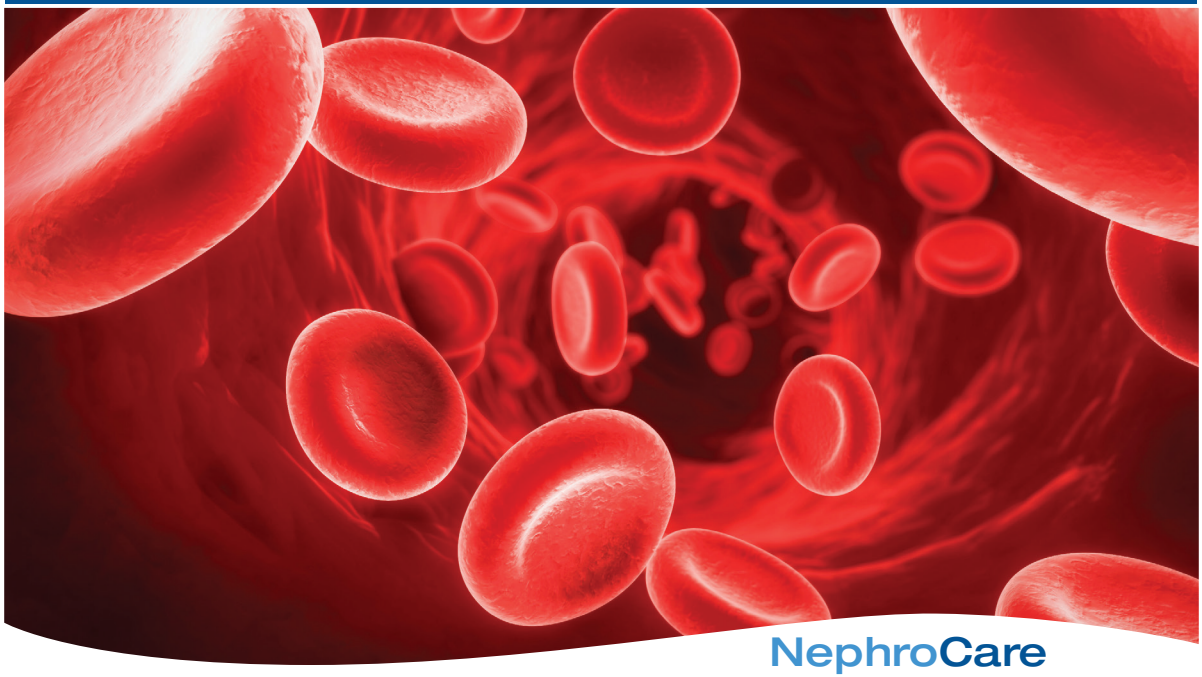
NephroCare Patient Training

Focus on: Common Blood Chemistries



NephroCare

FRESENIUS MEDICAL CARE

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Fresenius Medical Care's Way of Caring

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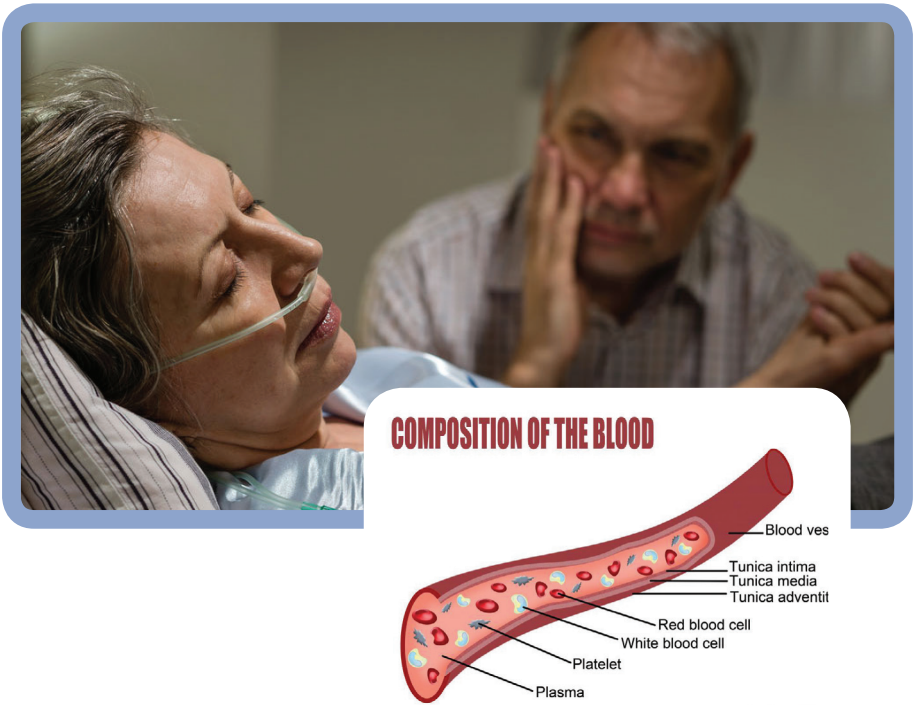
Plasma Albumin

