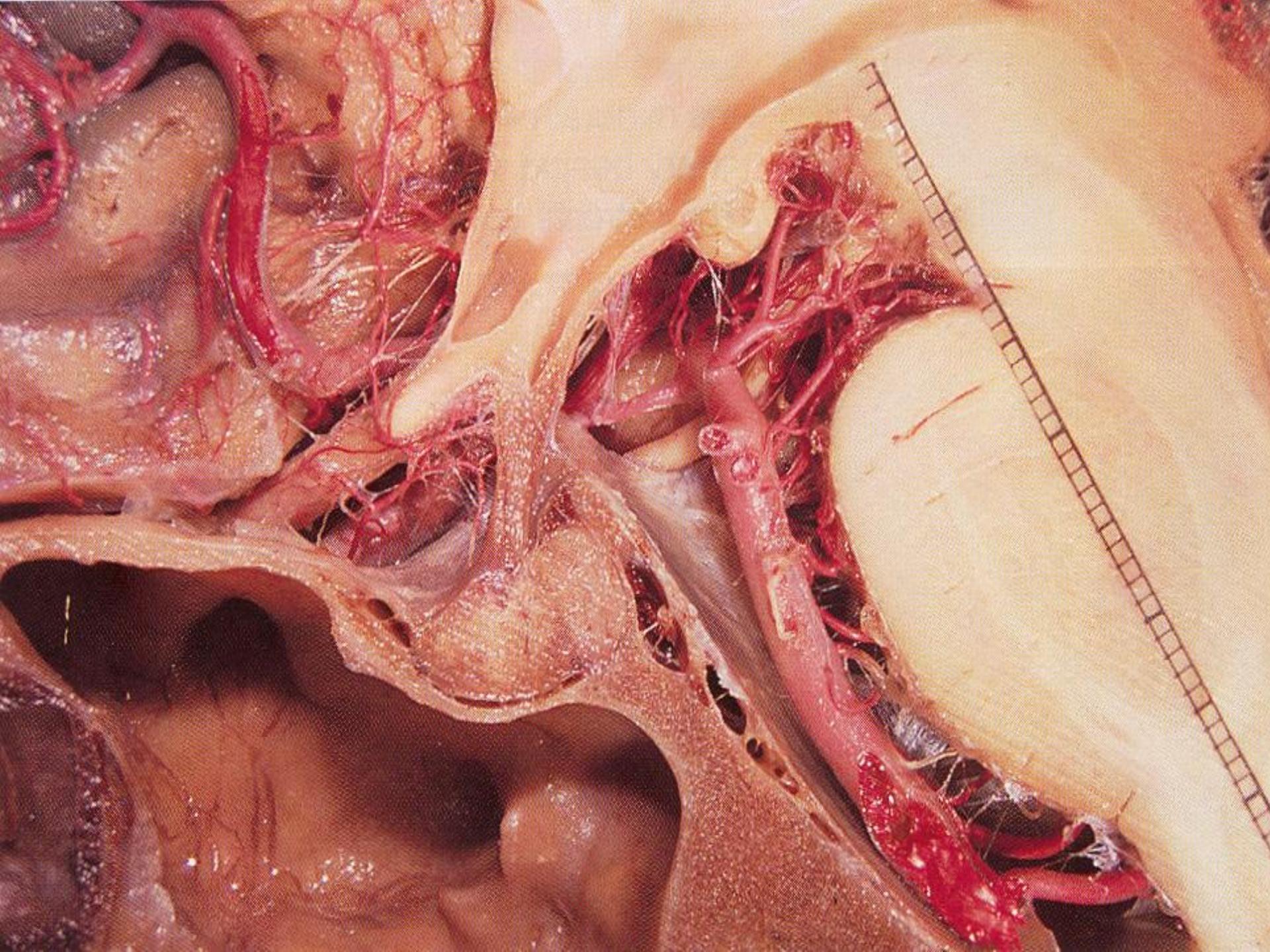
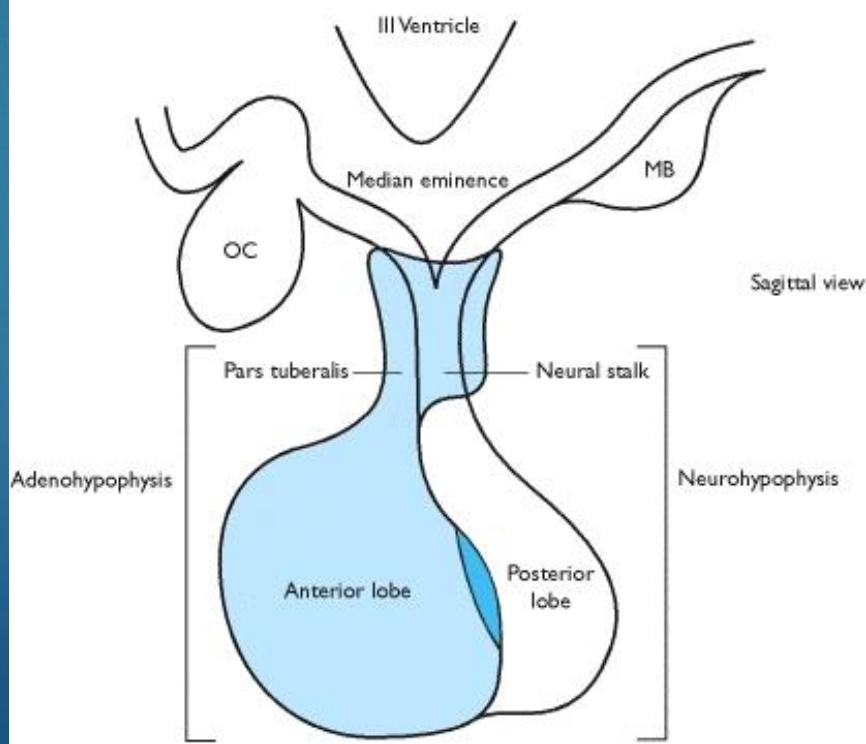
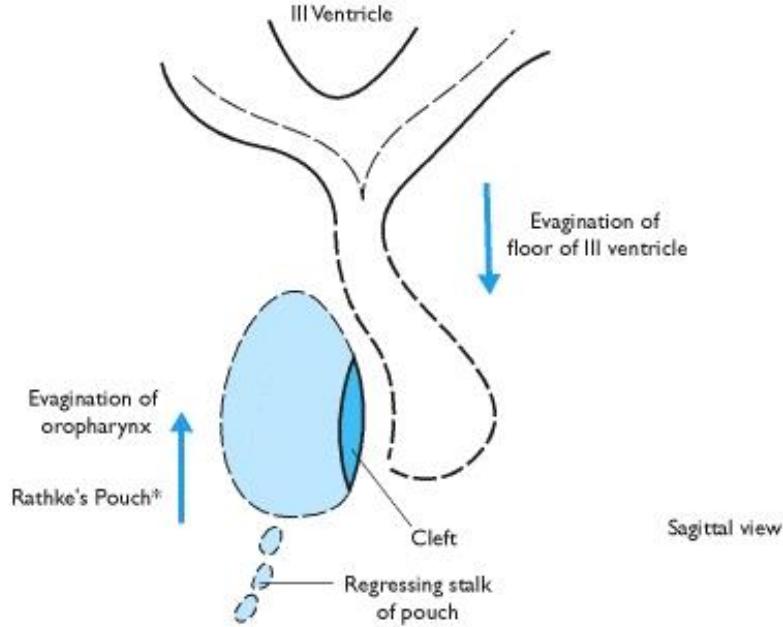


