

Interpreting Blood Test Seminar



Glad You're Here!



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Most Relevant Tests

 Electrolytes & Urea

 Liver Markers

 Lipid Studies

 Iron Studies

 Female Hormones

 Full Blood Evaluation

 Blood Glucose

 Cardiovascular Markers

 Thyroid Function

 Vit D, Calcium, Phosphate



As we go
along we
will cover:

■ How to use these
results in clinic

■ Monitoring Patient
Progress

■ Creating a
Treatment
Protocol

■ Red Flags,
Referring Out

■ Chinese Medicine
Diagnosis vs
Western Medicine
Diagnosis

■ Confidence in
reading blood
tests

■ Case Studies

Concluding Discussion



When to Test



Clinical efficacy vs
Complete Clinical
Information



When Not to Test



Cost vs
Outcomes

3 Day Masterclass



Electrolytes



Liver Markers



Inflammatory
Markers



Renal Markers



Glucose Studies



Vitamins and
Minerals



Strong
Foundations



My Strategy



Hormones



Lipid Studies



White Blood Cell
Panel



Red Blood Cell Panel



Iron Studies



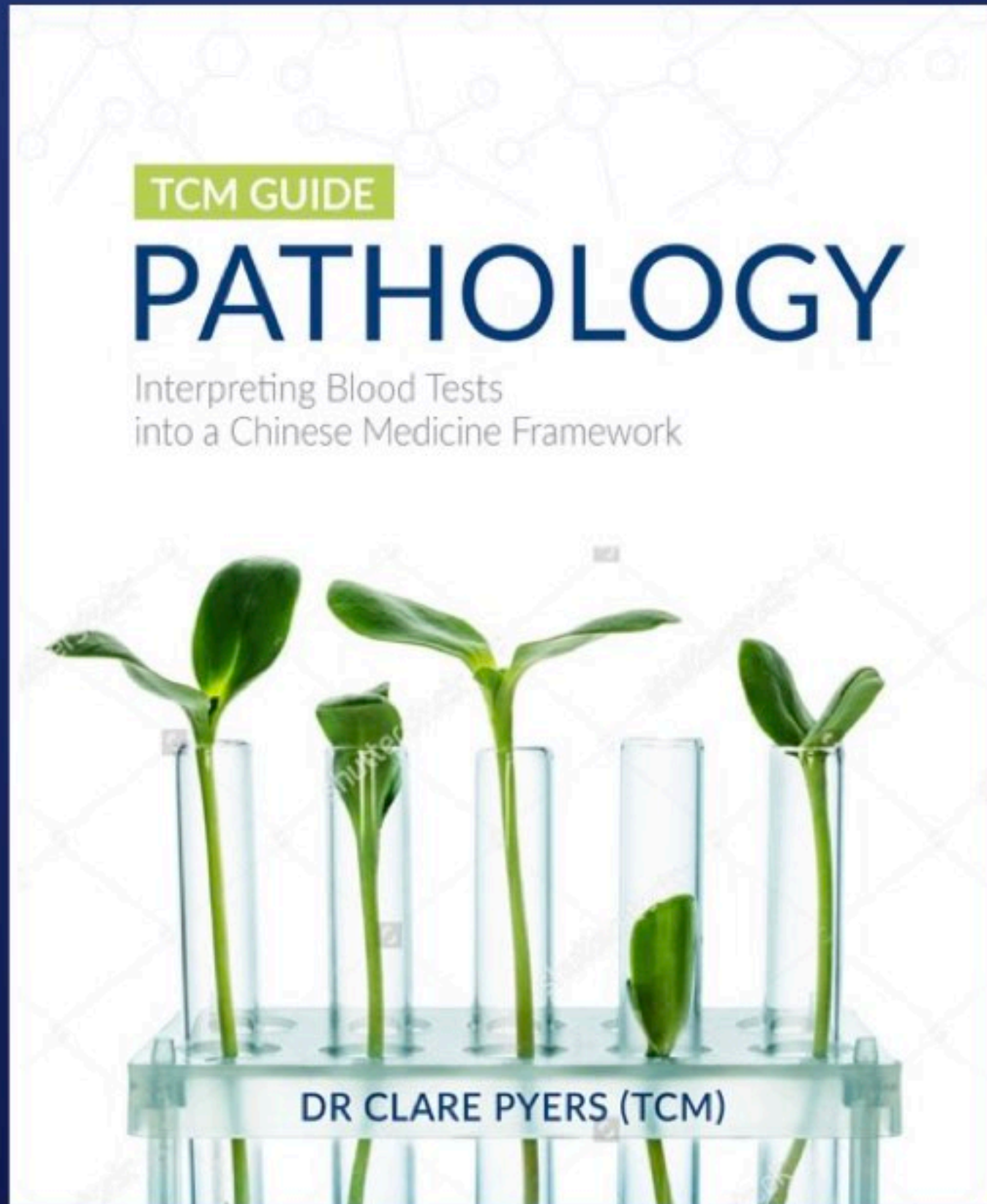
Pregnancy
Considerations



Reference Ranges



To test or not to
test?



**Available from China
Books or from
clarepyers.com**

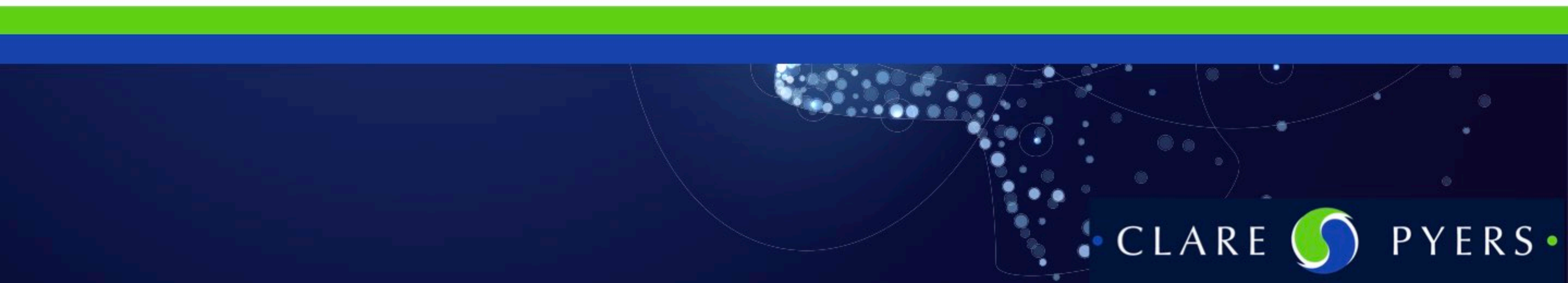








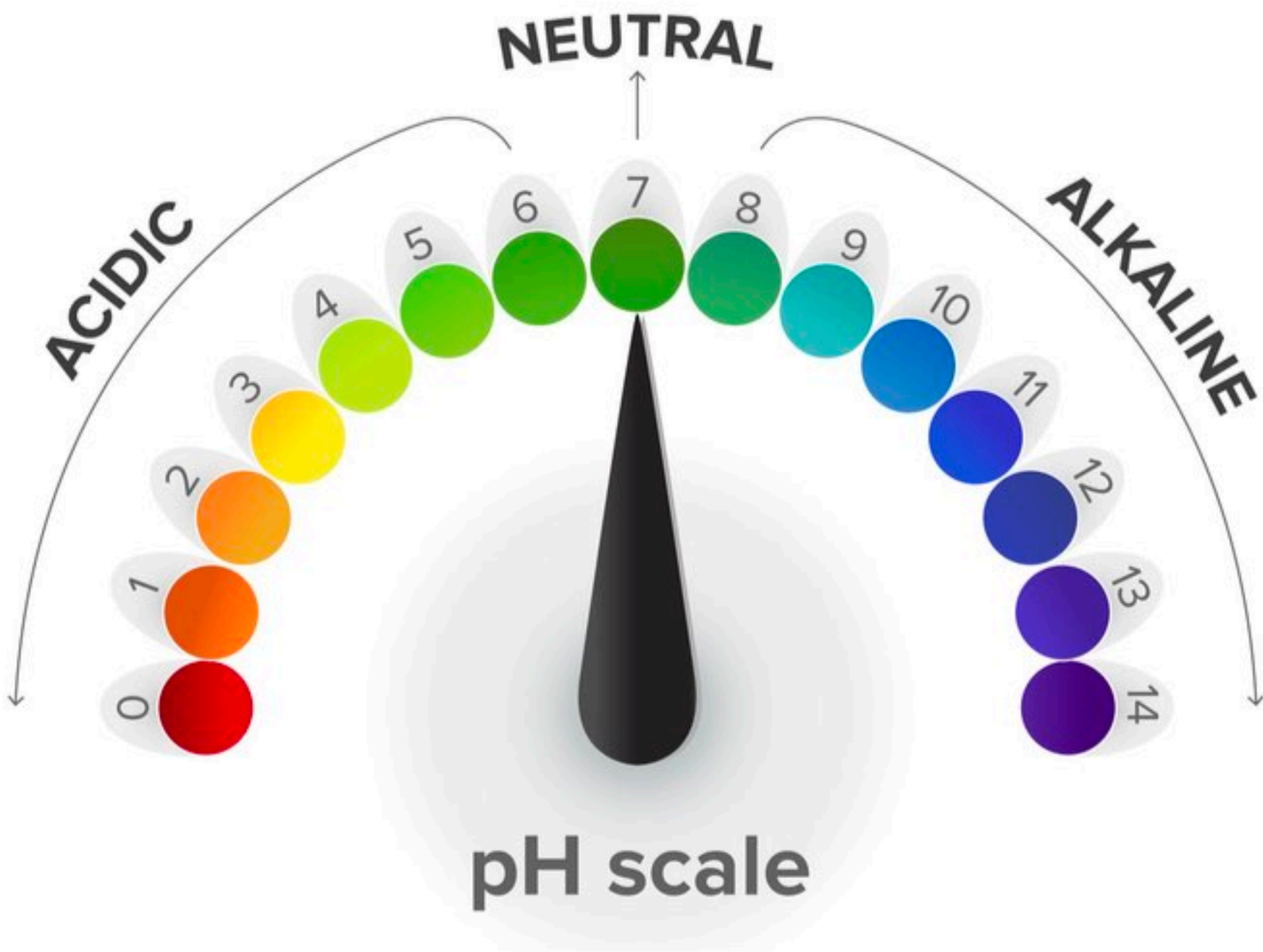
Electrolytes



Acid Base Balance



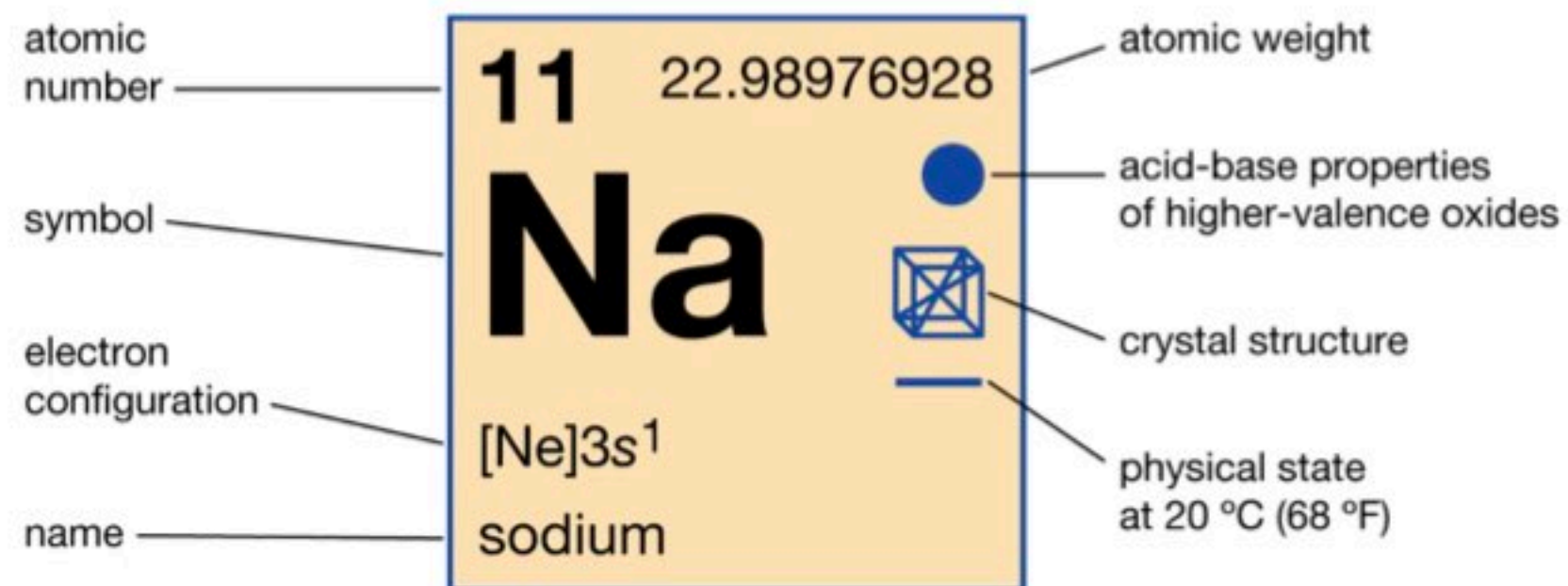
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Time F-Fast	1103	1006	1700	1023 F		
Lab Id.	337776649	338183344	337800654	337978453	Units	Reference
S SODIUM				139	mmol/L	(135-145)
S POTASSIUM				4.4	mmol/L	(3.5-5.5)
S CHLORIDE				101	mmol/L	(95-110)
S BICARB.				24	mmol/L	(20-32)
S CALCIUM				2.33	mmol/L	(2.15-2.55)
S PHOSPHATE				1.28	mmol/L	(0.8-1.5)
S MAGNESIUM				0.81	mmol/L	(0.70-1.05)



Acid-Base Balance

- How well a person is able to regulate fluid transport
- How well hydrated a person is in general
- How well a person can maintain healthy blood pressure
- How well a person can maintain appropriate pH levels in the blood
- General indication of the health of the kidneys

Sodium



 Alkali metals	 Solid
 Body-centred cubic	 Strongly basic

Sodium

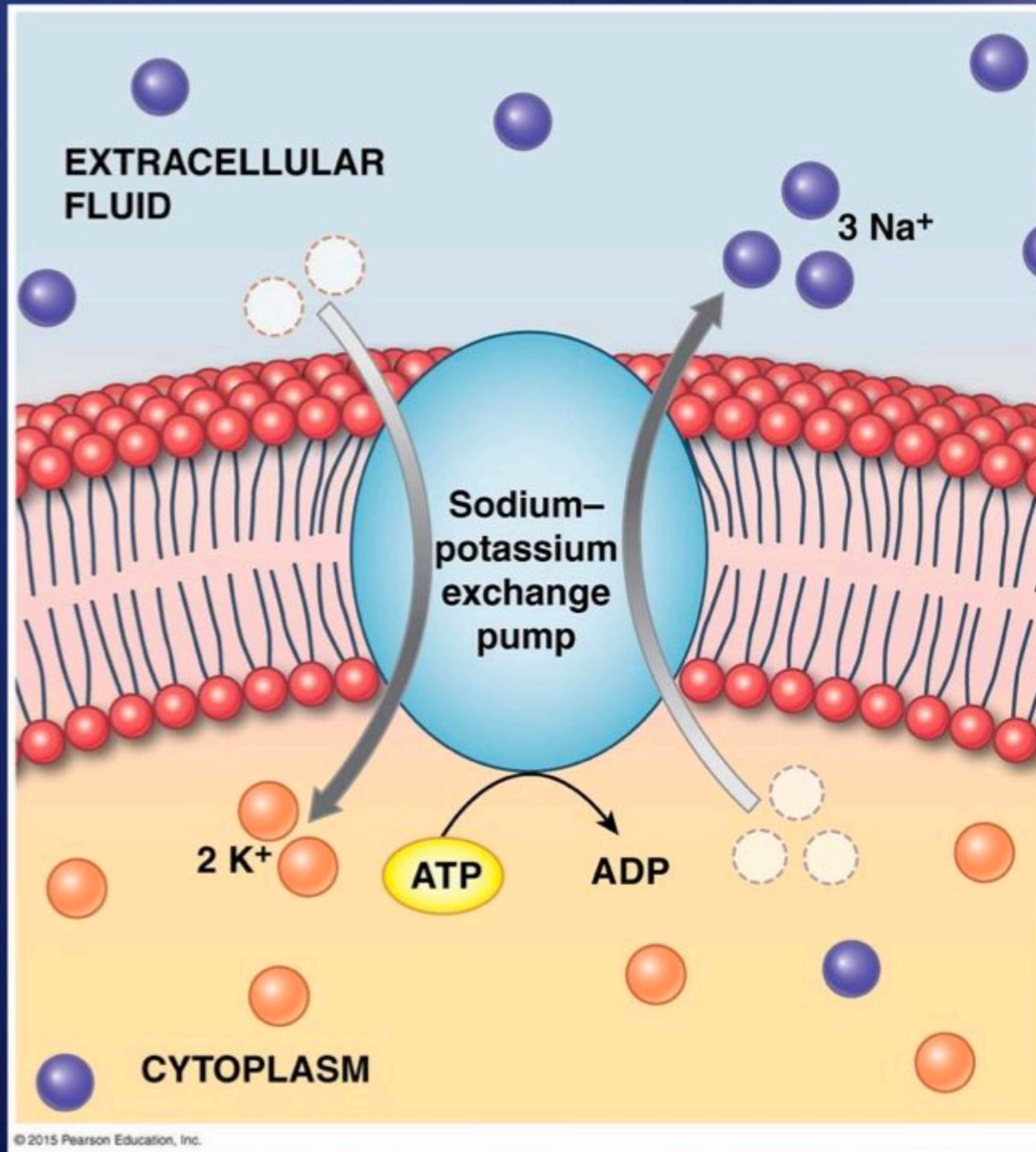
- Most abundant electrolyte in the blood
- Levels are regulated by aldosterone
- Active transport of various compounds into cells
- Levels are regulated by Renin-angiotensin-aldosterone system
- Ideal 140-144

Sodium-Potassium Pump

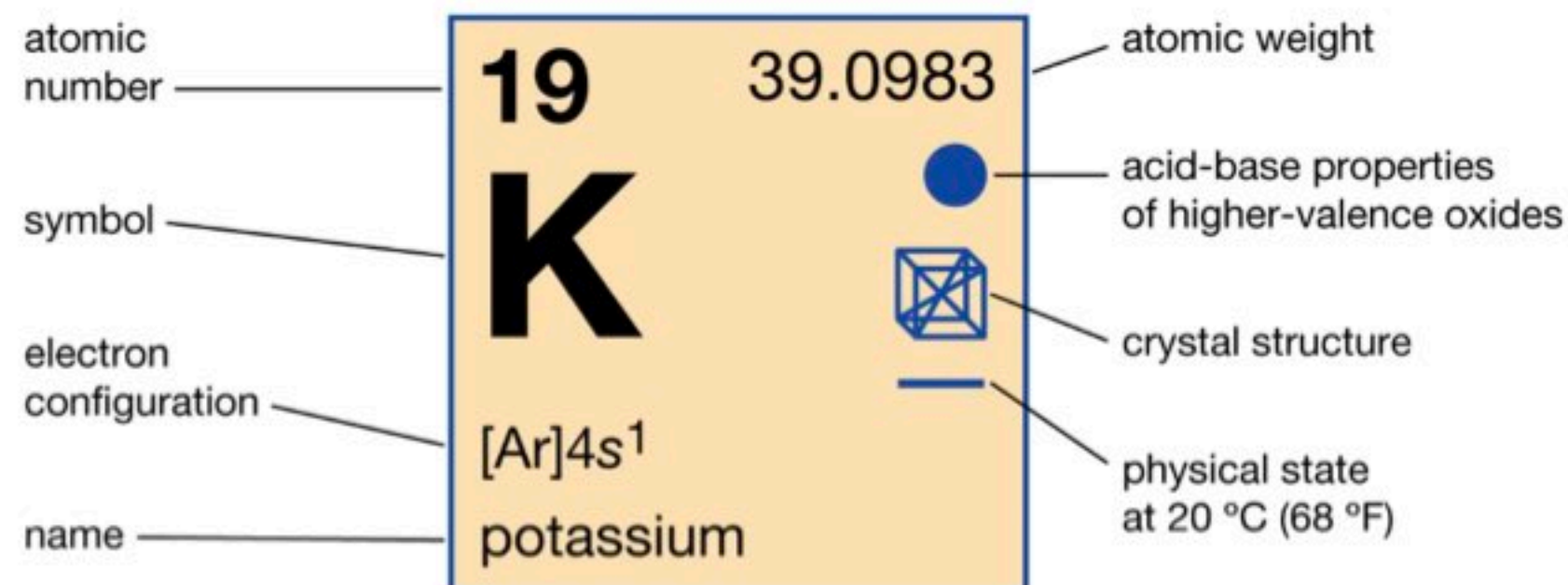
Helps to maintain electrical charge of the cell.

Uses the energy from converting ATP into ADP to push sodium back into the blood against the concentration gradient.

The presence of adequate sodium levels is reflective of a person who has enough energy to fully fuel this process.



Potassium



Alkali metals	Solid
Body-centred cubic	Strongly basic

Potassium

<1% found in the blood

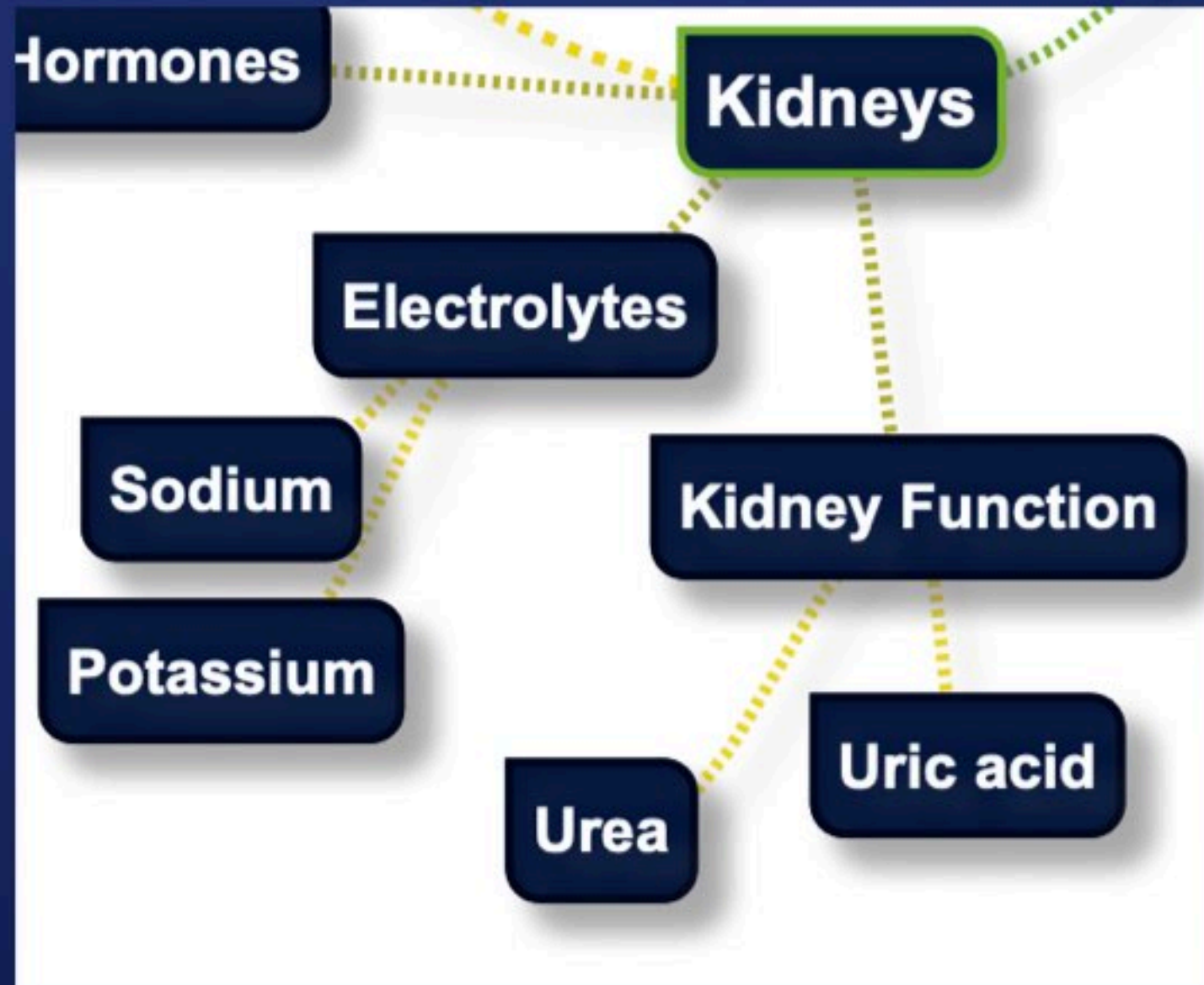
Works with sodium to facilitate active transport of compounds into the cell

