



---

## Abstract

## Introduction

---

Author correspondence  
ORCID  
Supplementary material:  
Licensed under:  
Received



## History

### Backdoor Pathways to 5 $\alpha$ -Dihydrotestosterone



## 5 $\alpha$ -Dione Pathway

*in vitro*

## 11-Oxygenated Androgen Pathways

### Definition

### Nomenclature and Background

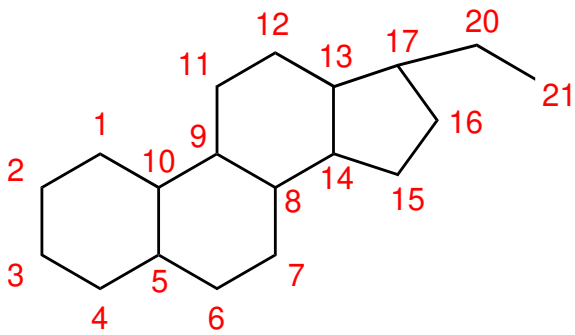


Figure 1



*sic*

## Biochemistry

### Backdoor Pathways to 5 $\alpha$ -Dihydrotestosterone

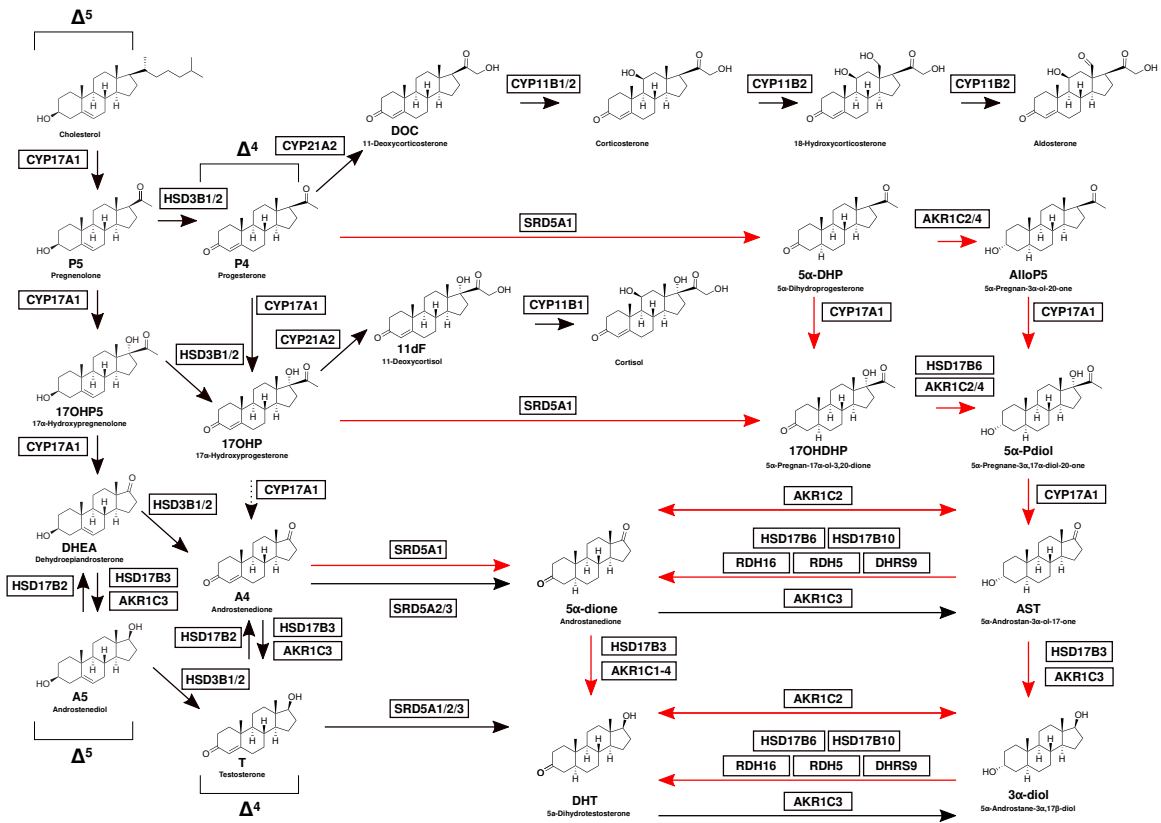


Figure 2



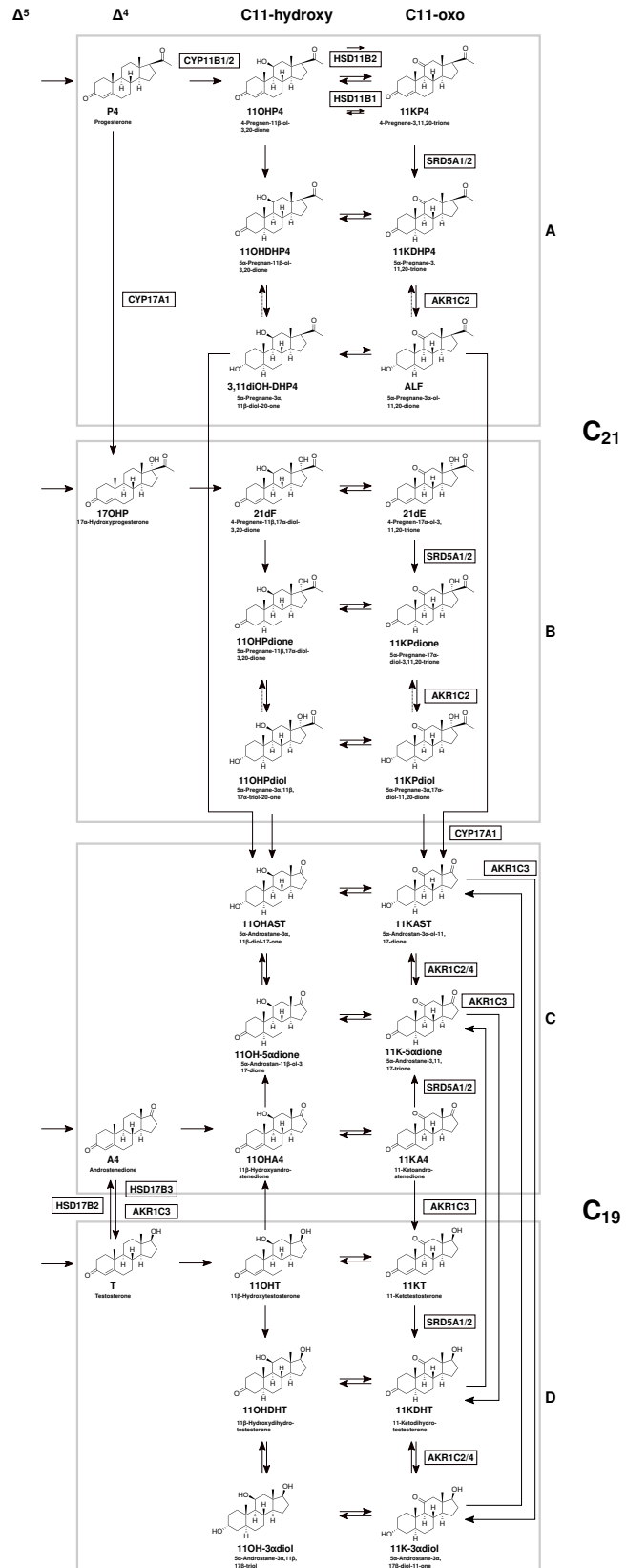
## 17 $\alpha$ -Hydroxyprogesterone Pathway

