ROLE OF PROLACTIN IN FISH, AMPHIBIANS, BIRDS

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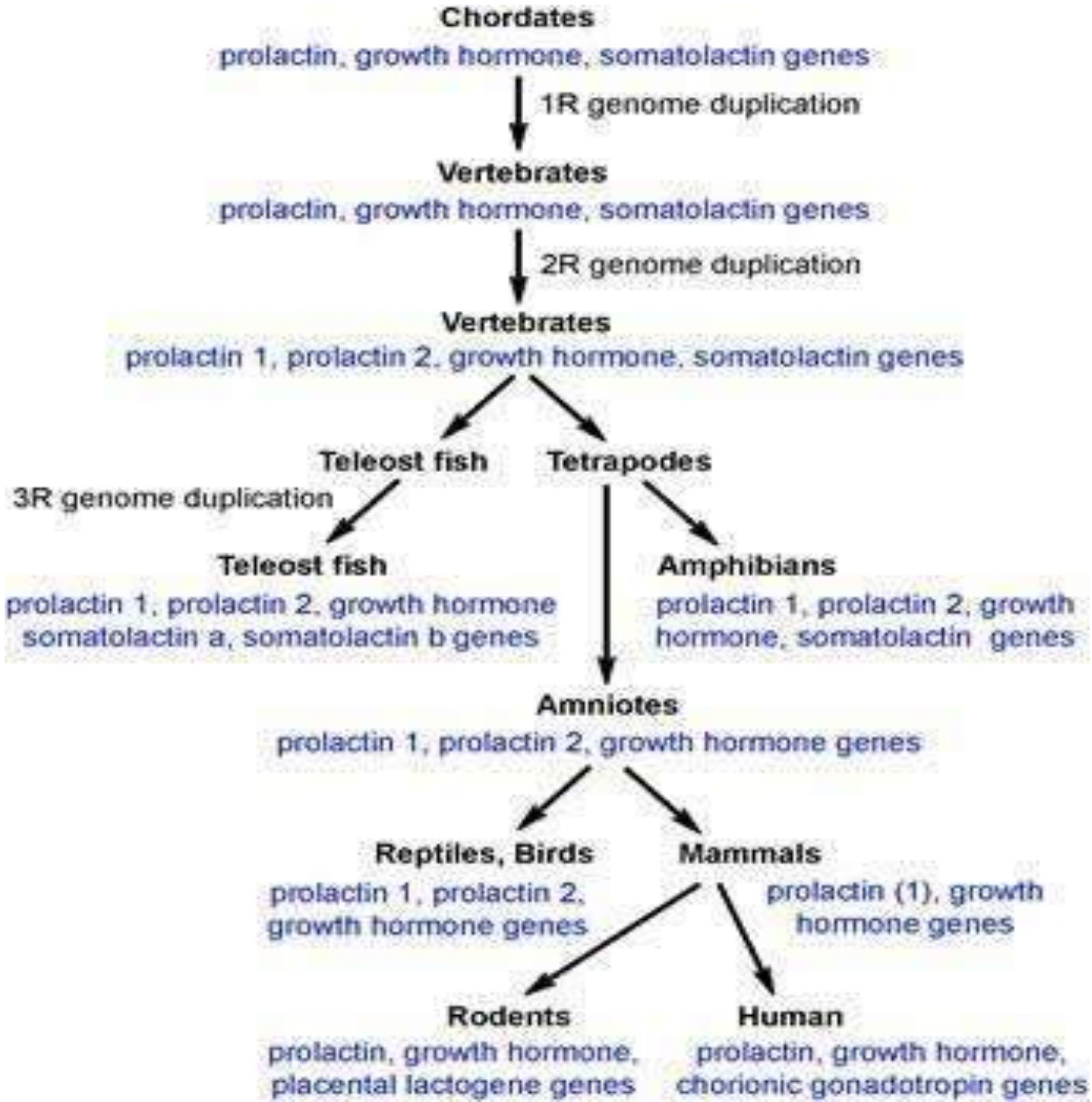