Levels are regulated by aldosterone and corticosteroids

Low-normal potassium levels usually don't reflect dietary intake

Low-normal potassium can sometimes indicate magnesium deficiency

Ideal 4.3-4.7



Sodium

Low sodium

- Adrenal fatigue
- Hypothyroidism
- Low blood pressure
- Night urination

High sodium

- Dehydration
- High blood pressure
- Adrenal hyperfunction

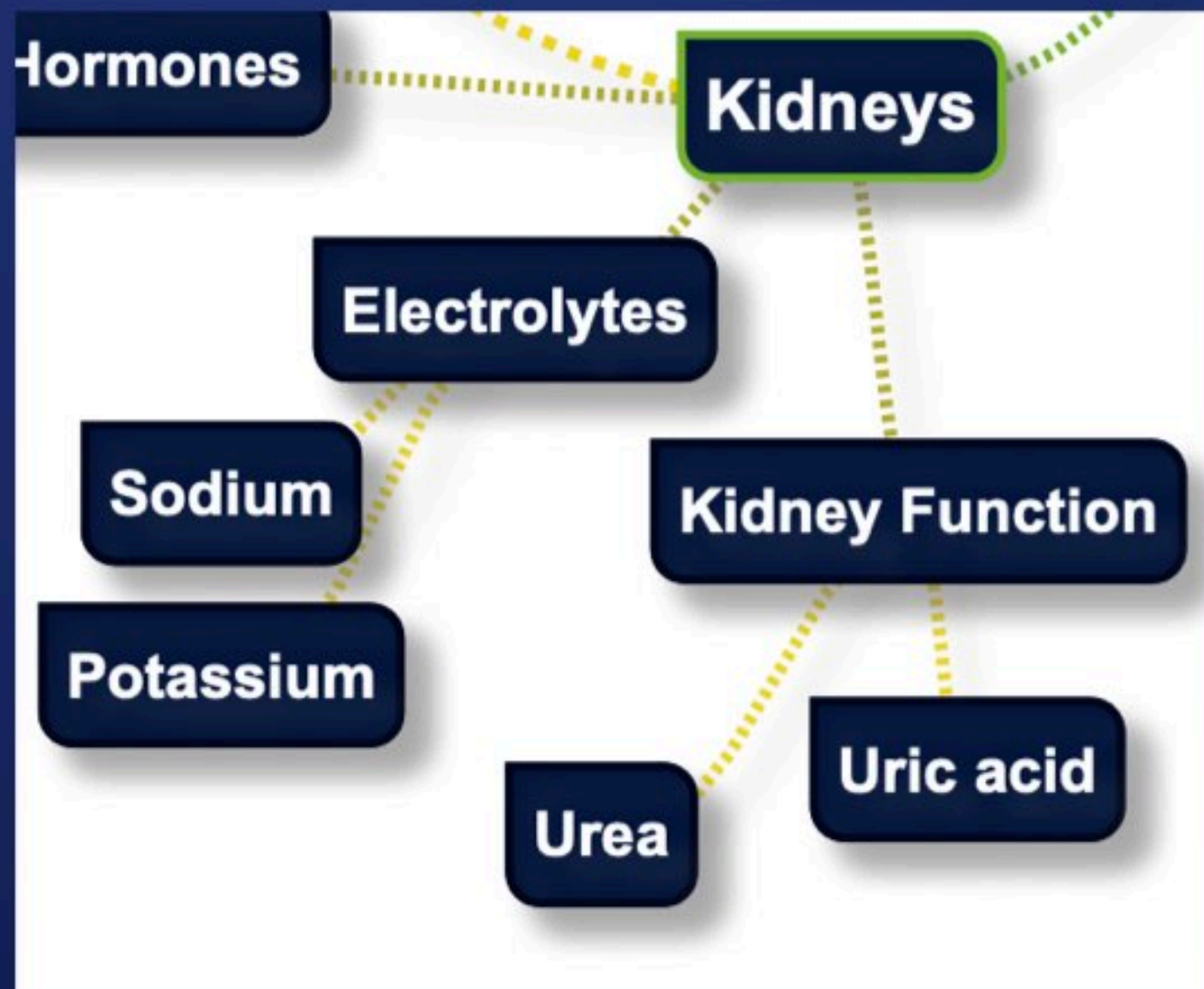
Potassium

Low potassium

- Dehydration
- High blood pressure
- Stress
- Nerve pain

High potassium

- Scalloped tongue
- Fluid retention



Sodium = Kidney Yang

Low sodium

- Adrenal fatigue
- Hypothyroidism
- Low blood pressure
- Night urination

High sodium

- Dehydration
- High blood pressure
- Adrenal hyperfunction

Potassium = Kidney Yin

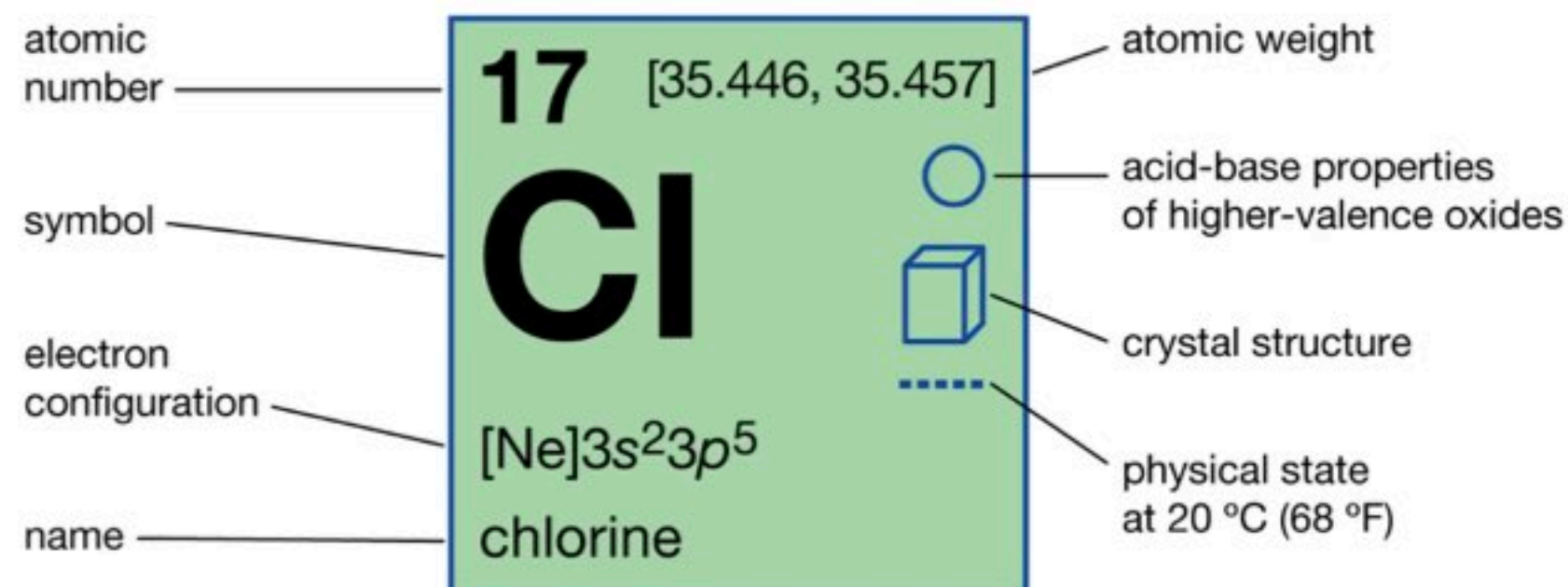
Low potassium

- Dehydration
- High blood pressure
- Stress
- Nerve pain

High potassium

- Scalloped tongue
- Fluid retention

Chlorine



 Halogens	 Gas
 Orthorhombic	 Strongly acidic

Chloride

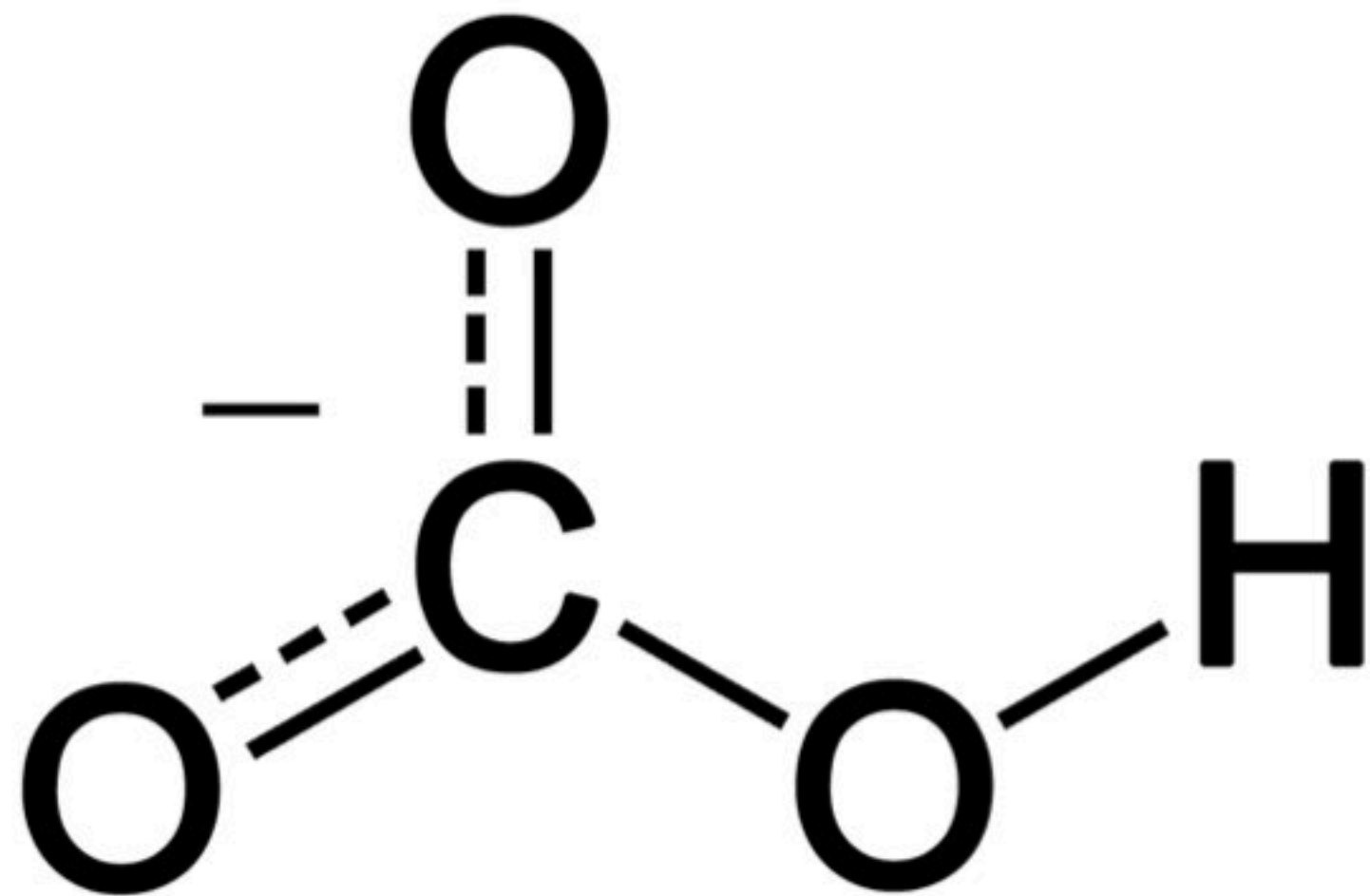
Abundant in the blood.

Levels usually track with sodium.

Low chloride = Kidney Yang Xu with
water overflowing
Edema, fatigue, low blood pressure

High chloride = Internal heat.
Dehydration, hypertension,
hyperparathyroidism

Ideal 101-107



Bicarbonate

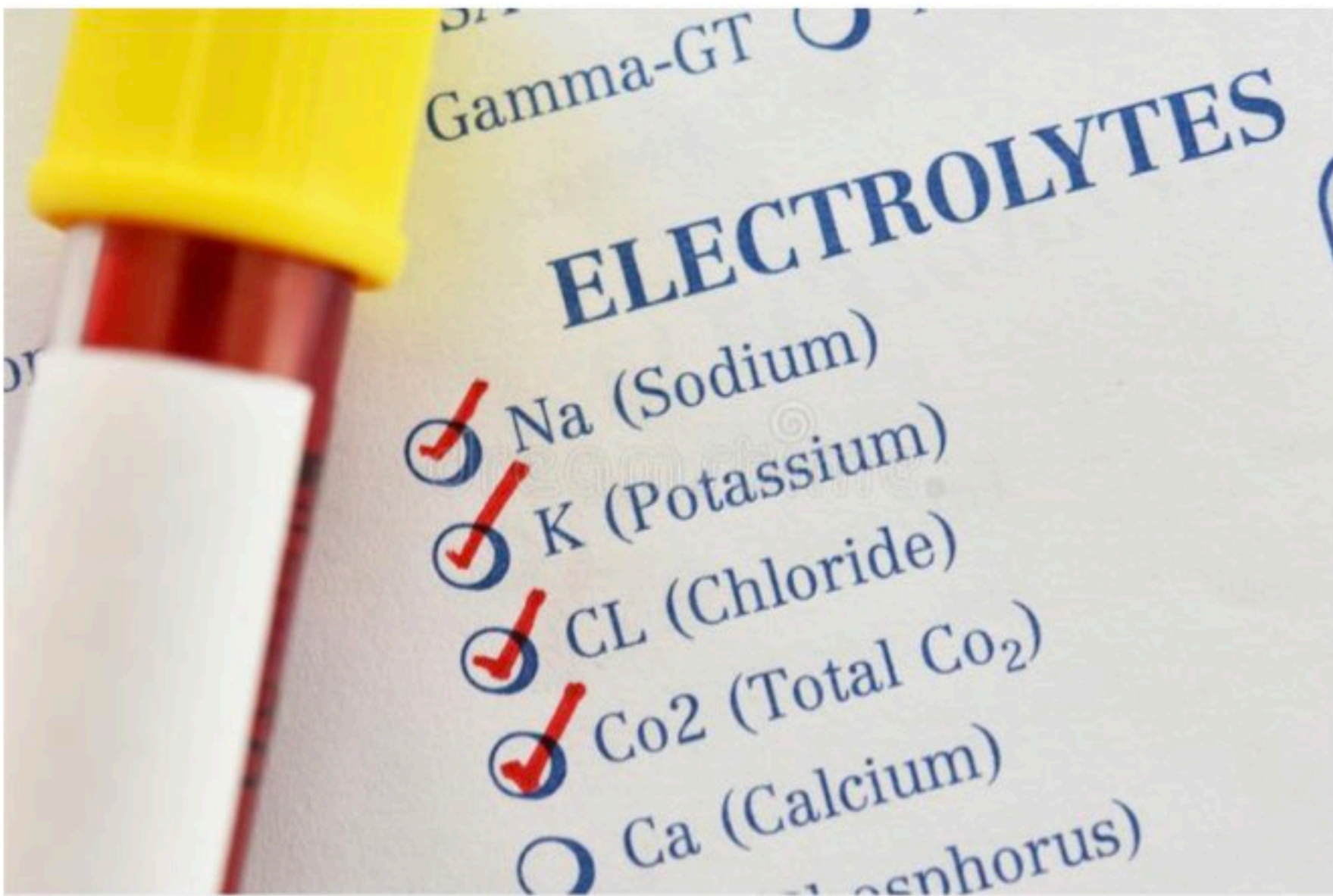
Produced by cellular respiration.

Neutralises acids - eg lactic acid.

Low bicarbonate = Lung Qi not descending, Full Heat, Empty Heat hyperventilation, stress, metabolic disease, cancer, cardiovascular disease, obesity, acid burden.

High bicarbonate = Dampness, Pooled Yin, Yang xu alkalosis, low blood pressure, cyanosis.

Ideal Bicarbonate 26-29



Anion Gap

Calculation, not a “thing” that is measured

$$\text{Anion Gap} = \text{Na} + \text{K} - \text{Cl} - \text{HCO}_3$$

Overall measure of electrolyte balance.

Ideal Anion gap 12-16

Anion gap >16 = acid burden, yin xu.

Anion gap <12 = yang xu. General slowness and lack of adaptability

Calcium

atomic number

20

symbol

Ca

electron configuration

[Ar]4s²

name

calcium

atomic weight

40.078

acid-base properties of higher-valence oxides

●

crystal structure

☐

physical state at 20 °C (68 °F)

—

Alkaline-earth metals

— Solid

Face-centred cubic

● Strongly basic

Calcium

Almost 99% of calcium is in the bones.

Most abundant cardiac electrolyte.

Closely linked with magnesium, vitamin D and vitamin K.

Bone mineralisation, blood clotting. Heavy mineral that anchors and calms Shen.

Low calcium = yin xu

High calcium = yang xu

Ideal 2.35-2.6

Phosphorus

atomic number	15	30.973762	atomic weight
symbol	P		acid-base properties of higher-valence oxides
electron configuration	[Ne]3s ² 3p ³		crystal structure
name	phosphorus		physical state at 20 °C (68 °F)

 Other nonmetals	 Solid
 Cubic	 Weakly acidic

Phosphate

>85% is in bones

Levels controlled by parathyroid

Closely linked with calcium

Required for ATP production

Low phosphate = yang xu, jing xu, pooled yin
Hypothyroidism, insulin resistance, bone loss

High phosphate = yin xu, internal heat
Arrhythmia, burning prickling hands and feet

Ideal 0.9-1.2 mmol/L



Vitamin D

Has mostly hormone-like actions, even though it is called a vitamin.

Crucial to bone formation, alongside vitamin K2, magnesium and calcium.

Is formed in the skin from the conversion of cholesterol by UVB radiation.

Important role in immunity

High = Liver Qi Stagnation, Liver Heat
Hypercalcemia, calcification of soft tissue,
vitamin K deficiency

Low = Kidney Qi xu, Yang xu, Wei Qi xu
Osteoporosis, cancer, recurrent respiratory
infections, depression

Ideal >80

71F

Extreme fatigue, pain, fever,
sweating, feels cold. Started
post vaccination

MULTIPLE BIOCHEMICAL ANALYSIS - Serum

Date	07/02/19	01/05/19	08/02/22		
Time F-Fast	0849 F	1330	1503 F		
Lab Id.	351251015	351240735	378570408	Units	Reference
S SODIUM	140		130 L	mmol/L	(135-145)
S POTASSIUM	4.5		3.9	mmol/L	(3.5-5.5)
S CHLORIDE	103		94 L	mmol/L	(95-110)
S BICARB	24		24	mmol/L	(20-32)

*Salt
a bit low
from drinking
lots of water*

1. What is the anion gap?
2. What advice do you have around drinking water?
3. What Chinese Medicine patterns would you potentially expect to see?

30F

Exhaustion. Dizziness. Brain fog. Tingly hands. Heart palpitations

GENERAL CHEMISTRY

SPECIMEN: SERUM

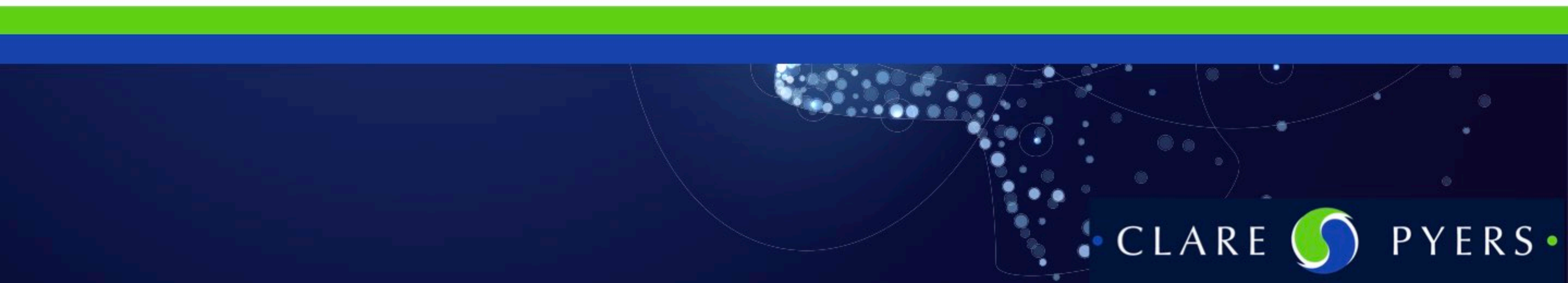
Date: 11/06/22
Coll. Time: 08:50
Lab Number: 66626195

Sodium	136	(135 - 145)	mmol/L
Potassium	4.8	(3.5 - 5.2)	mmol/L
Chloride	103	(95 - 110)	mmol/L
Bicarbonate	23	(22 - 32)	mmol/L

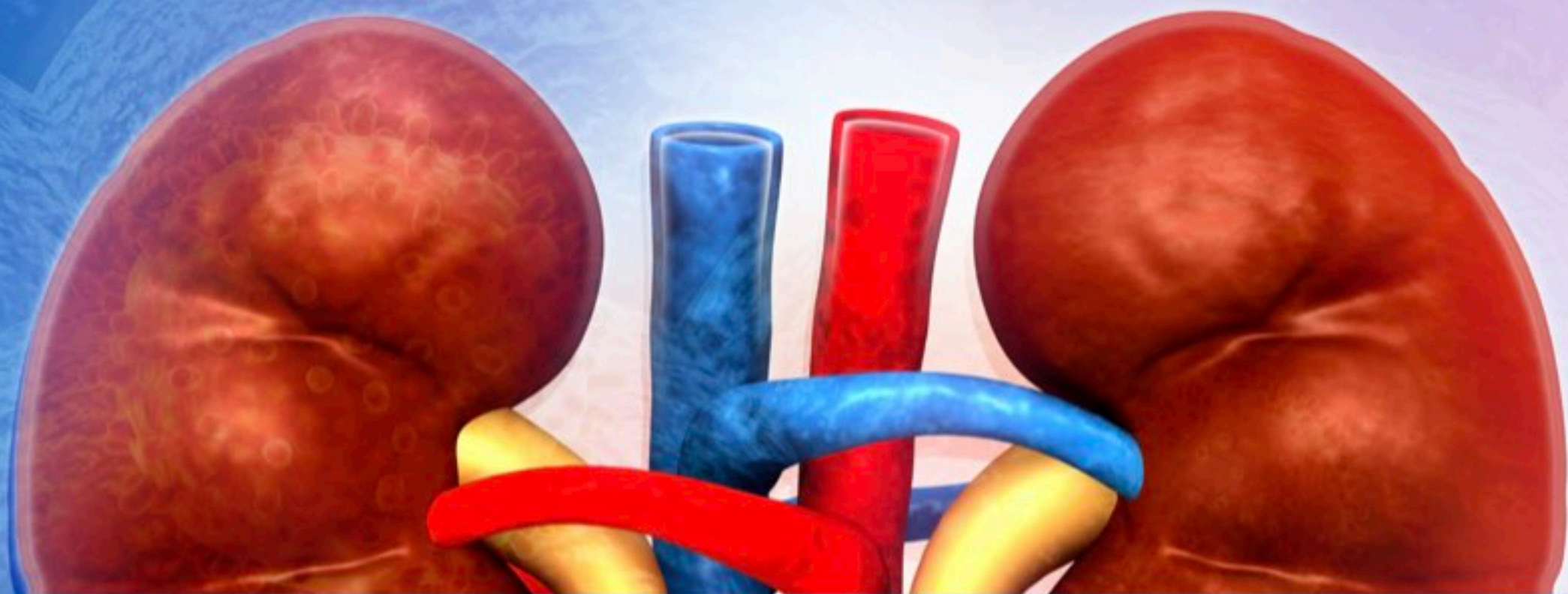
1. What is the anion gap?
2. What does the bicarb level tell you?
3. What Chinese Medicine pattern(s) would you potentially expect to see?



Kidney Markers



Kidney Markers



Date	27/11/15	28/11/15	13/07/17		
Time F-Fast	0808	1957	0842 F		
S UREA	5.6	2.6 L	5.4	mmol/L	(3.0-8.0)
S CREAT.	75	66	82	umol/L	(60-110)
eGFR	>90	>90	>90		
S URIC ACID			0.32	mmol/L	(0.20-0.50)

Renal Function

■ Removal of
Metabolic Waste

■ Vitamin D
regulation

■ Homocysteine
removal

■ EPO production

■ Acid-Base Balance

■ Electrolyte
Regulation

■ Protein loss

■ Renin-Angiotensin



What are we
actually testing
when we are
looking at renal
markers?

Renal Failure

Metabolic Waste

High creatinine, urea, ammonia

Vitamin D

Abnormal phosphate, calcium, magnesium

Homocysteine removal

High homocysteine

EPO production

Anaemia, iron deficiency

Acid-Base Balance

Low pH, low bicarb, excess phosphate

Electrolytes

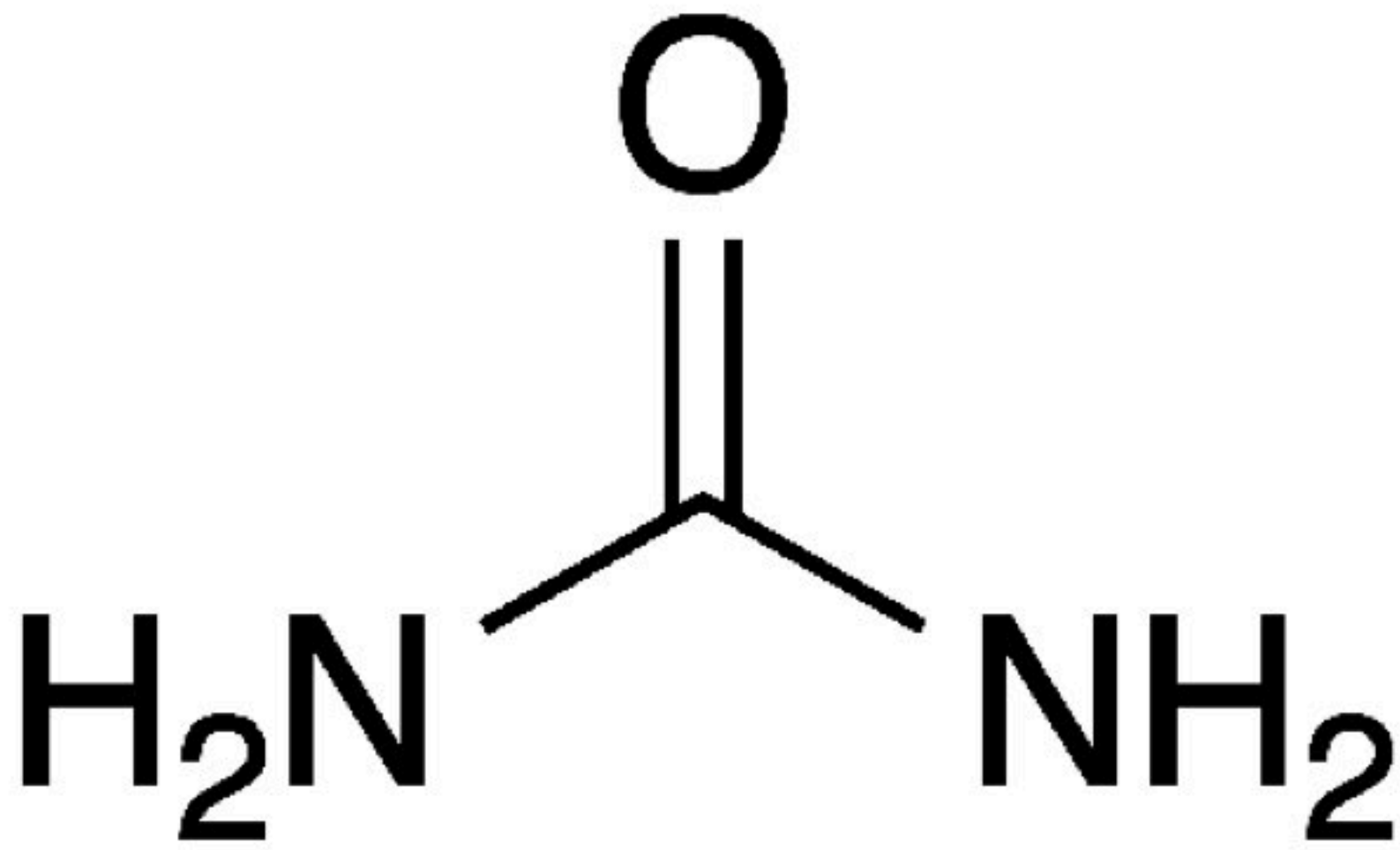
Increased potassium

Protein loss

Low albumin, low transferrin

Renin-Angiotensin

Increased blood pressure



Urea

End product of protein metabolism, formed in the liver.

Most benign form of nitrogen.

Represents availability of amino acids to the body.

Produced by certain types of pathological bacteria found in GIT.

High urea = Yin fire. Gu syndrome.
Constrained heat in middle jiao or lower jiao. dysbiosis, bacterial overgrowth, poor kidney function

Low urea = Yang xu. Spleen Qi xu.
Liver Qi or Yang xu.

Ideal 4.5-6



Creatinine

Creatine produced in liver to help fuel muscles. Creatinine is the end product.

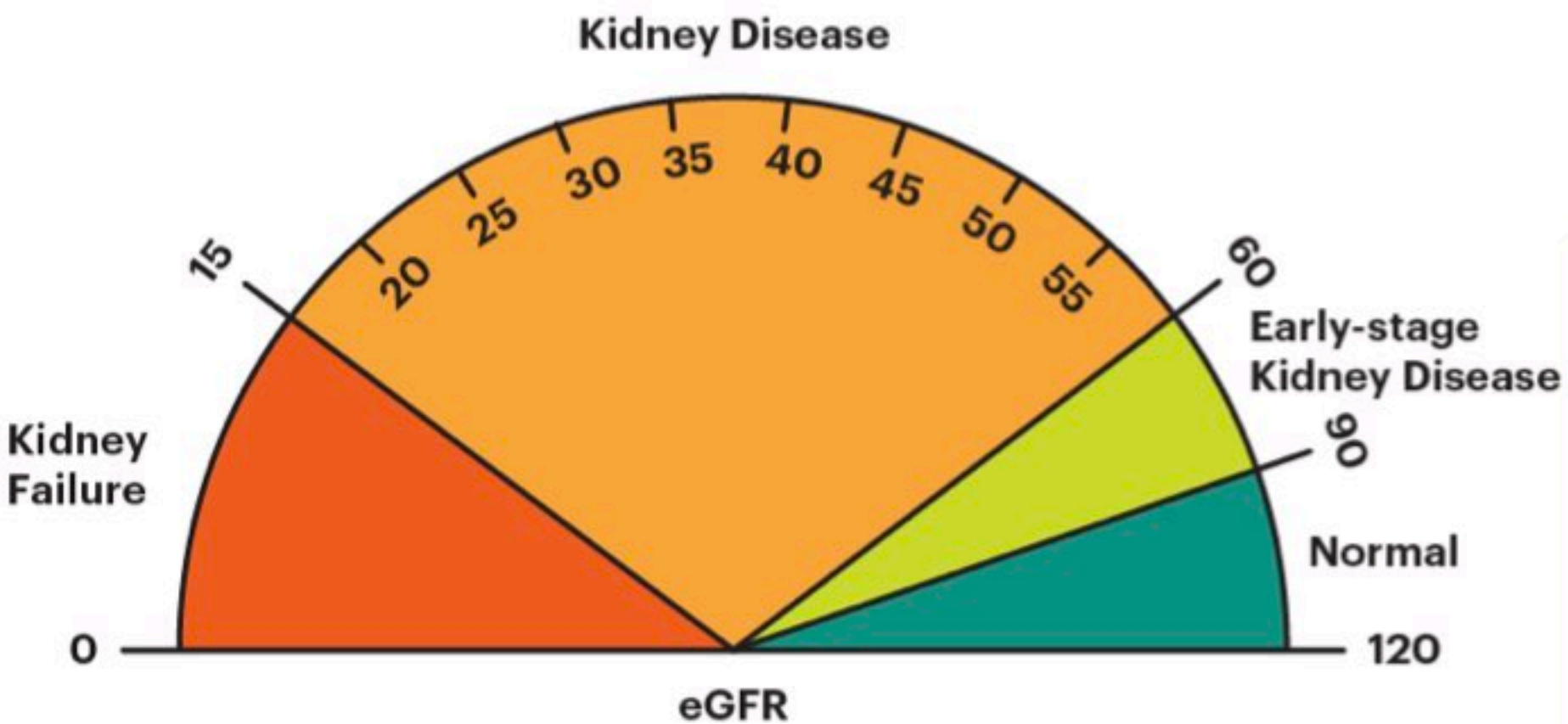
Levels are reflective of muscle mass and dietary protein requirements

Creatinine is the measurement on which eGFR is based.

High = Kidney Yang xu. Kidney Qi xu.
Kidney disease, dehydration.

Low = Spleen Qi xu. Impaired Spleen T&T
Malnutrition, severe weight loss, sarcopenia

Ideal 60-90 (according to muscle mass)



eGFR

estimated Glomerular Filtration Rate

eGFR is a calculation, not a “thing” that is measured.

Used to estimate a person’s kidney function.

Based on the creatinine level, along with gender and age.

Ideal >90

Low 80-90

Moderately low 60-80

Kidney disease <60

30F

Exhaustion.

