

CIBA FOUNDATION COLLOQUIA ON ENDOCRINOLOGY

VOLUME III

Hormones, Psychology and Behaviour
and
Steroid Hormone Administration

General Editor for the Ciba Foundation

G. E. W. WOLSTENHOLME, O.B.E., M.A., M.B., B.Ch.

Assisted by

MARGARET P. CAMERON, M.A., A.B.L.S.

With 78 Illustrations

1952

**CIBA FOUNDATION COLLOQUIA
ON ENDOCRINOLOGY**

**Vol. III. Hormones, Psychology and Behaviour
and
Steroid Hormone Administration**

Ciba Foundation Symposia

Other Volumes in this Series :

- Vol. I. Steroid Hormones and Tumour Growth
and Steroid Hormones and Enzymes**
- Vol. II. Steroid Metabolism and Estimation**
- Vol. IV. Anterior Pituitary Secretion and
Hormonal Influences in Water Metabolism**

General Volumes :

Toxæmias of Pregnancy	21s.
Liver Disease	25s.
Isotopes in Biochemistry	27s. 6d.
Visceral Circulation	about 30s.

PREFACE

THE Ciba Foundation is an international centre where workers active in medical and chemical research are encouraged to meet informally to exchange ideas and information. In two and a half years since its opening in June, 1949, in addition to many part-day discussions, there have been 13 international symposia, each lasting two to four days, attended on invitation by outstanding workers from many countries.

The informality and intimacy of these meetings have permitted discussion of current and incomplete research and stimulated lively speculation and argument. They have also been the occasion for reference to much published and unpublished work throughout the world. The proceedings are now being issued in full, with only the minimum of editing, in order to pass on to a far wider audience the benefits of these meetings. Assembled in book form they present very readably much information not readily available elsewhere.

Nine of the first 13 Symposia form a series of "Colloquia on Endocrinology," dealing mainly with steroid hormone problems. One of these, on Nomenclature of Steroids, has had its conclusions published separately;* of the remaining eight, two are now combined in each of four volumes.

This third volume contains in its first part the papers and full discussions of a conference held originally under the title of The Influence of Steroid Hormones on Psychological and Behavioural Reactions. The participants came from unusually diverse disciplines, and included biochemists, experimental physiologists, zoologists, clinicians and psychiatrists. Much new ground, not previously of common knowledge and interest to all members of this group, was covered during

*Chemistry and Industry, June 28rd, 1951.

consideration of psychological and behavioural reactions with normal and with pathological secretion of hormones and following hormone administration. The discussion ended with a debate, reported in full, on "methodology".

Book II of this volume contains the proceedings of the first of the Ciba Foundation colloquia on endocrinological subjects, on Administration and Dosage of Steroid Hormones. No manuscripts were demanded or prepared on that occasion, and the informal contributions, both of programme speakers and speakers in the discussions, have been reproduced from recordings. Information was pooled on such matters as the use of injections, emulsions, nasal sprays, and particularly subcutaneous pellets of steroid hormones in man and animals in relation to the effects produced, the bioassay of progesterone and pharmacological assay of synthetic oestrogens, and excretion studies after hormone administration by different routes.

The facts from much experimental work and the speculative nature and frankness of the discussions, with easy reference to important trivialities not normally mentioned on more formal occasions, should make volume III both stimulating and agreeable reading.

List of those participating in or attending the Conference
on the Influence of Steroid Hormones on Psychological and
Behavioural Reactions, 9th-12th April, 1951.

