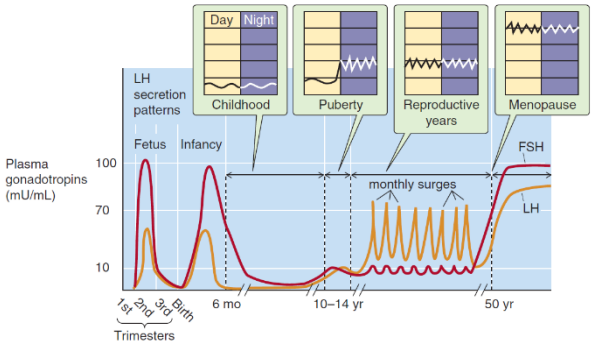
PHYSIOLOGY OF REPRODUCTION

PUBERTY



Summary of the key events and associations during growth and puberty.

	What happens	When	Factors involved
Mini-puberty	Gn and sex steroid levels rise after nadir at birth. Facilitates testicular descent in M and gonadal cell populations mature	2–3 months of age	T levels in M reach mid-pubertal levels. Oestradiol levels similar in M and F.
Adrenarche	'Awakening of adrenal gland' causes development of body odour, oily skin and hair, pubic hair (pubarche)	Usually begins at 6–8 years of age and is independent of true central puberty- usually precedes gonadarche by approx. 2 years	Production of androgens by adrenal cortex including DHEA, DHEAS and androstenedione
Thelarche (F)	Onset of female breast development, or budding (Tanner stage 2), usually first sign of puberty in girls	Usually occurs after 8 years of age (mean 10–11, range 8–13 years)	Rising oestrogen levels
Gonadarche	Growth of ovaries and testes and increased sex steroid production (true central puberty).	Testicular enlargement in M usually signals pubertal development. Ovarian growth can't be directly seen but usually coincides with thelarche	Activation of gonads by LH and FSH to increase T and oestrogen levels
Pubarche	Development of first pubic hair	First pubic hair occurs at adrenarche (can be transient) and then again at Tanner stage 3. In F usually 6 m after thelarche.	Rising levels of androgens (during adrenarche) and sex steroids during central puberty
Growth spurt	Peak growth velocity seen in childhood after infancy. Occurs shortly before final height is reached.	Usually occurs at Tanner stage 2 in F and 3–4 in M. Always occurs before menarche in F.	Multiple hormones involved. Rising Oestrogen levels cause GH secretion and act directly at GP. Occurs later in M as T needed in higher conc to convert to oestradiol via aromatase
Spermarche (M)	Development of sperm in the testicle and first ejaculation	Usually coincides with development of secondary sexual characteristics in mid-puberty	Increased T levels from Leydig cells and nocturnal LH surge
Menarche (F)	Onset of menstruation (Often thought of as culmination of pubertal development in F)	Usually occurs 2 years after thelarche and soon after growth spurt	Oestrogen stimulated growth of uterus and vascularity of endometrium, leading to sloughing of part of the lining. Most menstrual cycles are initially anovulatory.

CONTRACEPTIVES

BARRIER CONTRACEPTIVES:

- condoms
- contraceptive sponges with spermicide
- diaphragms
- cervical caps

HORMONAL:

- oral pills
- implants under the skin
- injections
- patches
- IUDs
- vaginal ring

INTRAUTERINE DEVICES:

- copper IUDs
- IUD with levonorgestrel

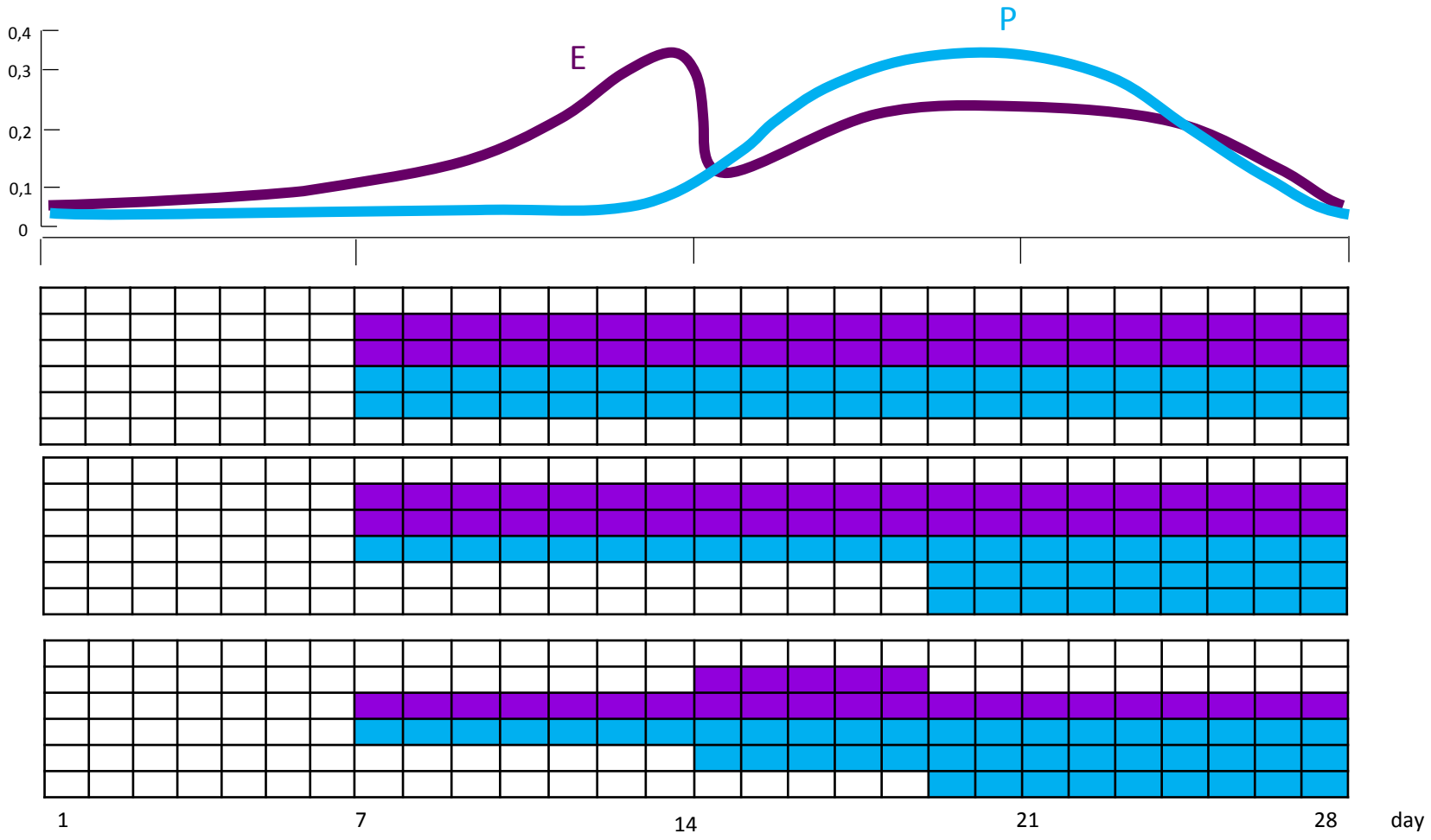
BEHAVIORAL:

- fertility awareness methods
- coitus interruptus
- lactation

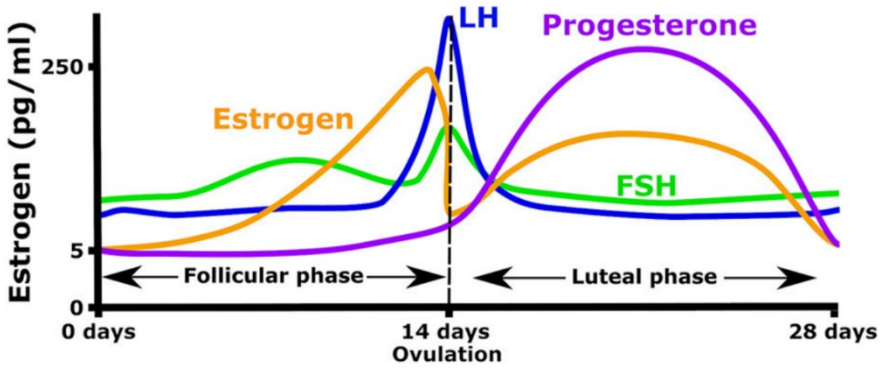
STERILIZATION:

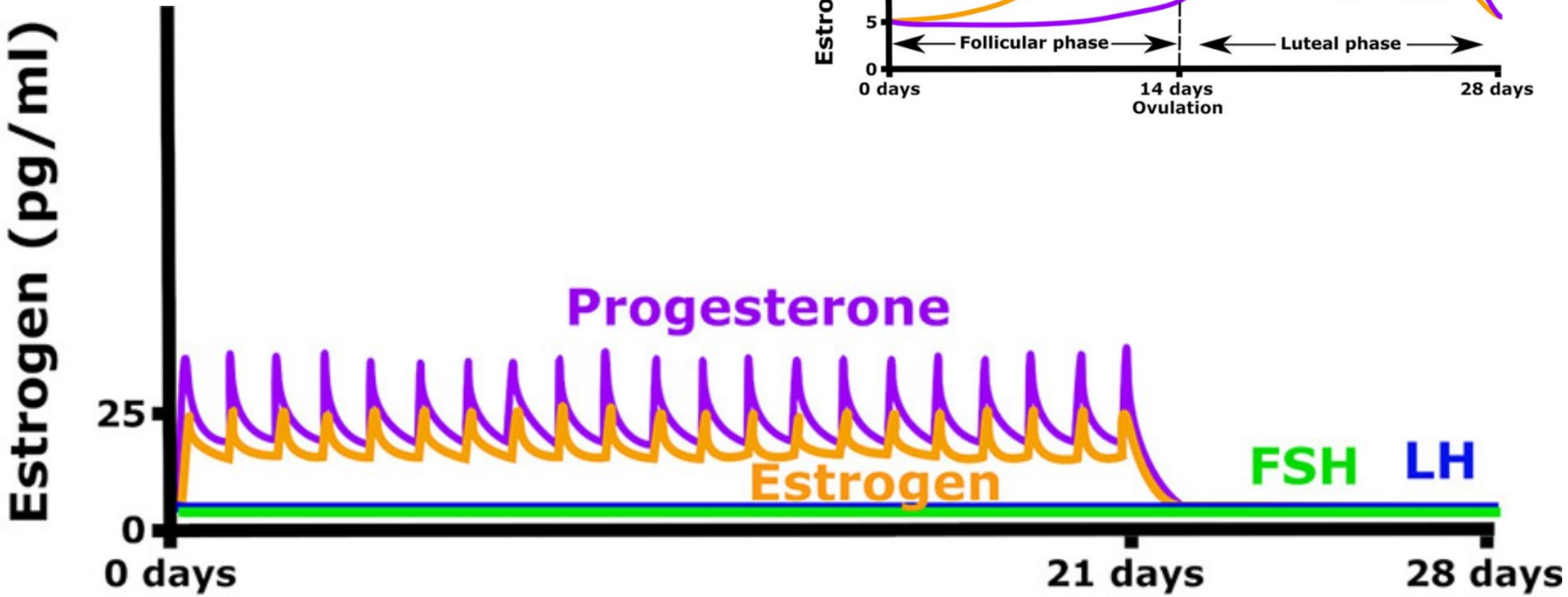
- tubal ligation
- vasektomy

ORAL PILLS



ORAL PILLS


LH
Progesterone
Estrogen
FSH
Estrogen (pg/ml)
250
5
0
Follicular phase
Luteal phase
0 days
14 days
Ovulation
28 days


Progesterone
Estrogen
FSH
LH
Estrogen (pg/ml)
25
0
0 days
21 days
28 days

ORAL PILLS

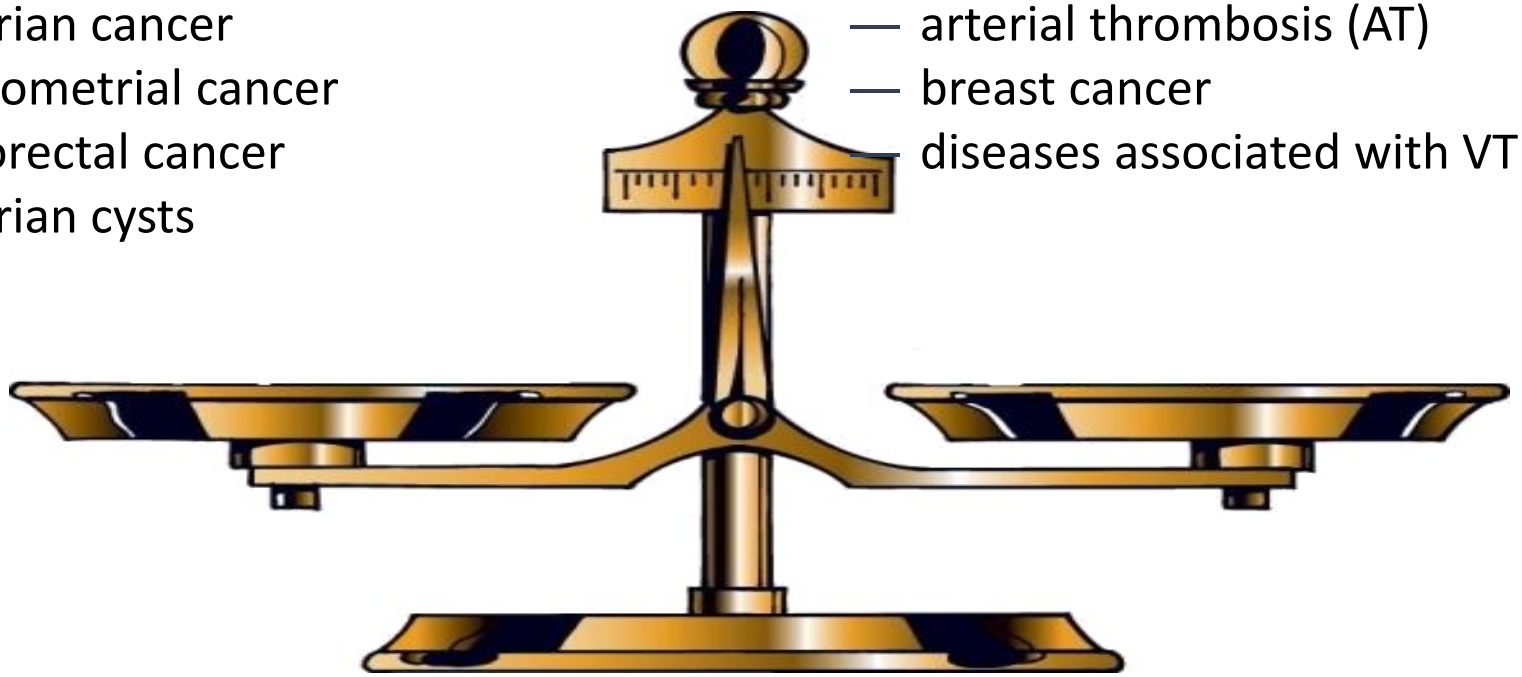
- Progestational effects include:
  - Inhibition of ovulation by suppressing luteinizing hormone (LH);
  - Thickening of cervical mucus, thus hampering the transport of sperm;
  - Possible inhibition of sperm capacitation;
  - Hampered implantation by the production of decidualized endometrium with exhausted and atrophic glands
- Estrogenic effects include:
  - Partial inhibition of ovulation in part by the suppression of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), depending on dose;
  - Alteration of secretions and cellular structures of the endometrium within the uterus