Albumin = 35 - 50 g/l
Dialysis value > 38 g/l
Balance Score Card >/= 35 g/L

- Plasma Albumin is measured every 3 months.
- Plasma albumin concentration is an important indicator of nutritional state
- A low value is a strong indicator of subsequent illness or death in dialysis patients.
- The mortality risk begins at less than 34 g/l
- Patients with low albumins are at high risk of morbid events thus the cause must be found and treated



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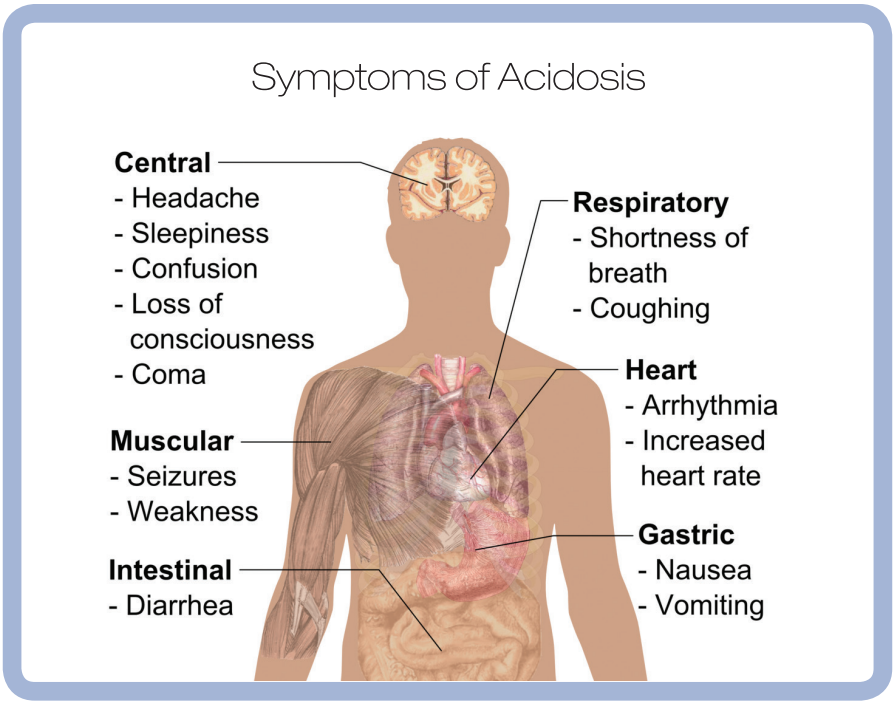
Bicarbonate (HCO_3)

Bicarbonate (HCO_3) = 24 - 30 mmol/L

- Plasma bicarbonate is measured monthly
- The lowest mortality with values between 20 and 22.5 mmol/L
- Mortality increases with both higher and lower values
- High mortality if under 15 mmol/L
- Correct promptly with dialysis and / or IV infusion
- Low results cause acidosis with altered blood results, cramps, consciousness and breathing
- Low results may be due to increased protein intake causing a decrease in CO_2, type 1 diabetes
- This may result in tachypnoeia



