

PROGRESS IN

# Nucleic Acid Research and Molecular Biology

*edited by*

KIVIE MOLDAVE

*Department of Molecular Biology and Biochemistry  
University of California, Irvine  
Irvine, California*

Volume 59



ACADEMIC PRESS

San Diego London Boston New York  
Sydney Tokyo Toronto

# Contents

SOME ARTICLES PLANNED FOR FUTURE VOLUMES .....	ix
--	----

Rhodopsin: A Prototypical G Protein-Coupled Receptor .....	1
--	---

Thomas P. Sakmar

I. Structure and Function of Rhodopsin: A Prototypical G Protein-Coupled Receptor .....	2
II. Spectral Tuning and the Mechanism of the Opsin Shift .....	10
III. Light-Induced Conformational Changes in Rhodopsin .....	13
IV. Molecular Switches and Determinants of the Active Receptor Conformation .....	20
V. Coupling of Light-Induced Conformational Changes to Transducin Activation .....	22
VI. Structural Modeling of Rhodopsin .....	25
VII. Rhodopsin Mutations as a Cause of Human Disease .....	28
VIII. Conclusions .....	29
References .....	30

Cell Membrane and Chromosome Replication in <i>Bacillus subtilis</i> .....	35
--	----

Noboru Sueoka

I. Introduction .....	36
II. Early Evidence of Membrane—Chromosome Association .....	36
III. Chromosome Initiation Mutants of <i>Bacillus subtilis</i> .....	39
IV. Preparation of Origin—Membrane and Terminus—Membrane Complexes .....	39
V. The <i>dnaB</i> Gene: Critical for Chromosome Initiation and Replication Origin Membrane Attachment .....	40
VI. Chromosomal Membrane Attachment Sites .....	44
VII. <i>In Vitro</i> Initiation of Chromosome Replication Using the Membrane Fraction .....	46
VIII. Membrane Attachment to the Terminus .....	47
IX. Differences in Replication Initiation in Two Systems .....	47
X. Unsolved Questions .....	47
References .....	51

Stability and Structure of Model DNA Triplexes and Quadruplexes and Their Interactions with Small Ligands . . . . .	55
Richard H. Shafer	
I. Triple-Helical Structures . . . . .	57
II. Guanine Quadruplex Structures . . . . .	79
III. Summary . . . . .	91
References . . . . .	91
 On the Physiological Role of Casein Kinase II in <i>Saccharomyces cerevisiae</i> . . . . .	 95
Claiborne V. C. Glover III	
I. General Properties of CKII . . . . .	96
II. <i>Saccharomyces cerevisiae</i> CKII . . . . .	100
III. Potential Functions of CKII in <i>Saccharomyces cerevisiae</i> . . . . .	109
IV. Substrates of CKII in <i>Saccharomyces cerevisiae</i> . . . . .	119
V. The Physiological Role of CKII . . . . .	127
References . . . . .	129
 The Heparan Sulfate—Fibroblast Growth Factor Family: Diversity of Structure and Function . . . . .	 135
Wallace L. McKeehan, Fen Wang, and Mikio Kan	
I. Diversity and Ubiquity of the Fibroblast Growth Factor Family . . . . .	136
II. Diversity of Structure and Function . . . . .	142
III. Structure, Assembly, and Control of the FGF Receptor Complex . . . . .	155
IV. The FGF Family in Liver Growth and Function . . . . .	164
V. The FGF Family in Prostate and Prostate Tumors . . . . .	168
References . . . . .	173
 The Ribosomal Elongation Cycle and the Movement of tRNAs across the Ribosome . . . . .	 177
Knud H. Nierhaus, Heinrich B. Stuhmann, and Dmitri Svergun	
I. Introduction . . . . .	178
II. Functional Aspects: Models of the Elongation Cycle . . . . .	180

III. Structural Aspects: The Shape of Ribosomes and the Localization of tRNAs .....	188
IV. Conclusions .....	201
References .....	202
Life on the Salvage Path: The Deoxynucleoside Kinases of <i>Lactobacillus acidophilus</i> R-26 .....	205
David H. Ives and Seiichiro Ikeda	
I. Historical Background—Nucleotide Metabolism in Lactobacilli .....	207
II. Purification of Deoxynucleoside Kinases from <i>Lactobacillus acidophilus</i> R-26 .....	212
III. Steady-State Kinetics .....	224
IV. Assignment of Subunit Functions .....	230
V. Cloning the Genes for dAK/dCK or dAK/dGK .....	232
VI. dCK and dGK Are Products of the Same Gene .....	238
VII. Probing the Active Site and Subunit Contacts .....	243
VIII. Summary .....	250
References .....	252
Molecular Analyses of Metallothionein Gene Regulation .....	257
Susan L.-A. Samson and Lashitew Gedamu	
I. Overview of Metallothioneins .....	258
II. Metallothionein Gene Regulation .....	259
III. Metallothionein Promotor Organization and Function .....	261
IV. MRE-Binding trans-Acting Factors .....	274
V. Conclusions and Suggestions for Further Research .....	285
References .....	285
Transcriptional Regulation of the Steroid Receptor Genes .....	289
M. Vijay Kumar and Donald J. Tindall	
I. Structure of a Steroid Receptor Gene .....	290
II. Molecular Mechanism of Transcription .....	291
III. Regulation of the Androgen Receptor Gene .....	293
IV. Regulation of the Glucocorticoid Receptor Gene .....	298
V. Regulation of the Progesterone Receptor Gene .....	300

VI. Regulation of the Estrogen Receptor Gene: Characterization of the 5' Flanking Region .....	301
VII. Concluding Remarks .....	303
References .....	304
Molecular Evolution of Snake Toxins: Is the Functional Diversity of Snake Toxins Associated with a Mechanism of Accelerated Evolution? .....	307
M. Ohno, R. Ménez, T. Ogawa, J. M. Danse, Y. Shimohigashi, C. Fromen, F. Ducancel, S. Zinn-Justin, M. H. Le Du, J.-C. Boulain, T. Tamiya, and A. Ménez	
I. About Snake Toxins .....	309
II. Snake Toxins with a Phospholipase A <sub>2</sub> -Type Fold .....	311
III. Snake Toxins with a Three-Fingered Fold .....	339
IV. General Conclusion on the Evolution of Snake Toxins .....	356
References .....	357
INDEX .....	365