Dizziness. Brain fog.

Tingly hands. Heart
palpitations

Date: 11/06/22
Coll. Time: 08:50
Lab Number: 66626195

Sodium	136	(135 - 145)	mmol/L
Potassium	4.8	(3.5 - 5.2)	mmol/L
Chloride	103	(95 - 110)	mmol/L
Bicarbonate	23	(22 - 32)	mmol/L
Urea	5.0	(3.0 - 7.0)	mmol/L
Creatinine	79	(45 - 90)	umol/L
eGFR	87	(> 59)	mL/min/1.73m2

71F

Extreme fatigue,
pain, fever, sweating,
feels cold. Started
post vaccination

MULTIPLE BIOCHEMICAL ANALYSIS - Serum

Date	07/02/19	01/05/19	08/02/22
Time F-Fast	0849 F	1330	1503 F
Lab Id.	351251015	351240735	378570408

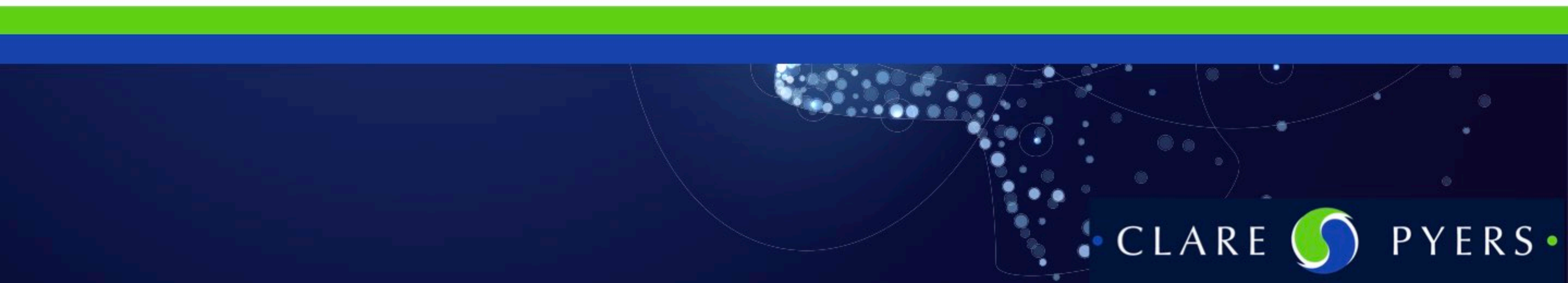
			Units	Reference
S SODIUM	140	130 L	mmol/L	(135-145)
S POTASSIUM	4.5	3.9	mmol/L	(3.5-5.5)
S CHLORIDE	103	94 L	mmol/L	(95-110)
S BICARB	24	24	mmol/L	(20-32)
S UREA	5.7	4.8	mmol/L	(3.5-9.5)
S CREAT	80	71	umol/L	(45-90)
eGFR	66	75		

Salt a bit low from drinking lots of water

Kidney ✓



Liver Markers



Liver Functions

Removes potentially toxic byproducts of certain medications.

Prevents shortages of nutrients by storing vitamins, minerals and sugar.

Metabolizes, or breaks down, nutrients from food to produce energy, when needed.

Produces most proteins needed by the body.

Helps your body fight infection by removing bacteria from the blood.

Produces most of the substances that regulate blood clotting.

Produces bile, a compound needed to digest fat and to absorb vitamins A, D, E and K.

Liver performs hundreds of actions in the body.



Bilirubin

Antioxidant and anti-inflammatory agent

Bilirubin is created by breakdown of red blood cells in the spleen, then removed from the blood by the liver.

High = Liver Blood Stasis. Liver Qi xu.

Spleen Qi xu. Damp heat.

Jaundice. Red blood cell fragility.

Gallstones. Cirrhosis. Gilbert's syndrome.

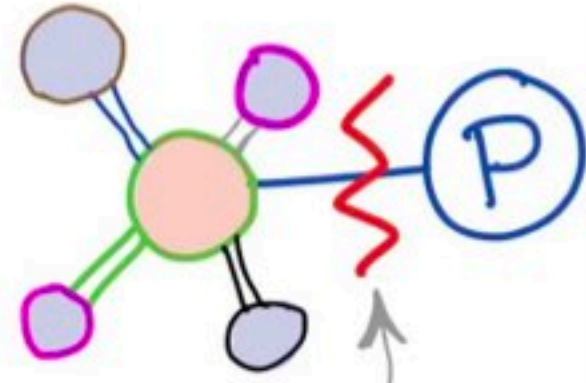
Low = Spleen Qi xu. Spleen Yang xu. Heart Yang xu.

Angina. Cardiovascular disease.

Inflammation

Ideal 8.5-13.5

Alkaline phosphatase



ALP

Alkaline Phosphatase

ALP removed phosphate groups from a range of molecules.

Present in all tissues but predominantly in liver, bile duct, bones, kidneys.

Rises in response to bone growth, low vitamin D, liver disease and pregnancy.

High = Liver Qi stagnation. Blood stasis. Gallstones. Liver cancer. Bone cancer. Jing reserves activated.

Low = Liver Blood xu. Kidney Qi xu. Anaemia. Wilson's disease. Zinc deficiency.

Ideal 50-75



ALT

Alanine Transaminase

ALT is required for the breakdown of alanine into alpha-ketoglutarate - a key step in the Krebs cycle (aerobic energy production).

Similar to AST - but more specific to the liver.

High = Qi or Yang xu due to overexertion.
Liver Qi xu. Liver Blood xu.
liver damage. Diabetes. Viral hepatitis.
Strenuous exercise.

Low = Liver Blood xu.
B6 deficiency. Fatigue.

Ideal 12-30



AST

Aspartate Transaminase

Involved in bi-directional conversion of aspartate and alpha-ketoglutarate into glutamate and oxaloacetate.

Similar to ALT, except AST is found throughout the body and isn't specific to the liver.

High = Damp heat. Heat in Liver. Yang xu with empty Heat.

Low = Liver Blood xu. Qi deficiency. Yin Xu with Empty Heat. Hun not anchored. Shen not nourished.

Poor concentration, memory issues, restlessness, insomnia.

Ideal 15-30



GGT

Gamma Glutamyltransferase

Transport of amino acids into cells

Required for glutathione synthesis.

Rises acutely in response to liver damage or biliary obstruction.

High = Liver Heat, Blood Heat, Liver Qi Stagnation

alcohol toxicity, gallstones, non-specific liver damage, mercury toxicity

Low = Liver Blood deficiency
Deficiencies of: Zn, Mg, B6, A. Chronic inflammation. Benign recurrent intrahepatic cholestasis. Itching.

Ideal 15-30



Protein

Represents the total of albumin and globulin in the blood.

Provides general overview of kidney and liver function, and overall nutritional status.

High = Toxic Heat, Damp heat, Internal heat, Liver Fire, Gu Syndrome, Qi Stagnation chronic inflammation or infection, multiple myeloma.

Low = Spleen Qi xu, Kidney Qi xu, Impaired Spleen T&T.
haemorrhage, extensive burns, malabsorption, malnutrition, kidney disease.

Ideal 70-74



Albumin

Synthesised in the liver.

Transports many compounds in the blood:
bilirubin, calcium, hormones, medications.

Helps to keep fluid in the blood from leaking
into the tissues.

Has an anti-oxidant effect and helps buffer
against metabolic acidosis.

High = Toxic Heat, Damp Heat, Liver Fire,
Internal heat
Dehydration, Acute or Chronic inflammation

Low = Yin xu, Internal Heat, Spleen Qi xu,
Spleen Qi not holding

Ideal 40-46



Globulin(s)

A class of proteins that form a major part of the immune system

- IgG - major antibody class, memory for the immune system (includes CRP)
- IgA - first line border defence
- IgM - first line viral defence
- Fibrinogen - clotting factor
- Complement C3 - Complement cascade

Synthesised in response to inflammation, toxins and infections, required to make antibodies

High: toxic heat, damp heat, internal heat, liver fire acute or chronic inflammation, bacterial infection, toxins, mercury exposure, carcinogens, liver disease, allergic reaction

Low: MJ obstruction, gu syndrome, impaired spleen T&T, liver qi deficiency, constrained heat in MJ, kidney qi deficiency.

Ideal 22-28

CONFIDENCE LEVEL

A graphic of a thermometer with a red liquid level and a green/blue curved line. The thermometer is tilted and has a red liquid level that is rising. The words 'CONFIDENCE LEVEL' are written in large, bold, black letters at the top. Below the liquid level, the words 'INVINCIBLE', 'STRONG', 'STEADY', and 'BUILDING' are written in bold, black letters. A green and blue curved line is on the right side of the thermometer.

Poll

Your current
level of
confidence
with
interpreting
blood test
results

If I had more
confidence I
would....



Fears+Insecurities

Uncertainty

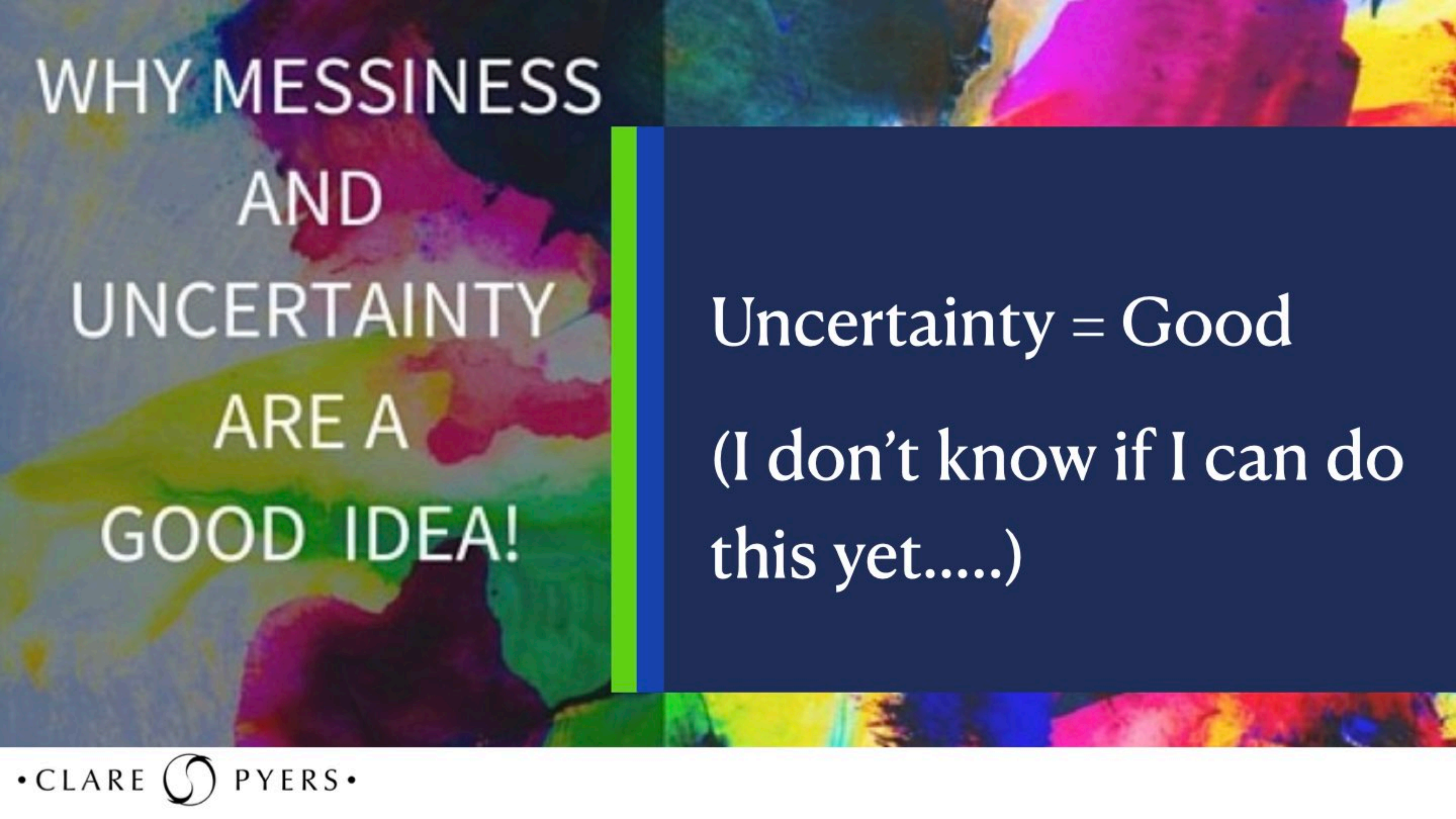
(I don't know if I can do this)



UNCERTAINTY
AHEAD

Certainty = Danger
Risk of confirmation bias





WHY MESSINESS
AND
UNCERTAINTY
ARE A
GOOD IDEA!

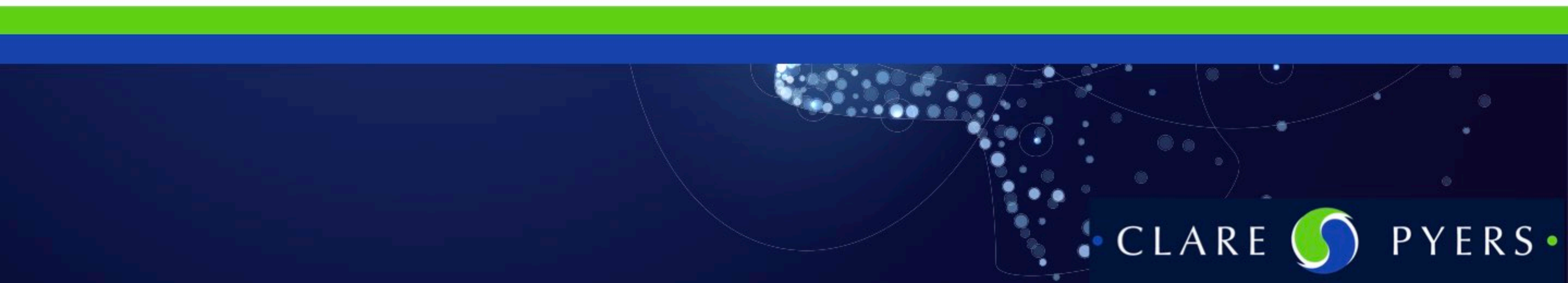
Uncertainty = Good
(I don't know if I can do
this yet.....)

Uncertainty + Curiosity
= Great Frame of Mind for
Learning

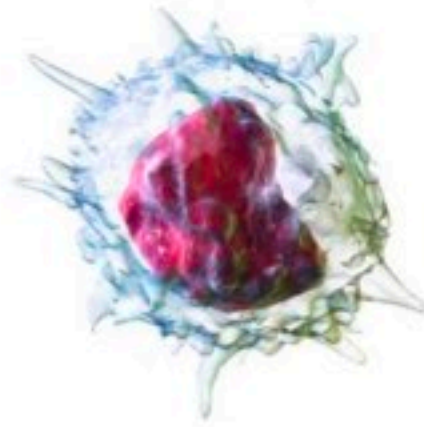




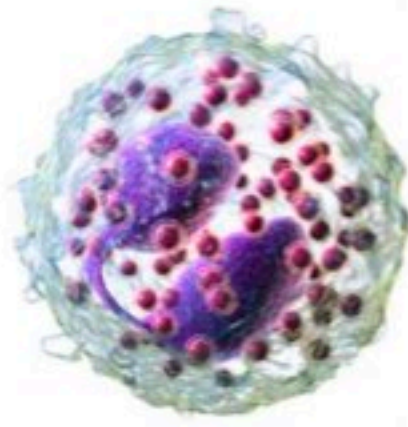
White Blood Cell Panel



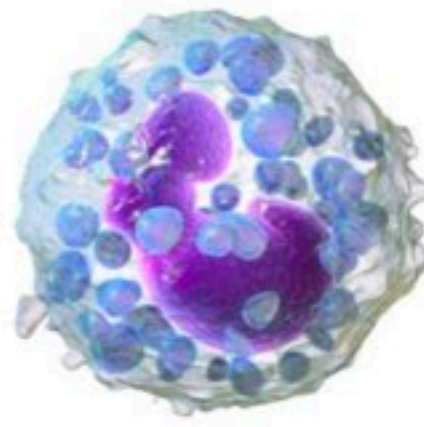
White Blood Cells



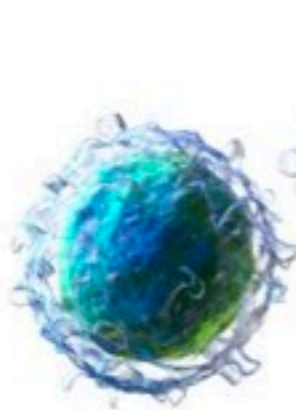
monocyte



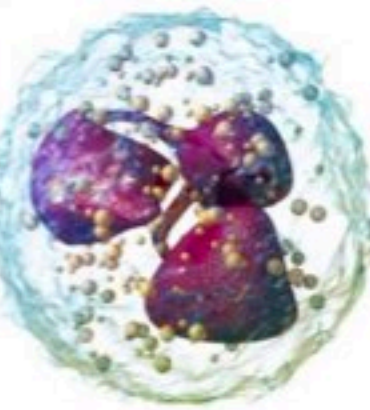
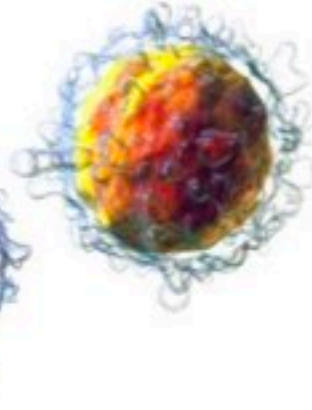
eosinophil



basophil



lymphocytes



neutrophil

WCC

White Cell Count

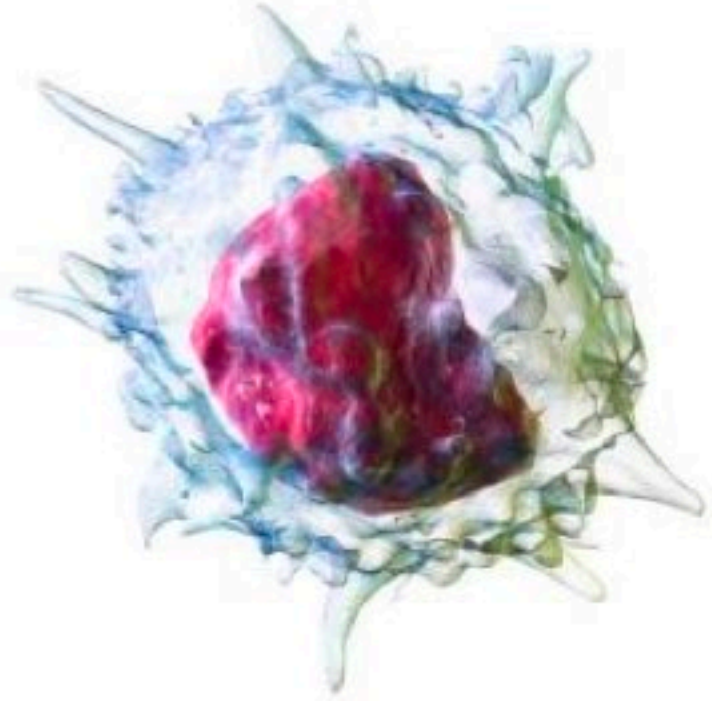
The total number of circulating white blood cells. Includes neutrophils, lymphocytes, monocytes, eosinophils, basophils.

High = Internal heat. Damp heat. Yin xu heat.
External pathogen. Gu syndrome.
Food allergies. Autoimmunity. Infection.

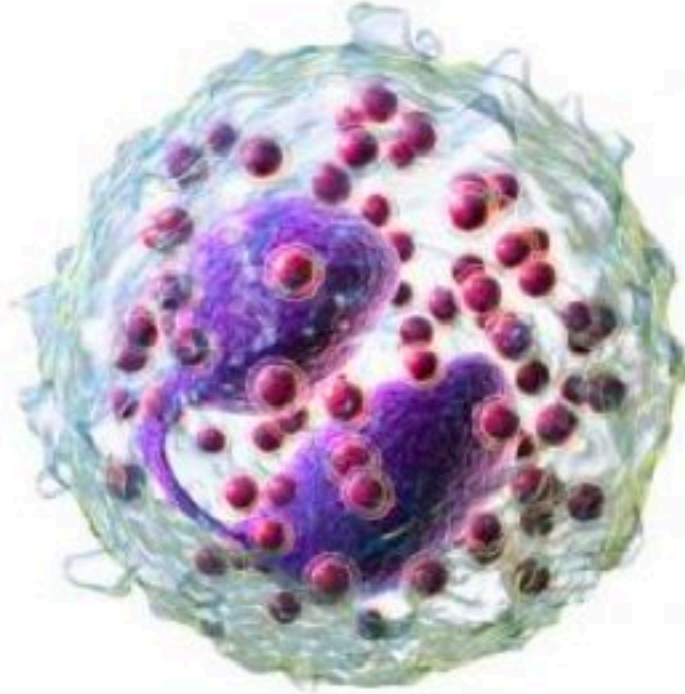
Low = Spleen Qi xu, Blood xu, Wei Qi xu.
Compromised immunity, or
immunosuppression. Autoimmunity. Low
protein intake.

Ideal 5-6.5

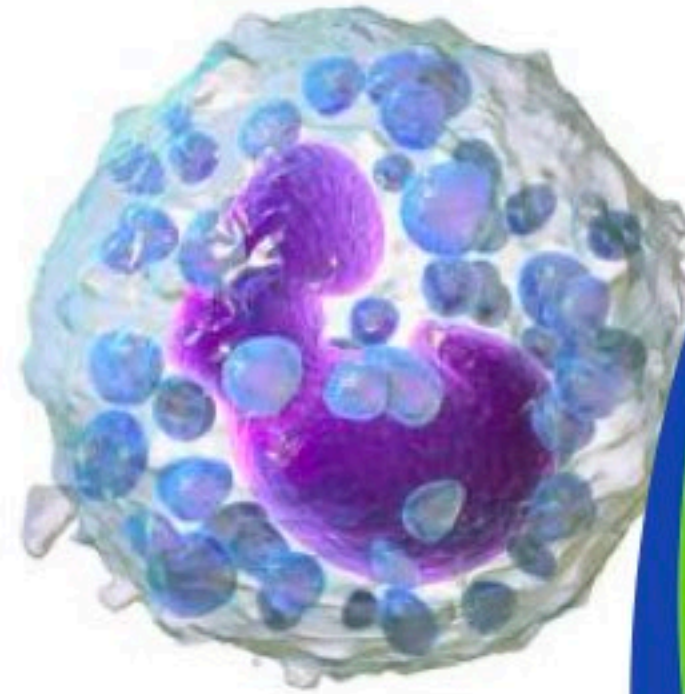
White Blood Cells



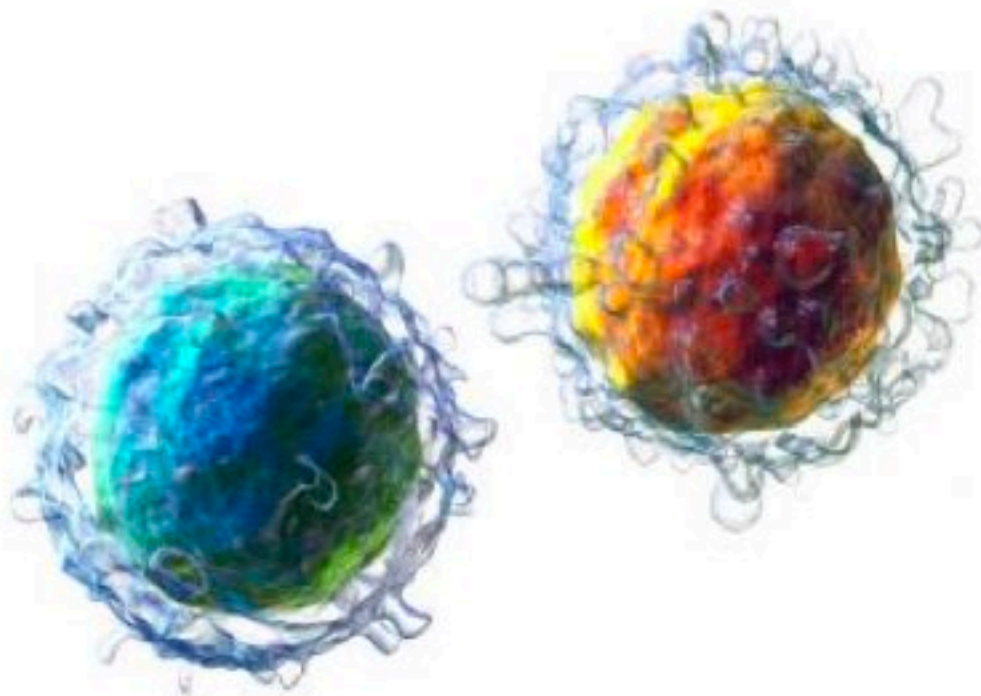
monocyte



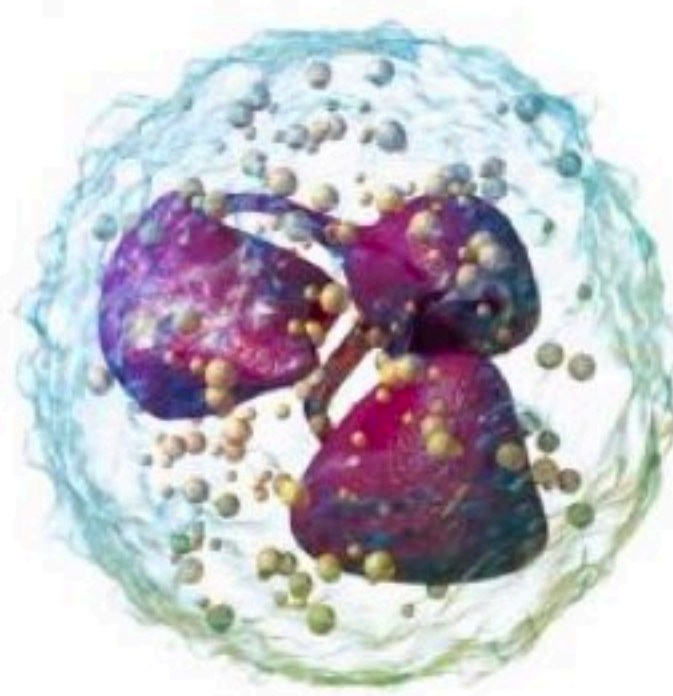
eosinophil



basophil



lymphocytes



neutrophil

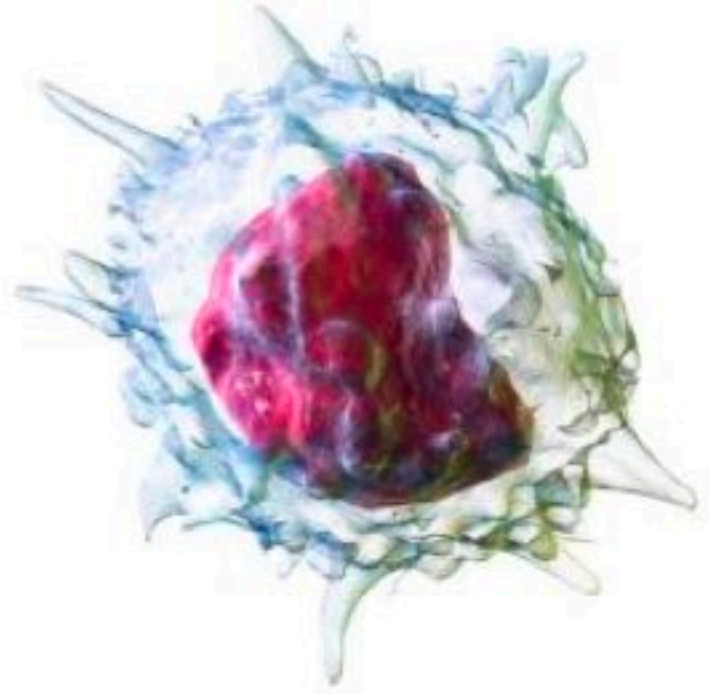
Neutrophils - pacman.
Innate immunity

Lymphocytes -
become b cells and t
cells. Adaptive
immunity

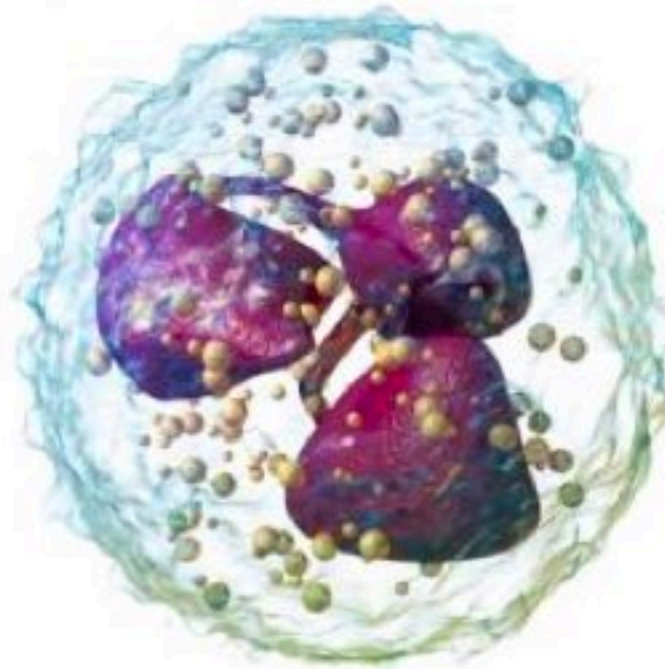
Monocytes -
“janitors”

Eosinophils +
Basophils = “special
forces”

White Blood Cells



monocyte

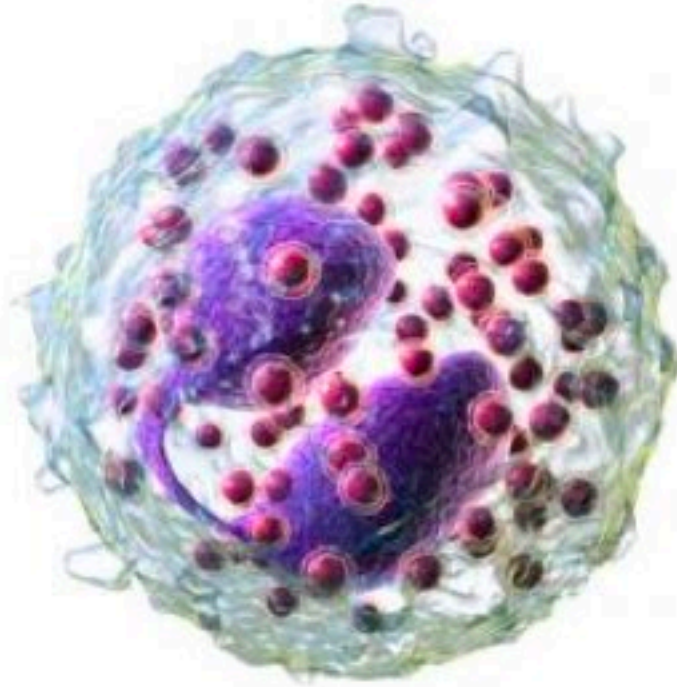


neutrophil

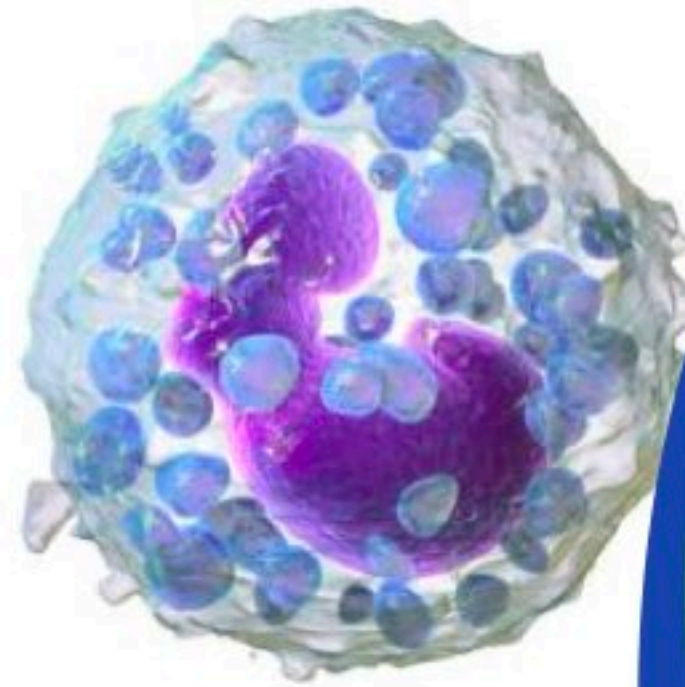
Phagocytes

“Eating” target cells in the body.