BENEFITS AND RISCS OF HC

reducing the risk of total cancer by 12%:

- ovarian cancer
- endometrial cancer
- colorectal cancer
- ovarian cysts

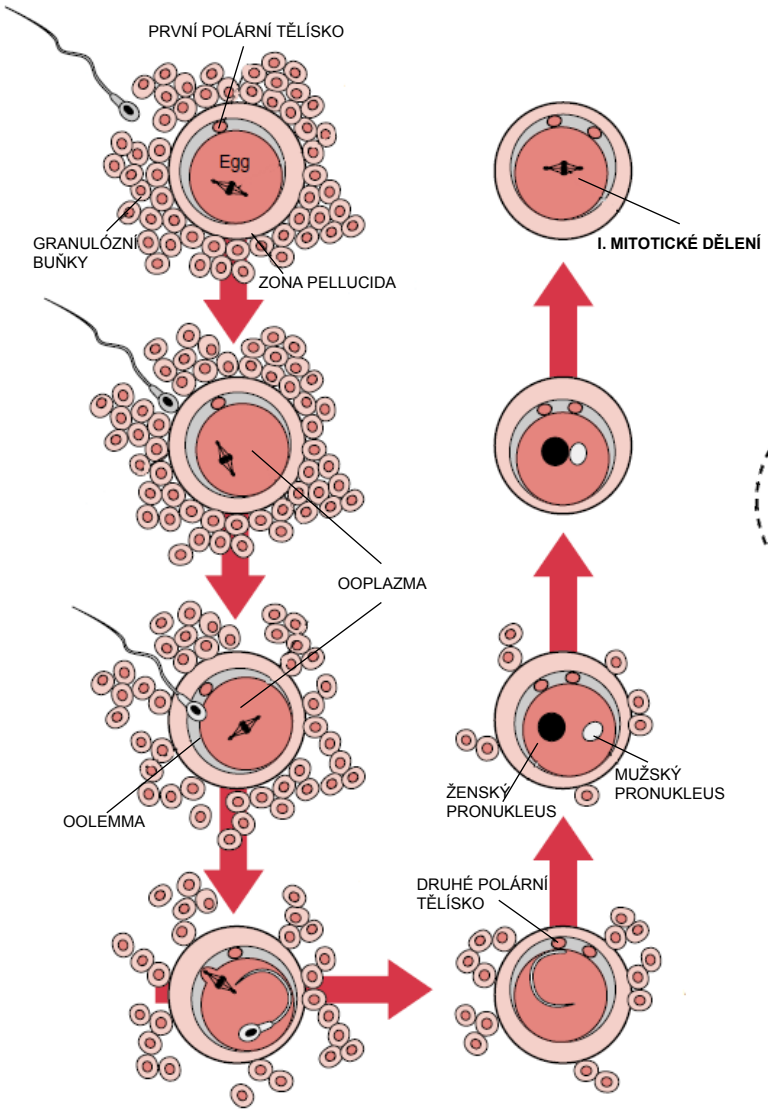
acne

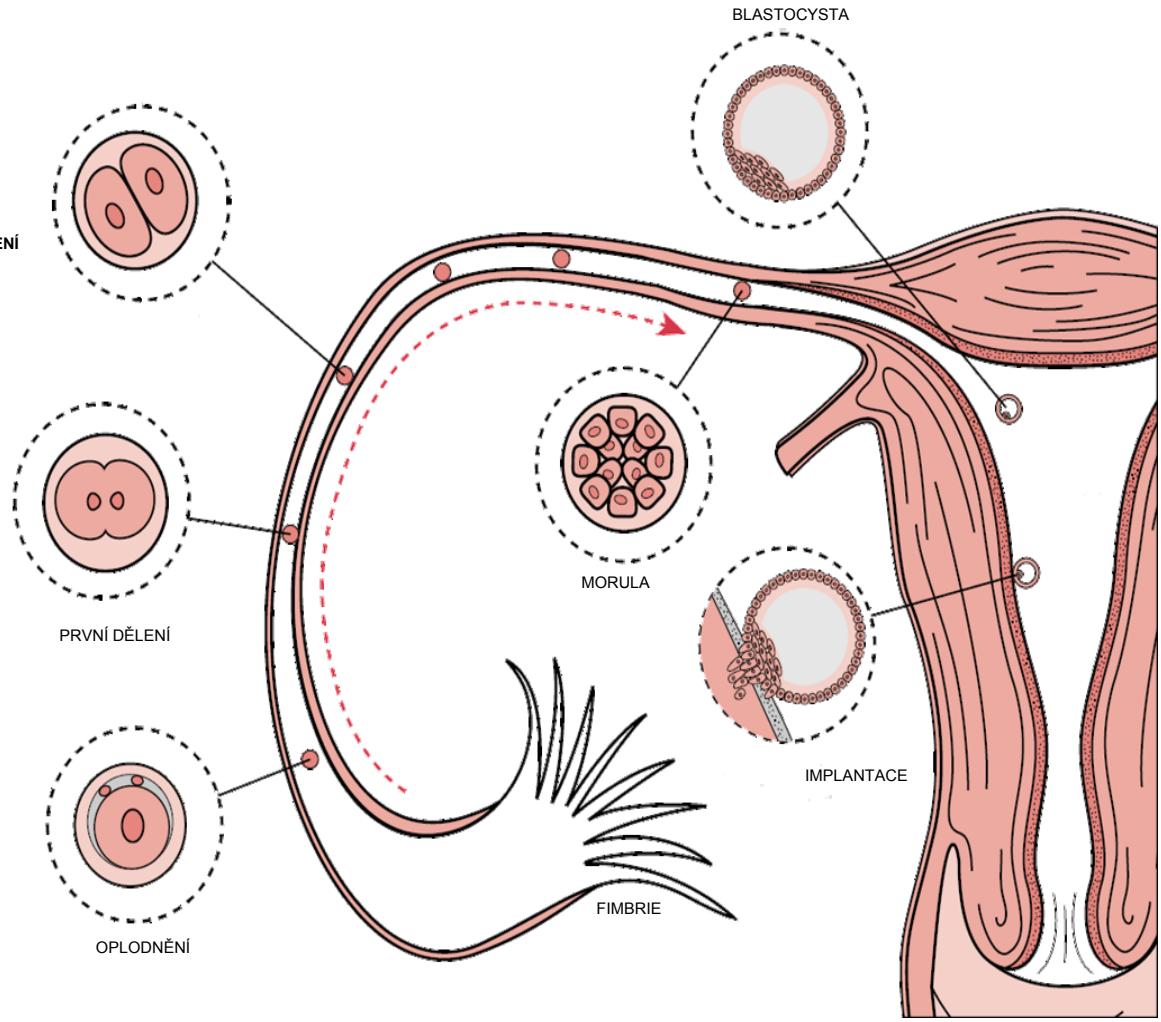


- venous thromboembolism (VTE)
- arterial thrombosis (AT)
- breast cancer
- diseases associated with VTE and AT

FERTILIZATION

FERTILIZATION





PLACENTAL FUNCTION

I. Transport and metabolism

a. Transfer of respiratory gases
b. Transport and metabolism of carbohydrates
c. Transport and metabolism of amino acids
d. Transport and metabolism of lipids
e. Transfer of water, inorganic ions, minerals and vitamins

II. Endocrine functions

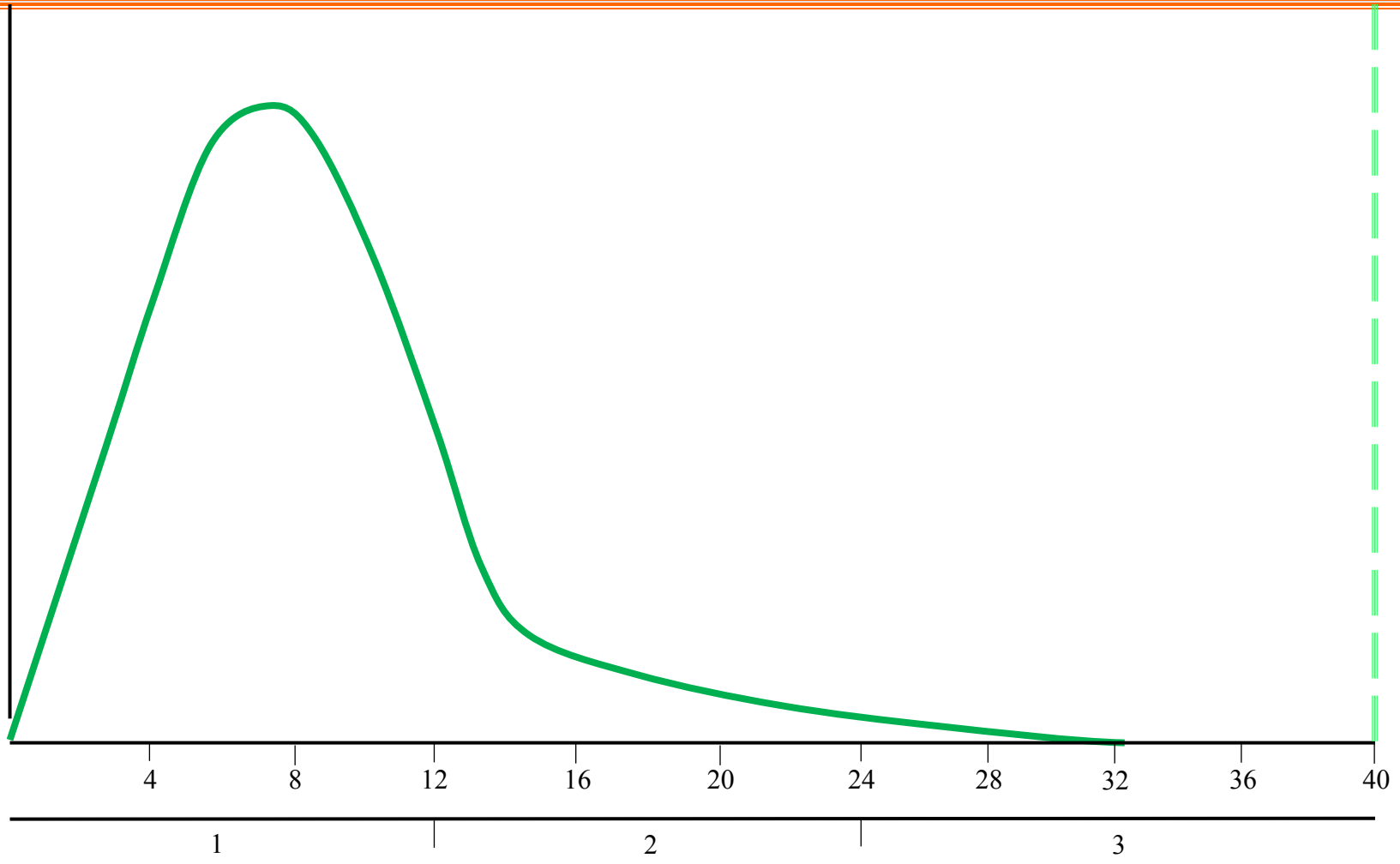
a. Oestrogens
b. Progesterone
c. Chorionic gonadotrophin
d. Placental lactogen
e. Placental growth factors

III. Protektivní funkce

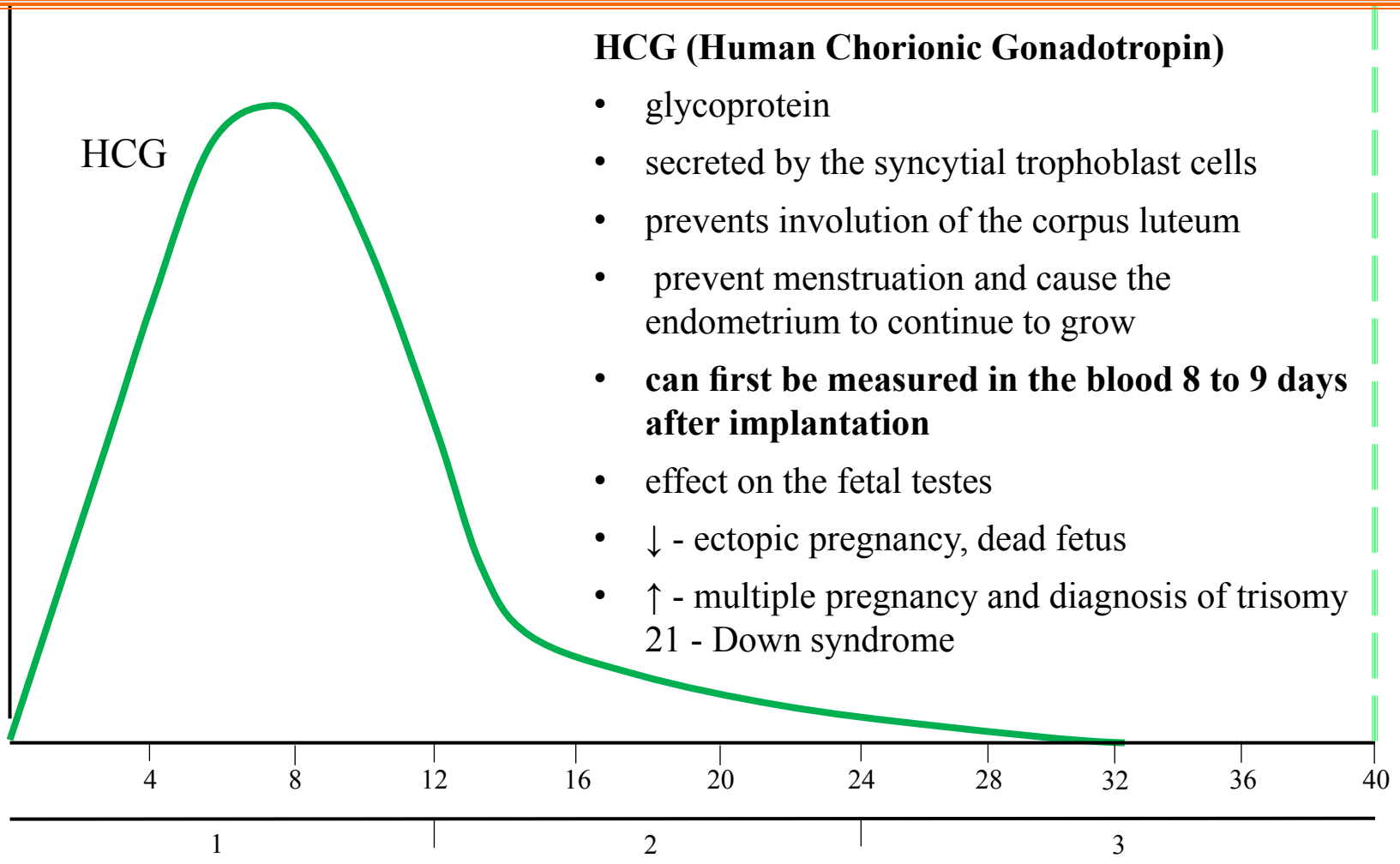
a. Cytochrome P450 (xenobiotics)
b. A barrier against transmission of many bacteria

