



Charting New Horizons in Education

Biochemistry and medicine

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Biochemistry



va The aim of biochemistry



1. Is the complete understanding, at molecular level all biomolecules composed in the living organisms (their chemical structures, occurrence, location and their functions), also, the chemical processes associated with living cells.
 2. Identification of mechanisms of diseases
 3. Study of Inborn metabolic errors
 4. Study of oncogenes in cancer cells (An oncogene is a mutated gene that has the potential to cause cancer)
 5. Also, structures and functions, metabolism and its regulation, gene expression modulation and how the life has begun (DNA → RNA → Proteins).
- To realize these targets, biochemists have to isolate numerous molecules found in cells, determine their structures, and analyze how they function.
 - Many techniques have been used for these purposes as **isolation techniques: chromatography, electrophoresis, ultracentrifugation** and **analytic techniques elemental analysis, mass spectrometry and X-ray crystallography.**

va Biochemistry and Medicine are Intimately related



1. In a specific diseased condition there occurs derangements in the hormonal actions, which affects, homeostatic mechanisms and metabolic processes, which in turn alters the normal concentrations of biochemical constituents in body cells and their fluids.
2. Metabolic changes associated with specific disorders may give rise to a changes in the body fluids.
3. Biochemical profile of a particular body fluid is analyzed for example:
 - Blood glucose in Diabetes mellitus;
 - Glucose levels in the cerebrospinal fluid in bacterial meningitis (which are greatly reduced).
- ✓ So, specific parameters are looked for in a specific body fluid when a disease is suspected to be investigated for the levels of biochemical parameters
- ✓ In various collected biological specimens → Blood/plasma/serum/urine/CSF/other body fluids



1. **Medical Biochemistry:** it deals with chemical basis of human body, biochemical constituents of human body, their interactions intracellularly to maintain normal health, growth and reproduction and related diseases.
 - Study of various Biochemical constituents of cell: (Chemistry, properties , functions, metabolism and related disorders).
 - - Carbohydrates - Lipids – Proteins, Vitamins - Minerals – Water
 - Metabolism of Biomolecules:
 - Ingestion → digestion → absorption → transport → uptake, finally assimilation of food constituents in human body.
1. **Clinical Biochemistry:** it deals with clinical diseases/pathological conditions of human body to support the diagnosis, therapy and research of Medical field

Branches of Biochemistry



- Clinical Biochemistry includes two main components: Methodological and Interpretative.
- Which is driven by the discovery of biomarkers, and the availability of appropriate measurement methods.
- **Diagnostic Investigations of Clinical Biochemistry, Types:**
 1. **Routine biochemical investigations:**
 - ✓ Blood glucose {fasting, postprandial and random}
 - ✓ Kidney function tests: Non-protein nitrogenous substances -blood urea ,uric Acid, creatinine.
 - ✓ Serum and urinary proteins
 - ✓ Lipids: triacylglycerols, cholesterol, lipoproteins.
 - ✓ Liver function tests: enzymes (AST, ALT, GGT, ALP), bilirubin (total, direct, indirect), total Proteins, albumin
 - ✓ Electrolytes: (Na, K)
 - ✓ Minerals: (Ca, P)
 - ✓ Blood: pH, anion gap, pO₂, pCO₂, bicarbonate.

Branches of Biochemistry



2. **Special investigations:**

- ✓ Glucose Tolerance Test
- ✓ Vitamins
- ✓ Hormones
- ✓ Minerals (Mg, Zn, Cu, Fe, I)
- ✓ Drugs
- ✓ Bence Jones Proteins
- ✓ Electrophoresis
- ✓ Chromatography

3. **Biochemical test profiles and biomarkers:**

- ✓ Lipid Profile
- ✓ Cardiac Profile
- ✓ Diabetic Profile
- ✓ Bone Markers
- ✓ Anemia Markers
- ✓ Tumor Markers

Some uses of biochemical laboratory tests in relation to diseases



Use	Example
To reveal the fundamental causes and mechanisms of diseases	Demonstration of the causes of genetic defect as in cystic fibrosis
To suggest rational treatments of diseases based on 1 above	A diet low in phenylalanine for treatment of Phenylketonuria
To assist in the diagnosis of specific diseases	Use of the plasma enzyme creatine kinase MB (CK-MB) in the diagnosis of myocardial infarction
To act as screening tests for the early diagnosis of certain diseases	Use of measurement of blood thyroxine or (TSH) in the diagnosis congenital hypothyroidism (Cretinism)
To assist in monitoring the progress (e.g, recovery, worsening, remission, or relapse) of certain diseases	Use of the plasma enzyme ALT in monitoring the progress of infectious hepatitis
To assist in assessing the response of diseases to therapy	Use of measurement of blood CEA in patients who have been treated for cancer colon.



«Wherever the art of medicine is loved,
there is also a love of humanity.»

- Hippocrates-