White Blood Cells



eosinophil

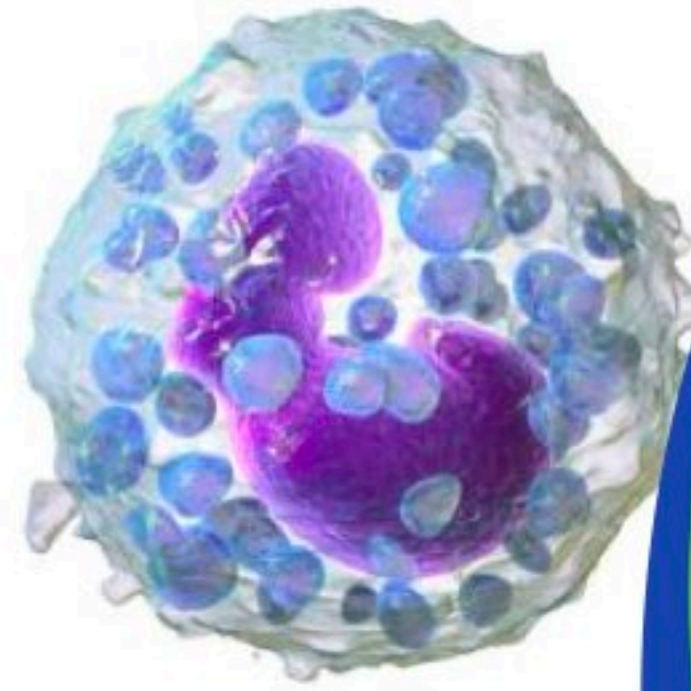


basophil

**Releases
Cytokines**

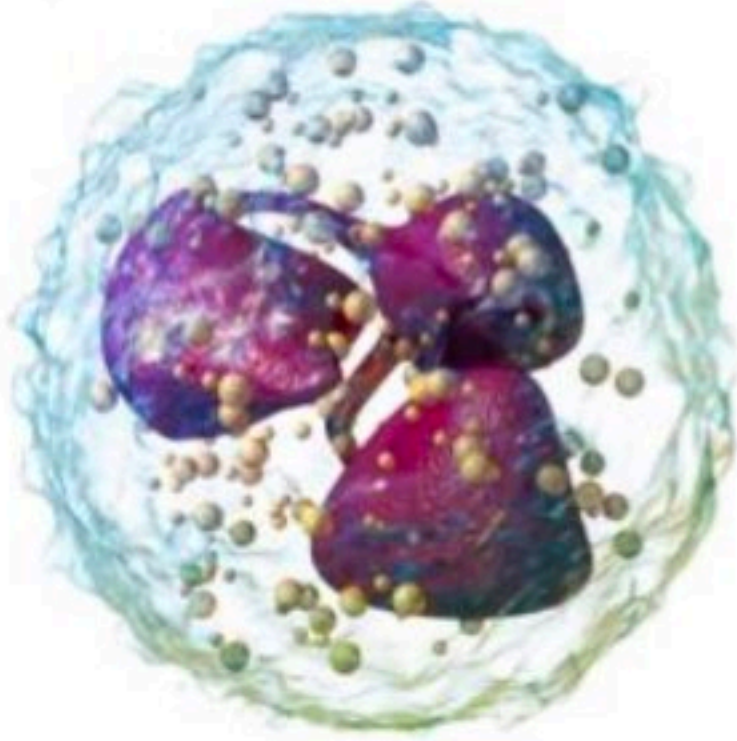
**Target
allergic
tissue**

White Blood Cells



basophil

**Releases
Histamine**



neutrophil

Neutrophils

Innate immune system - hit everything with a sledgehammer.

Produced in bone marrow.

High = Internal heat. Damp heat. Yin xu heat.

External pathogen. Gu syndrome.

Chronic or acute infection. Exercise.

Extreme Heat or Cold. Adrenal dysfunction.

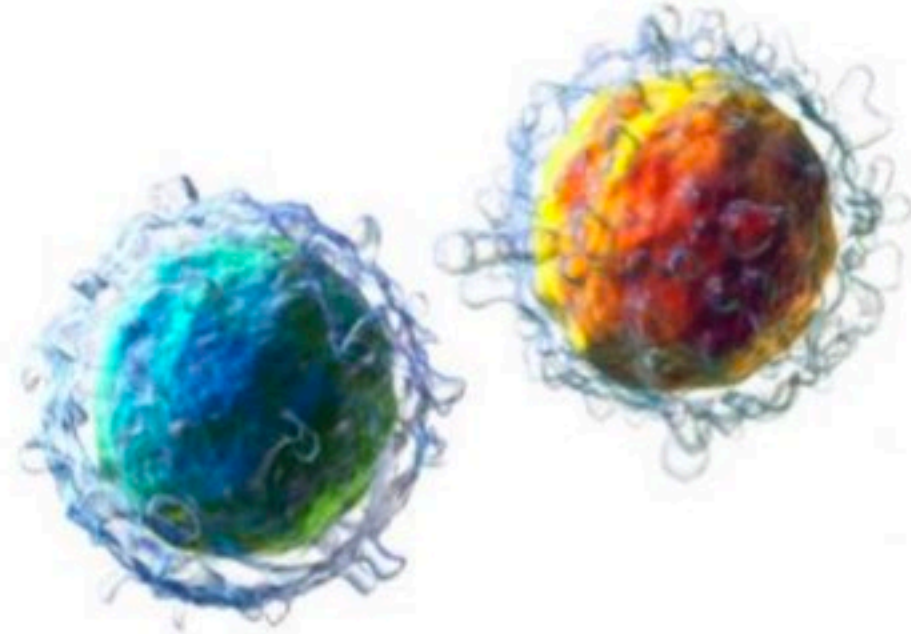
Parasite.

Low = Spleen Qi xu, Blood xu, Wei Qi xu.

Kidney xu.

Low calorie diet. Low sulfur diet. Low protein diet.

Ideal = 3-4 (60-65%)



lymphocytes

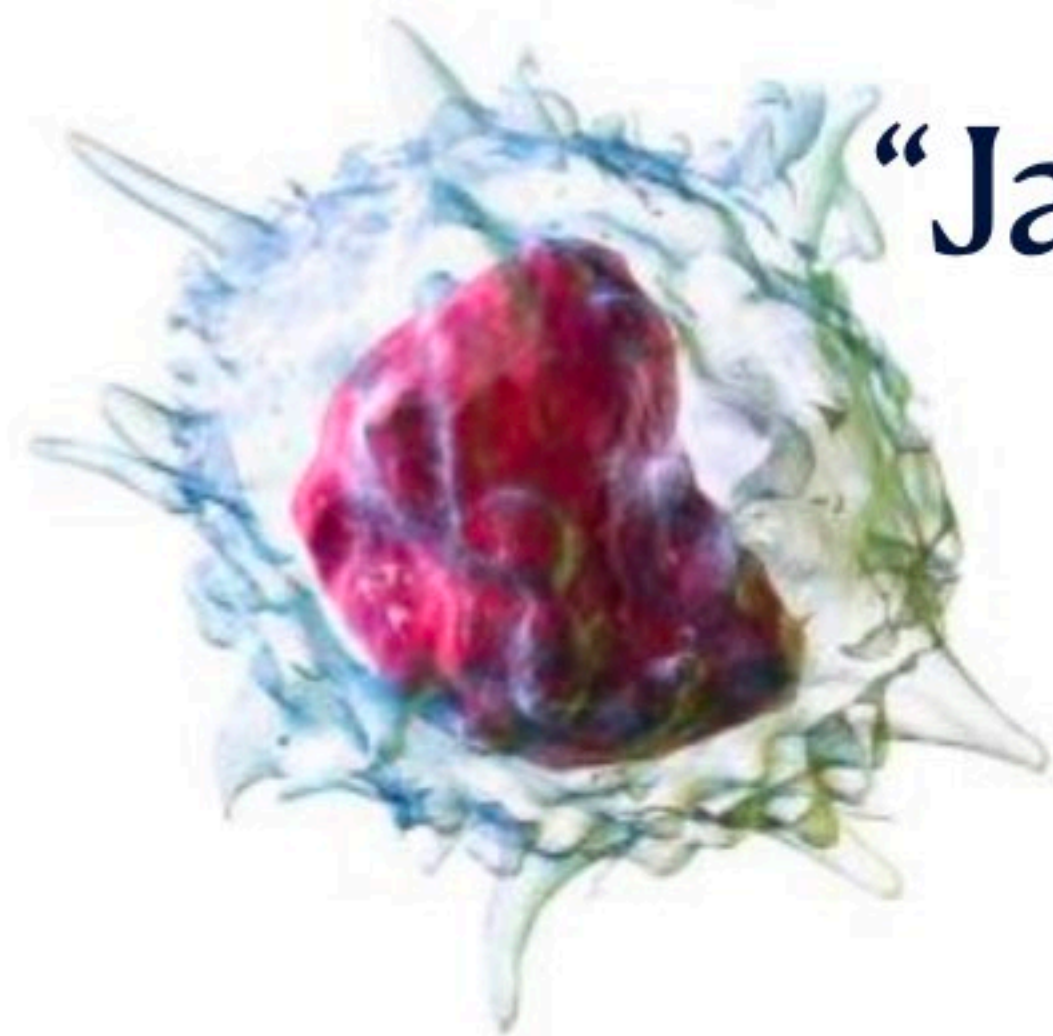
Lymphocytes

Adaptive immune system - right tool for the job.

Natural killer cells, B cells and T cells - specific immune cells that are targeted and precise.

CD4+ T helper cells = “directing the traffic” activating macrophages (eat pathogen) and b cells (neutralise pathogen with antibodies)

CD8+ Cytotoxic T cells = “natural born killer” destruction of infected cells, killing tumour cells



monocyte

Monocytes

“Janitors” of the immune system

Driven by chronic stress.

Help with GIT repair and maintain mucosal barrier

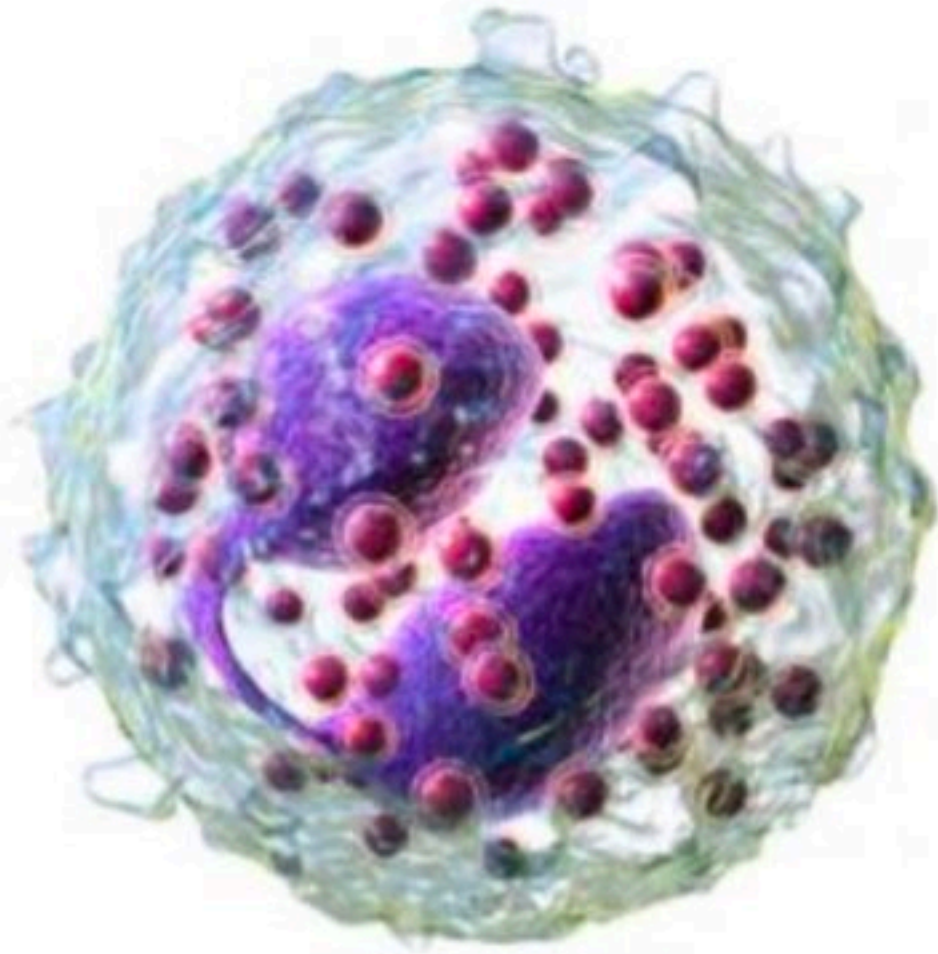
Development of arterial plaque

Chronic stress > Immature monocytes released from bone marrow before they're ready > more inflammatory and less able to be switched off

Monocytes migrate into adipose tissue to stimulate macrophage activity in fat tissue.

This is a main source of secondary inflammation in obesity.

Ideal 0.3-0.4 (5-6%)



eosinophil

Eosinophils

Eosinophils: tissue dwelling.

Migrate to areas of inflammation or infection in response to a range of chemokines and leukotrienes.

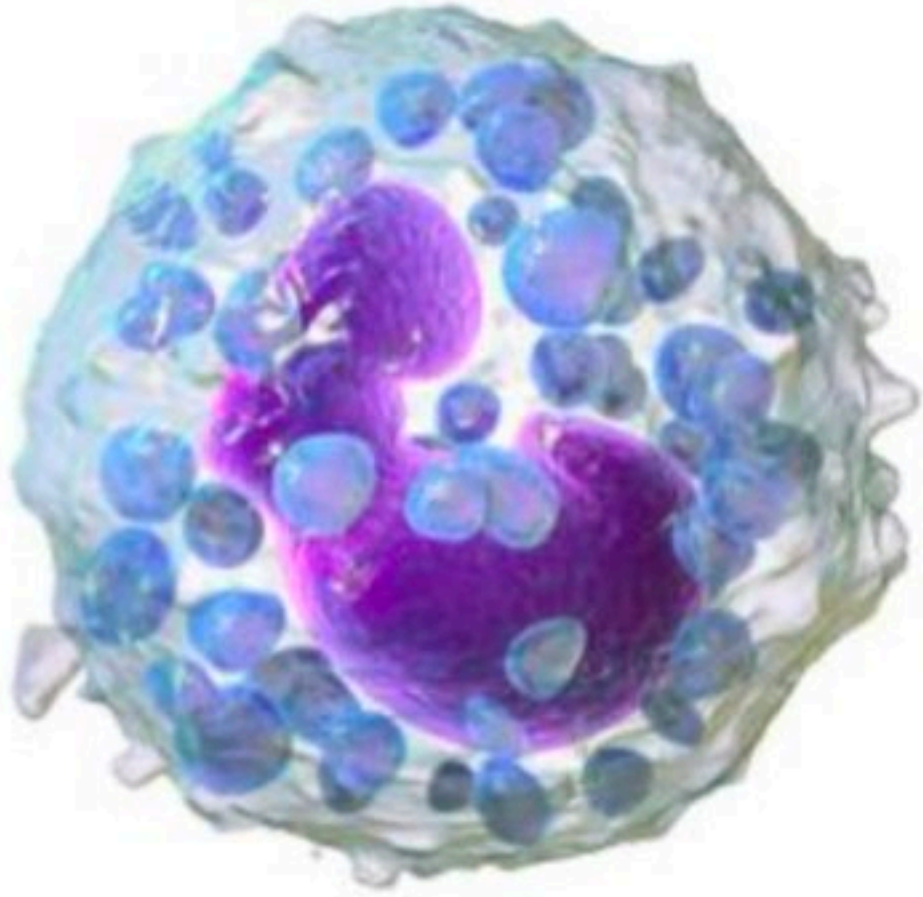
Mostly related to allergy. Can generate ROS (peroxidase). Activate mast cells. Conduct tumor surveillance.

Marker of adrenal function (levels $>3\%$ associated with adrenal insufficiency)

Levels increase in response to low cortisol or low vitamin d, linked with IBD and AITD

Levels suppressed by high cortisol, glucocorticoids, fever (bacterial, viral)

Ideal 0-0.2 (0-1% WCC)



basophil

Basophils

Basophils - tissue dwelling

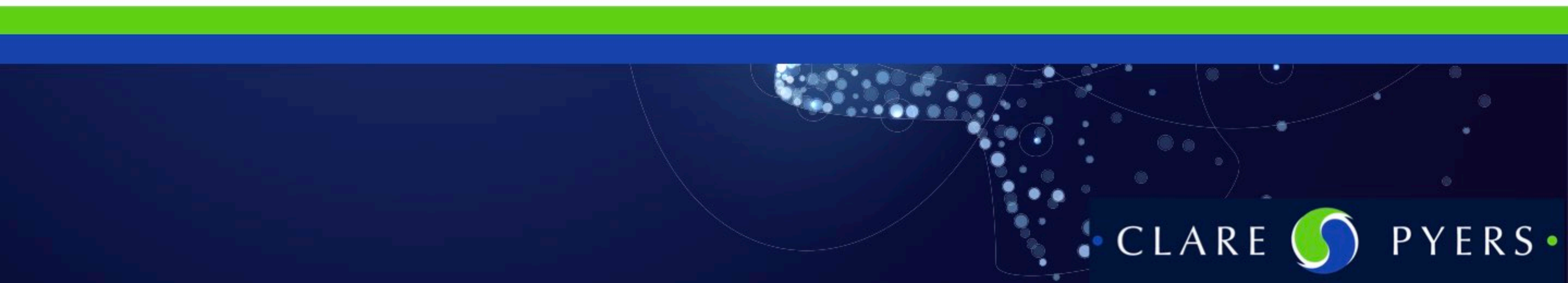
Release a range of compounds:
heparin, histamine, serotonin, TNF α and
tryptase

Increased due to low iron, vitamin D, mercury,
lead. Diabetes, ketoacidosis, allergy. Helminth.
Parasites. IBD. AITD. Some cancers.

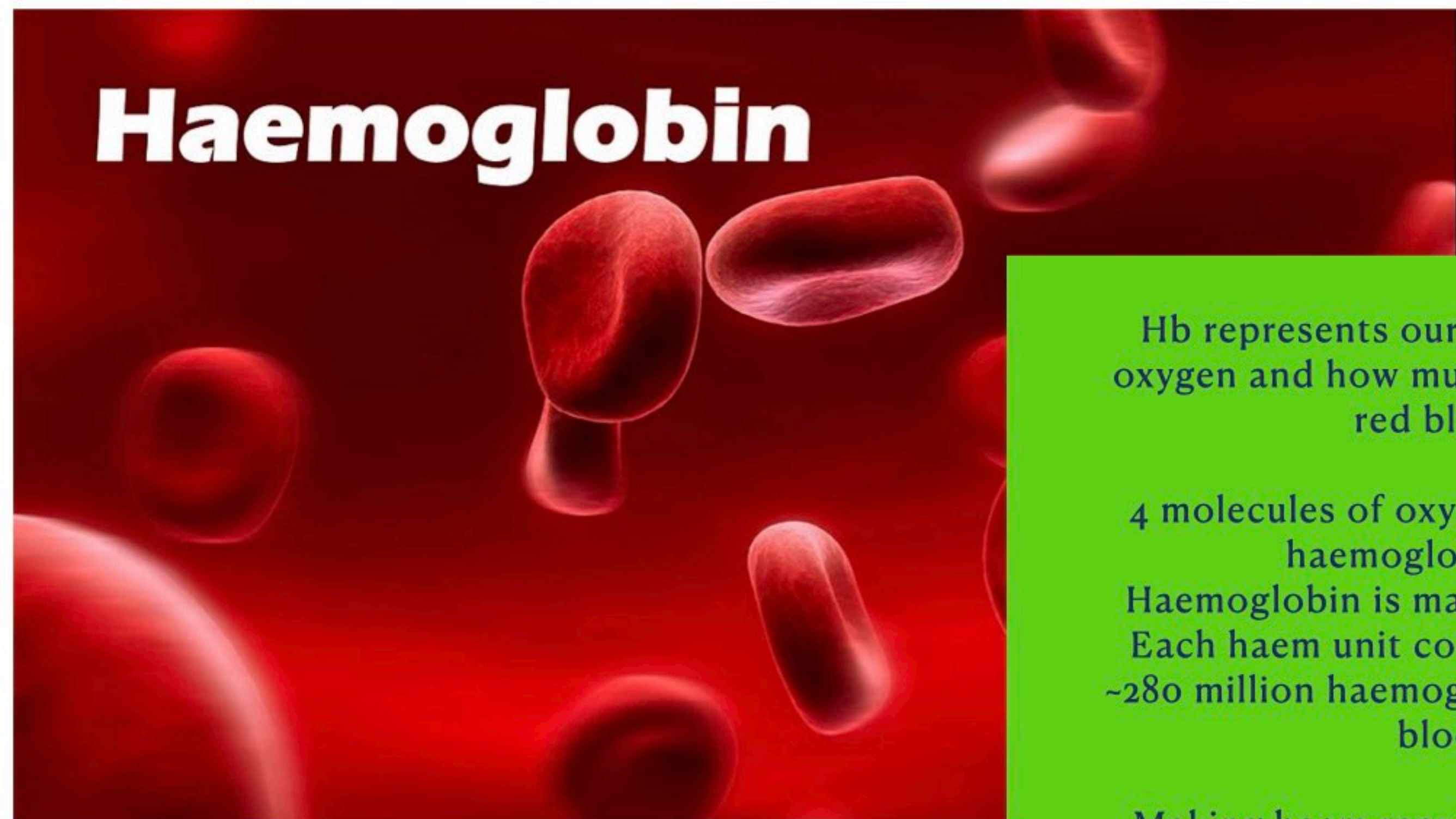
Ideal 0-0.1 (0-0.5%)



Red Blood Cell Panel



Haemoglobin

A microscopic view of several red blood cells, which are biconcave and reddish in color, set against a dark red background.

Hb

Haemoglobin

Hb represents our capacity for carrying oxygen and how much oxygen is within the red blood cells.

4 molecules of oxygen can be carried per haemoglobin molecule.

Haemoglobin is made up of 4 haem units.
Each haem unit contains 1 iron molecule.
~280 million haemoglobin are found per red blood cell.

Making haem requires: Zinc, B6, glycine, lipoic acid, biotin, B5, B2.
Copper - use, mobilisation, transport of iron around the body.



Hct

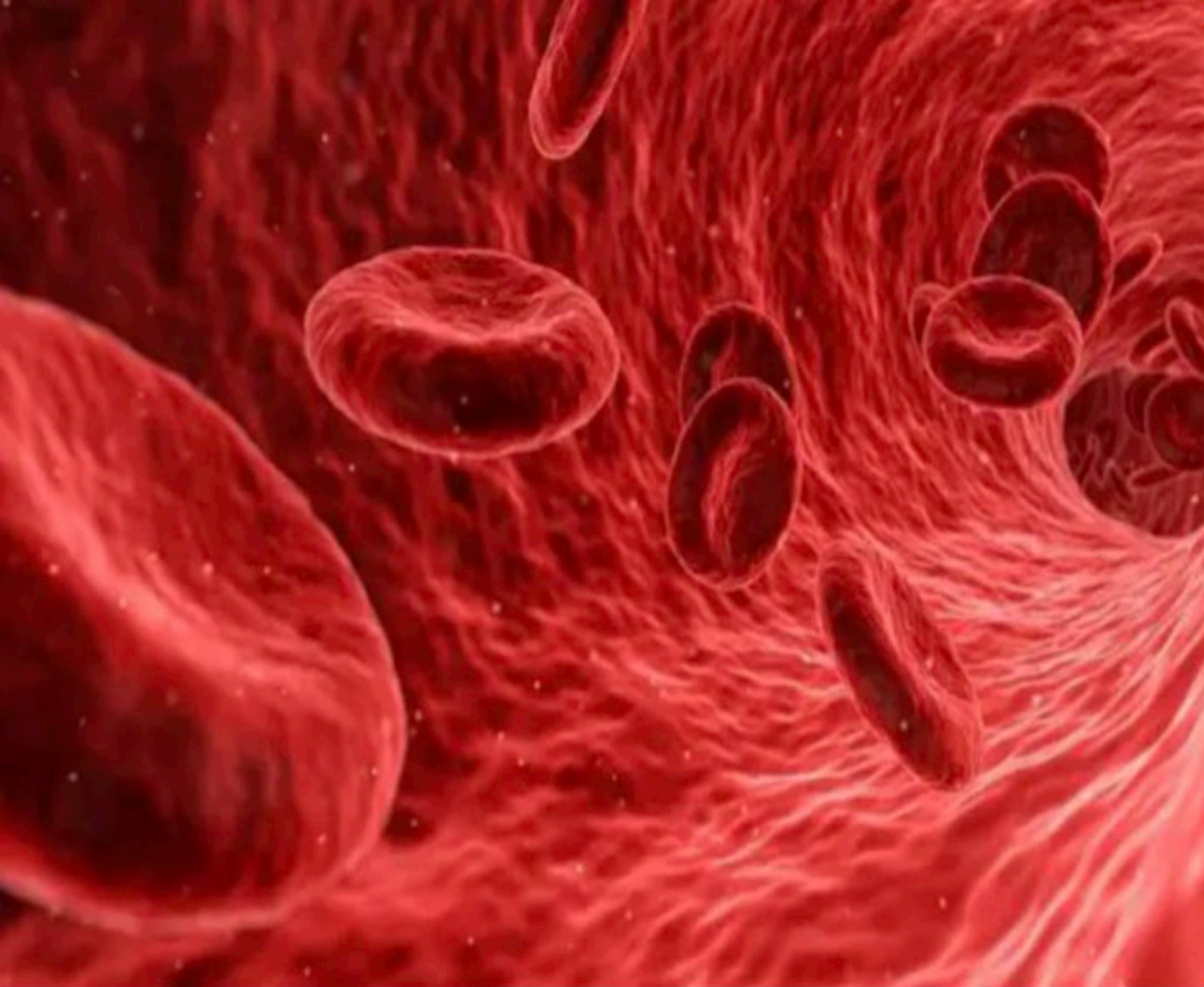
Haematocrit

Hematocrit - % that is solid, formed (not fluid), this is mostly red blood cells

High: Dryness, Yin xu, Fluid deficiency, Internal Heat, Phlegm, Blood Stasis. thickening and hardening of arterial wall, metabolic syndrome, hypertension, NAFLD, high altitude,

Low: Blood xu, Qi xu, Spleen Yang xu. low immunity, inadequate protein intake, deficiency in iron, b12, folate, copper, manganese or iodine, metabolic acidosis, blood loss.