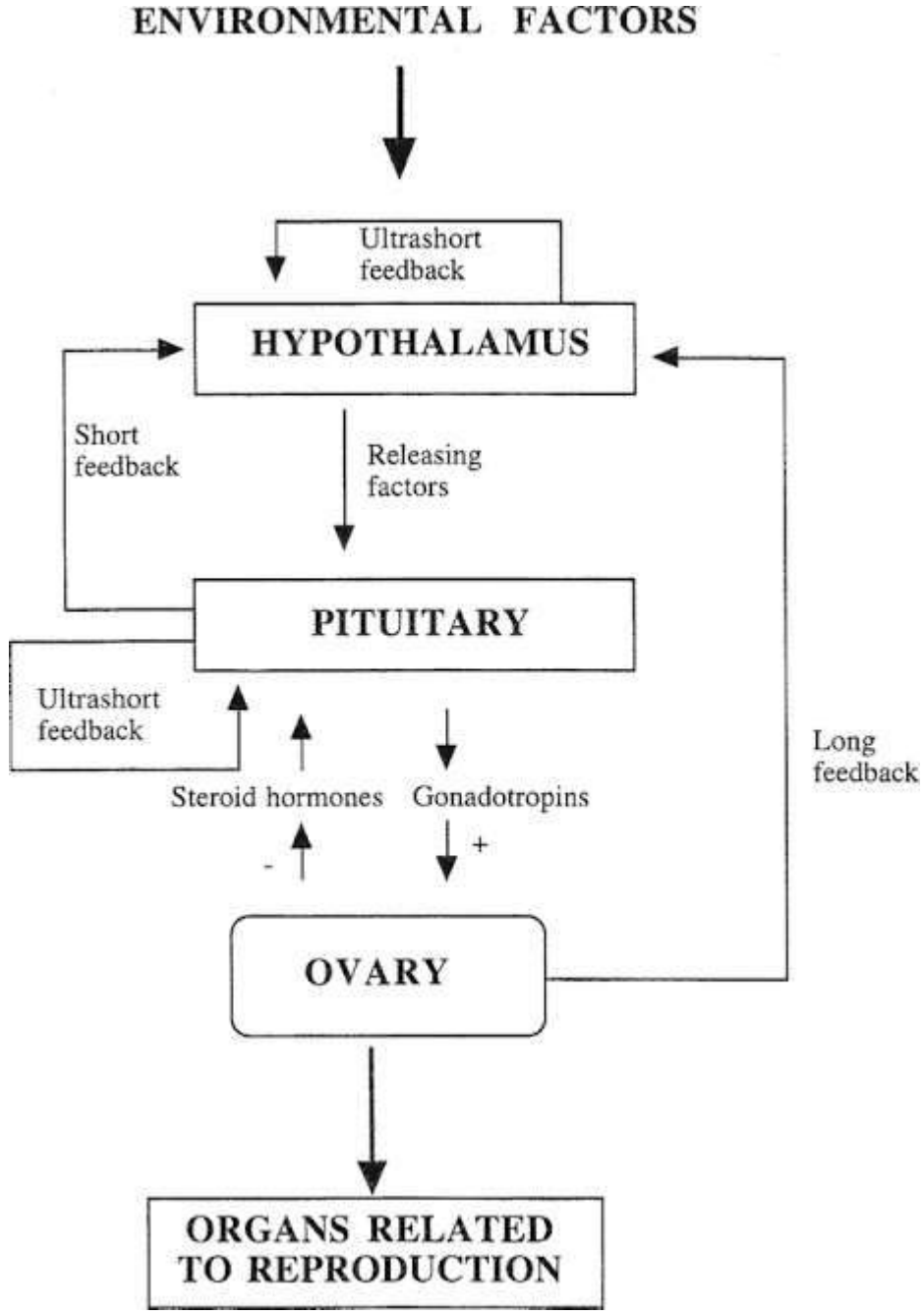
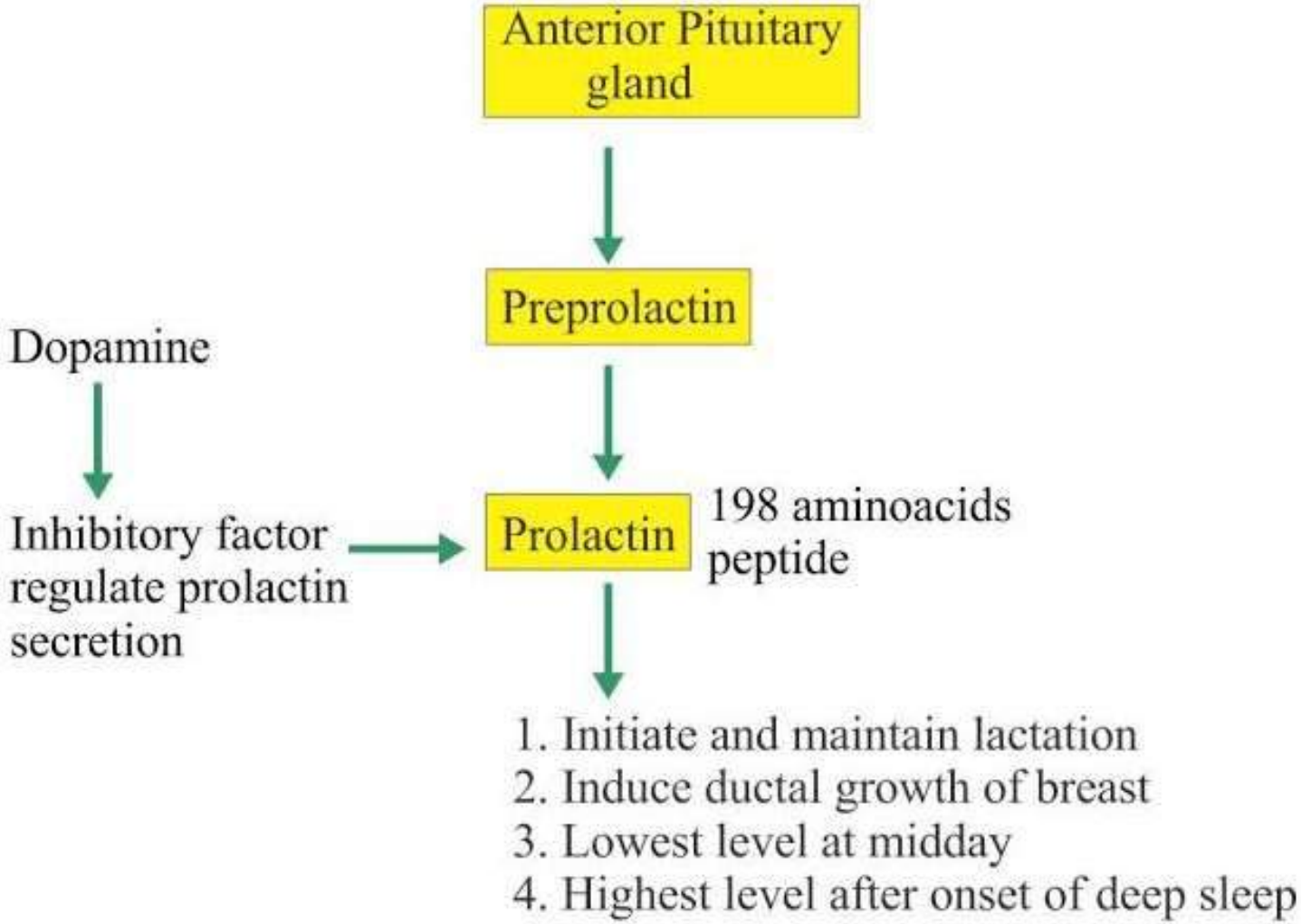
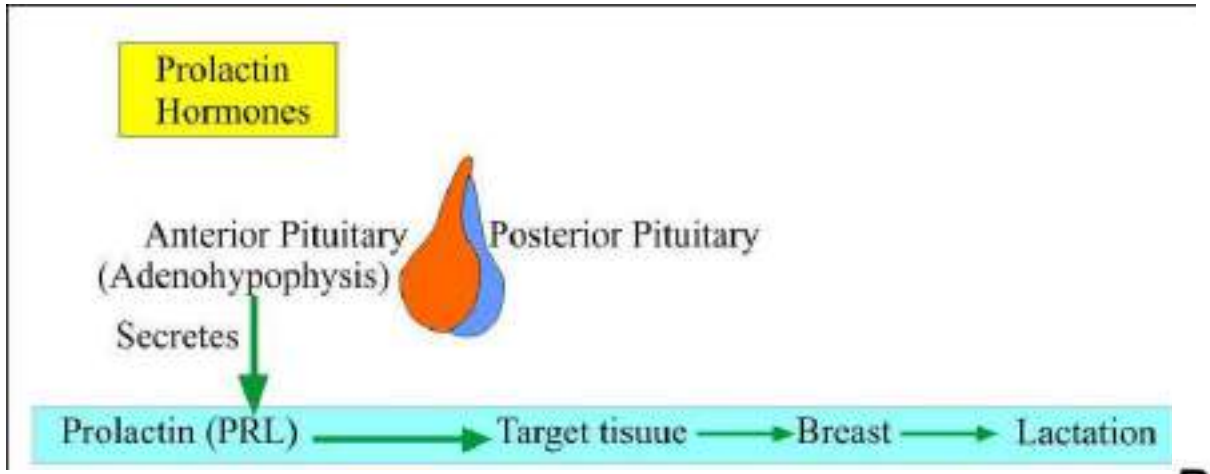
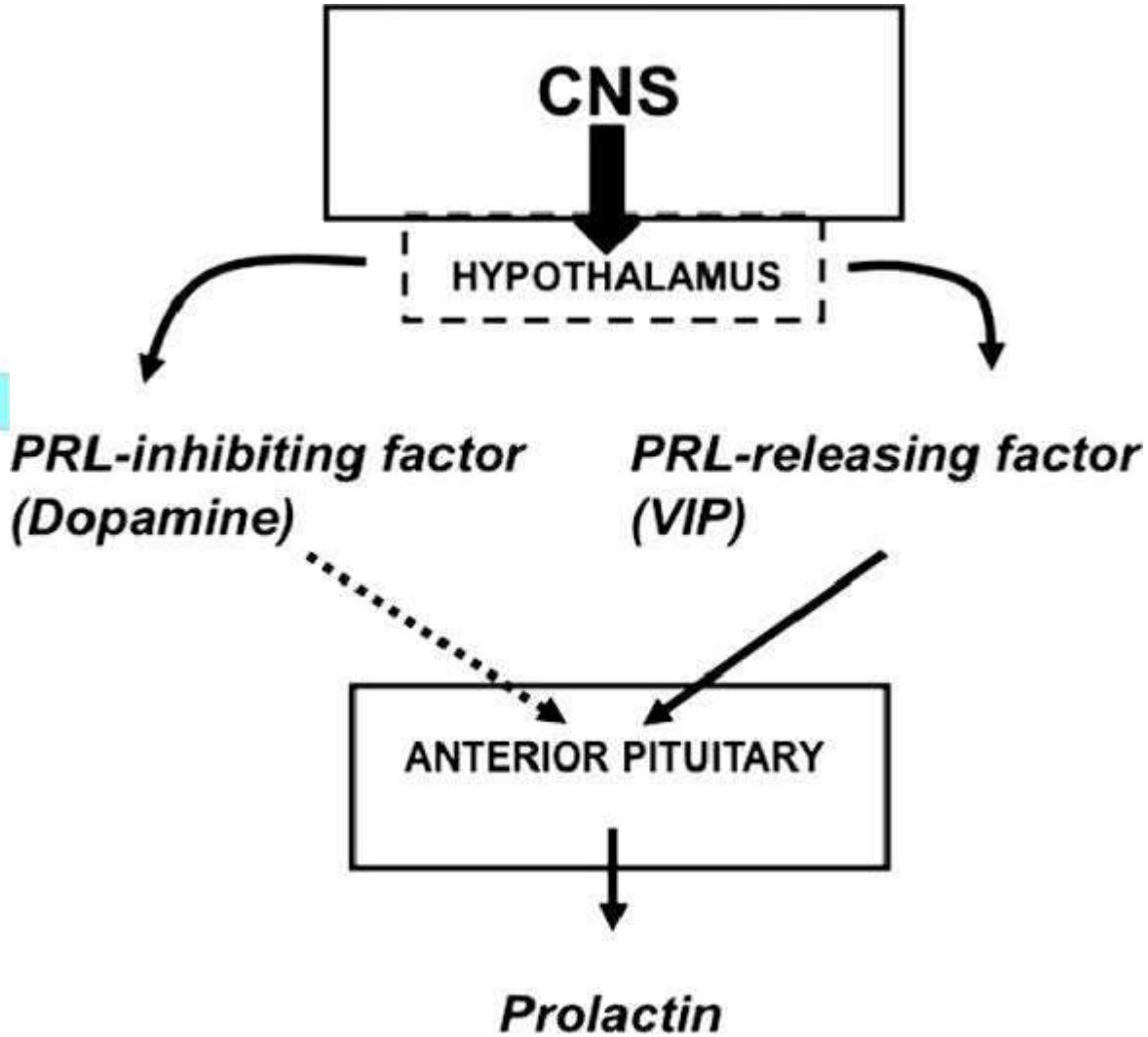

