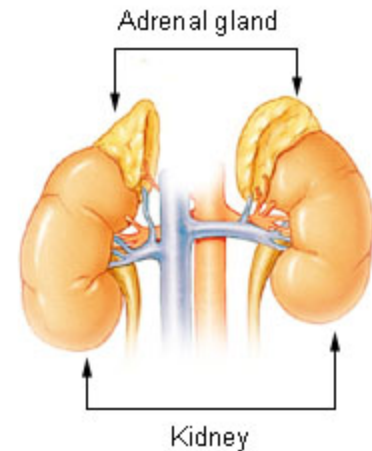


# Endocrine Physiology

## The Adrenal Gland 3 Adrenal Androgen

*Dr. Khalid Alregaiey*

**Adrenal Gland**



# Zona Reticularis

## Zona reticularis

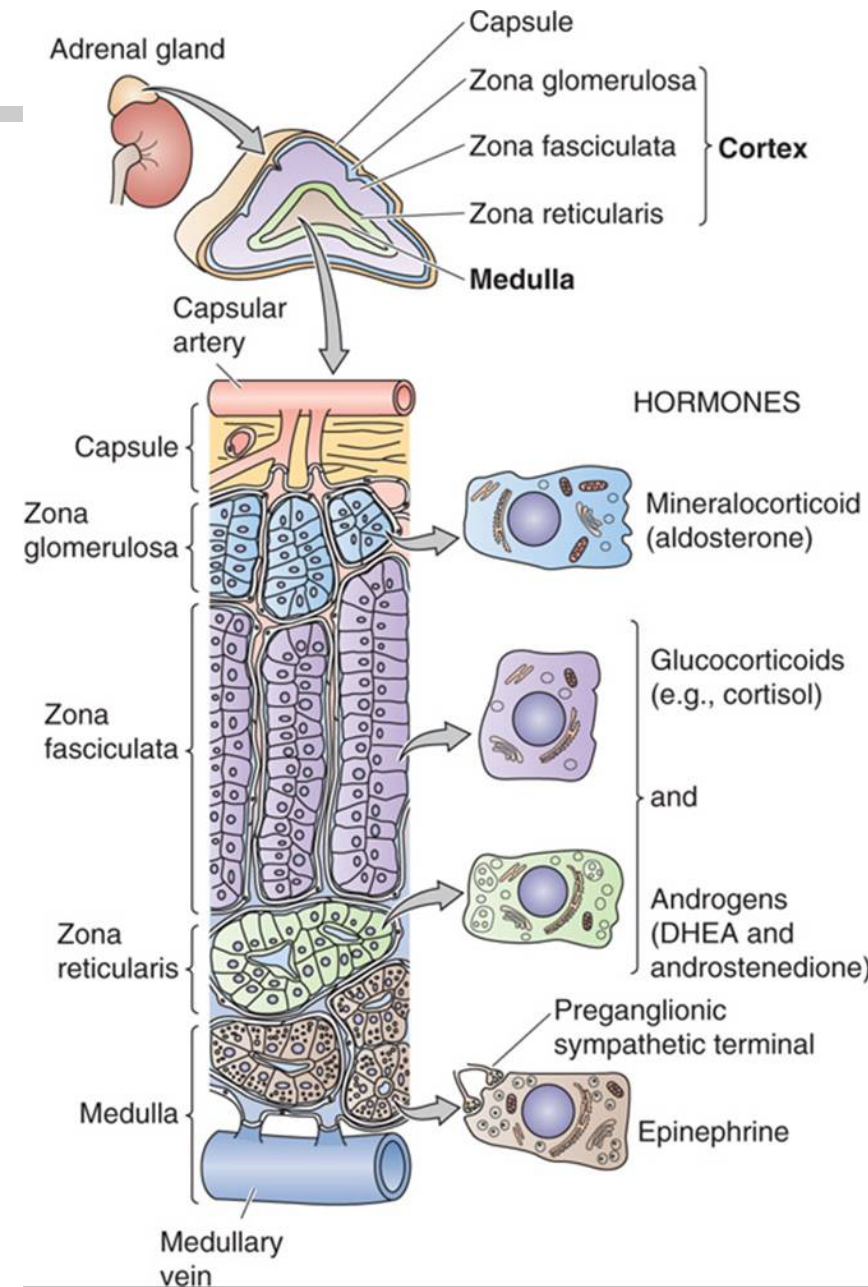
Produces significant amounts of androgens, mostly dehydroepiandrosterone sulfate (DHEAS),

