Diseases of the INDOCRINE GLANDS

SOFFER

Second Edition



Diseases of the ENDOCRINE GLANDS

BY LOUIS J. SOFFER, M.D., F.A.C.P.

Clinical Professor of Medicine, State University of New York, College of Medicine, New York City. Attending Physician and Head of Endocrinology, The Mount Sinai Hospital, New York City

> Second Edition, Thoroughly Revised 102 Illustrations and 3 Coloured Plates

> > LONDON
> > HENRY KIMPTON
> > 25 BLOOMSBURY WAY, W.C.1
> > 1956

CONTENTS

Section 1.—THE HYPOPHISIS	
CHAPTER	PAGE
1. The Embryology, Anatomy, and Histology of the Hypophysis	13
2. The Physiologic Functions of the Hypophysis. The Hormones Elaborated by the Pituitary Body	26
3. Diseases of the Hypophysis. Tumors of the Anterior Lobe of the Hypophysis	78
4. Diseases of the Hypophysis ($Cont.$). Hypopituitarism, Pituitary Dwarfism	138
5. Diseases of the Hypophysis (Cont.). Posterior Pituitary and Hypothal-amic Disease. Diabetes Insipidus, Dystrophia Adiposogenitalis (Fröhlich's Syndrome), Laurence-Moon-Biedl Syndrome	166
SECTION II.—THE ADRENALS	
6. The Anatomy, Morphologic Structure, and Embrylogy of the Adrenals	189
7. Physiology of the Adrenals—Physiology of the Adrenal Medulla. Physiology of the Adrenal Cortex. Relation of the Adrenal Cortex to Electrolyte Metabolism—To Renal Function—To Carbohydrate Metabolism. Hormones of the Adrenal Cortex. Relation of the Adrenal Cortex to the Urinary Excretion of the Neutral 17-Ketosteroids and the Glycogenic Corticoids. Physiologic Effects of Corticotropin on the Adrenal Cortex. Clinical Uses of ACTH and the Glycogenic Adrenal Steroids	198
8. Physiology of the Adrenal Cortex (Cont.). Factors Determining Adrenal Size, Relation of Adrenal Cortex to Other Endocrine Glands, Relation of Adrenal Cortex to Shock. The Alarm Reaction	235
9. Addison's Disease: Pathology, Clinical Description, Laboratory Findings, Differential Diagnosis. Suprarenal Apoplexy (Waterhouse-Friderichsen Syndrome)	269
10. The Treatment of Addison's Disease	316
 Adrenocortical Hyperfunction: Adrenogenital Syndrome, Virilism, Cushing's Syndrome, Adrenal Cortical Hyperplasia, and Adrenal Cortical Tumors 	335
12. Adrenocortical Hyperfunction (Cont.): Blood Electrolyte and Hormonal Studies; Diagnosis, Prognosis, and Treatment of Adrenal Cortical Tumors and Hyperplasia	384

CHAPTER	PAGE
13. Sympathogoniomas, Neuroblastomas, and Ganglioneuromas of the Adrenal	ne . 415
14. Pheochromocytoma and Paraganglioma of the Adrenal	. 425
SECTION III.—THE GONADS	
15. The Testis: Embryology of the Genital System, Sex Determination Anatomy of the Male Genitalia, Gross Anatomy and Histology of the Testis, Spermatogenesis, The Male Accessory Genitalia	ne
16. Physiology of the Testis: Hypophyseal Regulation, Spermatogenic and Secretory Function, Question of a Second Testicular Hormone, Reci rocal Relationship Between the Testis and the Pituitary. The Materian Sex Hormone: Nature, Chemistry, Metabolism, Biologic and Metabolic Actions. Extra-Testicular Sources of Androgens.	o- le a-
17. Diseases of the Testis: Hypogonadism, Adolescence and the Problem Delayed Puberty, Effects of Castration, Effects of Partial Androgon Deficiency (Eunuchoidism), Klinefelter Syndrome, "Functional" Propuberal Castration, Cryptorchidism, Male Infertility, Male Climacteric Panhypopituitarism, Relative Hypopituitarism, Hypogonadism Due Congenital and Genetic Causes, Tumors of the Testis.	en e- e, 50
18. The Ovary: Embryology of the Female Genital System; Anatomy the Female Genitalia; Histology of the Ovaries; Oögenesis; Histolog of the Endometrium and Vaginal Mucosa By Arthur R. Sohya	У
19. Physiology of the Ovary: Hypophyseal Regulation, Reciprocal Relationship between the Ovary and the Pituitary, Endocrine Aspects the Normal Ovarian Cycle. The Estrogenic Hormone: Natur Chemistry, Metabolism, Biologic and Metabolic Actions, Levels in the Blood and Urine. The Hormone of the Corpus Luteum: Natur Chemistry, Metabolism, Biologic Actions. Androgen Secretion by the Ovary. Physiology of Menstruation, Ovulation and Pregnancy. The Clinical Recognition of the Functioning Corpus Luteum BY ARTHUR R. SOHVA	of e, ee, ee
20. Diseases of the Ovary: Hypoövarianism; Corpus Luteum Deficience Anovulatory Failure, Estrogenic Failure, Problem of Delayed Ado escence. Hypoestrogenic Osteoporosis. Estrogen and Gonadotropic Therapy. Climacteric. Syndrome of Ovarian Agenesis, Panhypopituitarism, Relative Hypopituitarism. Functional Uterine Bleeding Feminizing and Masculinizing Tumors of the Ovary. Stein-Levenths and Diffuse Lutenization Syndromes (Ovarian Hyperthecosis). BY ARTHUR R. SOHVA	l- n g.

