The Vampire Strikes Back

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Overview

- Clinical -v- Underwriting
- Blood physiology
- The blood sample
- Screening for the 3 main killers
- The top 3 useful blood tests
- The future

Blood and Body Composition

70kg

45kg fluid

= 45 litres

30L intracellular

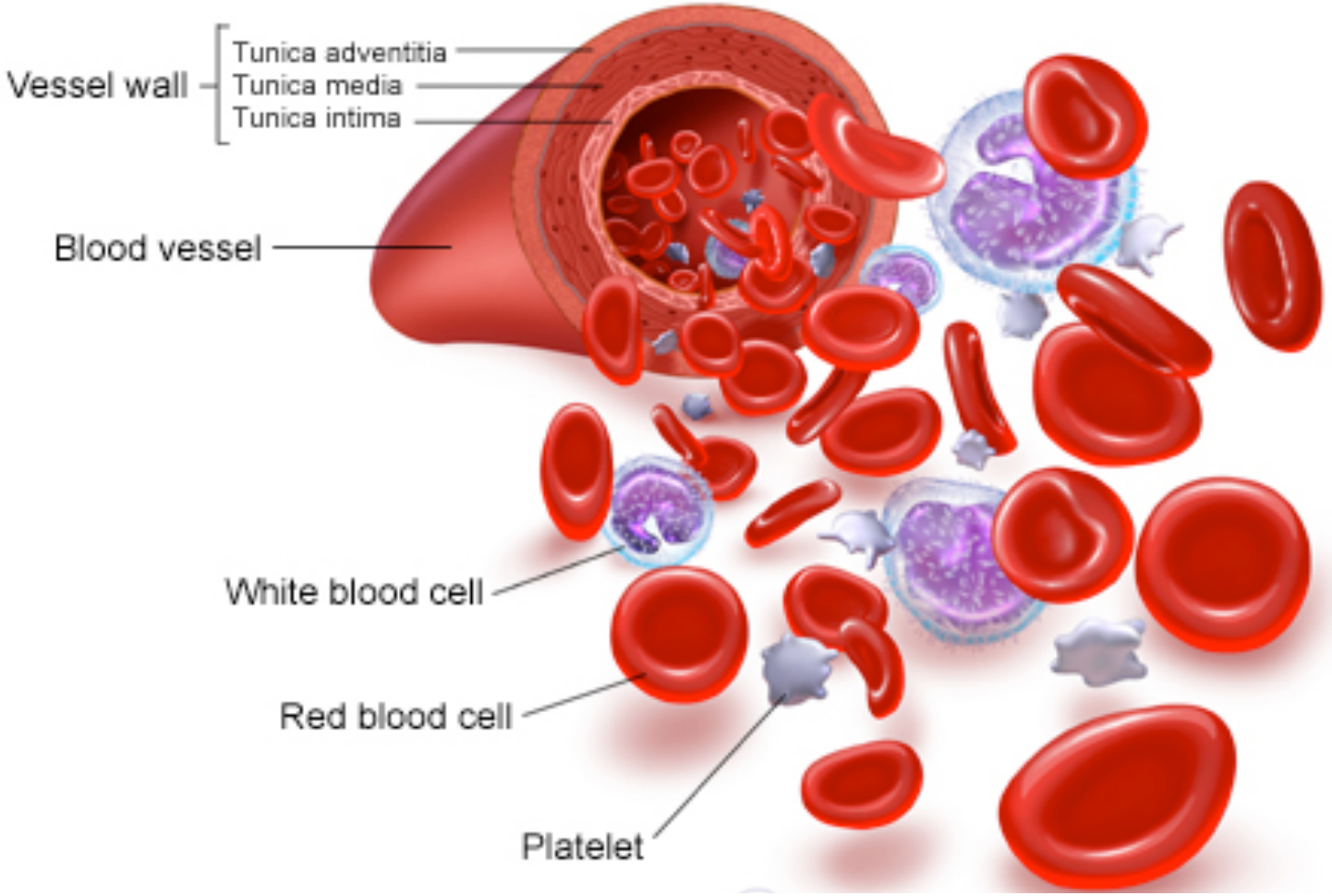
15L extracellular

3L plasma

Blood

2.5L blood cells

Blood Cells


Vessel wall
Tunica adventitia
Tunica media
Tunica intima
Blood vessel
White blood cell
Red blood cell
Platelet

