ANDROGENS

Biochemistry, Physiology, and Clinical Significance

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PREFACE

Approximately one-quarter of a century has elapsed since concentrated androgenic extracts were first prepared from testicular tissue. During this time the structure of a number of androgens has been elucidated, and their total synthesis achieved. A great deal of theoretical information has now been documented, and the androgens have become definitive, important therapeutic agents. It has been our intention to bring all this information together in one volume so that the student (medical and graduate), the clinician, and the research worker can quickly get a rounded picture of all phases of the subject matter, ranging from the biochemistry of androgenic compounds to their significance in clinical medicine. For those individuals who desire a more precise knowledge of the steroids, a detailed section is included which deals with steroid nomenclature. This is coupled with a section in the appendix which lists the structural formulae of each steroid mentioned in the text and tables. This arrangement, we hope, should lighten the burden of the student and guide the clinician, with the least trauma, through this often confusing subject.

The early studies of the isolation of androgens from tissues and urine are now classical works. Most of the details are included in this book, not only because of their bearing on the characterization of certain androgenic compounds, but because some of the historical aspects are of considerable interest.

We hope that our book will be of particular value to men of medicine, both the general practitioner and the specialist. Androgens, by virtue of their diverse roles in normal physiology, must be considered in many medical specialties. The internist, the clinical endocrinologist, the pediatrician, the urologist, the gynecologist, the gerontologist, and the oncologist are constantly confronted with problems involving androgens and androgen therapy. The theoretical and practical aspects are herein documented.

The summary of the literature on urinary androgen and 17-ketosteroid excretion, including interpretations, should serve as an aid for both diagnosis and prognosis. This is perhaps the most complete and

systematic summary available. And for those individuals who do not have ready access to all the literature, we have included, in the appendices, the detailed directions for the preparation of urinary extracts suitable for analysis, together with detailed directions for the biological and chemical assays.

The literature on androgens is enormous, and we cannot claim that every report is herein described, digested, and documented. Every effort has been made to consult as many of the papers as possible, and we hope that at least a partial success was achieved.

Many friends and colleagues graciously assisted us in many phases of the work, and it is with deep pleasure that we record our indebtedness. Drs. Irene T. Kline, Annabelle M. Miller, Sara Schiller, Betty L. Rubin, Hans Hirschmann, Kenneth Savard, and Erwin Schwenk kindly read parts of the manuscript and made helpful suggestions. Special thanks are due Mrs. R. I. Dorfman and Miss Phyllis Galanto for their enormous efforts in typing and checking the manuscript as well as in reading proof and doing the infinite number of chores that must be taken care of in the publishing of a book. We are also grateful to Miss Frances Callaghan for assistance in typing a considerable portion of the manuscript. Dr. Banay, librarian of the Worcester State Hospital, gave freely of his knowledge and time so that the references could be accurate. We thank him for this help but remind the reader that inaccuracies of literature citation, as is true of all errors and omissions of pertinent facts, are not intentional and are solely the responsibility of the authors.

Ralph I. Dorfman
Reginald A. Shipley

January 1956

FOREWORD

In this volume Dr. Dorfman and Dr. Shipley have provided endocrinologists with the kind of exposition of their subject that has been sought for many years. So vast has become the field of endocrinology that no single book or author can hope to consider adequately its many-faceted aspects. Those who do attempt this task succeed only in furnishing us with cursory summaries of the subject or volumes in which some areas are given relative overemphasis and others are slighted—usually in proportion to the author's or authors' particular interests. Thus we must recognize the necessity for comprehensive considerations of relatively delimited areas by authors who possess extensive experience and competence in those areas. In the present instance Dr. Dorfman and Dr. Shipley have brought their skills and knowledge to a thorough consideration of the androgenic hormones.

