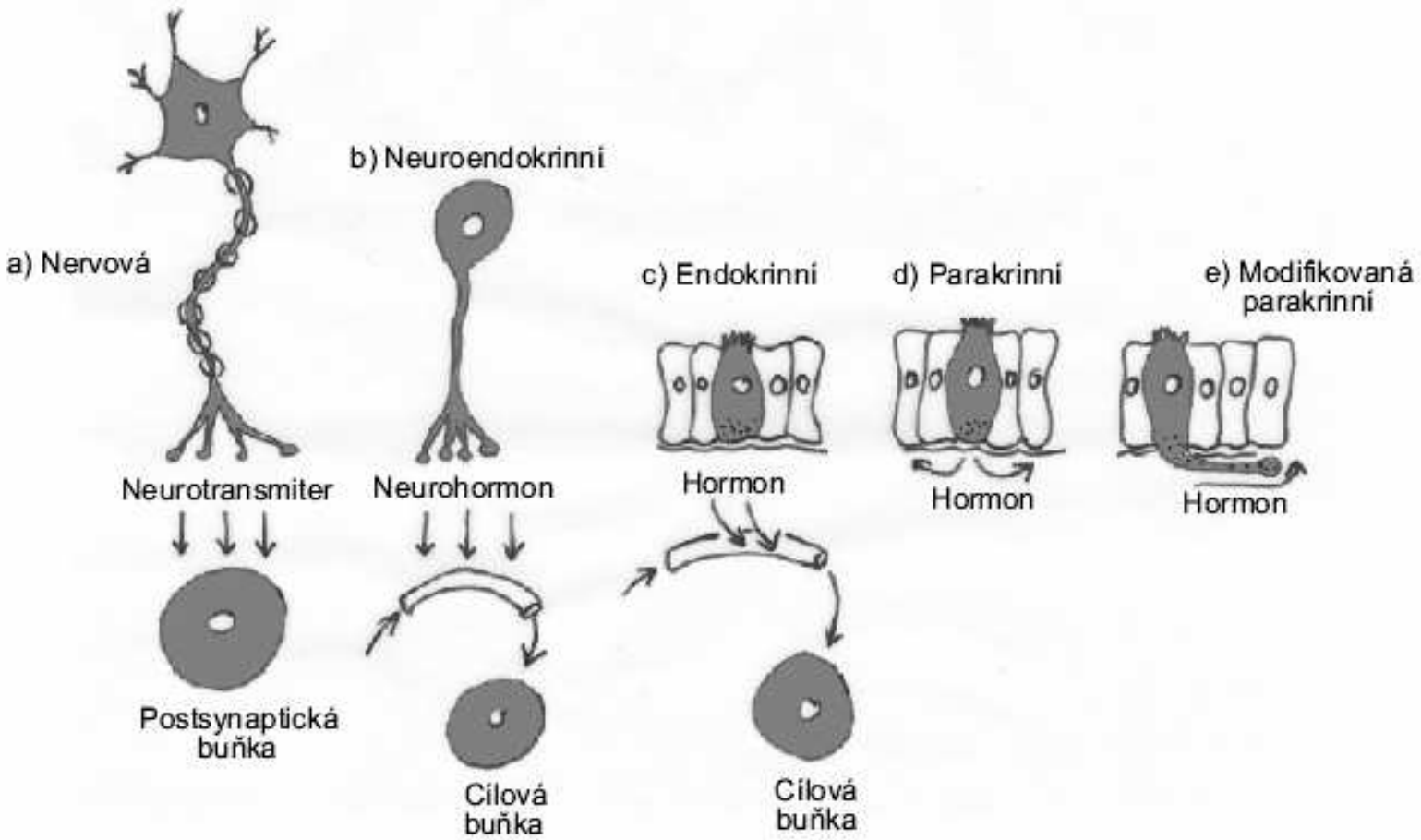
Hormonální řízení


a) Nervová
b) Neuroendokrinní
c) Endokrinní
d) Parakrinní
e) Modifikovaná parakrinní
Neurotransmiter
Neurohormon
Hormon
Hormon
Hormon
Postsynaptická buňka
Cílová buňka
Cílová buňka

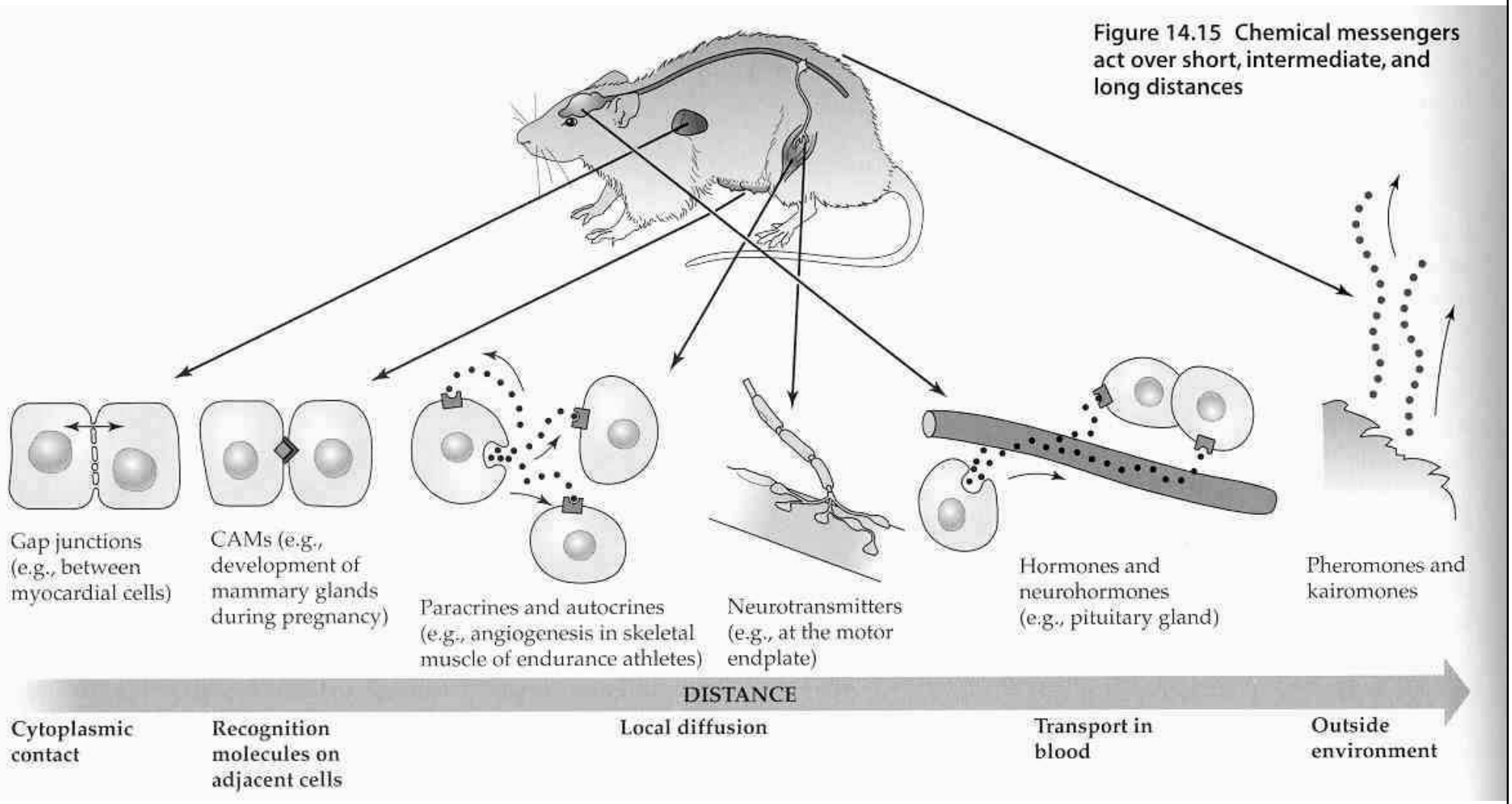
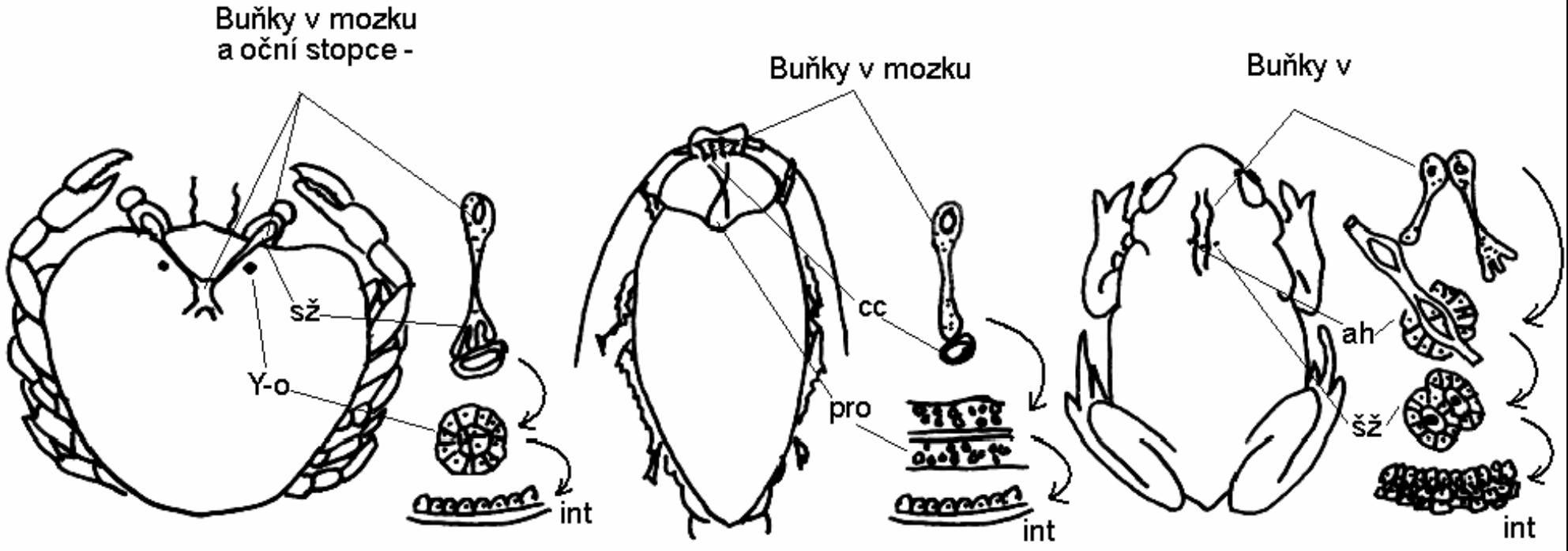
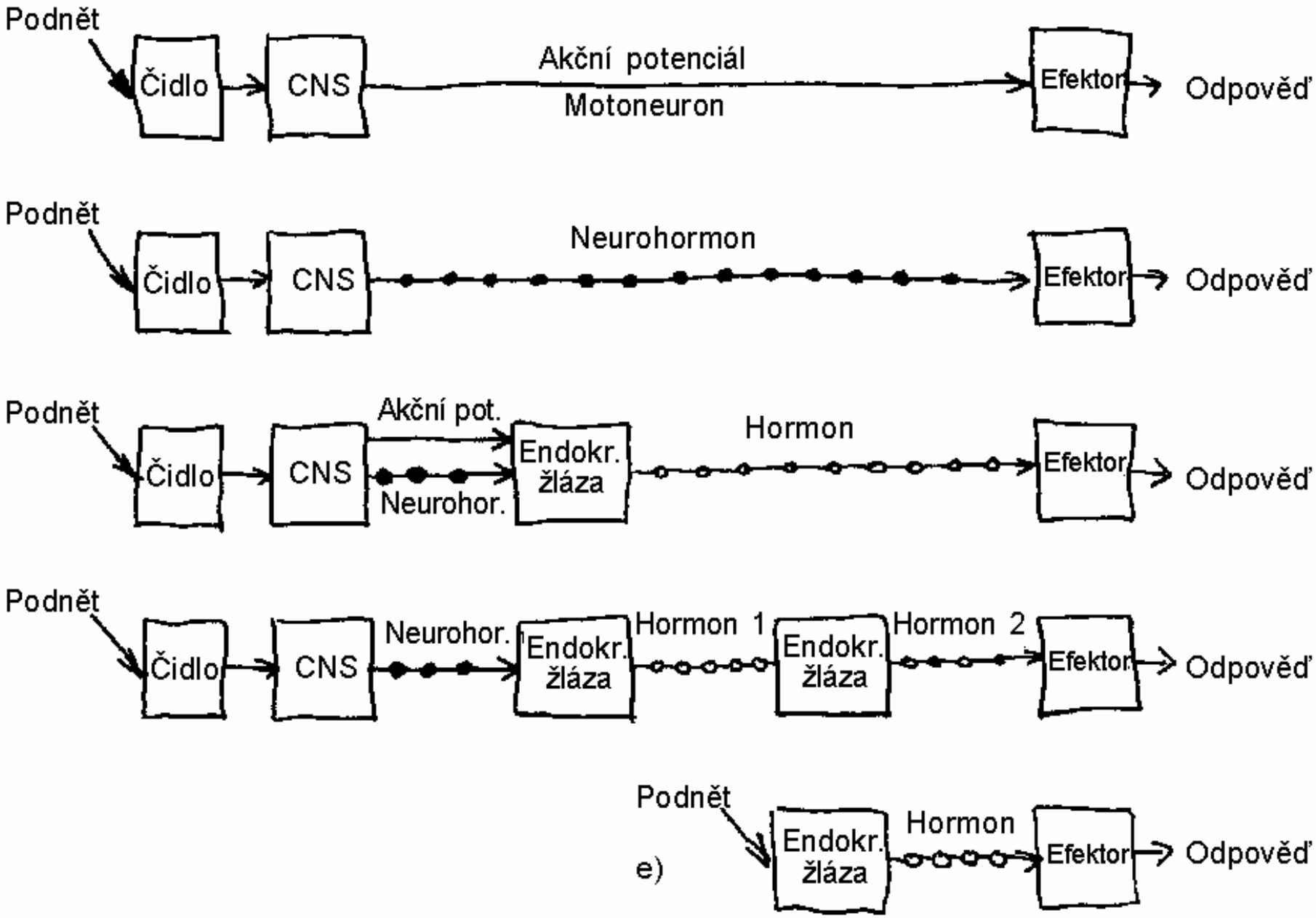
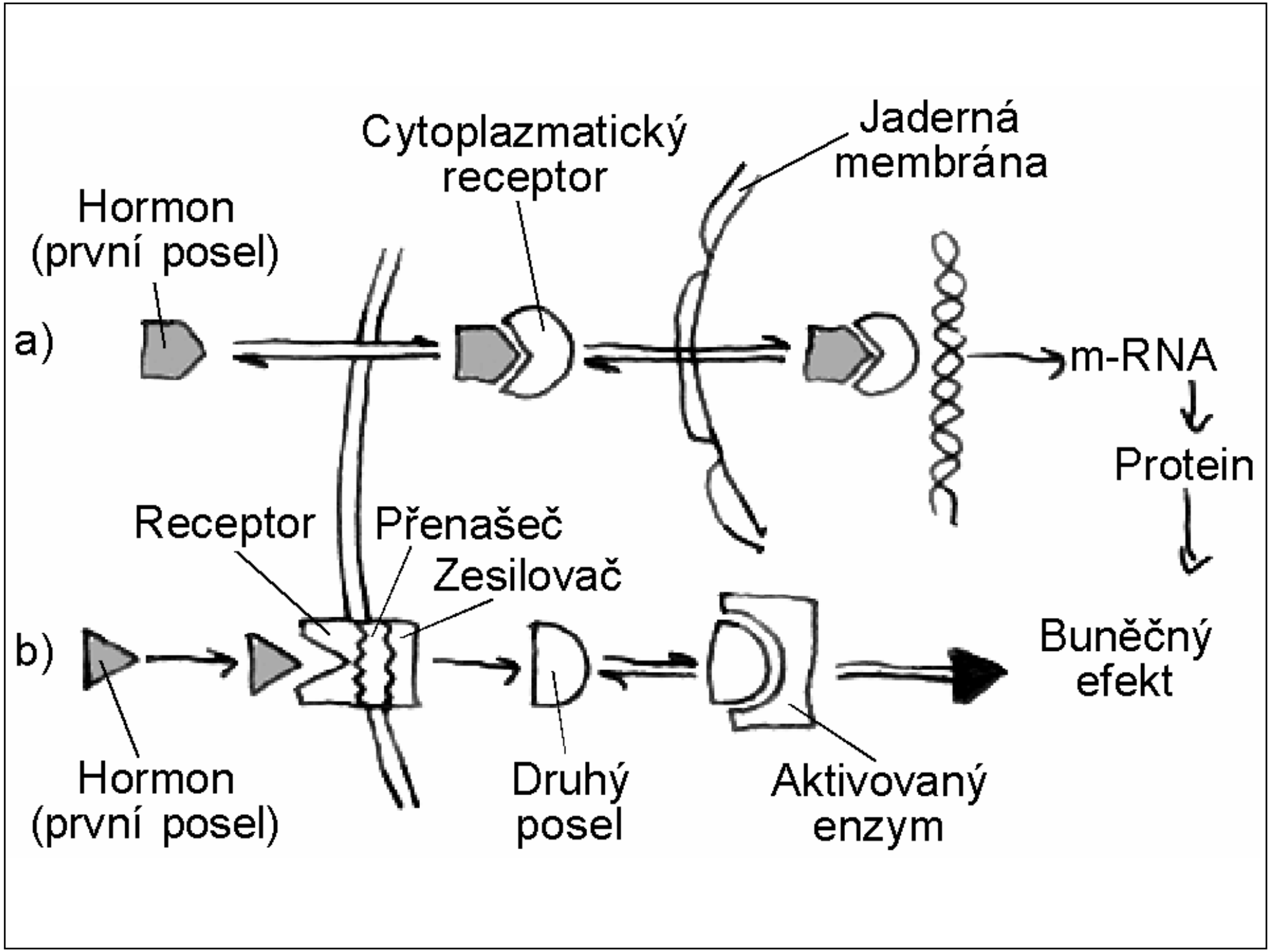