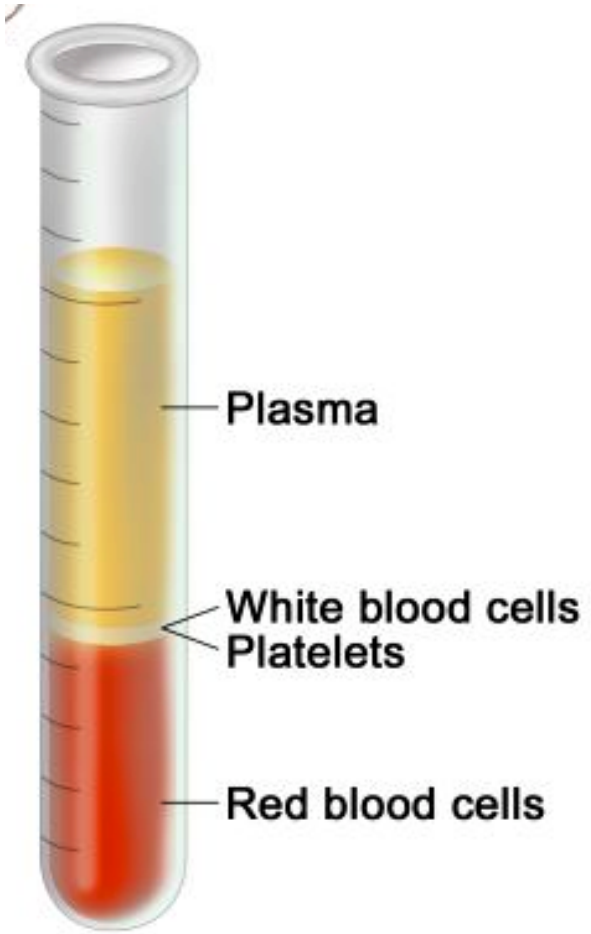
How do you take a blood sample ?

Spurious Results

- Haemolysis
- **Delayed separation (old sample)**
- Drugs
  - anticonvulsants and barbiturates
  - diuretics and steroids

Haemolysis & Delayed Separation

- Potassium ++
- Phosphate +
- Liver enzymes +
- Bilirubin +



Does Haemolysis Matter ?

It depends…

- On the degree of haemolysis
  - Mild haemolysis eg K+ mildly raised, other tests within the reference range
  - Severe Haemolysis - should be repeated

- Can you ‘adjust’ results for delayed separation ?
  - No !

