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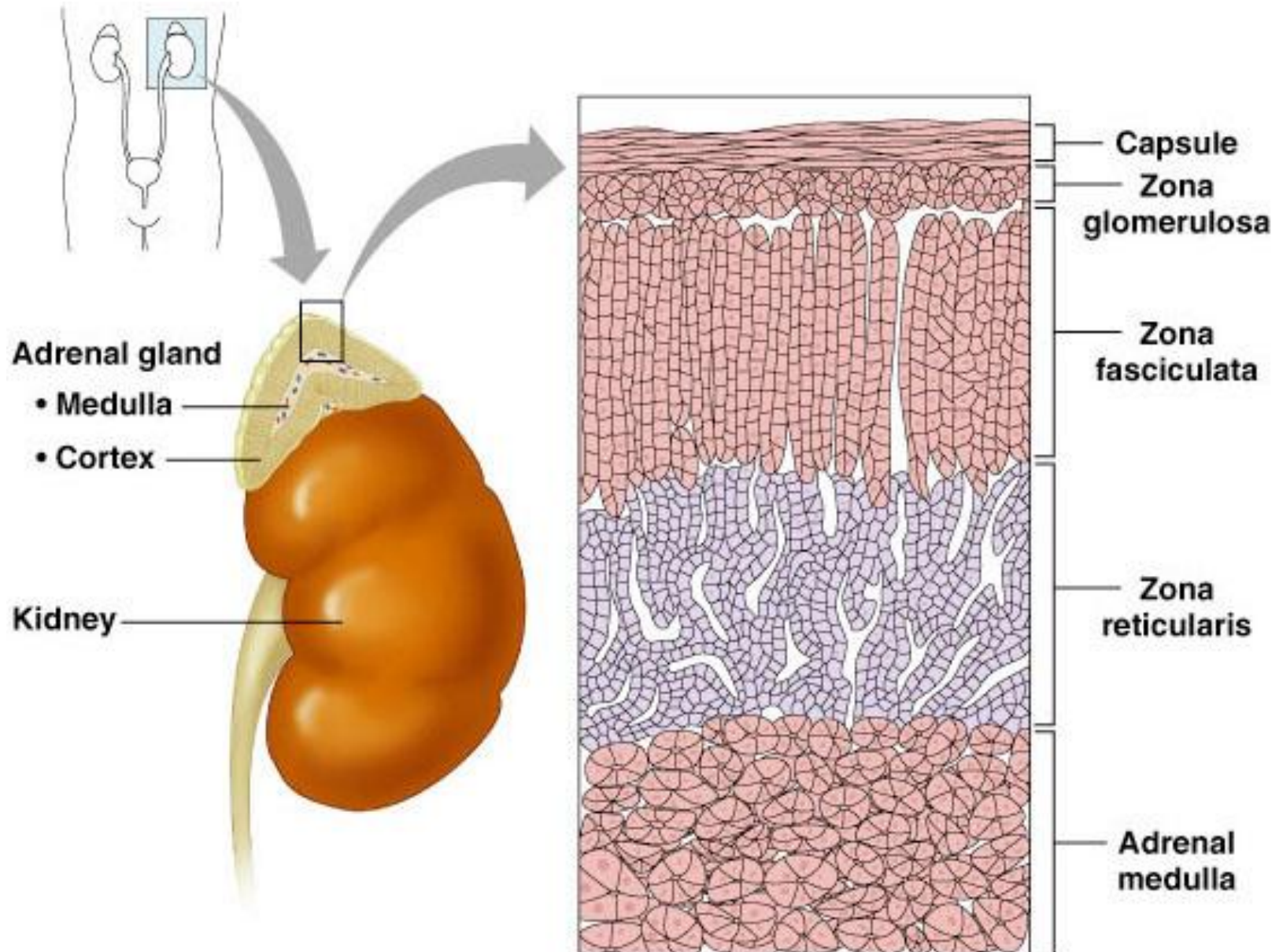
**ENDOCRINOLOGY**