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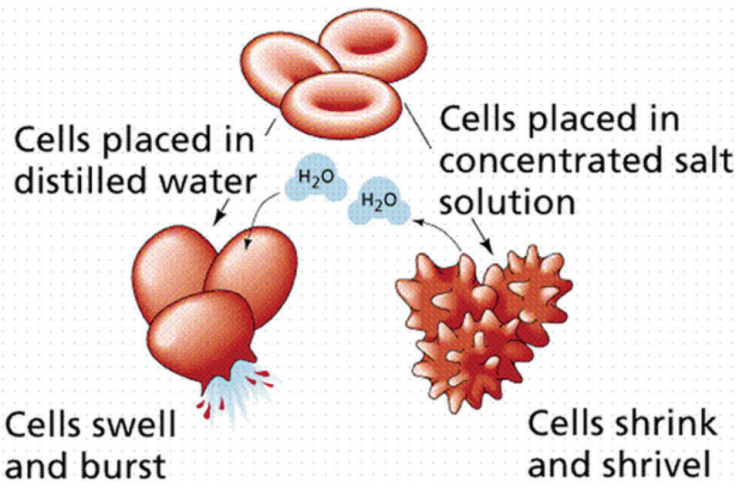
Chloride

Chloride = 98 - 106 mmol/L

Measured monthly

- Occurs predominantly in extracellular space
- Maintains cellular integrity via its effects on osmotic pressure and water balance
- Also maintains acid - base balance
- Deviations on both sides of the norm can cause complications and therefore must be diagnosed and treated e.g. over / under hydration, cramps
- Increased levels may be due to ingestion of canned foods, potato chips, bacon and cold meats, added salt on food



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Calcium

Calcium: Total and Ionised
Total: 2.18 - 2.58 mmol/L
Ionised: 1.05 - 1.3 mmol/L

- Total Ca++ is bound to proteins particularly albumin
- Changes may be a result of hyper and Hypoalbuminaemia, multiple myeloma
- Ionised Ca++ I free calcium in the blood not attached to proteins
- Changes may be a result of acid base disorders, parathyroid hormone, Hyperphosphataemia
- Low levels may be due to high phosphate intake; non compliance with taking phosphate binders, resulting in muscle twitching; seizures; depression; hair loss; cataracts
- High levels may be due to diet; over active parathyroid gland, resulting in muscle weakness, fatigue, cramps, anorexia

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Urea

Urea (BUN – Blood Urea Nitrogen) = 2.5 - 8 mmol/L
Dialysis Value: 14 - 30 mmol/L

- Measured monthly, pre midweek dialysis treatment
- Indicates the protein catabolic rate and protein intake
- Changes may be caused by high / low protein diet; shortened dialysis time; low blood flow rates; recirculation and incorrect dialyser
- Symptoms may include fatigue; nausea; insomnia; uriniferous smell to breath and body; confusion; seizures

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Creatinine

Creatinine = 53 - 130 µmol/L
Dialysis value: 880 - 1700 µmol/L

- Measured monthly along with plasma urea
  If changes in both occur, the dialysis prescription must be looked at and residual renal function
- Paradoxically in dialysis patients high plasma creatinine levels are associated with a lower risk of mortality because of it being an indicator of muscle mass and nutritional status
- Observe as this could indicate inadequate dialysis

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Plasma Glucose

Plasma Glucose level = 2.5 - 6.4 mmol/L

- Taken monthly, with, glucometer readings hourly or as required on diabetic patients on dialysis
- High levels may indicate increased ingestion of sugars and high glycaemic index foods; known diabetes - non compliant or uncontrolled
- Low levels may be due to insulin injections with insufficient food; anorexia, persistent urea, all resulting in excessive thirst

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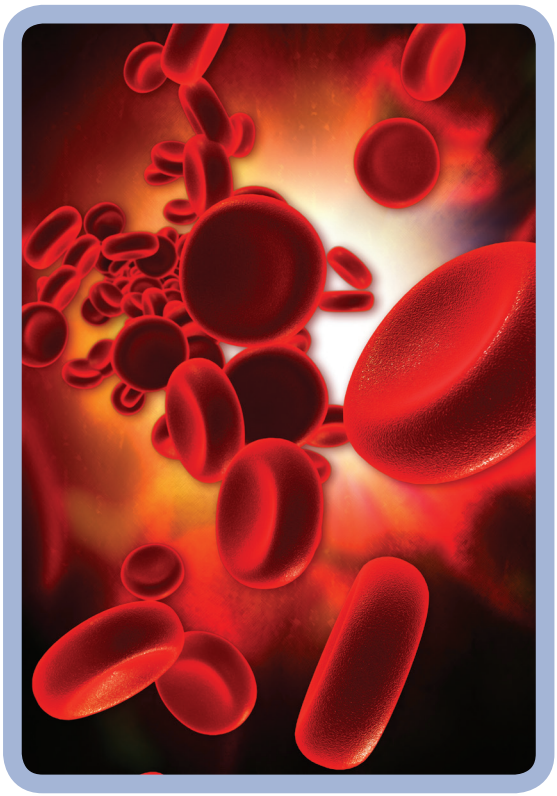
Serum Haematocrit (HCT)