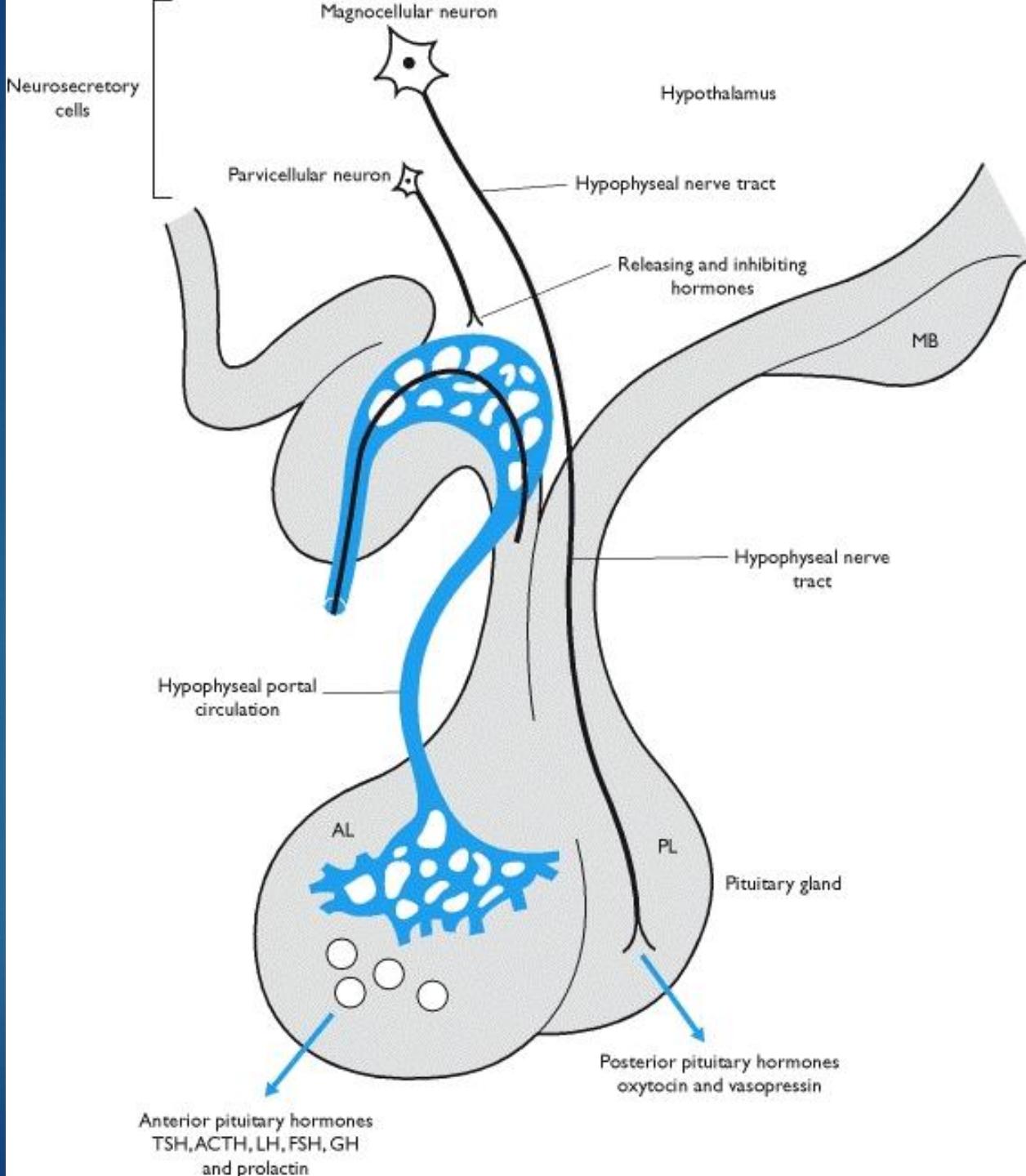


The hypothalamo-pituitary axis

