Preface

This is the first edition of this book that provides the reader with current information on the stearoyl-CoA desaturase gene family that encode stearoyl-CoA desaturase, a previously unknown enzyme and its role in metabolism in different organisms. Whereas today many genes and gene families are defined and analyzed bioinformatically, early events using the murine 3T3-L1 system provided the foothold that have enabled our current understanding of what has become one of the most interesting and important loci in cellular metabolism. In addition, the reader will learn about the important and widely diversified field of fatty acids and their health implications in humans. However since the precise role of fatty acids in the etiology of the various metabolic disorders has yet to be delineated it is not the intention of the book to present a unified view on the healthy implications of monounsaturated fatty acids or provide guidelines for fatty acid consumption.

Work over the last 20+ years has focused on identifying and analyzing numerous SCD isoforms in a variety of species that are in turn controlled by multiple signaling systems. Given the diverse role of monounsaturated fatty acids in metabolic processes it is not surprising that multiple genes exist and that multiple regulatory elements control isoform expression. In addition, tissue-specific dietary control of isoform expression occurs via a series of complex signal transduction schemes making SCD one of the most highly studied gene families. Conditional alleles and corresponding tissue-specific knockout models for many of the murine SCD genes have provided a wealth of information on not only tissue-specific fatty acid metabolism but also the key transcription factors that regulate SCD expression under a variety of metabolic and genetic backgrounds. Our studies using mice with whole-body and tissue-specific deletions of one of the mouse SCD isoforms (SCD1), together with several human studies have all agreed that the expression of the SCD1 gene isoform represents a key step in partitioning of lipids between storage and oxidation. High SCD1 expression (high oleate levels) favors fat storage leading to obesity while reduced SCD1 (low oleate levels) expression favors fat burning and leanness. However, as we understand more about the detrimental roles of cellular saturated fatty acids, it is becoming clear that unqualified complete inhibition of SCD1 activity, whether systemic or restricted to specific organ systems, may not

come without a plethora of undesirable side effects, including an increased propensity to inflammatory disease. A proper ratio of saturated/monounsaturated fat may be required for normal health and physiological function. Nevertheless, novel insights gained into the multifaceted roles of these intrinsic loci in cellular metabolism may yet lead to new models for pharmacological interventions for the treatment of metabolic disease.

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