Ideal 0.41-0.45



RBC

Red Blood Cell Count

The number of red blood cells that are circulating in the blood

We make approx 200 billion red blood cells per day.

Lead, arsenic, other heavy metals, herbicides, alcohol, can interfere with production of red blood cells.

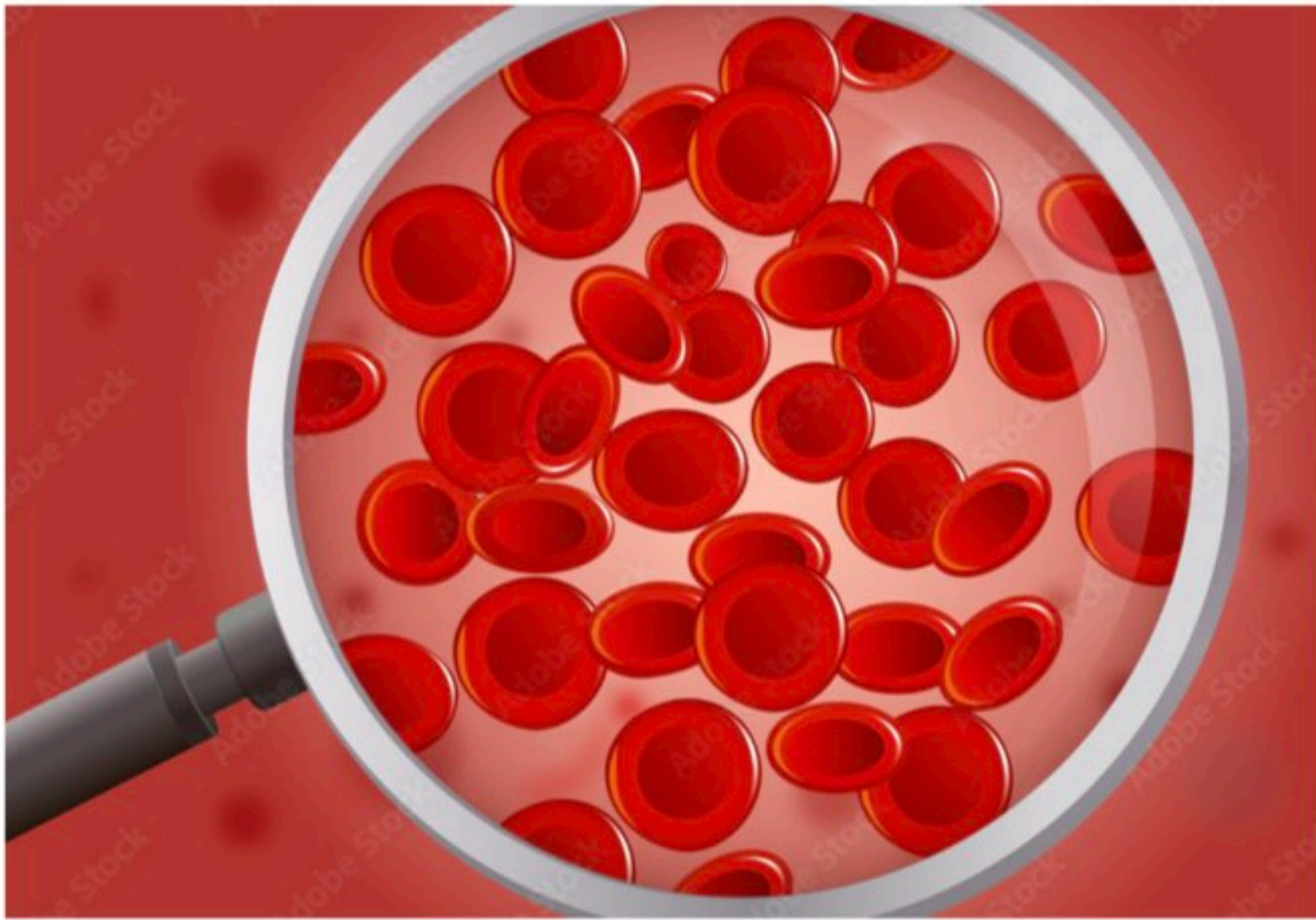
Impacted by size of cells - more reliable to look at Hct result.

High - Blood Stasis, Qi Stagnation, Internal Heat.

High altitude, polycythemia, kidney disease, severe dehydration.

Low: Blood xu, Spleen Blood xu, Qi xu, Yang xu
hyperthyroid, autoimmunity, obesity, cancer,
athletes, CFS, fibromyalgia, low HDL

Ideal 4.8-5.0



MCV

Mean Cell Volume

Measurement of the average size of red blood cells

Elevated when red blood cells are larger than normal (macrocytic anaemia)

Reduced when red blood cells are smaller than normal (microcytic anaemia)

High: Spleen Qi xu, Spleen Qi sinking, Yang xu. Oxidative stress, low B12 or folate, coeliac disease, dysbiosis, parasites, heavy metals.

Low: Blood xu, Spleen Blood xu, Qi xu. Thalassemia, iron deficiency, coeliac disease, dysbiosis, parasites, heavy metals.

Ideal 85-90



MCH

Mean Cell Hemoglobin

Measurement of the average mass of red blood cells

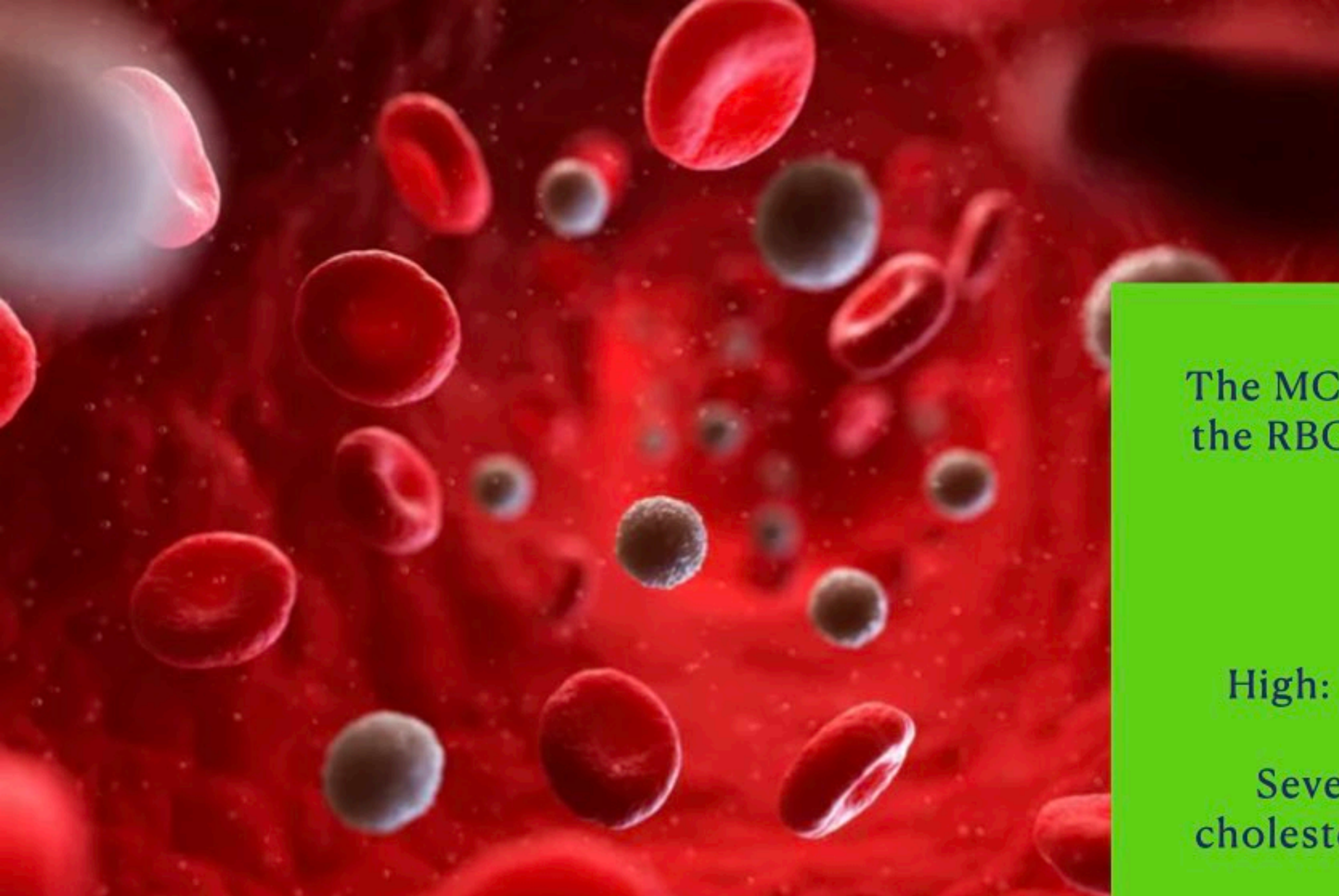
Is affected by the size of the red blood cell. The bigger the cell, the more hemoglobin you can fit, the higher the MCH.

Calculated by Hb/RCC

High: Spleen Qi xu, Spleen Qi sinking, Yang xu. Oxidative stress, low B12 or folate, coeliac disease, dysbiosis, parasites, heavy metals.

Low: Blood xu, Spleen Blood xu, Qi xu
Thalassemia, iron deficiency, coeliac disease, dysbiosis, parasites, heavy metals.

Ideal 28-32pg



MCHC

Mean Cell Hemoglobin Concentration

The MCHC is the ratio of haemoglobin mass in the RBC to cell volume. It is performed as part of a full blood count

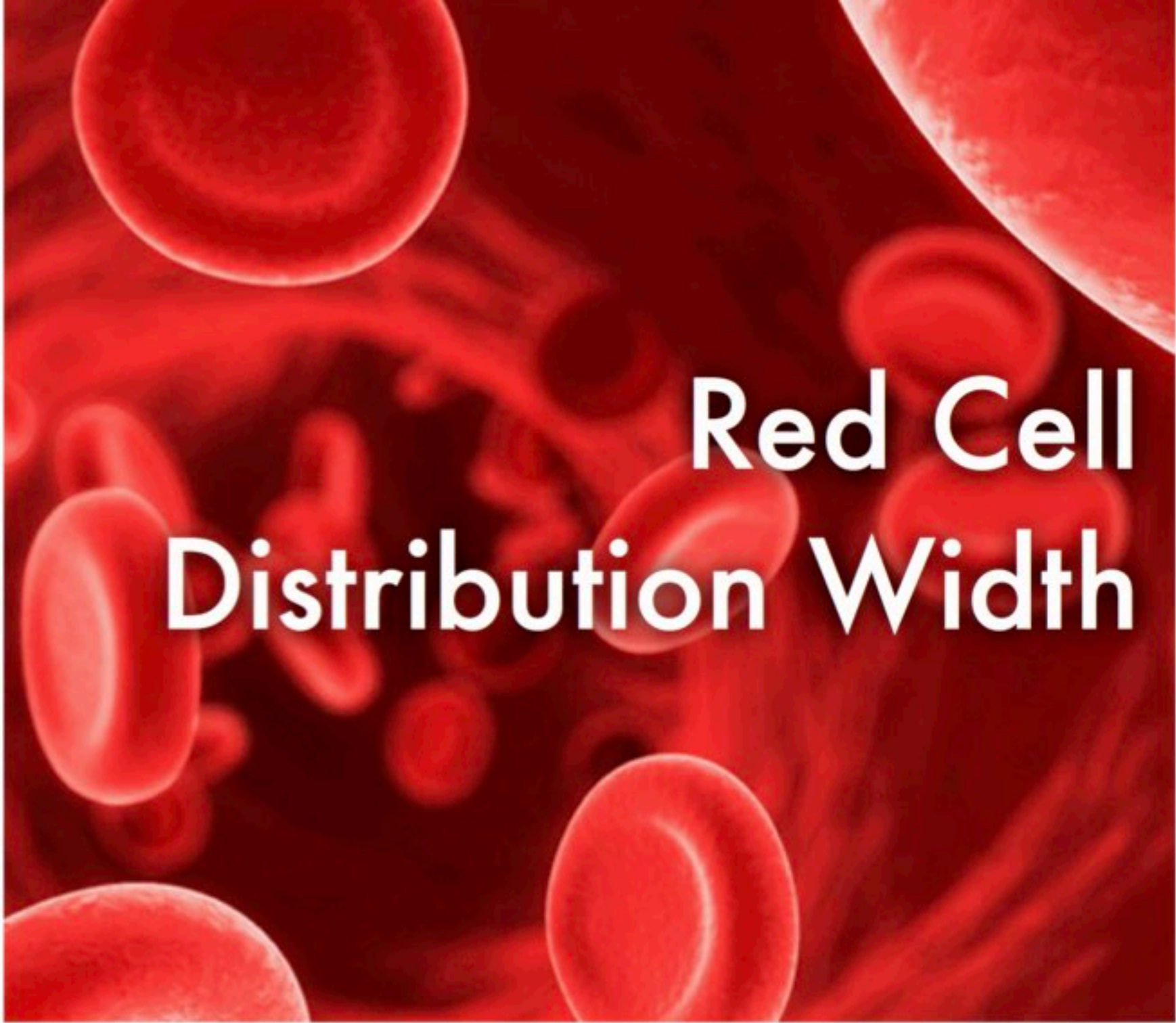
Calculated by Hb/Hct

High: Blood Stasis, Qi Stagnation, Internal Heat.

Severe burns, autoimmune disease, high cholesterol, Oxidative stress, low B12 or folate

Low: Blood xu, Spleen Blood xu, Qi xu
Thalassemia, iron deficiency, heavy metals.

Ideal 320-350g/L



Red Cell Distribution Width

RDW

Red Cell Distribution Width

Measures the amount of variation in the size of red blood cells.

The higher the RDW value, the greater the variation in size of the cells.

Best interpreted with MCV to identify iron deficiency anaemia or vitamin B12 deficiency anaemia; or other reason (eg blood loss)

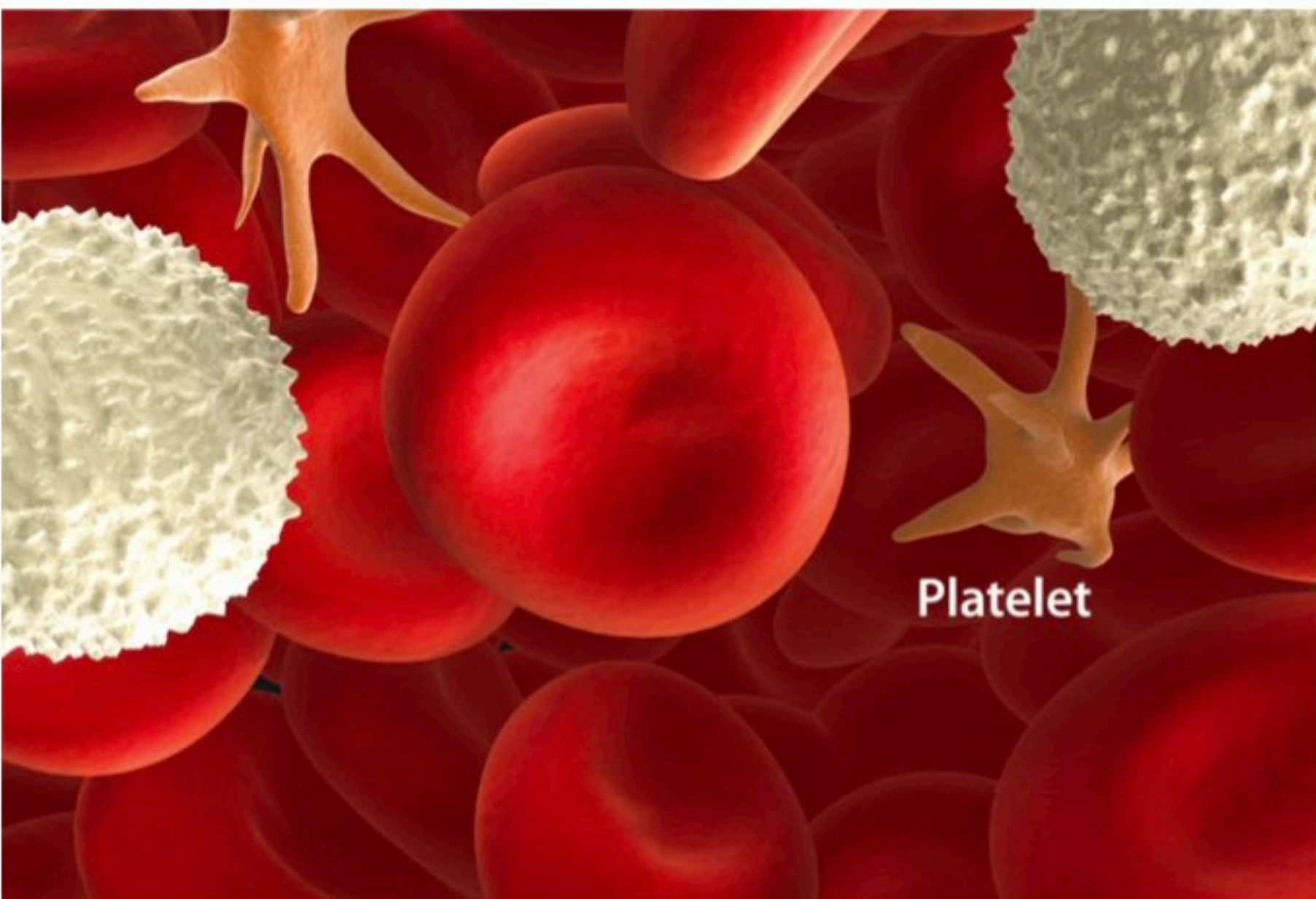
High = Spleen Qi xu, Spleen Qi sinking, Yang xu

Pernicious anaemia, oxidative stress, b vitamin deficiency

Low = Blood Xu, Spleen Blood xu, Qi xu, Yang xu

Microcytic anaemia, microcytic anaemia, chronic inflammation

Ideal 11-13

A microscopic view of blood cells. Large red blood cells are visible, along with smaller white blood cells. One small, star-shaped platelet is highlighted with a white label.

Platelets

Platelet

2 primary roles: Immune system and Blood clotting

Immune system: First responder to injury/infection - even before any white cells

Can create immune compounds on demand. (5HT, histamine, TGFb and others)

Blood: help with clotting. Thrombopoeitin stimulates platelet production via IL-6 in presence of inflammation or iron deficiency

High = Blood Stasis, Qi Stagnation, Yin xu, Internal Heat, Toxic Heat
Thrombocytosis, chronic inflammation, magnesium deficiency

Low = Spleen Qi xu, Blood xu, Gu Syndrome, Wei Syndrome
B12 or folate deficiency, leukaemia, idiopathic thrombocytopenia

Ideal 200-250

HAEMATOLOGY - Blood/EDTA

Date	03/06/22	20/06/22		
Time	1437	1628		
Lab Id.	387097564	386848539	Units	Reference
HAEMOGLOBIN	131	125	g/L	(115-160)
Hct	0.40	0.38		(0.35-0.47)
RBC	4.5	4.4	$\times 10^{12}/L$	(3.7-5.2)
MCV	90	88	fL	(80-100)
MCH	29	29	pg	(27-34)
MCHC	325	326	g/L	(310-360)
RDW	13.9	13.5		(11-17)
PLATELETS	341	369	$\times 10^9/L$	(150-450)
WHITE CELLS	7.3	6.2	$\times 10^9/L$	(4.0-11.0)
Neutrophils	4.7	3.9	$\times 10^9/L$	(2.0-7.5)
Lymphocytes	2.1	1.8	$\times 10^9/L$	(1.0-4.0)
Monocytes	0.4	0.4	$\times 10^9/L$	(0-1.0)
Eosinophils	0.1	0.1	$\times 10^9/L$	(0-0.5)
Basophils	0.1	0.1	$\times 10^9/L$	(0-0.3)

What do these
result indicate?

- Platelets
- RDW

HAEMATOLOGY

SPECIMEN: WHOLE BLOOD

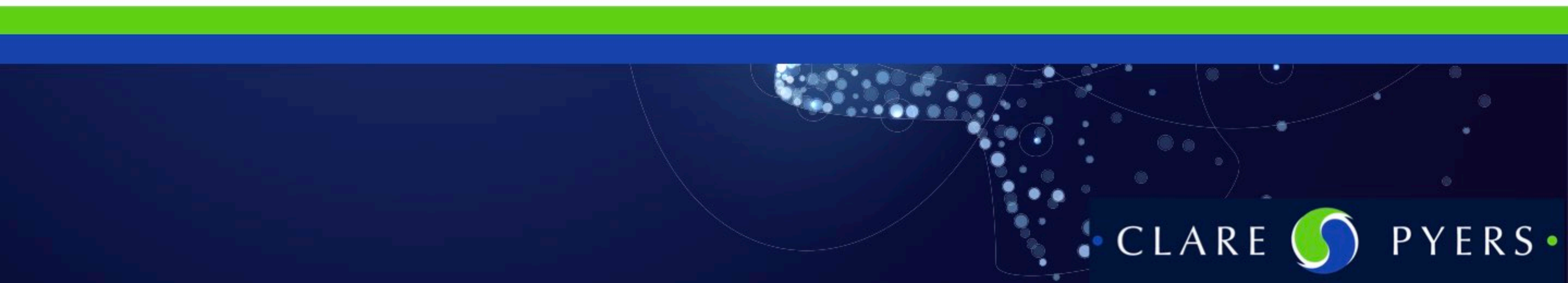
Date: 11/06/22
Coll. Time: 08:50
Lab Number: #66626195

(#Refers to current
result only)

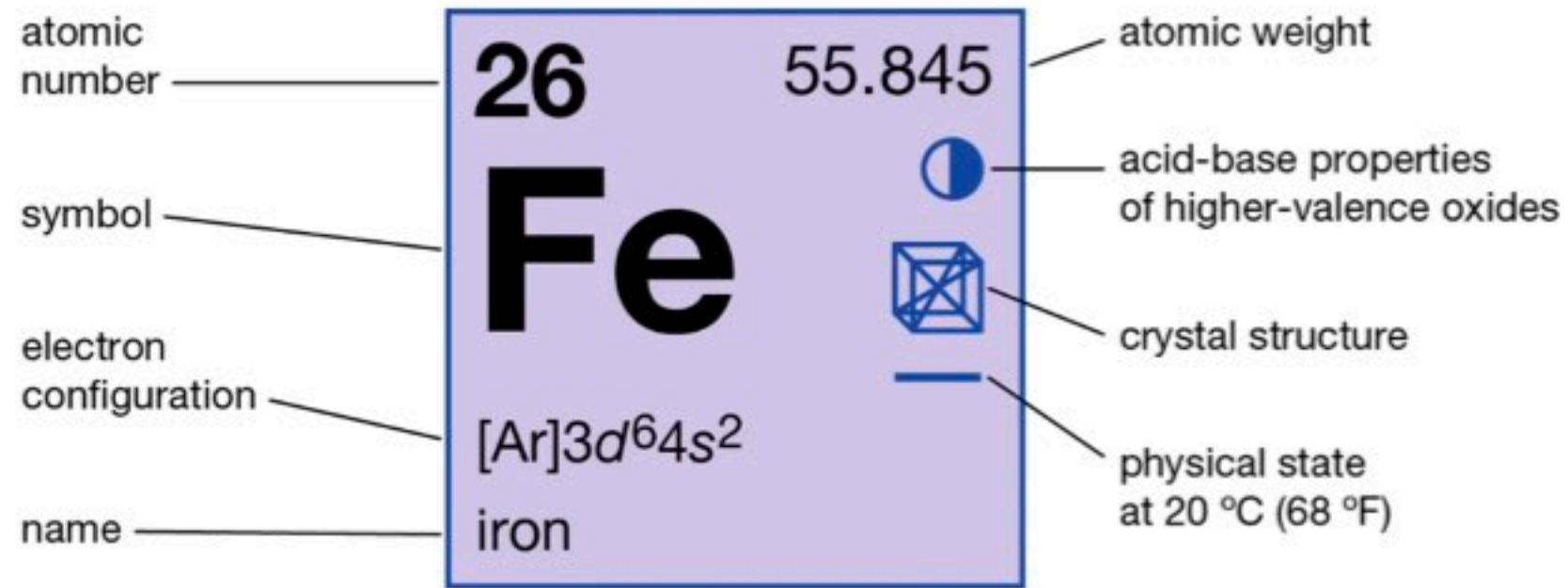
HAEMOGLOBIN	131	(115 - 165) g/L
RBC	4.65	(3.80 - 5.50) $\times 10^{12} /L$
HCT	0.41	(0.35 - 0.47)
MCV	89	(80 - 99) fL
MCH	28.2	(27.0 - 34.0) pg
MCHC	317	(310 - 360) g/L
RDW	13.8	(11.0 - 15.0) %
WCC	5.7	(4.0 - 11.0) $\times 10^9 /L$
Neutrophils	3.2	(2.0 - 8.0) $\times 10^9 /L$
Lymphocytes	2.0	(1.0 - 4.0) $\times 10^9 /L$
Monocytes	0.4	(< 1.1) $\times 10^9 /L$
Eosinophils	< 0.1	(< 0.7) $\times 10^9 /L$
Basophils	< 0.1	(< 0.3) $\times 10^9 /L$
PLATELETS	329	(150 - 450) $\times 10^9 /L$



Iron Studies



Iron



Transition metals	Solid
Body-centred cubic	Equal relative strength

Iron

Iron is bound to protein—mainly transferrin—and transported around the body. Small amounts of iron are stored in the liver.

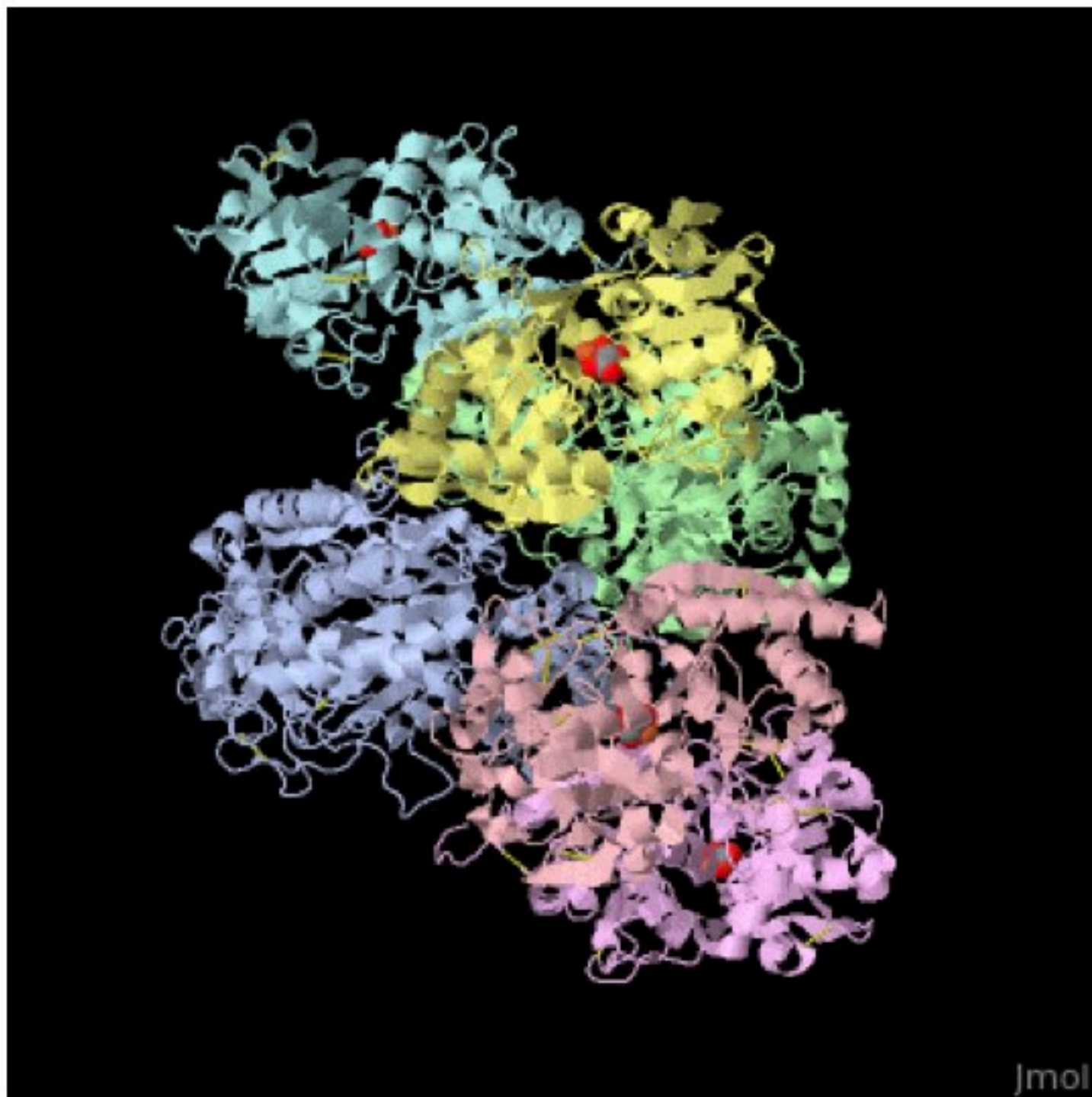
Copper and vitamin A are important nutrients for iron metabolism.

