

PREFACE

Physiology is a synthesizing science that applies physical and chemical methods to biology. It is the analysis of function in living organisms. Physiologists attempt to understand the mechanisms that operate in living organisms at all levels, ranging from the subcellular to the integrated whole organism. Physiology, actually developed as the theoretical basis for medical practice. But now, it is an integrative science which helps us to differentiate between the vast amounts of information about the external and internal environment typically received by an animal. It is this theme of integration that sets physiology apart from other sciences adding to its complexity, at the same time to its fascination.

Physiology is firmly rooted in the laws and concepts of Chemistry and Physics. The principles of evolution, natural selection and speciation underlie animal physiology, just as they do in any other study of life on earth. Thus, the history of animal physiology is rich in studies of the adaptations by individual species to particular environmental constraints and demands.

There are several important subdisciplines in the overall discipline of animal physiology. Comparative physiology goes beyond medical physiology to contribute to the understanding of basic biology. It recognizes the diversity and modulation of highly conserved properties of organisms by using 'kind' of animal as an experimental variable. Environmental physiology focuses on the evolutionary adaptations *i.e.*, animals in the context of the environment they inhabit. Evolutionary physiology uses methods and techniques of evolutionary biology and systematics to understand evolution of animals from a physiological viewpoint using physiological markers.

Physiology provides an intellectual bridge between molecular and whole animal biology. It also emphasizes the integration of the organisms at all levels of organization. Thus, arises the need of studying animal physiology. Animal physiologists feel that the more we learn, the more we realize how little we know about physiological systems of animals. The curiosity factor plays a very important role here. The advantages lent by physiology to the common man justify its applications and importance. Studies have yielded knowledge central to many commercial and agricultural advances during the past few decades. The yield and quality of milk, eggs, meat *etc.* have helped farmers, whereas improved breeding techniques now include widespread use of artificial insemination.

Animal Physiology has made innumerable contributions in the understanding of human physiology. It is the corner stone of scientific medical practice. Understanding of the functioning and malfunctioning of living tissues provided the foundation for developing effective, scientifically sound treatment for human diseases. A physician and a medical researcher with the knowledge of animal physiology is better equipped to make intelligent and perceptive use of information from animal models.

There are various central themes in animal physiology that are basic to all animal groups, since they have been shaped by selective forces during evolution. Comparing and contrasting how different organisms have adapted to survive similar environmental challenges provide useful insights about patterns of physiological evolution and adaptive value of physiological processes. The various themes are regarding structure-function relationships, adaptation, acclimatization and acclimation, homeostasis, feedback control system, conformity and regulation. Functions of an organism depend on its structure and that holds true across the whole range of physiological processes. Armed with theories and observations developed by evolutionary biologists, physiologists are now realizing that even though evolution by natural selection leads to change in physiological processes, many of these changes are good enough to ensure survival of animal. Internal consistency of an animal was related to the organization and function within cells, tissues and organs. It was also concluded by Physiologists that consistency of the internal environment is the condition of free life. Physiological investigations have discovered a great deal about temperature regulation including the location of the body thermostat. On the basis of conformity and regulators, broad generalizations about taxonomy can be made. Thus, physiology has provided a viewpoint that adds to our understanding of human nature. It combines viewpoints of genetics and cultural heritage. It provides tools for diagnosis and therapy. Every kind of animal that has been successful during its period in the earth's history has been adapted to its physical and biotic environments. Man is currently successful because he excels in cognition, communication and social organization via the understanding of physiological processes.

The present volume has been compiled to make the student conversant about the basic and applied aspects of animal physiology. It starts with the introduction to atomic and molecular basis of life, cell structure and its chemical constituents, the metabolism followed by discussion on various organ systems such as digestive, respiratory, circulatory, nervous, reproductive and defence. A special chapter has been added on the animal cell culture, a technique commonly used for understanding the Cell Physiology.

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