## 5 $\alpha$ -Dione Pathway

## Progesterone Pathway



Figure 3







## 11-Oxygenated Androgen Pathways

*in vitro*

**Other Backdoor Androgen Pathways**



## Clinical Significance

### 11-Oxygenated Androgens

### Hyperandrogenism

<



## Congenital Adrenal Hyperplasia

## Other Disorders of Sex Development



## Premature Adrenarche

## Polycystic Ovary Syndrome

## Cushing's Disease



## Prostate Cancer

### Future Directions

**The role of non-classical CAH in  
CP/CPPS**

**Benign Prostatic Hyperplasia,  
Chronic Prostatitis/Chronic Pelvic  
Pain Syndrome**

**The biomarkers of disease control in  
CAH due to CYP21A2 deficiency**



## SRD5A2 in the backdoor pathway to DHT

### Additional Information

#### Acknowledgements

#### Competing Interests

#### Immune Response Regulation

#### Funding

## Abbreviations and Identifiers

### Steroids

Abbreviation	Systematic Name	Trivial Name	Other Names and Abbreviations	PubChem CID









HGNC Gene Symbol	Enzyme Name

### Conditions

Abbreviation	Full Name

### Other Abbreviations

Abbreviation	Full Name

### References

*Journal of Clinical Oncology* **20** *Journal*

**63** *Maturitas*

*Endocrinology* **144** *Trends*

*in Endocrinology and Metabolism: TEM* **15**

*The Journal of Steroid Biochemistry and Molecular Biology* **174**



*Metabolites* **9**

- *General Subjects* **924**

*Biochimica et Biophysica Acta (BBA)*

*Proceedings of the National Academy of Sciences of the  
United States of America* **97**

*Endocrine Reviews* **18**

*Molecular and Cellular Endocrinology* **222**

*The  
Journal of Clinical Endocrinology and Metabolism* **97**

*Proceedings of the National Academy of Sciences of the United  
States of America* **108**

*J Investig Med* **60**

*Best Practice & Research. Clinical Endocrinology &  
Metabolism* **22**

*Mol Cell Endocrinol* **441**

*et al*

*J Clin Endocrinol Metab*



*Mol Cell Endocrinol* **377**

*PLOS ONE* **11**

*and Molecular Biology* **178**

*The Journal of Steroid Biochemistry*

*Steroid Biochemistry and Molecular Biology* **199**

*The Journal of*

*ogy* **17**

*et al*

*PLOS Biol-*

*Advances in Experimental Medicine and Biology* **1210**

*Eur J Biochem* **186**

*Eur J Biochem* **186**



3S-1.4

*Eur J Biochem* **186**

*Nomenclature of Organic Chemistry*  
- *IUPAC Recommendations and Preferred Names 2013*

*Nomenclature of Organic Chemistry*  
- *IUPAC Recommendations and Preferred Names 2013*

*Eur J Biochem* **186**

*Eur J Biochem* **186**

*Nomenclature of Organic Chemistry - IUPAC Recommendations and Preferred Names 2013*



*Rev* **32**  
*Endocr*  
*ocrinology and Metabolism* **1**  
*Clinics in En-*

*Proc Soc Exp Biol Med* **85**

*Steroids* **3**

**6**

*et al*  
*J Endocr Soc*

*Nat Rev Endocrinol* **16**

*Molecular and Cellular Endocrinology* **525**  
*Nomenclature of Organic Chem-*  
*istry - IUPAC Recommendations and Preferred Names 2013*

*Flame* **160**  
*Combustion and*

*Eur J Biochem* **186**

*Nucleic Acids Research* **49**



*J Clin Endocrinol Metab* **77**

*Developmental Dynamics* **242**

*et al*

*Proceedings of the  
National Academy of Sciences of the United States of America* **116**