Serum Haematocrit (HCT) = 35 - 49 %

- High Hct levels without EPO may indicate polycystic kidney disease; hydronephrosis; renal carcinoma
- Low levels may indicate decreased production of red cells; blood loss on dialysis; shortened life span of red blood cells due to damage or disease
- Low HCT results in fatigue; breathlessness; chest pain on exertion



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Magnesium

Magnesium level = 0,75 - 1.05 mmol/L

Measured monthly

- Increased levels may indicate use of phosphate binders containing magnesium, or use of other magnesium containing medication
- This may result in decreased mental function, drowsiness or coma, decreased tendon reflexes and paralysis, nausea, vomiting, hypotension

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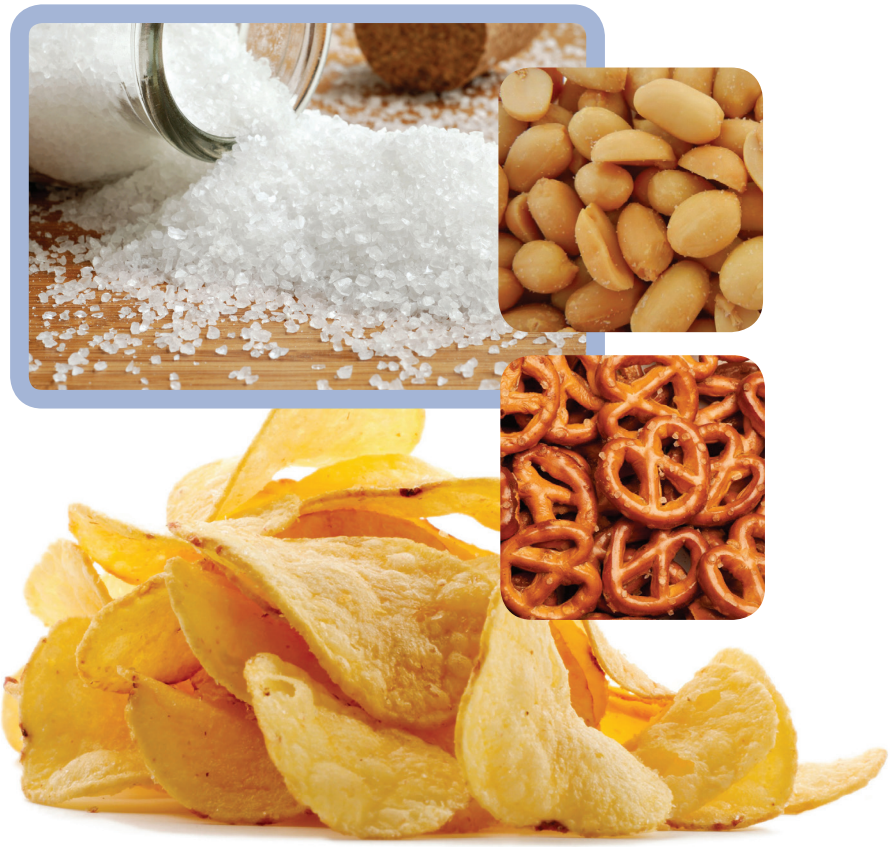
Serum Sodium

Check monthly

Serum Sodium = 133 - 147 mmol/L

- High levels may be a result of dietary non compliance (too much salt intake); profiling on the dialysis device, resulting in thirst, fluid overload; hypertension; shortness of breath
- Low levels may be a result of polyuria, vomiting, diarrhoea, removal of fluid on dialysis, resulting in cramping, mental confusion, headaches



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Serum Phosphate

Serum Phosphate levels = 0.8 - 1.5 mmol/L
Dialysis value = 1.13 - 1.18 mmol/L
Balance Score Card </= 1.13 mmol/l