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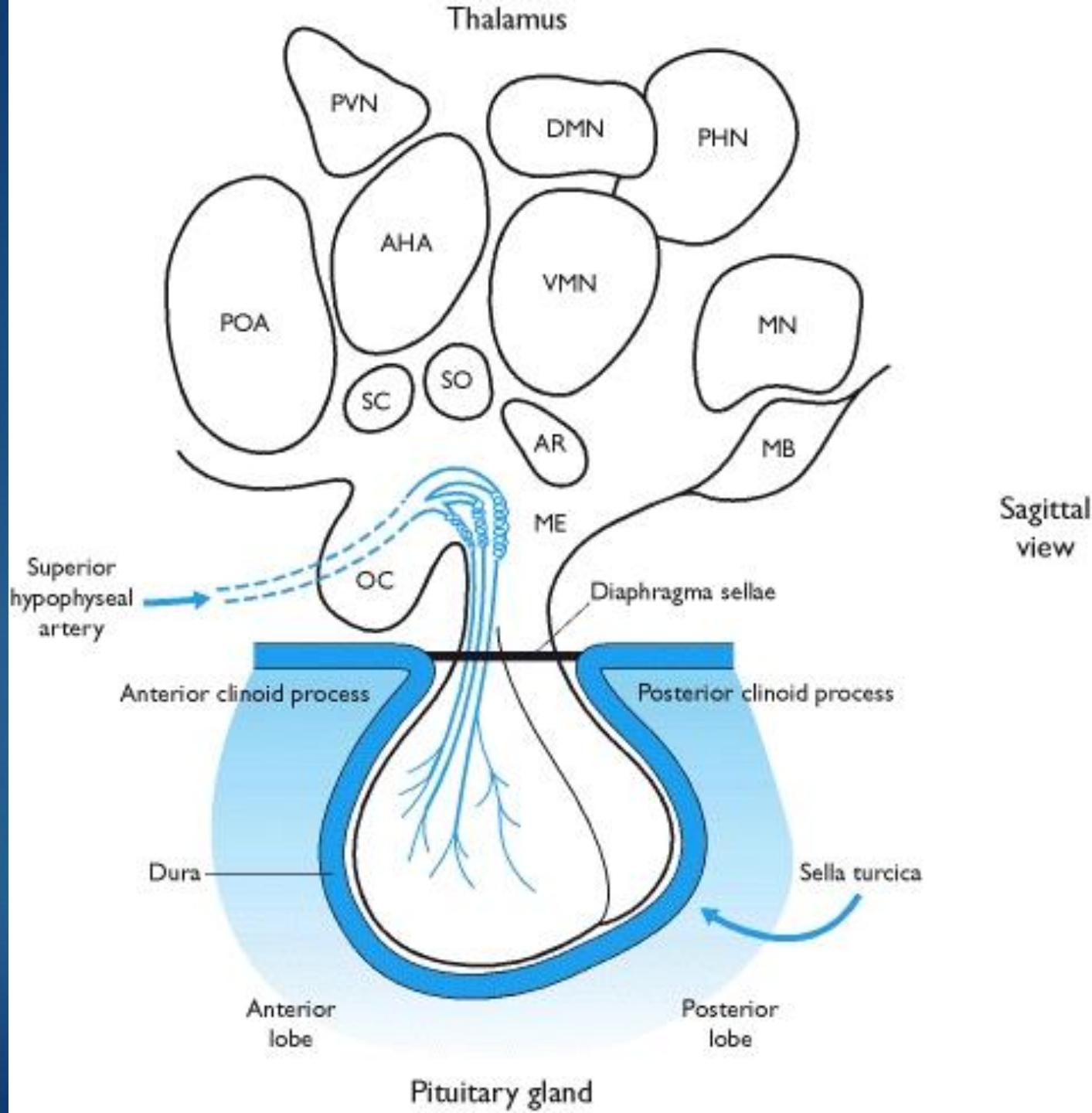