C. E. ALLEN	.	.	Dreadnought Seaman's Hospital, Greenwich
E. C. AMOROSO	.	.	Royal Veterinary College, London
F. A. BEACH	.	.	Yale University
L. R. BROSTER	.	.	Charing Cross Hospital, London
J. S. L. BROWNE	.	.	Royal Victoria Hospital, Montreal
R. A. CLEGHORN	.	.	Allen Memorial Institute of Psychiatry, Montreal
A. T. COWIE	.	.	National Institute for Research in Dairying, Reading
E. W. DEMPSEY	.	.	Washington University, St. Louis.
J. T. EAYRS	.	.	University of Birmingham.
F. A. ELLIOTT	.	.	Charing Cross Hospital, London
S. J. FOLLEY	.	.	National Institute for Research in Dairying, Reading
G. L. FOSS	.	.	Bristol
R. GREENE	.	.	Royal Northern Hospital, London
J. HAMMOND, SR.	.	.	University of Cambridge
J. L. HANCOCK	.	.	A.R.C. Unit of Animal Reproduction, Cambridge
G. W. HARRIS	.	.	University of Cambridge
H. HEDIGER	.	.	Zoologischer Garten, Basel
H. KALMUS	.	.	University College, London
M. KLEIN	.	.	Université de Strasbourg
A. J. LEWIS	.	.	Institute of Psychiatry, London
L. H. MATTHEWS	.	.	Zoological Society of London
P. MESCHAKS	.	.	Royal Veterinary College, Stockholm.
A. S. PARKES	.	.	National Institute for Medical Research, London

LIST OF CONFERENCE ATTENDANCE

xv

G. PINCUS	.	.	.	Worcester Foundation for Experimental Biology, Shrewsbury, Mass.
M. REISS	.	.	.	Bristol Mental Hospitals
C. P. RICHTER	.	.	.	Johns Hopkins Hospital, Baltimore
S. L. SIMPSON	.	.	.	St. Mary's Hospital, London
A. W. SPENCE	.	.	.	St. Bartholomew's Hospital, London
A. WALTON	.	.	.	A.R.C. Unit of Animal Reproduction, Cambridge
S. ZUCKERMAN	.	.	.	University of Birmingham

**List of those participating in or attending the Conference
on Steroid Hormone Administration, 23rd to 24th February,
1950**

P. M. F. BISHOP	.	.	Guy's Hospital, London
J. A. BROOM	.	.	Boots Pure Drug Co., West Bridgford, Notts
G. BROWNLEE	.	.	King's College, London
A. T. COWIE	.	.	National Institute for Research in Dairying, Reading
R. DEANESLY	.	.	National Institute for Medical Research, London
E. C. DODDS	.	.	Courtauld Institute of Biochemistry, Middle- sex Hospital, London
S. J. FOLLEY	.	.	National Institute for Research in Dairying, Reading
T. R. FORBES	.	.	Yale University
G. L. FOSS	.	.	Bristol
J. H. GADDUM	.	.	University of Edinburgh
F. GROSS	.	.	Ciba Ltd., Basle
C. HAMBURGER	.	.	Statens Seruminstitutet, Copenhagen
J. HEER	.	.	Ciba Ltd., Basle
M. KLEIN	.	.	Université de Strasbourg
M. H. I. MACAULAY (now Mrs. M. H. I. Dodd)	.	.	Gatty Marine Laboratory, St. Andrews
F. H. MALPRESS	.	.	Queen's University, Belfast
G. A. OVERBEEK	.	.	N. V. Organon, Oss, Holland.
A. S. PARKES	.	.	National Institute for Medical Research, London
A. W. SPENCE	.	.	St. Bartholomew's Hospital, London
A. WESTMAN	.	.	Caroline Hospital, Stockholm

BOOK I

**HORMONES, PSYCHOLOGY
AND BEHAVIOUR**

CONTENTS

PAGE

Book I—HORMONES, PSYCHOLOGY AND BEHAVIOUR

Chairman's Opening Remarks

PROFESSOR S. ZUCKERMAN, CB, MD, DSc, FRs 1

Part I—Psychological and behavioural reactions connected with the physiological production of steroid hormones.

