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Autore	Permiakov E. A (Evgenii Anatolevich)
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and Viruses; 3 Comparison of the Ca^{2+} Ion with Other Metal Cations; 3.1 Calcium Isotopes; 3.2 Calcium in the Environment; 3.3 Uses of Calcium; 3.4 Health Effects of Calcium; 3.5 Biologically Significant Metals in the Periodic Table; 3.6 Hydration of Metal Ions; 3.7 "Hard" and "Soft" Metal Ions; 4 Complexes of Calcium and Other Cations with Compounds of Low Molecular Weight; 4.1 Crystal Structures of Complexes of Calcium with Low Molecular Weight Compounds 4.2 Dissociation Constants of Calcium and Analogs with Small Compounds 4.3 Solubilities of Calcium and Analogs with Small Compounds; 5 Stoichiometry, Kinetics, and Thermodynamics of Calcium Binding; 5.1 Stoichiometry, Affinity, and Cooperativity of Binding; 5.2 Kinetics of Binding; 5.3 Partition of Free Energy of Binding (G) Among Enthalpy (H) and Entropy (S); 6 Experimental Methods Used to Study Calcium Binding to Proteins; 6.1 Radioactivity; 6.2 Ion-Selective Electrodes; 6.3 Calcium Buffers; 6.4 Dialysis, Equilibrium, and Flow; 6.5 Proteolysis; 6.6 Deuterium Exchange 6.7 Isothermal Titration Calorimetry 6.8 Differential Scanning Calorimetry; 6.9 Mass Spectroscopy; 6.10 Calcium-Specific Dyes and Fluors; 6.11 Atomic Flame Absorption Spectroscopy; 6.12 Absorption Spectroscopy; 6.13 Fluorescence Spectroscopy; 6.14 Circular Dichroic and Optical Rotatory Dispersion Spectroscopy; 6.15 Nuclear Magnetic Resonance; 6.16 Electron Spin Resonance; 6.17 Surface Plasmon Resonance; 6.18 Extended X-ray Absorption Spectroscopy; 6.19 Small Angle X-ray Scattering; 6.20 Crystallography; 7 Structure and Evolution of Proteins; 7.1 Domain; 7.2 Structure; 7.3 Evolution 8 Protein Complexes with Metals Other than Calcium 8.1 Essential Hard Cations; 8.2 Essential Metals with Several Valence States; 8.3 Conclusions; 9 Nonessential Metals; 9.1 Alkali Metals (Group Ia); 9.2 Alkali Earth Metals (Group IIa); 9.3 Group IIIa; 9.4 Group IVa; 9.5 Group Va; 9.6 Group VIIa; 9.7 Group VIII; 9.8 Group Ib; 9.9 Mercury (Group IIb); 9.10 Group IIIb; 9.11 Group IVb; 9.12 Group Vb; 9.13 Polonium (Group VIb); 9.14 Conclusions and Generalizations; 10 Parvalbumin; 10.1 Structure; 10.2 Function; 11 EF-Hand Proteins 11.1 CTER (Calmodulin, Troponin C, Essential and Regulatory Light Chain) Subfamily

Sommario/riassunto

Calcium Binding Proteins explains the unique and highly diverse functions of calcium in biology, which are realized by calcium binding proteins. The structures and physical characteristics of these calcium binding proteins are described, as well as their functions and general patterns of their evolution. Techniques that underlie the description of proteins are discussed, including NMR, circular dichroism, optical rotatory dispersion spectroscopy, calorimetry, and crystallography. The book discusses the patterns of biochemical phenomena such as calcium homeostasis, mineralization, and cell