METHODS OF HORMONE RADIOIMMUNOASSAY

EDITED BY

Bernard M. Jaffe, M.D.

Harold R. Behrman, Ph.D.



1977年9月19日

METHODS OF HORMONE RADIOIMMUNOASSAY

EDITED BY

Bernard M. Jaffe, M.D.

Department of Surgery
Washington University School of Medicine
St. Louis, Missouri

Harold R. Behrman, Ph.D.

Laboratory of Human Reproduction and Reproductive Biology and Department of Physiology Harvard Medical School Boston, Massachusetts



COPYRIGHT © 1974, BY ACADEMIC PRESS, INC. ALL RIGHTS RESERVED. NO PART OF THIS PUBLICATION MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPY, RECORDING, OR ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE PUBLISHER.

ACADEMIC PRESS, INC. 111 Fifth Avenue, New York, New York 10003

United Kingdom Edition published by ACADEMIC PRESS, INC. (LONDON) LTD. 24/28 Oval Road, London NW1

Library of Congress Cataloging in Publication Data

Jaffe, Bernard M Date Methods of hormone radioimmunoassay.

Includes bibliographies.

Hormones-Analysis. 2. Radioimmunoassay.

Behrman, Harold R., joint author. [DNLM: 1. Hormones-Analysis.

WK102 J23m 19741

OP571.J33 ISBN 0-12-379250-9

612'.405'0154582

Title. II.

Radioimmunoassay

73-18980

PRINTED IN THE UNITED STATES OF AMERICA

List of Contributors

Numbers in parentheses indicate the pages on which the authors' contributions begin.

- GLEN ARTH (347) Department of Synthetic Chemical Research, Merck Sharp and Dohme Research Laboratories, Rahway, New Jersey
- FREDERICK J. AULETTA * (359), Laboratory of Gynecologic Endocrinology, Department of Obstetrics and Gynecology, Yale University School of Medicine, New Haven, Connecticut
- RAHIM M. BASSIRI † (37), Department of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania
- HAROLD R. BEHRMAN ‡ (19, 333, 347), Laboratory of Human Reproduction and Reproductive Biology and Department of Physiology, Harvard Medical School, Boston, Massachusetts
- GUENTHER BODEN (275), Department of Medicine, General Clinical Research Center, Temple University Health Sciences Center, Philadelphia, Pennsylvania
- BURTON V. CALDWELL (333, 359), Laboratory of Gynecologic Endocrinology, Department of Obstetrics and Gynecology, Yale University School of Medicine, New Haven, Connecticut
- LEONARD J. DEFTOS (231), Department of Medicine, University of California, San Diego School of Medicine and Veterans Administration Hospital, La Jolla, California
- GERALD R. FALOONA (317), Department of Biochemistry, The University of Texas Southwestern Medical School at Dallas, and Veterans Administration Hospital, Dallas, Texas
- ARTHUR E. FREEDLENDER (455), Department of Pharmacology, University of Wisconsin Medical School, Madison, Wisconsin
- FREJ FYHRQUIST (455), Minerva Institute for Medical Research, Helsinki, Finland
- P. H. GALE (45), Department of Reproductive Biology, Merck Institute for Therapeutic Research, Merck Sharp and Dohme Research Laboratories, Rahway, New Jersey
- * Present address: Laboratory of Gynecic Endocrinology, Department of Gynecology and Obstetrics, Michael Reese Hospital and Medical Center, Chicago, Illinois
 - † Present address: Veterans Administration Hospital, Lebanon, Pennsylvania
- ‡ Present address: Department of Reproductive Biology, Merck Institute for Therapeutic Research, Merck Sharp and Dohme Research Laboratories, Rahway, New Jersey