Figure 14.15 Chemical messengers act over short, intermediate, and long distances



a) Korýš b) Hmyz c) Obojživelník


Podnět
Čidlo
CNS
Akční potenciál
Motoneuron
Efektor
Odpověď
Podnět
Čidlo
CNS
Neurohormon
Efektor
Odpověď
Podnět
Čidlo
CNS
Akční pot.
Neurohor.
Endokr. žláza
Hormon
Efektor
Odpověď
Podnět
Čidlo
CNS
Neurohor.
Endokr. žláza
Hormon 1
Endokr. žláza
Hormon 2
Efektor
Odpověď
Podnět
e)
Endokr. žláza
Hormon
Efektor
Odpověď


Cytoplazmatický receptor
Jaderná membrána
Hormon (první posel)
a)
m-RNA
Protein
Receptor
Přenašeč
Zesilovač
b)
Buněčný efekt
Hormon (první posel)
Druhý posel
Aktivovaný enzym

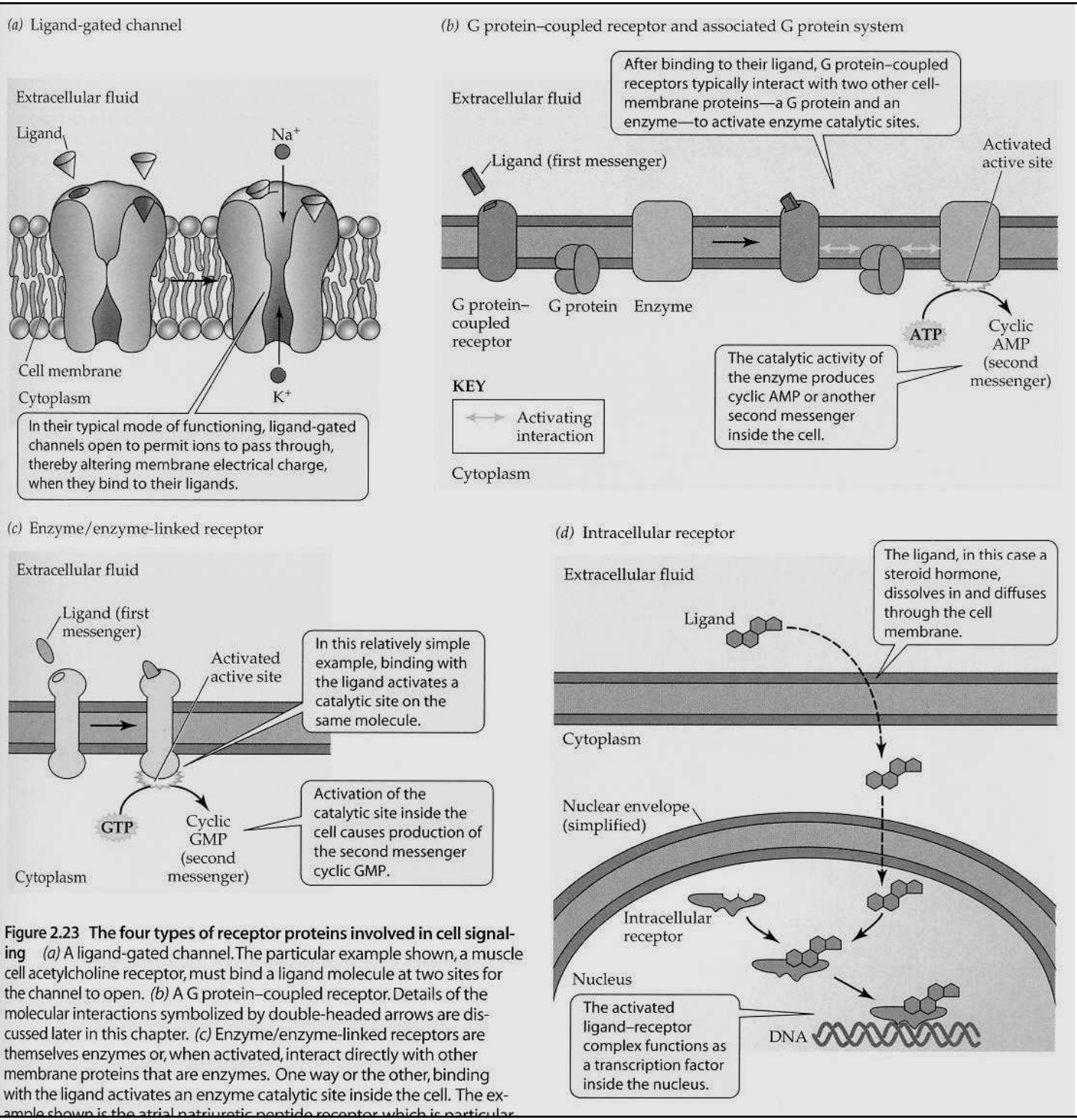
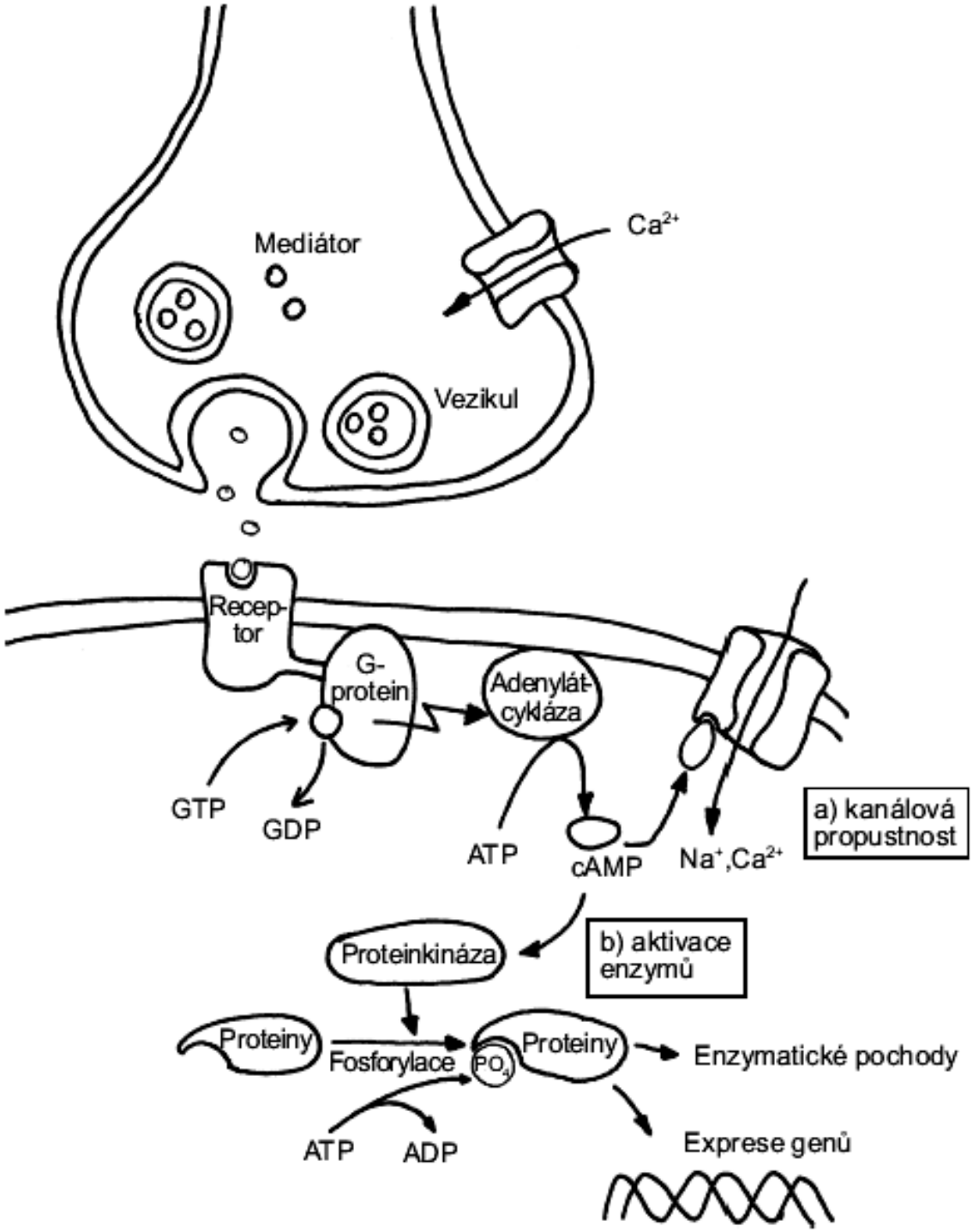
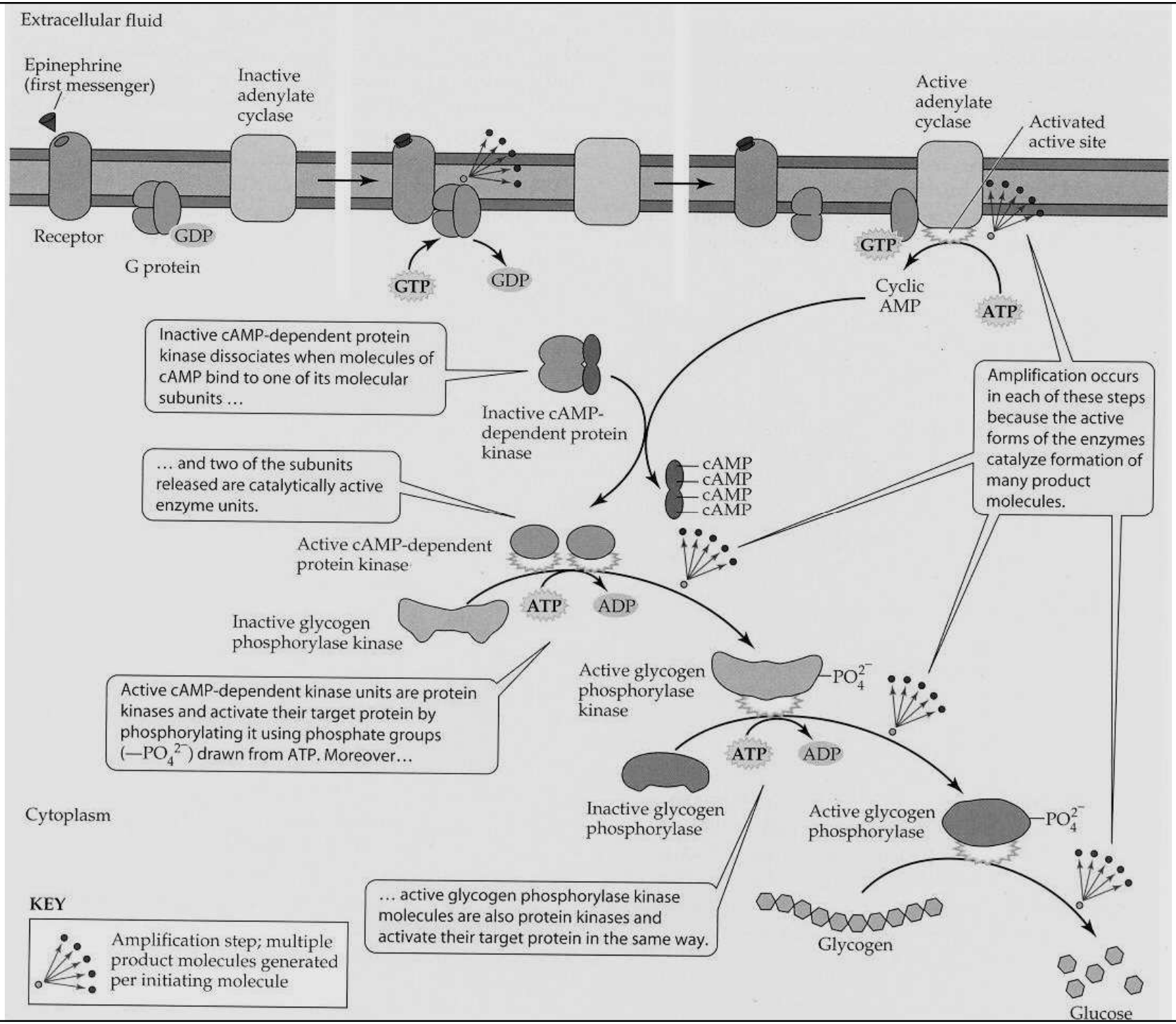
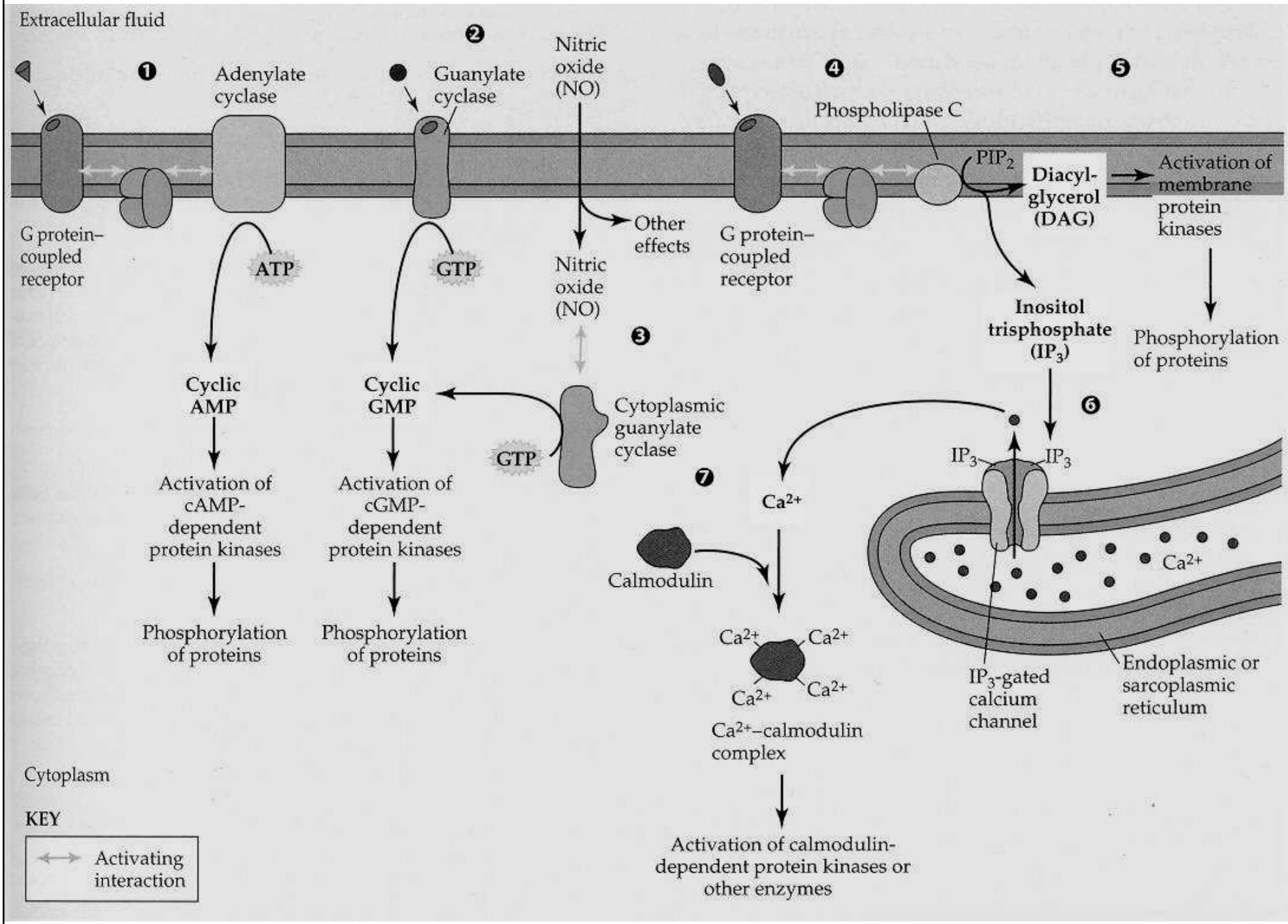
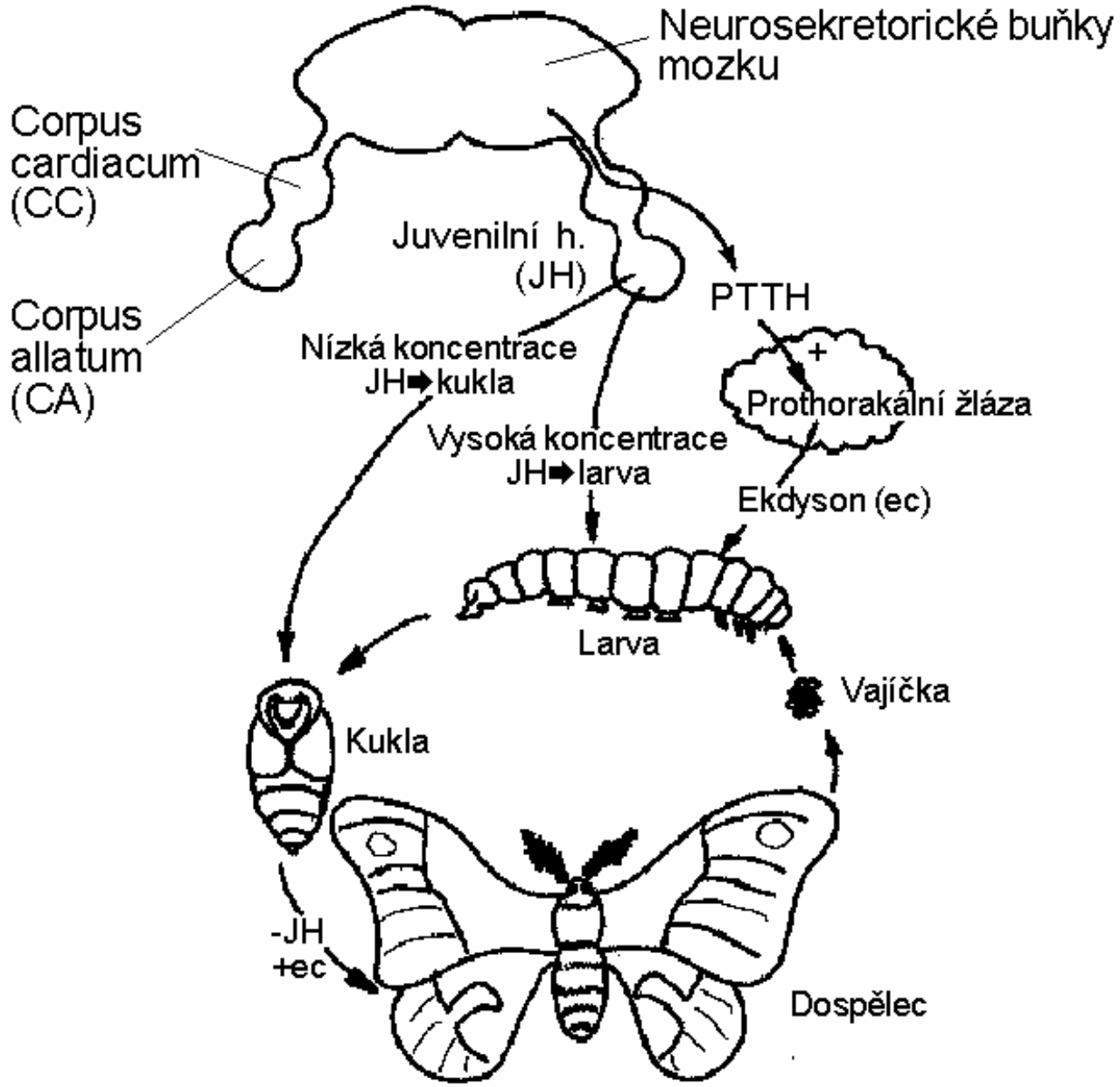


