

PREFACE

Rapid advances in biology have had a major impact on our society. From the production of new drugs, to revolutionary advances in our understanding of how cells work, the areas of cell and molecular biology have contributed to our lives in a number of ways. Training in these areas is essential for careers in medicine, pharmacology, biochemistry, virology, immunology, developmental biology, and in a number of the high-tech industries. From agriculture to the space program, fundamental information from these areas has had enormous impact on the changes that have occurred in our generation. Cell and molecular biology is an interdisciplinary field of science that deals with the fields of chemistry, structure and biology as it seeks to understand life and cellular processes at the molecular level. Cell biology is the study of the properties and functions of cells. The cell is the basic unit of life for all living things and learning about the composition of the cell as well as the way they replicate and interact with their environment helps scientist better understand the tissues, organs and organisms that they come together to create. Molecular biology is the study of living things at the level of the molecules which control them and make them up. While traditional biology concentrated on studying whole living organisms and how they interact within populations (a "top down" approach), molecular biology strives to understand living things by examining the components that make them up (a "bottom up" approach). Both approaches to biology are equally valid, although improvements to technology have permitted scientists to concentrate more on the molecules of life in recent years.

Organization of the book

The book contains eight chapters. From the laboratory to the real world, cell and molecular biology has a far-ranging impact upon everything from the environment to health and medical issues. Cell and molecular biology enables researchers to study the minute world of microbes and cells. Further

on in the book, we touch upon more complex subjects such as: DNA and RNA; protein structures; and movement along cellular pathways.

Chapter 1 presents an introduction to cell and molecular biology.

Chapter 2 presents a focus on the biochemistry of cell. Biochemistry focuses on understanding how biological molecules give rise to the processes that occur within living cells and between cells, which in turn relates greatly to the study and understanding of tissues, organs, and organism structure and function.

Chapter 3 intends to cover on the cell surface and the extracellular matrix. Cell surface receptors, often called trans-membrane receptors, are important proteins that mediate communication between the cell and the outside world.

Chapter 4 focuses on nucleus. The nucleus is now known to be the repository of the genome and the source of the informational macromolecules that control the synthetic activities of the cytoplasm. As such it is an essential organ present in nearly all eukaryotic cells. The few exceptional anucleate cells (mammalian erythrocytes, blood platelets, core fibers of the lens) are incapable of protein synthesis and are severely limited in their metabolic activities.

Chapter 5 laid emphasis on membrane-bound organelles. Membrane bound organelles are mostly found in eukaryotic cells and they are found in majority numbers within the cytoplasm. The mitochondria, Golgi body, nucleus, endoplasmic reticulum, chloroplast etc. are some of the examples which contain membrane bound structures.

Chapter 6 focuses on the cytoskeleton and cell motility. The cytoskeleton is a network of filaments and tubules that extends throughout a cell, through the cytoplasm, which is all of the material within a cell except for the nucleus. It is found in all cells, though the proteins that it is made of vary between organisms. The cytoskeleton supports the cell, gives it shape, organizes and tethers the organelles, and has roles in molecule transport, cell division and cell signaling.

Chapter 7 focuses on cellular metabolism which is the set of chemical reactions that occur in living organisms in order to maintain life. Cellular metabolism involves complex sequences of controlled biochemical reactions, better known as metabolic pathways. These processes allow organisms to grow and reproduce, maintain their structures, and respond to environmental changes.

In last **Chapter 8**, current trends in cellular and molecular biology is also explored. Recombinant DNA technology, RNA interference, and nanotechnology. Molecular biology is a specialized branch of biochemistry, the study of the chemistry of molecules which are specifically connected to living processes. Of particular importance to molecular biology are the nucleic acids (DNA and RNA) and the proteins which are constructed using the genetic instructions encoded in those molecules.