The androgenic hormones, more commonly but less accurately known as the male sex hormones, are now known to have functions other than the stimulation of such structures as the secondary sex characteristics of the male organism. The female, too, shares in the beneficial effects provided by this hormone or hormones, since it has become more and more evident that important aspects of protein anabolism in both sexes are regulated by androgenic substances. In as much as the proteins have far-reaching importance in essentially all phases of physiologic economy, it is apparent that thorough regard for the factors controlling their disposition should have our interest and attention. Today our comprehension of the nature of the androgenic substances and the role they play in the spectrum of physiologic mechanisms has been the product of studies involving biological organic and synthetic chemistry, physiology, bacteriology, enzymology, cytology, and clinical medicine. Each of these has contributed its measure to the proper appreciation of the important function played by the androgens in stimulating, regulating, and modifying a multitude of mechanisms important to the physiologic economy.

This emphasis on the extra-sexual sphere of importance of the androgens by no means belittles the role such substances play in provid-

ing for sexual normality. Indeed, the existing evidence suggests that not only normal function of the male accessory organs of reproduction but also the production of male gametes depend upon an adequate level of androgen. Such a far-reaching significance is not applicable to the female, but even in her case we have reason to believe that libido is influenced materially by androgenic hormone. Thus the evidence mounts and indicates that these substances are of importance in perpetuating the species not only by assuring the advent of new organisms, but also by providing for the development of those organisms to at least the age of reproduction when they are ready to begin the cycle again.

The far-reaching significance of androgenic function deserves the kind of careful and thorough consideration that has been accorded the subject by Dr. Dorfman and Dr. Shipley. The reader of this book is certain to obtain from it a fuller and clearer picture of the nature and function of the androgenic hormones.

WARREN O. NELSON

Rockefeller Institute
January 1956

CONTENTS

PART ONE · INTRODUCTION

CHAPTER
1. General Concepts 3
2. Historical Background 5

PART TWO · BIOCHEMISTRY

3. Sources of Androgens 13
Testis, 13
Ovary, 14
Adrenal cortex, 15
Plant sources, 16

4. Isolation and Chemistry of Androgens and Related Compounds 18
Nomenclature of steroids, 18
Androgens and related substances isolated from testicular tissue, 25
C_{19} compounds from testes, 25
Testosterone, 27
Δ^{16}-Androstenols, 27
C_{21} compounds from testes, 28
Miscellaneous compounds from swine testes, 29
Androgens and related substances isolated from urine, 29
Androsterone, epiandrosterone, and etiocholan-3α-ol-17-one, 29
Steroids containing C-11-oxygen substitutions, 32
Δ^4-3-Ketosteroids, 36
C_{19} saturated diones, 36
Δ^5-Steroids, 36
Miscellaneous unsaturated compounds, 42
Miscellaneous saturated compounds, 46
Androgens from the adrenal, 48
Bile, 49
Total synthesis, 49

5. Preparation of Urinary Extracts 53
General principles, 53
Androgen complexes in urine, 54
Artifacts in urinary extracts, 55
Artifacts of substitution, 56
Artifact of dehydration, 57
Artifact of rearrangement, 59
Artifacts of acetylation, 59
Artifact of epimerization, 60
Artifacts of degradation, 60

CHAPTER

6. Assay of Androgens and 17-Ketosteroids 62
Bioassay of androgens, 63
Determination of 17-ketosteroids, 63
Zimmermann reaction, 63
Pincus reaction, 64
Polarographic determination of androgens and related compounds, 64
Comparison of methods for 17-ketosteroid determination, 64
Determination of β-17-ketosteroids by colorimetric procedures, 65

7. Metabolism of the Androgens 67
General statements, 67
In vivo metabolism, 68
Testosterone, 68
Dehydroepiandrosterone and other Δ^5-steroids, 74
Adrenocortical steroids, 78
Metabolism of androgens to estrogens, 89
Studies on bile, 89
Generalizations concerning the metabolism of androgens and related steroids in human beings, 90
Reduction of Δ^4-3-ketone in C_{19} steroids, 90
Metabolism of C_{21} steroids to C_{21} metabolites, 91
Metabolism of C_{21} steroids to C_{19}-17-ketosteroids, 92
Mechanism of in vivo conversion of C_{21} steroids to 17-ketosteroids, 93
Predicted relationship between adrenocortical steroids and 17-ketosteroids, 94
In vitro metabolism, 95
Testosterone and Δ^4-androstene-3,17-dione, 95
Dehydroepiandrosterone and Δ^5-androstene-3β,17β-diol, 96
Androsterone, 97
Etiocholan-3α-ol-17-one, 97
Androstane-3α,17β-diol, 99
Remarks on comparison of in vitro and in vivo studies, 99
Enzyme systems involved in androgen metabolism, 100
Metabolism of androgens by microorganisms, 101
Androgens and 17-ketosteroids of animal excretions, 108
Chimpanzee urine, 108
Monkey urine, 109
Miscellaneous animal urines, 110
Androgens in feces, 111