Sex and species differences in the behavioural effects of gonadal hormones

F. A. BEACH, PhD (Professor of Psychology, Yale University) 8

Discussion

C. E. ALLEN, F. A. BEACH, J. S. L. BROWNE, R. A. CLEGHORN, S. J. FOLLEY, J. HAMMOND, SR., J. L. HANCOCK, G. PINCUS, C. P. RICHTER, A. WALTON, S. ZUCKERMAN 14

Sex differences in the maturation and function of the nervous system in the rat

J. T. EAYRS, BSc (Dept. of Anatomy, University of Birmingham) 18

Discussion

F. A. BEACH, J. S. L. BROWNE, R. A. CLEGHORN, E. W. DEMPSEY, J. T. EAYRS, J. HAMMOND, SR., G. PINCUS, C. P. RICHTER, S. ZUCKERMAN 31

The influence of sex hormones on the performance of a learned response

S. ZUCKERMAN, CB, MD, DSc, FRs (Professor of Anatomy, University of Birmingham) 34

Discussion

F. A. BEACH, J. S. L. BROWNE, J. T. EAYRS, S. J. FOLLEY, M. REISS, C. P. RICHTER, S. ZUCKERMAN 44

Patterns of male sex behaviour

A. WALTON, PhD (A.R.C. Unit of Animal Reproduction, Cambridge) 47

Discussion

F. A. BEACH, J. HAMMOND, SR., J. L. HANCOCK, H. HEDIGER, L. H. MATTHEWS, A. WALTON, S. ZUCKERMAN 52

	PAGE
The experimental induction of sexual behaviour by steroid hormones	
E. W. DEMPSEY, PhD (Professor of Anatomy, Washington University, St. Louis)	55
Discussion	
F. A. BEACH, J. S. L. BROWNE, E. W. DEMPSEY, S. J. FOLLEY, J. HAMMOND, SR., J. L. HANCOCK, G. W. HARRIS, M. KLEIN, G. PINCUS, S. ZUCKERMAN	56
On the excretion of neutral steroids in the urine of normal and infertile bulls	
P. MESCHAKS (Royal Veterinary College, Stockholm)	61
Discussion	
F. A. BEACH, J. S. L. BROWNE, G. W. HARRIS, P. MESCHAKS, G. PINCUS, A. WALTON, S. ZUCKERMAN	72
Observations on reproduction behaviour in zoo animals	
H. HEDIGER, ScD (Professor of Zoology, University of Basel)	74
Discussion	
C. E. ALLEN, J. S. L. BROWNE, H. HEDIGER, H. KALMUS, M. KLEIN, A. J. LEWIS, L. H. MATTHEWS, S. ZUCKERMAN	81
Uterine distension, ovarian hormones and maternal behaviour in rodents	
M. KLEIN, MD (Professor of Medical Biology, Université de Strasbourg)	84
Discussion	
F. A. BEACH, J. HAMMOND, SR., G. W. HARRIS, M. KLEIN, S. ZUCKERMAN	87
The effect of domestication on the steroids of animals and man	
C. P. RICHTER, PhD (Director, Psychobiology Laboratory, Johns Hopkins Hospital, Baltimore)	89
Discussion	
F. A. BEACH, J. S. L. BROWNE, R. A. CLEGHORN, E. W. DEMPSEY, S. J. FOLLEY, J. HAMMOND, SR., G. W. HARRIS, H. HEDIGER, H. KALMUS, M. KLEIN, L. H. MATTHEWS, G. PINCUS, C. P. RICHTER, S. ZUCKERMAN	107

Part II—Psychological and behavioural reactions connected with pathological disturbances of steroid hormone production.

The interplay between endocrine disturbances and psychological aberrations

J. S. L. BROWNE, MD, PhD (Director, University Clinic, Royal Victoria Hospital, Montreal) 112

Discussion

C. E. ALLEN, F. A. BEACH, J. S. L. BROWNE, R. A. CLEGHORN, A. J. LEWIS, G. PINCUS, M. REISS, S. L. SIMPSON, S. ZUCKERMAN 118

