Inorganic Biochemistry of Iron Metabolism by Robert R. Crichton

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This is the first book of its type which surveys the broad field of iron in biology but from an inorganic perspective. The volume is a pleasure to read. It presents the highlights of various fields of research in iron biochemistry and physiology and thus serves as an excellent introduction to those seeking an overview of the subject.

The first chapter is devoted the solution chemistry of iron in biological media with emphasis on the hydrolysis chemistry of Fe(III). This chapter lays the groundwork for understanding the need for strong chelators of iron(III) in the biological transport and storage of this element. The coordination chemistry of iron is discussed in later chapters in reference to particular proteins and siderophores. The second chapter is devoted to the importance of iron in biological systems. Here the roles of various heme proteins are reviewed as well as iron sulfur and other iron containing proteins such as ribonucleotide reductase and hememerythrin. The third and fourth chapters are devoted to microbial iron uptake and iron assimilation in plants and fungi. The structures of various siderophores and plant iron chelators and the mechanisms of iron uptake in microorganisms and plants are presented as well as recent advances in understanding the genetics of iron metabolism in bacteria. Chapter five presents an overview of iron absorption in mammals with emphasis on intestinal iron absorption in man, and sources of dietary iron and inhibitors of its uptake. Chapter six is devoted to the chemistry and biology of the transferrins. Here the structure of the various transferrins are discussed in relation to their iron binding properties. Binding of other metals by the transferrins is covered as well. Chapter seven covers the mechanism of cellular iron uptake from transferrin with reference to the transferrin receptor, the transferrin-to-cell cycle and intracellular iron release. Chapter eight reviews intracellular iron storage and discusses ferritin, hemosiderin, and the low molecular iron pool. The structure and function of ferritin is discussed in some detail as is the regulation of ferritin biosynthesis. Chapter nine covers iron homeostasis and cellular iron release. Chapter ten is devoted to iron deficiency and overload in man and touches on diseases of iron overload such as hemochromatosis and the thalassaemias. Iron and oxidative damage to cells associated with the production of oxyradicals is reviewed in chapter eleven. Carcinogenesis and ischaemia/reperfusion damage and inflammation-immune injury associated with the presence of radicals are discussed in this chapter as are the fundamental radical producing reactions. Iron and infection is reviewed in chapter twelve. Some concluding remarks are presented in chapter thirteen. Adequate references to the original literature are given throughout the text so the interested reader can delve more deeply into any subject he or she wishes.

I highly recommend the book, especially to graduate students embarking on research careers in iron biochemistry. The volume nicely provides a broad perspective of the subject, placing ones own work within the broader context of the field. However, the book contains relatively less bioinorganic chemistry of iron compared to its biochemistry and physiology. Nevertheless it is a valuable reference as well as learning book and should be part of the library of any researcher or student interested in iron biochemistry and metabolism.