Chordates
prolactin, growth hormone, somatolactin genes
1R genome duplication
Vertebrates
prolactin, growth hormone, somatolactin genes
2R genome duplication
Vertebrates
prolactin 1, prolactin 2, growth hormone, somatolactin genes
Teleost fish
Tetrapodes
3R genome duplication
Teleost fish
prolactin 1, prolactin 2, growth hormone somatolactin a, somatolactin b genes
Amphibians
prolactin 1, prolactin 2, growth hormone, somatolactin genes
Amniotes
prolactin 1, prolactin 2, growth hormone genes
Reptiles, Birds
prolactin 1, prolactin 2, growth hormone genes
Mammals
prolactin (1), growth hormone genes
Rodents
prolactin, growth hormone, placental lactogene genes
Human
prolactin, growth hormone, chorionic gonadotropin genes


ENVIRONMENTAL FACTORS
Ultrashort feedback
HYPOTHALAMUS
Short feedback
Releasing factors
PITUITARY
Ultrashort feedback
Steroid hormones
Gonadotropins
-
+
Long feedback
OVARY
ORGANS RELATED TO REPRODUCTION

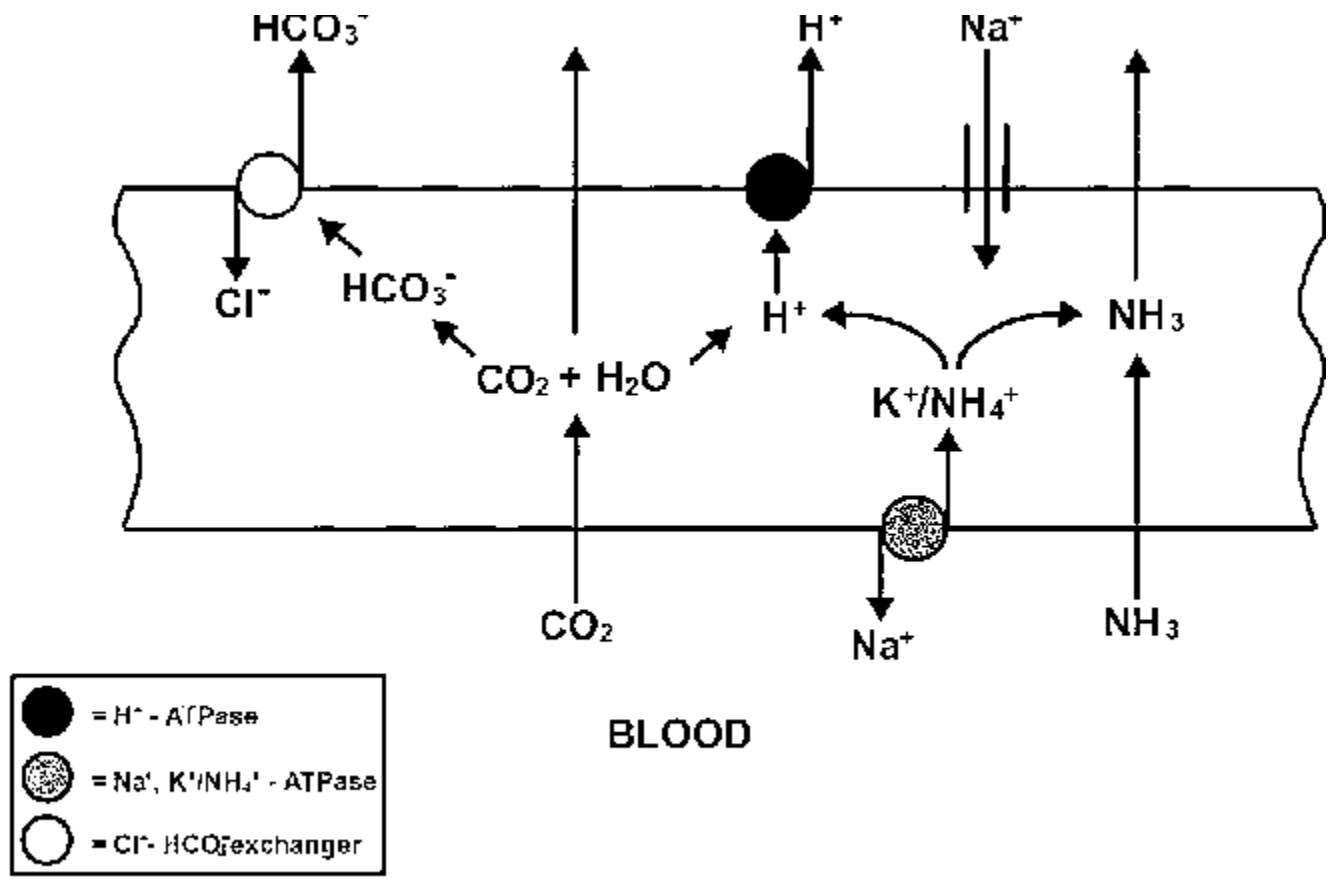

Anterior Pituitary gland
Preprolactin
Dopamine
Inhibitory factor regulate prolactin secretion
Prolactin
198 aminoacids peptide
1. Initiate and maintain lactation
2. Induce ductal growth of breast
3. Lowest level at midday
4. Highest level after onset of deep sleep


Prolactin Hormones
Anterior Pituitary (Adenohypophysis)
Posterior Pituitary
Secretes
Prolactin (PRL)
Target tisuue
Breast
Lactation

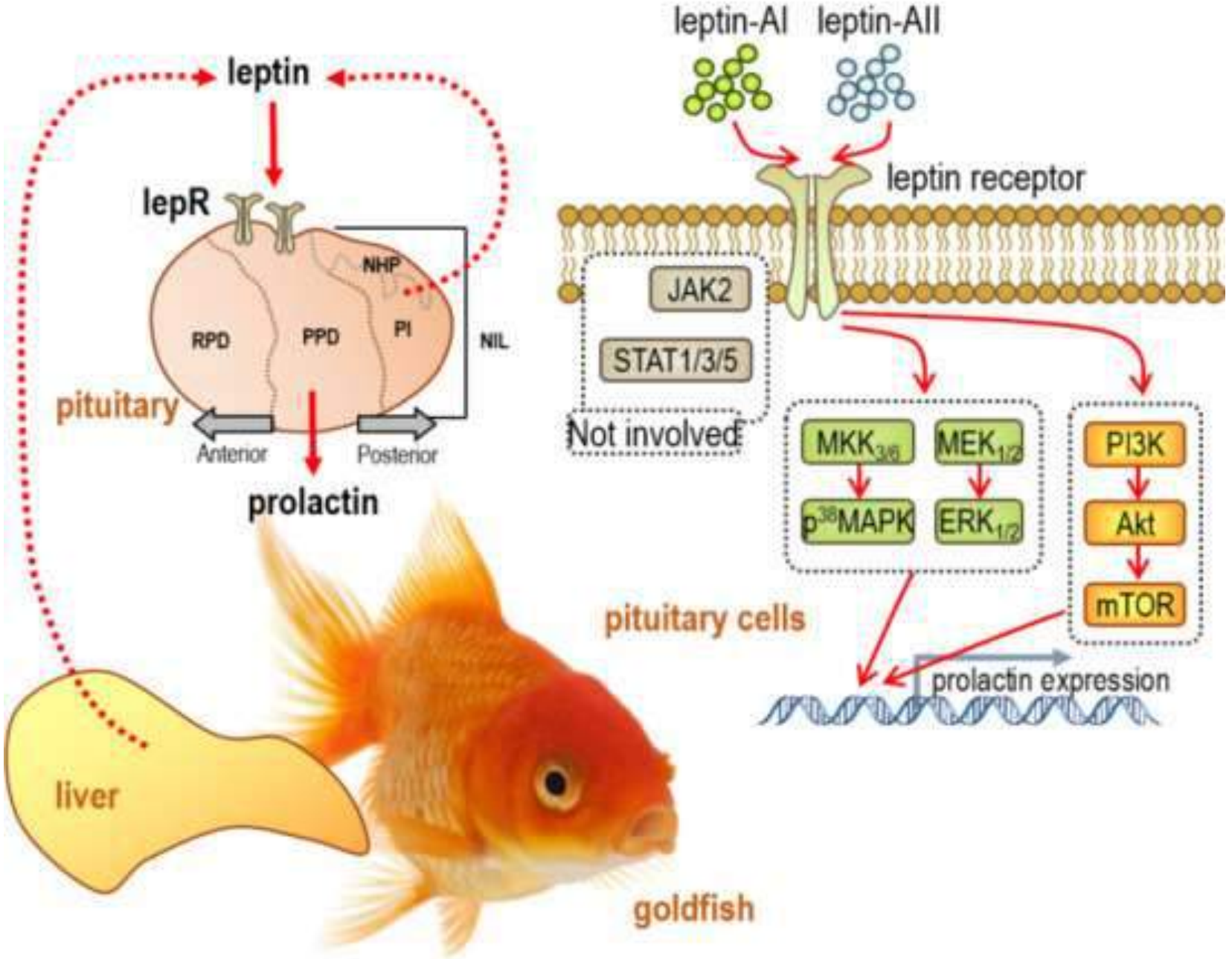

CNS
HYPOTHALAMUS
PRL-inhibiting factor (Dopamine)
PRL-releasing factor (VIP)
ANTERIOR PITUITARY
Prolactin

In Fish

In **fish**, PRL plays an important **role** in freshwater osmoregulation by preventing both the loss of ions and the uptake of water.