Behaviour patterns and psychiatric disturbances in major endocrine disorders

S. L. SIMPSON, MA, MD, FRCP (St. Mary's Hospital, London) 120

Discussion

C. E. ALLEN, J. S. L. BROWNE, A. J. LEWIS, G. PINCUS, S. L. SIMPSON, S. ZUCKERMAN 125

Psychological changes connected with spontaneous and experimentally produced alterations in steroid hormone metabolism

M. REISS, MD, DSc (Bristol Mental Hospital) 128

Discussion

J. S. L. BROWNE, G. PINCUS, M. REISS 138

Observations on the mechanism of the disordered psychological outlook in Addison's disease and hypopituitarism

R. A. CLEGHORN, MD, DSc (Director of Therapeutic Research, Allen Memorial Institute of Psychiatry, Montreal) 141

Discussion

C. E. ALLEN, F. A. BEACH, L. R. BROSTER, J. S. L. BROWNE, R. A. CLEGHORN, F. A. ELLIOTT, R. GREENE, H. KALMUS, A. J. LEWIS, G. PINCUS, S. L. SIMPSON, S. ZUCKERMAN 149

Adrenal function in schizophrenic men

G. PINCUS, ScD (Director of Laboratories, Worcester Foundation for Experimental Biology, Shrewsbury, Mass.) 154

Discussion

J. S. L. BROWNE, A. J. LEWIS, G. PINCUS, M. REISS, S. ZUCKERMAN 164

	PAGE
Clinical types of altered sexuality in relation to adrenal-ectomy	
L. R. BROSTER, MA, DM, MCh, FRCS, FASA (Charing Cross Hospital, London)	168
The relationship of steroids to psychosis	
C. E. ALLEN, MD, MRCP, DPM (Dept. of Psych. Medicine, Greenwich)	175
Discussion	
C. E. ALLEN, F. A. BEACH, L. R. BROSTER, J. S. L. BROWNE, R. A. CLEGHORN, S. J. FOLLEY, G. PINCUS, A. WALTON, S. ZUCKERMAN	181
 <i>Part III—Psychological and behavioural reactions as side effects of steroid administration</i>	
Alterations in psychological states by therapeutic increase in adrenal cortical hormones	
R. A. CLEGHORN, MD, DSc (Director of Therapeutic Research, Allen Memorial Institute of Psychiatry, Montreal)	187
Effects of ACTH and cortisone on behaviour	
J. S. L. BROWNE, MD, PhD (Director, University Clinic, Royal Victoria Hospital, Montreal)	197
Discussion	
J. S. L. BROWNE, R. A. CLEGHORN, A. J. LEWIS, G. PINCUS, S. ZUCKERMAN	204
 <i>Part IV—Effects of Hormones on the Nervous System</i>	
Mechanisms of hormonal action upon behaviour	
F. A. BEACH, PhD (Professor of Psychology, Yale University)	209
Discussion	
F. A. BEACH, E. W. DEMPSEY, F. A. ELLIOTT, S. J. FOLLEY, G. W. HARRIS, G. PINCUS, M. REISS, A. WALTON, S. ZUCKERMAN	215

Part V—Debate on Methodology

S. ZUCKERMAN, F. A. BEACH, R. A. CLEGHORN, G. W. HARRIS, G. PINCUS, M. REISS, A. J. LEWIS, M. KLEIN, J. S. L. BROWNE, E. W. DEMPSEY, A. WALTON, H. KALMUS, J. HAMMOND, SR., C. P. RICHTER	221
--	-----

Chairman's Closing Remarks PROFESSOR S. ZUCKERMAN, CB, MD, DSc, FRs	239
--	-----

Book II—STEROID HORMONE ADMINISTRATION

Chairman: PROFESSOR J. H. GADDUM, ScD, FRs

Relation between effect and method of administration of androgens and oestrogens to fowl A. S. PARKES, PhD, DSc, FRs (National Institute for Medical Research, London)	248
---	-----

Discussion

P. M. F. BISHOP, W. A. BROOM, G. BROWNLEE, S. J. FOLLEY, T. R. FORBES, J. H. GADDUM, A. S. PARKES	252
--	-----

Some data on emulsions of steroid hormones G. A. OVERBEEK (N. V. Organon, Oss, Holland)	254
--	-----