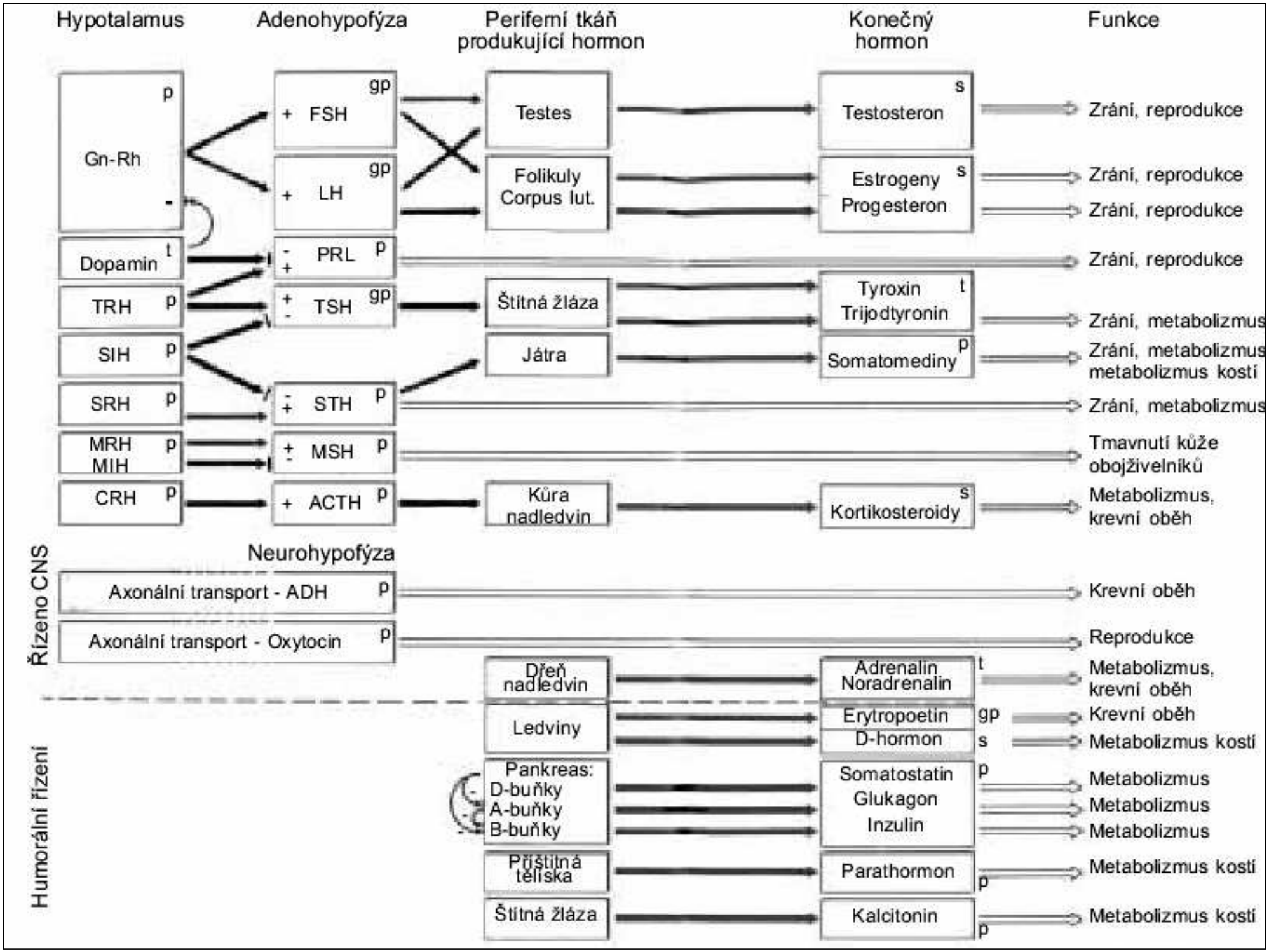
Figure 2.23 The four types of receptor proteins involved in cell signaling *(a)* A ligand-gated channel. The particular example shown, a muscle cell acetylcholine receptor, must bind a ligand molecule at two sites for the channel to open. *(b)* A G protein–coupled receptor. Details of the molecular interactions symbolized by double-headed arrows are discussed later in this chapter. *(c)* Enzyme/enzyme-linked receptors are themselves enzymes or, when activated, interact directly with other membrane proteins that are enzymes. One way or the other, binding with the ligand activates an enzyme catalytic site inside the cell. The example shown is the atrial natriuretic peptide receptor which is particular

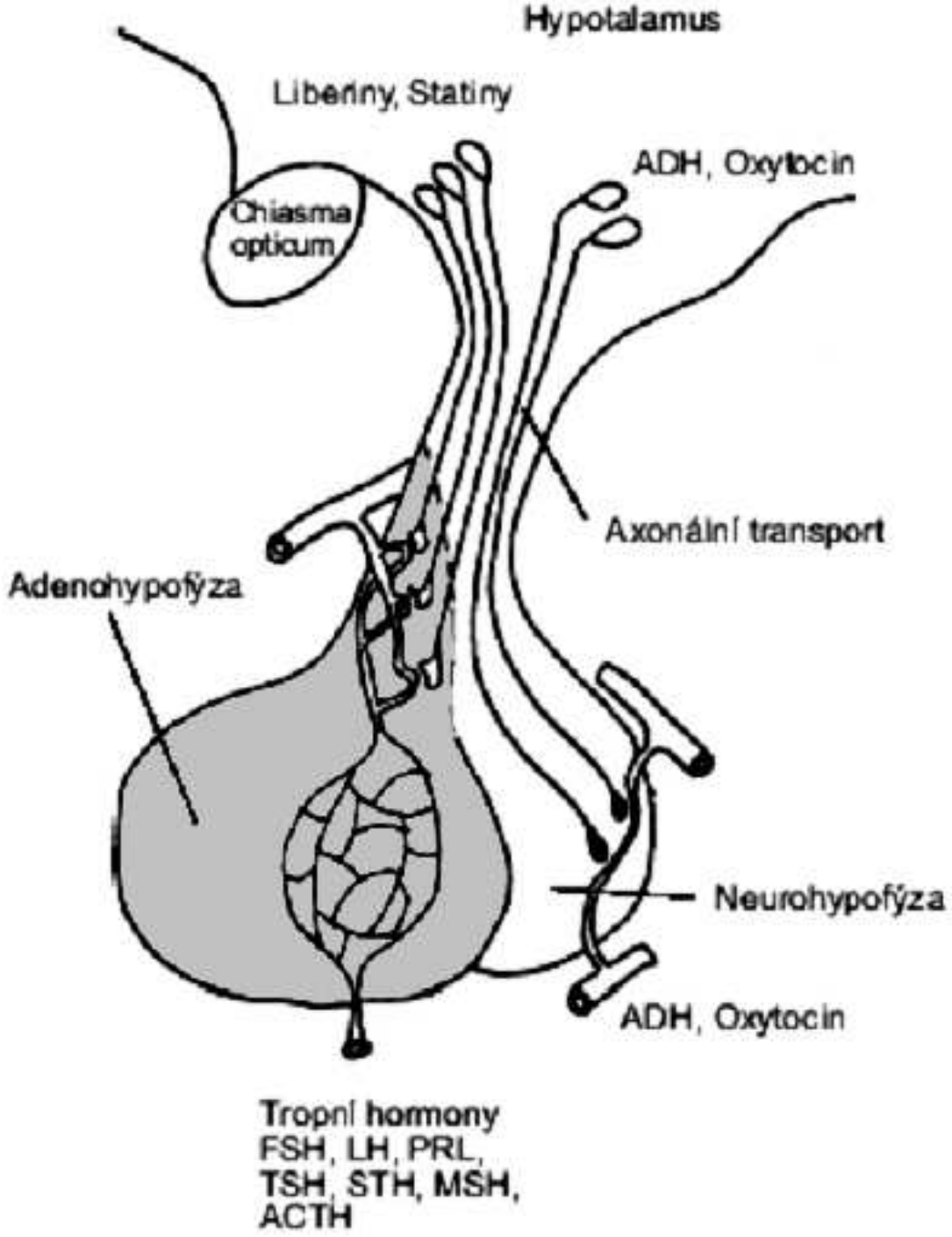

Mediátor
Ca2+
Vezikul
Recep-
tor
G-
protein
Adenylát-
cykláza
GTP
GDP
ATP
cAMP
Na+,Ca2+
a) kanálová
propustnost
Proteinkináza
b) aktivace
enzymů
Proteiny
Fosforylace
PO4
Proteiny
Enzymatické pochody
ATP
ADP
Exprese genů