Hypothalamus

- ▶ Nervous regulation of the autonomous nervous system – adrenal medulla
- ▶ Production of ADH and oxytocin
 - ▶ supraoptical and paraventricular nuclei
 - ▶ neurophysin
- ▶ Regulation of hormone production in the pituitary gland

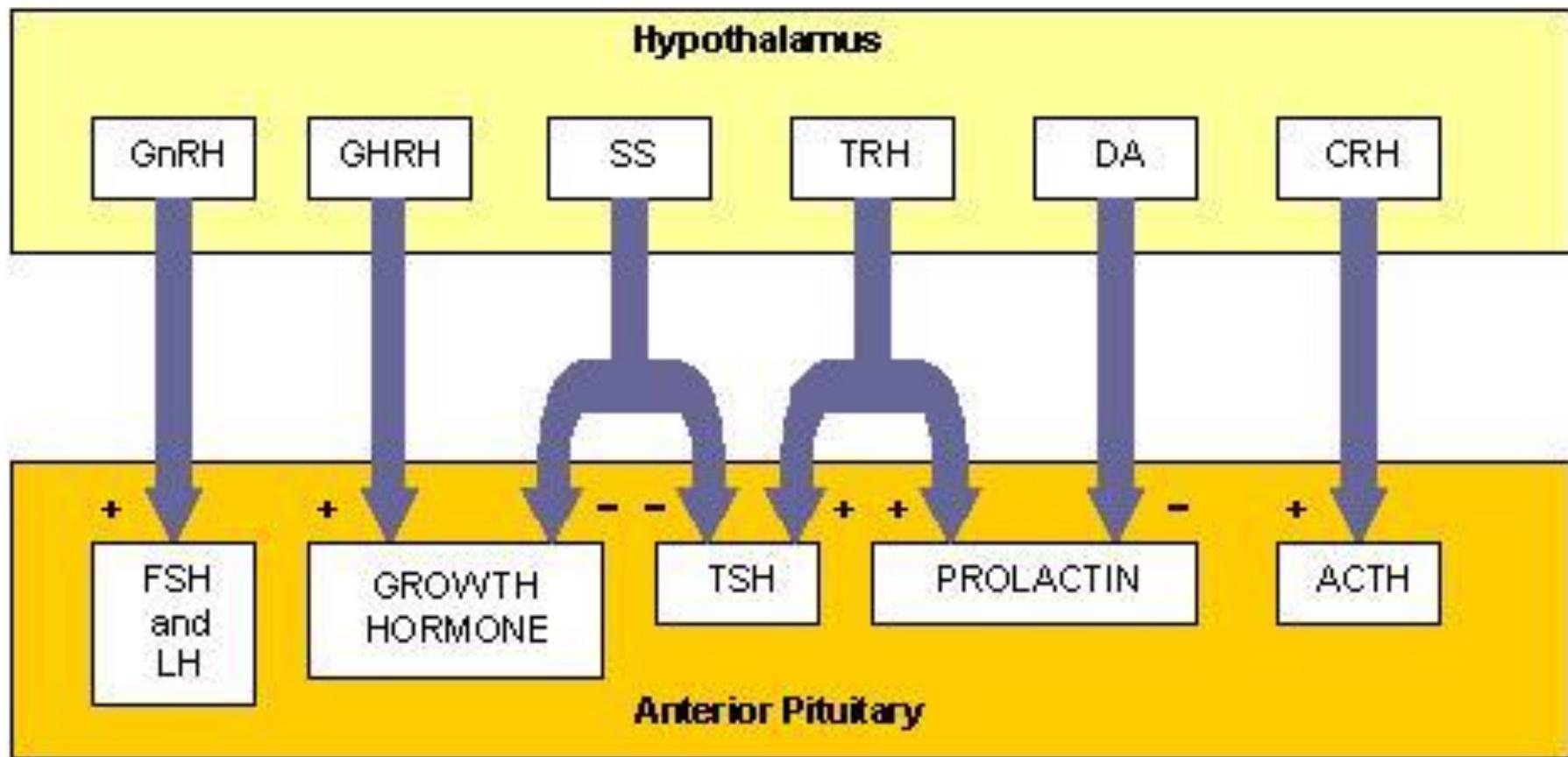


Hypothalamus

- ▶ Liberins
 - ▶ CRH (ACTH), TRH (TSH), GHRH (GH), GnRH (LH, FSH), Salsolinol (PRL), Kisspeptin (GnRH)
- ▶ Statins
 - ▶ Somatostatin (GH), Dopamin (PRL)