Discussion

P. M. F. BISHOP, W. A. BROOM, G. BROWNLEE, R. DEANESLY, S. J. FOLLEY, G. L. FOSS, J. H. GADDUM, F. GROSS, M. KLEIN, F. H. MALPRESS, G. A. OVERBEEK, A. S. PARKES	259
---	-----

Data on relative absorption rates of subcutaneous pellets of steroid hormones in rats T. R. FORBES, PhD (Dept. of Anatomy, Yale University)	263
---	-----

Studies on the absorption of pellets of steroid hormones and related substances in man P. M. F. BISHOP, DM, MRCP (Guy's Hospital, London) and S. J. FOLLEY, DSc, PhD, FRs (National Institute for Research in Dairying, Reading)	265
--	-----

	PAGE
Discussion	
P. M. F. BISHOP, G. BROWNLEE, S. J. FOLLEY, T. R. FORBES, J. H. GADDUM, F. GROSS, G. A. OVERBEEK, A. S. PARKES	280
Absorption data from tablet implantation in ruminants	
F. H. MALPRESS, PhD (Dept. of Biochemistry, Queen's University, Belfast)	283
Discussion	
P. M. F. BISHOP, G. BROWNLEE, S. J. FOLLEY, G. L. FOSS, J. H. GADDUM, F. H. MALPRESS, G. A. OVERBEEK, A. S. PARKES	288
Data on progesterone physiology and metabolism	
T. R. FORBES, PhD (Dept. of Anatomy, Yale University)	291
Discussion	
P. M. F. BISHOP, R. DEANESLY, T. R. FORBES, M. KLEIN, M. H. I. MACAULAY, F. H. MALPRESS, G. A. OVERBEEK, A. S. PARKES	300
17-Ketosteroid excretion and modes of administering testosterone preparations	
C. HAMBURGER (Statens Seruminstitut, Copenhagen)	304
Discussion	
P. M. F. BISHOP, G. BROWNLEE, S. J. FOLLEY, T. R. FORBES, G. L. FOSS, J. H. GADDUM, C. HAMBURGER, G. A. OVERBEEK	319
Administration of sex hormones and sexual behaviour	
M. KLEIN, MD (Professor of Medical Biology, Université de Strasbourg)	323
Discussion	
P. M. F. BISHOP, G. BROWNLEE, S. J. FOLLEY, T. R. FORBES, M. KLEIN, M. H. I. MACAULAY, G. A. OVERBEEK, A. S. PARKES	334
Artificial induction of lactation in goats by steroid hormones and synthetic oestrogens	
A. T. COWIE, PhD, MRCVS (National Institute for Research in Dairying, Reading)	338

CONTENTS

xiii

PAGE

Discussion of Dr. Cowie's paper by Dr. MALPRESS . . . 346

Discussion

G. BROWNLEE, A. T. COWIE, T. R. FORBES . . . 348

The difficulty of evaluating the potency of steroid hormones by different routes of administration in humans .

P. M. F. BISHOP, DM, MRCP (Guy's Hospital, London) . 349

Discussion

P. M. F. BISHOP, G. A. OVERBEEK . . . 355

Observations on the results of pharmacological assay of synthetic oestrogens and their clinical effects

W. A. BROOM, BSc, FRIC (Boots Pure Drug Co. Ltd., West Bridgford, Notts) . . . 356

Discussion

P. M. F. BISHOP, W. A. BROOM, G. BROWNLEE, S. J. FOLLEY, H. J. GADDUM, F. GROSS, A. S. PARKES . . 358

Clinical impressions of values of oestrogens and androgens administered by different routes

G. L. FOSS, MA, MD, BCh (Bristol) . . . 361

Discussion

P. M. F. BISHOP, T. R. FORBES, G. L. FOSS, F. GROSS . 368

Chairman's Closing Remarks

J. H. GADDUM, ScD, FRS . . . 370