CHAPTER	PAGE
21. The Virilizing Syndrome: A Summary of the Causes of Virilization in Man and Their Differentiation	742
SECTION IV.—THE THYROID	
22. Embryology, Gross and Microscopic Anatomy, and the Physiology of the Thyroid Gland	765
23. The Value of Laboratory Aids in the Diagnosis of Thyroid Disease: The Basal Metabolic Rate, Serum Cholesterol, Serum Protein Bound Iodine (Serum Precipitable Iodine), Tracer Studies with Radioactive Iodine, Spontaneous Creatinuria and the Creatine Tolerance Test, Circulation Time, The Therapeutic Response to Iodine.	796
24. Inflammatory Diseases of the Thyroid Gland. Acute Non-Suppurative and Acute Suppurative Thyroiditis, Subacute Thyroiditis, Specific Chronic Thyroiditis, Hashimoto's Struma, Riedel's Struma.	819
25. Hypothyroidism: Cretinism, Juvenile and Adult Myxedema (Gull's Disease)	829
26. Hyperthyroidism (Graves' Disease), Diffuse and Nodular Toxic Goiter, Malignant Exophthalmos	869
27. Tumors of the Thyroid Gland: Nodular Goiter, Benign and Malignant Thyroid Tumors, Endemic and Sporadic (Colloid) Goiter, Thyroglossal Duct Cysts, Amyloid Goiter	910
SECTION V.—THE THYMUS, AND PARATHYROIDS	
28. The Thymus	931
29. Anatomy Physiology and Diseases of the Parathyroids. Hypoparathyroidism, Primary Hyperparathyroidism (Von Recklinghausen's Disease of Bone), Secondary Hyperparathyroidism	937
APPENDIX	
35. Laboratory Tests of Endocrine Function	970

Diseases of the ENDOCRINE GLANDS

With

J. LESTER GABRILOVE, M.D., F.A.C.P.

 $Assistant\ Attending\ Physician\ and\ Member\ of\ the\ Endocrine\ Research\ Laboratory\ and\ Clinic,$ $The\ Mount\ Sinai\ Hospital$

And the Section on the Gonads by

ARTHUR R. SOHVAL, M.D., F.A.C.P.

Associate Attending Physician and Member of the Endocrine Research Laboratory and Clinic, The Mount Sinai Hospital

Diseases of the ENDOCRINE GLANDS

BY LOUIS J. SOFFER, M.D., F.A.C.P.

Clinical Professor of Medicine, State University of New York, College of Medicine, New York City. Attending Physician and Head of Endocrinology, The Mount Sinai Hospital, New York City

> Second Edition, Thoroughly Revised 102 Illustrations and 3 Coloured Plates

> > LONDON
> > HENRY KIMPTON
> > 25 BLOOMSBURY WAY, W.C.1
> > 1956

ALL RIGHTS RESERVED, 1956

Printed in America

In Memory
of
My Mother and Father

PREFACE TO THE SECOND EDITION

During the five years that have elapsed since the appearance of the first edition of this volume, considerable further progress has been achieved in endocrinology. This is an ever-growing and changing field, one which continues to challenge and stir the imagination and ingenuity of its students. I may be permitted a pardonable pride when I speak of the investigators in this field as the dedicated ones who have embarked on an intellectual adventure of enormous magnitude. Endocrinology is no mere laboratory exercise. Its facts and principles serve to reveal and illuminate processes essential to the understanding of physiological functions in health and their distortion in disease.

