Preface

More than five decades ago, Dr. Ananda S. Prasad discovered zinc (Zn) as the essential trace element for human life. Zn deficiency was the first discovery in Zn imbalance-related abnormality that causes growth retardation, immunodeficiency, hypogonadism, and neuronal and sensory dysfunctions. Human diseases including cancer, diabetes, osteoporosis, dermatitis, and auto-immune and neurodegenerative diseases have been shown to be associated with abnormal Zn status. Investigations of the biological roles of Zn, however, had been challenging because Zn compounds are normally colorless, and the natural status of Zn is stable as a divalent cation, unlike other bioactive metals such as iron and copper.

Until now, there have been at least four issues that advanced our knowledge about the significant roles of Zn in physiology and diseases. First: bioinformatics, which revealed that approximately 10% of all proteins in humans may bind with Zn. Second: genetic approaches using animal models and human genetics, which contributed to demonstrating the physiological roles of Zn in cells, tissues, and the whole body. Third: investigation of Zn transporters and metallothioneins in vitro and in vivo, which provided a variety of information on the importance of Zn transportation within and between cells, which led us to the fourth issue: Zn indeed acts as a signaling factor like calcium, called “Zn signaling”. Because this is a quite new field, we were motivated to introduce the current status of the study of Zn signaling and to review the whole scheme of this area to date.

The present book overviews up-to-date information on the study of Zn signaling, describing not only the essence of Zn signaling including its history, the molecular analysis of the structures and functions of Zn transporters and metallothioneins, and detection techniques for Zn signals, but also the involvement of Zn signaling in physiology and disease status as in brain function, immunity, inflammation, skeletogenesis, diabetes, and cancer. Besides the introduction of new insights in the study of Zn signaling, this book aims to address the many unsolved problems in the field. For this reason, we made a great effort to furnish educational contexts that will provide great introductions for students, young scientists, and clinical personnel. These contexts can also be valuable references for the pioneers and aficionados among researchers involved with Zn. So that all these goals would mesh, we as editors invited contributions from investigators who are world leaders in this field.
We believe the publication of this book is timely for reviewing the nature of Zn signaling, in which there is growing evidence that Zn signals regulate intra- and extracellular events leading to biological homeostasis, as all the authors will discuss. Also, we are confident that readers will find the book valuable for teaching, lecturing, and other outreach activities that can help make known to the public the importance of Zn itself. Finally, we express our heartfelt thanks to the splendid contributions of all authors, which will lead us to our goal.

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