- SEYMOUR M. GLICK (173, 187), Department of Medicine, State University of New York, Downstate Medical Center, and Coney Island Hospital, Brooklyn, New York
- THEODORE L. GOODFRIEND (439), Departments of Pharmacology and Internal Medicine, University of Wisconsin School of Medicine, Madison, Wisconsin
- GERALD L. HAMILTON (359), Laboratory of Gynecologic Endocrinology, Department of Obstetrics and Gynecology, Yale University School of Medicine, New Haven, Connecticut
- STUART HANDWERGER (417, 427), Department of Pediatrics, Duke University Medical Center, Durham, North Carolina
- MARTIN HICHENS (45, 347), Department of Reproductive Biology, Merck Institute for Therapeutic Research, Merck Sharp and Dohme Research Laboratories, Rahway, New Jersey
- CHARLES S. HOLLANDER (215), The Endocrine Division, Department of Medicine, New York University School of Medicine, New York, New York
- HENDRIK J. G. HOLLEMANS (455), Division of Endocrinology, Department of Medicine, University Hospital, Wilhelmina Gasthuis, Amsterdam,
 The Netherlands
- LAURENCE S. JACOBS (87), Metabolism Division, Department of Internal Medicine, Washington University School of Medicine, St. Louis, Missouri
- BERNARD M. JAFFE (19, 251), Department of Surgery, Washington University School of Medicine, St. Louis, Missouri
- AVIR KAGAN (173, 187), Department of Radiology, State University of New York, Downstate Medical Center, and Coney Island Hospital, Brooklyn, New York
- N. R. MOUDGAL (57), Department of Biochemistry, Indian Institute of Science, Bangalore, India
- CHARLES E. ODYA (439), Department of Pharmacology, University of Wisconsin School of Medicine, Madison, Wisconsin
- GAYLE P. ORCZYK * (333, 347), Laboratory of Human Reproduction and Reproductive Biology, Harvard Medical School, Boston, Massachusetts
- DAVID N. ORTH (125), Department of Medicine, Cancer Research and Treatment Center, Vanderbilt University School of Medicine, Nashville, Tennessee
- GLENN T. PEAKE (103), Departments of Medicine and Pediatrics, University of New Mexico School of Medicine, Albuquerque, New Mexico
 - H. G. MADHWA RAJ (57), Department of Anatomy and Laboratory of Human Reproduction and Reproductive Biology, Harvard Medical School, Boston, Massachusetts
- * Present address: Department of Reproductive Biology, Merck Institute for Therapeutic Research, Merck Sharp and Dohme Research Laboratories, Rahway, New Jersey

- A. H. RUBENSTEIN (289), Department of Medicine, Pritzker School of Medicine, University of Chicago, Chicago, Illinois
- H. SCHWAM (45), Merck Institute for Therapeutic Research, Merck Sharp and Dohme Research Laboratories, Rahway, New Jersey
- LOUIS SHENKMAN (215), The Endocrine Division, Department of Medicine, New York University School of Medicine, New York, New York
- LOUIS M. SHERWOOD (417, 427), Department of Medicine, Michael Reese Hospital, and Pritzker School of Medicine, University of Chicago, Chicago, Illinois
- J. I. STARR * (289), Department of Medicine, Pritzker School of Medicine, University of Chicago, Chicago, Illinois
- ALTON L. STEINER † (1), Department of Medicine, Albany Medical College, Albany, New York
- ARMEN H. TASHJIAN, JR. (199), Laboratory of Pharmacology, Harvard School of Dental Medicine, and Department of Pharmacology, Harvard Medical School, Boston, Massachusetts
- LEE TYREY (427), Department of Obstetrics and Gynecology and Department of Anatomy, Duke University Medical Center, Durham, North Carolina
- RICHARD H. UNDERWOOD (371), Endocrine Metabolic Unit and Department of Medicine, Peter Bent Brigham Hospital, and Harvard Medical School, Boston, Massachusetts
- ROGER H. UNGER (317), Department of Internal Medicine, The University of Texas Southwestern Medical School at Dallas, and Veterans Administration Hospital, Dallas, Texas
- ROBERT D. UTIGER (37, 161), Department of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania
- P. VECSEI (393), Department of Pharmacology, University of Heidelberg, Heidelberg, Germany
- EDWARD F. VOELKEL (199), Laboratory of Pharmacology, Harvard School of Dental Medicine, and Department of Pharmacology, Harvard Medical School, Boston, Massachusetts
- JOHN H. WALSH (251), Department of Medicine, University of California at Los Angeles, School of Medicine, and Wadsworth Veterans Administration Hospital, Los Angeles, California
- GORDON H. WILLIAMS (371), Endocrine Metabolic Unit and Department of Medicine, Peter Bent Brigham Hospital, and Harvard Medical School, Boston, Massachusetts
- * Present address: Worcester Diabetes Metabolic Associates, Worcester, Massachusetts
- † Present address: Department of Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina

