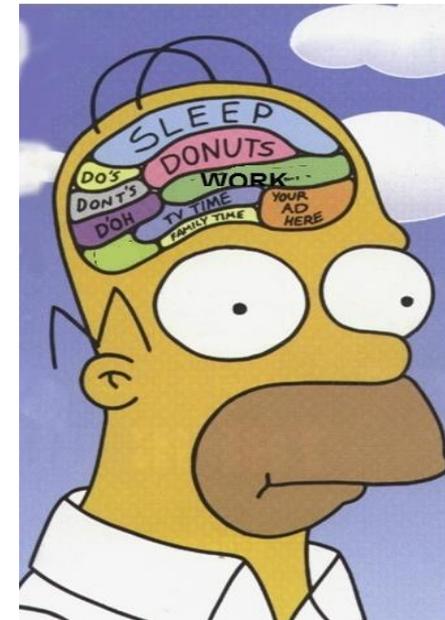


♀ *Hormonal Regulation of Sex Determination*



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Objectives

1. Describe the hormonal regulation of differentiation
2. List types of hormonal regulation of differentiation abnormalities
3. Changes of puberty and its abnormalities

Hormonal Regulation of Differentiation

- During fetal life (7th and 8th week) testes are stimulated to secrete testosterone in moderate amount by chorionic gonadotropin from placenta. Testosterone with mullerian inhibitory factor (from Sertoli cells) causes conversion of Wolffian ducts to male genital system and inhibits the formation of female reproductive system from Mullerian (Mesonephric) duct in male fetus.

Abnormal Hormonal SEXUAL DIFFERENTIATION

- Pseudohermaphroditism: This is a condition in which an individual has the genetic constitution and gonads of one sex *while external genitalia of the other.*
- There are 2 types of this condition :
 - 1- Female pseudohermaphroditism
 - 2- Male pseudohermaphroditism

Female Pseudohermaphroditism

- i.e. development of male type external genitalia (enlarged clitoris & big fused labia like scrotum).
- Causes: exposure of a female fetus to excess androgens during the 8th -13th weeks of pregnancy commonly due to

A- a congenital adrenal tumour

B- excessive doses of androgens given to the mother.

- *After the 13th week of pregnancy, the genitalia are almost completely formed and exposure of the female fetus to androgens can only cause hypertrophy of the clitoris.*

Male pseudohermaphroditism

i.e. male with well developed testis and male internal genitalia but with female external genitalia (no growth of penis). He is usually raised as a girl. When he reaches puberty, LH and testosterone levels are increased. He develops male contours, libido and body hairs.

Causes: Congenital 5 α -reductase deficiency that convert testosterone to dihydrotestosterone in target cell e.g. prostate gland, skin and external genitalia.

● Puberty

Onset of puberty:

In male between 9-14 years (12).

In female between 8-13 years (11).



The earliest sign

In male genital enlargement.

In female breast enlargement.

The sure sign

In male Wet dreams.

In female menarche.



● Puberty

Factors affecting onset of puberty:

- 1- Genetic factor.
- 2- Nutrition factor.
- 3- familial factor.
- 4- General health & body composition and fat deposition (leptin & Ghrelin hormones).

-A critical body weight must be reached.

- Sever obesity is with delayed puberty.

Environment

= Temperature

Exercise

Education

Family

socioeconomic

**Peers and
Friends**

Media

School

● Puberty Changes

Group	Female	Male
A. Structural		
(i) Body configuration	Narrow shoulders, broad hips (broad pelvis) Thighs converge Arms diverge (wide carrying angle)	Shoulders are broader than pelvis
(ii) Skin	Skin is smooth and light	Skin is thick, dark and oily (sebaceous glands secretion thickens and predisposing to acne)
(iii) Hair growth on: <ul style="list-style-type: none"> • Body • Face • Scalp • Pubic region 	Body hair fine and scanty – Thick growth, frontal hairline rounded Concave	Body hair rough and dark – Moustaches and beard appeared – Frontal hairline indented at the side Convex and extends towards umbilicus (triangle with apex up)
(iv) Muscularity	Muscles are soft (+)	Muscle bulk and strength is far greater (+++)
(v) Subcutaneous fat	Female distribution of fat due to deposition of fat in breast and hips, which gives characteristic curves and contours to the body	
(vi) Genitalia and accessory sex organs	Adult type: <ul style="list-style-type: none"> • Clitoris increases in size, labia majora and minora get enlarged • Breasts are developed • Uterus and vaginal growth increases and their activity starts 	Adult type: <ul style="list-style-type: none"> • Penis and scrotum increase in size and become pigmented, scrotal skin thickens and rugal folds appear • Prostate, seminal vesicles, bulbourethral glands enlarged and their secretion begins
B. Functional		
(i) Voice	No change (remains soft and shrill)	Larynx enlarges and vocal cords get thickened, therefore, voice becomes loud, bass (low pitched) deep and breaks 5–10% higher than female
(ii) Basal metabolic rate (BMR)	Lower	Higher
(iii) RBC count and Hb, concentration	Lower	Absent
(iv) Menstrual cycle	Begins	
C. Psychological		
	Girls are more emotional, shy, introvert and sexually attracted towards males	Behaviour is more aggressive, extrovert, competitive and interested in opposite sex

Abnormal puberty

- 1) Delayed or absent puberty: After 14 years in girls and 17 years in boys.
- 2) Early puberty: Precocious puberty:
Before 8 years in girls or 9 years in boys it may be:

A-Precocious true puberty : early normal puberty due to early secretion of GnRH due to abnormality of hypothalamus or pituitary gland .

a) Precocious pseudopuberty : early development of secondary sex organs and characteristics without gametogenesis due to exposure of immature male to androgen or exposure of immature of female to estrogen .

The cause may be adrenal or gonadal in origin .