Overview

Hypothalamic hormones and their effect on pituitary function



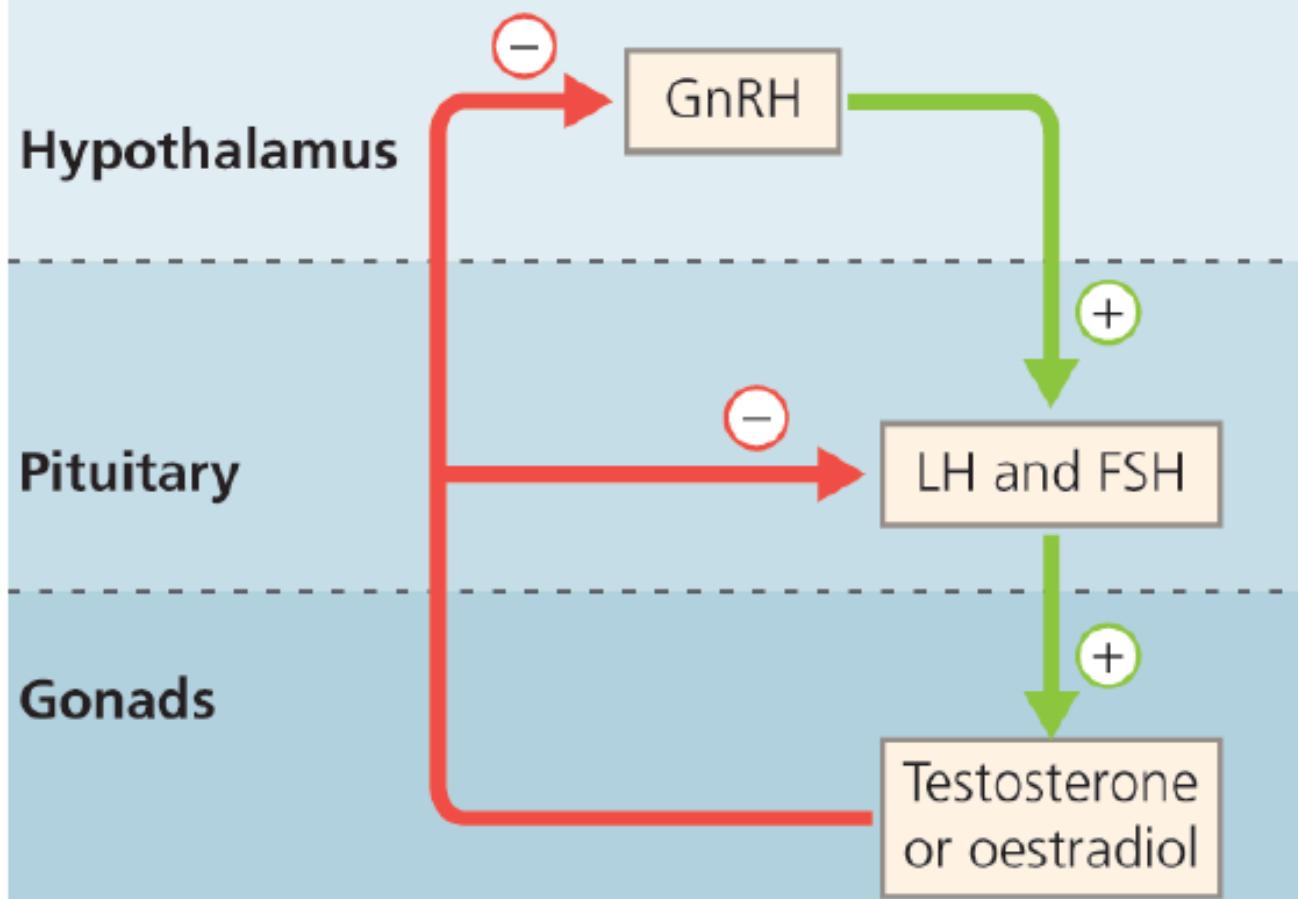
Pituitary gland

Anterior pituitary gland hormones

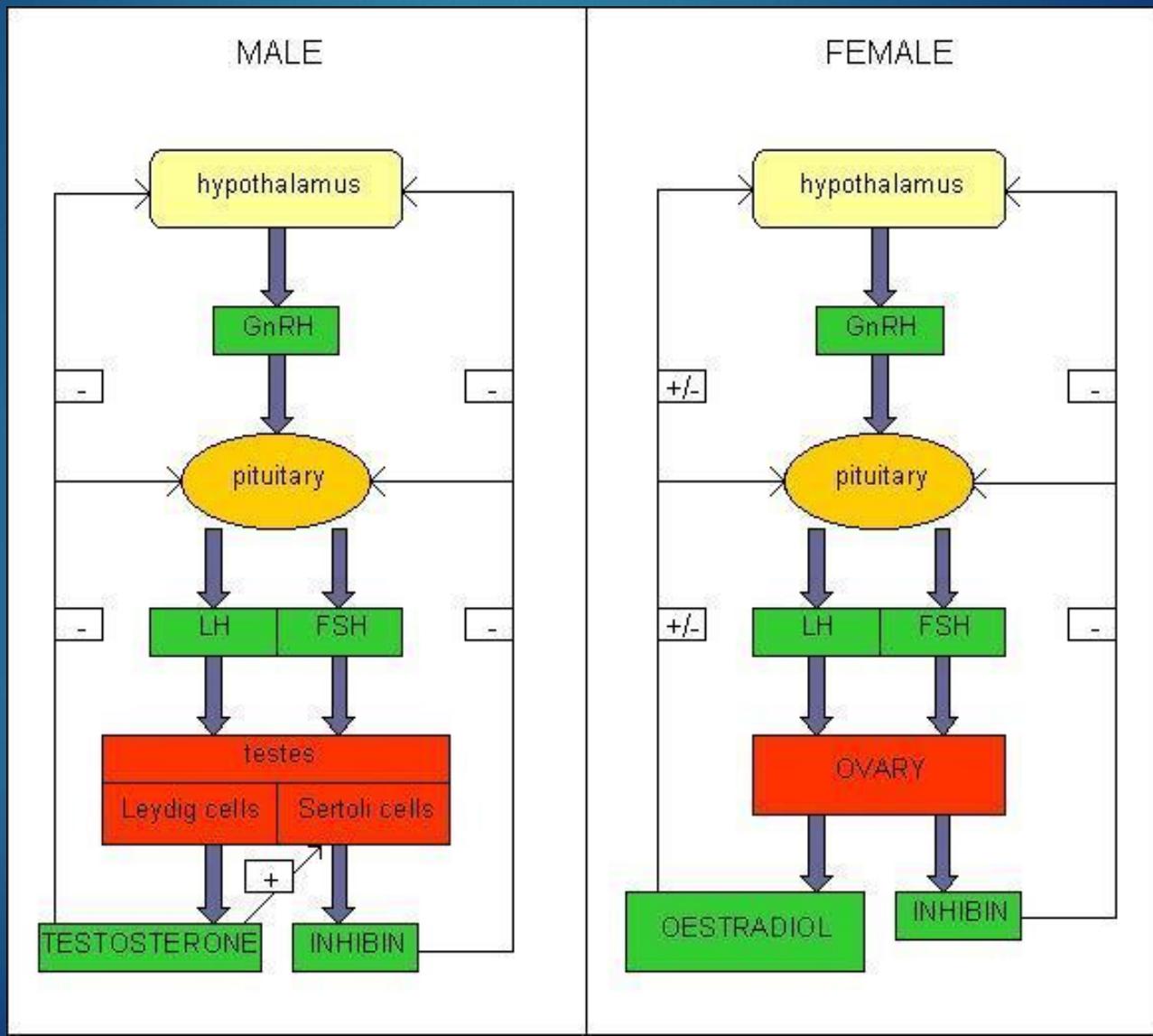
Hormone	Pituitary cell type	Target	Hormone effect(s)
Growth hormone	Somatotrophic	Hepatocytes and adipose cells	Promotes growth and regulates metabolism. Stimulates IGF-1 production in the liver
Adrenocorticotropic hormone	Corticotropic	Adrenal cortex	Increases secretion of corticosteroids
Thyroid-stimulating hormone	Thyrotrophic	Thyroid gland	Stimulates secretion of thyroxine and tri-iodothyronine
Luteinising hormone	Gonadotrophic	Testes (in males) or ovaries (in females)	Increases sex hormone secretion
Follicle-stimulating hormone	Gonadotrophic	Testes	Stimulates spermatogenesis
		Ovaries	Stimulates follicle production
Prolactin	Lactotrophic	Mammary glands	Promotes lactation