Radioimmunoassay systems have been developed to quantitate virtually every hormone available in pure form. Utilizing the potent tools of radioactivity and immunology, these exquisitely sensitive techniques have revolutionized the fields of endocrine physiology and clinical endocrinology. It is therefore remarkable that despite their widespread use, there has been, until now, no one volume available which describes all of the current techniques. This book is comprised of chapters in which methods for measuring hormones by radioimmunoassay are described. Each paper was written by an authority chosen particularly because of his contribution to the radioimmunoassay method. To are managed the mile below the learner to learner

Although the absence of such a book might alone serve to justify its need at this time, it was the expanded use of radioimmunoassays that prompted its preparation. For example, it is now becoming increasingly obvious that measuring single hormone responses to stimuli is gross oversimplification. Endocrine responses are coordinated activities of multiple hormones and must be studied as such. Thus, there is a tendency now for the utilization of multiple radioimmunoassay systems for the simultaneous evaluation of several hormones. In addition, diagnostic techniques are being refined to the degree that clinical laboratories are starting to use radioimmunoassays. By describing what we think are the best techniques for each hormone, we hope to direct such interests to effective completion.

Although specific problems are associated with specific immunoassays, it must be obvious that there is some overlap. By compiling a series of discussions of the successful management of a variety of problems, we hope to present a wealth of information which might be utilized to solve problems in related areas.

We do not anticipate nor would we recommend that a description of methodology, no matter how detailed, replace laboratory experience. We hope, however, that this volume will point out the problems and advantages of each system, aid in selection of techniques, and serve as a source of reference material. material.

Bernard M. Jaffe

Harold R. Behrman

Contents

xvii

Prefa	Luceinizing Hormone Releasing Factor	
	Intracellular Messenge	ers
12	Cyclic AMP and Cyclic GMP	
	ALTON L. STEINER	
I. II. III. IV.	Introduction Method of Radioimmunoassay Problems Related to Measuring cAMP and cGMP Comparison of Radioimmunoassay with Other Cyclic Nucleotide Assay Methods References	3 5 14 15 15
2	Prostaglandins E, A, and F BERNARD M. JAFFE AND HAROLD R. BEHRMAN	
I. II. III. IV.	Introduction Method of Radioimmunoassay Evaluation of the Radioimmunoassay Measurement of Prostaglandin Metabolites References	19 20 28 31 32

Assay and Inactivation of TRH in Biologic Fluids

List of Contributors

viii

Hypothalamic Hormones

3	Thyrotropin-Releasing Hormone	2
	RAHIM M. BASSIRI AND ROBERT D. UTIGER	
I. II. III.	Introduction Method of Radioimmunoassay Assay and Inactivation of TRH in Biologic Fluids References	37 38 42 43
4	Luteinizing Hormone-Releasing Factor	
	M. HICHENS, P. H. GALE, AND H. SCHWAM	
I. II. III.	Introduction Radioimmunoassay Technique LH-RF in Blood Note References	45 46 52 54 54
	Pituitary Hormon	es
	Pituitary Hormon Froblems Related to Measuring eAMP and coMP Comparison of Radioimmunoassay with Other Cyclic	es
14	Pituitary Hormon Pituitary Gonadotropins	es
	Pituitary Hormon Froblems Related to Measuring eAMP and coMP Comparison of Radioimmunoassay with Other Cyclic	57 58 80 81

CONT	CENTS	ix
II. III. IV. V.	Newer Bioassay Methods Radioimmunoassays Heterologous Radioimmunoassay New Developments References	88 89 92 100 100
7	Growth Hormone	
	GLENN T. PEAKE	
I. III. IV. V. VI.	Introduction Preparation of Buffers and Columns for HGH Assay Technique of Radioimmunoassay Cross-Reactivity with Other Hormones Measurements of the Hormone in Blood Measurements of the Hormone in Tissue and Urine References	
8	Adrenocorticotropic Hormone and Melanocyte Stimulating Hormone (ACTH and MSH)	
	DAVID N. ORTH	
I. II. III. IV. V.	Introduction Methods of Radioimmunoassay Problems Other Radioimmunoassays Recent Developments References	125 131 153 153 154 155
9	Thyrotropin ANAISOV A GRANGE	
II. III.	ROBERT D. UTIGER Introduction Method of Radioimmunoassay Other Immunoassays References	161 162 169