In Fish


leptin
lepR
NHP
RPD
PPD
PI
NIL
pituitary
Anterior
Posterior
prolactin
liver
goldfish
leptin-AI
leptin-AII
leptin receptor
JAK2
STAT1/3/5
Not involved
MKK3/6
MEK1/2
p38MAPK
ERK1/2
PI3K
Akt
mTOR
pituitary cells
prolactin expression

In Amphibians

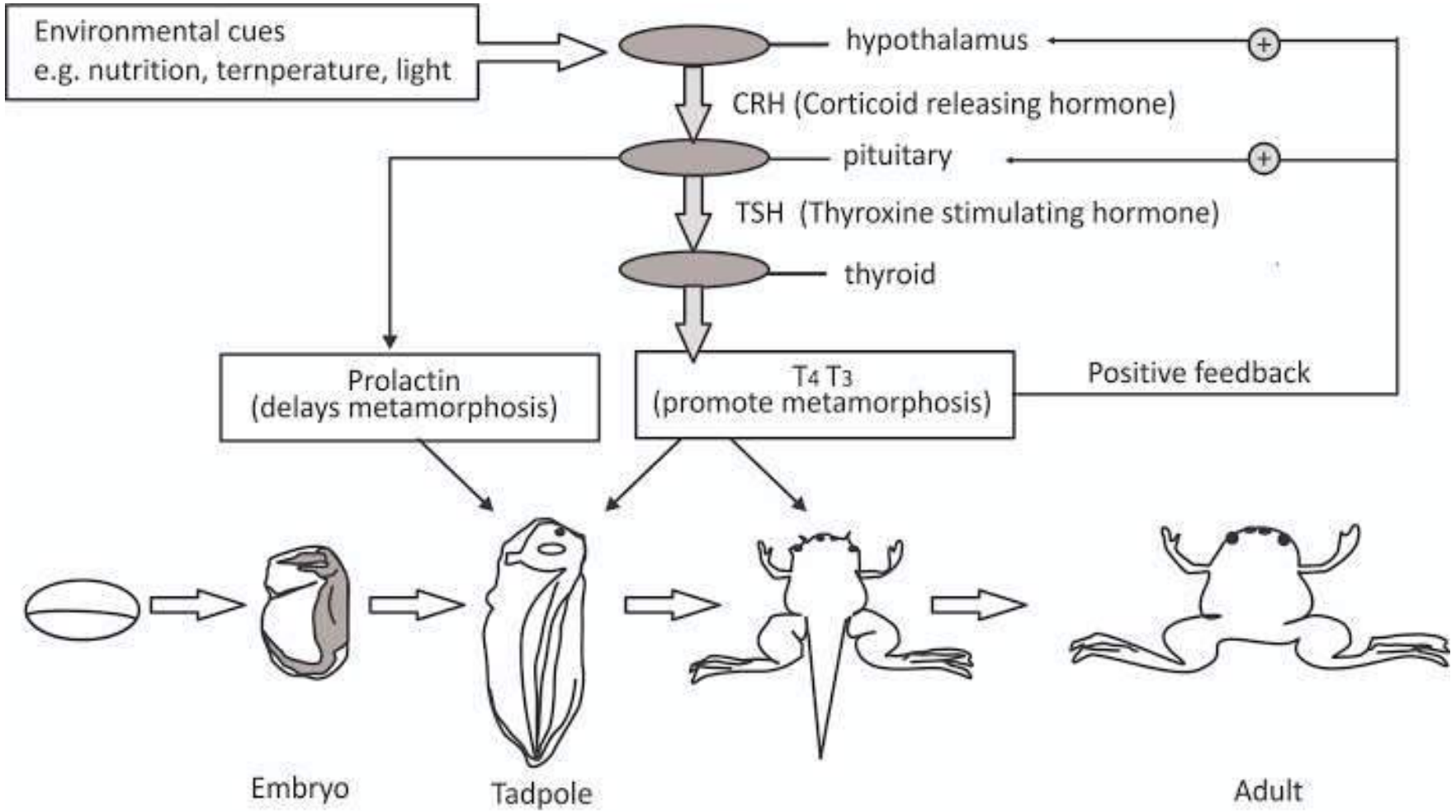
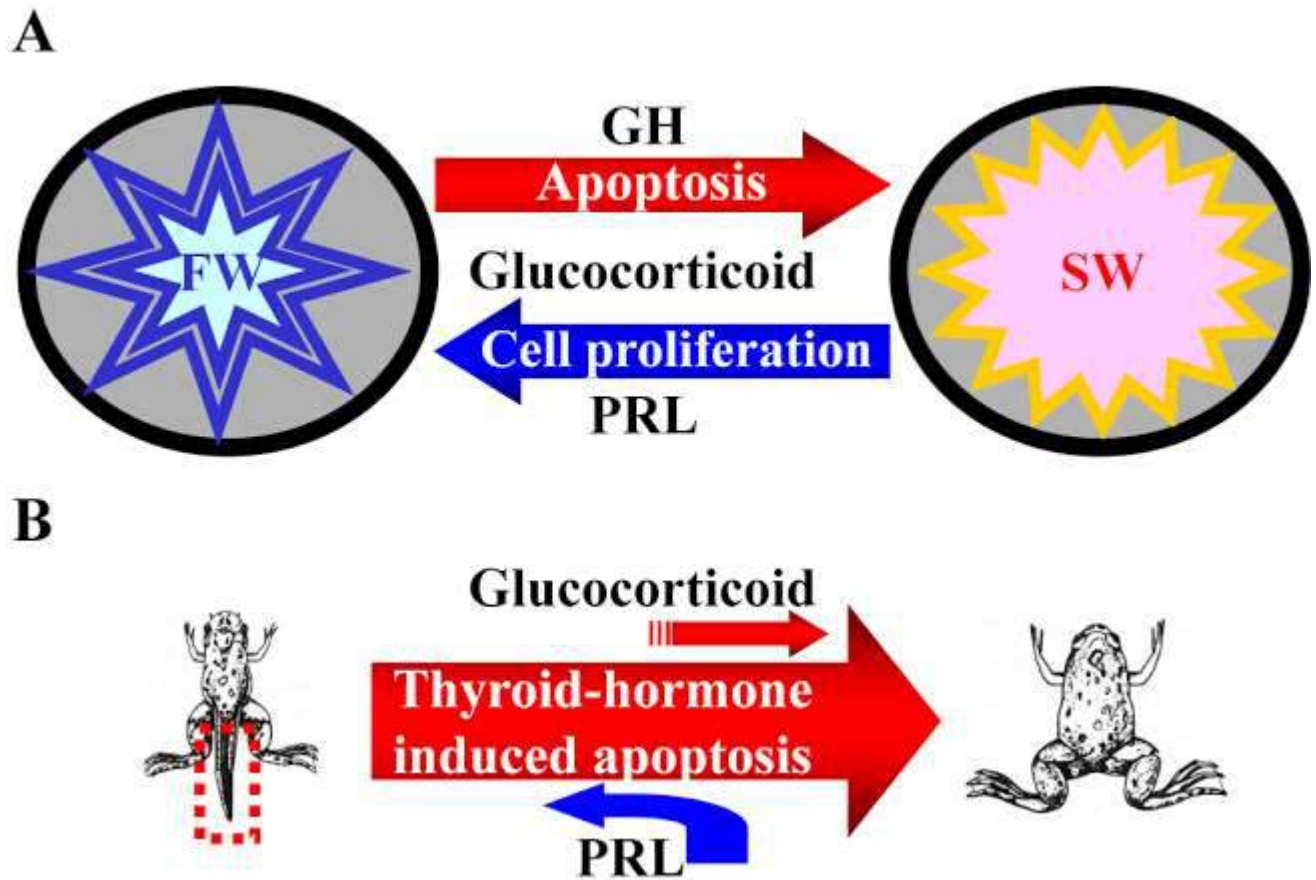
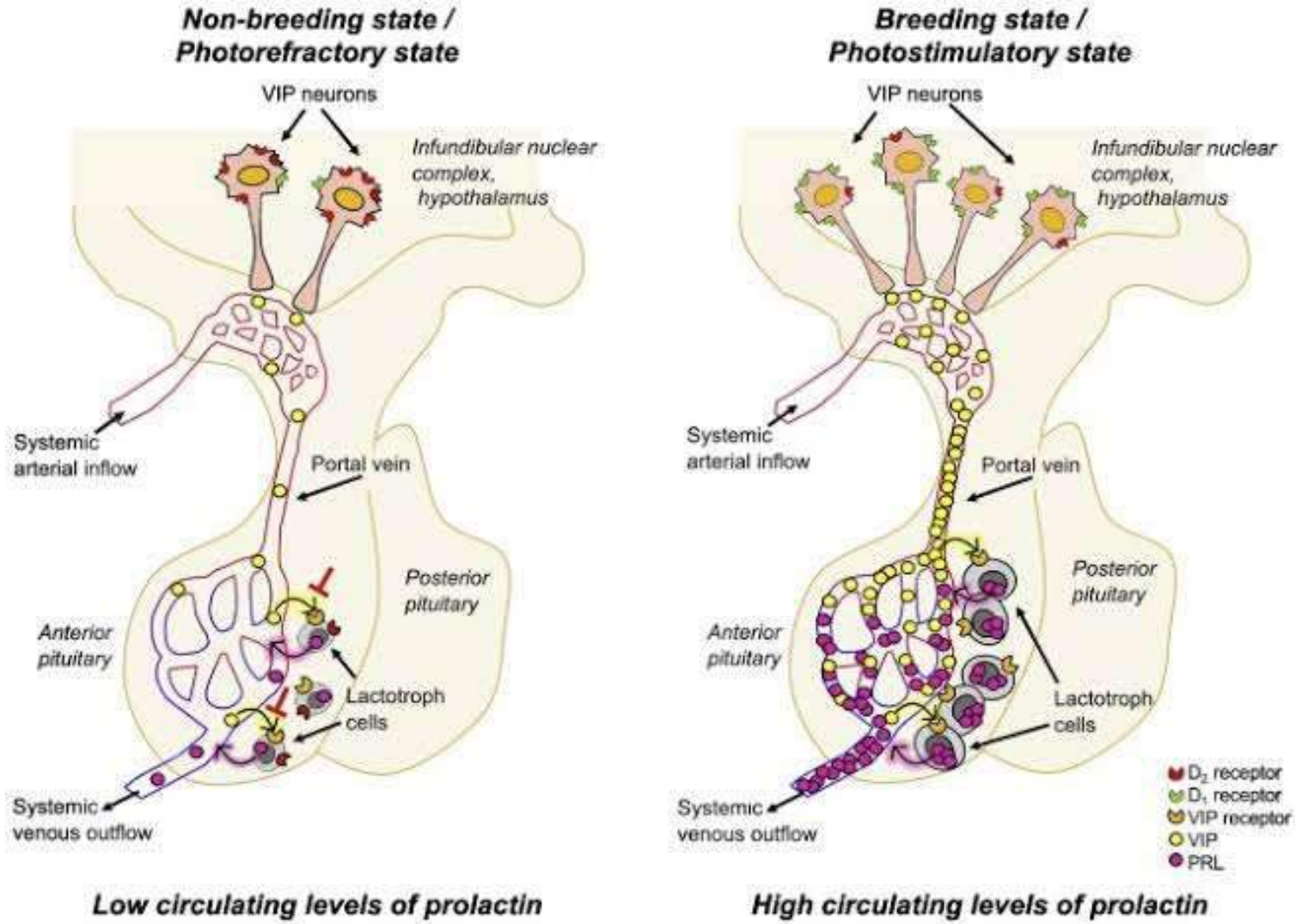