- Mortality increases with high levels!
- High levels may be a result of non compliance with taking phosphate binders, dietary non compliance (milk, cheese, organ meats etc)
- High levels result in itching, red eyes, cause hyperparathyroidaemia by lowering calcium
- Low phosphate generally due to overdosing on phosphate binders

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Serum Potassium

Serum Potassium = 3.5 - 5.0 mmol/L
Dialysis values = 4.0 - 6.5 mmol/L

- Mortality risk high above 6.5 mmol/L and below 3.5 mmol/L
- Both high and low levels may lead to cardiac dysrythmias and eventual cardiac arrest
- High potassium results from dietary non-compliance, inadequate dialysis
- Low potassium may result from sodium potassium wasting syndrome, vomiting and diarrhoea, potassium ion bonders e.g. kayexalate
- The above will result in extreme muscle weakness; cardiac arrest and death

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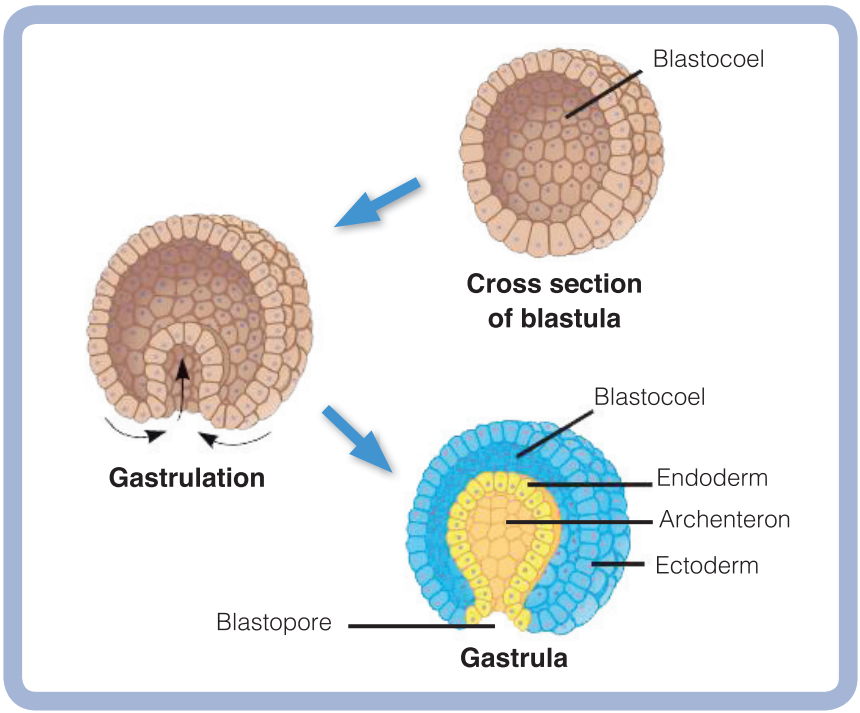
Parathyroid Levels

Parathyroid level = 12 - 72 pg/ml
Dialysis levels = 10.3 - 1042 pg/ml

- Increased levels are caused by non compliance with taking of phosphate binders, non compliance with diet
- Primary hyperparathyroidism may be caused by other disease processes such as tumours
- Patients will present with long-term imbalance of calcium and phosphate levels



