Puberty

CHILD \rightarrow ADULT

(delayed or absent)

(normal)

early

obesity, family, stress

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Leptin permissive or threshold factor

A puberty woman has 400,000 follicles in ovaries

1 oocyte in meiotic prophase

granulosa

basement membrane

theca (internal, external layers)

usually one follicle ripens in any cycle

Q? two ovaries
GnRH 10 aa
preoptic area
hypophysial portal circulation
PYRQHTWSTG-LRRPG-amide
GnRH-R gonadotropes in
anterior pituitary
α/β FSH follicle stimulating hormone
α/β LH luteinizing hormone

gonad
steroids
hypogonadotropic-hypogonadism

absent GnRH neurons in hypothalamus

:: Kallmann syndrome

olfactory epithelium → GnRH neuron → hypothalamus

→ olfactory tract

anosmic, etc.

Δ GnRH → no puberty

Δ GnRH-R on gonadotropes in anterior pituitary
rupture of follicle releases ovum for fertilization, implantation leaves behind yellow corpus luteum (lutein and other carotenoids)
cholesterol \[\xrightarrow{}\] progesterone \[\xrightarrow{}\] androgens \[\xrightarrow{aromatase} \]
\[\xrightarrow{}\] estrogens
FSH
LH

FOLLICULAR PHASE

LUTEAL PHASE

1  14  28

ovulation

progesterone

estrogen
1978 lesion GnRH neurons in hypothalamus (Pituitary) rescue with GnRH

Continuous GnRH $\Rightarrow$ ↓ LH, FSH

pulsatile GnRH (hourly intervals) $\Rightarrow$ ↑ gonadal function ↑ reproductive cycle
low frequency, high amplitude GnRH pulses → FSH synthesis secretion

high frequency, low amplitude GnRH pulses → LH synthesis secretion

aside - LH has shorter half-life than FSH in the blood

aside - constant frequency of GnRH pulses is → spermatogenesis
LH 4 androgen by theca
4 progesterone by granulosa
(pre-ovulation)

FSH 4 aromatase in granulosa
4 LH-R in granulosa
4 growth

LH surge to LH-R granulosa stops proliferation
5-10% women PCOS

polycystic ovarian syndrome -
most common form of anovulatory infertility

prenatal androgen exposure mouse model

fast, low amplitude GnRH pulses

central energy sensors

mTOR - AMPK

mammalian target of rapamycin

S/T kinase + L-leucine, etc

AMP-activated protein kinase

aside repeated rapamycin
delays puberty
1. Pregnancy

2. Implanted egg secretes hCG, human chorionic gonadotropin that maintains endometrium.

3. GnRH not required once pregnancy is established.


5. Estrogen primes uterine lining (endometrium).