

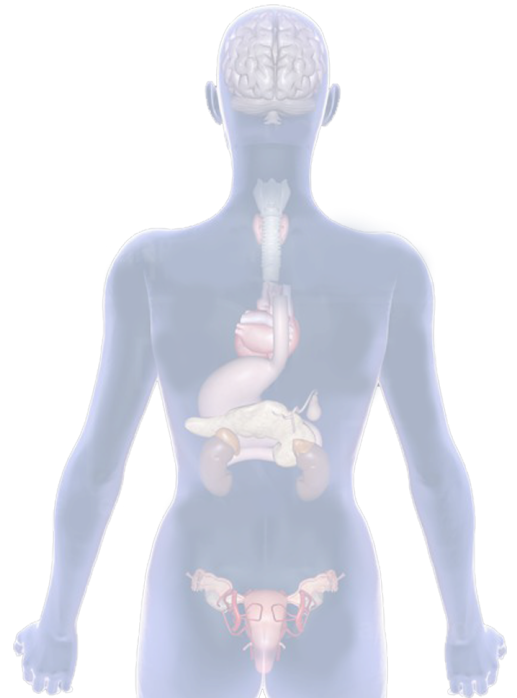
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## #12 Adrenal gland(adrenal androgens)

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### Objectives:

- Summarize the actions of adrenal androgens.



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- Important
  - Male's notes
  - Female's notes
  - Extra

Resources: 435 male's & female's slides + guyton

Editing file: [click Here](#)

Revised by

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# Androgens

**Definition:** androgens are the hormones that exert masculinizing effects<sup>1</sup> and they promote anabolism and growth.

## Androgens sources:

**1-Testis (testosterone):** It's the major active androgen.

**2-Adrenal gland (adrenal androgens):** It has less than 20% of testosterone activity.

Adrenal androgens are produced from zona reticularis (innermost layer of adrenal cortex) in small amounts, Its secretion is controlled by ACTH.

**Target tissue:**General body cells

## Adrenal cortex:

**1-Female sex hormones,** which are estrogen and progesterone.

**2-Male sex hormones (adrenal androgens)** include: dehydroepiandrosterone (DHEA) and androstenedione.

## Types of adrenal androgens (adrenal gland)

Dehydroepiandrosterone (DHEA)	androstenedione
<ul style="list-style-type: none"><li>It is the most abundant adrenal androgen, and it's the <b>primary precursor of natural estrogens</b>.</li><li>Normally they exert very little masculinizing<sup>2</sup> effect (weak) when secreted in normal amount (mild effect in female)</li></ul>	<ul style="list-style-type: none"><li>An androgenic steroid produced by the testis, adrenal cortex and ovaries.</li><li>Androstenediones are converted metabolically to testosterone and to estrogen in the <b>fat</b> and other peripheral tissues.</li><li>It is an <b>important source</b> of estrogen in <u>men</u> and <u>postmenopausal women</u>.</li><li><u>Androstenedione</u> were used as an <u>Athletic</u> or body building supplement.</li></ul>

## **NOTES:**

- The adrenal cortex in both sexes produces small amounts of sex hormone of the opposite sex.
- Some testosterone in males is converted into estrogen by the enzyme **Aromatase** found in adipose tissues.

## Production of androgen in women:boy's slide only

- By Adrenal cortices (controlled by ACTH):The adrenal cortex produces the majority of DHEA (80%) and its sulfate DHEAS (>90%).
- By ovarian theca cells (controlled by LH):Ovaries produce androgen as an **intermediate step** in estrogen production. Little of this androgen is released in the blood instead of being converted into estrogen.
- Precursors **DHEA** and **androstenedione** are produced by the ovaries and adrenal cortices.

# Role of Androgen

The androgens function as paracrine hormones

Male	Female
<ol style="list-style-type: none"> <li>1. Spermatogenesis (it acts on Sertoli cells)</li> <li>2. Inhibition of fat deposition.</li> <li>3. Muscle mass.</li> <li>4. Brain: Androgen levels have been implicated in the regulation of human aggression and libido.</li> <li>5. Masculinization of the developing male fetus (including penis and scrotum formation).</li> </ol>	<ol style="list-style-type: none"> <li>1. <b>Growth of pubic and axillary hair</b></li> <li>2. Pubertal growth spurt. يساعد على البلوغ</li> <li>3. Androgen have potential roles in relaxation of myometrium (عضلات الرحم) preventing premature uterine contractions in pregnancy.</li> <li>4. Development and maintenance of female sex drive.</li> </ol>