10	Oxytocin abortism vassessia rework	
	AVIR KAGAN AND SEYMOUR M. GLICK	
I.	T 1 1 1 1 1 TYP 1	
·II.	Methods of Radioimmunoassay	17
III.	Sensitivity, Cross-Reactivity, and Validation	180
IV.	Oxytocin in Plasma	18
V.	Discussion Supremental Marcon	18:
	References	18
	Vasopressin vasa communica a la supinda al	
	SEYMOUR M. GLICK AND AVIR KAGAN	
LS	Introduction and History and an amount of the amount was all	18'
	Methods of Radioimmunoassay	
III.	Sensitivity, Cross-Reactivity, and Validation	19
IV.	Vasopressin in Plasma	192
V.		10
	Deferences	10
	References (HZM and MZH) suomnot guitalinmid	
	Thyrola and Taramyrola Hormo	nes
12	Human Calcitonin: Application of Affinity	
1	Chromatography	
	ARMEN H. TASHJIAN, JR., AND EDWARD F. VOELKEL	
I.	Introduction STORT G TRABOA	199
II.	Method of Radioimmunoassay	200
III.		203
IV.	.Concentrations of Calcitonin in Human Serum and Urine	200
V.	Recent Developments: Affinity Chromatography	20'
173	References	21:

试读结束, 需要全本PDF请购买 www.ertongbook.com

CONTENTS

13	Thyroxine and Triiodothyronine	
	CHARLES S. HOLLANDER AND LOUIS SHENKMAN	
Q.I.	Introduction	215
II.	Methods of Assay	216
III.	Comparison of Various T3 and T4 Radioimmunoassay	222
IV.	Techniques and Results Physiologic Considerations	222
V.	Summary and Conclusions	227
980	References and additional additional and additional additi	228
.14	Parathyroid Hormone	
	LEONARD J. DEFTOS	
I.	Introduction ability 9-3 manuff not gazzanamanigha A	231
II.	Methodology	232
III.	Problems in Assay Methodology	241
IV.	A	243
	Telefology	245
	Hormones of the Gastrointestinal Tre	act
317 318 320	Hormones of the Gastrointestinal Tra	
	Hormones of the Gastrointestinal Transfer and Related Peptides	
317 318 320	Hormones of the Gastrointestinal Transfer and Related Peptides	
716 818 008 15 1.	Hormones of the Gastrointestinal Transfer and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction	
15 I. II.	Hormones of the Gastrointestinal Transfer and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction Methods of Radioimmunoassay	251 252
15 I. II. III.	Hormones of the Gastrointestinal Transfer and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction Methods of Radioimmunoassay Evaluation of Radioimmunoassay Data	251 252 261
15 I. II. III. IV.	Hormones of the Gastrointestinal Transfer and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction Methods of Radioimmunoassay Evaluation of Radioimmunoassay Data Radioimmunoassay for Cholecystokinin-Pancreozymin	251 252 261 265
15 I. II. III.	Hormones of the Gastrointestinal Transfer and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction Methods of Radioimmunoassay Evaluation of Radioimmunoassay Data Radioimmunoassay for Cholecystokinin-Pancreozymin Measurement of Gastrin Tetrapeptide	251 252 261 265 268
15 I. II. III. IV.	Hormones of the Gastrointestinal Transfer and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction Methods of Radioimmunoassay Evaluation of Radioimmunoassay Data Radioimmunoassay for Cholecystokinin-Pancreozymin	251 252 261 265
15 I. II. III. IV.	Hormones of the Gastrointestinal Transfer and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction Methods of Radioimmunoassay Evaluation of Radioimmunoassay Data Radioimmunoassay for Cholecystokinin-Pancreozymin Measurement of Gastrin Tetrapeptide	251 252 261 265 268
I. III. IV. V.	Hormones of the Gastrointestinal Transaction and Related Peptides BERNARD M. JAFFE AND JOHN H. WALSH Introduction Methods of Radioimmunoassay Evaluation of Radioimmunoassay Data Radioimmunoassay for Cholecystokinin-Pancreozymin Measurement of Gastrin Tetrapeptide References	251 252 261 265 268 270