**Hormone Control:**

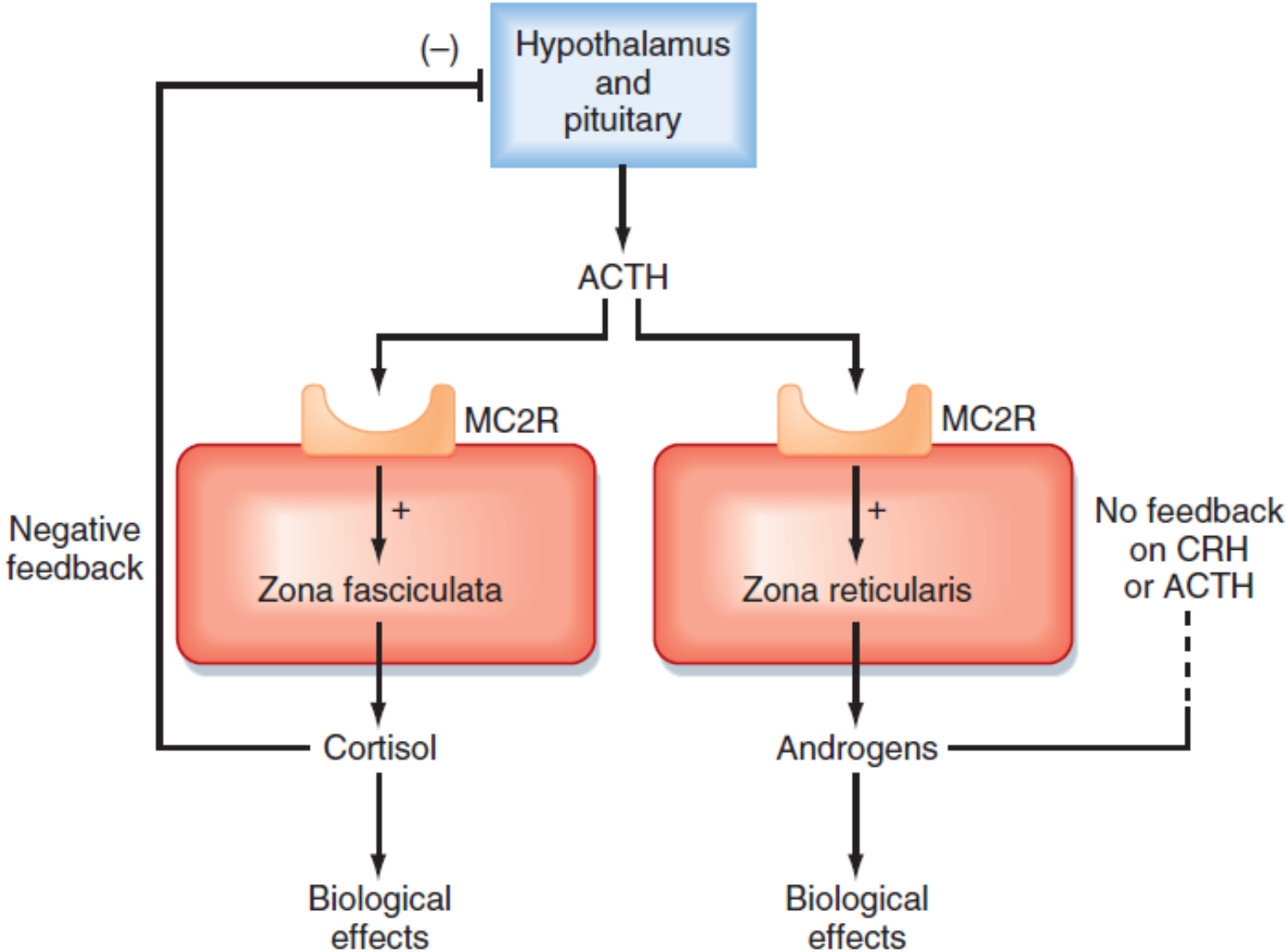
ACTH

**Target tissue:**

General body cells



# The “loophole” in the hypothalamic-pituitary-adrenal axis



# Androgens

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Androgens are the male hormones. They exert masculinizing effects and promote anabolism and growth.

**Adrenal androgens** have little androgenic activity, but they provide a pool of circulating precursor for peripheral conversion to more potent androgens (e.g. testosterone, T) and estrogens, (e.g. estradiol)

# Adrenal Androgens

The adrenal cortex produces both **androgens** “male sex hormones” and **estrogens** or “female sex hormones.”

The adrenal cortex in both sexes produces small amounts of sex hormone of the opposite sex. Additional small amounts of sex hormones come from nonadrenal sources. Some testosterone in males is converted into estrogen by the enzyme aromatase found in adipose tissues.

In females, 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.