8. Relative Activities of Androgens 116
Local and systemic tests, 116
Correlation between mammalian and capon end points, 119
Influence of esterification, 119
Qualitative differences among androgens, 122
Comparative activity by different end points, 122
Questionable androgens, 126
Unusual androgens, 127

9. Biological Actions and Interactions of Androgens 129
Theoretical considerations, 129

CHAPTER
Factors influencing androgenic activity, 132
Vitamins, diet, and nonsteroid hormones, 132
Inhibition of androgens, 133
Ability of androgens to inhibit the action of other steroid hormones, 136
Pro-hormones, 137
Androgens potentiating other hormones, 137

PART THREE · PHYSIOLOGY

10. Androgens and the Embryo, Intersexuality 143
The anatomic basis of sex determination, 143
The role of hormones in sex differentiation, 144
The "freemartin," 144
Action of androgens on the embryo, 145
Hormone secretion by embryonic gonad, 148
Effects of gonadectomy, 148
Intersexuality in man, 149
True hermaphroditism, 149
Pseudohermaphroditism, 150

11. Actions of Androgens on Sex Structures of Animals 152
Males, 152
Fish, 152
Amphibians, 154
Reptiles, 154
Birds, 155
Mammals, 157
Influence of castration, 157
Testis, 158
Scrotum, 168
Penis, 169
Seminal vesicles, 169
Coagulating gland, 170
Prostate, 170
Vas deferens, epididymis, Cowper's gland, and preputial glands, 171
Females, 172
Fish, 172
Amphibians, 173
Birds, 174
Mammals, 175
Ovary, 175
Uterus, 176
Vagina, 177
Preputial gland, 178
Female prostate (Skene's ducts), 179
Clitoris, 179
Urethra, 179
Mammary gland, 180

12. Androgens and Behavior 187
Males, 187
Fish, 187

CHAPTER

Amphibians, 188
Reptiles, 189
Birds, 189
Mammals, 190
Females, 194
Fish, 194
Amphibians, 194
Reptiles, 194
Birds, 194
Mammals, 195

13. Influence on Endocrine Glands, Other than Gonads, and Various Nonendocrine Glands 200
Endocrine glands, 200
Anterior pituitary, 200
Adrenals, 203
Thyroids and parathyroids, 205
Nonendocrine glands, 206
Kidney, 206
Liver, 208
Heart and circulation, 208
Blood, 209
Erythrocytes, 209
Hemoglobin, 209
Skeletal muscle, 209
Adipose tissue, 210
Bone, 210
Thymus, 211
Miscellaneous effects, 211
Androgens and tumors, 212

14. Influence of Androgens on Metabolism and Enzymes 218
Protein metabolism, 218
General statement, 218
Dog, 219
Rat, 220
Human being, 221
Carbohydrate metabolism, 225
Creatine and creatinine, 226
Rodent, 226
Monkey, 226
Human being, 227
Electrolytes, 228
Atherosclerosis, 228
Basal metabolism and respiratory quotient, 229
Oxidative metabolism and enzyme concentrations, 229
Succinic dehydrogenase and succinoxidase, 230
Arginase, 231
Amino acid oxidase, 234
Cytochrome oxidase, 234
Cholinesterase, 234

CHAPTER

Phosphatases, 234
Vesiculase, 237
β-Glucuronidase, 238
Androgens and specific enzyme systems, 239
D-Amino acid oxidase, 239
α-Glycerophosphate dehydrogenase, 239
Choline acetylase, 242
Miscellaneous, 242