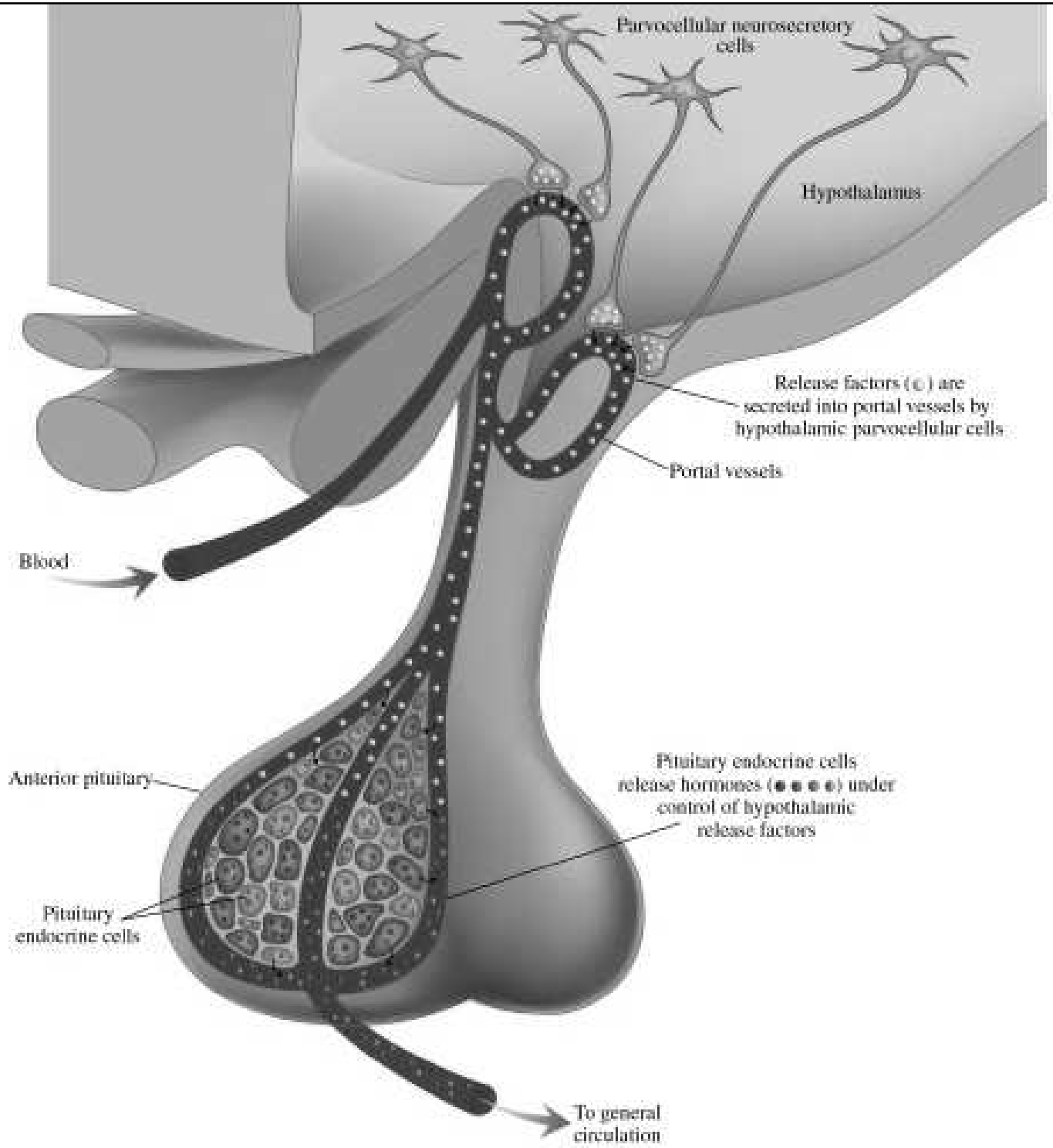

Extracellular fluid
Epinephrine (first messenger)
Inactive adenylate cyclase
Active adenylate cyclase
Activated active site
Receptor
GDP
G protein
GTP
GDP
GTP
Cyclic AMP
ATP
Inactive cAMP-dependent protein kinase dissociates when molecules of cAMP bind to one of its molecular subunits …
Inactive cAMP-dependent protein kinase
Amplification occurs in each of these steps because the active forms of the enzymes catalyze formation of many product molecules.
… and two of the subunits released are catalytically active enzyme units.
cAMP
cAMP
cAMP
cAMP
Active cAMP-dependent protein kinase
ATP
ADP
Inactive glycogen phosphorylase kinase
Active cAMP-dependent kinase units are protein kinases and activate their target protein by phosphorylating it using phosphate groups (—PO_4^{2-}) drawn from ATP. Moreover…
Active glycogen phosphorylase kinase
PO_4^{2-}
ATP
ADP
Cytoplasm
Inactive glycogen phosphorylase
Active glycogen phosphorylase
PO_4^{2-}
… active glycogen phosphorylase kinase molecules are also protein kinases and activate their target protein in the same way.
Glycogen
Glucose
KEY
Amplification step; multiple product molecules generated per initiating molecule

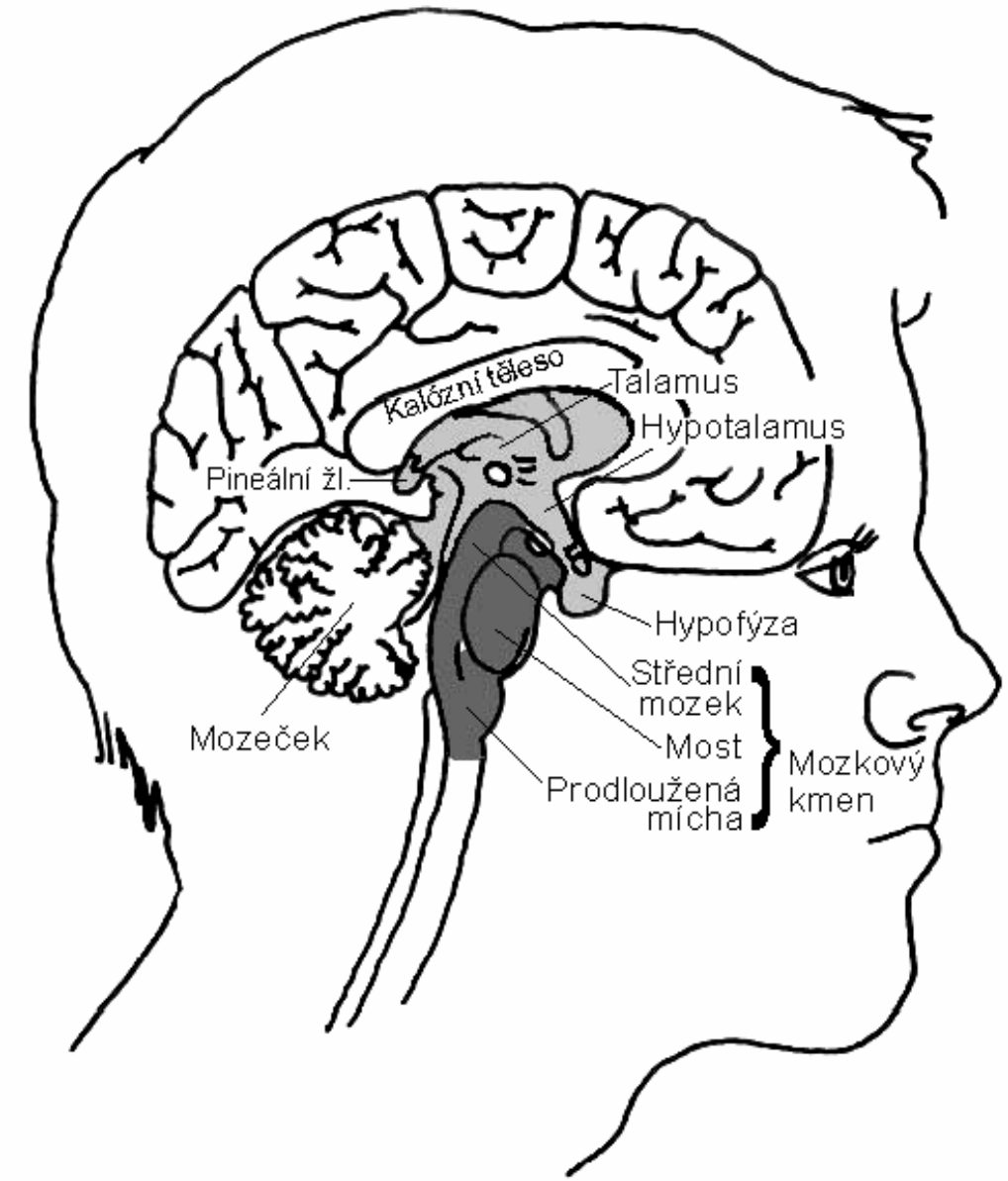

Extracellular fluid
1
2
3
4
5
6
7
Adenylate cyclase
Guanylate cyclase
Nitric oxide (NO)
Phospholipase C
G protein–coupled receptor
ATP
GTP
Other effects
Nitric oxide (NO)
G protein–coupled receptor
PIP2
Diacyl-glycerol (DAG)
Activation of membrane protein kinases
Phosphorylation of proteins
Inositol trisphosphate (IP3)
Cyclic AMP
Cyclic GMP
Cytoplasmic guanylate cyclase
GTP
Activation of cAMP-dependent protein kinases
Activation of cGMP-dependent protein kinases
Phosphorylation of proteins
Phosphorylation of proteins
Ca2+
Calmodulin
IP3
IP3
Ca2+
Ca2+
Ca2+
Ca2+
Ca2+
Ca2+–calmodulin complex
IP3-gated calcium channel
Endoplasmic or sarcoplasmic reticulum
Activation of calmodulin-dependent protein kinases or other enzymes
Cytoplasm
KEY
Activating interaction

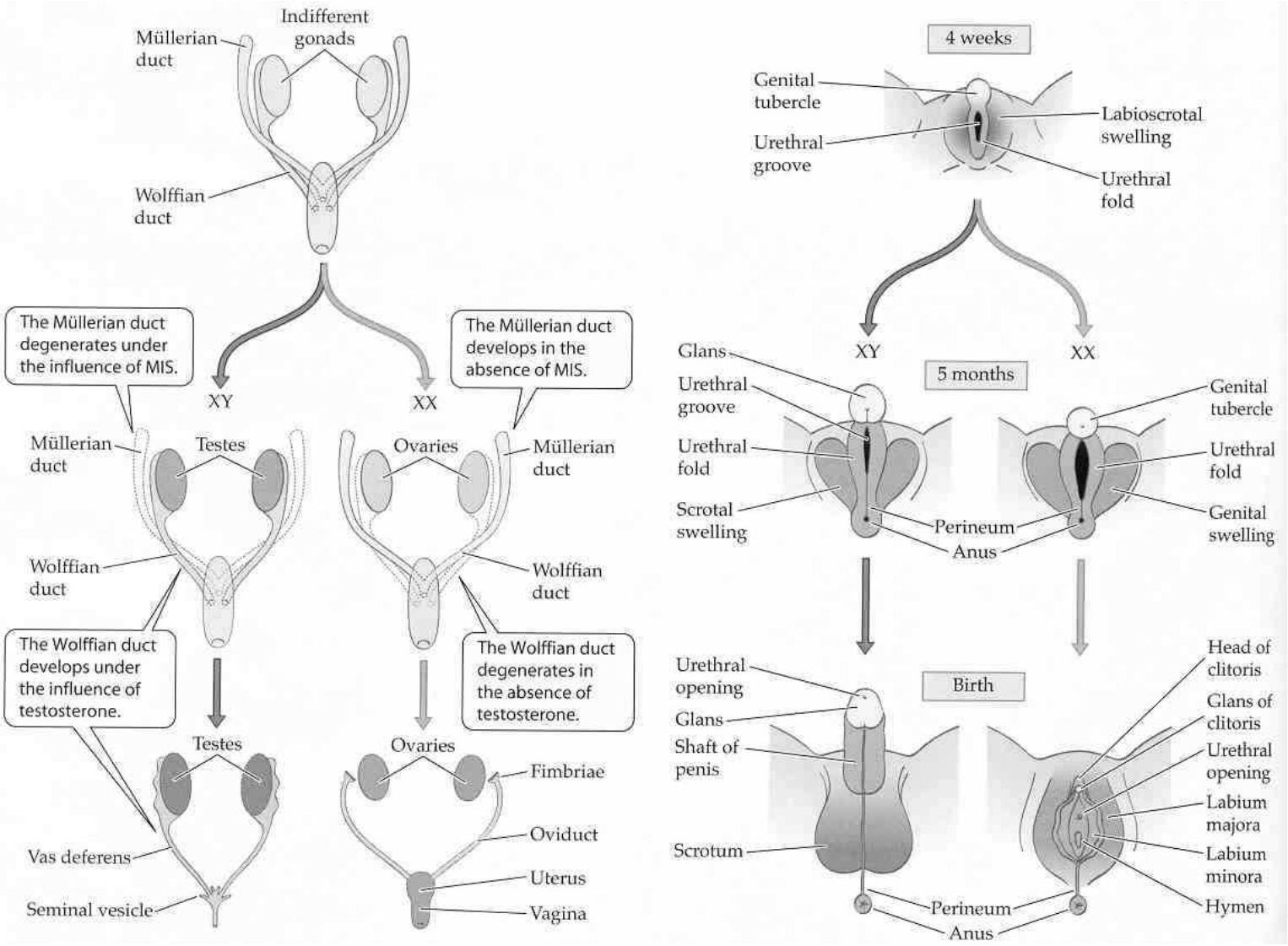

Neurosekretorické buňky mozku
Corpus cardiacum (CC)
Corpus allatum (CA)
Juvenilní h. (JH)
PTTH
Nízká koncentrace JH➡kukla
+
Prothorakální žláza
Vysoká koncentrace JH➡larva
Ekdyson (ec)
Larva
Vajíčka
Kukla
-JH
+ec
Dospělec