Fig. : Environment factors affecting the metamorphosis.

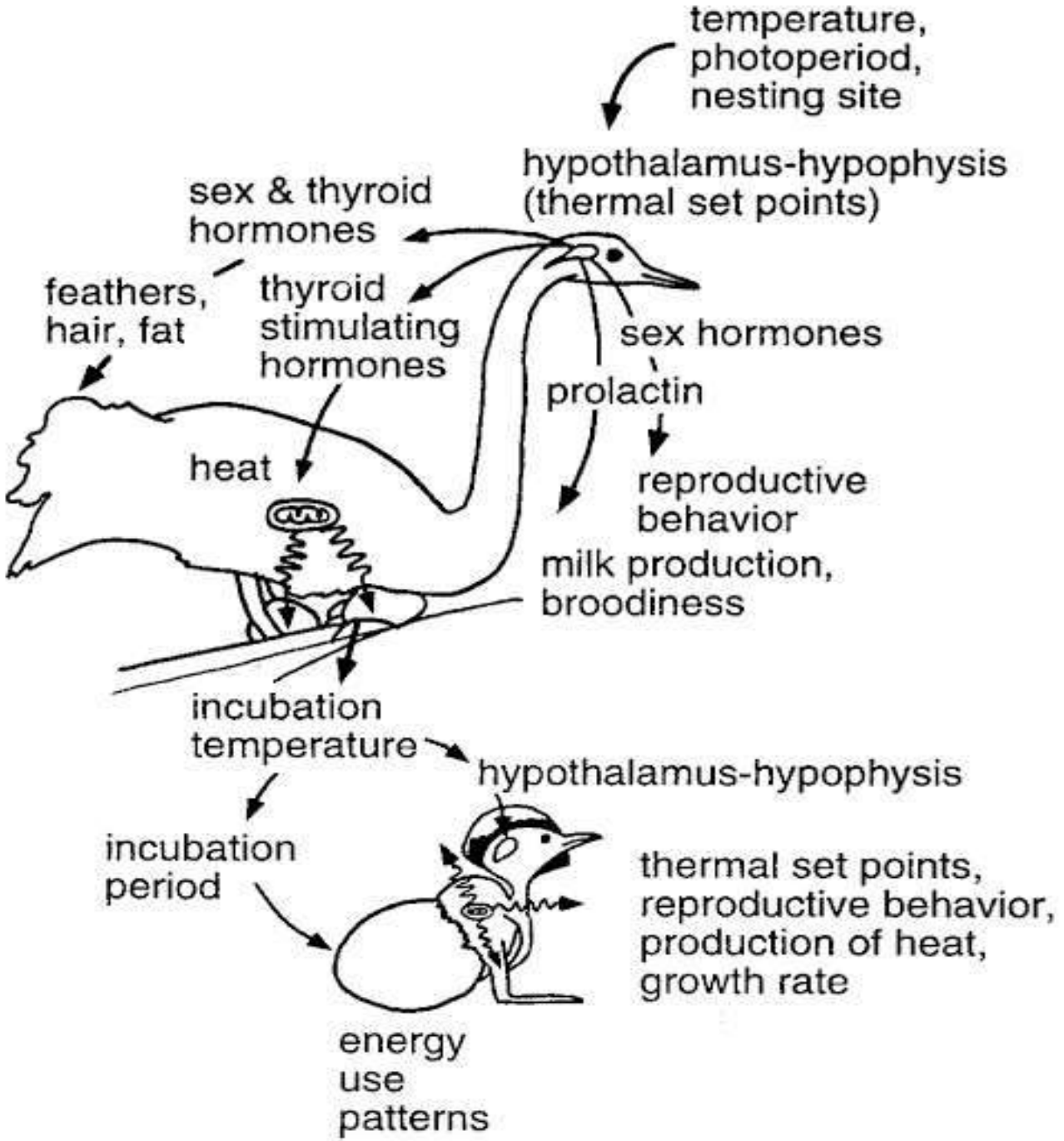
In Amphibians



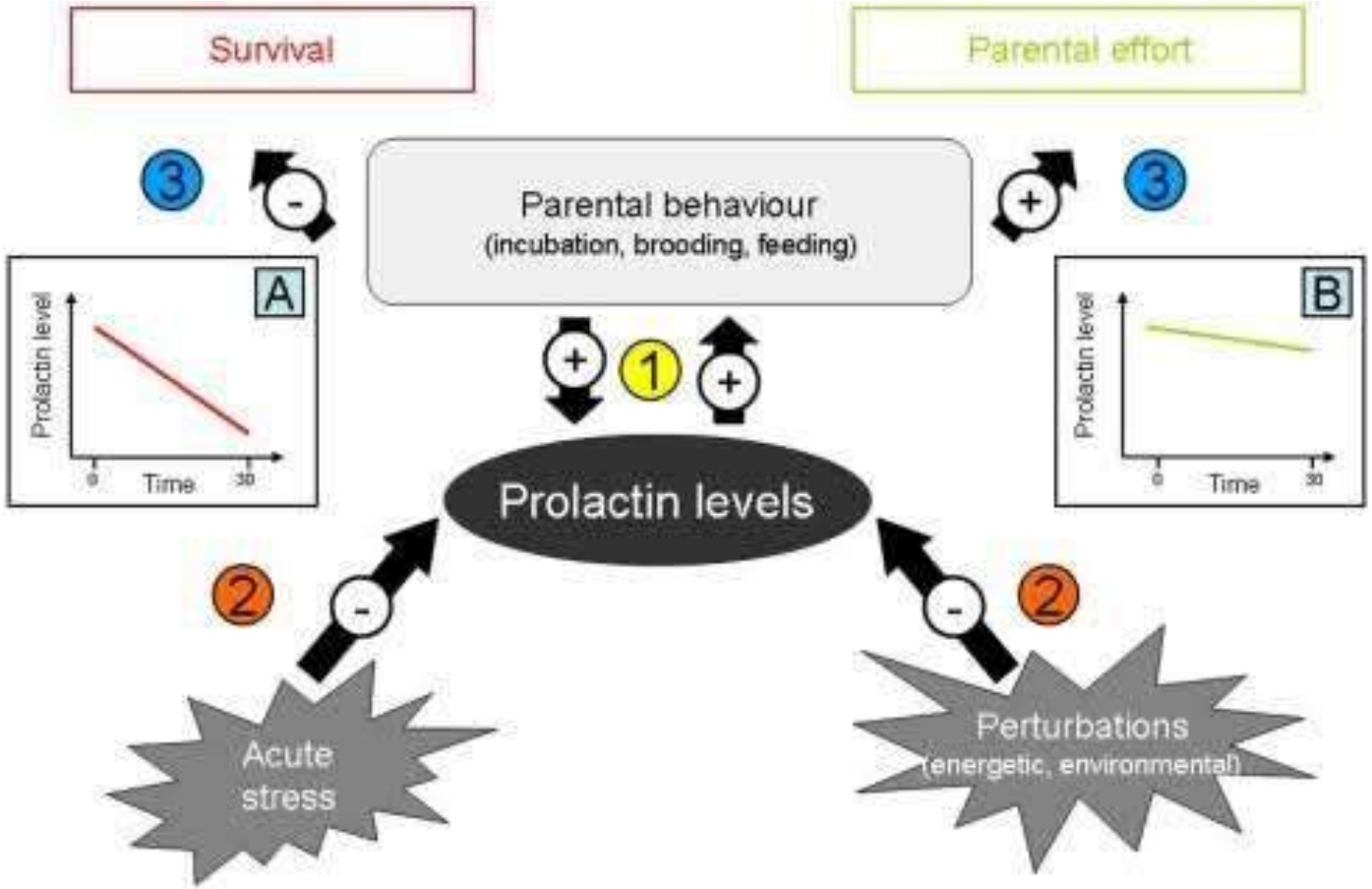
In Birds


Non-breeding state / Photorefractory state
VIP neurons
Infundibular nuclear complex, hypothalamus
Systemic arterial inflow
Portal vein
Posterior pituitary
Anterior pituitary
Lactotroph cells
Systemic venous outflow
Low circulating levels of prolactin
Breeding state / Photostimulatory state
VIP neurons
Infundibular nuclear complex, hypothalamus
Systemic arterial inflow
Portal vein
Posterior pituitary
Anterior pituitary
Lactotroph cells
Systemic venous outflow
D2 receptor
D1 receptor
VIP receptor
VIP
PRL
High circulating levels of prolactin

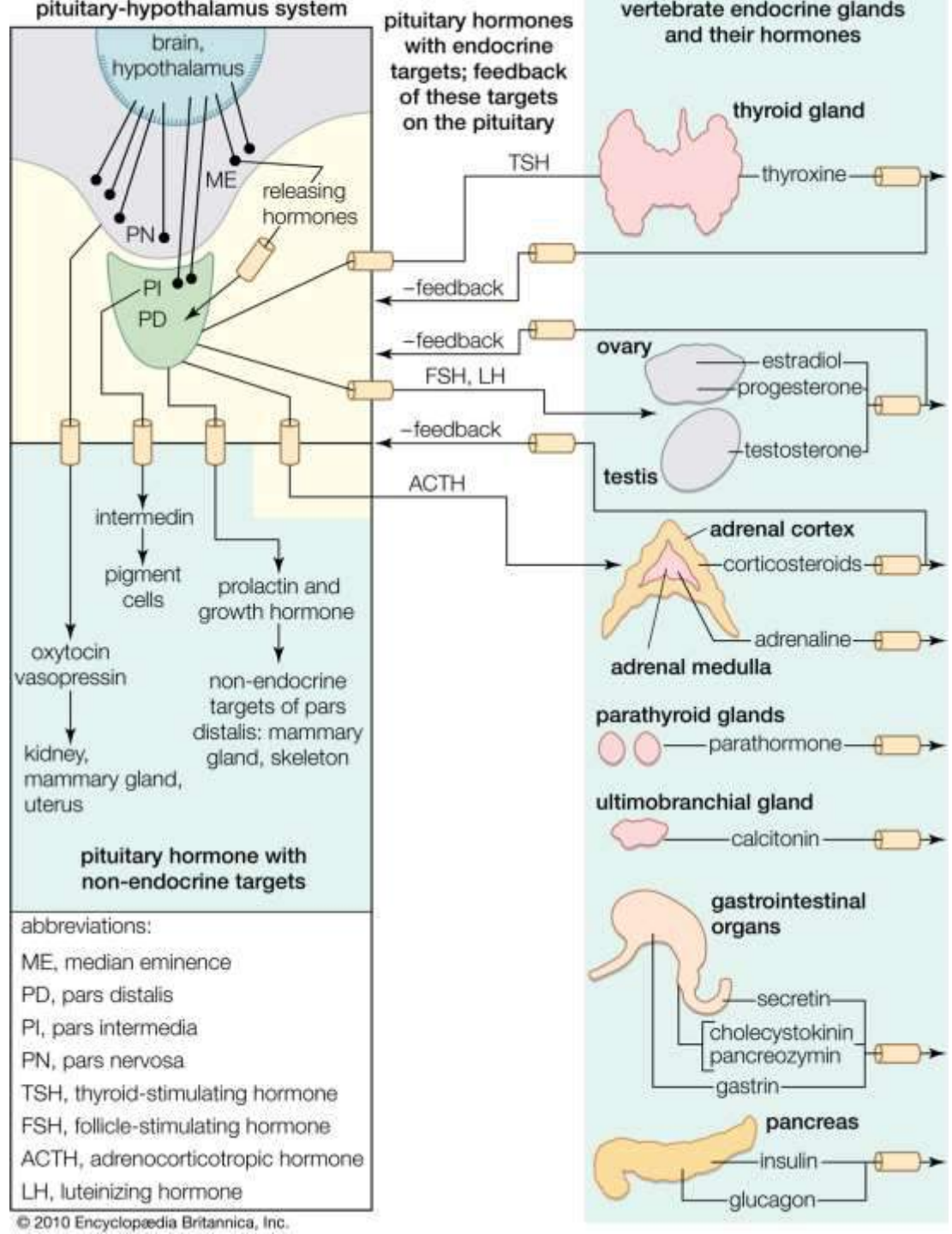
In Birds


temperature,
photoperiod,
nesting site
hypothalamus-hypophysis
(thermal set points)
sex & thyroid
hormones
feathers,
hair, fat
thyroid
stimulating
hormones
sex hormones
prolactin
heat
reproductive
behavior
milk production,
broodiness
incubation
temperature
hypothalamus-hypophysis
incubation
period
thermal set points,
reproductive behavior,
production of heat,
growth rate
energy
use
patterns

In Birds


Survival
Parental effort
3
-
Parental behaviour
(incubation, brooding, feeding)
+
3
A
Prolactin level
Time
0
30
B
Prolactin level
Time
0
30
+
1
+
Prolactin levels
2
-
2
-
Acute
stress
Perturbations
(energetic, environmental)

Role of melanotropin in teleost fish, amphibians, reptiles



In Fish

Melanin-concentrating hormone (MCH) was originally discovered in fish, in which it causes aggregation or concentration of melanin granules in melanophores, thus regulating body color. MCH is a cyclic neuropeptide synthesized as a preprohormone in the hypothalamus of all vertebrates. Mammalian MCH plays an important role as a neurotransmitter or neuromodulator in regulating food intake and energy homeostasis. MCH signaling system may involve in regulating food intake also in fish. This neuropeptide binds to G-protein-coupled seven transmembrane receptor[s] to mediate its functions.