During this period many significant contributions have appeared. These have served to invalidate or to clarify many of our older concepts and to introduce new ones. Right or wrong, they serve a constructive purpose in that they stimulate further thought and work. The identification and synthesis of aldosterone, the synthesis of polypeptide hormones such as oxytocin and vasopressin, the chemical identification of corticotropin, the identification of triiodothyronine as a potent thyroidal fraction, all represent landmarks in achievement. The development of various hormonal analogues such as prednisone, prednisolone, and the halogenated compounds of cortisol, which serve to modify the effects of the parent hormones, opens new avenues for the organic chemist and the clinician. In addition, important advances have been made both in the laboratory diagnosis and the clinical management of endocrine disease. These and other numerous changes have been incorporated in this second edition.

In the present volume the section dealing with carbohydrate metabolism and diabetes mellitus has been omitted after a great deal of thought. This step was decided upon essentially for two reasons: 1. an effort to maintain the volume within a reasonable length; and 2. the feeling that this field merits separate treatment because of its complexity and detail. This is reflected in clinical practice, since in many institutions the endocrine and diabetic clinics are maintained as separate entities.

Once more I must publicly express my indebtedness to my associates, Dr. J. Lester Gabrilove and Dr. Arthur R. Sohval, for their wholehearted cooperation. Without them this volume would have been impossible of achievement.

Louis J. Soffer

CONTENTS

SECTION 1.—THE HYPOPHISIS	
CHAPTER	PAGE
1. The Embryology, Anatomy, and Histology of the Hypophysis	13
2. The Physiologic Functions of the Hypophysis. The Hormones Elaborated by the Pituitary Body	26
3. Diseases of the Hypophysis. Tumors of the Anterior Lobe of the Hypophysis	78
$4. \ \ Diseases of the \ Hypophysis \ (Cont.). \ \ Hypopituitarism, Pituitary \ \ Dwarfism$	138
5. Diseases of the Hypophysis (Cont.). Posterior Pituitary and Hypothal-amic Disease. Diabetes Insipidus, Dystrophia Adiposogenitalis (Fröhlich's Syndrome), Laurence-Moon-Biedl Syndrome	166
SECTION II.—THE ADRENALS	
6. The Anatomy, Morphologic Structure, and Embrylogy of the Adrenals	189
7. Physiology of the Adrenals—Physiology of the Adrenal Medulla. Physiology of the Adrenal Cortex. Relation of the Adrenal Cortex to Electrolyte Metabolism—To Renal Function—To Carbohydrate Metabolism. Hormones of the Adrenal Cortex. Relation of the Adrenal Cortex to the Urinary Excretion of the Neutral 17-Ketosteroids and the Glycogenic Corticoids. Physiologic Effects of Corticotropin on the Adrenal Cortex. Clinical Uses of ACTH and the Glycogenic Adrenal Steroids	198
8. Physiology of the Adrenal Cortex (Cont.). Factors Determining Adrenal Size, Relation of Adrenal Cortex to Other Endocrine Glands, Relation of Adrenal Cortex to Shock. The Alarm Reaction	235
9. Addison's Disease: Pathology, Clinical Description, Laboratory Findings, Differential Diagnosis. Suprarenal Apoplexy (Waterhouse-Friderichsen Syndrome)	269
10. The Treatment of Addison's Disease	316
 Adrenocortical Hyperfunction: Adrenogenital Syndrome, Virilism, Cushing's Syndrome, Adrenal Cortical Hyperplasia, and Adrenal Cortical Tumors 	335
12. Adrenocortical Hyperfunction (Cont.): Blood Electrolyte and Hormonal Studies; Diagnosis, Prognosis, and Treatment of Adrenal Cortical Tumors and Hyperplasia	384