# **The Adrenal Gland**

*Adrenal Androgens*

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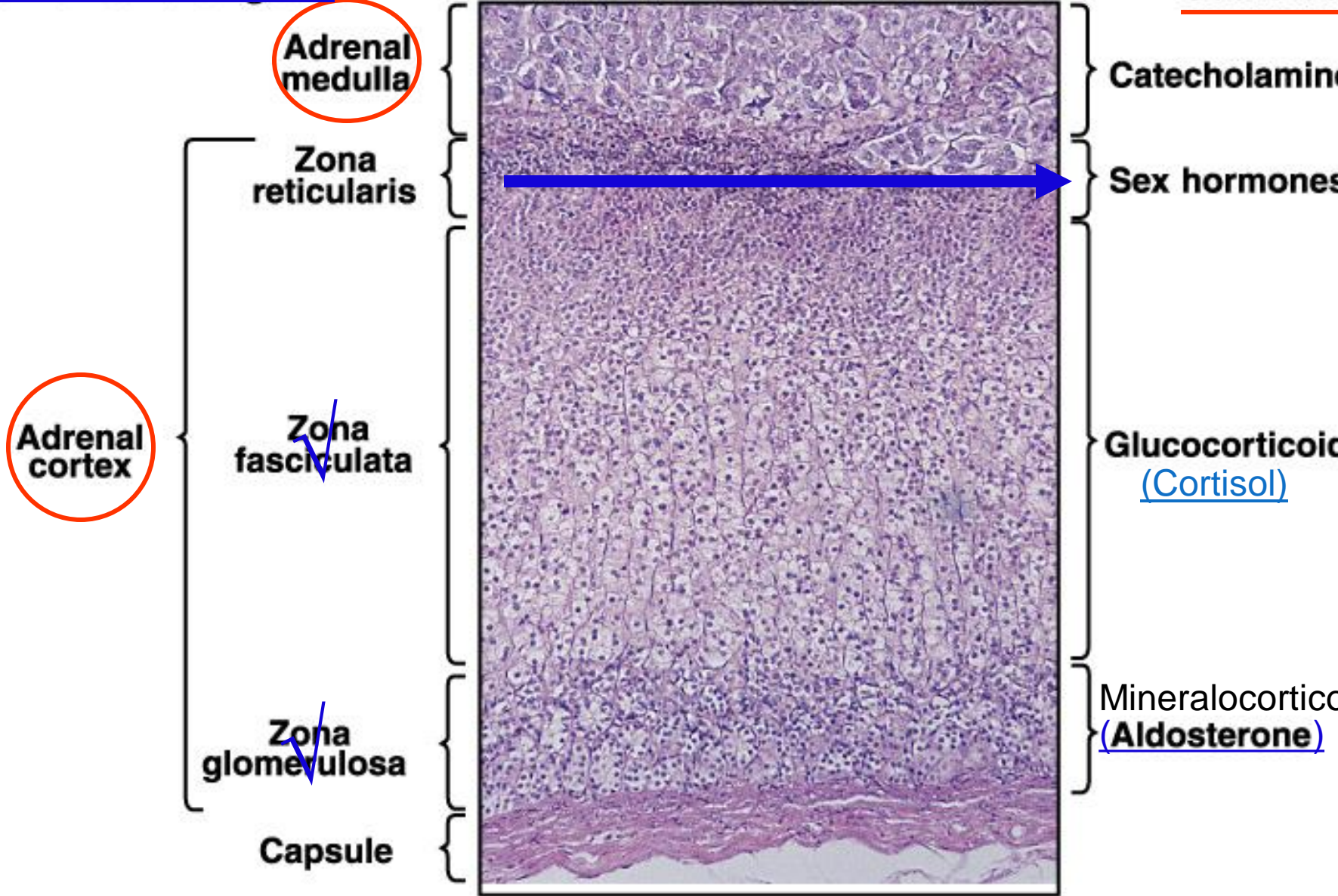
# Adrenal Cortex



# The Adrenal Gland

## Region of adrenal gland

## Secretes



# Androgens

Androgens are the hormones that exert masculinizing effects and they promote anabolism and growth.