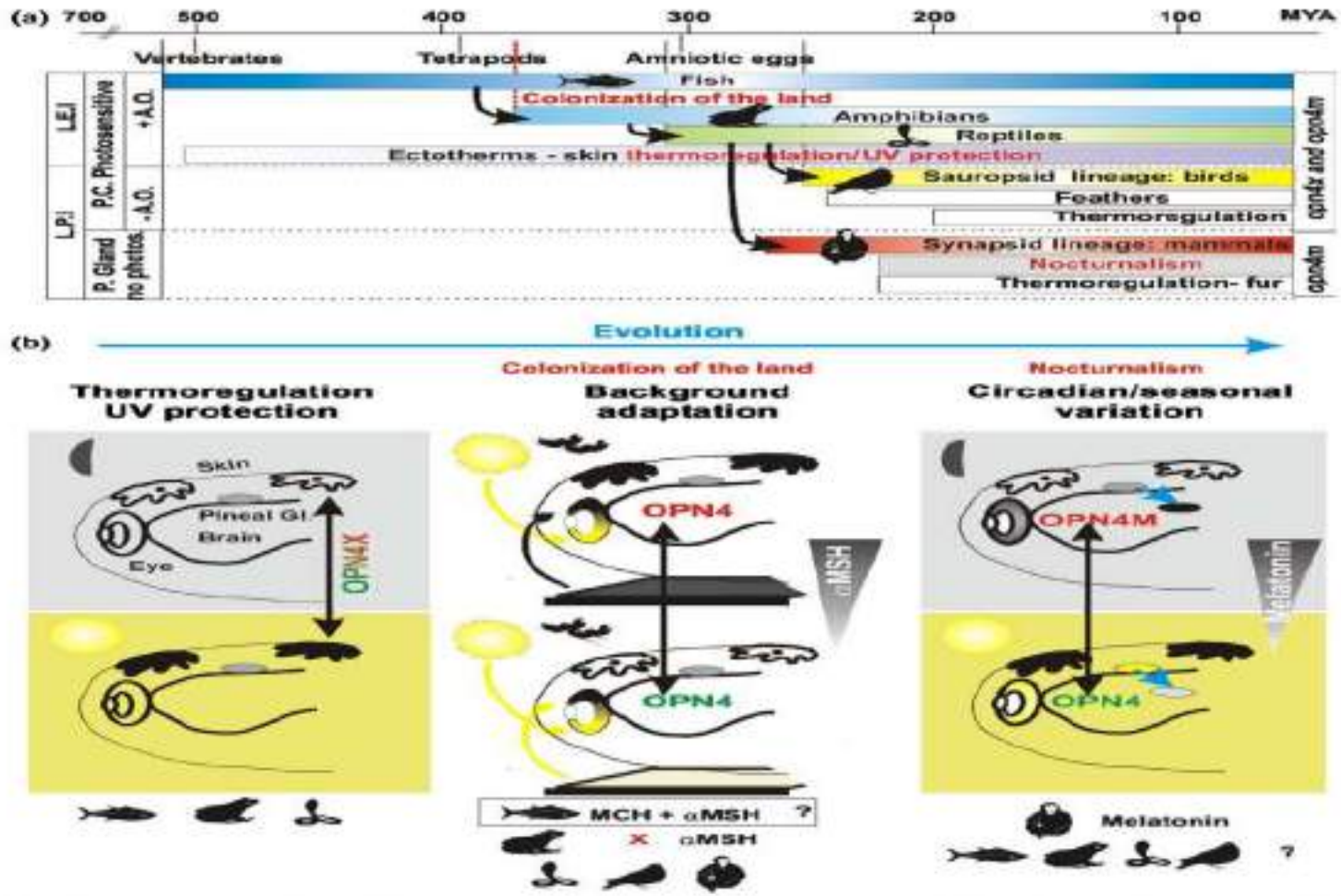
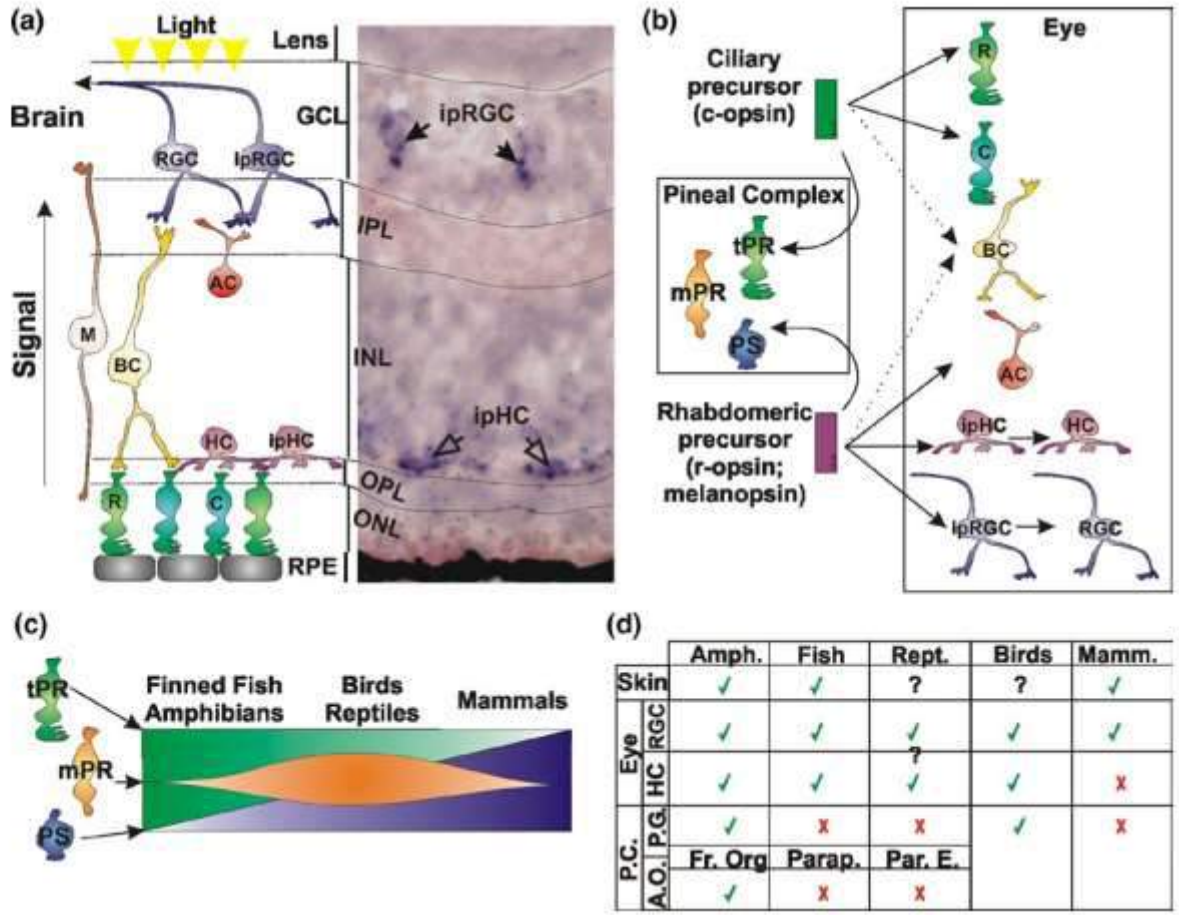