!!! IgG

HORMONAL PROFILE OF PREGNANCY



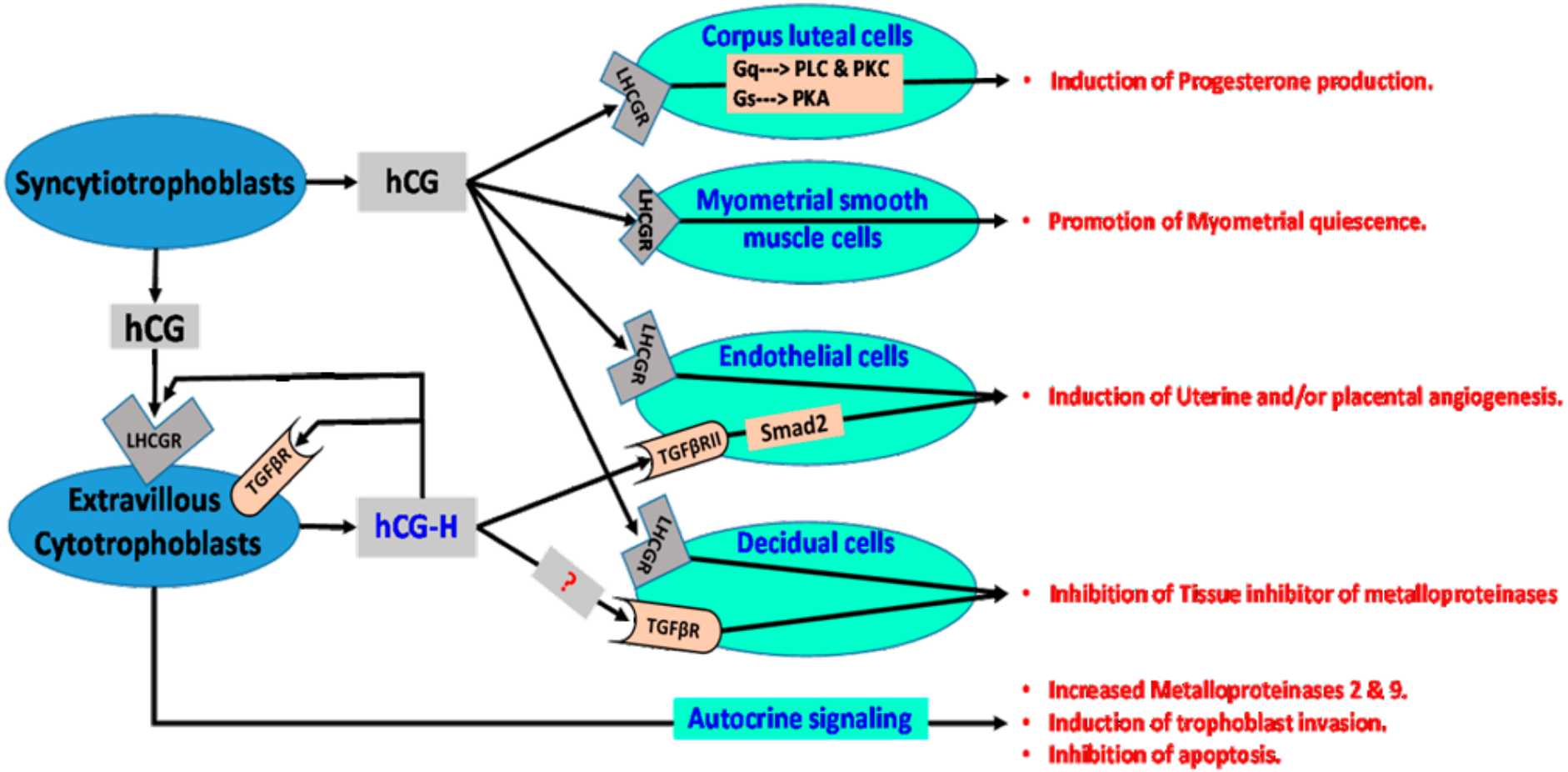
HORMONAL PROFILE OF PREGNANCY



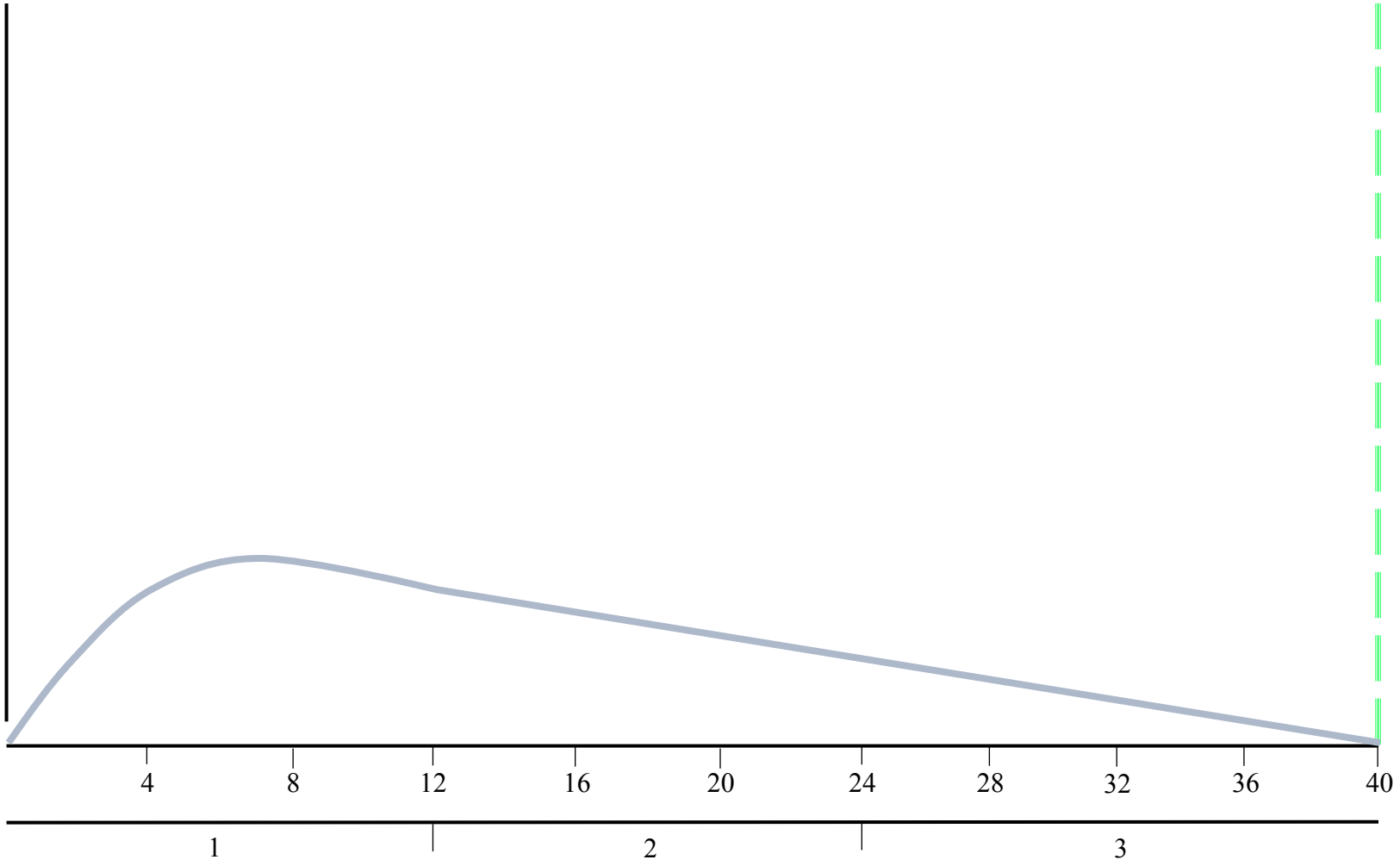
HCG (Human Chorionic Gonadotropin)

- glycoprotein
- secreted by the syncytial trophoblast cells
- prevents involution of the corpus luteum
- prevent menstruation and cause the endometrium to continue to grow
- **can first be measured in the blood 8 to 9 days after implantation**
- effect on the fetal testes
- ↓ - ectopic pregnancy, dead fetus
- ↑ - multiple pregnancy and diagnosis of trisomy 21 - Down syndrome

