

Overview:

# INTERPRETATION OF BLOOD RESULTS

(Biochemistry, Lipids,  
Enzymes & Other)



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# BIOCHEMICAL VALUES

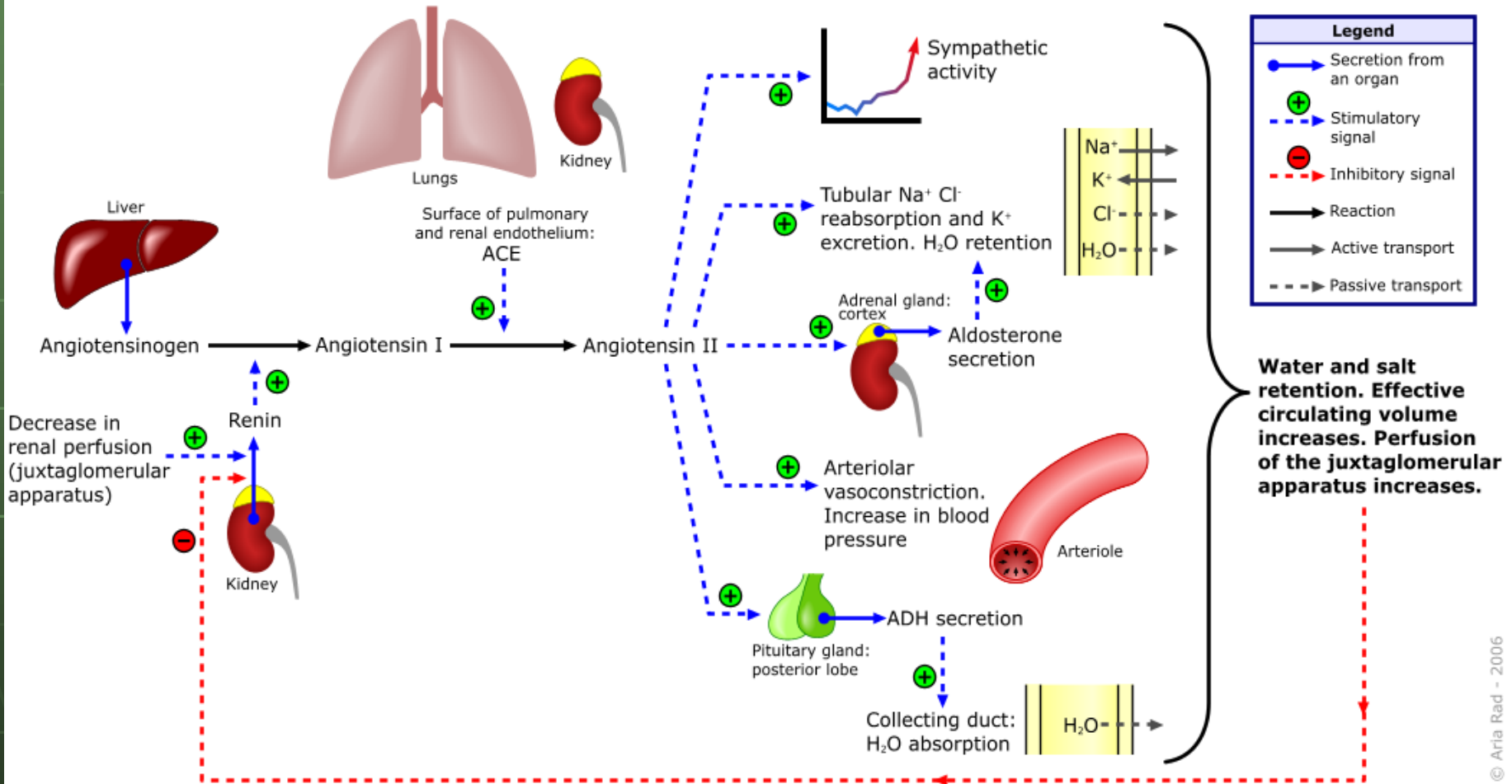
# BIOCHEMICAL VALUES

- Sodium : 136 – 145 mmol/L
- Potassium : 3.5 – 5.1 mmol/L
- Urea: M – 3.2 – 7.4 / F – 2.5 – 6.7
- Creatinine : 53 – 115  $\mu$ mol/L
- GFR:
- HbA1c : 4.3 – 6.1% : Insulin therapy
- Glucose (random) : 4.0 – 7.8mmol/L
- Fasting Glucose : 3-6mmol/L
- Bilirubin : 0-20  $\mu$ mol/L
- ALT: 10-30 (IU/L)
- ALP: 39-128 (IU/L)
- Albumin : 35-50 g/L
- Magnesium : 0.7-1 mmol/L
- Phosphate : 0.74 -1.52 mmol/L
- Calcium : 2.2 - 2.6 mmol/L