GnRH

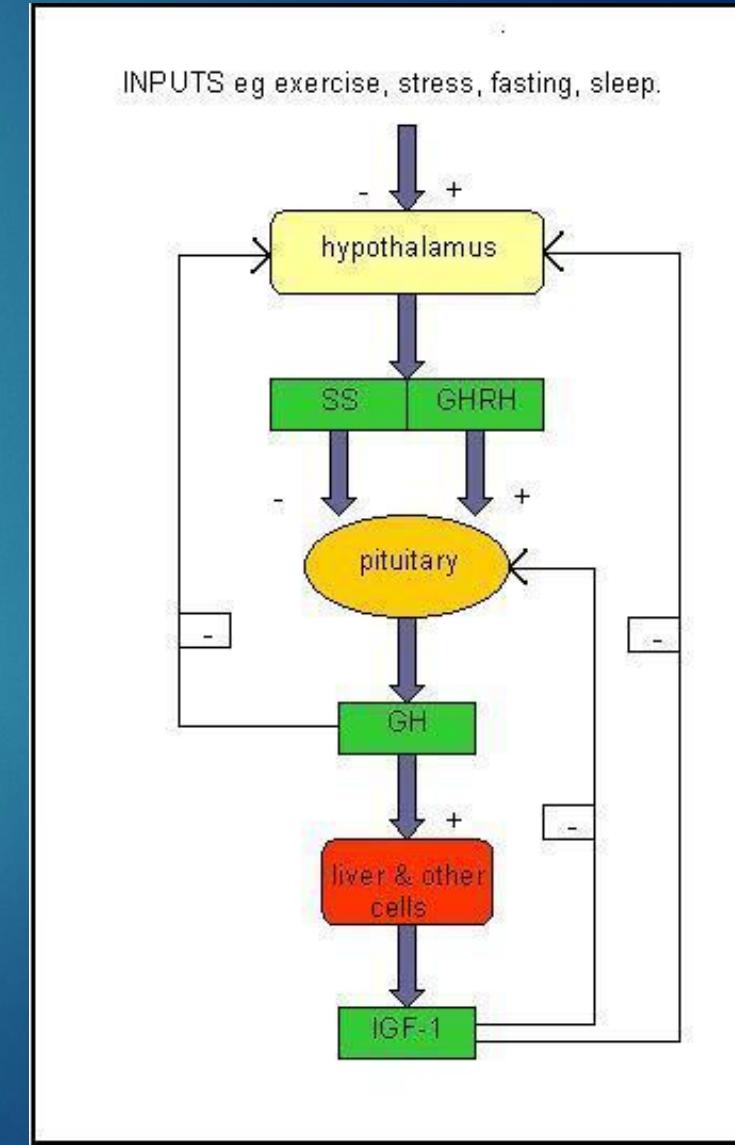
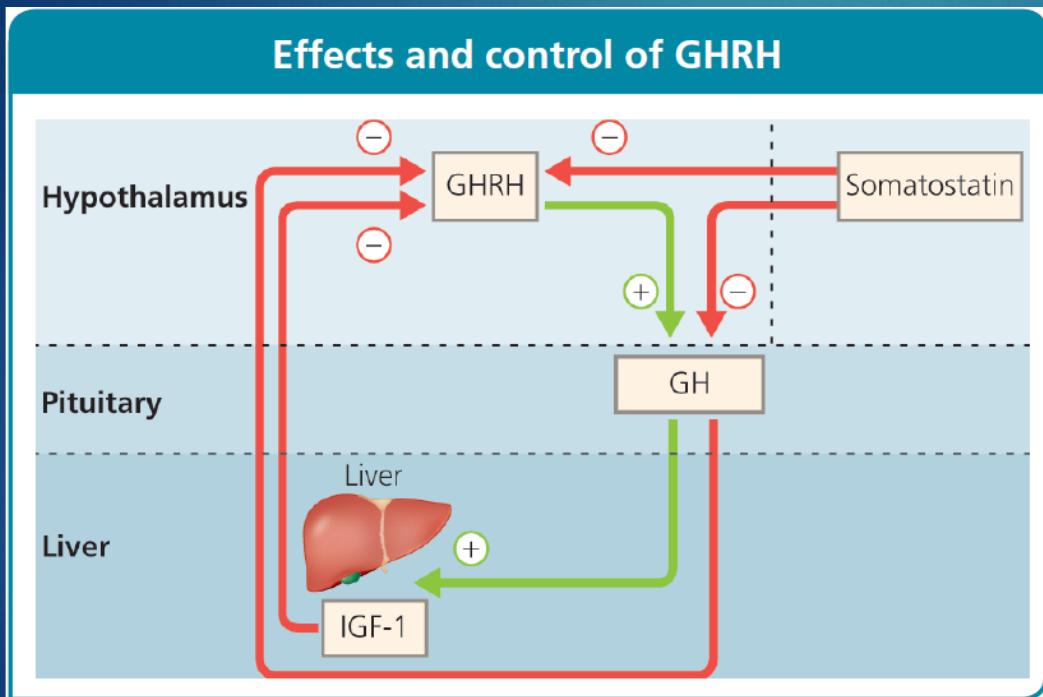
Effects and control of GnRH

