ADVANCES IN PHYSIOLOGICAL SCIENCES

Volume 12

Nutrition, Digestion, Metabolism

Editors
T. GÁTI
L. G. SZOLLÁR
Gy. UNGVÁRY

PERGAMON PRESS
AKADÉMIAI KIADÓ

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Proceedings of the 28th International Congress of Physiological Sciences
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Pergamon Press is the sole distributor for all countries, with the exception of the socialist countries.

HUNGARY	Akadémiai Kiadó, Budapest, Alkotmány u. 21. 1054 Hungary
U.K.	Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, England
U.S.A.	Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, New York 10523, U.S.A.
CANADA	Pergamon of Canada, Suite 104, 150 Consumers Road, Willowdale, Ontario M2J 1P9, Canada
AUSTRALIA	Pergamon Press (Aust.) Pty. Ltd., P.O. Box 544, Potts Point, N.S.W. 2011, Australia
FRANCE	Pergamon Press SARL, 24 rue des Ecoles, 75240 Paris, Cedex 05, France
FEDERAL REPUBLIC OF GERMANY	Pergamon Press GmbH, 6242 Kronberg-Taunus, Hammerweg 6, Federal Republic of Germany

British Library Cataloguing in Publication Data

International Congress of Physiological Sciences
(28th : 1980 : Budapest)
Advances in physiological sciences
Vol. 12: Nutrition, digestion, metabolism
1. Physiology - Congresses
I. Title II. Gáti, T. III. Szollár, L. G.
IV. Ungváry, Gy.
591.1 QP1 80-42185

Pergamon Press	ISBN 0 08 026407 7 (Series) ISBN 0 08 026825 0 (Volume)
Akadémiai Kiadó	ISBN 963 05 2691 3 (Series) ISBN 963 05 2738 3 (Volume)

In order to make this volume available as economically and as rapidly as possible the authors' typescripts have been reproduced in their original forms. This method unfortunately has its typographical limitations but it is hoped that they in no way distract the reader.

Printed in Hungary

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(Each volume is available separately.)

FOREWORD

This volume is one of the series published by Akadémiai Kiadó, the Publishing House of the Hungarian Academy of Sciences in coedition with Pergamon Press, containing the proceedings of the symposia of the 28th International Congress of Physiology held in Budapest between 13 and 19 July, 1980. In view of the diversity of the material and the "taxonomic" difficulties encountered whenever an attempt is made to put the various subdisciplines and major themes of modern physiology into the semblance of some systematic order, the organizers of the Congress had to settle for 14 sections and for 127 symposia, with a considerable number of free communications presented either orally or as posters.

The Congress could boast of an unusually bright galaxy of top names among the invited lecturers and participants and, naturally, the ideal would have been to include all the invited lectures and symposia papers into the volumes. We are most grateful for all the material received and truly regret that a fraction of the manuscripts were not submitted in time. We were forced to set rigid deadlines, and top priority was given to speedy publication even at the price of sacrifices and compromises. It will be for the readers to judge whether or not such an editorial policy is justifiable, for we strongly believe that the value of congress proceedings declines proportionally with the gap between the time of the meeting and the date of publication. For the same reason, instead of giving exact transcriptions of the discussions, we had to rely on the introductions of the Symposia Chairmen who knew the material beforehand and on their concluding remarks summing up the highlights of the discussions.

Evidently, such publications cannot and should not be compared with papers that have gone through the ordinary scrupulous editorial process of the international periodicals with their strict reviewing policy and high rejection rates or suggestions for major changes. However, it may be refreshing to read these more spontaneous presentations written without having to watch the "shibboleths" of the scientific establishment.

September 1, 1980

J. Szentágothai

President of the
Hungarian Academy of Sciences

PREFACE

The 28th Congress of Physiological Sciences was held in Budapest amid a greater interest than ever on previous similar occasions.

In the Nutrition-Digestion-Metabolism section alone 268 papers were presented including two invited lectures.

In the frames of nine symposiums 58 invited and 30 free presentations were delivered. In the free communication part 69 oral communications and 109 posters were presented.

From all this material this volume contains the two invited lectures and the subject matter of the following eight symposiums:

I. Vitamins and trace elements
II. Role of cyclic nucleotides in stimulus–secretion coupling of exocrine glands
III. Physiological components of the gastric mucosal barrier and their role in mucosal defense
IV. Motility in control of gastric emptying
V. Intestinal polypeptides and peptidergic nerves
VI. Molecular changes during metabolic processes of gastrointestinal peptide hormones
VII. Factors involved in the integrated mechanism of intestinal absorption
VIII. Lipoprotein metabolism, apolipoproteins, lipid constituents

The Lecture Halls were filled to capacity. In general there was a lively discussion and a useful exchange of experiences after the lectures.