# Na<sup>+</sup> (136 – 145 mmol/L)

- Mostly ECF
- Controlled by RAS
- Low Na<sup>+</sup>
  - Signs and Symptoms: Seizures, Cardiac Failure, Dehydration
  - Causes: Vomiting, Diuretics, Addison's Disease, Low ADH, Renal Failure
  - Management: Correct underlying cause, not the [Na<sup>+</sup>] alone
  - Acute Situation: Saline infusion and Furosemide

# Renin-angiotensin-aldosterone system



- High Na<sup>+</sup>

- Signs and symptoms: Thirst, Hypertension, Dehydration, Fits, Oliguria
- Causes: H<sub>2</sub>O loss (without Iron loss, eg. Vomiting & Diarrhea ) Diabetes insipidus (ADH intolerance)
- Management: H<sub>2</sub>O administration

# K<sup>+</sup> 3.5 – 5.1 mmol/L

- Mostly ICF
- Exchanges with H<sup>+</sup> across memb.
- Insulin/Catecholamines stimulate K<sup>+</sup> uptake into cells
- High K<sup>+</sup>:
  - » Signs and Symptoms: Cardiac arrhythmias (sudden death)
  - » ECG: WIDE QRS Complex
  - » Causes: Diuretics, Addison's Disease, Met Acidosis, Burns, ACE Inhibitors
  - » Management: Treat underlying cause
  - » Emergency Treatment: Insulin and Glucose admin. (IV)

- Low  $K^+$ :

- » S & S: Muscle weakness, cramps
- » ECG: Depressed ST Segment
- » Causes: Diuretics, Conn's Syndrome, Alkalosis. High ACTH production
- » Management:  $K^+$  supplements, IV  $K^+$