PART FOUR · CLINICAL ASPECTS

15. Normal Puberal Development in Boys 249
Time and sequence of development of puberal changes, 250
Testes and scrotum, 251
Penis and prostate, 252
Body growth, 252
Hair growth, 253
Voice change, 254
Glands of the skin, 254
Pigmentation, 254
Breasts, 255
Sex drive and behavior, 255
Miscellaneous changes, 256
The variability of puberal development, 257
Hormone assays, 259
Androgens and 17-ketosteroids, 259
Estrogens, 259
Gonadotropins, 260

16. Conditions of Androgen Excess 262
General clinical manifestations, 262
Prepuberal boys ("isosexual sex precocity"), 262
Prepuberal girls ("heterosexual sex precocity"), 264
Postpuberal women, 265
Postpuberal men, 265
Reversibility of anatomic and functional changes, 266
Disorders of specific organs, 266
Testis, 266
Leydig cell (interstitial cell) tumor, 266
Ovary, 267
Arrhenoblastoma, 267
Virilizing lipoid cell tumors (masculinovoblastoma), 269
Leydig cell tumor (hilus cell, sympathicotropic cell), 271
Stein-Leventhal syndrome (microcystic or sclerocystic ovaries, hyperthecosis ovarii), 273
Hyperadrenocorticism, 276
Evolution of present concepts, 276
Adrenal virilism in the female—onset after birth, 278
Adrenal virilism in the female—onset in utero (congenital adrenal hyperplasia; female pseudohermaphroditism, mixed adrenal disease of infancy), 280

CHAPTER

Postnatal onset of androgen excess in boys (precocious pseudopuberty), 282
Prenatal onset of androgen excess in the male (congenital adrenal hyperplasia, mixed adrenal disease of infancy), 283
Cushing's syndrome, 288
Sex precocity of intracranial origin, 294
Lesions of the pineal and hypothalamus, 294
Idiopathic sex precocity (simple early puberty), 295
Premature growth of sex hair, 296
Idiopathic hypertrichosis, 297
Differential diagnosis, 298

17. Androgen Deficiency—Hypogonadism 305
Definition of hypogonadism, 305
Significance of adrenal androgens, 305
Disorders dominated by tubular failure, 306
Causes of eunuchoidism, 309
Secondary to pituitary deficiency, 309
Primary testicular disease, 310
"Klinefelter's syndrome," "puberal failure," 311
Prepuberal agenesis, "functional castration," 311
Miscellaneous disorders, 311
Less common types, 312
Froelich's syndrome, 313
Clinical features of male hypogonadism, 314
Prepuberal onset, 314
Bone development, 315
Muscles, 315
Fat, 315
Skin, 316
Hair, 318
Voice, 319
Genitalia, 319
Psychiatric aspects, 319
Miscellaneous changes, 321
Incomplete hypogonadism, 321
Postpuberal onset, 321
Castration, 321
Spontaneous testicular failure in late life, 322
Hypopituitarism, 325
Therapeutic castration, 326
Cancer of the prostate, 326
Cancer of the breast, 327
Other conditions, 327

18. Androgen Therapy 330
Stimulation therapy, 330
Hypogonadism, 330
Small genitalia in childhood—delayed puberty, 331
Adiposogenital dystrophy, 332
Undescended testes, 333
Substitution therapy, 335
Hypogonadism (eunuchoidism, castration), 335

CHAPTER

Androgens in miscellaneous disorders, 338
Pituitary dwarfism; Simmonds' disease (panhypopituitarism), 338
Benign prostatic hypertrophy, 340
Cardiovascular disease, 342
Promotion of anabolism in various disorders, 343
Cushing's syndrome, 343
Addison's disease, 344
Osteoporosis of late life, 345
Induction of positive nitrogen balance in miscellaneous disorders, 345
Impotence and low sex drive, 346
Psychoses of middle and late life, 347
Homosexuality, 348
Simple gynecomastia, 348
Muscular dystrophies, 348
Kidney damage, 349
Sterility, 349
Skin disorders, 351
Hyperthyroidism, 351
Lupus erythematosis, 352
Simple senility, 352
Miscellaneous disorders of childhood, 352
Body stature, 353
Undescended testes, 354
Small genitalia, 354
Enuresis, 354
Separation of prepuce, 354
Disorders of the female reproductive system, 354
Masculinizing effects of androgen, 355
Menopausal syndrome, 356
Excessive uterine bleeding, 358
Dysmenorrhea, 360
Endometriosis, 361
Premenstrual tension, 361
Frigidity, 362
Postpartum state, 364
Benign breast disorders, 364
Neoplasms, 365
Undesirable side effects of androgen, 368
Salt and water retention, 368
Depression of spermatogenesis, 369
Stimulation of cancer growth, 369
Jaundice, 369

