



## Unit IV – Problem 12 – Physiology: Male Sex Hormones

### - Synthesis of testosterone:

- Testosterone is synthesized and secreted by Leydig cells. Notice that these cells do not contain 21 $\beta$ -hydroxylase or 11 $\beta$ -hydroxylase.
- LH-hormone increases testosterone synthesis by stimulating cholesterol desmolase (the first step in the pathway).
- The enzyme 5 $\alpha$ -reductase converts testosterone to its active form  $\rightarrow$  dihydrotestosterone. Notice that 5 $\alpha$ -reductase inhibitors (e.g. Finasteride) are used to treat benign prostatic hyperplasia.

### - Regulation of testes:

- **Hypothalamic control:** GnRH stimulates the anterior pituitary gland (adenohypophysis) to secrete FSH and LH.
- **Anterior pituitary gland:**
  - ✓ FSH acts on the sertoli cells to maintain spermatogenesis.
  - ✓ LH acts on the leydig cells to promote testosterone synthesis which is reinforcing the spermatogenic effects of FSH in sertoli cells.
- **Negative feedback control:**
  - ✓ Testosterone inhibits the secretion of LH:
    - ❖ *Directly:* by inhibiting the release of LH from the anterior pituitary.
    - ❖ *Indirectly:* by inhibiting the release of GnRH from the hypothalamus.
  - ✓ Inhibin (produced by the sertoli cells) inhibits the secretion of FSH.

### - Actions of testosterone and dihydrotestosterone:

- **Testosterone:**
  - ✓ Differentiation of male internal genitalia (epididymis, vas deferens and seminal vesicles).
  - ✓ Pubertal growth spurt and epiphyseal closure.
  - ✓ Libido.
  - ✓ Spermatogenesis in sertoli cells.
  - ✓ Deepening of voice.
  - ✓ Increased muscle mass (because testosterone is an anabolic hormone).
- **Dihydrotestosterone:**
  - ✓ Differentiation of male external genitalia (penis, scrotum and prostate).
  - ✓ Male hair pattern.
  - ✓ Male-pattern baldness.
  - ✓ Sebaceous gland activity.
  - ✓ Growth of prostate.

### - Androgen insensitivity disorder (also known as: testicular feminization syndrome):

- **Caused by:** deficiency of androgen receptors.
- **Characterized by:** female external genitalia with no internal genital tract.
- Notice that testosterone levels are elevated due to the lack of testosterone receptors in the anterior pituitary (lack of feedback inhibition).

### - Puberty (male and female):

- **Stimulated by:** pulsatile GnRH release  $\rightarrow$  FSH and LH are, in turn, secreted in pulsatile fashion.

### - Variation in FSH and LH levels over the life span (male and female):

<b>Childhood</b>	Hormone levels are lowest (FSH > LH)
<b>Puberty</b>	Hormone levels increase (LH > FSH)
<b>Senescence</b>	Hormone levels are highest (FSH > LH)