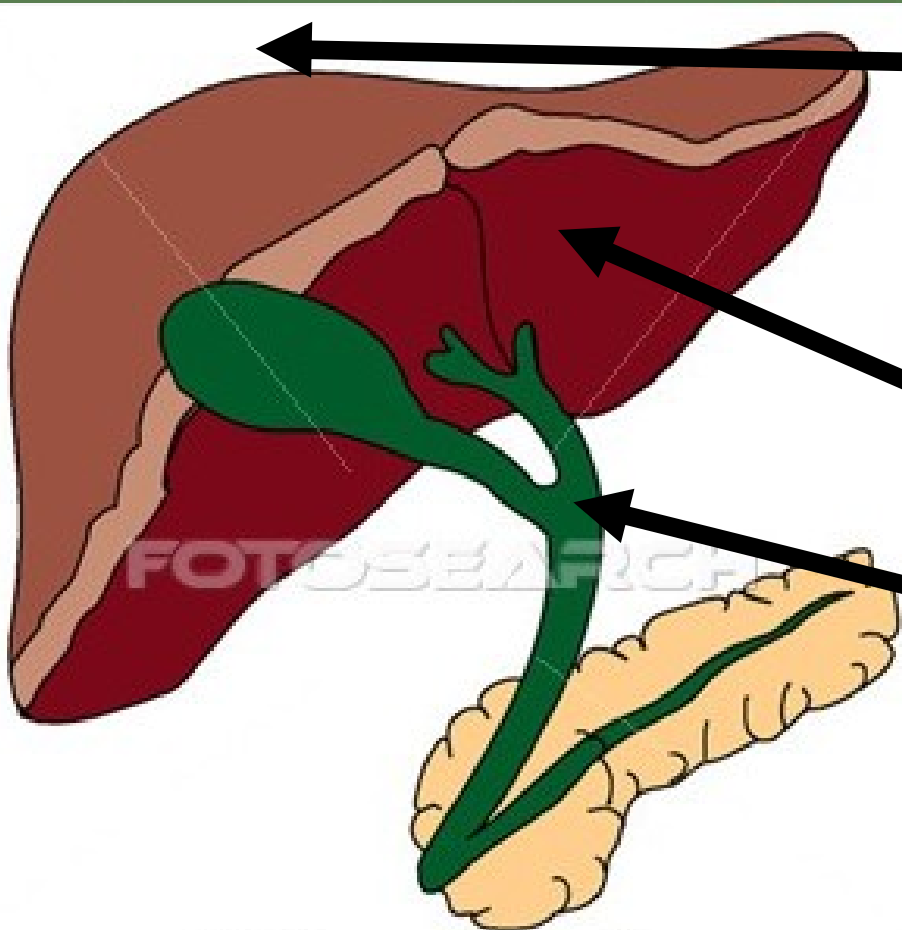
Do not give  $K^+$  if oliguric



# Glucose: 4.0 – 7.8 mmol/L

- Fasting: 3.0-6.0 mmol/L
- Post eating (pranadial): <10 mmol/L
- High Glucose
  - » Causes: DM Type I & II, Cushing's Syndrome, Pheochromocytoma,
  - » Treatment: Insulin therapy (I) and Diet therapy (II)
  - » Diagnosis: oGTT
- Low Glucose
  - » Causes: E-PLAIN (Exogenous drugs (insulin), Pituitary Insuff., Liver Failure, Addison's, Islet cell tumour, non-pancreatic neoplasm)
  - » Treatment: Oral Glucose/Long acting starch (toast)
  - » Diagnosis: Finger-prick test

# Bilirubin : 0-20 $\mu\text{mol/L}$



**Pre-hepatic:** High unconjugated bilirubin (hemolysis)

**Intra-hepatic:** Hepatitis, Cirrhosis, Carcinoma

**Post-hepatic:** High conjugated bilirubin (biliary obstruction-stones, pancreatitis)

ALT: 10-30 (IU/L)  
ALP: 39-128 (IU/L)

Increase = marker of a disease

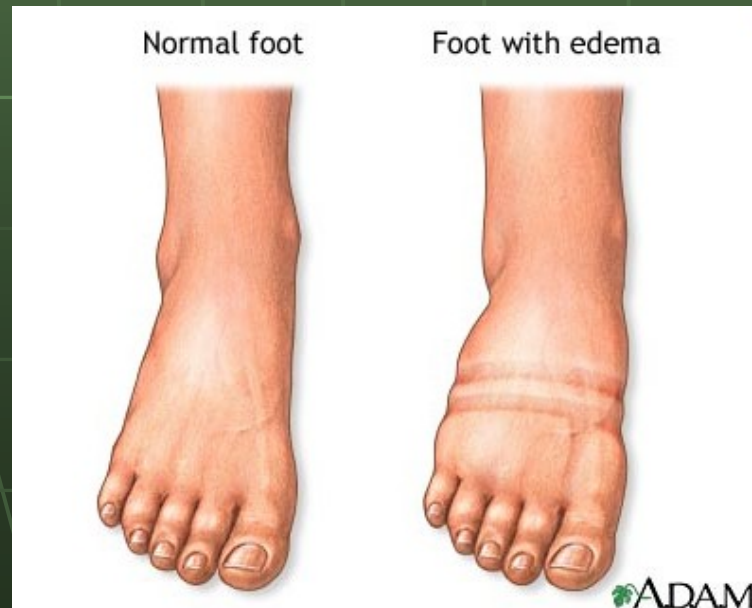
- **High ALP;**
  - Causes: Liver disease (bile duct block), Bone disease (high activity e.g. Paget's disease)
- **High ALT;**
  - Causes: Liver damage (hepatitis), Infectious mononucleosis, Biliary duct obstruction

AST:ALT > 2 = Alcoholic hepatitis

AST:ALT < 1 = Viral hepatitis

# Albumin : 35-50 g/L

- **High Albumin;**
  - » Causes: Dehydration
  - » S & S: WIKI it...
- **Low Albumin;**
  - » S & S: Oedema
  - » Causes: Nephrotic Syndrome, Liver disease, Burns



# Magnesium : 0.7-1 mmol/L

- 65% in bone & 35% within cells
- **High Mg:**
  - S & S: Neuromuscular depression and CNS depression
  - Dg: Renal failure ?
- **Low Mg:**
  - Dg: Diarrhea ? Ketoacidosis ?