## Adrenogenital syndrome

**Definition:** Excessive adrenal androgens secretion.

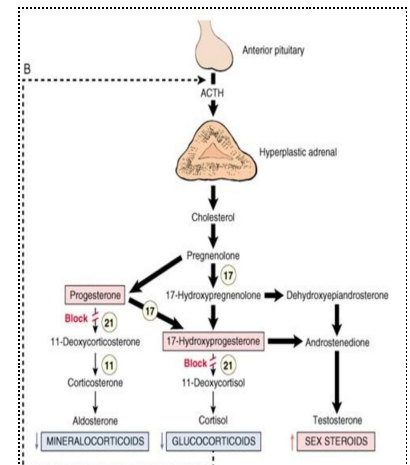
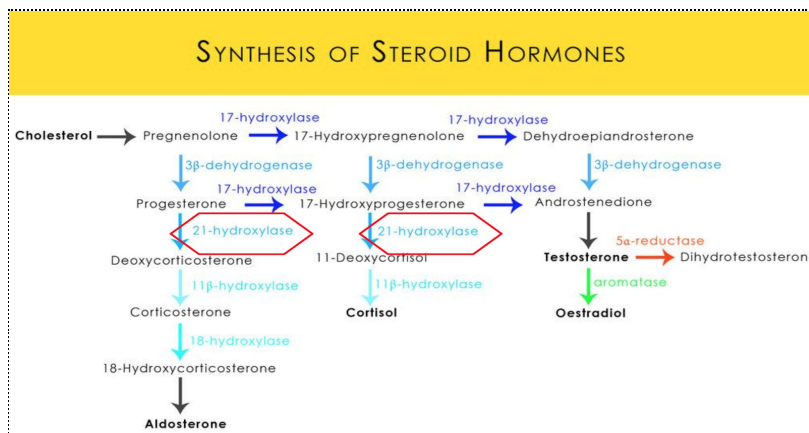
### Causes:

1. **Adrenocortical tumors:** secretes excessive quantities of androgens that cause intense masculinizing effects throughout the body.
2. **Congenital adrenal hyperplasia:**
  - Inherited as autosomal recessive diseases.
  - **Affect** both boys and girls.
  - The defect is lack of an enzyme (21-hydroxylase) needed by the adrenal gland to make the major steroid hormones of the adrenal cortex: cortisol and aldosterone.
  - As result of this defect :

-steroids are 'diverted' to becoming androgens.

-there is abnormal 'feedback' Lead to increase ACTH leading to excessive production of adrenal androgens.

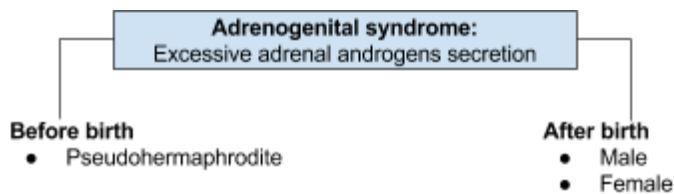
الصور للفهم فقط: تقولك انه فيه انزيم اسمه 21 هايدروكسلايز مهم لتصنيع الكورتيزول والالديسترون بدونه ماتتصنع اما الاندروجين فما يحتاج هذا الانزيم ابدأ ((, فاذا كان هالانزيم مومجد وششش بيصير اكيد مب متصنع الكورتيزول والالديسترون لكن الاندروجين بما انه ما يحتاجه فيبتصنع وكل الكلسترول بيتحول لاندروجين لانه الوحيد من الستيرويدات اللي الانزيمات المساعدة على تصنيعه سليمة



## Sign and symptoms:

<b>Female</b>	
<b>Before birth (Female)</b>	<b>After birth (Female)</b>
<ul style="list-style-type: none"> <li>● <b>Pseudohermaphroditism<sup>3</sup></b> خنثوية كاذبه</li> <li>● Before <b>12 weeks</b> in female fetus</li> <li>● XX <u>true female</u> with <b>external male genitalia</b></li> <li>● <b>Cause:</b> exposure of the mother to <u>excessive androgens</u></li> </ul>	<p>she develops <b>virile characteristics</b> (صفات رجولية), including:</p> <ul style="list-style-type: none"> <li>● growth of a beard.</li> <li>● a much deeper voice.</li> <li>● occasionally baldness.</li> <li>● masculine distribution of hair on the body. (توزيع ذكوري لشعر الجسم).</li> <li>● Increase bulk of muscles.</li> <li>● Atrophy of the breast.</li> <li>● Amenorrhea.</li> </ul>

<b>Male</b>	
<b>In prepubertal male</b>	<b>In the adult male</b>
<p>the same characteristics <b>as in the female</b> plus <b>rapid development of the male sexual organ.</b></p> <ul style="list-style-type: none"> <li>● Precocious puberty البلوغ المبكر</li> <li>● Early appearance of male characters</li> <li>● Increase musculature زيادة العضلات</li> <li>● Development of external genitalia organ to adult size.</li> <li>● <b>No spermatogenesis</b> هذا الوحيد الي يفرقه عن الاذولت ميل</li> </ul>	<p>the virilizing characteristics of adrenogenital syndrome are usually <b>obscured</b> by the <u>normal virilizing characteristics</u> of the testosterone secreted by the testes;</p> <p>That's why It is often <b>difficult</b> to make a diagnosis.</p> <p>يقولك ان صعب نفرق انه الصفات الذكريه الي فيه ناتجه عن افراز التستوسترون من الخصيتين كما في الرجل الطبيعي او انها ناتجه عن فرط افراز الاندروجين من الادرينال كما في الشخص الغير طبيعي, فالشي الي يبساعدهم بالتشخيص وجود ال 17 كيتوستيرويد بالبول (بكمية اكثر من الطبيعي بعشر اضعاف) ال 17 كيتوستيرويد ناتج عن تكسير الاندروجين ,</p> <p>However, the excretion of <b>17-ketosteroids</b> (derived from androgens) in urine may be 10 to 15 times normal, used in diagnosing the disease</p>



<sup>3</sup> Pseudohermaphroditism: A condition in which an individual of one sex has external genitalia superficially resembling those of the other sex (خنثي)

Precocious puberty: a child having developed certain abilities or proclivities at an earlier age than usual (بلوغ مبكر)

Amenorrhea: an abnormal absence of menstruation (انحباس الطمث)



**Thanks to this amazing team!**

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جوهرة المالكي  
رعدة القاسم  
ملاك اليحيى  
عمر الشهري