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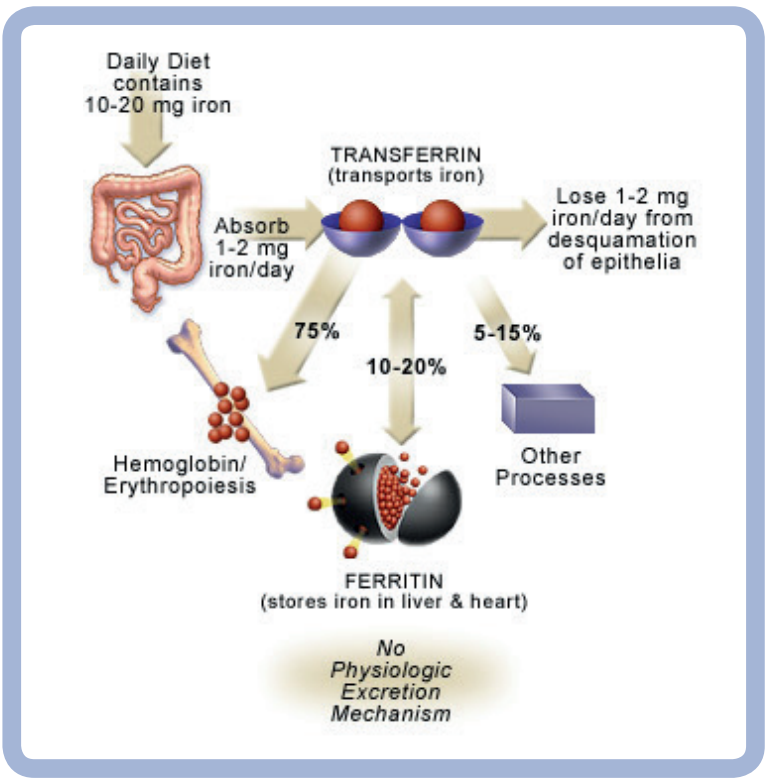
Serum Ferritin

Serum Ferritin = 10 - 250 ng/ml

- Checked 3 monthly with iron levels, iron binding capacity and erythrocyte indexes
- Ferritin indicates the level of stored iron



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Serum Total Protein

Serum Total Protein = 63 - 79 g/l

- It is a long term parameter of nutritional status and mainly represents serum albumin levels

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Hepatitis

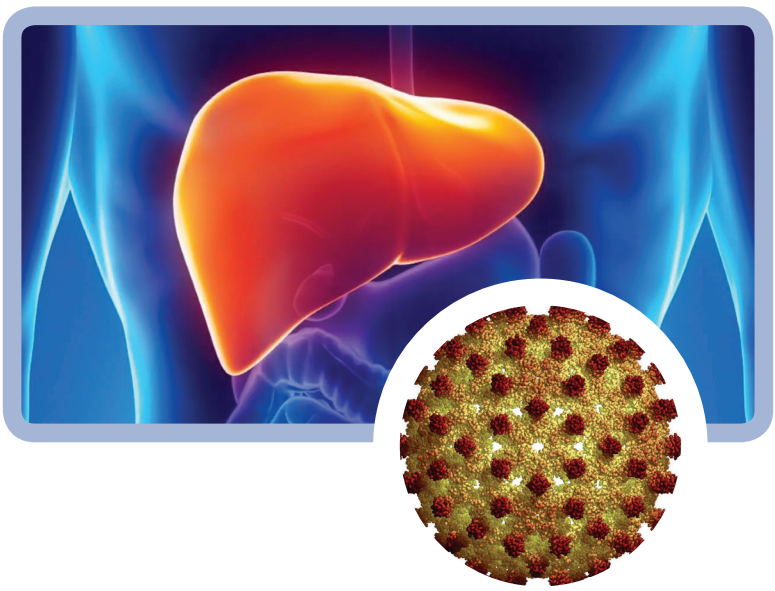
Hepatitis Studies (Hepatitis B blood panel)

- Essential on all patients and staff working in the dialysis centres
- At least 3 HBV vaccinations must be done for patients within 6 months or before admission for HbsAg negative and HbsAb<10IU/L patients
- Checked 6 monthly

Definitions:

Antibody = a protein that your immune system makes in response to a foreign substance. Antibodies can be produced in response to a vaccine or to a natural infection. Antibodies usually protect you against future infections

Antigen = a foreign substance in the body, such as the hepatitis B virus



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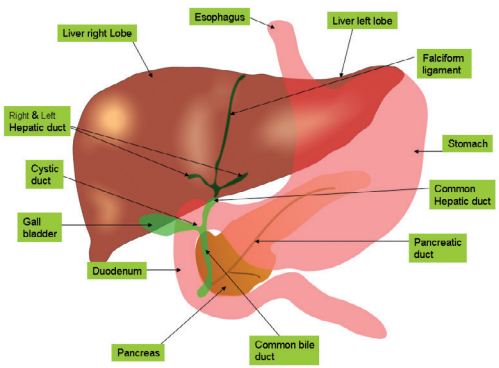
Hepatitis B

The 3 part hepatitis B blood panel

1. **Hepatitis B Surface Antigen (HBsAg):**
   The “surface antigen” is part of the hepatitis B virus that is found in the blood of someone who is infected. If this test is positive, then the hepatitis B virus is present.

