (become iron + bile pigment) (分解為鐵質及膽色素)	Killed by pathogens 被病原體殺死 Egested in faeces 隨糞便排出	Liver and spleen 肝臟及脾臟

4: Comparison of blood cells
血細胞比較

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	Arteries 動脈	Capillaries 微血管	Veins 靜脈
Blood flow direction 血液流向	Away from heart 離開心臟	--	Towards the heart 流往心臟
Blood flow 血液流速	Rapid 快速	Very slow 非常慢	Slow 慢
Oxygenated blood? 血液是否帶氧	V (except pulmonary artery and umbilical artery) (肺動脈及臍帶動脈除外)	V (arterial end) (動脈側) X (venous end) (靜脈側)	X (except pulmonary vein and umbilical vein) (肺靜脈及臍帶靜脈除外)
Blood driving force 血液動力來源	Pumping action from heart 心臟泵壓	Blood pressure 血壓	Contraction of skeletal muscles 骨骼肌收縮

5: comparison of blood vessels
血管比較



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	Arteries 動脈	Capillaries 微血管	Veins 靜脈
Blood pressure 血壓	High 高	Drops 下跌	Very low 非常低
Wall 血管壁	Thick 厚	1-cell thick 一層細胞	Thin 薄
Lumen 管腔	Small 小	Very small 非常小	Big 大
Valves 瓣膜	X (except pulmonary artery and aorta) (肺動脈及大動脈除外)	X	v

5: comparison of blood vessels
血管比較

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	Arteries 動脈	Capillaries 微血管	Veins 靜脈	4: comparison of blood vessels 血管比較
Adaptation 適應	<p>Thick wall can withstand blood pressure 厚管壁能承受高血壓</p> <p>smooth muscles regulate blood flow 滑肌能調節血液流速</p> <p>**elastic fibre maintain continuous blood flow 彈性組織能維持血液流通</p>	<p>Highly branched → total surface area ↑ 大量分支→表面積↑</p> <p>1-cell thick wall → diffusion distance ↓ 單層細胞構成的管壁 → 擴散距離</p> <p>large cross-section area → blood flow ↓ → time for exchange ↑ 橫切面面積大 → 血液流速↓ → 物質交換時間↑</p>	<p>Large lumen → reduce resistance of blood flow 管腔較大能減少血流阻力</p> <p>Presence of valve → ensure blood flow direction 瓣膜能確保血液流向</p>	

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FYI : material exchange 資料：物質交換

- By diffusion
(refer to ch7 & “adaption of capillaries”)
主要為擴散作用
(見第七課及“微血管”部分)

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