High = Blood Stasis, Blood Heat, Exuberant Yang

Haemocromatosis, liver disease, Gilbert's syndrome, b vitamin deficiency, copper deficiency.

Low = Blood xu, Qi and Blood xu
Anaemia, hypochlorhydria, low protein intake, excessive bleeding.

Ideal 14-22



TRF
Transferrin

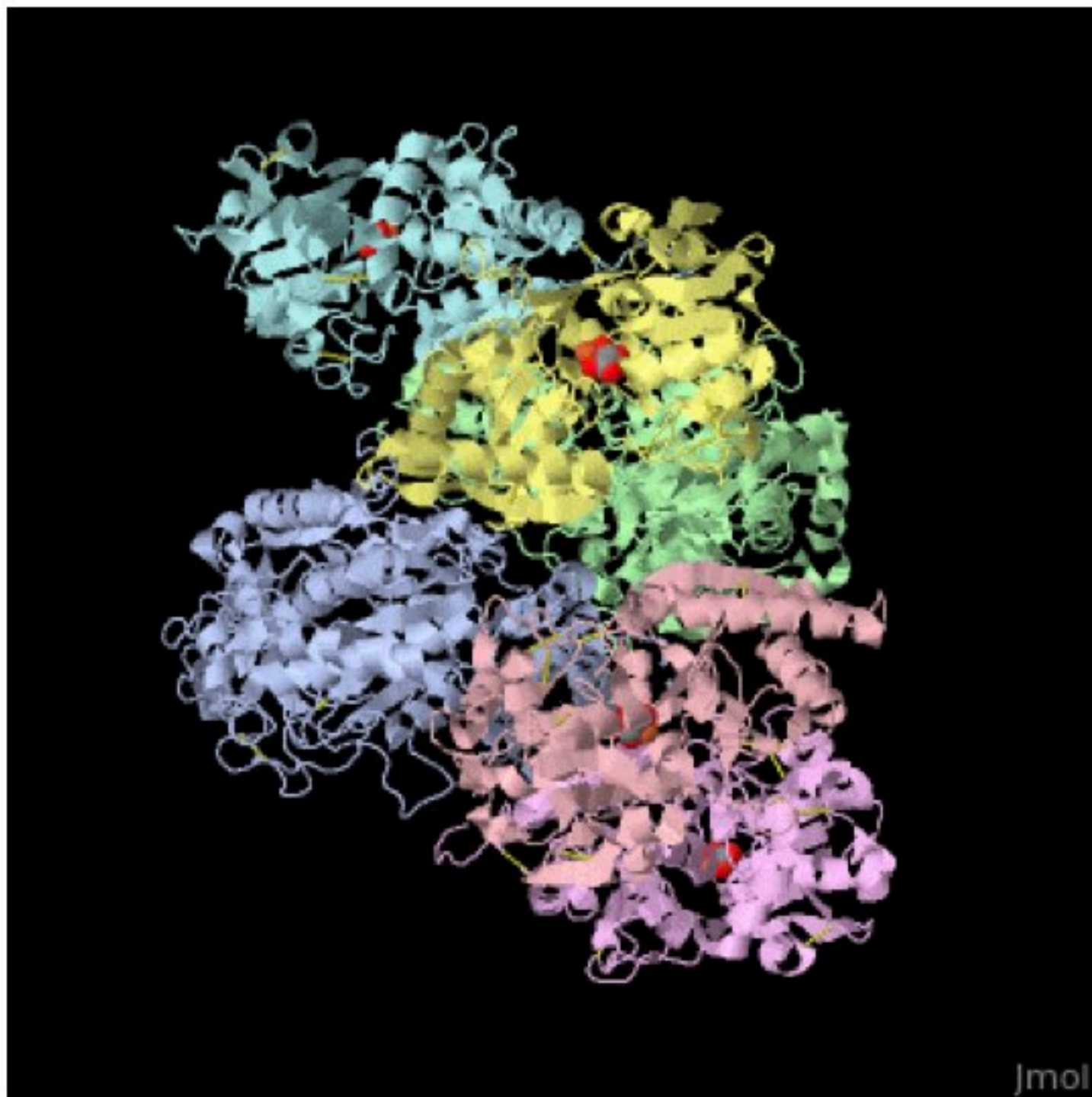
Transferrin is a protein that transports iron in the blood. It is made in the liver.

Represents the overall capacity of the body to deliver iron throughout the system

High =

Low =

Ideal 2-3.6g/L



TRF Sat

Transferrin Saturation

This is a calculated value that represents the percentage of transferrin proteins that are saturated with iron

High = Blood Stasis, Blood Repletion
haemochromatosis, haemolytic anaemia,
megaloblastic anaemia, thalassemia,
cirrhosis, lead poisoning, protein deficiency,
b vitamin deficiency

Low = Blood xu
chronic illness, iron deficiency, low copper

Ideal 28-35%



Ferritin Blood Test

Ferritin

Protein that stores iron.

Is an acute phase reactant, increases in response to inflammation, infection.

High = Blood Stasis, Blood Heat
Infection, cancer, parasites, chronic
inflammation, haemochromatosis,
autoimmune disease

Low = Blood xu, Liver Blood xu
Iron deficiency,

Ideal 50-150

IRON STUDIES

SPECIMEN: SERUM

Date: 11/06/22
Coll. Time: 08:50
Lab Number: 66626195

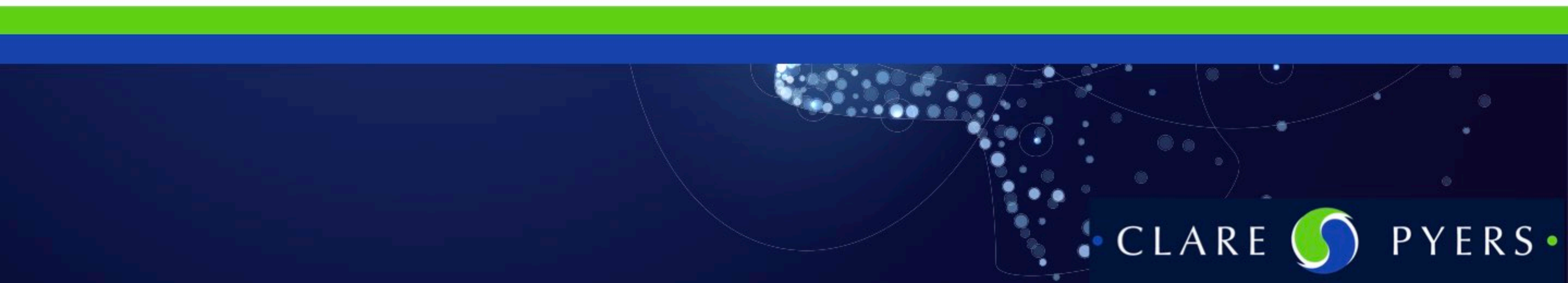
Iron	29.6	(10.0 - 30.0)	umol/L
Transferrin *	2.08	(2.10 - 3.80)	g/L
Saturation *	57	(15 - 45)	%
Ferritin	46	(30 - 200)	ug/L

30F

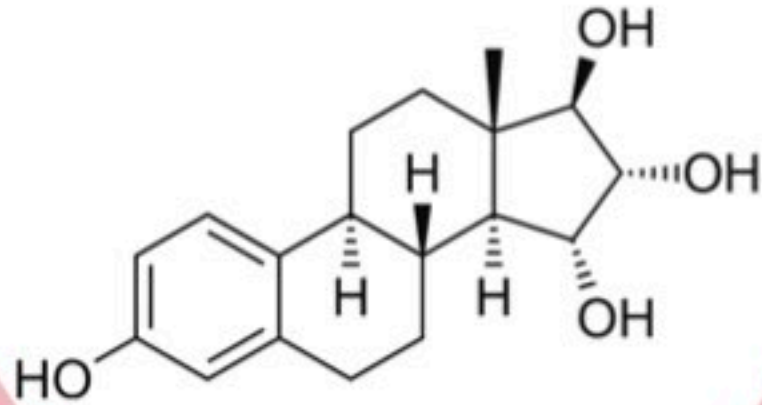
Exhaustion. Dizziness. Brain
fog. Tingly hands. Heart
palpitations



Reproductive Hormones



Oestrogen



Oestradiol is the main form of oestrogen, produced in the ovaries in the developing follicles.

Should ideally be tested alongside FSH and LH to better correlate results.

When tested on day 3 gives an idea of baseline oestrogen levels.

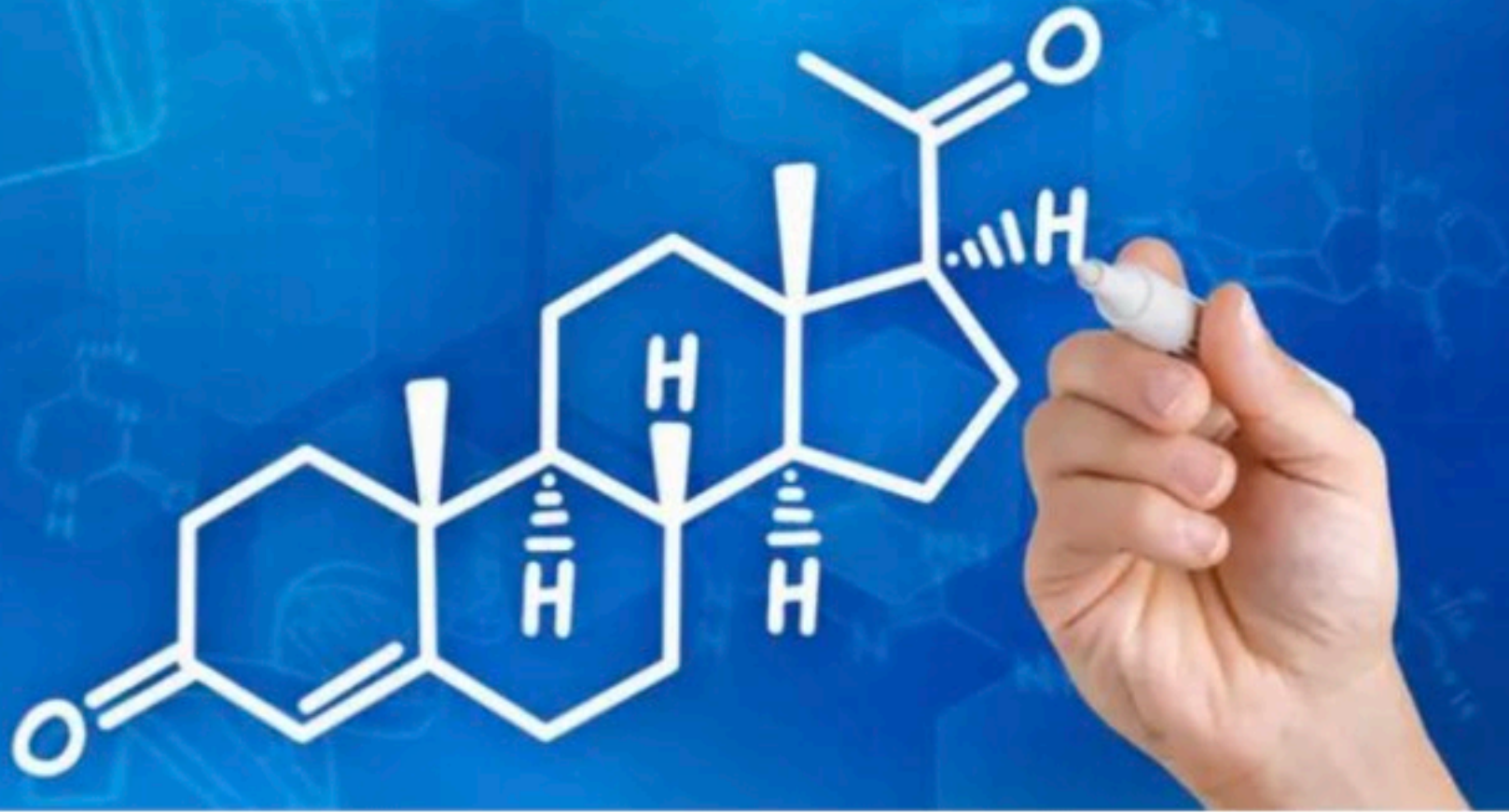
High = Blood Stasis, Qi Stagnation
Functional cyst, PCOS, endometriosis

Low = Yin xu, Blood xu
Menopause, perimenopause

Ideal 50-180

Oestradiol

PROGESTERONE



Progesterone

Hormone created in the ovaries, and to a lesser extent in the adrenal gland

After releasing its egg, the follicle becomes a corpus luteum and begins producing progesterone for the purpose of supporting the uterus for pregnancy

Should ideally be tested 7 days after ovulation (often prescribed as day 21 of menstrual cycle)

Low = Yang xu, Blood xu
Anovulation, PCOS, Adrenal fatigue,
Menopause

Ideal = >30

Follicle-Stimulating Hormone

What do your FSH levels mean?



FSH

Follicle Stimulating Hormone

Luteinising hormone promotes the release of ovarian follicles at ovulation. It also promotes testosterone production in the testes.

Baseline at day 2/3 of menstrual cycle, and peaks at ovulation.

High = Yin xu. Empty Heat, Blood xu
Menopause, peri menopause, infertility

Low = Cold, Yang xu

Ideal = 2.5-6

Luteinizing Hormone (LH)



LH

Luteinizing Hormone

Luteinising hormone promotes the release of ovarian follicles at ovulation. It also promotes testosterone production in the testes.

Baseline at day 2/3 of menstrual cycle. Peaks at ovulation.

High = Qi Stagnation, Phlegm, Dampness
PCOS, Menopause, peri menopause

Low = Yin xu, Blood xu, Jing xu

Ideal = 2.5-6



SHBG

Sex hormone-binding globulin

SHBG (sex hormone-binding globulin) is a protein made in the liver that tightly binds to oestrogen, testosterone and dihydrotestosterone and carries them in the blood

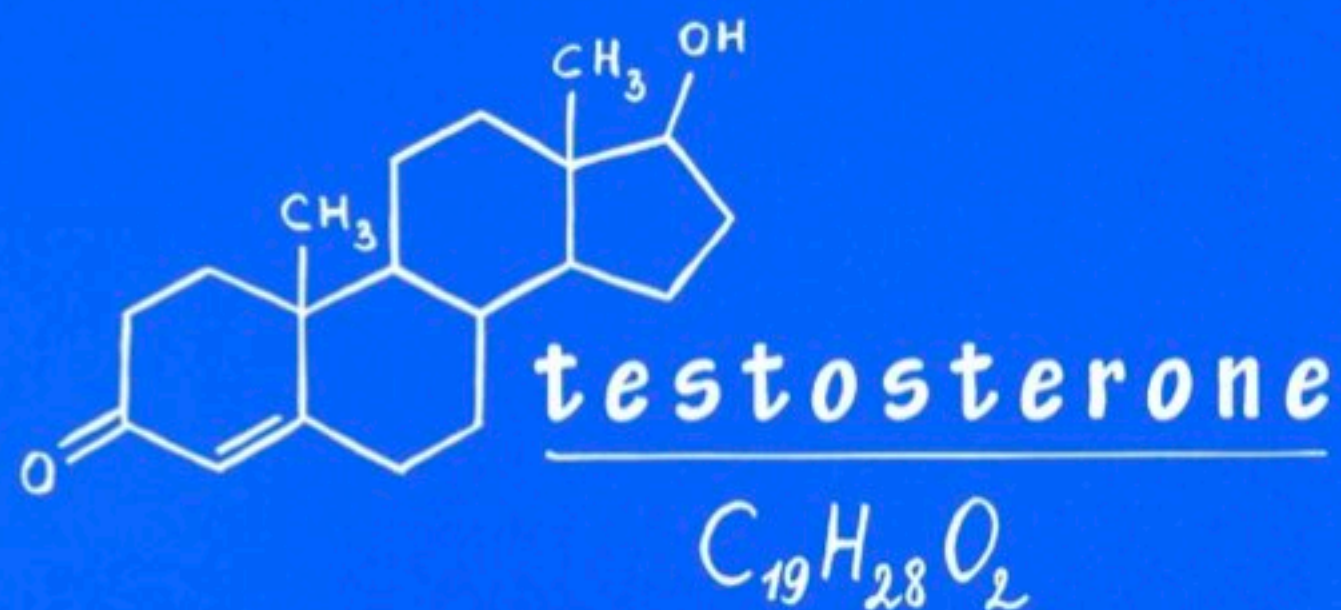
High = Blood Stasis, Qi Stagnation, Blood Heat
Elevated oestrogen, hyperthyroidism, hepatitis

Low = Yang xu, Liver Qi xu, Dampness
Elevated testosterone, insulin resistance, acne, hypothyroidism, adrenal fatigue, fluid retention

Ideal 40-120

SHBG

Sex Hormone Binding Globulin



Testosterone

Secreted from the adrenal gland, testes and the ovaries

The main male reproductive hormone and compared with oestrogen it has more of a Yang quality

The portion of free (unbound) testosterone is usually calculated from the testosterone and SHBG levels

High = Phlegm, Qi Stagnation, Damp Heat, Damp Acne, PCOS, hirsutism, amenorrhea, infertility, hair loss, depression

Low = Yin xu, Blood xu, Yang xu
Depression, low libido, vaginal dryness, osteoporosis,

Ideal 1.6-1.8 nmol/L (women)

Ideal 15-30 nmol/L (men)

Dehydroepiandrosterone Sulfate (DHEAS)

DHEAS

Dihydroepiandrosterone-Sulphate

Produced by the adrenal glands and metabolised into a range of reproductive hormones including testosterone, oestrogen, and cortisol

DHEA-S is tested in preference to DHEA as it has a longer half-life and is more representative of levels over time. DHEA and DHEA-S production declines with age, dropping 1–5 per cent per year from the age of 25

High = Yin xu heat, Qi stagnation
Anxiety, irritability, stress, acne

Low = Kidney Yang xu, Kidney Jing xu
Infertility, weight gain, fatigue, hair loss.

Ideal 5.0-6.0

GENERAL CHEMISTRY

SPECIMEN: SERUM

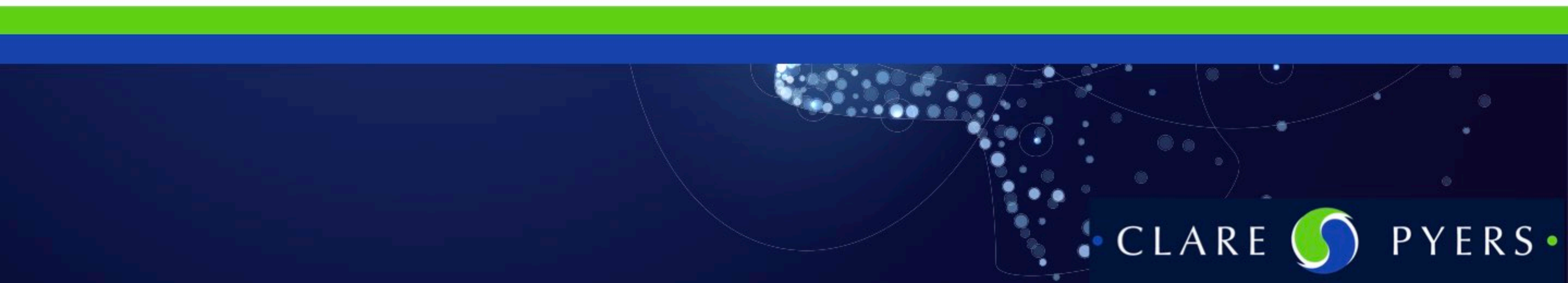
Date: 11/06/22
 Coll. Time: 08:50
 Lab Number: 66626195

Sodium	136	(135 - 145)	mmol/L
Potassium	4.8	(3.5 - 5.2)	mmol/L
Chloride	103	(95 - 110)	mmol/L
Bicarbonate	23	(22 - 32)	mmol/L

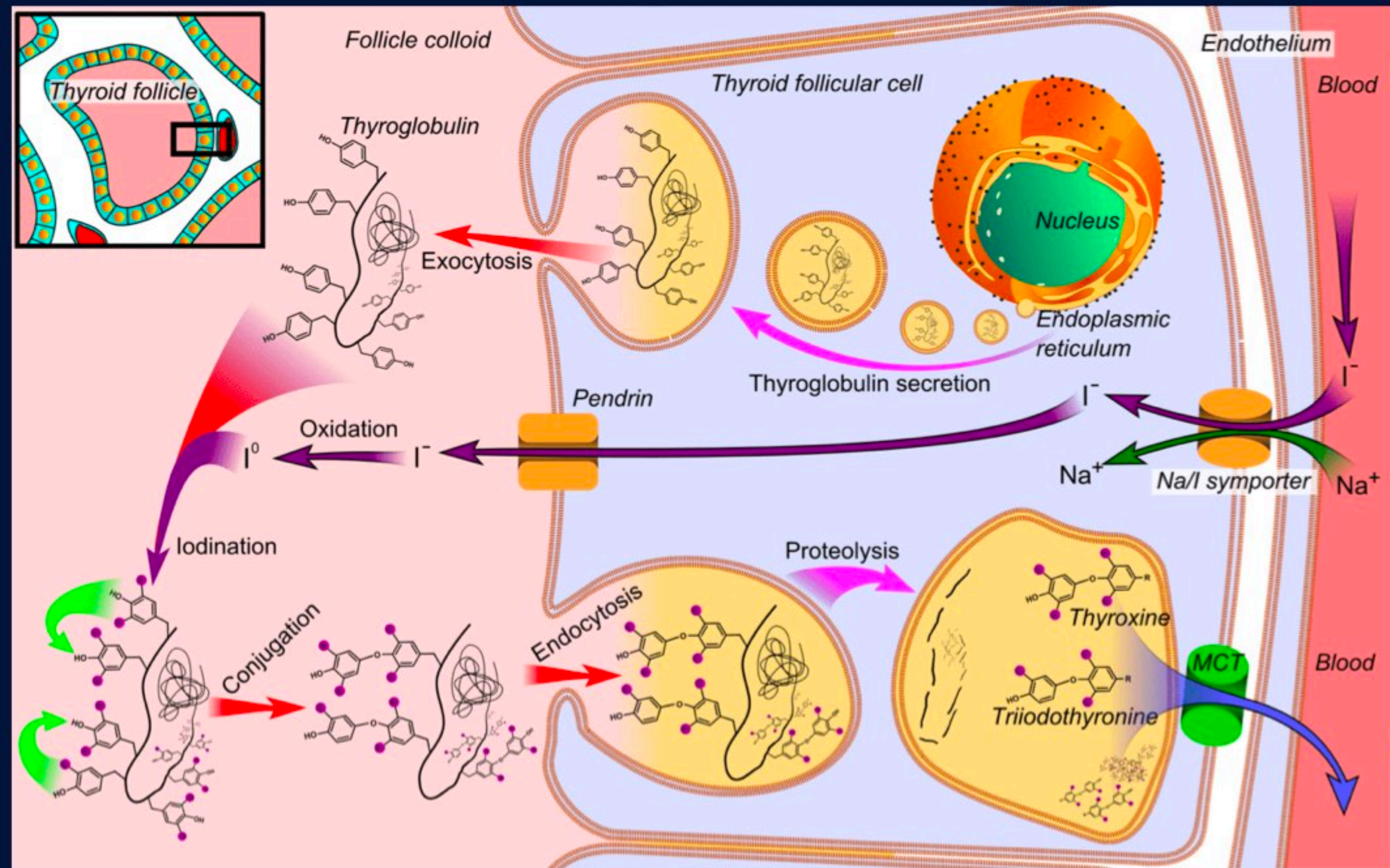
What might be
 happening with
 this person's
 adrenal gland
 activity?

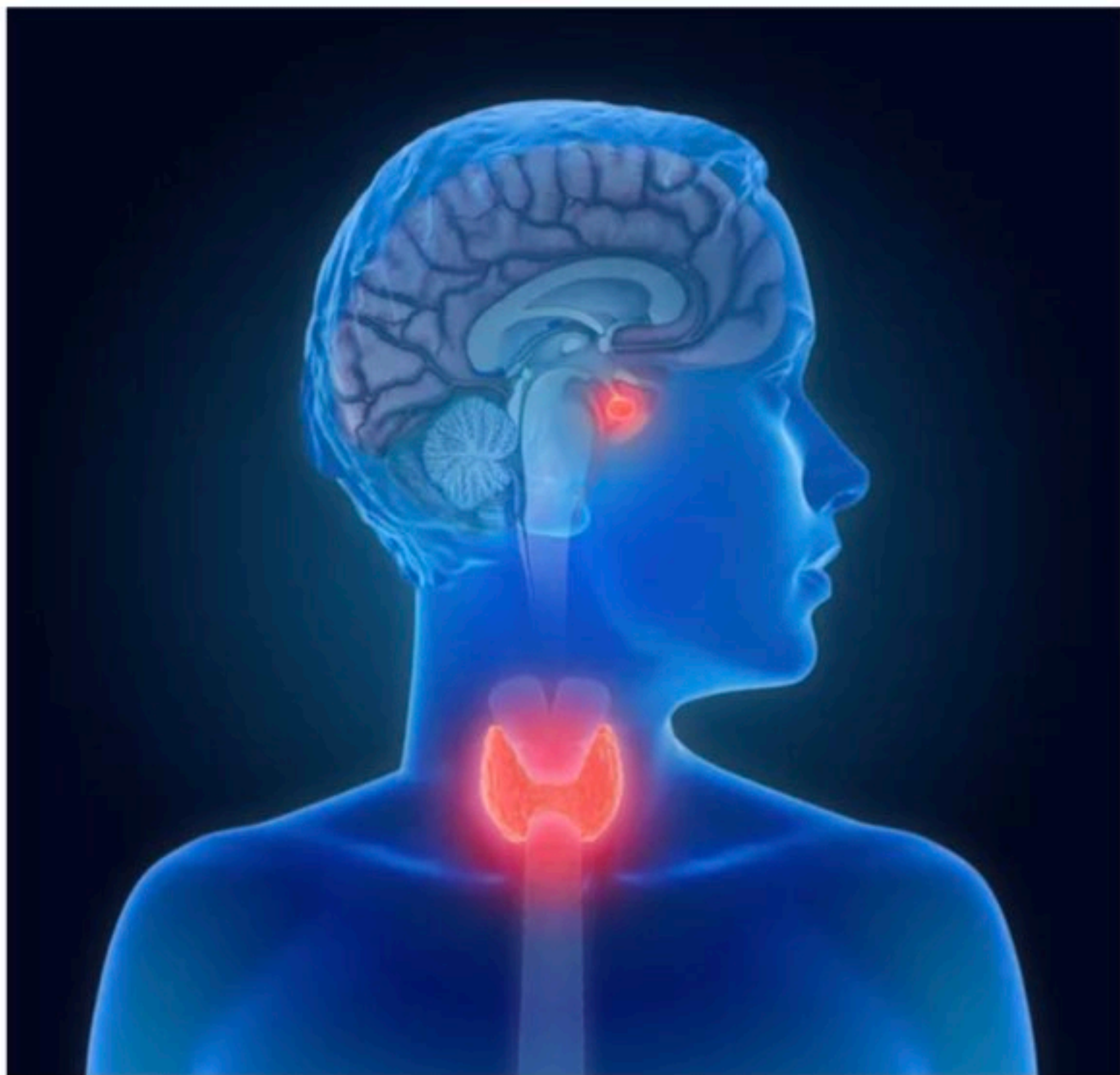


Thyroid Hormones



Thyroid Hormone Production





TSH

Thyroid Stimulating Hormone

Hormone released from anterior pituitary gland in response to low levels of thyroid hormone.

Stimulates the thyroid to produce thyroid hormone.

High: Spleen Yang xu, Heart Yang xu, Blood xu, Qi xu.

Hashimoto's disease, hypothyroidism, thyroiditis, pituitary disease.