xii CONTENTS

IV.	Methods of Radioimmunoassay Evaluation and Validation of the Method Problems Other Radioimmunoassay	276 284 286
215 216	Other Radioimmunoassays References References VEZZA 10 2borbaM	287
17	Insulin, Proinsulin, and C-Peptide	
	J. I. STARR AND A. H. RUBENSTEIN	
I.	Introduction	289
II.	Methods of Radioimmunoassay	290
III.	Verification of Assay Data	305
IV. V.	Problems Related to the Measurement of Insulin and Proinsulin Other Radioimmunoassays Available	307
VI.	Padioimmunossay for Human C Pontido	310
000	References vagoloborisM	311
18	Glucagon	
	anning a million and an investment	
	GERALD R. FALOONA AND ROGER H. UNGER	3
I.	GERALD R. FALOONA AND ROGER H. UNGER	317
I. II.	Introduction Special Problems in the Measurement of Plasma Glucagon	317
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay	317
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay	317 318 320
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay	317
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay Results of Glucagon Radioimmunoassay References	317 318 320 326
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay Results of Glucagon Radioimmunoassay References	317 318 320 326
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay Results of Glucagon Radioimmunoassay References	317 318 320 326 327
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay Results of Glucagon Radioimmunoassay References	317 318 320 326 327
II.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay Results of Glucagon Radioimmunoassay References Gonadal and Adrenal Steroid Hormon	317 318 320 326 327
II. IV.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay Results of Glucagon Radioimmunoassay References Gonadal and Adrenal Steroid Hormon	317 318 320 326 327
II. IV.	Introduction Special Problems in the Measurement of Plasma Glucagon by Radioimmunoassay Methods of Radioimmunoassay Results of Glucagon Radioimmunoassay References Gonadal and Adrenal Steroid Hormon Estrogens: Estradiol, Estrone, and Estriol GAYLE P. ORCZYK, BURTON V. CALDWELL,	317 318 320 326 327

CONT	TENTS	xiii
III. IV.	Methods for Radioimmunoassay Characteristics of the Radioimmunoassay References	335 342 343
393	Introduction	
20	Progesterone yeasonmunioibal to about M	
	GAYLE P. ORCZYK, MARTIN HICHENS, GLEN ARTH, AND HAROLD R. BEHRMAN	
I. II. III.	Introduction Methods of Radioimmunoassay Sensitivity and Precision References	347 349 355 357
21	Androgens: Testosterone and Dihydrotestosterone	
I. II. III. IV. V.	FREDERICK J. AULETTA, BURTON V. CALDWELL, AND GERALD L. HAMILTON Introduction Method of Radioimmunoassay Validation of Assay Normal Values Other Androgens—Androstenedione References Minoral continuidation of Aldostenedione References	359 360 367 368 370 370
22	Mineralocorticoids: Aldosterone and Deoxycorticosterone	
	GORDON H. WILLIAMS AND RICHARD H. UNDERWOOD	
I. III. IV. V. VI.	Introduction Methods of Radioimmunoassay Evaluation of the Radioimmunoassay Problems Related to Measuring Mineralocorticoids Other Radioimmunoassay Methods Newer Developments References	371 373 386 387 387 390

xiv CONTENTS

23	Glucocorticoids: Cortisol, Corticosterone,	
	and Compound S sees to the Radioish State of the State of the Radioish State of the	
	P. VECSEI	
I.	Introduction	393
II.	Methods of Radioimmunoassay	394
III.	Evaluation of Radioimmunoassay Data	405
IV.	Other Uses for Cortisol and Corticosterone Antibody	410
V.	General Discussion	410
	References vasaconumunoassav Methods of Radioimmunoassav	412
355		
24 I. II. III. IV.	Human Placental Lactogen (HPL) STUART HANDWERGER AND LOUIS M. SHERWOOD Introduction Methods of Radioimmunoassay Evaluation of Radioimmunoassay Data Other Techniques References	417 418 423 424 424
	Deaxycorheosterone	
25	Human Chorionic Gonadotropin (HCG)	
	LOUIS M. SHERWOOD	
I.	Introduction of the Radiounavassay	427
II.	Introduction Technique of Radioimmunoassay	428
III.		433
nor	References	435

Vasoactive Peptide Hormones

26	Bradykinin	
	THEODORE L. GOODFRIEND AND CHARLES E. ODYA	
I. II. III.	Introduction Radioimmunoassay Methodology Validation and Standards References	439 440 450 452
27	Renin and the Angiotensins ARTHUR E. FREEDLENDER, FREJ FYHI AND HENDRIK J. G. HOLLEMANS	RQUIST,
	Introduction Methods of Radioimmunoassay Verfication of Assay Results and Special Problems Commercial Kits and Newer Developments References	455 456 464 466 467
	Appendixes	473
Auth	or Index	489
Subje	ect Index	507

INTRACELLULAR MESSENGERS