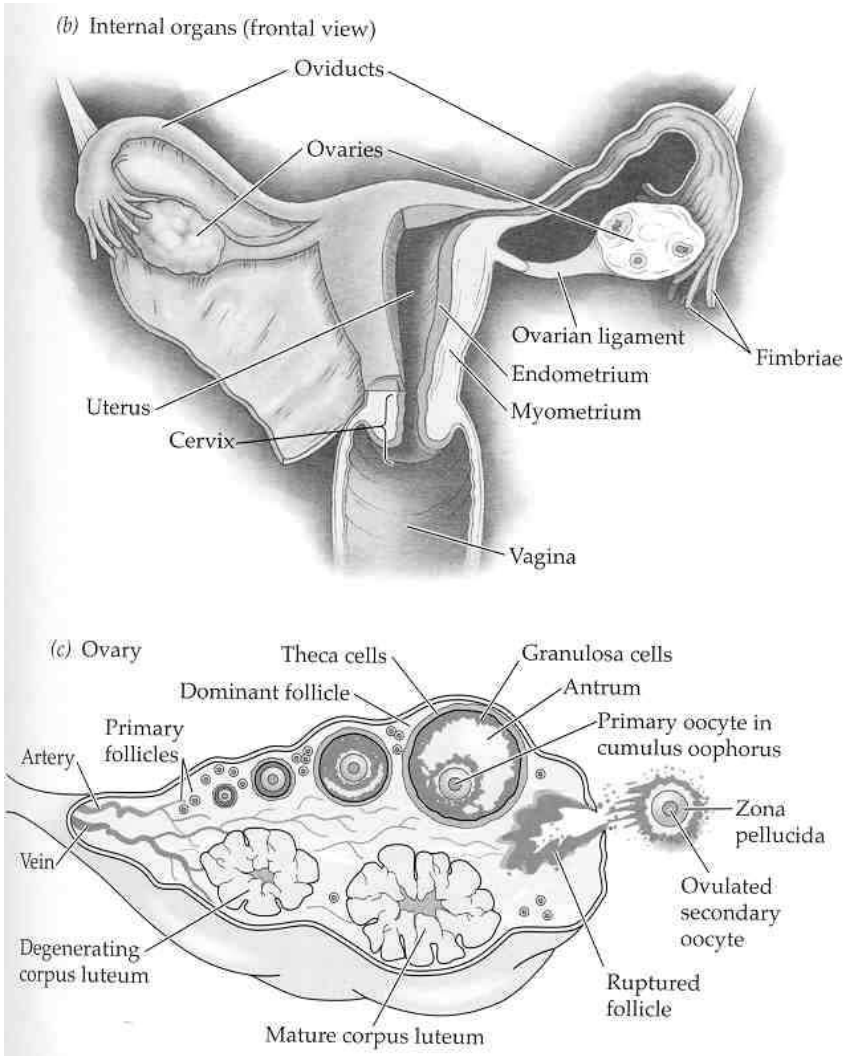

Hypotalamus
Adenohypofýza
Periferní tkáň produkující hormon
Konečný hormon
Funkce
Gn-Rh
Dopamin
TRH
SIH
SRH
MRH
MIH
CRH
FSH
LH
PRL
TSH
STH
MSH
ACTH
Testes
Folikuly
Corpus lut.
Štítná žláza
Játra
Kůra nadledvin
Testosteron
Estrogeny
Progesteron
Tyroxin
Trijodtyronin
Somatomediny
Kortikosteroidy
Zrání, reprodukce
Zrání, reprodukce
Zrání, reprodukce
Zrání, metabolizmus
Zrání, metabolizmus
metabolizmus kostí
Zrání, metabolizmus
Tmavnutí kůže obojživelníků
Metabolizmus, krevní oběh
Řízeno CNS
Neurohypofýza
Axonální transport - ADH
Axonální transport - Oxytocin
Krevní oběh
Reprodukce
Humorální řízení
Dřeň nadledvin
Ledviny
Pankreas:
D-buňky
A-buňky
B-buňky
Přištítná tělíska
Štítná žláza
Adrenalin
Noradrenalin
Erytropoetin
D-hormon
Somatostatin
Glukagon
Inzulin
Parathormon
Kalcitonin
Metabolizmus, krevní oběh
Krevní oběh
Metabolizmus kostí
Metabolizmus
Metabolizmus
Metabolizmus
Metabolizmus kostí
Metabolizmus kostí

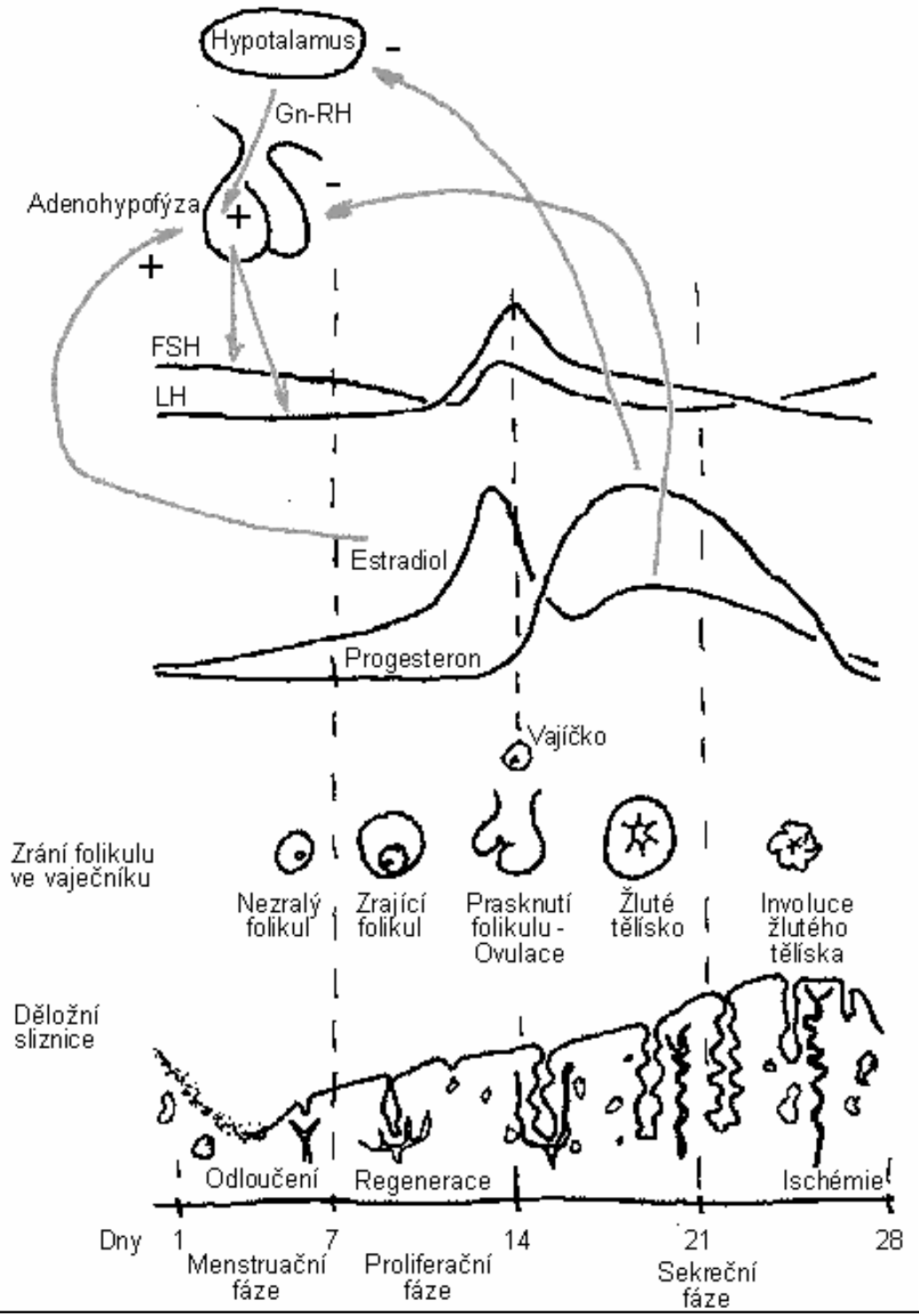

Hypotalamus
Liberiny, Statiny
ADH, Oxytocin
Chiasma opticum
Axonální transport
Adenohypofýza
Neurohypofýza
ADH, Oxytocin
Tropní hormony
FSH, LH, PRL,
TSH, STH, MSH,
ACTH

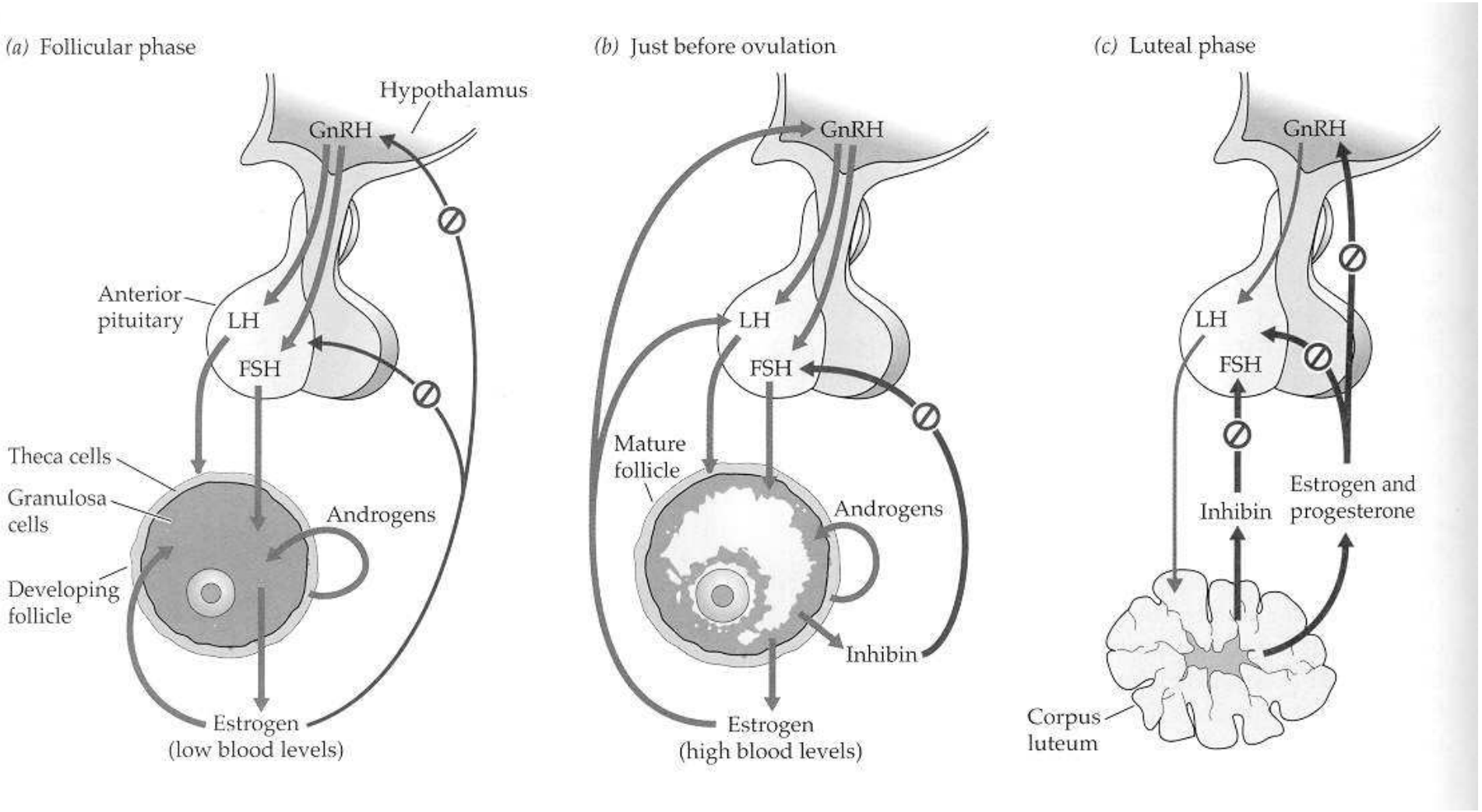

Parvocellular neurosecretory cells
Hypothalamus
Release factors (●) are secreted into portal vessels by hypothalamic parvocellular cells
Portal vessels
Blood
Anterior pituitary
Pituitary endocrine cells release hormones (● ● ● ●) under control of hypothalamic release factors
Pituitary endocrine cells
To general circulation


