**Clinical Chemistry**

**Purpose of Clinical Chemistry Tests**

1-Measure levels of substances found in blood that have biological functions. Examples: Glucose, Calcium

2-Measure non-functional metabolites or waste products. Examples: Creatinine, Blood Urea Nitrogen (BUN)

3-Detect or measure substances that indicate cell damage or disease. Examples: Liver enzymes, such as ALT, Cardiac enzymes.

3-Detect drugs or toxic substances.

**Types of Specimens for Chemical Analysis**

1-Whole blood, serum or plasma.

2-Urine – often 24 hour collections.

3-Others – Cerebrospinal Spinal Fluid (CSF).

**Collection and Handling of Blood Specimens for Chemical Analysis**

Blood collection tubes for obtaining serum -tubes do not have an anticoagulant but do contain a gel substance which will form an interface between the clot and the serum when the blood specimen is centrifuged.



**Preparation; time of collection; & effects of eating on chemistry analysis**

1-Some specimens are increased or decreased after eating (ex. Glucose, triglycerides), . Specimens for these tests are usually collected in a fasting state.

2-Sometimes serum or plasma appears lipemia (milky) after a patient has eaten a fatty meal. The blood must be recollected when the patient is fasting.



**Clinical Chemistry Tests**

**Chemistry Panel grouping** – some tests are according to the system or organ targeted. Examples: thyroid panel, liver panel, cardiac panel, kidney panel, basic metabolic panel, etc.

1-Proteins – Provides information about state of hydration, nutrition and liver function.

2-Electrolytes

Includes sodium (Na), potassium (K), chloride (Cl) and bicarbonate (HCO3-) these have a great effect on hydration, acid-base balance and osmotic pressure as well as pH and heart and muscle contraction.

3-Minerals and salts

Calcium used in coagulation and muscle contraction 99% is in skeleton and is not metabolically active influenced by vitamin D, parathyroid hormone, estrogen and calcitonin

Hypercalcemia – occurs in parathyroidism, bone malignancies, hormone disorders, excessive vitamin D, and acidosis; may cause kidney stones

Hypocalcemia – can cause tetany; occurs in hypoparathyroidism, vitamin D deficiency.

Phosphorus: 80% in bone and rest in energy compounds such as ATP Influenced by calcium and certain hormones.

Iron: Essential for hemoglobin, deficiency results in anemia; may be caused by lack of iron in diet, poor absorption, poor release of stored iron or loss due to bleeding.Increased in hemolytic anemia, increased iron intake or blocked synthesis of iron-containing compounds, such as in leading to poisoning.

**4-Kidney Function Tests**

Serum Creatinine

BUN (Blood Urea Nitrogen)

Uric Acid

**5-Liver Function Tests**

Total Bilirubin: Waste production of hemoglobin breakdown. Increased in excessive RBC breakdown, such as hemolytic anemia, or impaired liver function or some sort of obstruction, such as a tumor or gall stone.

Liver Enzymes – levels increase following damage to liver tissues:

-Alkaline Phosphatase (ALP or AP) - Greatly increased in liver tumors and lesions; moderately increased in diseases such as hepatitis

-Alanine Aminotransferase (ALT; formerly called SGPT) -

- Asparate Aminotransferase (AST; formerly called SGOT) -

-Gamma Glutamyl Transferase (GGT) -

-Lactate Dehydrogenase (LD) -

**Cardiac Function Tests:**

-Creatine Kinase (CK)

-Troponins; Cardiac Troponin T (cTnT), Cardiac Troponin I (cTnI)

**Lipid Metabolism Tests:**

Cholesterol, LDL = low density lipid, HDL = high density lipid, Triglycerides and VLDL= very low density lipid.

**Pancreas function tests**

-amylase

-lipase

Glucose -

**Thyroid Function Tests**

Thyroid Stimulating Hormone (TSH) (the higher the TSH, the lower the thyroid function). Other less common thyroid tests include T3 and T4

Hypothyroidism – underactive thyroid gland

Hyperthyroidism – overactive thyroid gland