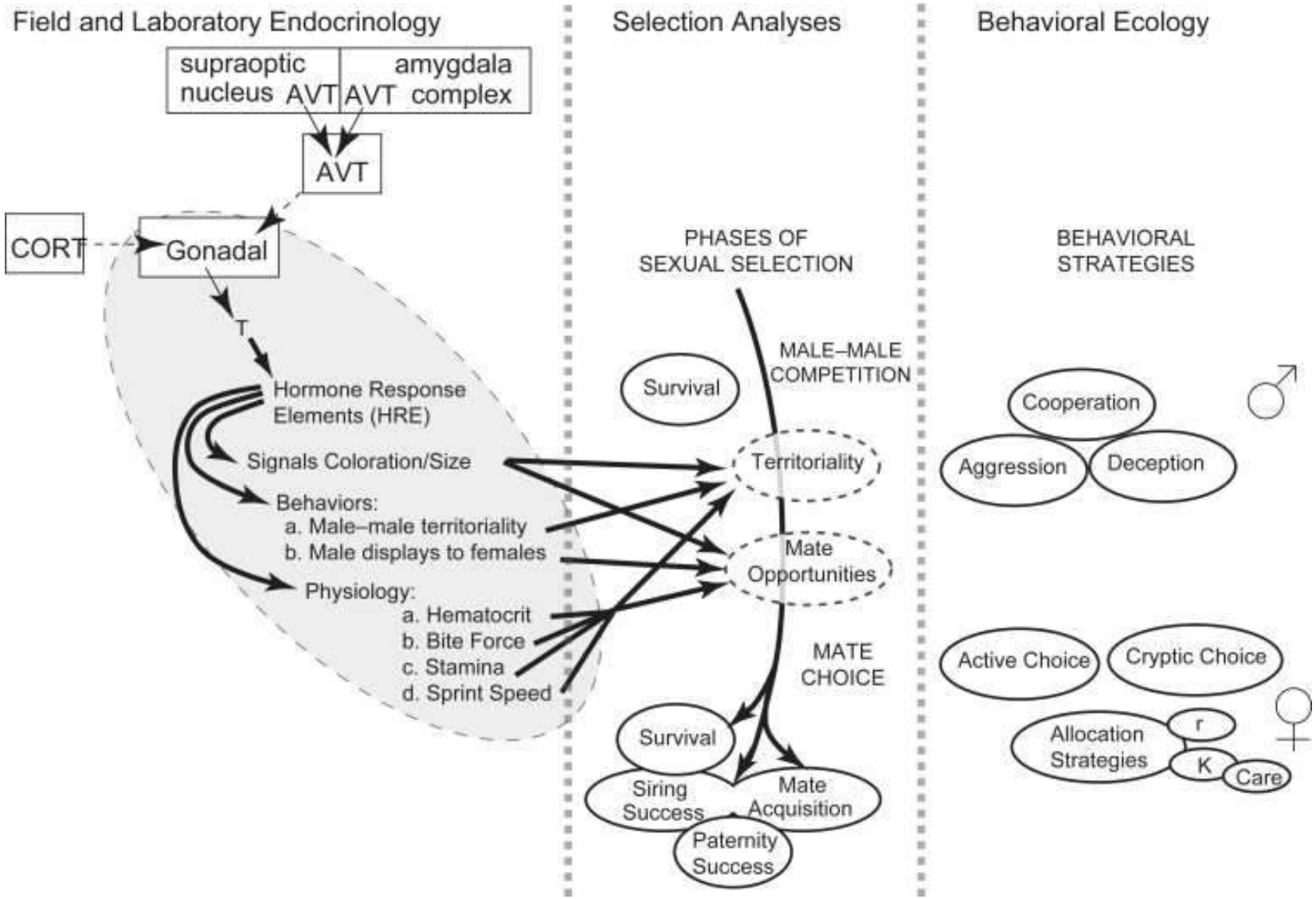
FIGURE 1 Classes of vertebrates analysed in relation to their evolutionary origin, and events/situations that may have affected the roles of melanopsin in light-mediated skin pigmentation. (a) Schematic of five different classes of vertebrates analysed in the context of their evolutionary origin (millions of years ago; MYA). Three important events/situations in evolution that influenced skin pigmentation are shown in red. Fish, amphibians and reptiles [referred to as organisms with a light-exposed integument (LEI) in this review] possess both a photosensitive pineal complex (P.C.) and accessory organs (A.O.; see text for details), while birds do not have accessory organs, although the pineal gland remains photosensitive. Birds and mammals are referred to as organisms with light-protected integument (LPI). Expression of melanopsin genes (*opn4x* and *opn4m*) in each group is indicated. (b) Schematic representation of an organism with pigmented cells in the skin, eyes and a pineal complex, in light (yellow) or dark conditions (grey). Melanopsin as a sensor of light to regulate skin pigmentation may have been evolutionarily influenced by three critical features: Opn4x expressed in skin melanophores induces darkening under light conditions, which in organisms with LEI contributes to thermoregulation and UV protection (left); a dual system, with melanin-concentrating hormone (MCH) levels increasing in the context of a white background and αMSH with a dark surface, exists in fish, although the role of melanopsin in regulating the process has not been tested. In amphibians, and possibly in reptiles, birds and mammals, Opn4m and/or Opn4x expressed in the eye participate in a neuroendocrine circuit that regulates α-MSH levels during background adaptation to darken the skin while the role of MCH changed or was lost, as in amphibians. MCH induces pigment dispersion (centre); finally, in mammals, the only melanopsin orthologue, Opn4m, regulates the circadian, and probably the seasonal, variation in melatonin levels, which lightens the skin in LEIs and regulates circadian/seasonal behaviours in organisms with LPI. A direct role of melanopsin in regulating melatonin levels in non-mammalian organisms is unknown. A speculative influence of the three processes on the adaptive selection in regulating skin pigmentation and the loss and incorporation into

In Amphibians

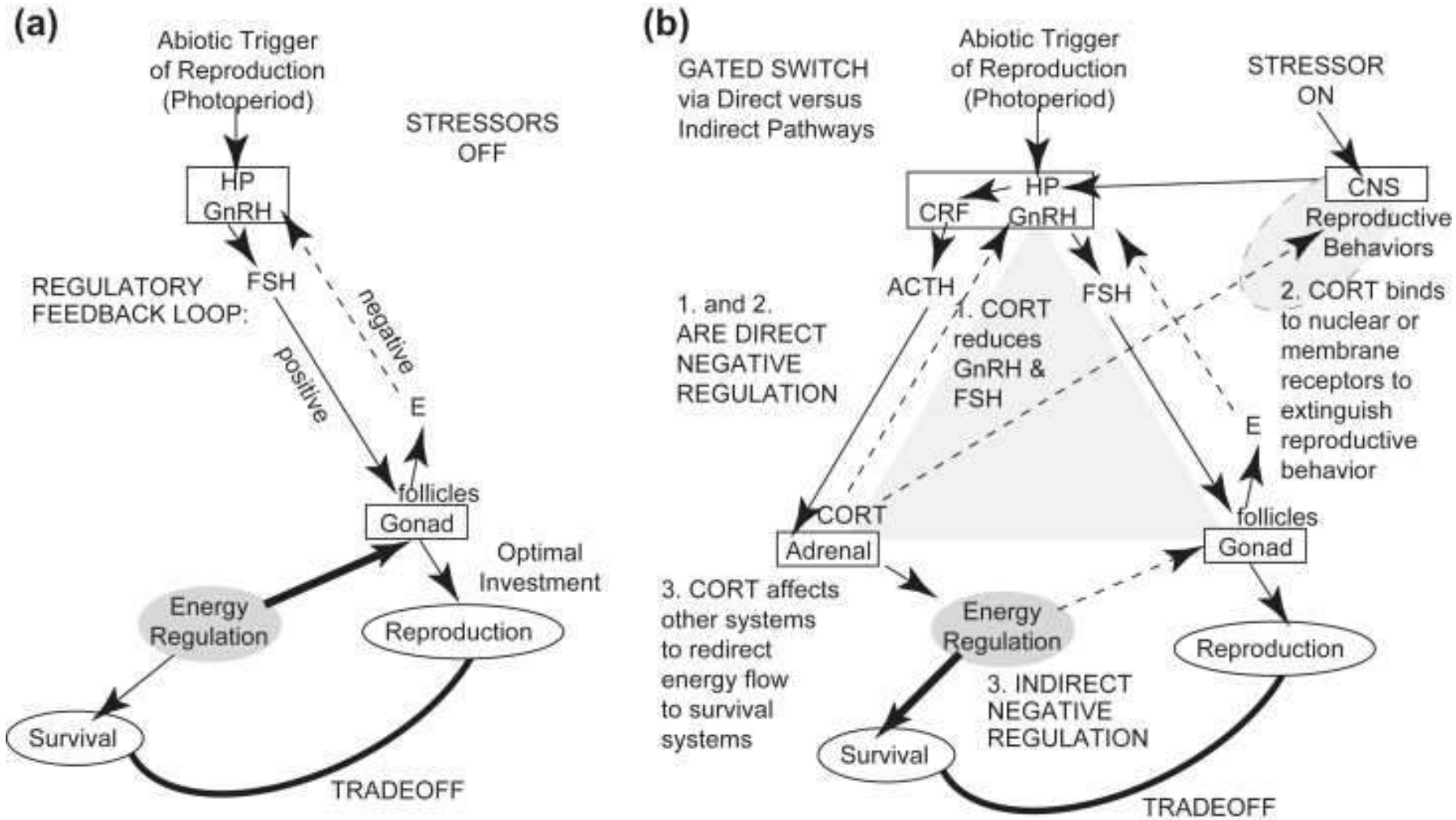


		Amph.	Fish	Rept.	Birds	Mamm.
Skin		✓	✓	?	?	✓
Eye	RGC	✓	✓	✓	✓	✓
	HC	✓	✓	✓ ?	✓	x
P.C.	P.G.	✓	x	x	✓	x
	A.O.	Fr. Org ✓	Parap. x	Par. E. x		

In Reptiles


Field and Laboratory Endocrinology
Selection Analyses
Behavioral Ecology
supraoptic nucleus AVT
amygdala AVT complex
AVT
CORT
Gonadal
T
Hormone Response Elements (HRE)
Signals Coloration/Size
Behaviors:
a. Male–male territoriality
b. Male displays to females
Physiology:
a. Hematocrit
b. Bite Force
c. Stamina
d. Sprint Speed
PHASES OF SEXUAL SELECTION
MALE–MALE COMPETITION
Survival
Territoriality
Mate Opportunities
MATE CHOICE
Survival
Siring Success
Mate Acquisition
Paternity Success
BEHAVIORAL STRATEGIES
Cooperation
Aggression
Deception
Active Choice
Cryptic Choice
Allocation Strategies
r
K
Care

In Reptiles


(a)
Abiotic Trigger of Reproduction (Photoperiod)
STRESSORS OFF
HP GnRH
REGULATORY FEEDBACK LOOP:
FSH
negative
positive
E
follicles
Gonad
Optimal Investment
Energy Regulation
Reproduction
Survival
TRADEOFF
(b)
GATED SWITCH via Direct versus Indirect Pathways
Abiotic Trigger of Reproduction (Photoperiod)
STRESSOR ON
CNS
Reproductive Behaviors
HP
CRF
GnRH
ACTH
FSH
1. and 2. ARE DIRECT NEGATIVE REGULATION
1. CORT reduces GnRH & FSH
2. CORT binds to nuclear or membrane receptors to extinguish reproductive behavior
E
CORT
Adrenal
follicles
Gonad
3. CORT affects other systems to redirect energy flow to survival systems
Energy Regulation
Reproduction
3. INDIRECT NEGATIVE REGULATION
Survival
TRADEOFF