# Ca<sup>2+</sup> : 2.2 - 2.6 mmol/L

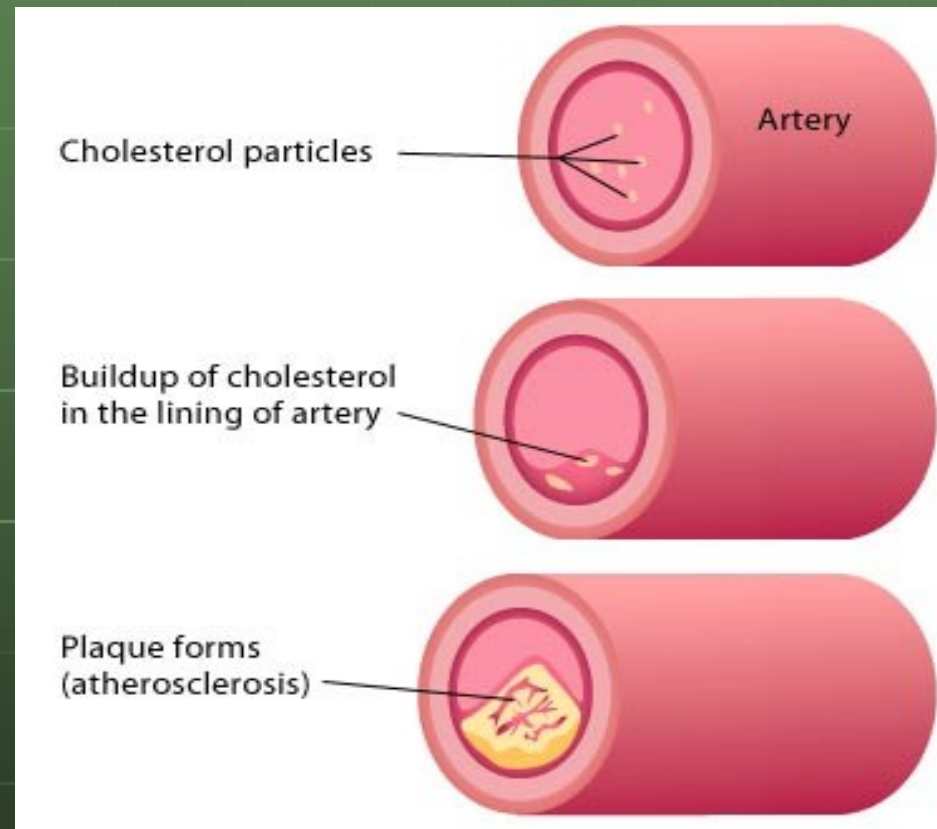
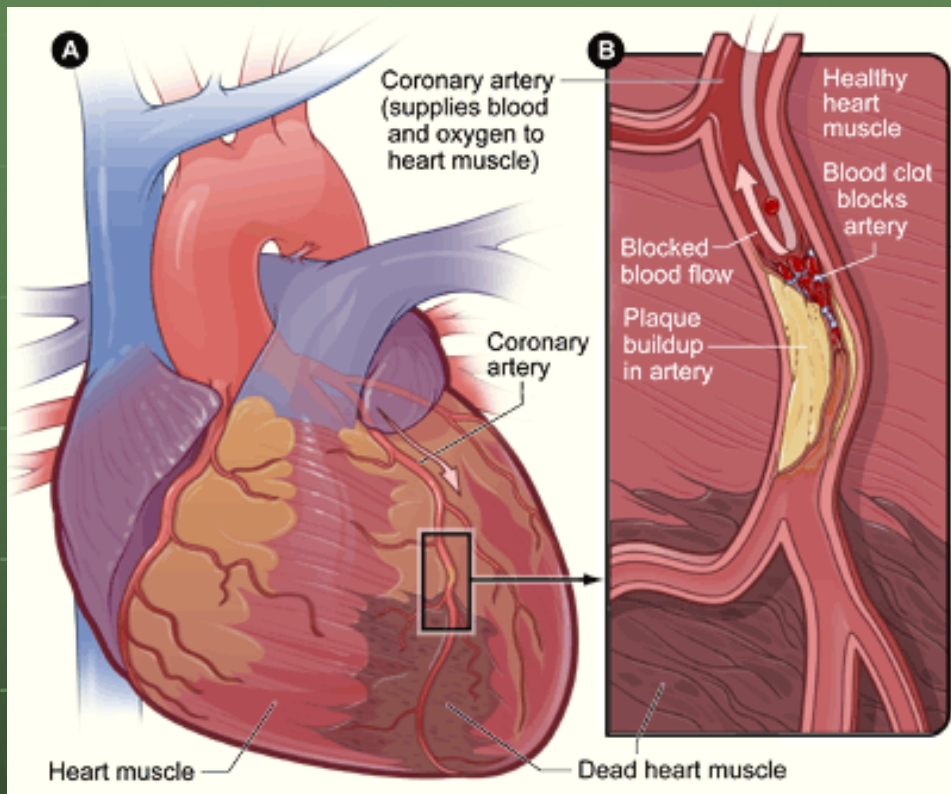
- **Control of Ca<sup>2+</sup>:**
  - PTH,
  - Vitamin D (Kidney, GIT, Skin)
  - Calcitonin
- **High Ca<sup>2+</sup>:**
  - S & S: 'bones stones groans', Abd. pain, Constipation
  - Dg: Primary PTH-ism ? Sarcoidosis ?
  - Treatment: Diuretics, Bi-phosphates
- **Low Ca<sup>2+</sup>:**
  - S & S: Tetani, Depression, Facial muscle twitch, Chvostek sign
  - Dg: Chronic renal failure ? Thyroid surgery ? Low Vitamin D
  - Treatment: Calcium admin.