HORMONAL PROFILE OF PREGNANCY



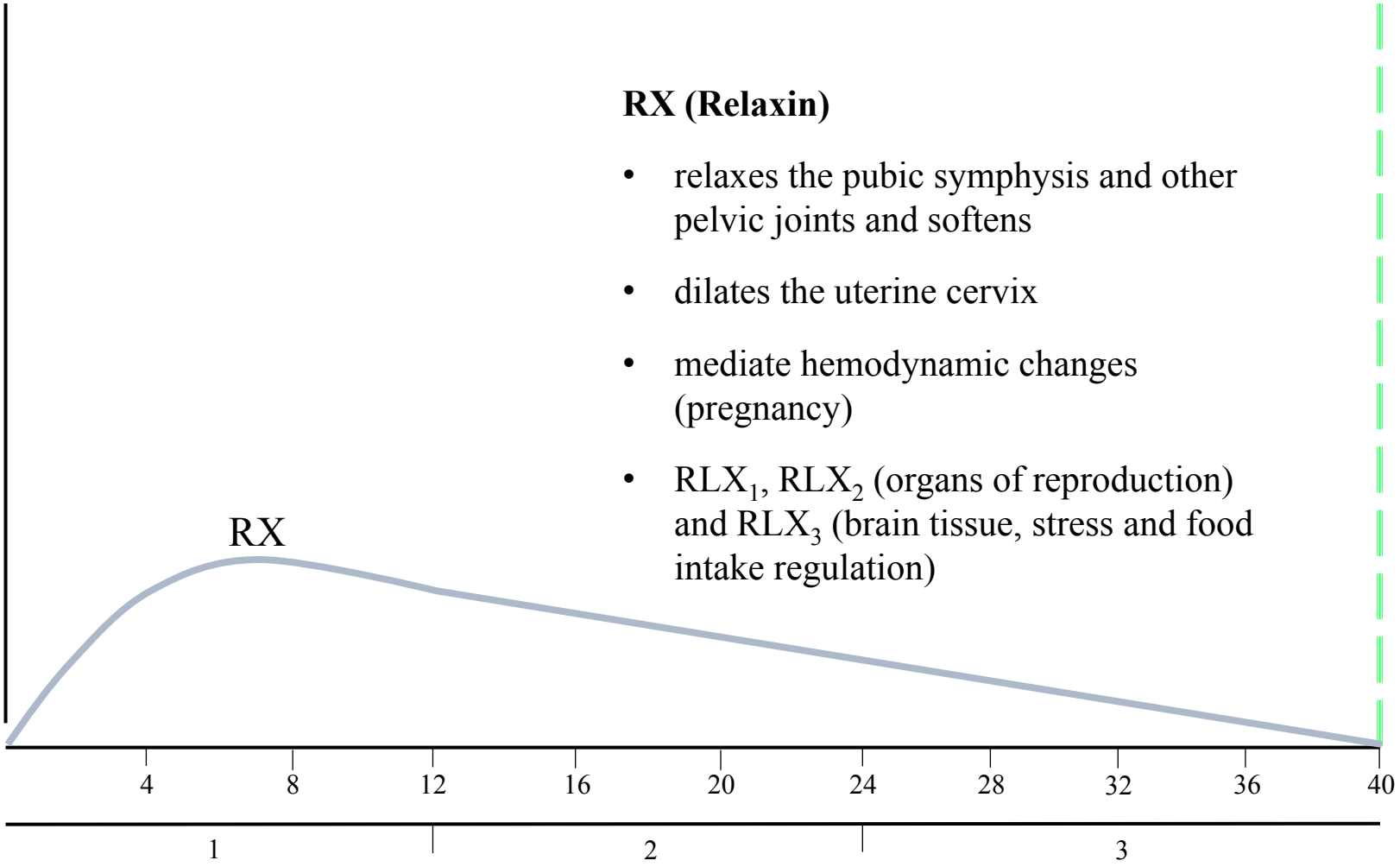
HORMONAL PROFILE OF PREGNANCY



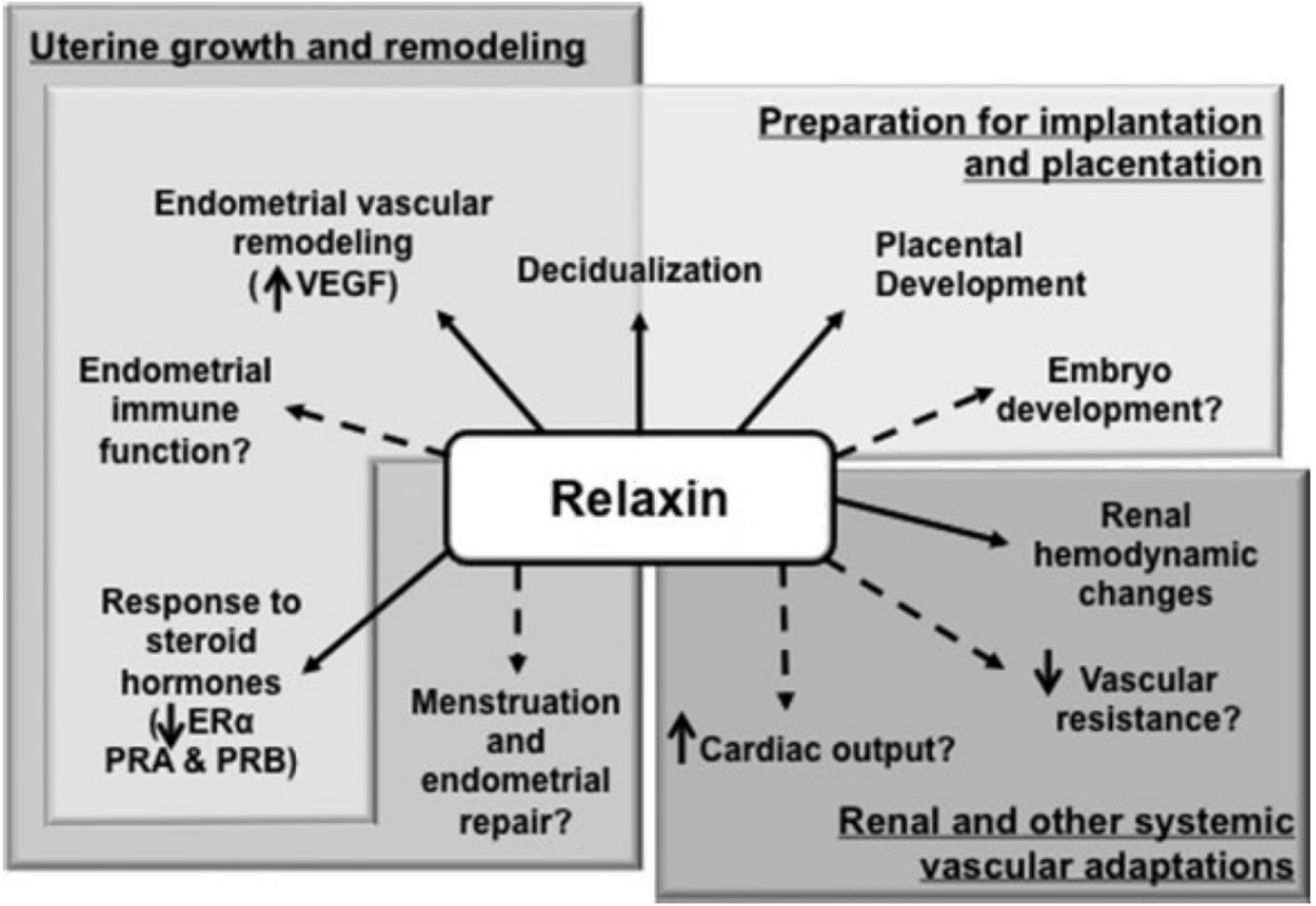
HORMONAL PROFILE OF PREGNANCY

RX (Relaxin)

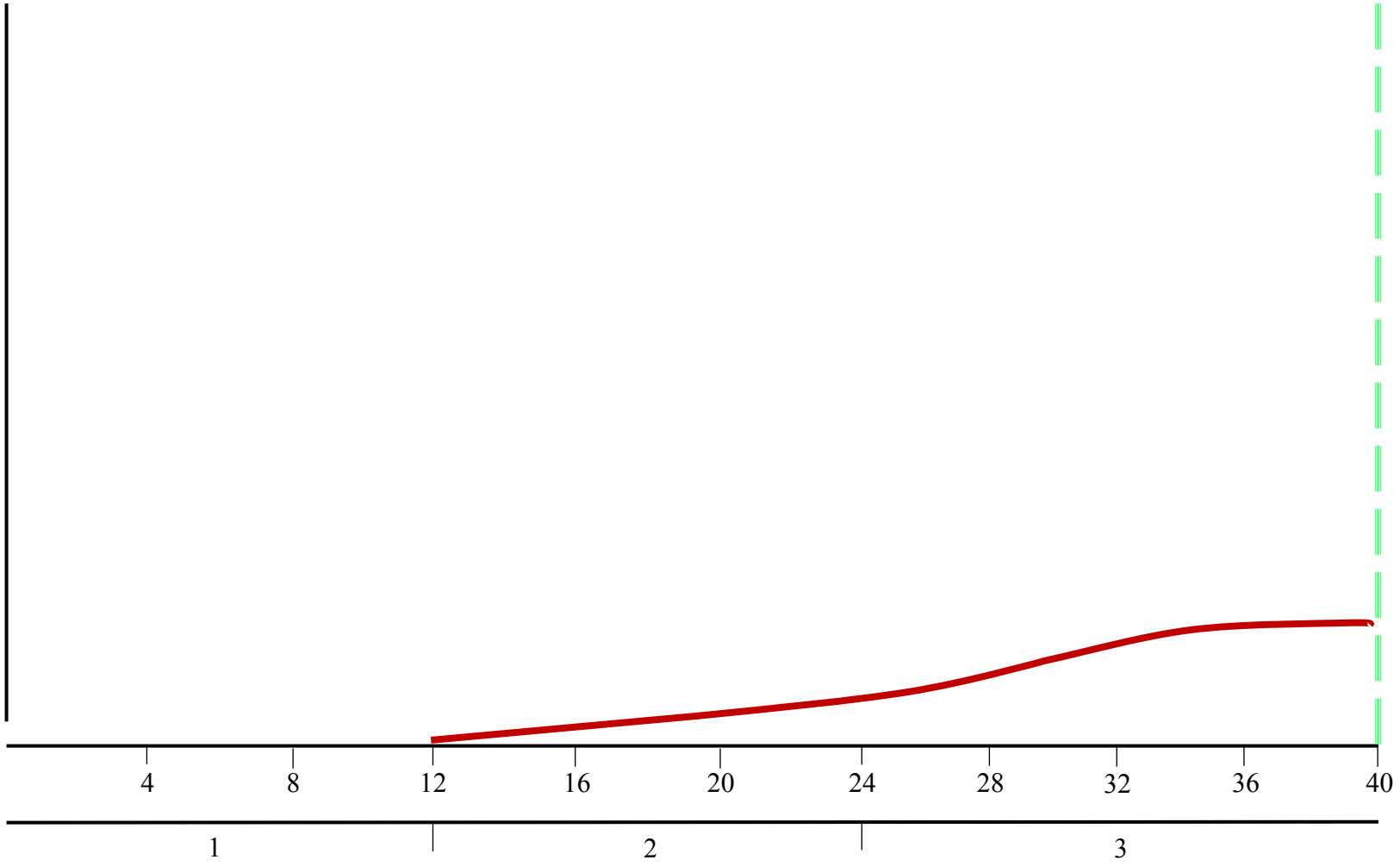
- relaxes the pubic symphysis and other pelvic joints and softens
- dilates the uterine cervix
- mediate hemodynamic changes (pregnancy)
- RLX_1, RLX_2 (organs of reproduction) and RLX_3 (brain tissue, stress and food intake regulation)



HORMONAL PROFILE OF PREGNANCY



HORMONAL PROFILE OF PREGNANCY

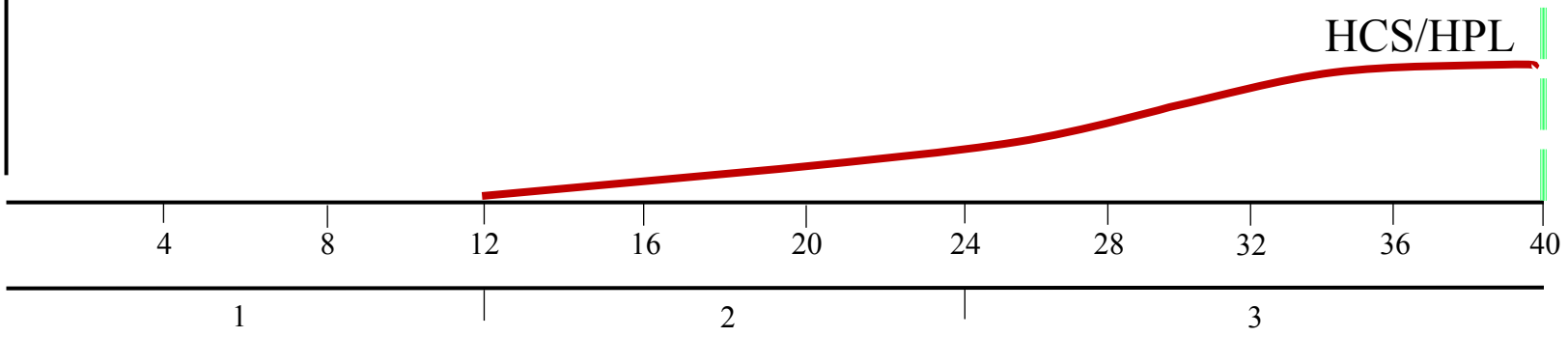


HORMONAL PROFILE OF PREGNANCY

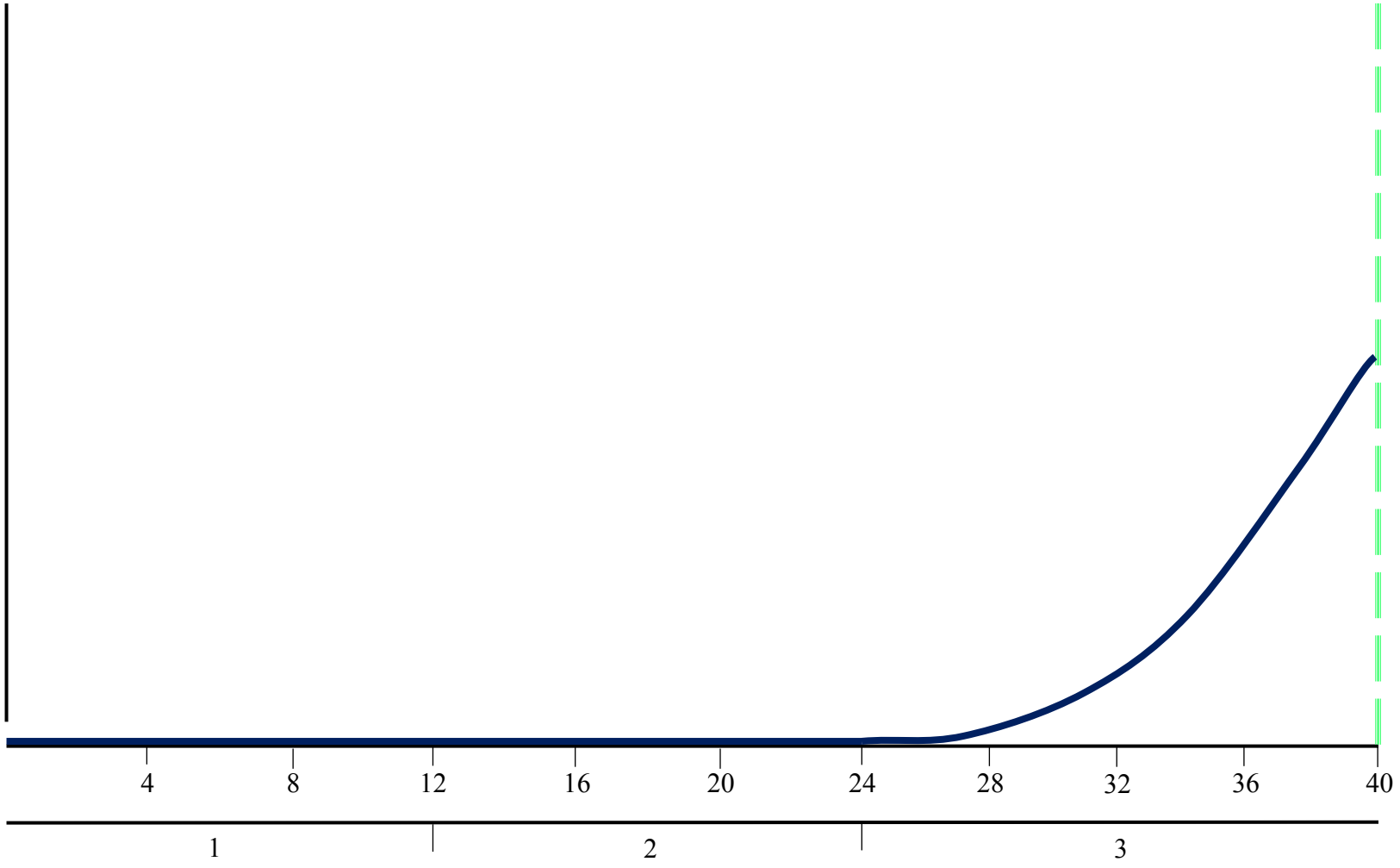
HCS (Human Chorionic Somatomammotropin)

placental growth hormone - Human placental lactogen (hPL)

- has weak actions similar of growth hormone
- causes retention of nitrogen, potassium, calcium
- causes decreased insulin sensitivity and decreased utilization of glucose in the mother
- secretion of this hormone increases progressively in direct proportion to the weight of the placenta



