METALLOBIOLOGY

MOLECULAR ASPECTS OF METALLOPROTEINS

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GENERAL INFORMATION:

Molecular Aspect of Metalloprotein is intended to provide you with a foundation in modern biochemistry with specific emphasis on metal-containing proteins. We will discuss general chemistry of metal ions, protein biochemistry, enzyme kinetics, electron transfer reactions, and selected metalloprotein systems important in dioxygen binding and transport, oxidative stress responses, mitochondrial electron transport, and nitrogen fixation.

RESOURCES:

Appropriate reading materials from Inorganic Biochemistry: An Introduction by J. A. Cowan (2nd ed. John Wiley & Sons, Inc., New York, 1997) and Fundamentals of Biochemistry by D. Voet, J. G. Voet, and C. W. Pratt (John Wiley & Sons, Inc., New York, 1999) will be distributed. Visit the Wiley web site for more information. We will also use selected articles from the current scientific literature, as appropriate.

The KEGG graphical pathway maps may be of use in learning the material concerning the various metabolic pathways. Molecular viewing applications RasMol and Chime may be of interest and use during this course. Visit the "Chime Square" site for selected examples.

You may wish to include additional materials and resources (internet). I will provide notes (WWW sites) and facilitate discussions during class, but it is up to you to develop a comprehensive understanding of the material.

GRADING POLICY:

Your performance in this course will be based on active participation and scheduled tests. Examinations will be a combination of short-answer, multiple-choice, and problem-solving questions.

<u>As a general policy, there will be no make-up examinations. Demonstrate your responsibility by attending lectures, discussions, and examinations.</u>

COURSE OUTLINE: (tentative schedule of topics)

General chemistry of metal ions <u>2 lectures (4 hours)</u>

Chemical and redox properties of transition metal ions, coordination chemistry of transition metal ions

Protein biochemistry 2 lectures (4 hours)
Amino acids as building blocks, constructing proteins, analyzing proteins using modern spectroscopic methods

Enzyme kinetics 2 lectures (4 hours)
Reaction rates, catalysis, Michaelis-Menten analysis, enzyme inhibition, multisubstrate-multiproduct reactions

Electron transfer reactions 2 lectures (4 hours)
Marcus theory, inner-sphere electron transfer, outer-sphere electron transfer

First Examination - General chemistry of metal ions, protein biochemistry, enzyme kinetics, and electron tranfer reactions

Dioxygen binding and transport 2 lectures (4 hours)
Myoglobin, hemoglobin, hemerythrin, hemocyanin

Oxidative stress responses 2 lectures (4 hours)
Catalase, superoxide dismutase, peroxidase

Mitochondrial electron transport 2 lectures (4 hours)
Cytochrome, cytochrome *c* oxidase, flavoprotein, succinate dehydrogenase (complex II), cytochrome bc_1 (complex III)

Nitrogen fixation 2 lectures (4 hours)
Nitrogenase, iron protein, FeMo cofactor, ferredoxin

Second Examination - Dioxygen binding and transport, oxidative stress responses, mitochondrial electron transport, and nitrogen fixation