Reducing Haemolysis & Delayed Separation

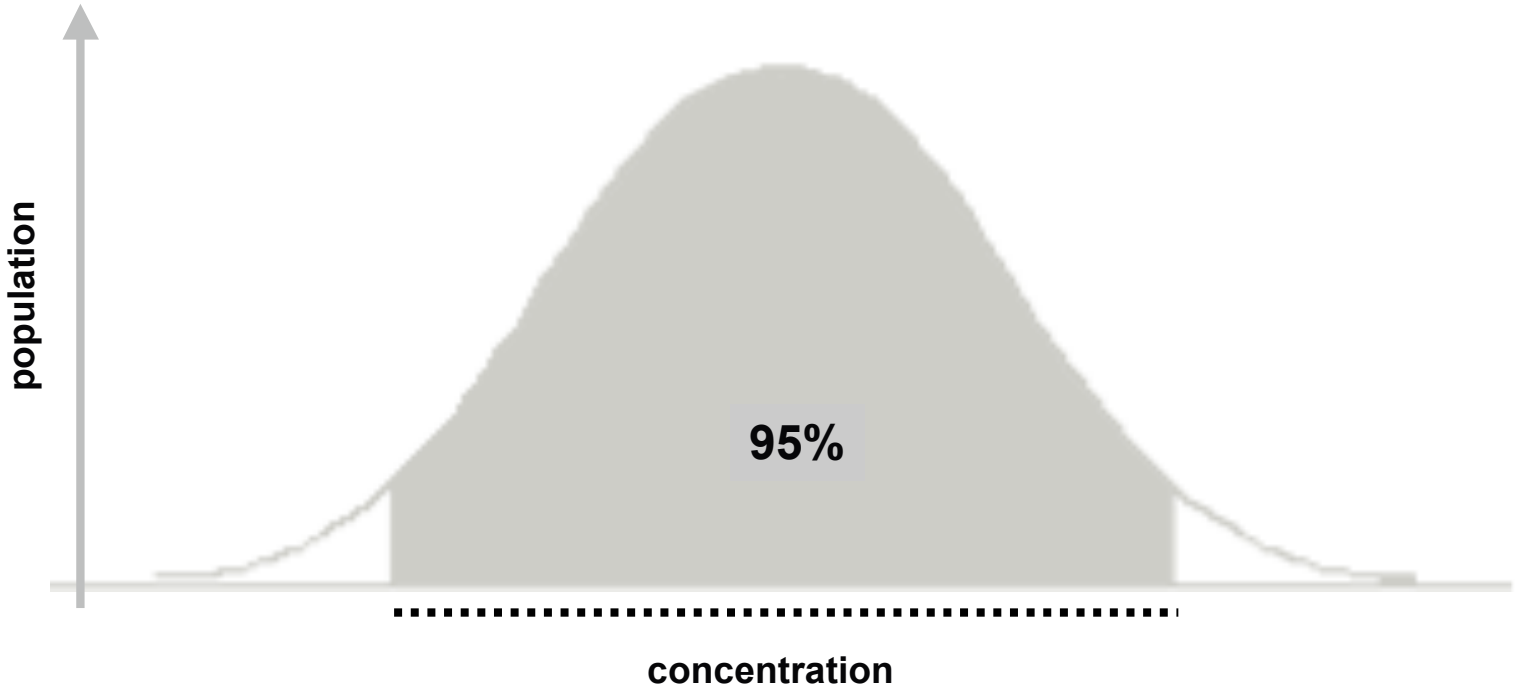
- Practical Measures
- Operator Technique

Question …
is this result normal ?

- Na+ 120 mmol/l (Ref range 135-146 mmol/l)
- Na+ 133 mmol/l (Ref range 135-146 mmol/l)

Reference Range

Relates to 95 % of the normal population



Why request a blood test?

Clinical	Underwriting
To confirm a diagnosis	-
To exclude a condition	-
Monitor treatment or disease progression	-
Screening	Screening

Screening

NHS	Underwriting
Important health problem	✔
Natural history is understood	?
Preclinical stage	✔
Early treatment is beneficial	✔
Cost of case finding and treatment are balanced	-
Reduced hospital expenditure	-
Screening will be ongoing	-
Screening is easy to do and not unpleasant or harmful for the people being screened,	✔
Screening test is ‘cost effective’.	✔

How good is the screening test?

Sensitivity	Probability the test is positive in a group of people with the disease	A test with high sensitivity has few false negatives.
Specificity	Probability the test is negative in a group of people who do not have the disease	A test with high specificity has few false positive results.