HORMONAL PROFILE OF PREGNANCY

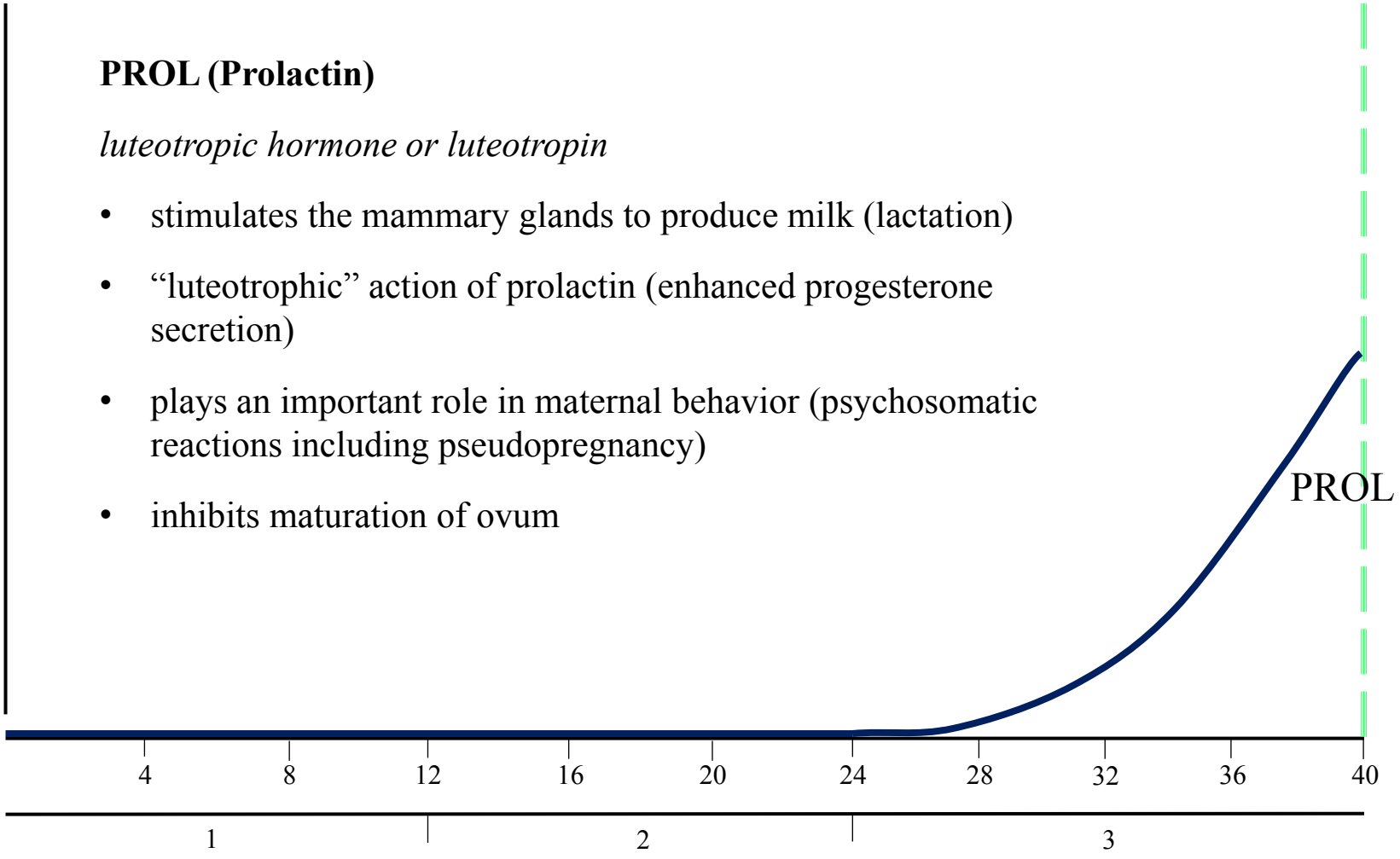


HORMONAL PROFILE OF PREGNANCY

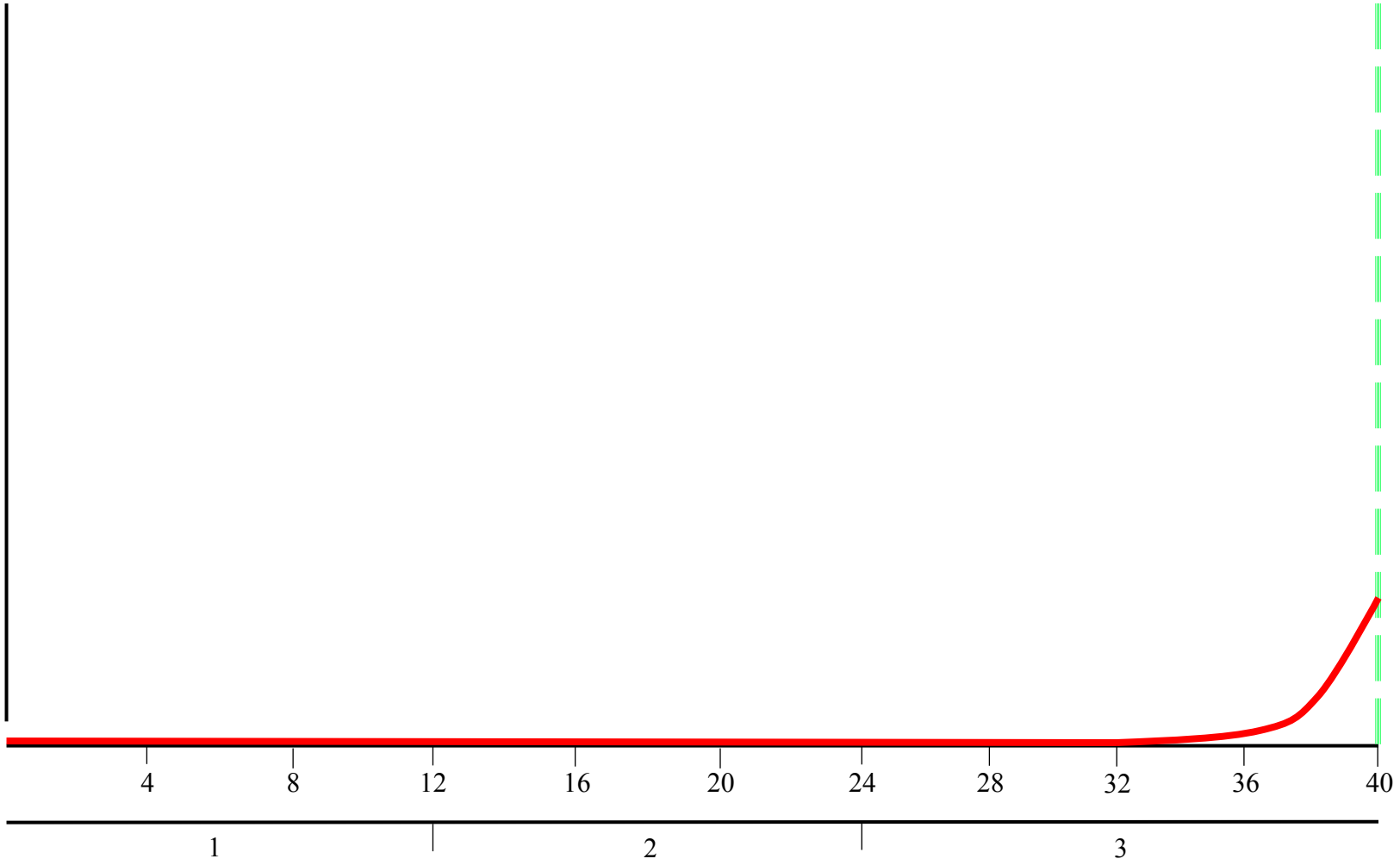
PROL (Prolactin)

luteotropic hormone or luteotropin

- stimulates the mammary glands to produce milk (lactation)
- "luteotrophic" action of prolactin (enhanced progesterone secretion)
- plays an important role in maternal behavior (psychosomatic reactions including pseudopregnancy)
- inhibits maturation of ovum



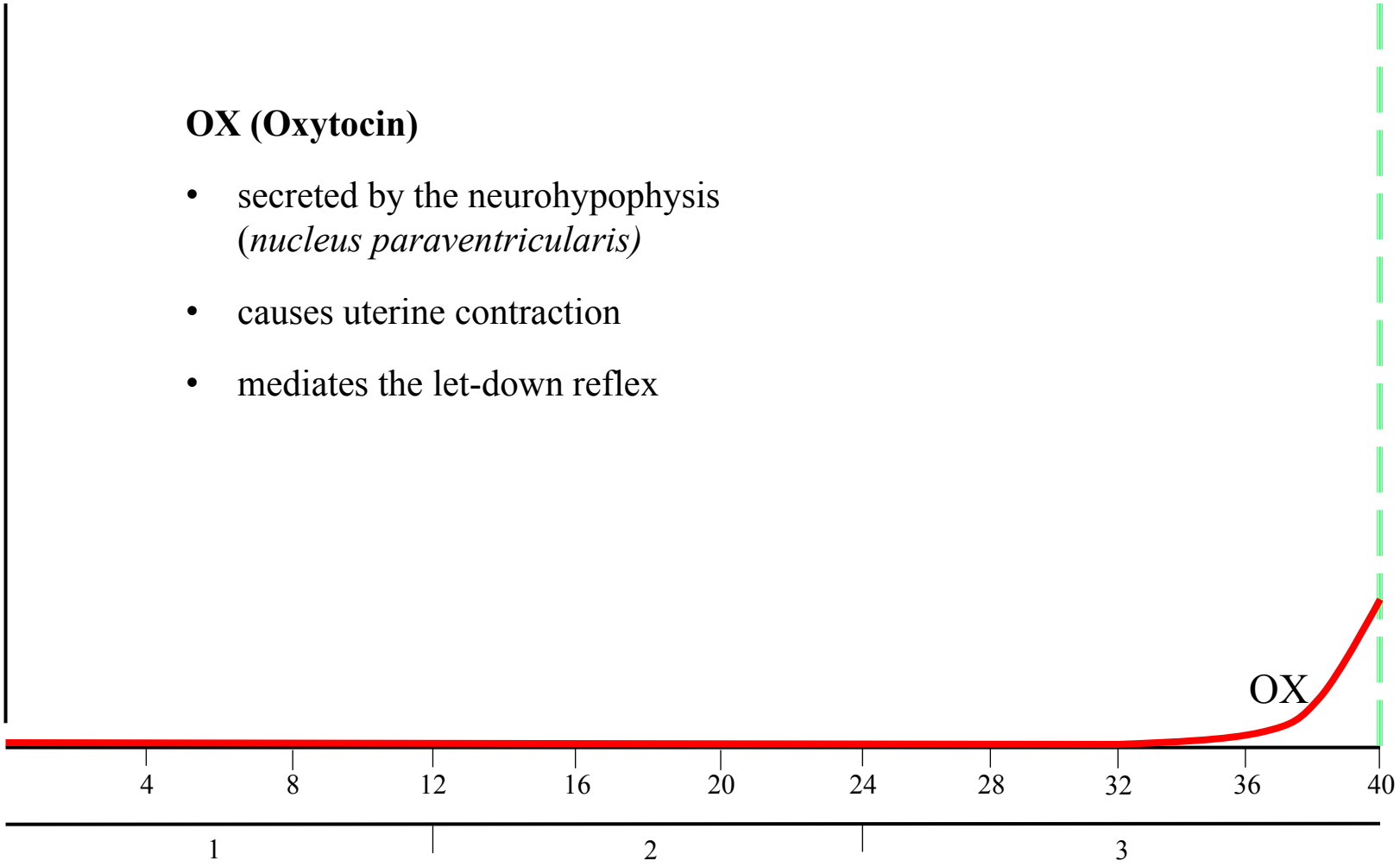
HORMONAL PROFILE OF PREGNANCY



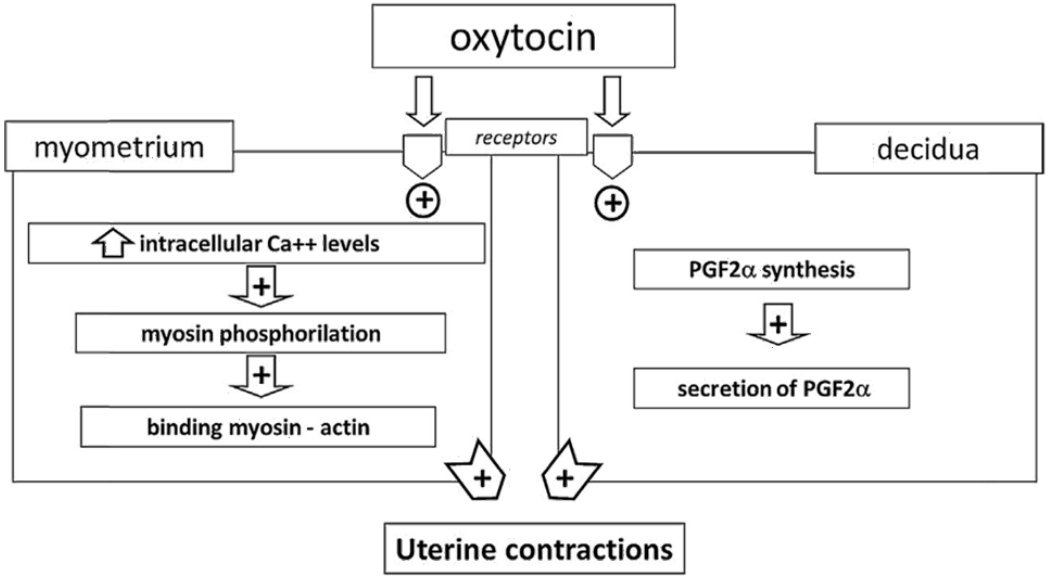
HORMONAL PROFILE OF PREGNANCY

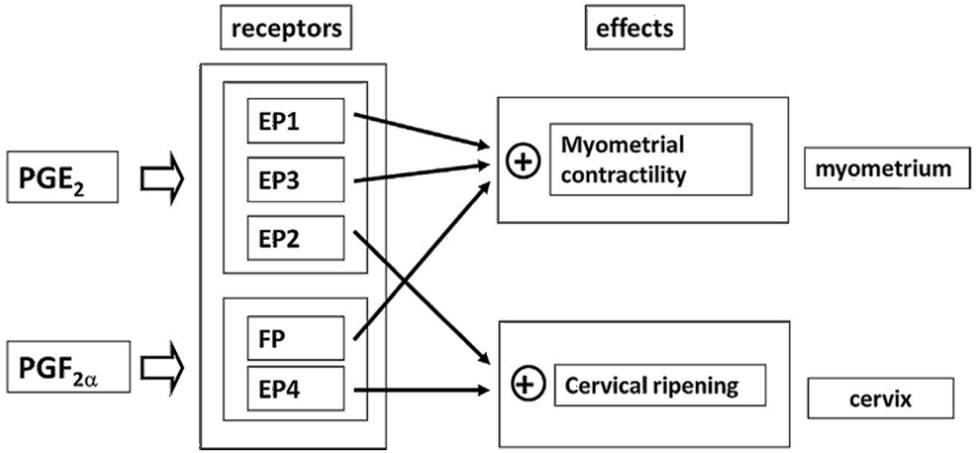
OX (Oxytocin)

- secreted by the neurohypophysis (*nucleus paraventricularis)*
- causes uterine contraction
- mediates the let-down reflex