*American Journal of Human Genetics* **89**

*J Biol Chem* **272**

*Natl Acad Sci U S A* **108**

*Proc*

*Chem Biol Interact* **143-144**

*of Urology* **185**

*Journal*

*et al*

*Prostate Cancer and Prostatic Diseases*

*Steroid Biochemistry and Molecular Biology* **218**

*The Journal of*



156

*J Steroid Biochem Mol Biol*

13

*Journal of Steroid Biochemistry*

*J Steroid Biochem Mol Biol* **128**

*J Steroid Biochem Mol Biol* **138**

183

*J Steroid Biochem Mol Biol*

*Scientific Reports* **6**

*The Aging Male* **20**

*Chromatography A* **1650**

*Journal of*

*J Clin Endocrinol Metab* **104**

*Clin Endocrinol Metab* **104**

*J*



*et al*

*J Clin Endocrinol Metab* **105**

*Human Reproduction* **35**

*et al*

*Endocrinology* **162**

*Steroids* **1**

*Int J Mol Sci* **21**

*tice & Research. Clinical Endocrinology & Metabolism*

**20**

*Best Prac-*

*Curr Opin Endocrinol Diabetes Obes* **24**

*et al*

*Reprod Biomed Online* **41**

**8**

*Frontiers in Pediatrics*

*istry and Molecular Biology*

**178**

*The Journal of Steroid Biochem-*

*Fertil Steril* **58**





*et al*

*Eur J Endocrinol*

*J Clin Endocrinol Metab* **20**

*J Clin Endocrinol Metab* **66**

*Lancet* **390**

*N Engl J*

*Med* **349**

*et al*

*ogy and Metabolism* **103**

*The Journal of Clinical Endocrinol-*

**27**

*Ann Pediatr Endocrinol Metab*

**44**

*Endocrinology and Metabolism Clinics of North America*

**100**

*et al*

*The Journal of Clinical Endocrinology and Metabolism*

*et al*

*Eur J Endocrinol* **181**

*J Obstet Gynaecol Res* **43**

*et al*



*The Journal of Clinical Endocrinology and Metabolism* **68**

*et al*

*Presse Medicale (Paris, France: 1983)*

**18**

*of the Endocrine Society* **1**

*Journal*

*et al*

*Eur J Endocrinol* **174**

*et al*

*Metab* **99**

*J Clin Endocrinol*

*et al*

*sanne)* **12**

*Front Endocrinol (Lau-*

*et al*

**102**

*The Journal of Clinical Endocrinology and Metabolism*

*J*

*Clin Endocrinol Metab* **107**

*PLOS Biology* **17**

*Ann Endocrinol (Paris)* **75**

*J Clin*

*Endocrinol Metab* **81**



*Best Pract Res Clin Endocrinol Metab* **36**

*J Steroid Biochem Mol Biol* **212**

*Front Endocrinol (Lausanne)*

**12**

*Endocrine Reviews* **36**

*Lancet (London, England)* **335**

*et al*

*J Clin Endocrinol Metab* **94**

*Molecular and Cellular En-*

*docrinology* **441**

*The Journal of Clinical Endocrinology & Metabolism* **105**

*et al*

*The Journal of Clinical Endocrinology & Metabolism*

*Mol Cell Endocrinol* **461**

*et al*

*Endocr Relat Cancer* **28**



*et al*

*JCI Insight* **6**

*Urology* **71**

*Molecular Biology* **196**

*The Journal of Steroid Biochemistry and*

*Hum Reprod Update* **23**

*Int J Pediatr Endocrinol* **2010**

*Urology*

*Urology*

*Hormone Research in Paediatrics* **91**

*J Biol Chem* **246**

*Biochem Biophys Res Commun* **215**

*et al*

*J Urol* **178**

*Steroid Receptors in Immune Cells*

*Sex*

*Seminars in Immunopathology* **41**



*Cellular Immunology* **294**

*Diabetes & Metabolic Syndrome: Clinical Research & Reviews* **14**

*Drug Development Research* **81**

*et al*

*Journal of Infection* **84**

*Endocrinology* **184**

*European Journal of*