Methods in Enzymology

Volume 279

Vitamins and Coenzymes

Part I

EDITED BY

Donald B. McCormick

DEPARTMENT OF BIOCHEMISTRY
EMORY UNIVERSITY
ATLANTA, GEORGIA

John W. Suttie

DEPARTMENT OF BIOCHEMISTRY UNIVERSITY OF WISCONSIN MADISON, WISCONSIN

Conrad Wagner

DEPARTMENT OF BIOCHEMISTRY
VANDERBILT UNIVERSITY AND VA MEDICAL CENTER
NASHVILLE, TENNESSEE



ACADEMIC PRESS

San Diego London Boston New York Sydney Tokyo Toronto

Table of Contents

CONTRIBUTORS TO VOLUME 279		1X
Preface		xv
Volumes in Series		xvii
Section I. Ascorbic	Acid	
Analysis of Ascorbic Acid, Dehydroascorbic Acid, and Transformation Products by Ion-Pairing High-Performance Liquid Chromatography with Multiwavelength Ultraviolet and Electrochemical Detection	Shigeyuki Terada, and	3
2. Gas Chromatographic/Mass Spectrometric Measurement of Ascorbic Acid and Analysis of Ascorbic Acid Degradation in Solution	John C. Deutsch	13
3. Expression of Recombinant L-Gulono-γ-lactone Oxidase	Kunio Yagi and Morimitsu Nishikimi	24
Purification and Characterization of Glutathione- Dependent Dehydroascorbate Reductase from Rat Liver	Emilia Maellaro, Barbara Del Bello, Lidia Sugherini, Mario Comporti, and Alessandro F. Casini	30
 Peptidylglycine α-Amidating Monooxygenase: An Ascorbate-Requiring Enzyme 	Aparna S. Kolhekar, Richard E. Mains, and Betty A. Eipper	35
6. Principles Involved in Formulating Recommendations for Vitamin C Intake: A Paradigm for Water-Soluble Vitamins	Mark Levine, Steven Rumsey, and Yaohui Wang	43
Section II. Thiamin: Phospha	ates and Analogs	
 High-Performance Liquid Chromatography Determination of Total Thiamin in Biological and Food Products 	Véronique Fayol	57
Determination of Thiamin and Its Phosphate Esters in Human Blood, Plasma, and Urine	CHANTAL M. E. TALLAKSEN, THOMAS BØHMER, JAN KARLSEN, AND HELGE BELL	67

9.	in Whole Blood by Reversed-Phase Liquid Chromatography with Precolumn Derivatization	J. GERRITS, H. EIDHOF, J. W. I. BRUNNEKREEFT, AND J. HESSELS	74
10.	High-Performance Liquid Chromatography Determination of Total Thiamin in Human Plasma	Hermann J. Mascher and Christian Kikuta	83
11.	Cyanogen Bromide-Based Assay of Thiamin	DAVID T. WYATT AND RICHARD E. HILLMAN	91
12.	Isotopically Labeled Precursors and Mass Spectrometry in Elucidating Biosynthesis of Pyrimidine Moiety of Thiamin in Saccharomyces cerevisiae	KAZUKO YAMADA, AND	97
13.	Thiamin Transporters in Yeast	Akio Iwashima, Kazuto Nosaka, Hiroshi Nishimura, and Fumio Enjo	· 109
14.	$\label{eq:linear_problem} \emph{In Vitro} \ \ \text{Systems for Studying Thiamin Transport} \\ \text{in Mammals}$	GIANGUIDO RINDI AND UMBERTO LAFORENZA	118
15.	Cofactor Designing in Functional Analysis of Thiamin Diphosphate Enzymes	Alfred Schellenberger, Gerhard Hübner, and Holger Neef	131
16.	Enzymatic Preparation of Derivatives of Thiamin: O - β -Galactosylthiamin and O - α -Glucosylthiamin .		146
	Section III. Lipoic (Thioctic) Ac	id and Derivatives	
17.	High-Performance Liquid Chromatography Methods for Determination of Lipoic and Dihydrolipoic Acid in Human Plasma		159
18.	Analysis of Lipoic Acid by Gas Chromatography with Flame Photometric Detection	Hiroyuki Kataoka, Noritoshi Hirabayashi, and Masami Makita	166
19.	Biosynthesis of Lipoic Acid and Posttranslational Modification with Lipoic Acid in <i>Escherichia coli</i>		176
20.	Lipoate Addition to Acyltransferases of α -Keto Acid Dehydrogenase Complexes and H-Protein of Glycine Cleavage System		184
21.	Lipoylation of Acyltransferase Components of 2-Oxo Acid Dehydrogenase Complexes	Janet Quinn	193
22.	Purification and Properties of Brain Lipoamidase	Jun Oizumi and Kou Hayakawa	202