Kalózní těleso
Talamus
Hypotalamus
Pineální žl.
Hypofýza
Střední mozek
Most
Prodloužená mícha
Mozkový kmen
Mozeček


Müllerian duct
Indifferent gonads
Wolffian duct
XY
XX
The Müllerian duct degenerates under the influence of MIS.
The Müllerian duct develops in the absence of MIS.
Müllerian duct
Testes
Ovaries
Müllerian duct
Wolffian duct
Wolffian duct
The Wolffian duct develops under the influence of testosterone.
The Wolffian duct degenerates in the absence of testosterone.
Testes
Ovaries
Fimbriae
Oviduct
Uterus
Vagina
Vas deferens
Seminal vesicle
4 weeks
Genital tubercle
Urethral groove
Labioscrotal swelling
Urethral fold
XY
XX
5 months
Glans
Urethral groove
Urethral fold
Scrotal swelling
Perineum
Anus
Genital tubercle
Urethral fold
Genital swelling
Birth
Urethral opening
Glans
Shaft of penis
Scrotum
Perineum
Anus
Head of clitoris
Glans of clitoris
Urethral opening
Labium majora
Labium minora
Hymen


(b) Internal organs (frontal view)
Oviducts
Ovaries
Ovarian ligament
Fimbriae
Endometrium
Myometrium
Uterus
Cervix
Vagina
(c) Ovary
Theca cells
Granulosa cells
Dominant follicle
Antrum
Primary oocyte in cumulus oophorus
Primary follicles
Artery
Zona pellucida
Vein
Ovulated secondary oocyte
Degenerating corpus luteum
Ruptured follicle
Mature corpus luteum


Hypotalamus
-
Gn-RH
Adenohypofýza
-
+
+
FSH
LH
Estradiol
Progesteron
Vajíčko
Zrání folikulu ve vaječníku
Nezralý folikul
Zrající folikul
Prasknutí folikulu - Ovulace
Žluté tělísko
Involuce žlutého tělíska
Děložní sliznice
Odloučení
Regenerace
Ischémie
Dny
1
7
14
21
28
Menstruační fáze
Proliferační fáze
Sekreční fáze


(a) Follicular phase
Hypothalamus
GnRH
Anterior pituitary
LH
FSH
Theca cells
Granulosa cells
Androgens
Developing follicle
Estrogen
(low blood levels)
(b) Just before ovulation
GnRH
LH
FSH
Mature follicle
Androgens
Inhibin
Estrogen
(high blood levels)
(c) Luteal phase
GnRH
LH
FSH
Inhibin
Estrogen and progesterone
Corpus luteum

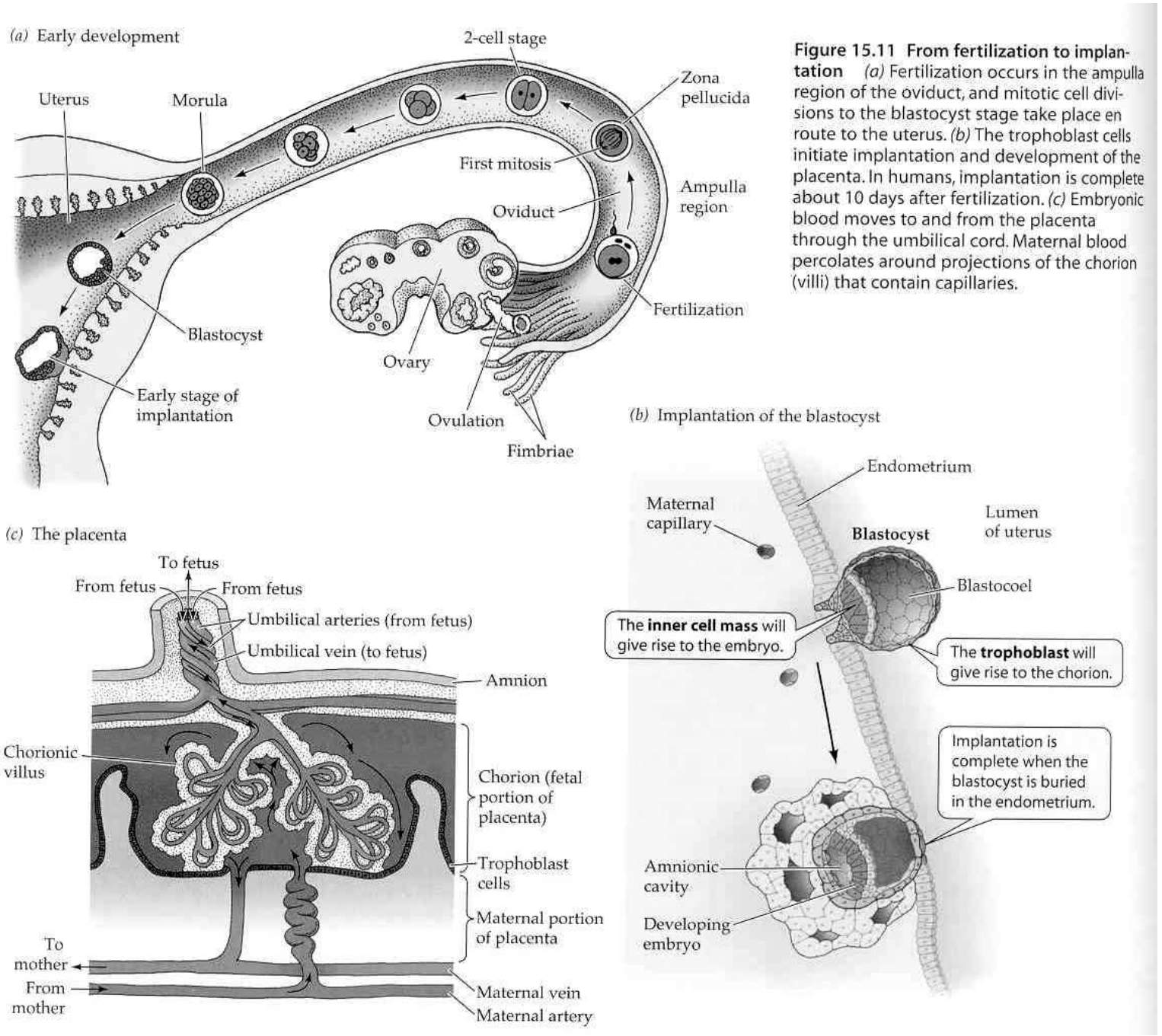
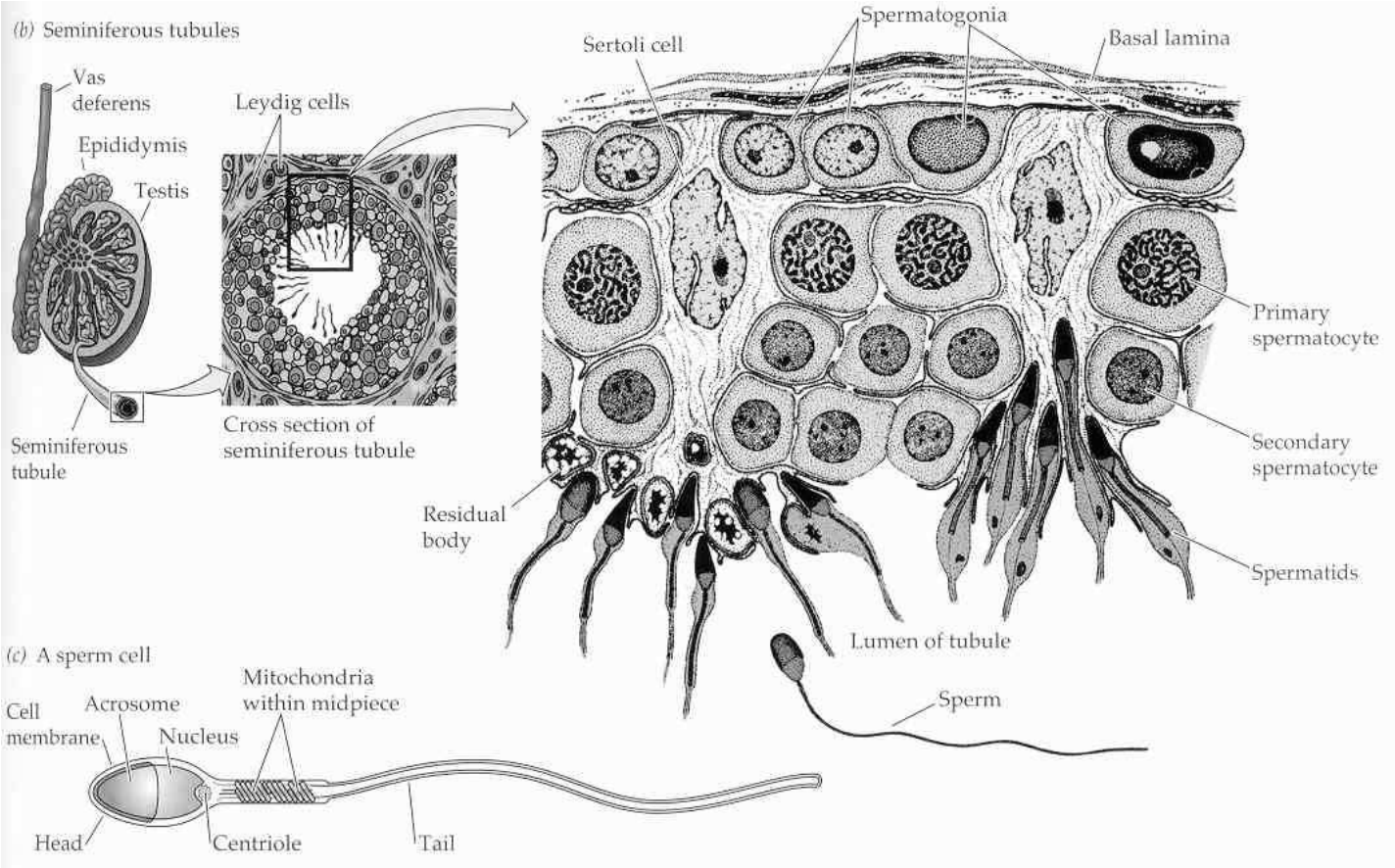
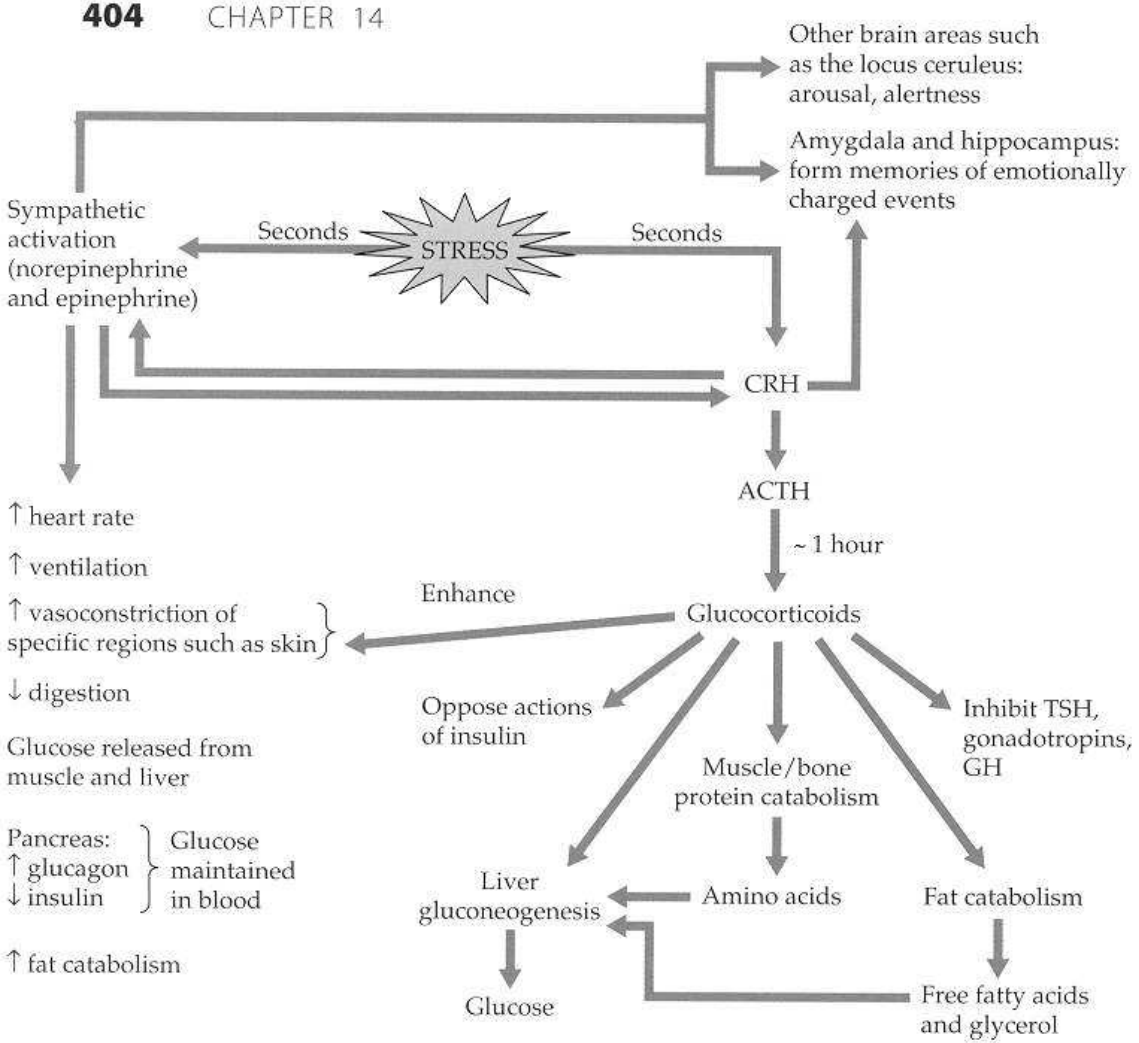


