Basic Principles in Clinical Biochemistry

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•Objectives:

- **Define clinical biochemistry.**
- **Describe the uses of biochemical tests.**
- **Describe the routine tests done in clinical chemistry.**
- **Describe sample analysis and interpretation of results.**
- **Highlight the importance of routine clinical chemistry tests in the diagnosis, prognosis, monitoring and screening for disease.**
- **Describe special chemistry test and correlate lab results with disease states.**

Clinical Biochemistry Process

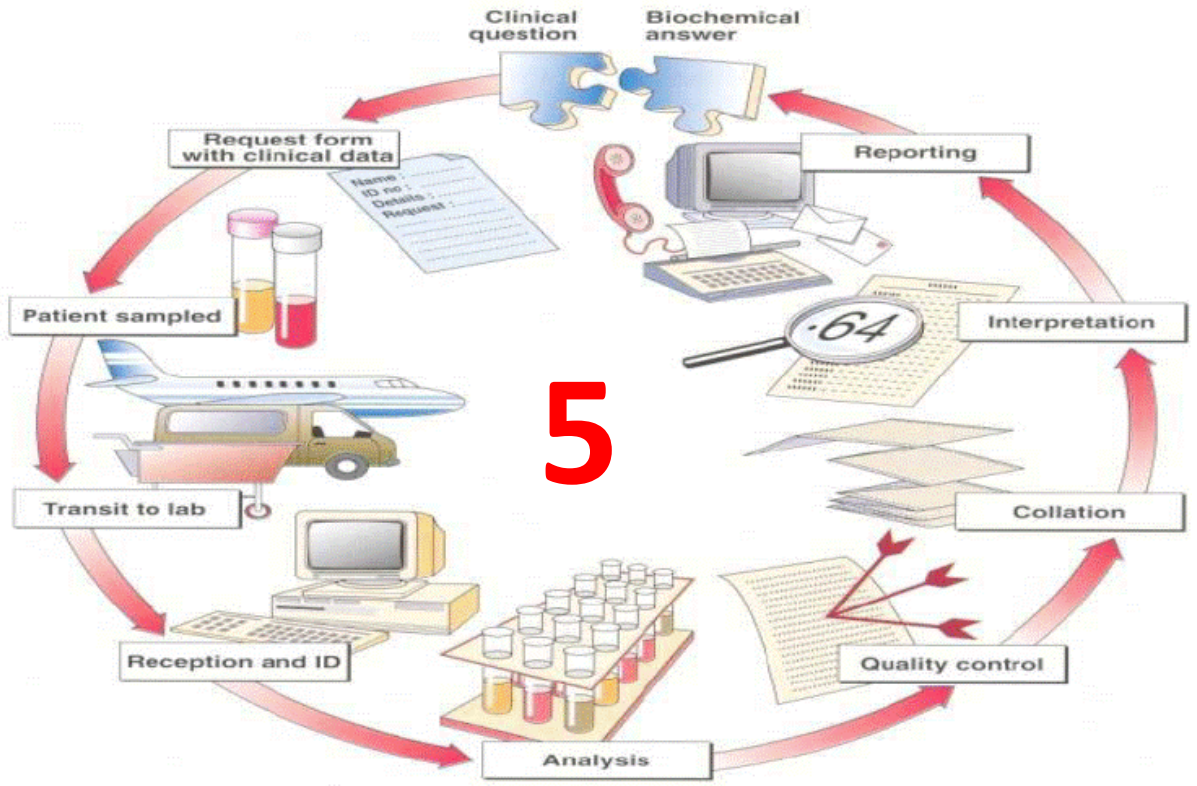


Fig. 2 **Circuit diagram of the clinical biochemistry process.**

Clinical Biochemistry

- Also known as chemical pathology, clinical chemistry, and or medical biochemistry. Its an area which concerned generally in the analysis of body fluids. For example; serum, plasma, urine, whole blood, CSF, sweat, and others. For diagnostic and therapeutic purpose. Wide variety of techniques (chemical processes) used to analyze substances like; substrates, enzymes, proteins, ions, amino acids, cholesterols, etc.