The presentations of the Poster Section were also followed with great interest. Unfortunately – because of technical reasons – we are not able to publish them.

We would like to thank to all the authors of the manuscripts, especially to Prof. Bonfils and Prof. Ugolev invited lecturers as well as to Prof. R. Buzina, Prof. J. Christophe, Prof. K. J. Öbrink, Prof. E. E. Daniel, Prof. B. Uvnäs, Prof. V. Varró, Prof. T. Z. Csaky, and Prof. P. S. Roheim; furthermore to Dr. E. Morava, Dr. Gy. Mózsik, Prof. E. Atanassova, Dr. J. Szolcsányi, Dr. L. Varga, Dr. T. Várkonyi and Dr. L. G. Szollár for the excellent organization of the symposia.

We also thank to Professors J. A. Young and R. M. Case for organizing the 9th Symposium titled: "Mechanism of Gastrointestinal Exocrine Secretion" the material of which will appear elsewhere.

We would like to express our gratitude to the Publishing House of the Hungarian Academy of Sciences for its valuable work.

Budapest, October 1980

Prof. T. Gáti
Chairman of the Nutrition-
Digestion-Metabolism section

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Adv. Physiol. Sci. Vol. 12. Nutrition, Digestion, Metabolism
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HORMONAL RECEPTORS IN THE CELL REGULATION OF DIGESTIVE FUNCTIONS

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The main digestive functions can be activated or inhibited by hormones secreted by the GEP system. Strong evidence has been presented for action of these hormones on: 1) exocrine secretions (water and electrolytes, proteins and glycoproteins); 2) motor activities (tonic and propulsive), 3) function of "survival", i.e. tissue metabolism and cell renewal. Less documented and still controversial are the possible effects on other endocrine secretions and on absorption, mainly by transcellular pathway.

But as indicated in table I, there is so far no strict identities

Table I

HORMONAL DEPENDENCE OF DIGESTIVE FUNCTIONS

DIGESTIVE FUNCTIONS		HORMONAL RECEPTOR	HORM. STIMUL. &/or INHIB.
Exocrine secretions	Water, electrolytes	+	+
	Proteins (enzymes)	+	+
	Glycoproteins	+	+
Endocrine secretions		-	?
Motor activity	Tonic (sphincter)	+	+
	Propulsive	-	+
Absorption & intestinal transepithelial transport		+	?
Survival of cells	Metabolism	?.	+
	Renewal	+	+

Comparison between evidences for hormonal receptor and for physiological actions at the organ level (-: no evidence so far; ?: no direct evidence).

between tissues undergoing hormonal influences and tissues (or cells) evidencing receptor activation and/or inhibition by the same hormones.

The concept of hormonal receptor is however highly stimulating; it particularly implies the cellular events resulting from hormone-tissue interactions, that could be considered as representative of function(s) (3). This could lead to controversial results when compared with organ physiology, all the more that in experimental approaches concerned with these effects, problems arise from the multiplicity of the GEP hormones that may interfere on a same target organ and the capability for one hormone of triggering simultaneously various physiological activities. A prerequisit for optimizing reliability and reproducibility of studies appears thus to minimize or suppress the other parameters of regulation, i.e. nervous influx, feed-back phenomena driven by the digestive secretions, blood supply.

I. FUNCTIONAL MODELS AT THE CELL LEVELS

Ideally, receptor studies should not only encompass binding parameters, but extend to specific functional activities: technically the methods used taken alone, are well defined and rather sophisticated; however, for an ideal demonstration, four criteria should be fulfilled. 1) Homogeneity of the tissue, i.e. constituted of one cell type (eventually equipped with more than one receptor type). 2) Specificity of hormone binding to receptor; this technically needs radiolabed hormones with full biological activities. 3) Characterization and measurement of intracellular messenger activities, in connection with 2 and 4. 4) Determination of the most relevant activity of the cell for assessing the functional response. These criteria which cover the succession of events intervening in the cell regulation of digestive functions are not often simultaneously obtained (table II).

Table II. CRITERIA FOR RECEPTOR STUDIES

CRITERIA	REQUIREMENTS
1. Homogeneity of the tissue	Isolated cells Enrichment in one cell type Group of cells with a predominant functional activity
2. Specificity of the binding	Radiolabeled hormones with full biological activity Distinction of various types of sites
3. Intracellular messenger activities	cAMP, cGMP, Ca^{++}, protein kinases
4. Functional responses	Specific and/or relevant for organ physiology
5. Competence within the E.Ds. obtained from 2., 3., 4.	