Figure 15.11 From fertilization to implantation *(a)* Fertilization occurs in the ampulla region of the oviduct, and mitotic cell divisions to the blastocyst stage take place en route to the uterus. *(b)* The trophoblast cells initiate implantation and development of the placenta. In humans, implantation is complete about 10 days after fertilization. *(c)* Embryonic blood moves to and from the placenta through the umbilical cord. Maternal blood percolates around projections of the chorion (villi) that contain capillaries.


(b) Seminiferous tubules
Vas deferens
Epididymis
Testis
Seminiferous tubule
Leydig cells
Cross section of seminiferous tubule
Sertoli cell
Spermatogonia
Basal lamina
Primary spermatocyte
Secondary spermatocyte
Spermatids
Residual body
Lumen of tubule
Sperm
(c) A sperm cell
Cell membrane
Acrosome
Nucleus
Mitochondria within midpiece
Head
Centriole
Tail



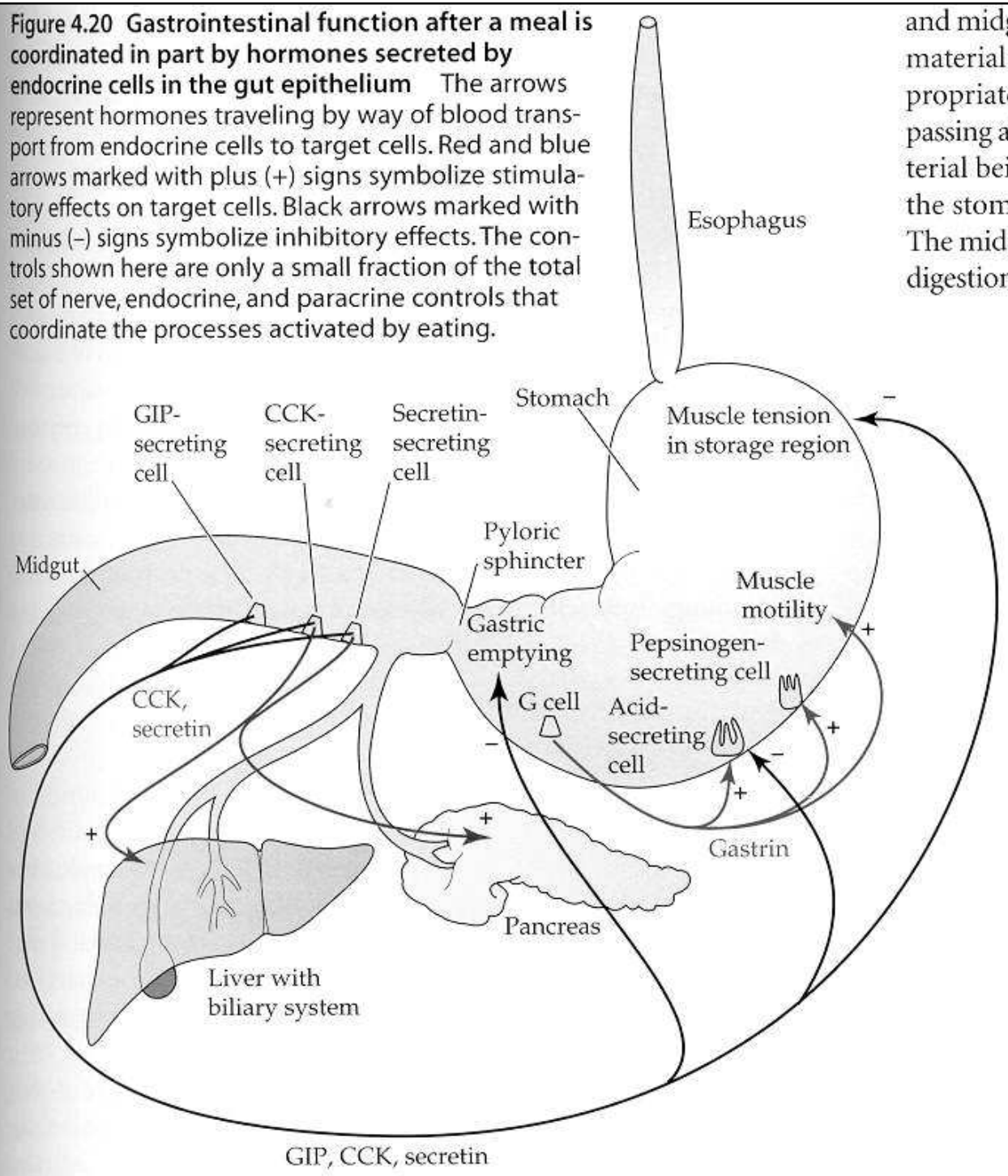
Blood loss:
↑ vasopressin → ↑ water reabsorption at kidney
↑ aldosterone → ↑ Na reabsorption at kidney
↓
↑ fluid retention
↓
↑ blood volume
↓
↑ blood pressure

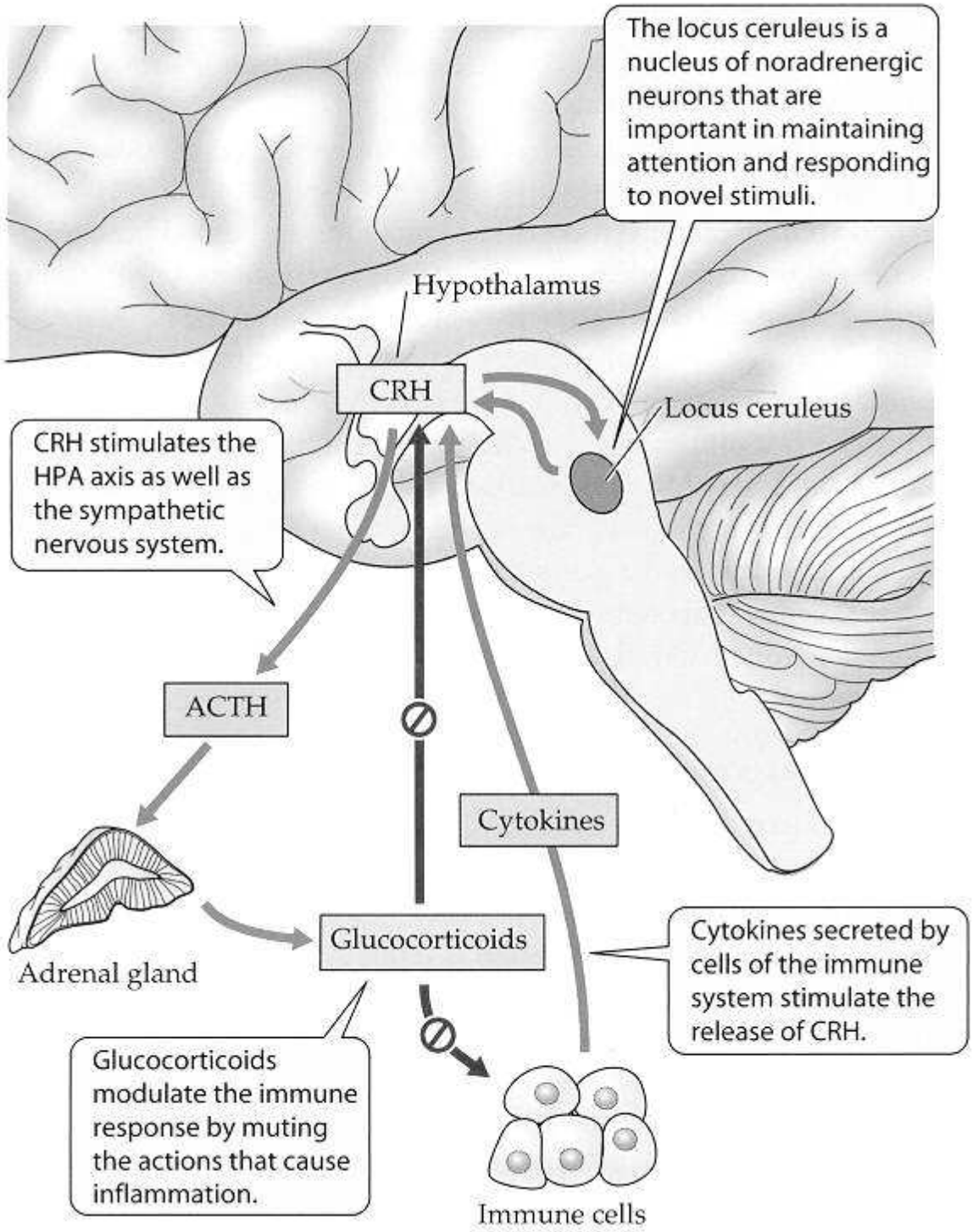
Figure 14.10 The mammalian stress response The stress response includes activation of both the sympathetic nervous system and the HPA axis.

these reveal that
and adrenocortica
a neurotransmitt
pocampus (which
ally charged event

The two outpu
norepinephrine. T
receive noradrene
the brain. Some
CRH as their neu

Figure 4.20 Gastrointestinal function after a meal is coordinated in part by hormones secreted by endocrine cells in the gut epithelium The arrows represent hormones traveling by way of blood transport from endocrine cells to target cells. Red and blue arrows marked with plus (+) signs symbolize stimulatory effects on target cells. Black arrows marked with minus (–) signs symbolize inhibitory effects. The controls shown here are only a small fraction of the total set of nerve, endocrine, and paracrine controls that coordinate the processes activated by eating.




The locus ceruleus is a nucleus of noradrenergic neurons that are important in maintaining attention and responding to novel stimuli.
Hypothalamus
CRH
Locus ceruleus
CRH stimulates the HPA axis as well as the sympathetic nervous system.
ACTH
Cytokines
Adrenal gland
Glucocorticoids
Cytokines secreted by cells of the immune system stimulate the release of CRH.
Glucocorticoids modulate the immune response by muting the actions that cause inflammation.
Immune cells