The 3 big killers

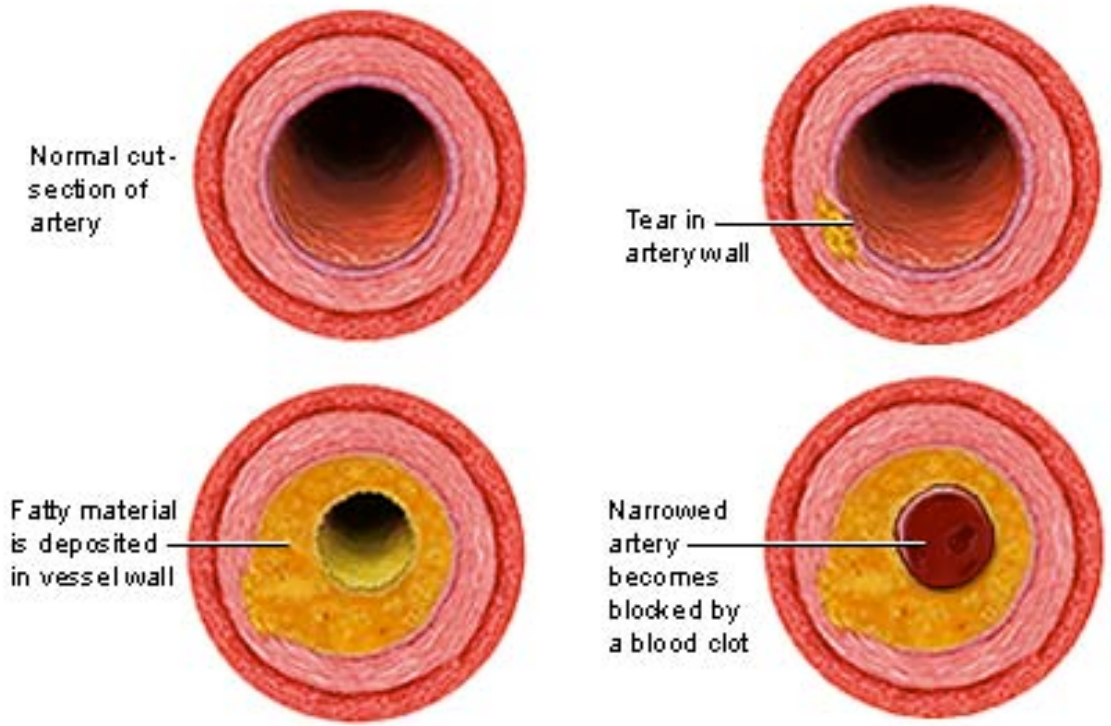
- Malignant Disease
- Ischaemic Heart Disease
- Cerebrovascular Disease

Screening for malignancy

	Screening	Crtiteria
Breast	✔	F 50 to 70
Cervical	✔	F 25 to 65
Bowel	✔	M & F >60
Prostate	-	Underwriting ?
Ovarian	-	Underwriting ?

Ischaemic Heart Disease & Cerebrovascular Disease

- Atherosclerosis



Ischaemic Heart Disease & Cerebrovascular Disease

- male
- age
- family history
- hypertension
- **smoking**
- **diabetes**
- **hypercholesterolaemia**
- **excessive alcohol consumption**

Smoking

- Nicotine -v- Cotinine

	Nicotine	Cotinine
Half life (hours)	< 4	7 to 40
Detectable up to (days)	< 1	3 to 4

Saliva	Urine	Hair	Blood
sampling cumbersome	10x concentrated	research and passive	gold standard

Diabetes

- 2.6 million known diabetics in UK
- 0.5 million undiagnosed
- incidence of impaired glucose tolerance in UK (40-65 age group) is 17%

	Level	Comment
Glucose Tolerance Test	2 hour plasma glucose concentration >= 11.1 mmol/l	Gold standard of diagnosis
Urinalysis	(screening)	
Random blood glucose	>= 11.1 mmol/l	Diagnostic
Fasting glucose	>= 7.0 mmol/l	Diagnostic
HbA1c	>= 6.5%	Monitoring, Diagnostic?

Lipid profile

- Lipids = cholesterol + triglycerides (fat)

screening protocol …

- Random blood samples for total cholesterol and high-density lipoprotein (HDL) cholesterol (capillary or plasma)
- If abnormal and there is a high cardiovascular risk, measure fasting lipids

Hypercholesterolaemia

- Total cholesterol < 5.0 mmol/L
- LDL cholesterol < 3.0 mmol/L
- HDL is an independent risk factor for cardiovascular disease
  - M >1.0 mmol/L
  - F >1.2 mmol/L
- For every 1% decrease in HDL there is an associated 2-3% increase in risk of coronary artery disease - this is independent of concentrations of LDL and triglycerides

Alcohol

- There are no laboratory tests that are diagnostic for alcohol dependence

But….

- Carbohydrate-deficient transferrin (CDT) test is the most sensitive for heavy drinking
- Level of GGT correlates with alcohol consumption
- If the AST:ALT ratio > 2 then this is suggestive of alcohol damage
- MCV - raised in over half of people with alcohol dependence. It is more commonly raised in women than men.

…… and Finally

- Point of Care or Near Patient Testing
- Statistical Analysis
- Personal Genomic Screen

Personal Genomic Screen

- Uses data from genome-wide association studies to predict a person's chance of developing a condition
- These studies identify markers that are statistically more common in people with the disease than in controls
- More than 38 web based companies worldwide offer testing direct to the consumer

Underwriting in 2020 ?