# LIPID VALUES

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- Cholesterol : <5 mmol/L
- Triglyceride : <2 mmol/L
- HDL : >1 mmol/L (good cholesterol)
- LDL : <3 mmol/L
  - HIGH LDL and LOW HDL = Increased risk of CHD
    - High cholesterol can lead to Atherosclerosis
  - Management: Lifestyle changes, Statins e.g. SIMVASTATIN





# CARDIAC ENZYMES

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- CK-MB
- Troponin T
- Myoglobin
  - Markers of MI / Heart disease?

# OTHER VALUES

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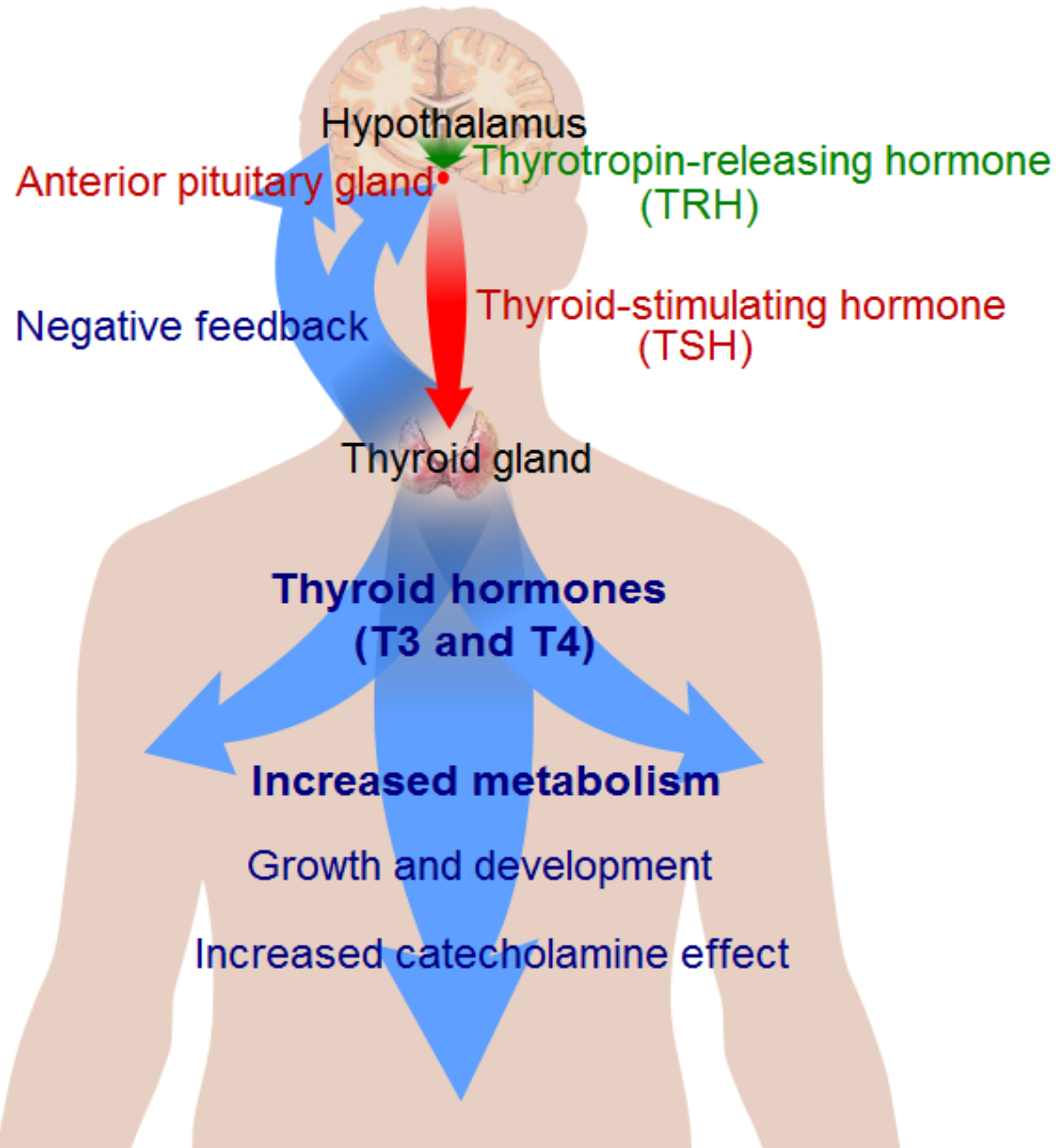
## ■ CRP