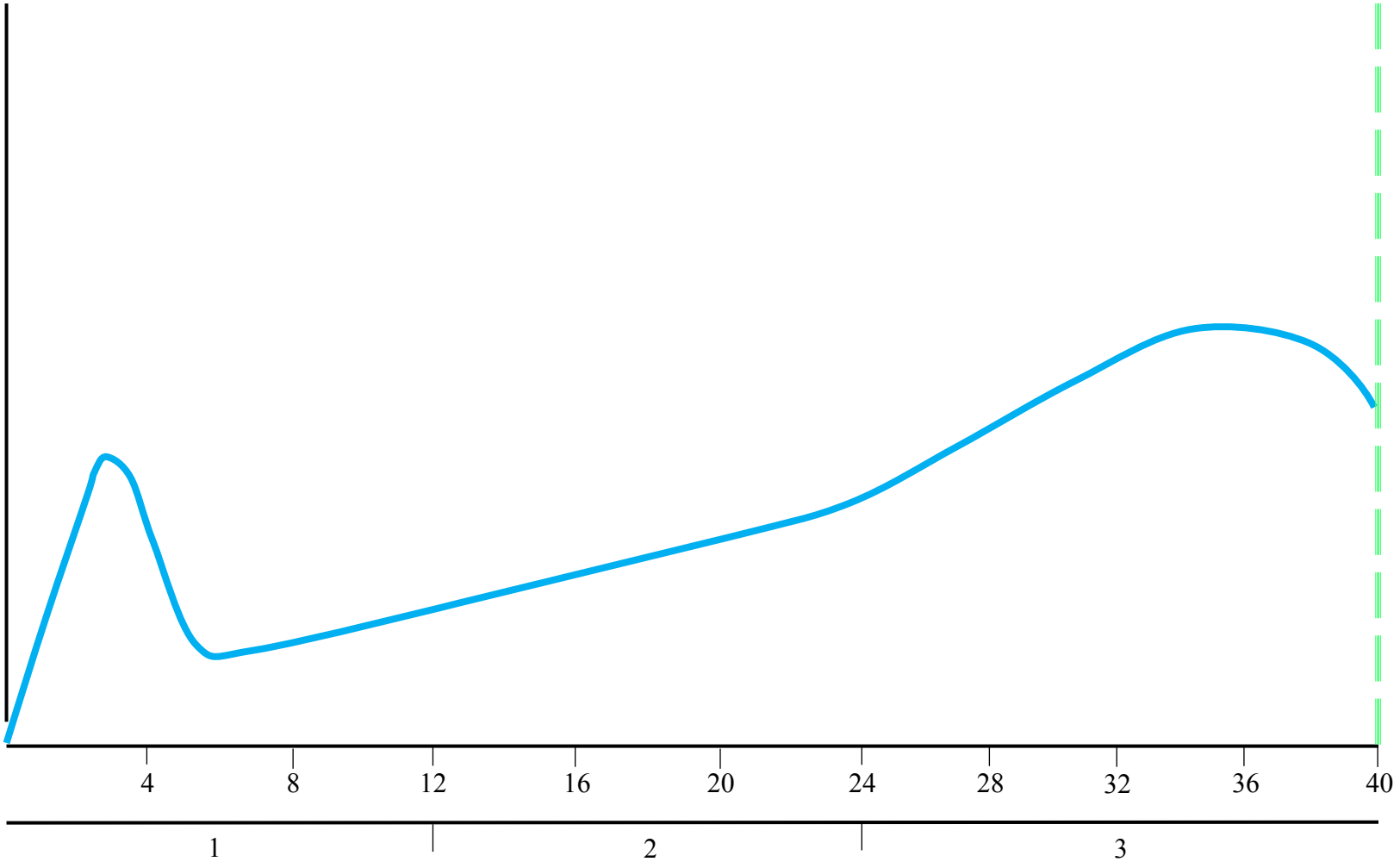


HORMONAL PROFILE OF PREGNANCY





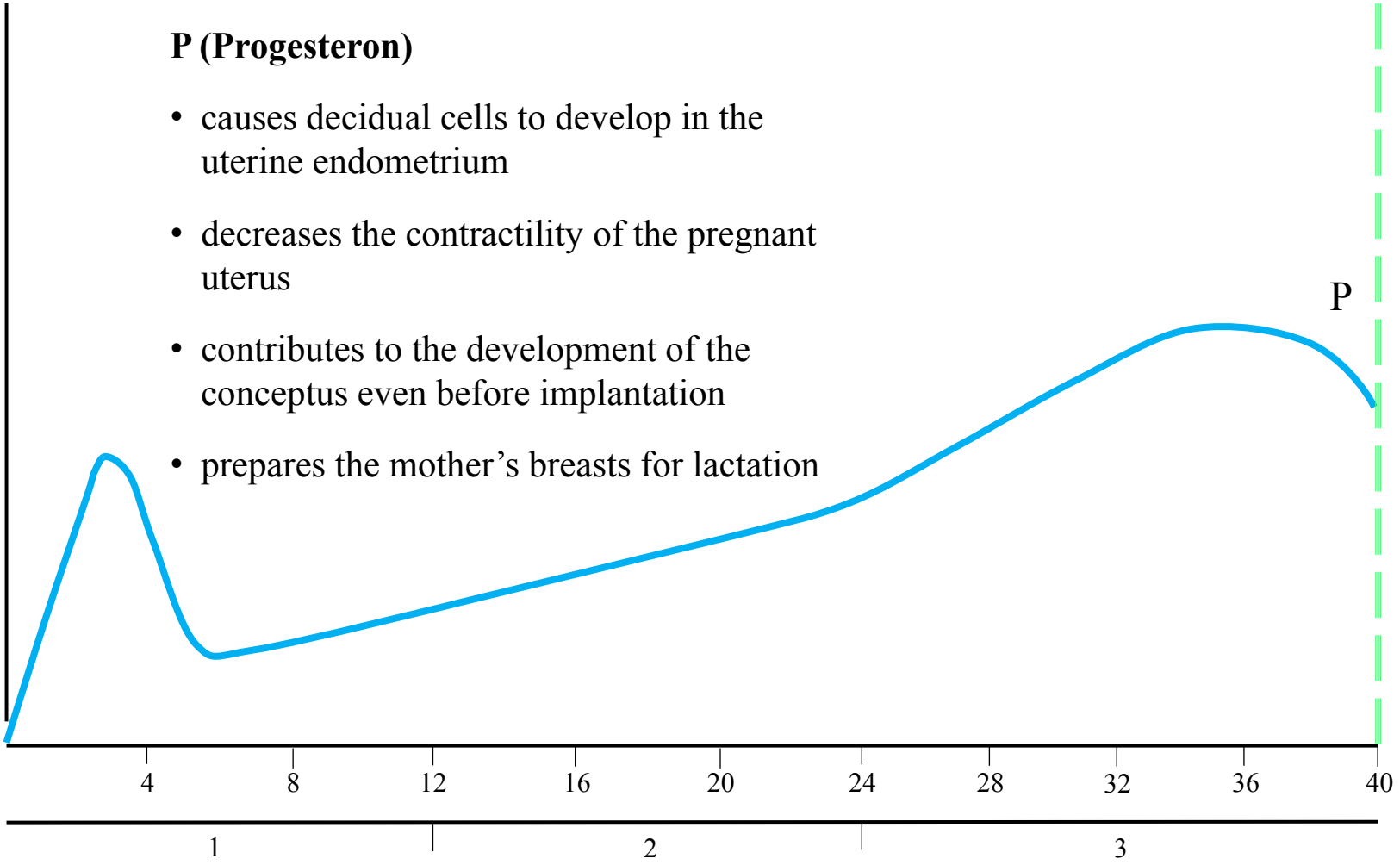
HORMONAL PROFILE OF PREGNANCY



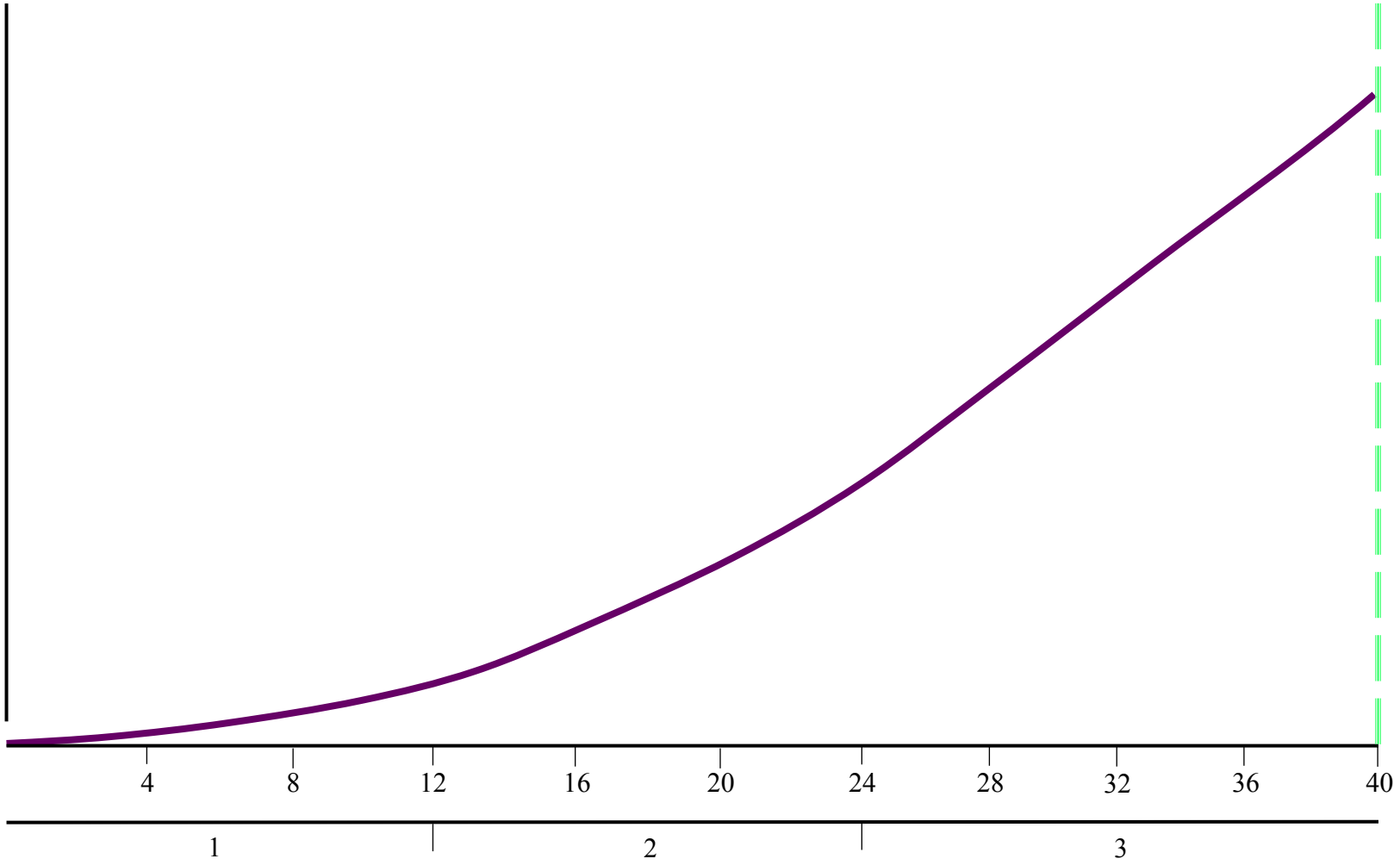
HORMONAL PROFILE OF PREGNANCY

P (Progesteron)

- causes decidual cells to develop in the uterine endometrium
- decreases the contractility of the pregnant uterus
- contributes to the development of the conceptus even before implantation
- prepares the mother's breasts for lactation