Adrenal androgens account for 50% of the androgens in females

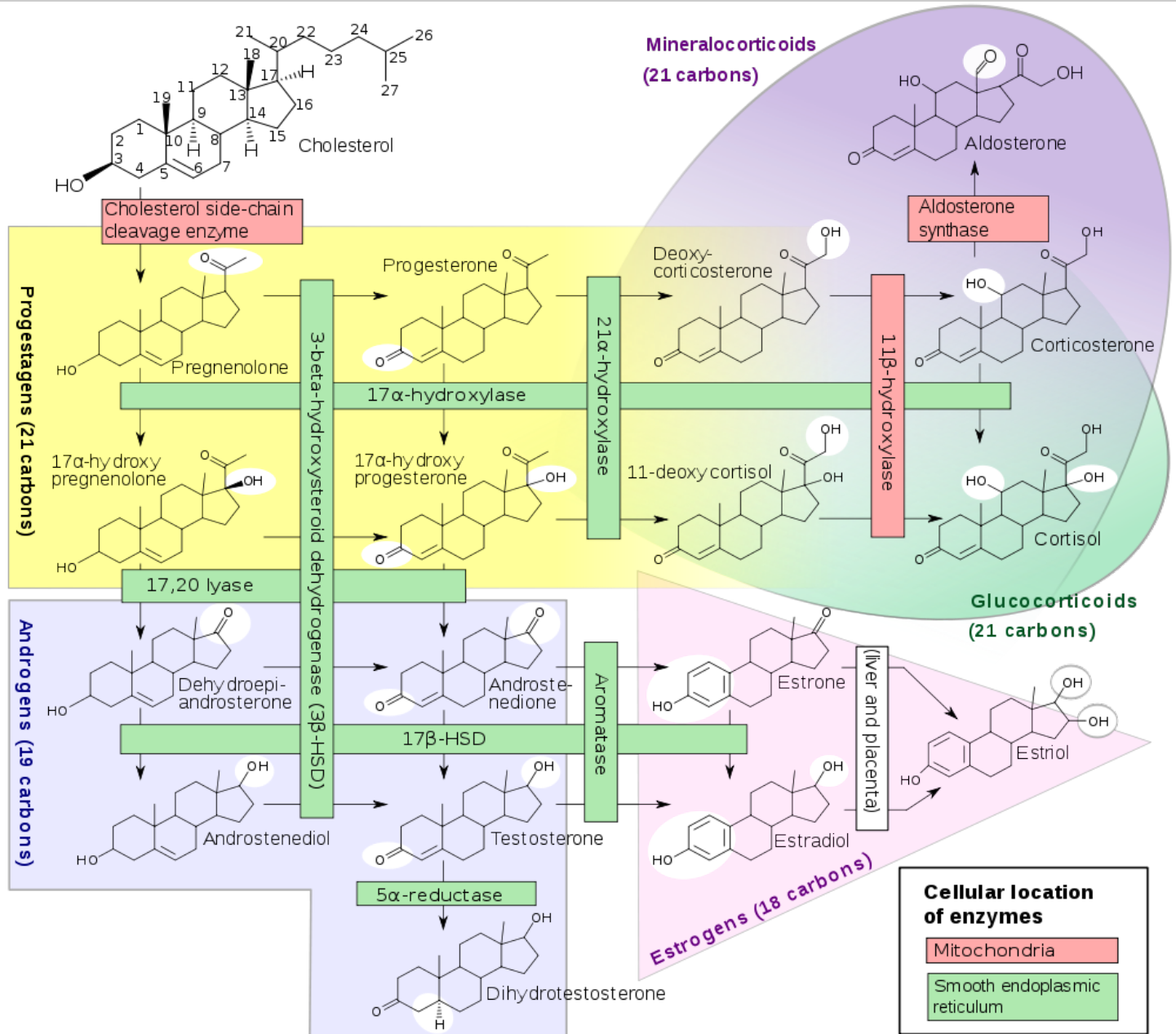
**Adrenarche:** the onset of adrenal androgens in humans is a gradual process that precedes the onset of puberty (6-7 years of age in girls and 7-8 years of age in boys).

# Adrenal Androgens

A subset of androgens, **adrenal androgens**, includes :

- Dehydroepiandrosterone (DHEA),
- DHEA sulfate (DHEAS),
- Androstenedione
- Androstenediol
- $11\beta$ -hydroxyandrostenedione (11OHA)
- $11\beta$ -hydroxytestosterone (11OHT)

# Steroidogenesis



# Adrenal Androgens

- About 90% of adrenal androgens are bound to albumin and 3% approximately is bound to sex hormone-binding globulin (SHBG).
- DHEAS has high affinity to albumin, half-life 7-10 hours. DHEA low affinity, 15-30 minutes.
- DHEA, DHEAS, and Androstenedione are converted to the potent androgens T and DHT in peripheral tissues.



# Effects of adrenal androgens:

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Actions of Androgens in the female include:

growth of pubic and axillary hair, pubertal growth spurt, development and maintenance of female sex drive (libido).

# Congenital adrenal hyperplasia (CAH)

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- It is a familial disorder of adrenal steroid biosynthesis with autosomal recessive mode of inheritance.
- The defect is expressed as adrenal enzyme deficiency.
- Most important enzyme deficiencies:
  - 21  $\alpha$ -Hydroxylase (>80% of cases).
  - 11  $\beta$ -Hydroxylase (5-10% of cases )
  - 17  $\alpha$ -Hydroxylase

# CAH

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- The enzyme deficiency causes reduction in end-products, accumulation of hormone precursors & increased ACTH production.
- The clinical picture reflects the effects of inadequate production of cortisol & aldosterone and the increased production of androgens & steroid metabolites.

## Hyper-secretion:

### Adrenogenital Syndrome

In **pre-pubertal males** it causes rapid development of secondary sexual characters, increased growth but shorter stature because of early closure of epiphyseal plates.



## Hyper-secretion:

### Adrenogenital Syndrome

**in females** causes beard growth, deeper voice, masculine distribution of body hair, and growth of the clitoris to resemble a penis.