2. **Hepatitis B Surface Antibody (HBsAb or anti-HBs):**
   The “surface antibody” is formed in response to the hepatitis B virus. The body can make this antibody if you have been vaccinated, or are recovering from a hepatitis B infection. If this test is positive, the immune system has successfully developed a protective antibody against the hepatitis B virus. This will provide long-term protection against future hepatitis B infection. Someone who is surface antibody positive is NOT infected and cannot pass the virus on to others.

3. **Hepatitis B Core Antibody (HBcAb or anti – HBc):**
   - This antibody *does not* provide any protection or immunity against the hepatitis B virus
   - A positive test indicates that a person may have been exposed to the hepatitis B virus
   - This test is often used by blood banks to screen blood donations. However, all three test results are needed to make a diagnosis



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Interpretation of Blood Panel Results

Tests	Results	Interpretation	Recommendation
HBsAg HBsAb HBcAb	Negative (-) Negative (-) Negative (-)	**NOT IMMUNE** Has not been infected but is still at risk for possible future infection - needs vaccine	Get vaccine
HBsAg HBsAb HBcAb	Negative (-) Positive (+) Negative or Positive (-/+)	**IMMUNE** Has been vaccinated or recovered from previous infection - cannot infect others	Vaccine is not needed
HBsAg HBsAb HBcAb	Positive (+) Negative (-) Negative or Positive (-/+)	**ACUTE OR CHRONIC INFECTION** Hepatitis B virus is present - can spread virus to others	Find a knowledgeable doctor for further evaluation
HBsAg HBsAb HBcAb	Negative (-) Negative (-) Positive (+)	**UNCLEAR** Several interpretations are possible - all 3 tests should be repeated	Find a knowledgeable doctor for further evaluation

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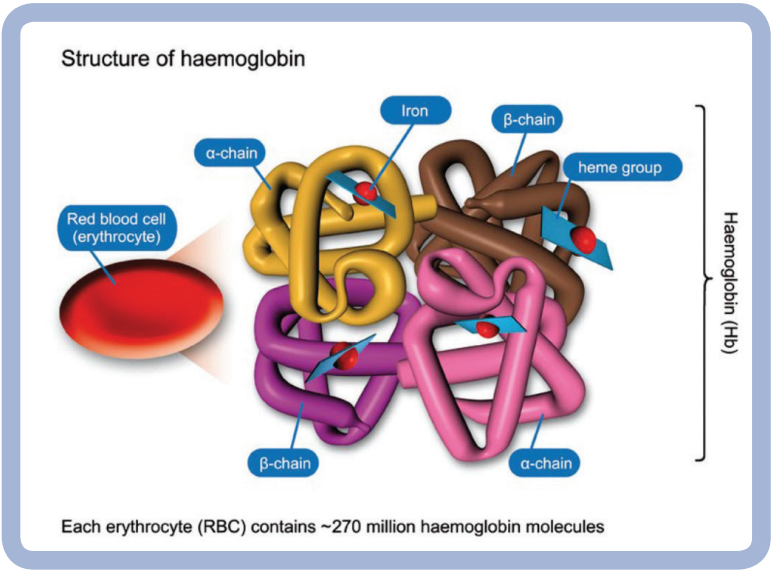
Haemoglobin (Hb)

- Haemoglobin is an iron-containing protein in red cells, which carries oxygen around the body
- Too little haemoglobin means your organs, lungs and body will not be properly oxygenated
- Haemoglobin returns carbon dioxide to the lungs from the tissues
- Values in people not on dialysis:
  Males = 14 - 18 g/dL
  Females = 12 - 16 g/dL
- All patients on dialysis = 10 - 12 g/dL



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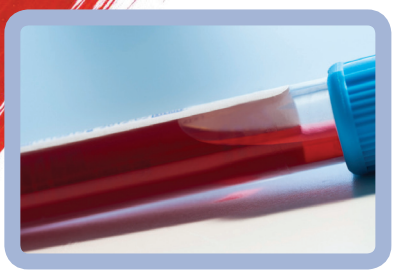
Blood Analysis

Saves Lives



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Fresenius Medical Care's Way of Caring

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