Low: Internal Heat, Yin xu, Empty Heat, Heart Fire, Wasting of Qi, Yang and Fluids
Grave's disease, Hyperthyroidism, thyroiditis, pituitary disease

Ideal 0.5-2.0



fT₄
Free thyroxine

Thyroxine is the main form of thyroid hormone produced in the thyroid gland.

Tyrosine and four iodine molecules are joined together in thyroglobulin (the protein that provides the location for T₄ production) to form thyroxine

Thyroid hormones act to increase the basal metabolic rate, assist cells with protein uptake and increase the sensitivity of the cells to adrenaline

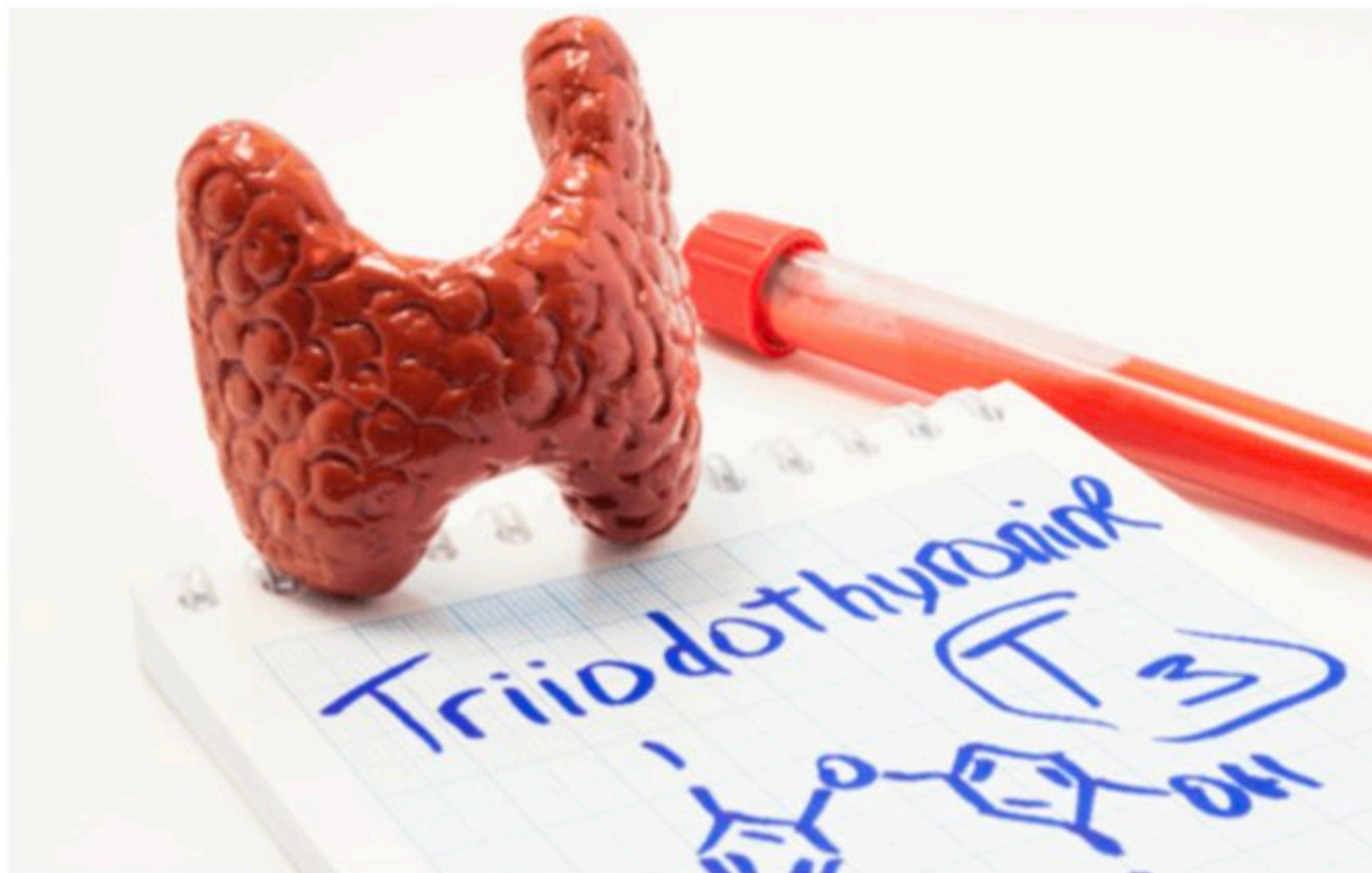
High: Heart Yin xu, Heart Fire, Heat in the Heart, Yang Rising.

Grave's disease, hyperthyroidism, thyroiditis

Low: Heart Blood xu, Heart Yin xu, Spleen Blood xu

Hashimotos' disease, hypothyroidism, thyroiditis

Ideal 15-19



fT₃
Free tri-iodothyronine

Triiodothyronine is produced by the thyroid gland, and by the deiodination of T₄ thyroxine in various organs and body tissues.

T₃ is the active form of thyroid hormone, and is the most biologically potent.

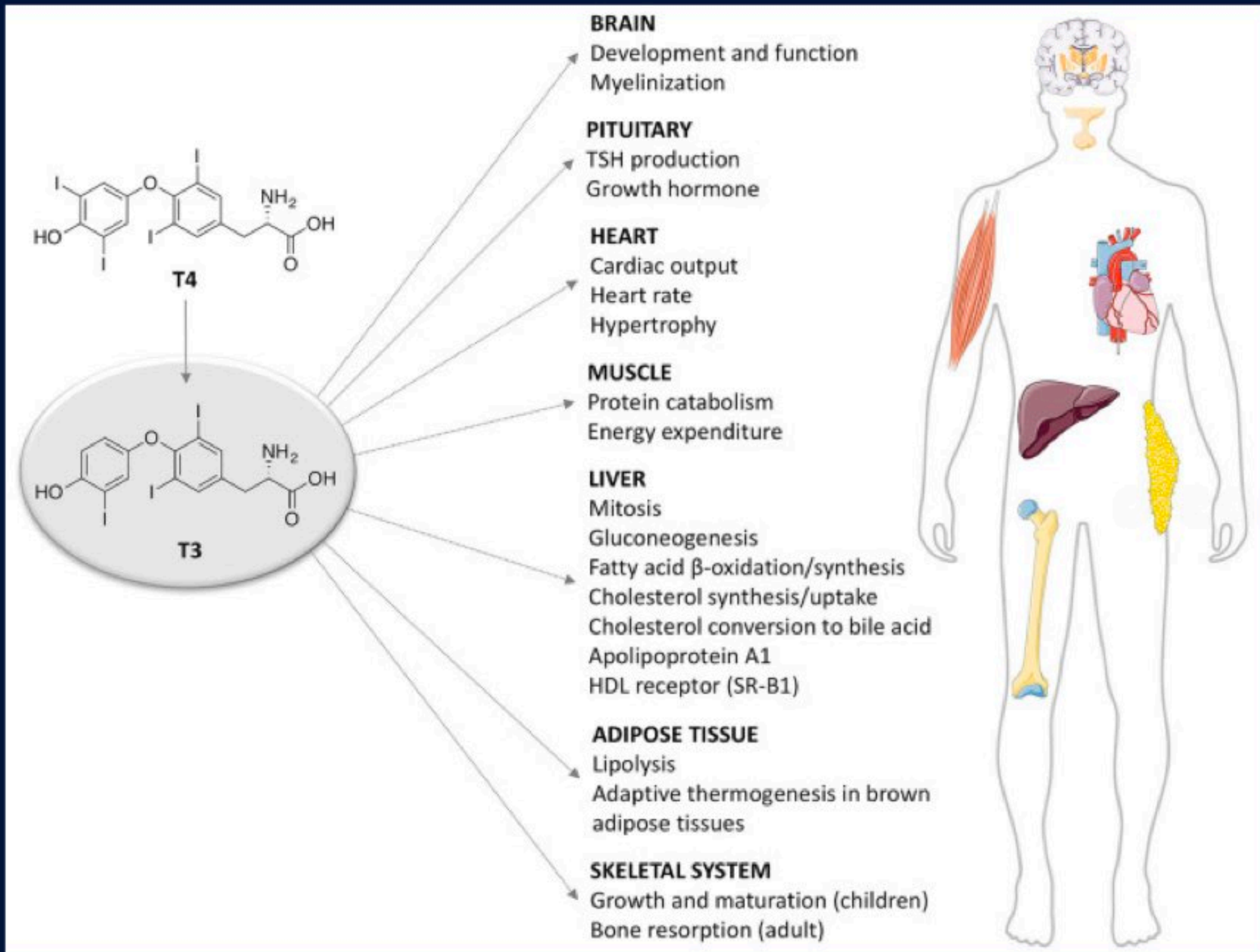
The “3” in T₃ refers to the three iodine molecules present in the hormone.

High: Heart Yin xu, Heart Fire, Heat in the Heart,
Yang Rising
Grave’s disease, hyperthyroidism

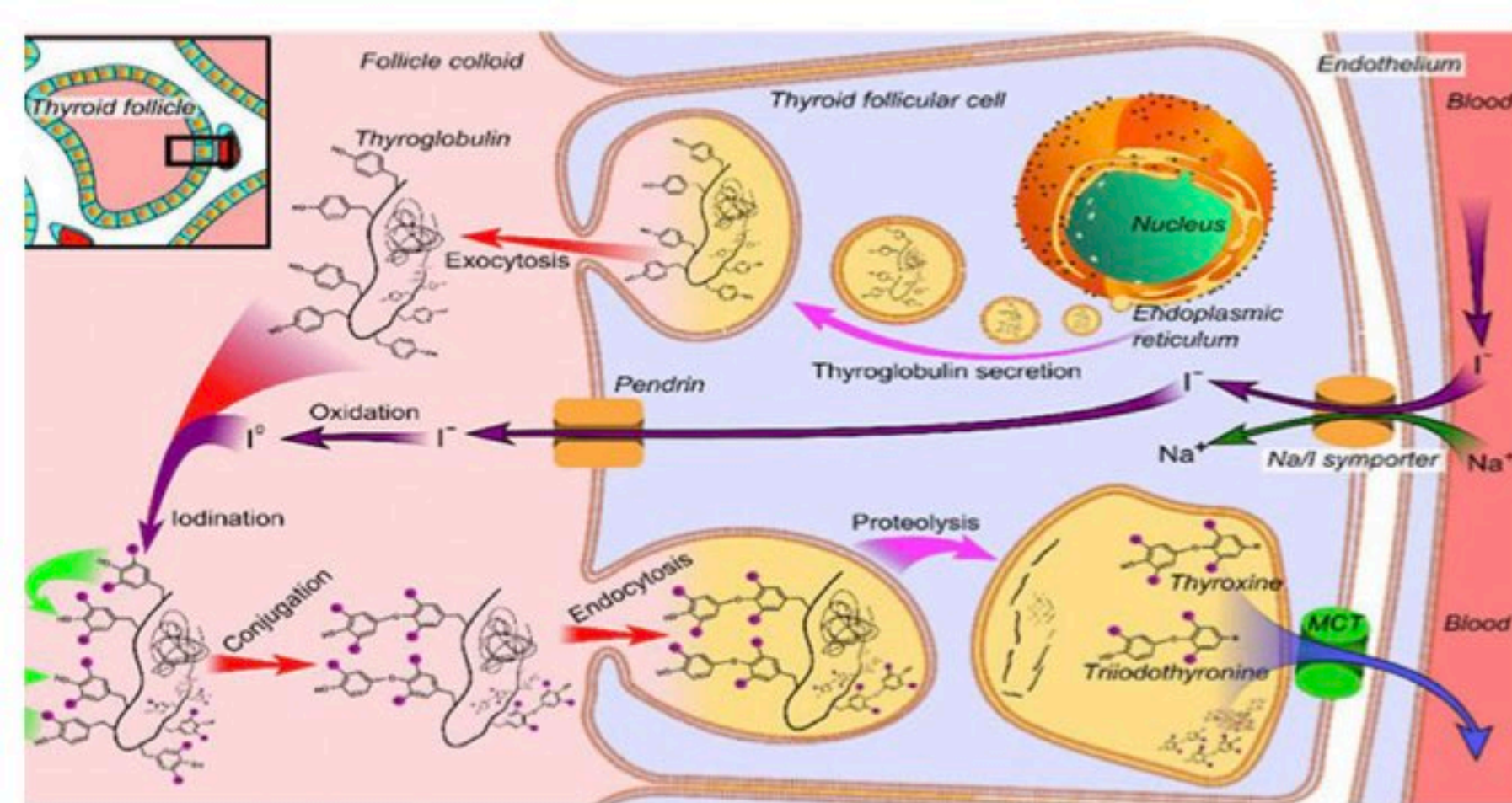
Low: Heart Qi xu, Spleen Qi xu, Heart Yang xu,
Spleen Yang xu.

Hashimoto’s disease, thyroiditis, liver disease,
kidney disease

Ideal 4.5-6.0



Effects of T₃ throughout the body



TPOAB

Thyroid Peroxidase Antibodies

Thyroid Peroxidase is an enzyme required for thyroid hormone production. It is made in the thyroid gland.

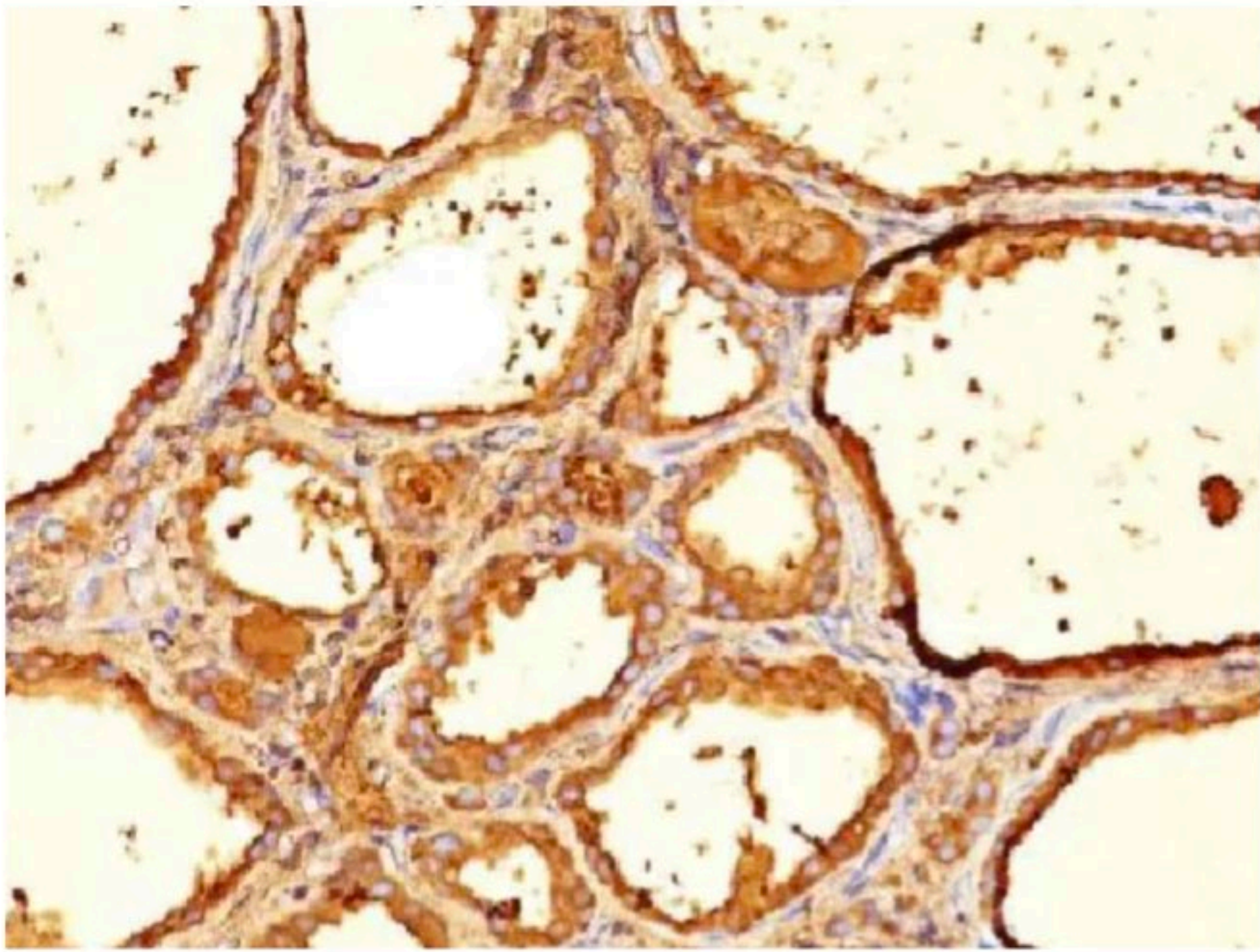
Lymphocytes entering the thyroid gland prompt the production of antibodies.

27% with PCOS have either elevated TPO or Tg antibodies

High: Shao Yin imbalance, Yang xu, Qi Stagnation, Blood xu.

Hashimoto's, Grave's, Lupus, Sjogren's, PCOS

Ideal <30



TgAb

Thyroglobulin Antibodies

Thyroglobulin is a protein made in the thyroid gland.

Provides the site for the formation of thyroxine T₄ and triiodothyronine T₃.

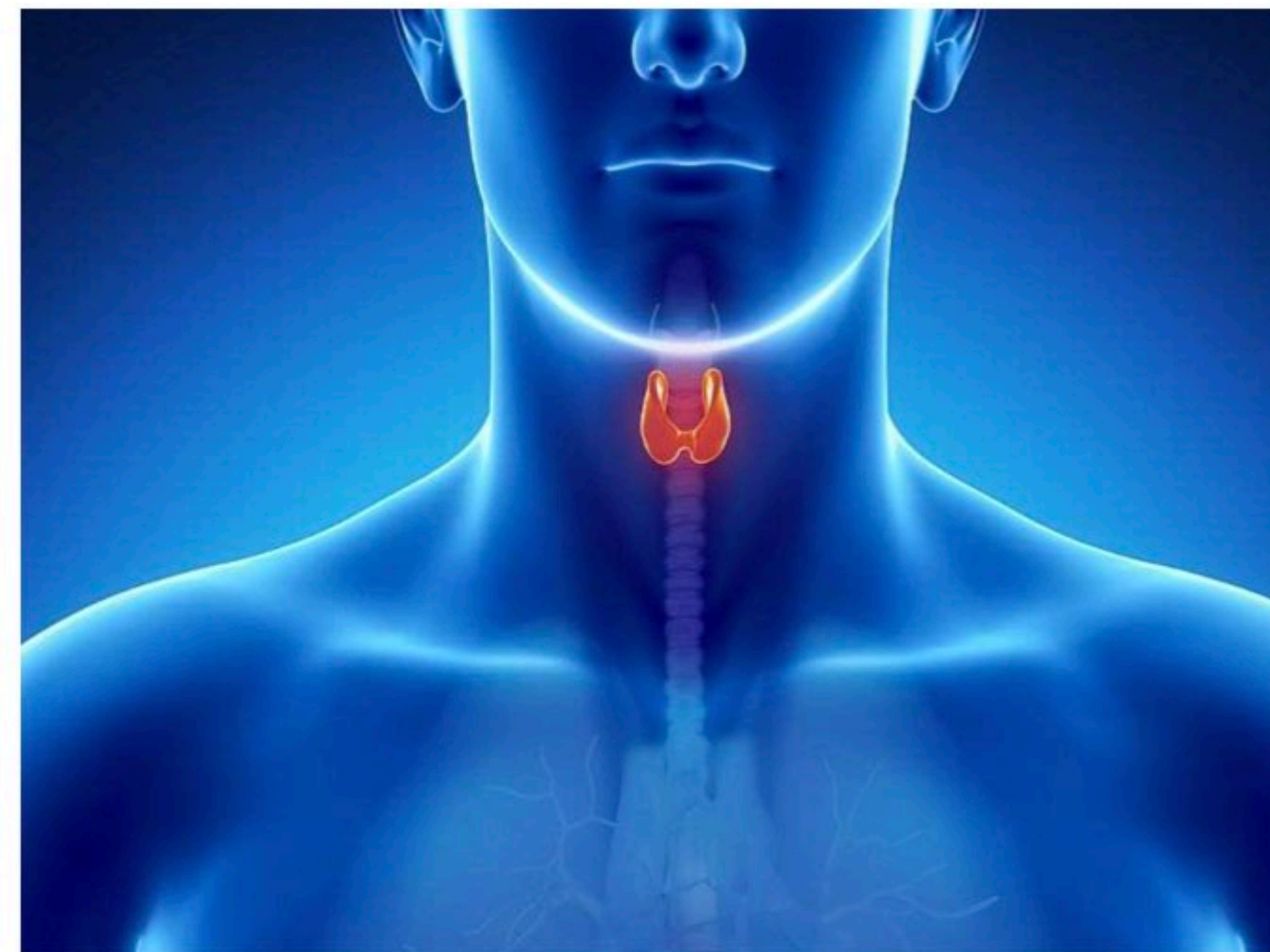
Requires the thyroid peroxidase TPO enzyme to perform its function

27% with PCOS have either elevated TPO or Tg antibodies

High: Shao Yin imbalance, Yang xu, Qi Stagnation, Blood xu.

Hashimoto's, Grave's, Lupus, Sjogren's, PCOS

Ideal <30



TRAb

TSH receptor antibodies

TSH receptor antibodies stimulate the production of thyroid hormone

High: Qi Stagnation, Blood Stasis, Heart Qi Stagnation, Heart Qi xu and Liver Yang rising

autoimmune hyperthyroidism – Graves' disease, dysbiosis, heavy metals, stress

Ideal <1.0

30F

THYROID FUNCTION TEST

SPECIMEN: SERUM

Date: 11/06/22
Coll. Time: 08:50
Lab Number: 66626195

Free T4		20.1	(9.0 - 25.0) pmol/L
TSH	***	0.02	(0.40 - 4.00) mIU/L
Free T3		6.4	(3.5 - 6.5) pmol/L

Exhaustion. Dizziness. Brain
fog. Tingly hands. Heart
palpitations

What do these
result indicate?

Note different
reference
ranges with
different labs

Note time of
day

IRON STUDIES		SPECIMEN: SERUM	
Date:	11/06/22		
Coll. Time:	08:50		
Lab Number:	66626195		
Iron	29.6	(10.0 - 30.0)	umol/L
Transferrin *	2.08	(2.10 - 3.80)	g/L
Saturation *	57	(15 - 45)	%
Ferritin	46	(30 - 200)	ug/L

IRON STUDIES			
Date	20/06/22		
Time	1628		
Lab Id.	386848539		
S IRON	12	umol/L	(5-30)
S TRF	2.4	g/L	(2.0-3.6)
S TRF SAT	20	%	(10-45)
S FERRITIN	46	ng/mL	(30-200)

GENERAL CHEMISTRY

SPECIMEN: SERUM

Date: 11/06/22
Coll. Time: 08:50
Lab Number: 66626195

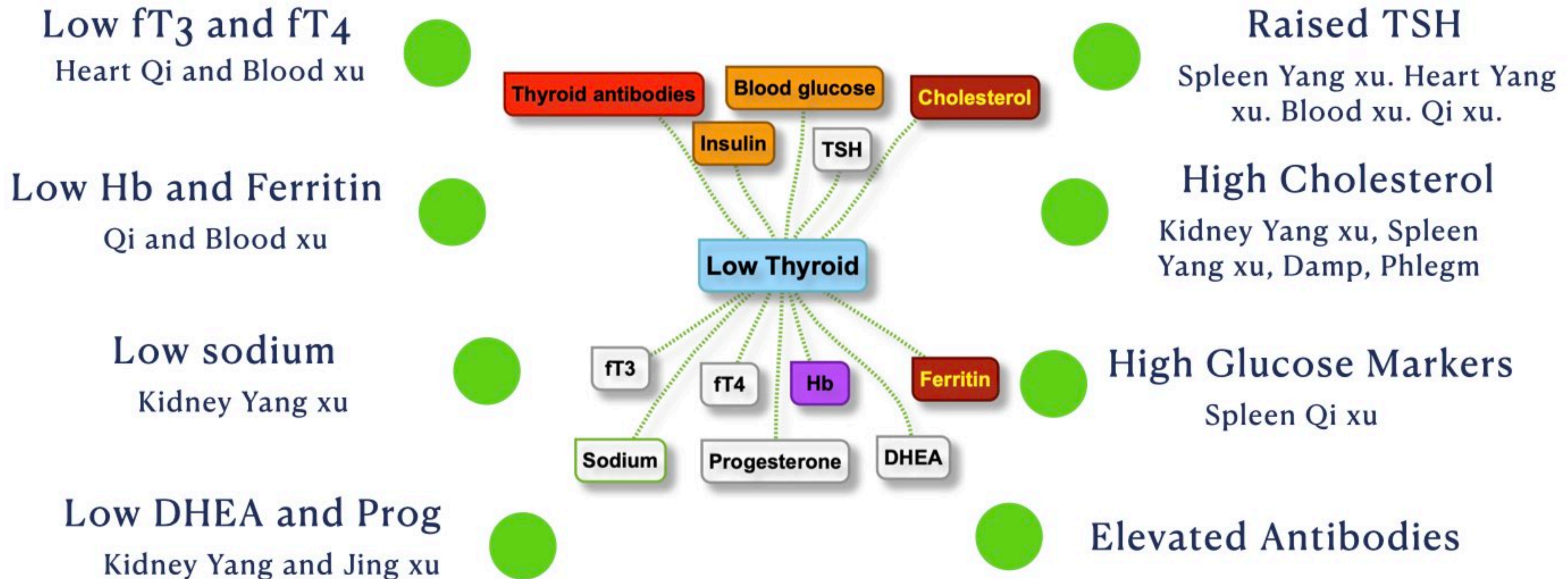
Sodium	136	(135 - 145)	mmol/L
Potassium	4.8	(3.5 - 5.2)	mmol/L
Chloride	103	(95 - 110)	mmol/L
Bicarbonate	23	(22 - 32)	mmol/L
Urea	5.0	(3.0 - 7.0)	mmol/L
Creatinine	79	(45 - 90)	umol/L
eGFR	87	(> 59)	mL/min/1.73m2

What do these
result indicate?

- Sodium
- Potassium
- Bicarb

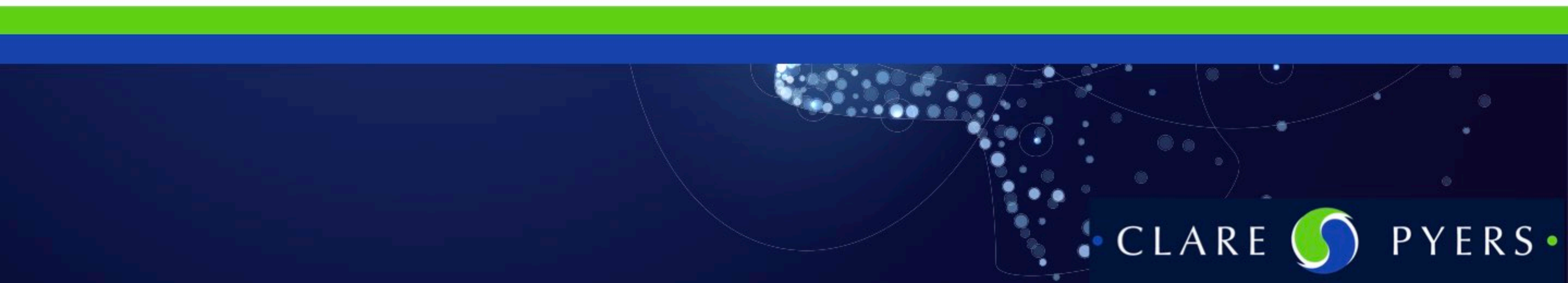
Does this fit the
clinical picture
of the patient?