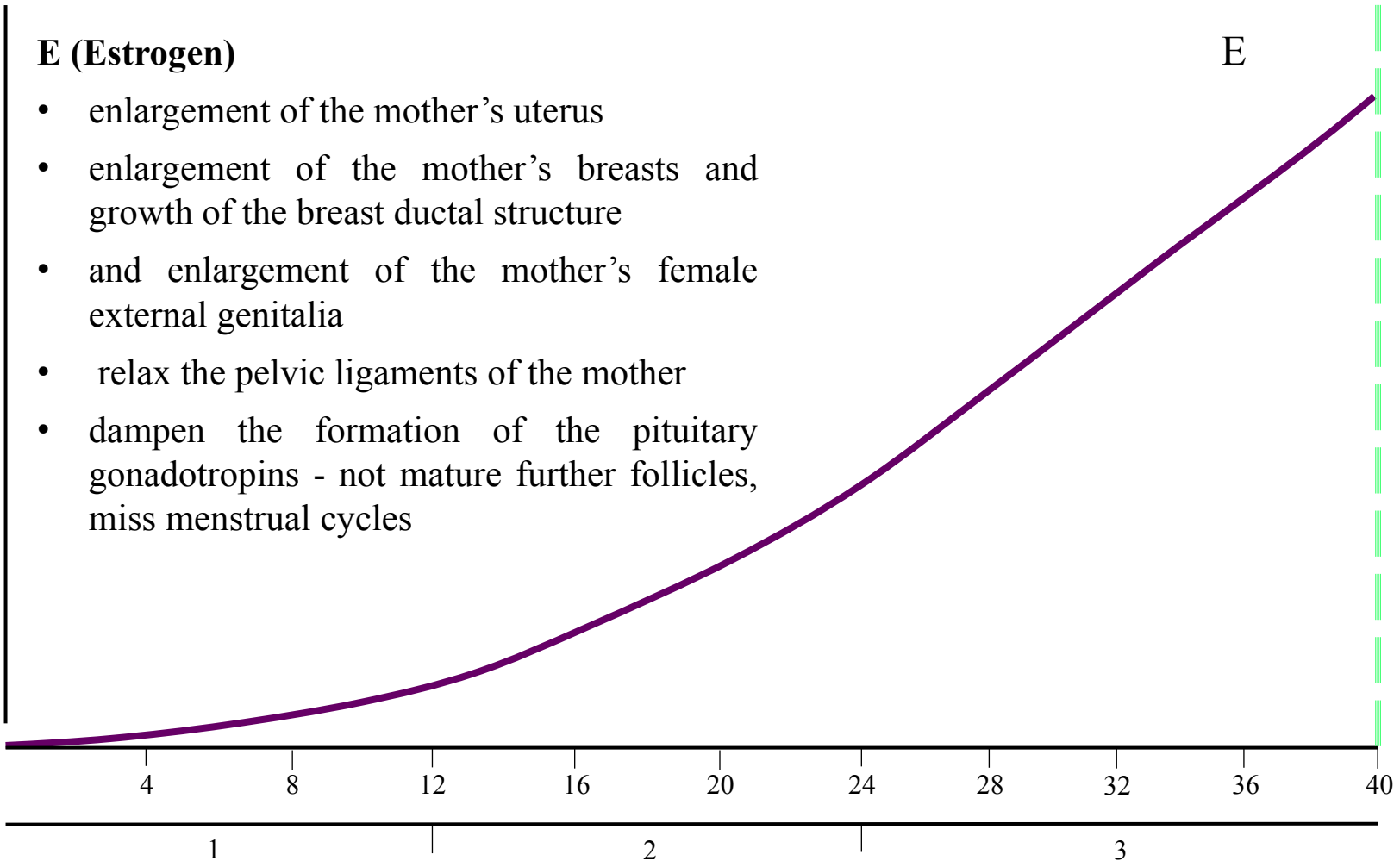
HORMONAL PROFILE OF PREGNANCY



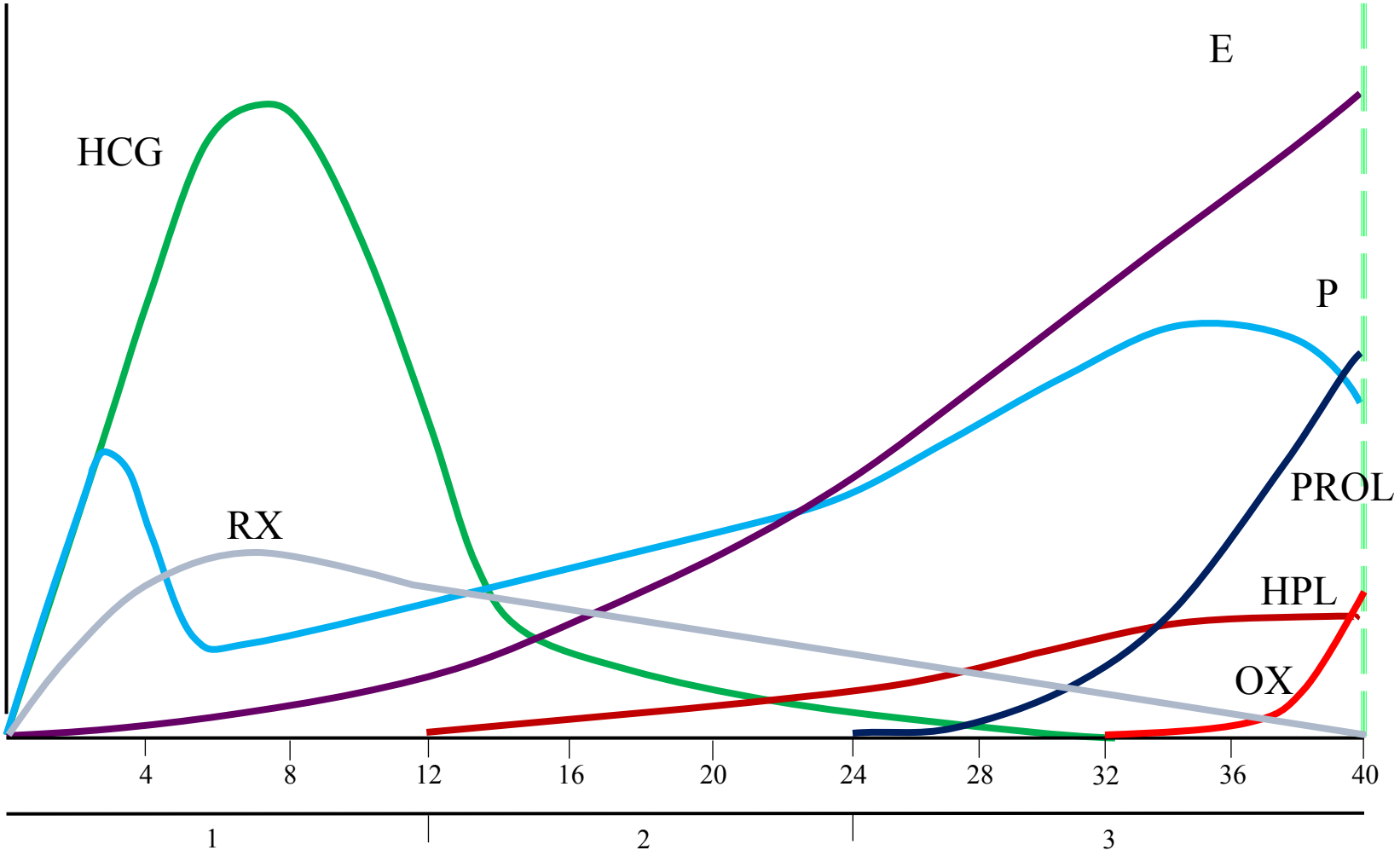
HORMONAL PROFILE OF PREGNANCY

E (Estrogen)

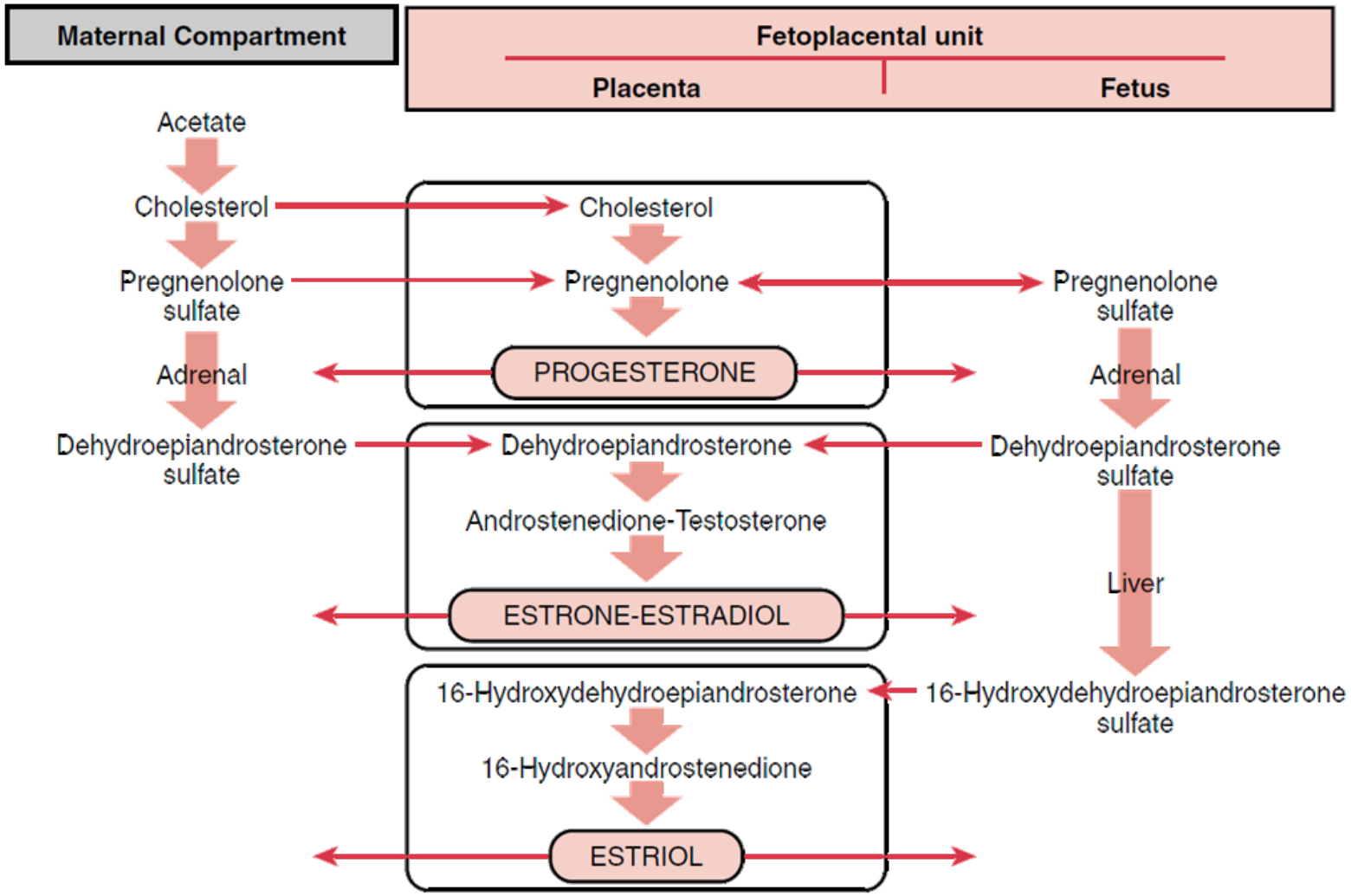
- enlargement of the mother's uterus
- enlargement of the mother's breasts and growth of the breast ductal structure
- and enlargement of the mother's female external genitalia
- relax the pelvic ligaments of the mother
- dampen the formation of the pituitary gonadotropins - not mature further follicles, miss menstrual cycles