Uses of Biochemical Test

Some of most Common Clinical Biochemistry Profiles/Tests/Markers	
Kidney Function Test (Kidney)	Serum Protein Electrophoresis (MM)
Liver Function Test (Liver)	Urine Protein Electrophoresis (MM)
Bone Profile (Bone mineralization)	MSUD Profile (Inborn Errors of Metabolism)
Lipid Profile (Heart)	PKU Profile (Inborn Errors of Metabolism)
Cardiac Markers (Heart)	Amino Acids Profile (Inborn Errors of Metabolism)
Sweat Tests (Inborn Errors of Metabolism)	Stone analysis (Kidney)
Fertility Tests (Hormones)	Iron Profile
Therapeutic Drugs Monitoring (Drug)	Catecholamines Test
Drug of Abuse Test (Toxicology)	Porphyrins/PBG Test

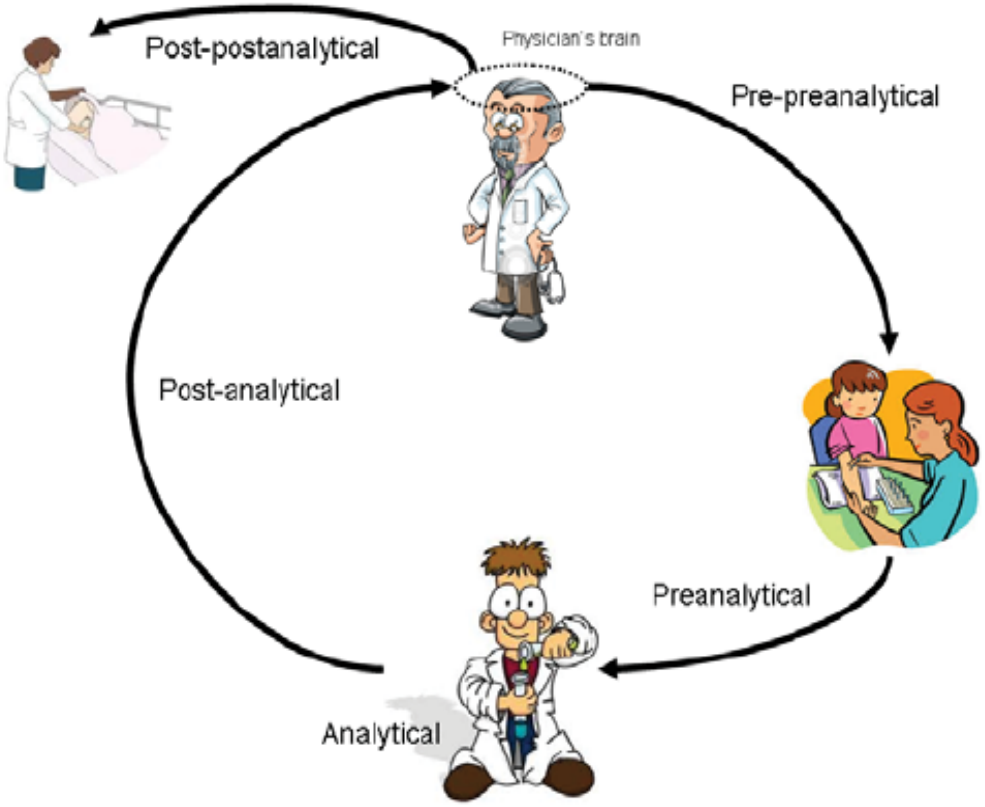
Routine Biochemical Tests

Some of Routine Clinical Biochemistry Tests	
Kidney Function Test	Na+, K+, Cl-, urea and creatinine
Liver Function Test	ALT, AST,ALP, Alb, Tbili, and total protein
Bone Profile	ALP, phosphate, Ca2+, Alb, and AlbCoRCa
Lipid Profile	Tchol, LDL, HDL, VLDL, and Triglycerides
Cardiac Markers	CK, CKMB, and Troponin (I)
Therapeutic Drugs Monitoring	Benz, TCA, ACETO, etc
Drug of Abuse Test	Morphine, Tramadol, Cocaine, etc
Iron Profiles	S-Iron and Transferrin

Sample analysis

- It varies from sample to sample (types). Or from test to test
- Some samples requires immediate running and some may store
- Depends also on specific sample collection criteria
- Depends on patients diagnosis
- Types of clinical biochemistry test (screening, definitive, confirmatory)
- Analytes nature (stability) e.g. blood gas