- Markers of inflammation associated with acute phase response

## ■ TSH

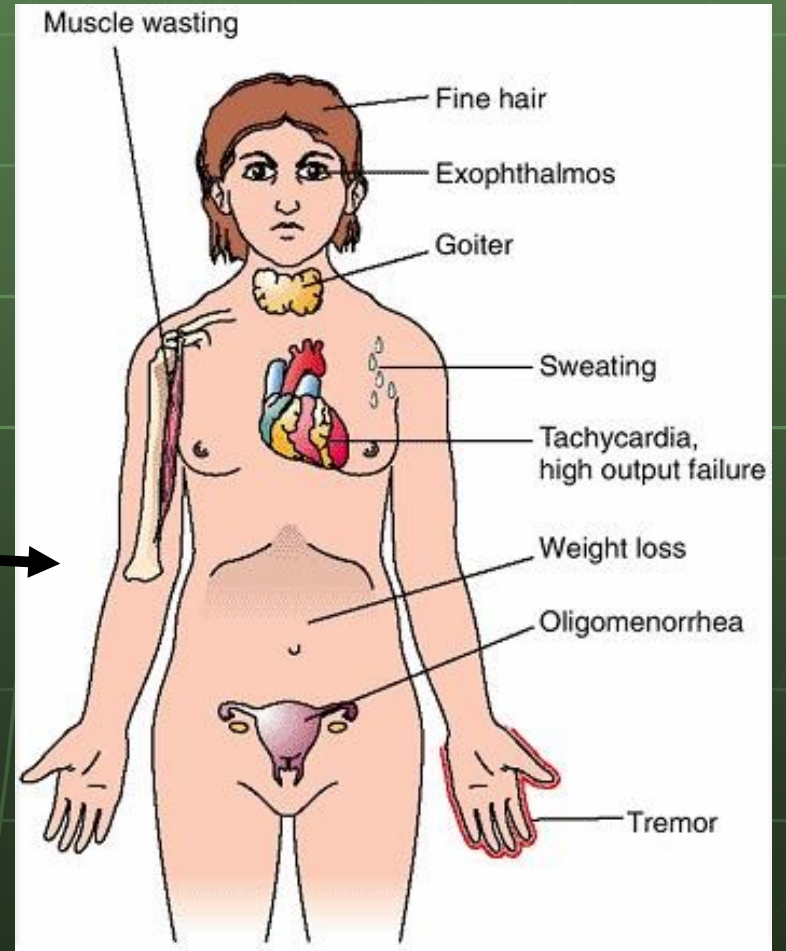
- Hyperthyroidism (Graves disease, Thyrotoxicosis)
  - S & S: Sweating, Goitres
- Hypothyroidism (Hashimoto's disease, Iodine deficiency)
  - S & S: Constipation, Mental retardation in Kids, Tiredness

# Thyroid system





Graves Disease



# FURTHER READING

- Thrombin Time
- APTT
- Coagulation screening tests
- Platelet aggregation tests
- Euglobulin clot lysing time (ELT)
- Thrombotic diseases
- Diseases of Blood and Bone Marrow
- Anaemias, Thalassemia, Splenomegaly, Haemophilia and coagulation disorders
- History taking in relation to Blood disorders (presenting symptoms)



THANKYOU FOR LISTENING