Extracellular Enzymes of Microorganisms

Extracellular Enzymes of Microorganisms

Edited by

J. Chaloupka

and

V. Krumphanzl

*Institute of Microbiology
Czechoslovak Academy of Sciences
Prague, Czechoslovakia*

Plenum Press • New York and London

Library of Congress Cataloging in Publication Data

Extracellular enzymes of microorganisms.

Includes bibliographical references and index.

1. Extracellular enzymes—Congresses. I. Chaloupka, Jiri. II. Krumphanzl, V. (Václav)
QR90.E98 1987 576/.11925 87-14102

ISBN-13: 978-1-4684-1276-5 e-ISBN-13: 978-1-4684-1274-1

DOI: 10.1007/978-1-4684-1274-1

Proceeding of an international symposium on Extracellular Enzymes of Microorganisms,
held September 1-5, 1986, at Bechyne Castle, Czechoslovakia

© 1987 Plenum Press, New York

Softcover reprint of the hardcover 1st edition 1987

A Division of Plenum Publishing Corporation

233 Spring Street, New York, N.Y. 10013

All rights reserved

No part of this book may be reproduced, stored in a retrieval system, or transmitted
in any form or by any means, electronic, mechanical, photocopying, microfilming,
recording, or otherwise, without written permission from the Publisher

PREFACE

Czechoslovak Society for Microbiology and Institute of Microbiology of the Czechoslovak Academy of Sciences organized an international symposium "Extracellular enzymes of microorganisms" in September 1986. The symposium took place in a small South-Bohemian town Bechyně and this book includes the main contributions presented at the meeting.

The study of microbial extracellular enzymes is a rapidly developing field of science, which is important both from practical and theoretical point of view. On one hand, microbial enzymes are nowadays broadly used in various branches of industry, medicine and agriculture, on the other hand, their study contributes substantially to our knowledge of problems of protein secretion, regulation of protein synthesis as related with growth and cytodifferentiation and - last but not least - it brings data important for the elucidation of evolutionary pathways. Microbial enzymology also represents a bordering area between different scientific disciplines such as microbiology, biochemistry, genetics, biotechnology and other and demonstrates that only their integration brings about a substantial progress in the development of our understanding of biological processes.

The symposium in Bechyně was a small one but the contributions of scientists from 15 different countries have brought information on recent approaches and developments in this field. I hope that this meeting was useful in facilitating closer contacts between specialists from different scientific areas and also contributed to a better understanding among people from different parts of the world.

Prof. Vladimír Krumphanzl
Corresponding Member of the Czechoslovak
Academy of Sciences, Director of the
Institute of Microbiology and President
of the Czechoslovak Society for
Microbiology

CONTENTS

PART I GENERAL ASPECTS OF ENZYME FORMATION

Regulation of Extracellular Enzyme Synthesis F.G. Priest	3
A Comparison of the Characteristics of Extracellular Protein Secretion by a Gram-positive and Gram-negative Bacterium G. Coleman, B. Abbas Ali, J. Sutherland, F. Fyfe, and A. Finley	13
Modelling of Physiological Control of Production of Hydrolytic Enzymes J. Votruba, J. Pazlarová, and J. Chaloupka	23
Cloning, Sequencing, and Expression in <u>E. coli</u> and <u>B. subtilis</u> of a Staphylokinase Gene D. Behnke, D. Gerlach, and R. Kraft	29
Effect of Cerulenin on <u>Bacillus subtilis</u> 168 S. Baykousheva, N. Cherepova, and K. Ilieva	39
Production of Extracellular Enzymes by Immobilized Microorganisms H. Ruttloff, D. Körner, and A. Leuchtenberger	43
New Gene-transfer Systems for <u>Aspergillus niger</u> I. Mattern, W. van Hartingsveldt, C. van Zeijl, P. Punt, R. Oliver, M. Dingemanse, P. Pouwels, and C. van den Hondel	51