Sample analysis



Interpretation of results

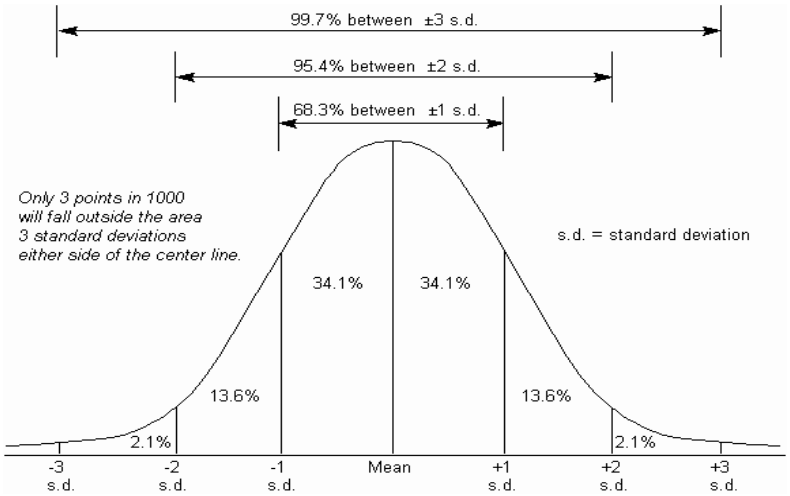
- Depends on type of data
- TAT
- Type of the test (screening, definitive, and confirmatory)
- Severity of patient condition (disease)
- BMS (Professionalism)
- Profile testing

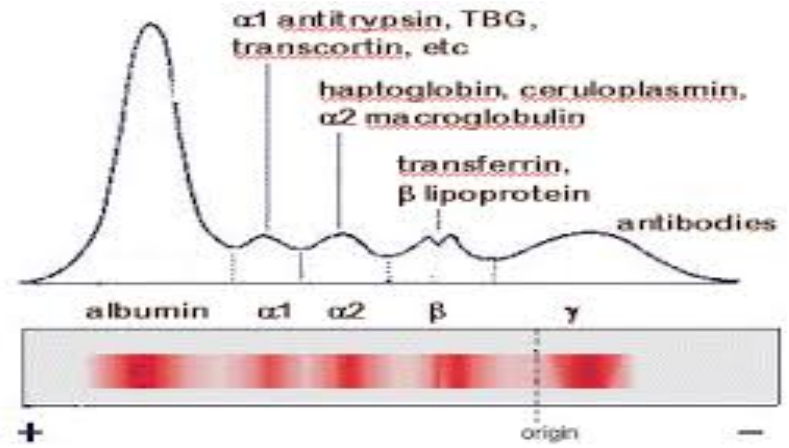
Interpretation of results

- Types of Data (Results):

1. Qualitative Results (+/-)
2. Semi-Quantitative Results (Fraction or %)
3. Quantitative results (e.g. concentration)

Interpretation of results





Fractions	%
Albumin	21.3L
Alpha 1	1.9
Alpha 2	5.5L
Beta	7.0L
Gamma	64.3H

Importance of Routine Clinical Chemistry Tests

- **Diagnostic Test:** Is a procedure perform to confirm, or determine the presence of disease in an individual suspected of having the disease usually following the reports of symptoms. (Troponin/Glu)
- **Prognostic Test:** Is used to predict a patient's likelihood of developing a disease. (Free lambda/Kappa Ratio)
- **Monitoring Test:** Test done on known patient condition for following up the results at timely basis. (HBA1c, SPE)
- **Screening Test:** Helps to identify people with increase risk for a disease before they have symptoms.

Special Chemistry Tests

Special Chemistry Testing at SQUH
MSUD Profile
PKU Profile
Qualitative and Quantitative Amino Acids Profiles
Plasma and Urine Catecholamines
Stone Analysis
Total Porphyrins Screening test
PBG
Toxicology Testing

Clinical Parameter & Disease states

- High serum creatinine and K^+ → correlates with renal failure
- High phenylalanine and tyrosine → Indicate PKU in children
- High B-hCG → Ectopic pregnancy
- Troponin I → MI