19. Androgen Preparations and Methods of Administration 376
Injection, 376
Percutaneous administration, 379
Animal experiments, 379
Clinical results, 380
Pellet implants, 380
Rate of absorption, 381

CHAPTER

Tissue reaction, 382
Methods of implantation in man, 382
Oral therapy, 383
Testosterone and its esters, 383
Methyltestosterone, 384
Potency, 384
Side effects, 384
Sublingual and buccal therapy, 386

20. The Excretion of Androgens and 17-Ketosteroids in Various Clinical Conditions 389
The normal subject, 390
Influence of sex, 390
Men, 390
Women, 390
Influence of age, 395
Children, 395
Old men and old women, 397
Short-term stresses, 401
Physiological stress, 401
Injury and nonspecific disease, 403
Starvation, 404
Various "constitutional" conditions, 405
Clinical disorders, 405
Eunuchoid and castrate men, 405
Hypogonadal and ovariectomized women, 407
Addison's disease, 409
Pituitary abnormalities, 409
Thyroid disease, 413
Testicular tumors, 415
Tumors and other lesions of the ovary and uterus, 415
Simple hirsutism, 418
Adrenocortical hyperplasia, 420
Adrenocortical tumor, 423
Cushing's syndrome without anatomic adrenal disease, 423
Precocious sex development not associated with anatomic adrenal or testicular disease, 426
Pregnancy, 426
Miscellaneous disorders, 428
Androgens and 17-ketosteroids in blood, 435
β-17-Ketosteroids, 436
Normal subjects, 437
Adrenocortical tumor, 438
Adrenal hyperplasia, 439
Miscellaneous conditions, 440
Summary of β-17-ketosteroid excretion, 440
Individual 17-ketosteroids of urinary extracts, 440

APPENDIX

A. Names and Structural Formulae of Compounds 451
B. Preparation of Urinary Extracts for 17-Ketosteroid and Androgen Assay . . 525
Introduction, 525

APPENDIX
Preparation of extracts for 17-ketosteroid and androgen assay, 527
Preparation of total urinary extract, 527
Extraction procedure A (Dorfman), 527
Extraction procedure B (Dorfman), 527
Extraction procedure C (Pincus), 528
Extraction procedure D (Talbot et al.), 528
Preparation of total neutral extract, 528
Preparation of neutral ketonic fraction, 528
Method A (Talbot), 528
Method B (Pincus and Pearlman), 529
Preparation of α- and β-neutral ketonic fractions, 529
Method A (Frame), 529
Method B (Butt et al.), 530
Micro extraction methods, 531
Method A (Drekter et al.), 531
Method B (Drekter et al.), 531
Method C (Hamburger), 532
Fractionation of individual 17-ketosteroids, 533
Method A (Robinson and Goulden), 534
Method B (Rubin et al.), 534
Method C (Rubin et al.), 536
Preparation of chromatograms, 536
Preparation and chromatography of urine extracts, 539

C. Androgen Bioassay Methods 543
Capon methods, 543
Caponizing, 543
Intramuscular injection methods, 543
Application of androgens to capon's comb, 545
Chick methods, 547
Relative reactivity of combs of various breeds, 547
Method of Frank et al., 549
Additional chick comb methods, 550
Mammalian assays, 552
Seminal vesicle method (Mathieson and Hays), 552

D. Chemical Assay Methods 556
Determination of 17-ketosteroids, 556
Method A (Callow, Callow, and Emmens), 556
Method B (Holtorff and Koch), 558
Method of Pincus, 558
Determination of dehydroepiandrosterone, 559
Patterson reaction, 559
Method of Munson et al., 560
Method of Jensen, 562
Determination of testosterone and testosterone propionate, 563
Assay of testosterone propionate in oil, 563
Determination of testosterone, 564

Index 567