PART II PROTEINASES AND PEPTIDASES

Structure of Thermitase, a Thermostable Serine Proteinase from <u>Thermoactinomyces vulgaris</u> , and Its Relationship with Subtilisin-type Proteinases M. Baudys, B. Meloun, V. Kostka, G. Hausdord, C. Frömmel, and W.E. Höhne	59
Regulation of Synthesis of an Extracellular Proteinase in Growing and Sporulating <u>Bacillus megaterium</u> J. Chaloupka, H. Kucerová, M. Strnadová, L. Váchová, M. Dvůřáková, J. Pazlarová, J. Moravcová, J. Votruba, and K. Vanatalu	73

Stimulation of a Proteinase Synthesis in <u>Bacillus megaterium</u> by Netropsin H. Kucerová and J. Chaloupka	85
Extracellular Protease Production by <u>B. amyloliquefaciens</u> M.J. Bawden, T. Litjens, T.R. Hercus, B.K. May, and W.H. Elliott	89
Formation and Properties of a <u>Bacillus subtilis</u> Protein Protease Inhibitor A.I. Aronson	93
Use of Highly Porous Bead Cellulose with Attached Bacitracin for Affinity Chromatography of a Microbial Proteinase J. Turková, M.J. Benes, M. Kühn, V.M. Stepanov, and L.A. Lyublinskaya	99
Saccharomyces Cerevisiae Secretes X-prolyl-dipeptidyl(amino)- peptidase. Electron Cytochemical Study with Statistical Evaluation J. Vorísek and K. Vanatalu	105

PART III AMYLASES

Production of α -amylase by <u>Bacillus stearothermophilus</u> (pAT9) and Gene Manipulation to Improve the Stability of the Recombinant Plasmid S. Aiba, Y. Monden, M. Ohnishi, M. Zhang, and J. Koizumi	113
Thermostable Alpha Amylase of <u>Bacillus stearothermophilus</u> : Cloning, Expression and Secretion by <u>Escherichia coli</u> I. Suominen, M. Karp, J. Lautamo, J. Knowles, and P. Mäntsälä	129
Exocellular Protein and α -amylase Secretion in <u>Bacillus</u> <u>subtilis</u> J. Pazlarová	139
Extracellular Amylase from the Thermophilic Fungus <u>Thermomyces</u> <u>lanuginosus</u> B. Jensen, J. Olsen, and K. Allermann	143

PART IV CELLULOLYTIC ENZYMES

Analysis of Multi-form Cellulases of <u>Sporotrichum cellulophilum</u> S. Kinoshita, M. Tamaki, J. Kim, A. Svarachorn, A. Araujo, and H. Taguchi	149
Cellulase Secretion from a Hypercellulolytic Mutant of <u>Trichoderma reesei</u> RUT-C30 B.K. Ghosh, A. Ghosh, and A. Salnar	157
Production of β -glucosidase in <u>Aspergillus terreus</u> ATG-5 O. Volfová and E. Kyslíková	173

Localization of β -D-glucosidase Activity in <u>Streptomyces granaticolor</u> ETH 7347 M. Jíresová, Z. Dobrová, J. Janecek, and J. Náprstek	181
Differentiation of Glycanases of Microbial Cellulolytic Systems using Chromogenic and Fluorogenic Substrates P. Biely	187
PART V OTHER ENZYMES	
Biosynthesis and Properties of Extracellular Pullulanase from <u>Bacillus stearothermophilus</u> G-82 M.S. Kambourova and E.I. Emanuilova	195
Continuous Production of the Extracellular Hydrolytic System by Immobilized Mycelia of <u>Alternaria tenuissima</u> V. Jirků	201
Export of Enzymes into Culture Medium by Yeasts of <u>Saccharomyces</u> genus A.B. Tsiomenko, V.V. Lupashin, and I.S. Kulaev	205
Index	209