Hypothyroid Patterns



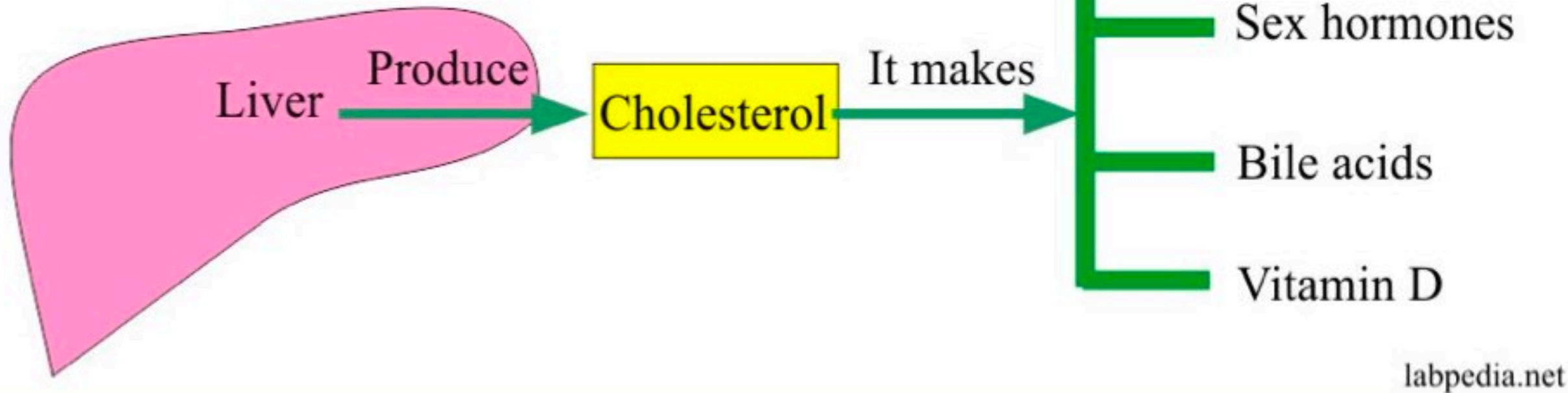


Lipid Studies



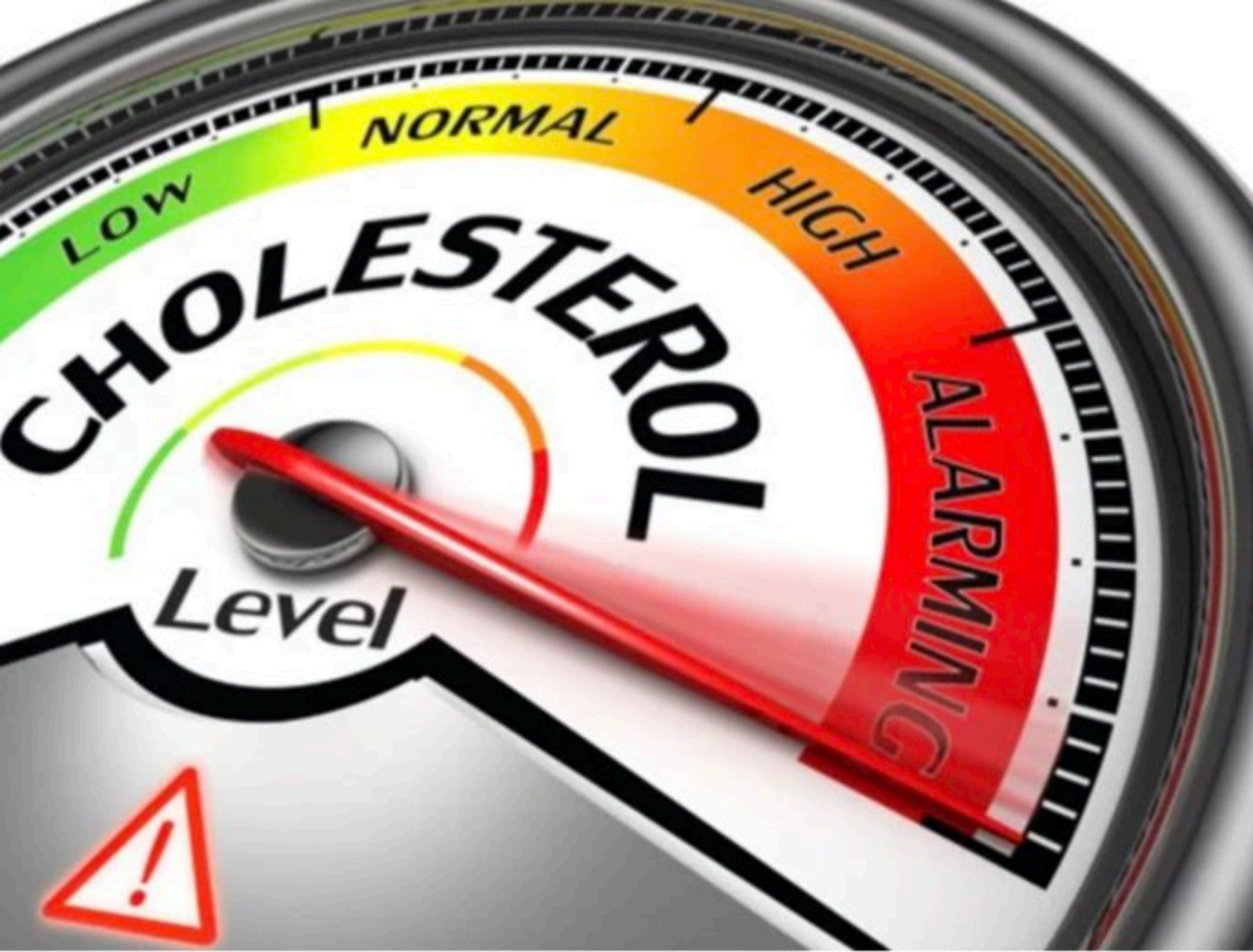
Cholesterol

Cholesterol Functions



On average: 2.2kg
cholesterol per kg of body
weight

- 15-20% comes from diet
 - Average 600mg
cholesterol consumes >
275mg absorbed
- 80-85% comes from
endogenous production
 - Approx 1g per day
 - 20% from liver
 - 80% from brain,
adrenals and other
tissues that produce
cholesterol



Cholesterol

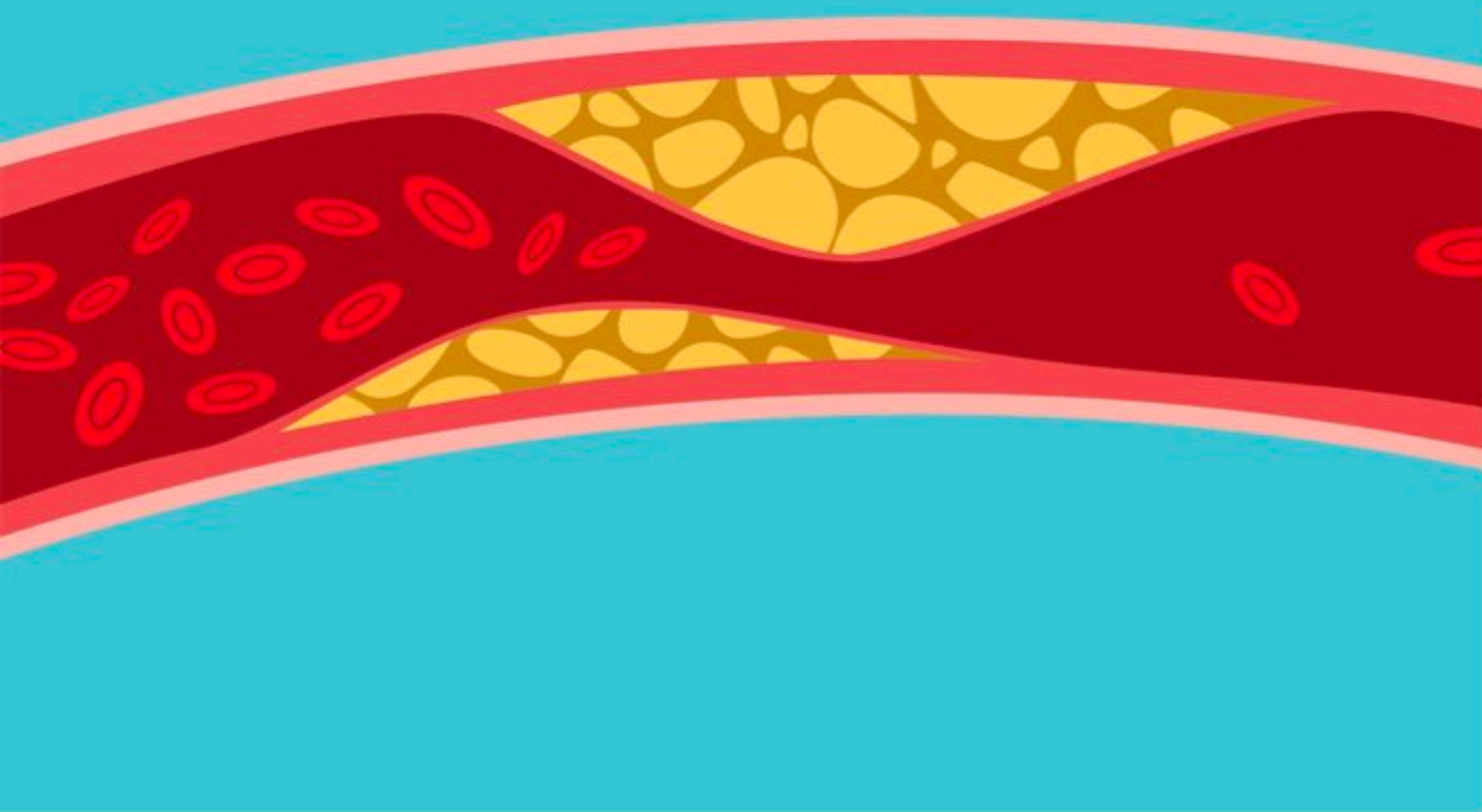
Plays 3 main roles in the body: cell membrane, precursor to hormone synthesis, precursor to bile acid production.

When elevated, is considered to be a significant marker for risk of cardiovascular disease ** (controversial due to numerous confounding factors)

High = Spleen Yang xu, Kidney Yang xu, Phlegm, Dampness, Qi Stagnation, Food Stagnation, Inflammation, vitamin D deficiency, adrenal exhaustion, reproductive hormone deficiency, obesity

Low = Dryness, Yin xu, Liver Yin xu, Liver Qi xu, Impaired Liver function, heavy metal toxicity, pesticide exposure

Ideal = 4.5-6.0 mmol/L



Triglycerides

Triglycerides - overflow of energy consumption, especially fructose.

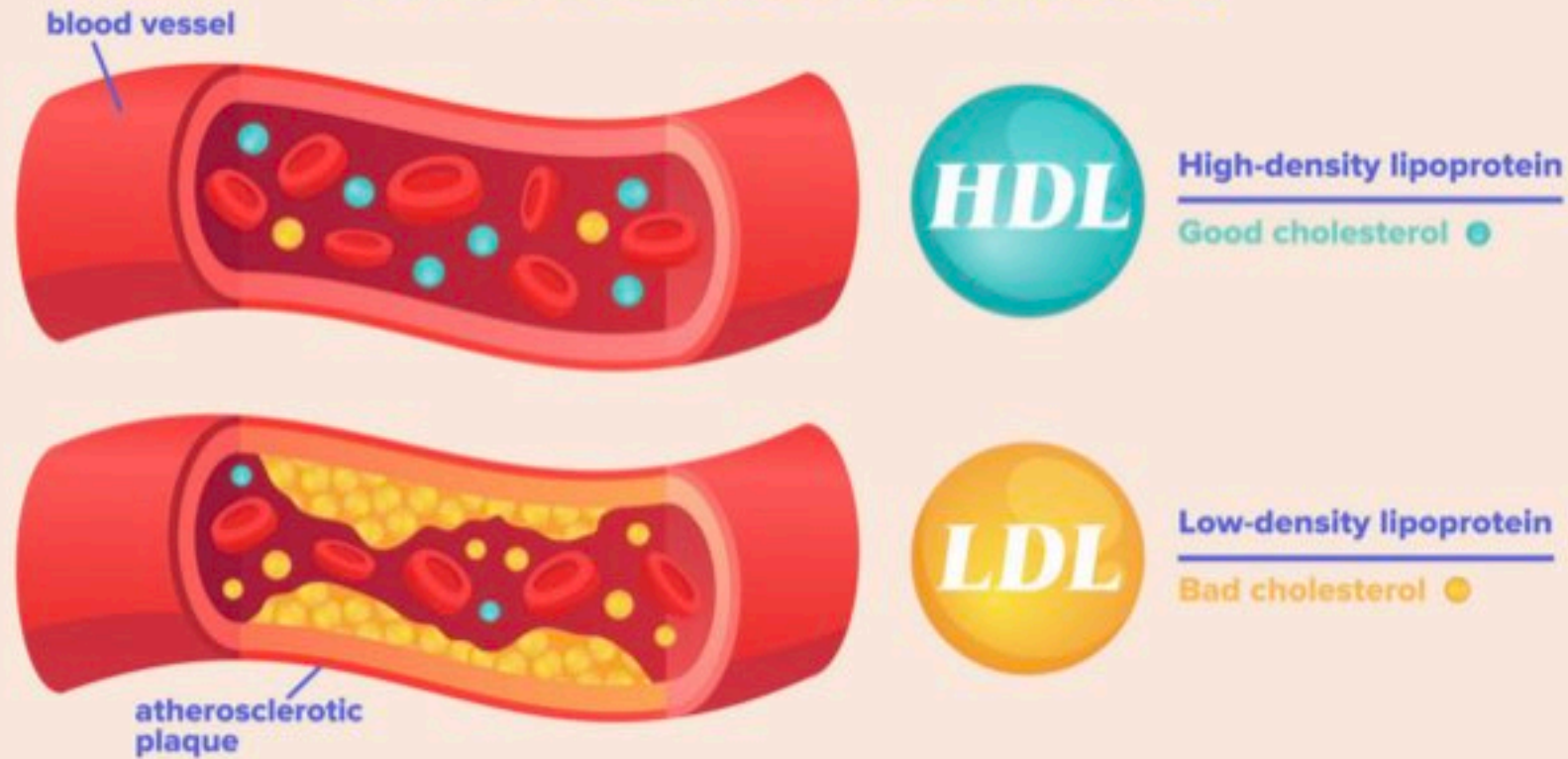
Rises especially in response to insulin. Key predictor and key abnormality in NAFLD. Big risk of CVD and all cause mortality. The main lipid marker that increases in a fed state

High = Damp, Damp Heat
Uncontrolled blood glucose, hypothyroidism, high GI diet, alcohol intake, carnitine deficiency

Low = Yin xu, Dryness, Blood dryness
Gut dysbiosis, intestinal inflammation

Ideal <1.0 mmol/L

Types of CHOLESTEROL



LDL

Low Density Lipoprotein

Delivers cholesterol to cells, for the production of hormones, making and repair of cell membranes, vitamin D production, production of bile acids.

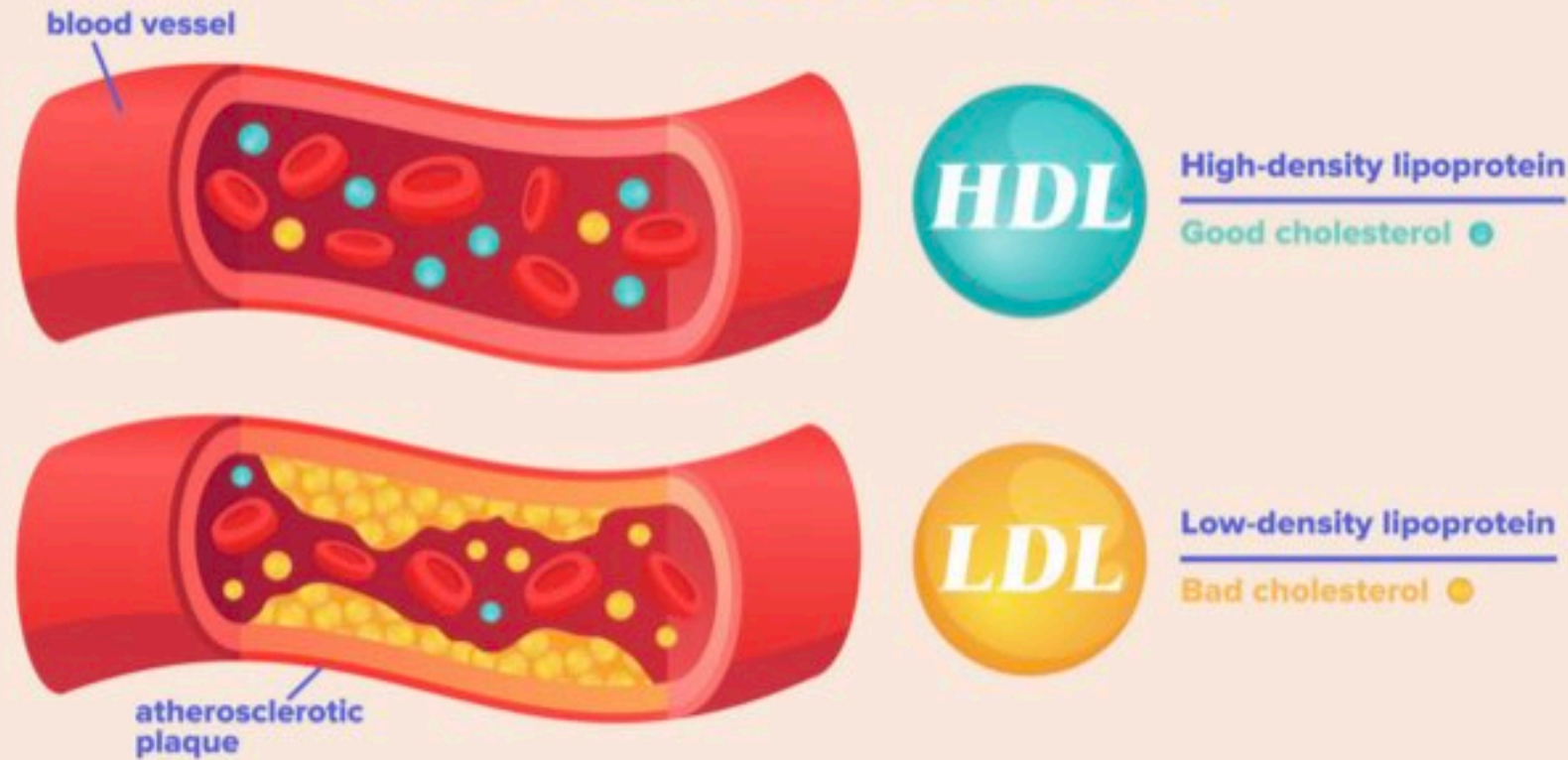
Can collect along artery walls to create atherosclerosis.

High: substantial Phlegm, Qi Stagnation, Blood Stasis, Dampness
subclinical hypothyroidism, mycotoxins, insulin resistance, heavy metals

Low: Spleen Qi xu, dispersed Qi
impaired liver function, impaired glucose metabolism, heavy metal toxicity, pesticide exposure

Ideal 1.5-3.0

Types of CHOLESTEROL



HDL

High Density Lipoprotein

Second most common lipoprotein. Smallest and densest of lipoprotein

Picks up used cholesterol from endothelium and non-hepatic tissue and takes it back to the liver.

Removes fat from artery walls and reduces macrophage accumulation related inflammation

Produced primarily in the liver. Excretion of cholesterol via bile and bowel.

Levels not affected by eating.

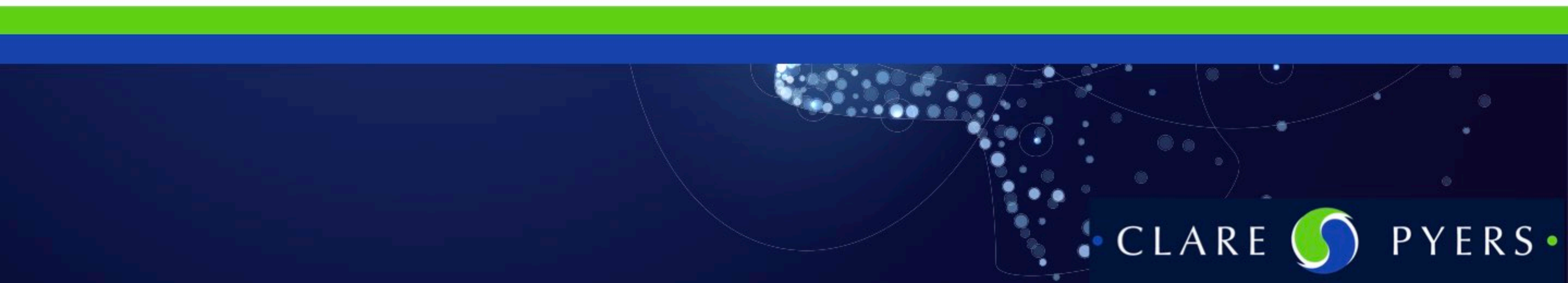
Low = Qi Stagnation, Phlegm, Dampness, Blood Stasis

Cardiovascular disease, atherosclerosis, stroke, poor response to inflammation

Ideal >1.5mmol/L



Glucose Studies





Glucose

Provides fuel for the cells, body's primary and preferred fuel source.

Should be tested in a fasted state

Absorbed from dietary intake, can also be made via gluconeogenesis using fat or protein as fuel source.

High = Spleen Qi xu, Impaired Spleen T&T, Qi Stagnation, Dampness, Heat and/or Phlegm

Low = Liver Yang Deficiency, Liver Qi Deficiency, Kidney Yang Deficiency, Jing Deficiency or Spleen Qi Deficiency

Ideal 4.3-4.9 mmol/L



Insulin

Produced in pancreatic beta cells

Should be tested after 12 hours of fasting

Insulin transports glucose into cells by making cell membrane permeable to glucose.

Directs liver to store excess glucose as glycogen

Promotes synthesis of fat.

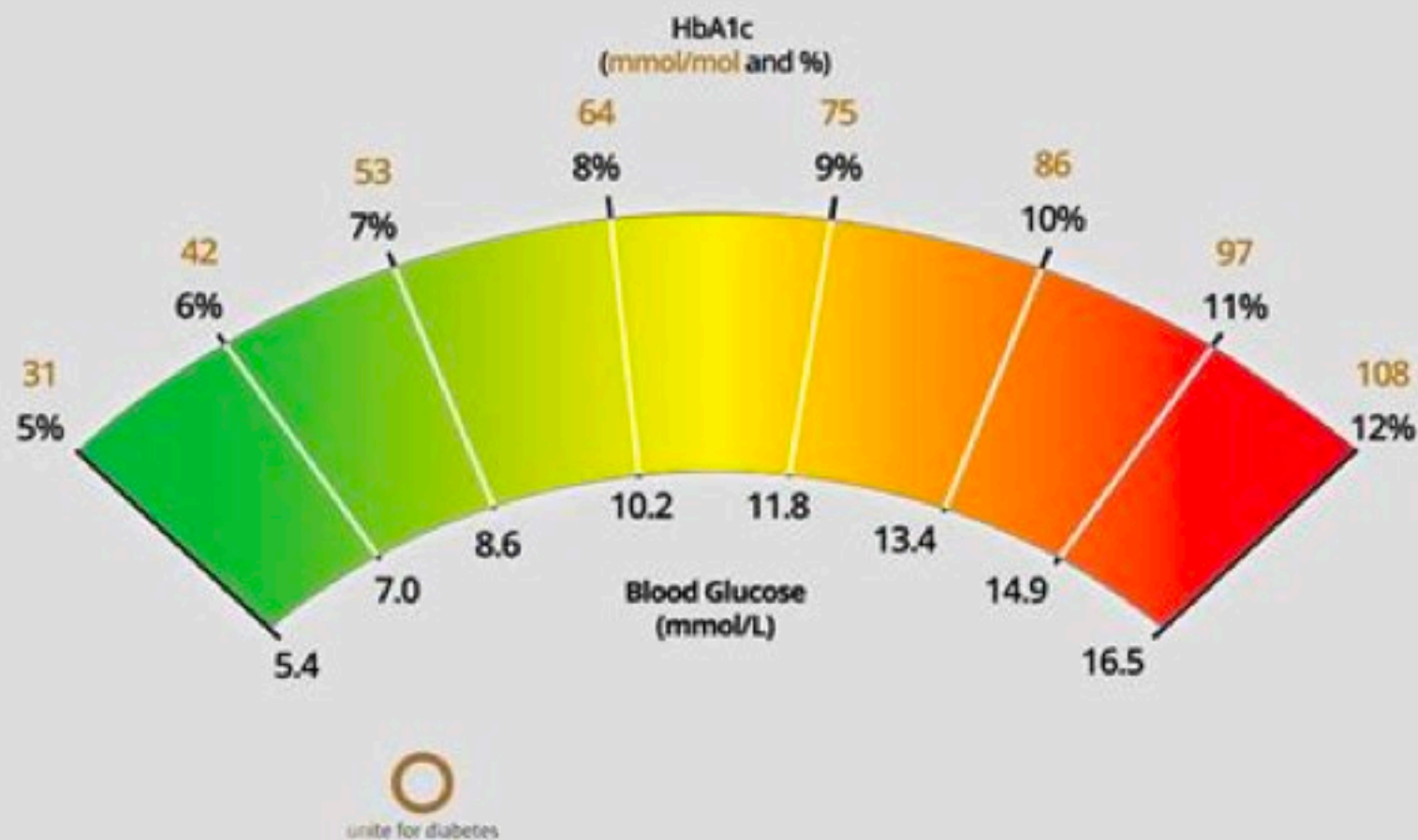
High: Dampness, Phlegm, Heat or Qi Stagnation
Insulin resistance, fructose intolerance, obesity,
Cushing's disease, corticosteroid use

Low (with high glucose): Spleen Yang xu.
Beta cell failure due to diabetes.

Low (with normal glucose): Healthy functioning
Spleen and Liver Qi

Ideal <4mIU/L

HbA1c as an indicator of Diabetes Control



HbA1C

Glucose and haemoglobin joined together to form glycohemoglobin. The amount of glycohemoglobin represents average blood glucose over the lifespan of the red blood cell (90-120 days).

Iron deficiency anaemia can falsely elevate HbA1C result due to lower production of RBC.

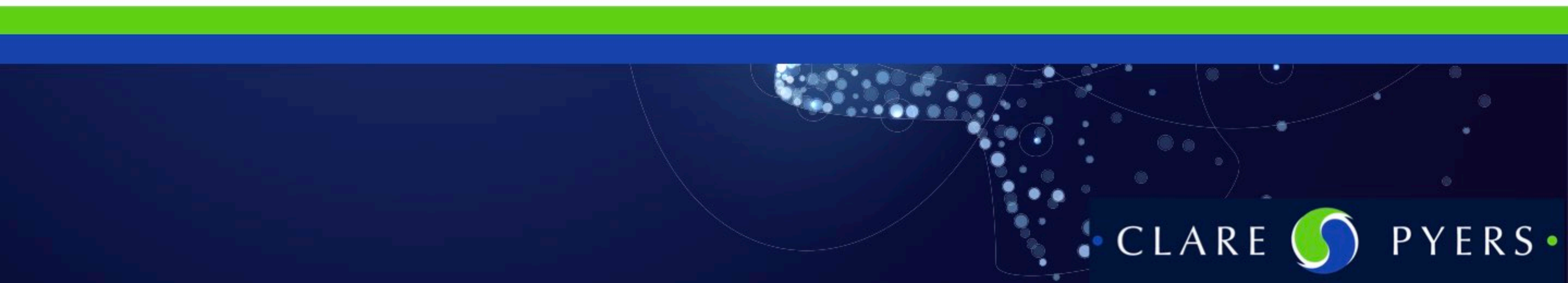
High HbA1C: Spleen Qi xu, Heat, Damp Heat, Liver Qi stagnation.
Insulin resistance, diabetes, lead toxicity, alcohol use, anaemia.

Low HbA1C: Qi and Blood xu, Kidney Qi xu, Liver Yang xu, Liver Qi xu
Haemorrhage, blood donation, autoimmune haemolytic anaemia.

Ideal 20–40 mmol/mol (4%–5.7%).



To Test or Not to Test?



Clinical Efficacy vs Complete Information

If you have partial blood test results - how might this change what you do?

If you didn't have blood test results - what would you do?

- Intake process
- Signs and symptoms
- Tongue and Pulse
- How do you normally go about establishing treatment plans?

Are you going to change your treatment plan based on pending results?



Cost/Benefit analysis of more tests

Is the patient in any danger?

What are the benefits of delaying care?

What are the consequences of delaying care?

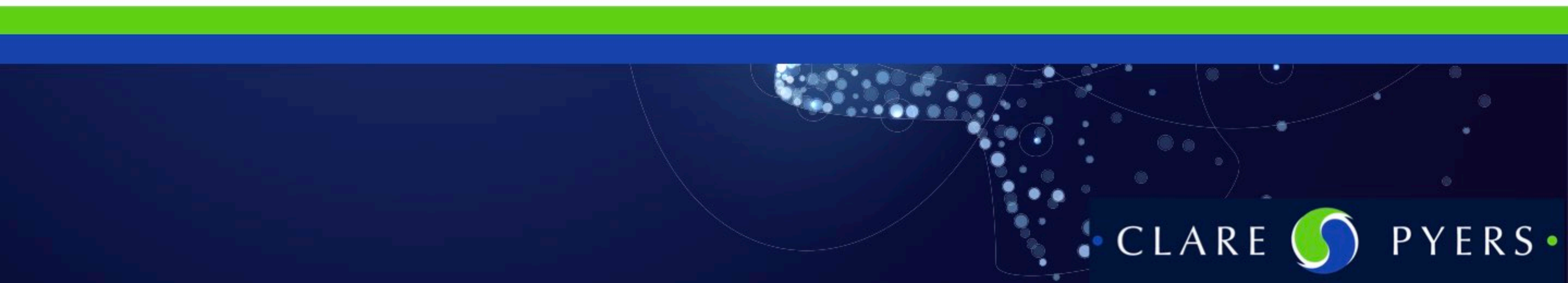
What is the out of pocket cost?

What to do whilst waiting for results?





Reference Ranges



**We are focused on a
holistic approach to
helping our patients, and
we are also an important
second set of eyes.**

Getting Started....

Clinical Diagnosis is
always the best starting
point

**BEGIN
HERE**

Context is everything

IF A PICTURE IS WORTH
A THOUSAND WORDS,
THEN CONTEXT
IS WORTH A MILLION.

@ADRIELBOOKER

Your skills as a clinician
shed light on the
underlying reasons



Stay in touch

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