CHAPTER	GE
13. Sympathogoniomas, Neuroblastomas, and Ganglioneuromas of the Adrenal	-15
14. Pheochromocytoma and Paraganglioma of the Adrenal	25
SECTION III.—THE GONADS	
15. The Testis: Embryology of the Genital System, Sex Determination, Anatomy of the Male Genitalia, Gross Anatomy and Histology of the Testis, Spermatogenesis, The Male Accessory Genitalia BY ARTHUR R. SOHVAL 44	47
16. Physiology of the Testis: Hypophyseal Regulation, Spermatogenic and Secretory Function, Question of a Second Testicular Hormone, Reciprocal Relationship Between the Testis and the Pituitary. The Male Sex Hormone: Nature, Chemistry, Metabolism, Biologic and Metabolic Actions. Extra-Testicular Sources of Androgens.	67
17. Diseases of the Testis: Hypogonadism, Adolescence and the Problem of Delayed Puberty, Effects of Castration, Effects of Partial Androgen Deficiency (Eunuchoidism), Klinefelter Syndrome, "Functional" Prepuberal Castration, Cryptorchidism, Male Infertility, Male Climacteric, Panhypopituitarism, Relative Hypopituitarism, Hypogonadism Due to Congenital and Genetic Causes, Tumors of the Testis.	86
18. The Ovary: Embryology of the Female Genital System; Anatomy of the Female Genitalia; Histology of the Ovaries; Oögenesis; Histology of the Endometrium and Vaginal Mucosa BY ARTHUR R. SOHVAL 57	70
19. Physiology of the Ovary: Hypophyseal Regulation, Reciprocal Relationship between the Ovary and the Pituitary, Endocrine Aspects of the Normal Ovarian Cycle. The Estrogenic Hormone: Nature, Chemistry, Metabolism, Biologic and Metabolic Actions, Levels in the Blood and Urine. The Hormone of the Corpus Luteum: Nature, Chemistry, Metabolism, Biologic Actions. Androgen Secretion by the Ovary. Physiology of Menstruation, Ovulation and Pregnancy. The Clinical Recognition of the Functioning Corpus Luteum.	91
20. Diseases of the Ovary: Hypoövarianism; Corpus Luteum Deficiency Anovulatory Failure, Estrogenic Failure, Problem of Delayed Adolescence. Hypoestrogenic Osteoporosis. Estrogen and Gonadotropin Therapy. Climacteric. Syndrome of Ovarian Agenesis, Panhypopituitarism, Relative Hypopituitarism. Functional Uterine Bleeding. Feminizing and Masculinizing Tumors of the Ovary. Stein-Leventhal and Diffuse Lutenization Syndromes (Ovarian Hyperthecosis)	64

CHAPTER	PAGE
21. The Virilizing Syndrome: A Summary of the Causes of Virilization in Man and Their Differentiation	742
SECTION IV.—THE THYROID	
22. Embryology, Gross and Microscopic Anatomy, and the Physiology of the Thyroid Gland	765
23. The Value of Laboratory Aids in the Diagnosis of Thyroid Disease: The Basal Metabolic Rate, Serum Cholesterol, Serum Protein Bound Iodine (Serum Precipitable Iodine), Tracer Studies with Radioactive Iodine, Spontaneous Creatinuria and the Creatine Tolerance Test, Circulation Time, The Therapeutic Response to Iodine	796
24. Inflammatory Diseases of the Thyroid Gland. Acute Non-Suppurative and Acute Suppurative Thyroiditis, Subacute Thyroiditis, Specific Chronic Thyroiditis, Hashimoto's Struma, Riedel's Struma	819
25. Hypothyroidism: Cretinism, Juvenile and Adult Myxedema (Gull's Disease)	829
26. Hyperthyroidism (Graves' Disease), Diffuse and Nodular Toxic Goiter, Malignant Exophthalmos	869
27. Tumors of the Thyroid Gland: Nodular Goiter, Benign and Malignant Thyroid Tumors, Endemic and Sporadic (Colloid) Goiter, Thyroglossal Duct Cysts, Amyloid Goiter	910
SECTION V.—THE THYMUS, AND PARATHYROIDS	
28. The Thymus	931
29. Anatomy Physiology and Diseases of the Parathyroids. Hypoparathyroidism, Primary Hyperparathyroidism (Von Recklinghausen's Disease of Bone), Secondary Hyperparathyroidism	937
APPENDIX	
35. Laboratory Tests of Endocrine Function	970