

## Biochemistry: The Heart of life science

### ⊕ Introduction:

Biochemistry is the study of the chemistry of living things. It is a fascinating, diverse and sprawling discipline; which makes it near impossible to pigeon-hole or define concisely. Many look upon biochemistry as a science that underpins and explains the essential processes of life.

**Lubert Stryer**, the famous biochemist and author of *Biochemistry* (*W.H. Freeman & Co.*), states that biochemistry is “rapidly progressing from a science performed almost entirely at the laboratory bench to one that may be explored through computers. Its practical approach applies the molecular aspects of chemistry to the vast variety of biological systems.”

### ⊕ History of Biochemistry:

It once was generally believed that life and its materials had some essential property or substance distinct from any found in non-living matter, and it was thought that only living beings could produce the molecules of life.

The dawn of biochemistry may have been the discovery of the first enzyme, **diastase** (today called amylase), in **1833** by **Anselme Payen**. The term “**biochemistry**” seems to have been first used in **1882**, it is generally accepted that the formal coinage of biochemistry occurred in **1903** by **Carl Neuberg**, a German chemist. Previous to this time, this area would have been referred to as **physiological chemistry**. Since then, biochemistry has advanced, especially since the **mid-20th century**, with the development of new techniques such as chromatography, X-ray diffraction, dual polarisation interferometry, NMR spectroscopy, radioisotopic labeling, electron microscopy, and molecular dynamics simulations. These techniques allowed for the discovery and detailed analysis of many molecules and metabolic pathways of the cell, such as glycolysis and the **Krebs cycle (citric acid cycle)**.

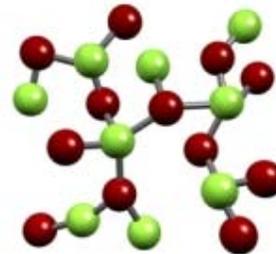
Another significant historic event in biochemistry is the discovery of the **gene** and its role in the transfer of information in the cell. This part of biochemistry is often called molecular biology. In the **1950s**, **James D. Watson**, **Francis Crick**, **Rosalind Franklin**, and **Maurice Wilkins** were instrumental in solving DNA structure and suggesting its relationship with genetic transfer of information (**Nobel prize in 1962**). In **1958**, **George Beadle** and **Edward Tatum** received the Nobel Prize for work in fungi showing that **one gene produces one enzyme**. In 1988, Colin Pitchfork was the first person convicted of murder with DNA evidence, which led to growth of forensic

science. More recently, Andrew Z. Fire and Craig C. Mello received the 2006 Nobel Prize for discovering the role of RNA interference (RNAi), in the silencing of gene expression.

### ✪ **Disciplines related to Biochemistry:**

Biochemistry is closely related to other biological sciences that deal with molecules. There is considerable overlap between these disciplines:

- ✚ Molecular Genetics
- ✚ Pharmacology
- ✚ Molecular Biology
- ✚ Chemical Biology
- ✚ Immunology
- ✚ Endocrinology



### ✪ **What Is Biochemistry used For?**

- ✧ Biochemistry is used to learn about the biological processes which take place in cells and organisms.
- ✧ Biochemistry may be used to study the properties of biological molecules, for a variety of purposes. For example, a biochemist may study the characteristics of the keratin in hair so that a shampoo may be developed that enhances curliness or softness.
- ✧ Biochemists find uses for biomolecules. For example, a biochemist may use a certain lipid as a food additive.
- ✧ Alternatively, a biochemist might find a substitute for a usual biomolecule. For example, biochemists help to develop artificial sweeteners.
- ✧ Biochemists can help cells to produce new products. Gene therapy is within the realm of biochemistry. The development of biological machinery falls within the realm of biochemistry.

### ✪ **What is the role of Biochemists?**

- ✧ Provide new ideas and experiments, essential for understanding how life works
- ✧ Support our understanding of health and disease
- ✧ Drive the discovery of new ways to use molecular systems and their biological functions
- ✧ Contribute essential innovative information to the technology revolution

- ✧ Work together as part of a team with chemists, physicists, healthcare professionals, government policy makers, engineers, zoologists, environmental scientists, sales and marketing managers, journalists and other professionals from a variety of different disciplines.

✧ **Biochemists have high-value jobs that influence work in:**

Hospitals, university research departments, agriculture, food institutes, education, scientific law, cosmetic industries, forensic crime research, industrial laboratories, drug manufacturing, biotechnology, publishing, sales and marketing, government administration, science writing and many more...

Biochemists are highly valued members of any company or institution, and their skills and expertise are greatly in demand by a variety of other professionals. Biochemistry is often a collaborative field, requiring biochemists to work and communicate as a team with professionals from a variety of disciplines to achieve their goals.

✧ **A degree in biochemistry provides many attractive and transferable skills:**

Analytical, communication, research, problem solving, numerical, written, observational, planning, team work, organizational, computational.....good preparation for any career.

The life science community is a fast-paced, interactive network with global career opportunities at all levels. The policy makers are now recognizing the potentiality in the developments of biochemistry and the life sciences for national prosperity and for improving the quality of life of the population. Funding for research in these areas has been increasing dramatically in most countries, and the biotechnology industry is expanding rapidly.



**The research and development of biochemical concepts and techniques in life science and medicine over the past 100 years have been staggering... the opportunities for further discovery are endless.**

### ✪ **Progress and prospect of Biochemistry in Bangladesh:**

Biochemistry was introduced in Bangladesh in 1958 in Dhaka University by our famous Professor and Scientist Dr.Kamaluddin Ahmed. After that, successively, this subject was inaugurated in different public and private universities such as Rajshahi, Chittagong, Jahangirnagar, Kushtia, Khulna, North South, BRAC University and many more. To meet the challenge of 21<sup>st</sup> century, every year a large number of biochemist and molecular biologist graduates are coming out and contributing a lot in different sectors to move forward our nation. The major contributions of biochemists in national development are,

1. Nutrition survey
2. Use of iodine in salt.
3. Generation of high yielding crops
4. Conducting various research for food safety
5. Decoding of jute genome
6. Introduction of oral rehydration saline (ORS)
7. Discovery of cholera vaccine

There are different areas in Bangladesh where Biochemist and Molecular Biologist can play a big role for the national development. They can get the position..

1. In different universities and colleges as a faculty member.
2. In different pharmaceutical companies for drug manufacturing and quality control.
3. In different life science research organization such as ICDDR'B, BCSIR, NIB, BRRI as a scientist.
4. In different diagnostic centres as a Biochemist.
5. In food industries as food analyst or nutritionist.
6. In DMCH forensic DNA laboratory as a scientist.