**Testosterone  
(Testis)**

the major active androgen

**adrenal  
androgens  
(Adrenal Gland)**

have less than 20% of testosterone activity.

# Adrenal cortex

## Male sex hormones (Androgens)

- Adrenal androgens includes :
  - dehydroepiandrosterone (DHEA),
  - Androstenedione.

## Female sex hormones

- Estrogens
- Progesterone

- The adrenal cortex in both sexes produces small amounts of sex hormone of the opposite sex.

## adrenal androgens (Adrenal Gland)

- Produced from Zona reticularis in small amounts
- Control of secretion of adrenal androgens is by ACTH
- dehydroepiandrosterone (DHEA):
  - It is the most abundant adrenal androgen
  - DHEA is the primary precursor of natural estrogens.
  - Normally they exert very little masculinizing effect (weak) when secreted in normal amount (mild effect in female).
- Androstenedione:
  - An androgenic steroid produced by the testes, adrenal cortex, and ovaries
  - Androstenediones are converted metabolically to testosterone and to estrogens in the fat and other peripheral tissues. It is an important source of estrogen in men and postmenopausal women.
  - Androstenedione were used as an athletic or body building supplement.

# Role of Androgens

## Males

- Spermatogenesis
- Inhibition of fat deposition
- Muscle mass
- Brain: Androgen levels have been implicated in the regulation of human aggression and libido.
- masculinization of the developing male fetus (including penis and scrotum formation).

## Females

- growth of pubic and axillary hair.
- pubertal growth spurt development
- Androgens have potential roles in relaxation of the myometrium preventing premature uterine contractions in pregnancy