Section IV. Pantothenic Acid, Coenzyme A, and Derivatives				
23. Measurement of Pantothenic Acid and Hopantenic Acid by Gas Chromatography-Mass Spec- troscopy	Kiyoshi Banno	213		
24. Large-Scale Synthesis of Coenzyme A Esters	RAGHAVAKAIMAL PADMAKUMAR, RUGMINI PADMAKUMAR, AND RUMA BANERJEE	220		
25. Synthesis of Nonhydrolyzable Acyl-Coenzyme A Analogs	Andreas Abend and János Rétey	224		
26. Synthesis, Purification, and Characterization of Dicarboxylylmono-coenzyme A Esters	Morteza Pourfarzam and Kim Bartlett	240		
27. Holo-[Acyl-Carrier-Protein] Synthase of Escherichia coli	RALPH H. LAMBALOT AND CHRISTOPHER T. WALSH	254		
Section V. Biotin and I	Derivatives			
28. Determinations of Biotin in Biological Fluids	DONALD M. MOCK	265		
29. Fluorophore-Linked Assays for High-Performance Liquid Chromatography Postcolumn Reaction Detection of Biotin and Biocytin		275		
30. High-Performance Liquid Chromatographic Determination of Biotin in Biological Materials after Crown Ether-Catalyzed Fluorescence Derivatization with Panacyl Bromide		286		
31. Bioluminescence Competitive Binding Assays for Biotin Based on Photoprotein Aequorin	Sergio Lizano, Sridhar Ramanathan, Agatha Feltus, Allan Witkowski, and Sylvia Daunert	296		
32. Competitive Enzymatic Assay of Biotin	Eric Z. Huang and Yu-Hui Rogers	304		
33. Competitive Agglutination Assay of Biotin	ERIC Z. HUANG	308		
34. Competitive Enzyme-Linked Immunosorbent Assay for Biotin	David Shiuan, Chwen-Huey Wu, Yuo-Sheng Chang, and Re-Jiin Chang	321		
35. Biotin Synthesis in Higher Plants	PIERRE BALDET, CLAUDE ALBAN, AND ROLAND DOUCE	327		

36.	Analysis of Biotin Biosynthesis Pathway in Coryne- form Bacteria: <i>Brevibacterium flavum</i>	Kazuhisa Hatakeyama, Miki Kobayashi, and Hideaki Yukawa	339
37.	Purification and Characterization of Biotin Synthases	Dennis H. Flint and Ronda M. Allen	349
38.	Biotin Synthase of Bacillus sphaericus	B. Tse Sum Bui and A. Marquet	356
39.	Escherichia coli Repressor of Biotin Biosynthesis	DOROTHY BECKETT AND BRIAN W. MATTHEWS	362
40.	Structure of ATP-Dependent Carboxylase, Dethiobiotin Synthase	Gunter Schneider and Ylva Lindqvist	376
41.	Purification and Properties of Bovine and Human Holocarboxylase Synthetases	Yoichi Suzuki and Kuniaki Narisawa	386
42.	Biotin Uptake in Cultured Cell Lines	DAVID L. DYER AND HAMID M. SAID	. 393
43.	Biotinyl-5'-Adenylate Synthesis Catalyzed by Escherichia coli Repressor of Biotin Biosynthesis	YAN XU AND DOROTHY BECKETT	405
44.	Biotinidase in Serum and Tissues	JEANNE HYMES, KRISTIN FLEISCHHAUER, AND BARRY WOLF	422
45.	Determination of Biotinidase Activity with Biotinyl-6-aminoquinoline as Substrate	Kou Hayakawa, Kazuyuki Yoshikawa, Jun Oizumi, and Kunio Yamauchi	435
46.	Determination of Serum Biotinidase Activity with Radioiodinated Biotinylamide Analogs	EVANGELIA LIVANIOU, SOTIRIS E. KAKABAKOS, STAVROS A. EVANGELATOS, GREGORY P. EVANGELATOS, AND DIONYSSIS S. ITHAKISSIOS	442
47.	Preparation and Properties of Anti-Biotin Anti-bodies	FORTÜNE KOHEN, HASAN BAGCI, GEOFF BARNARD, EDWARD A. BAYER, BATYA GAYER, DANIEL G. SCHINDLER, ELENA AINBINDER, AND MEIR WILCHEK	451
48.	Competitive Binding Assays for Biotin-Binding Proteins	HAROLD B. WHITE III	464
Αu	THOR INDEX		467
Stri	RIECT INDEX		489