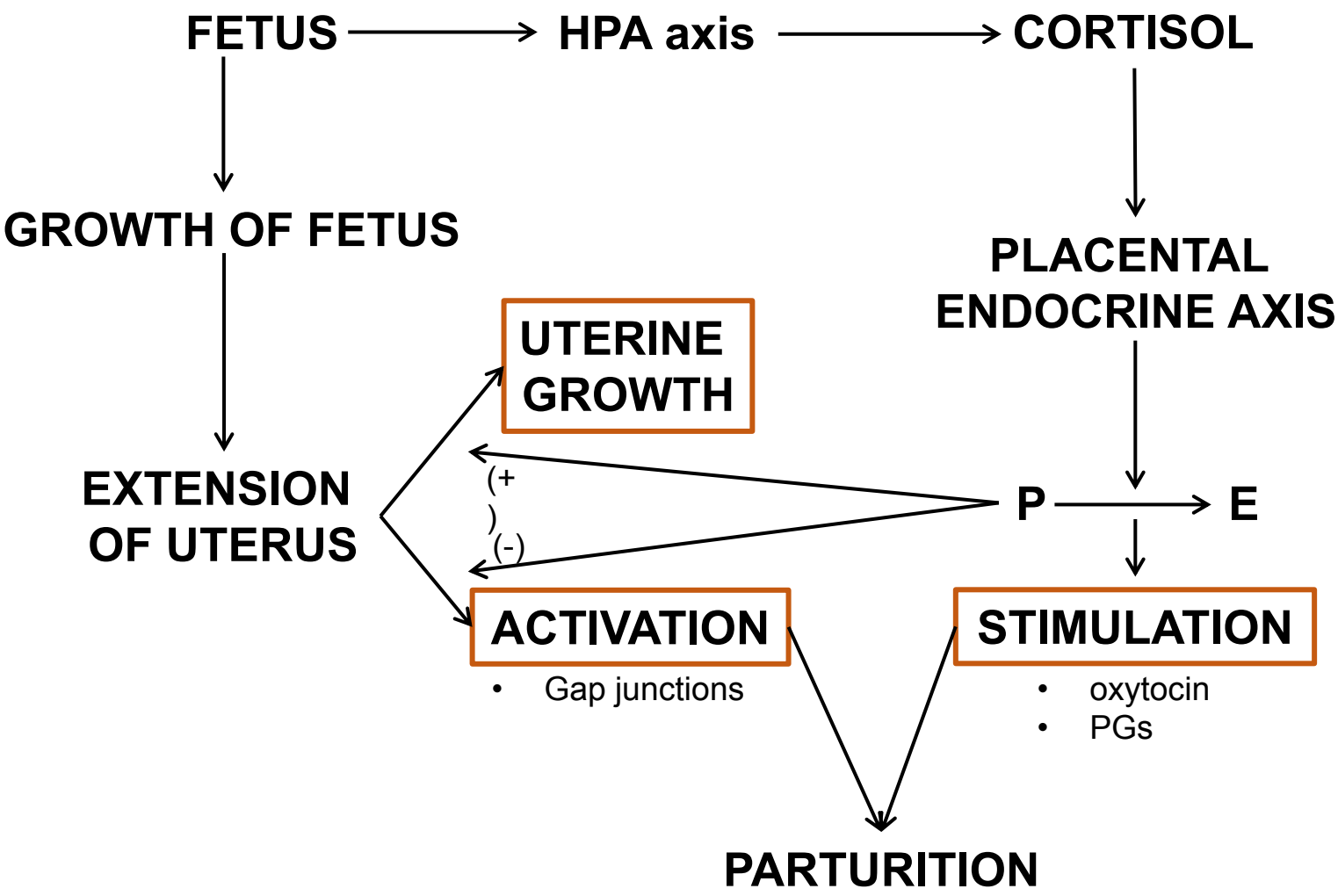
HORMONAL PROFILE OF PREGNANCY



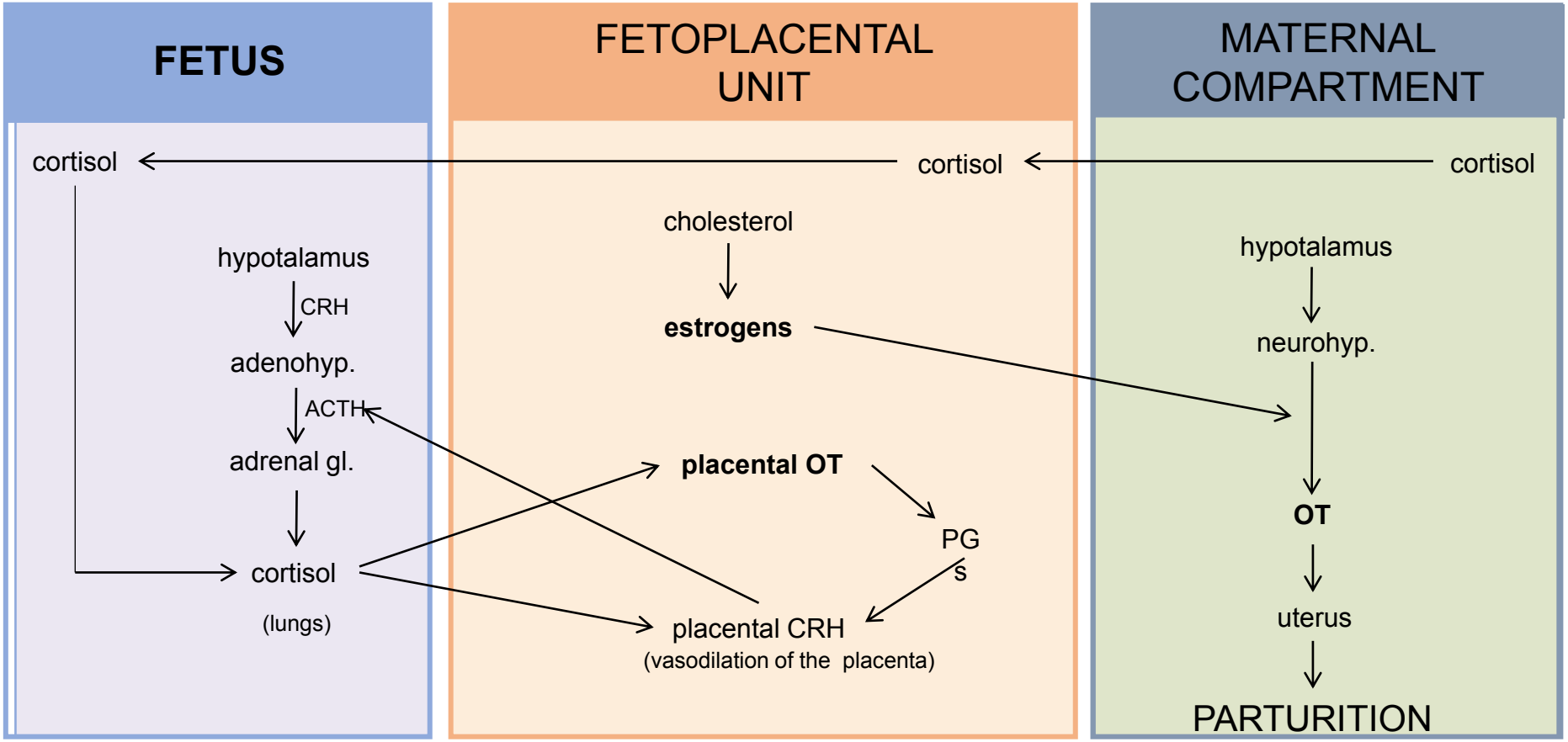
FETOPLACENTAL UNIT



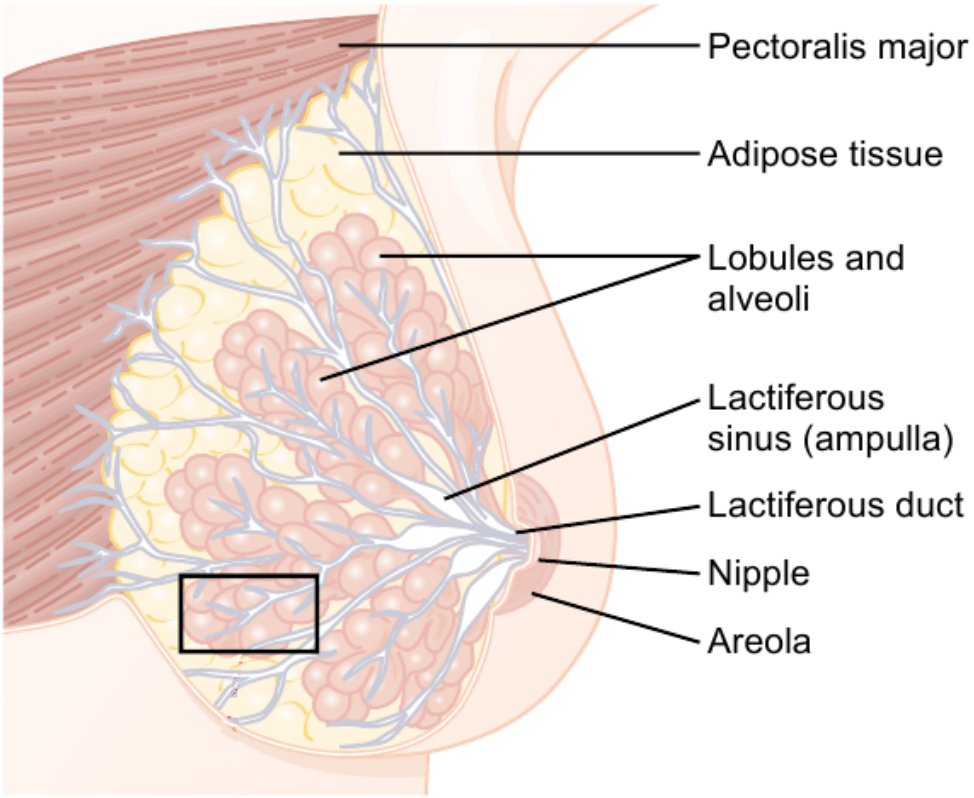
FETOPLACENTAL UNIT

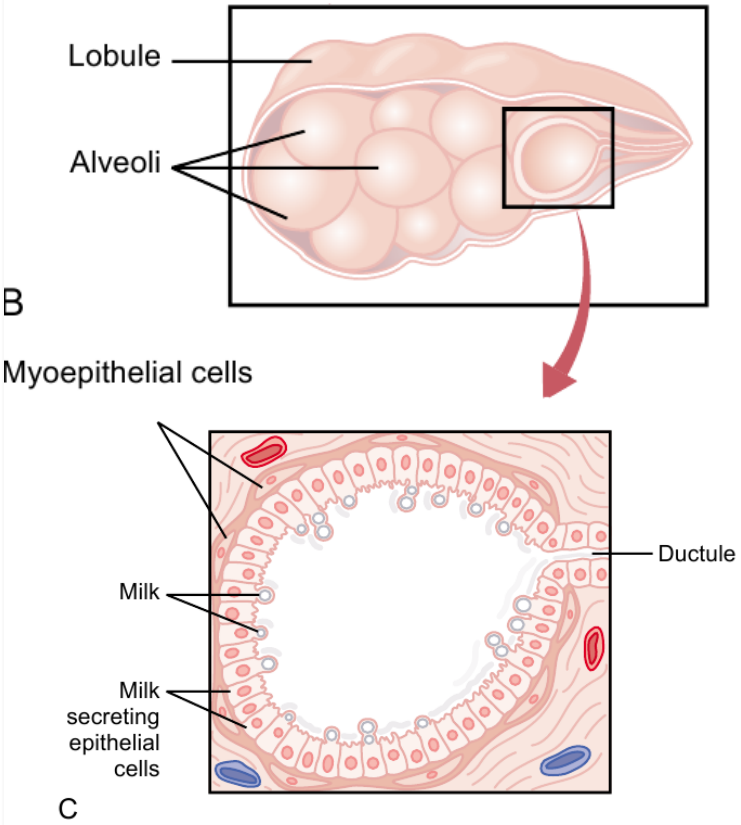


PARTURITION

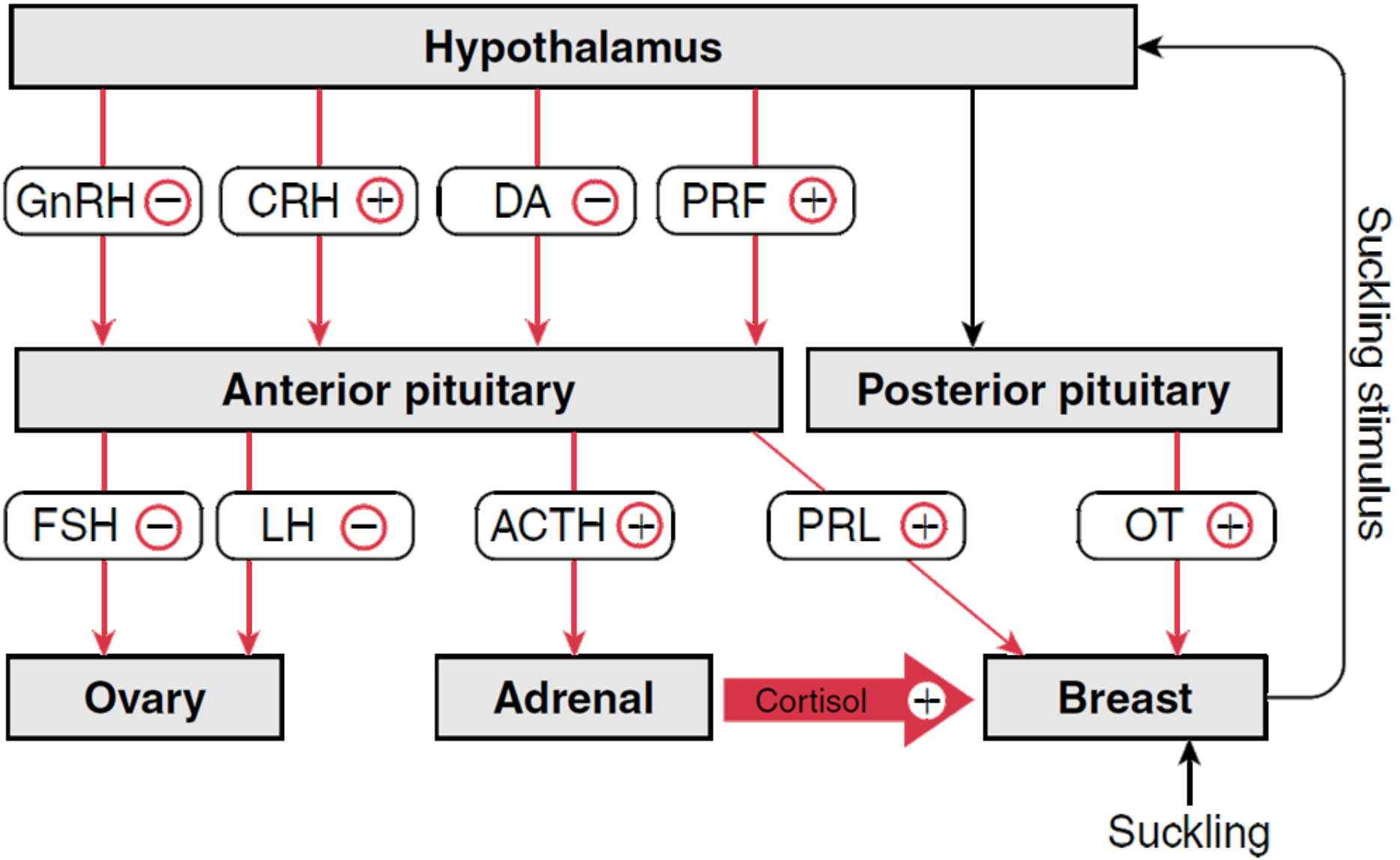


LACTATION

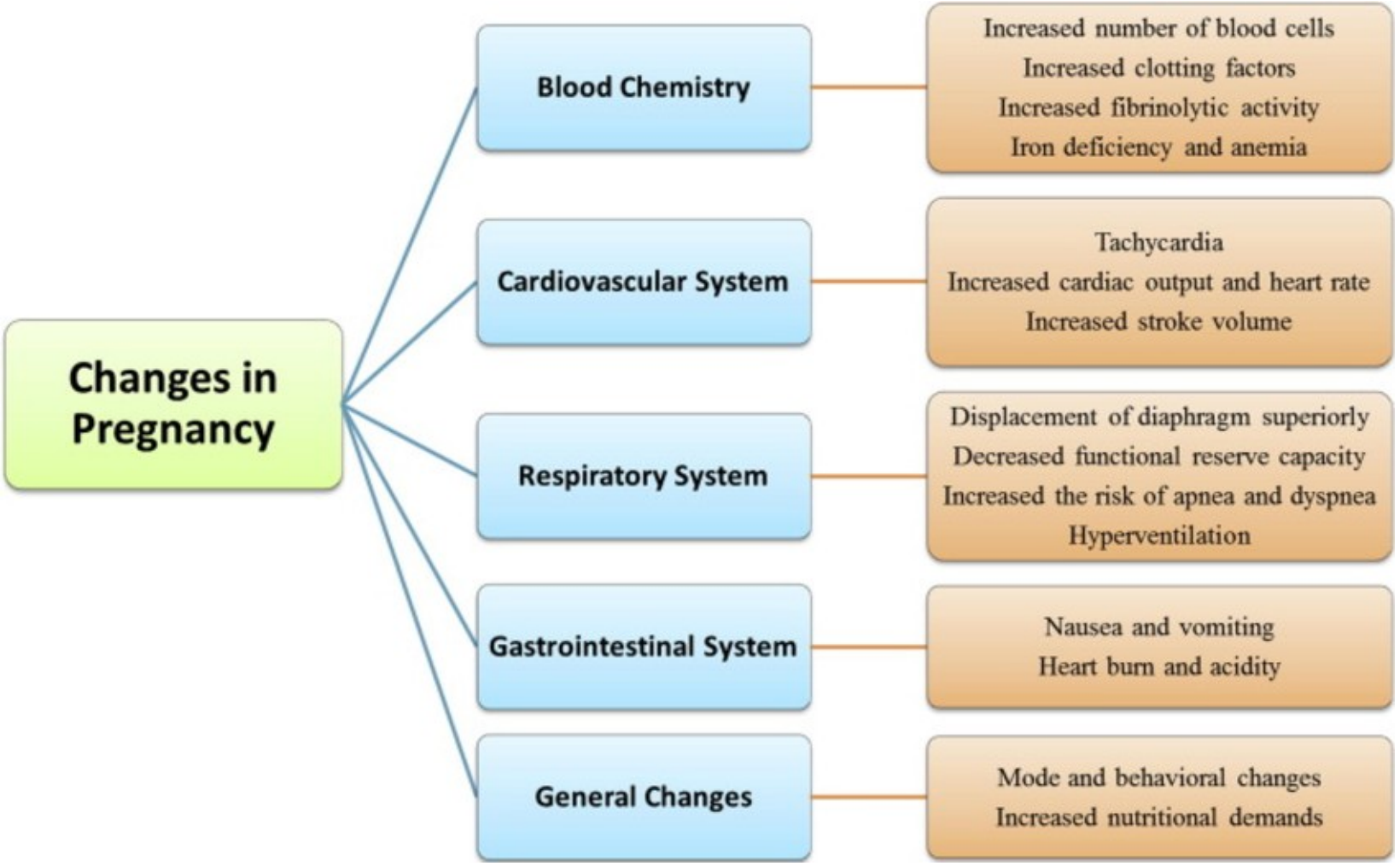

Pectoralis major
Adipose tissue
Lobules and alveoli
Lactiferous sinus (ampulla)
Lactiferous duct
Nipple
Areola


Lobule
Alveoli
B
Myoepithelial cells
Ductule
Milk
Milk secreting epithelial cells
C

LACTATION


Hypothalamus
GnRH ⊖
CRH ⊕
DA ⊖
PRF ⊕
Anterior pituitary
Posterior pituitary
FSH ⊖
LH ⊖
ACTH ⊕
PRL ⊕
OT ⊕
Ovary
Adrenal
Cortisol ⊕
Breast
Suckling stimulus
Suckling

PHYSIOLOGICAL CHANGES DURING PREGNANCY



THANK YOU FOR YOUR ATENTION