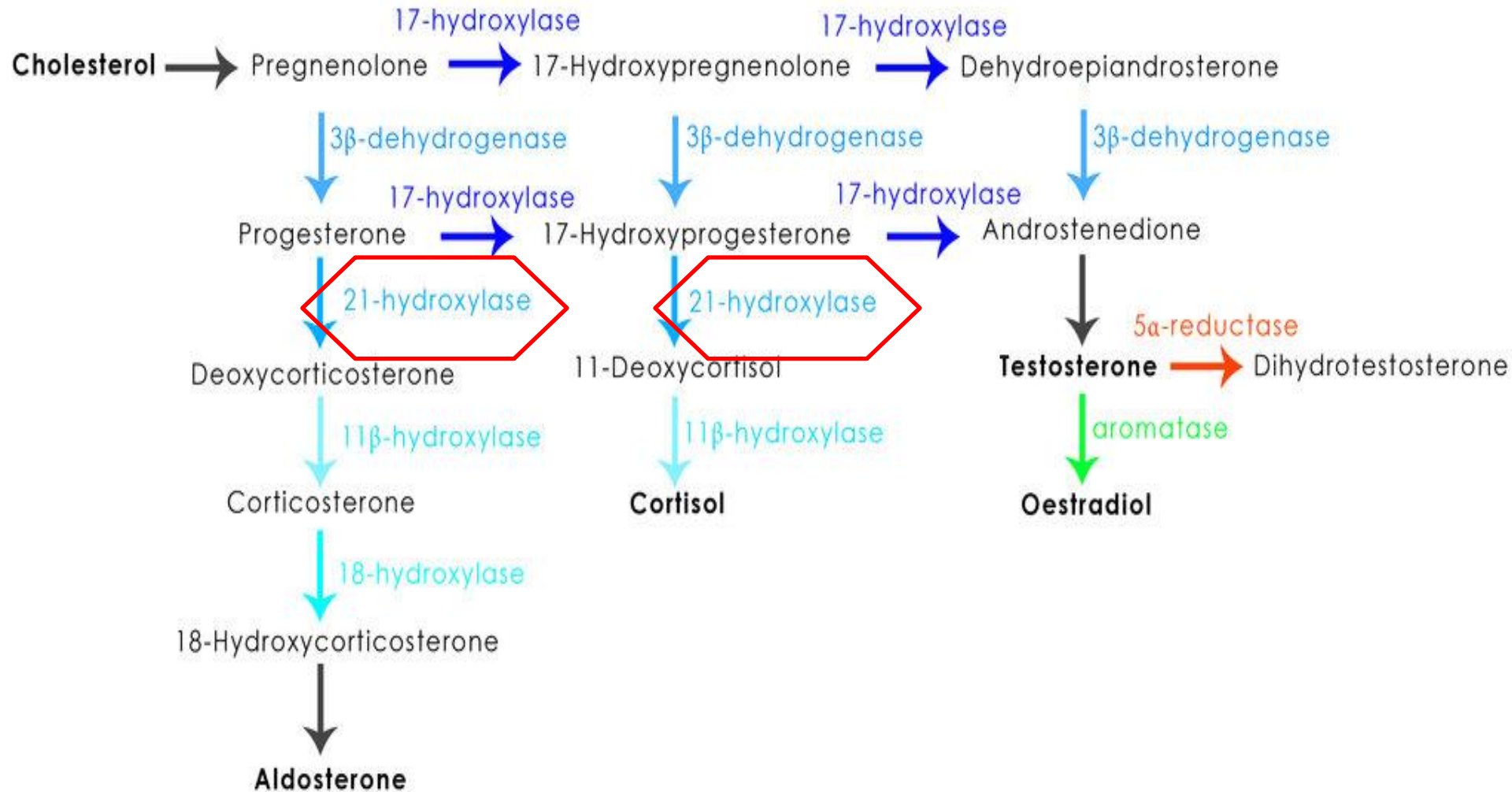


# Adrenogenital syndrom

## Excessive adrenal androgens secretion

- Cause:
  - ❑ Adrenocortical tumors
  - ❑ Congenital adrenal hyperplasia
- inherited as autosomal recessive diseases
- affect both boys and girls.
- Due to deficiency of one of the enzymes of the cortisol synthesis (21-hydroxylase) and steroids are 'diverted' to becoming androgens.
- Lead to increase ACTH leading to excessive production of adrenal androgens
  
- Tt: glucocorticoids

# SYNTHESIS OF STEROID HORMONES



*In black are hormones, in colour are enzymes.*

B



ACTH



Hyperplastic adrenal

Cholesterol

Pregnenolone

17

Progesterone

17-Hydroxypregnenolone

Dehydroxyepiandrosterone

Block



21

17

11-Deoxycorticosterone

17-Hydroxyprogesterone

Androstenedione

Corticosterone

11-Deoxycortisol

Block



21

Aldosterone

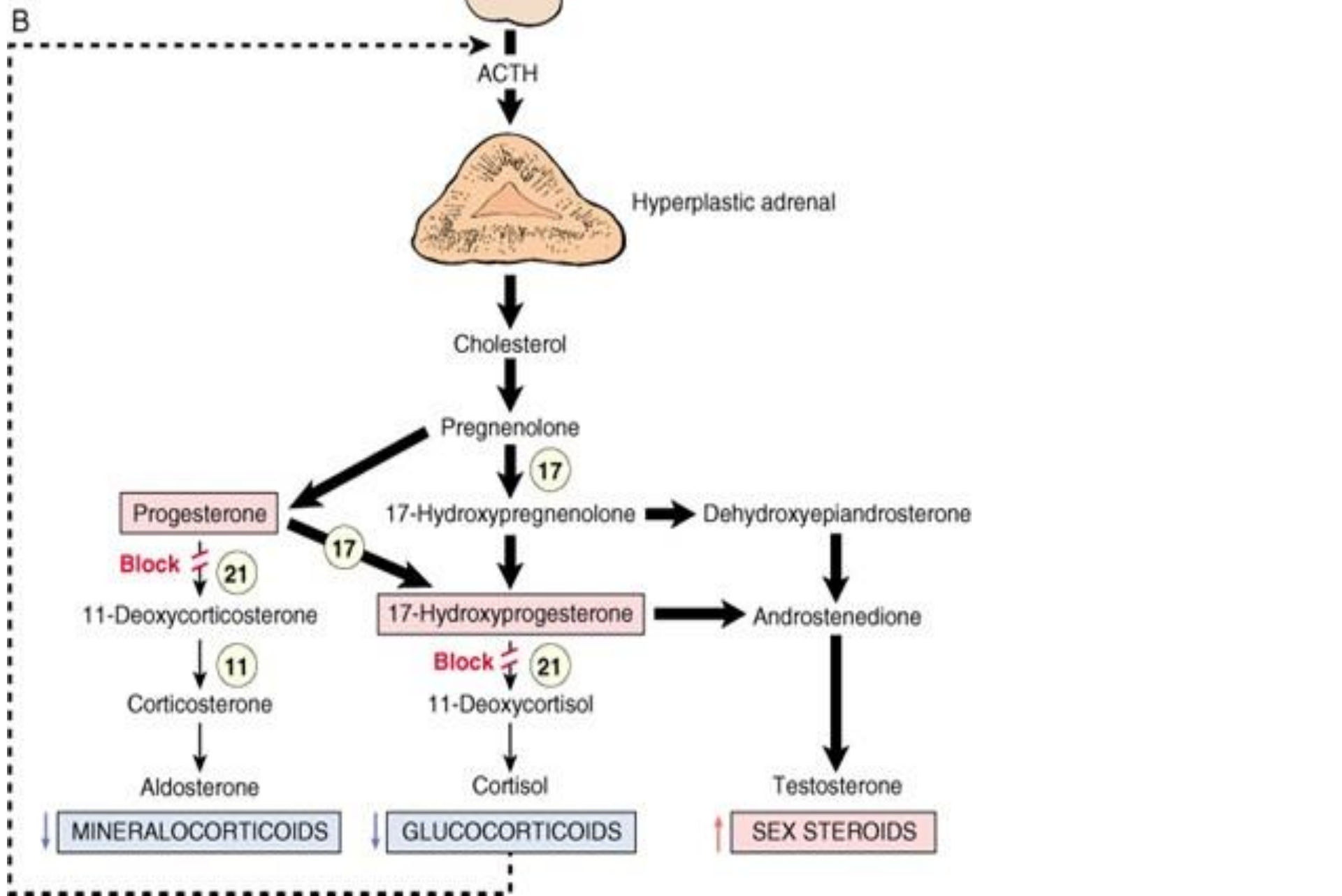
Cortisol

Testosterone

MINERALOCORTICOIDS

GLUCOCORTICOIDS

SEX STEROIDS



# Adrenogenital syndrom

Excessive adrenal androgens secretion

**Before birth**

- Pseudohermaphrodite

**After birth**

- Male
- Female

# Adrenogenital syndrom

## Before birth (female)

- Pseudohermaphroditism:
- Before 12 weeks in female fetus
- XX true female with external male genitalia
- Cause: exposure of the mother to excessive androgens

## After birth (Male)

- Precocious puberty
- Early appearance of male characters
- Increase musculature
- Development of external genitalia organ to adult size
- No spermatogenesis

## After birth (Female)

- Virilization
- Development of male characters in females:
  - Increase bulk of muscles
  - Hoarseness
  - Increase body hair
  - Increase facial hair
  - Atrophy of the breast
  - Amenorrhea

# Adrenogenital Syndrome

Adrenocortical tumor secretes excessive quantities of ***androgens*** that cause intense ***masculinizing*** effects throughout the body.

## In a female:

she develops virile characteristics, including: growth of a beard, a much deeper voice, occasionally baldness, masculine distribution of hair on the body.

In prepubertal male: a virilizing adrenal tumor causes the same characteristics as in the female plus rapid development of the male sexual organ.

In the adult male: the virilizing characteristics of adrenogenital syndrome are usually obscured by the normal virilizing characteristics of the testosterone secreted by the testes.

It is often difficult to make a diagnosis.

However, the excretion of 17-ketosteroids (derived from androgens) in urine may be 10 to 15 times normal, used in diagnosing the disease.