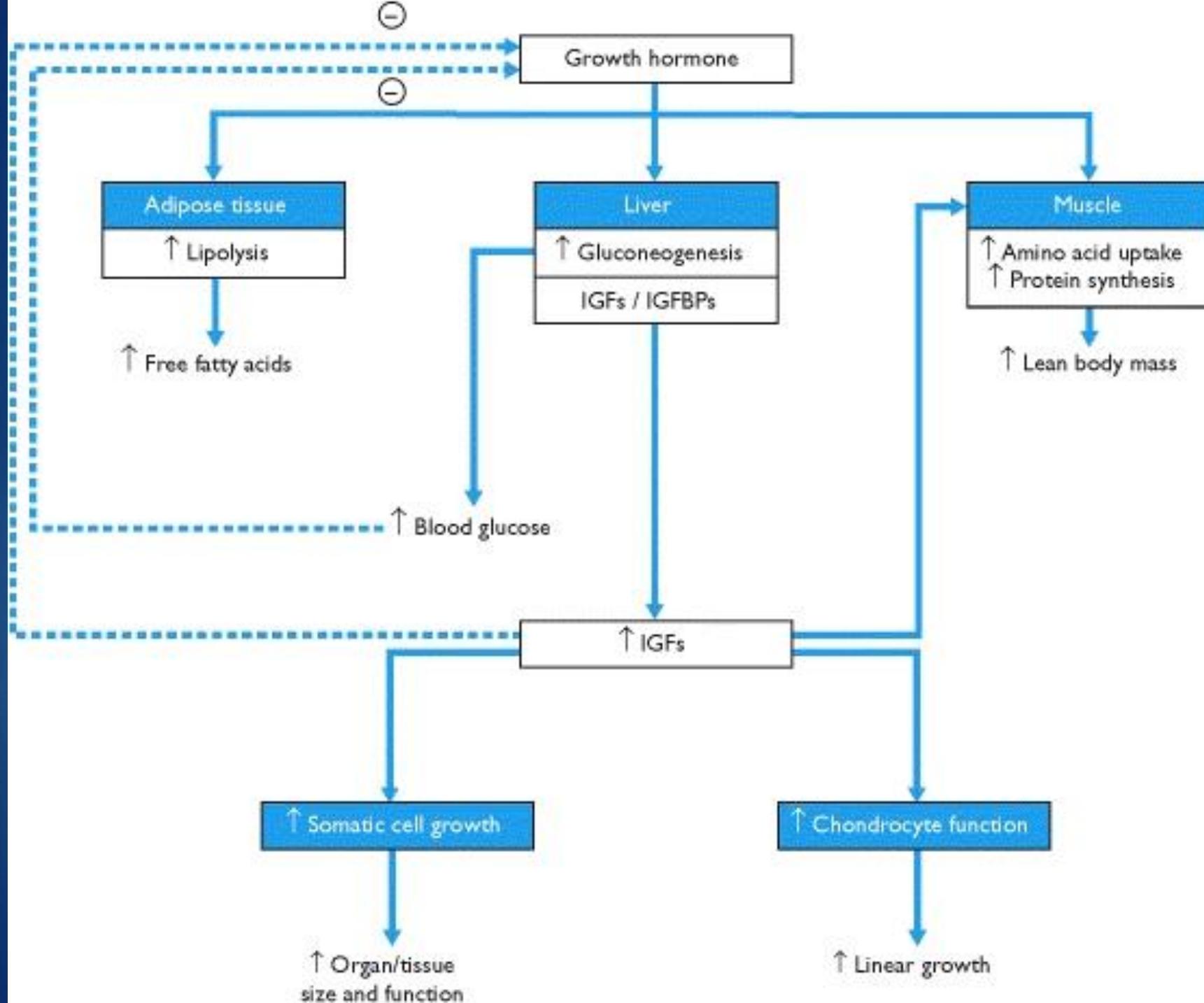


GnRH



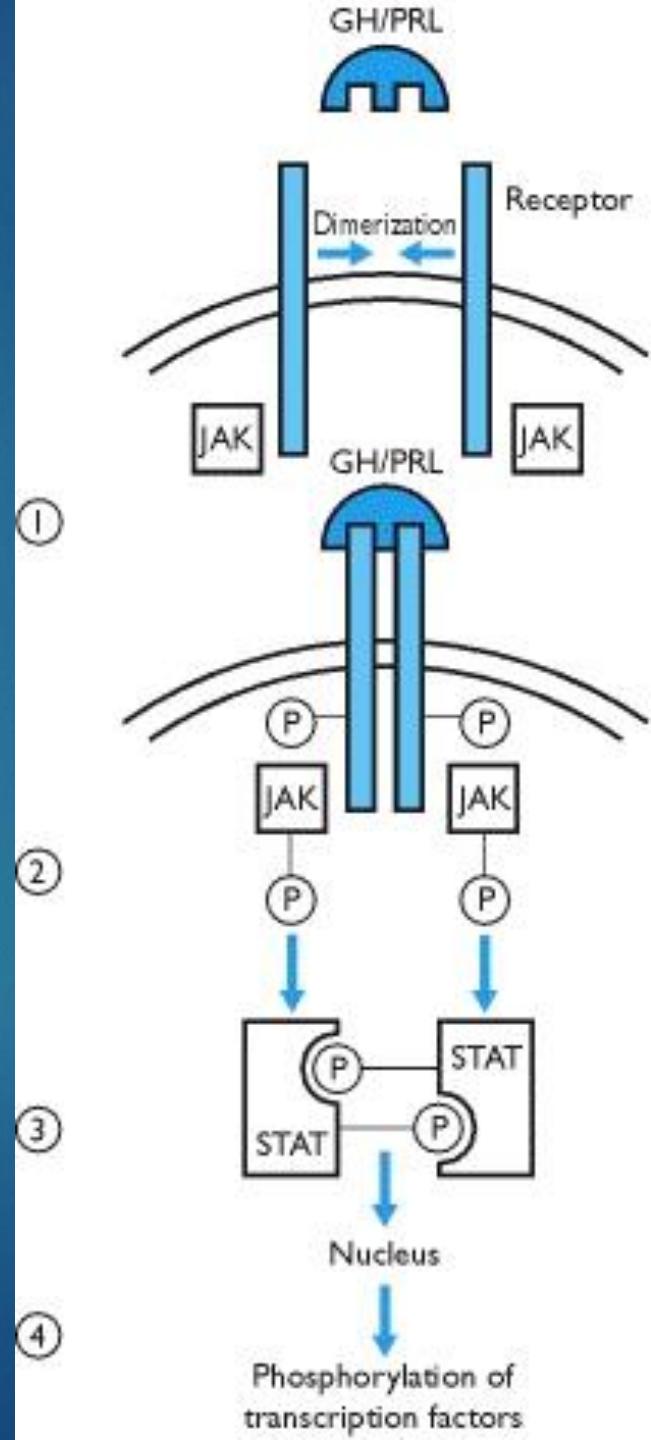
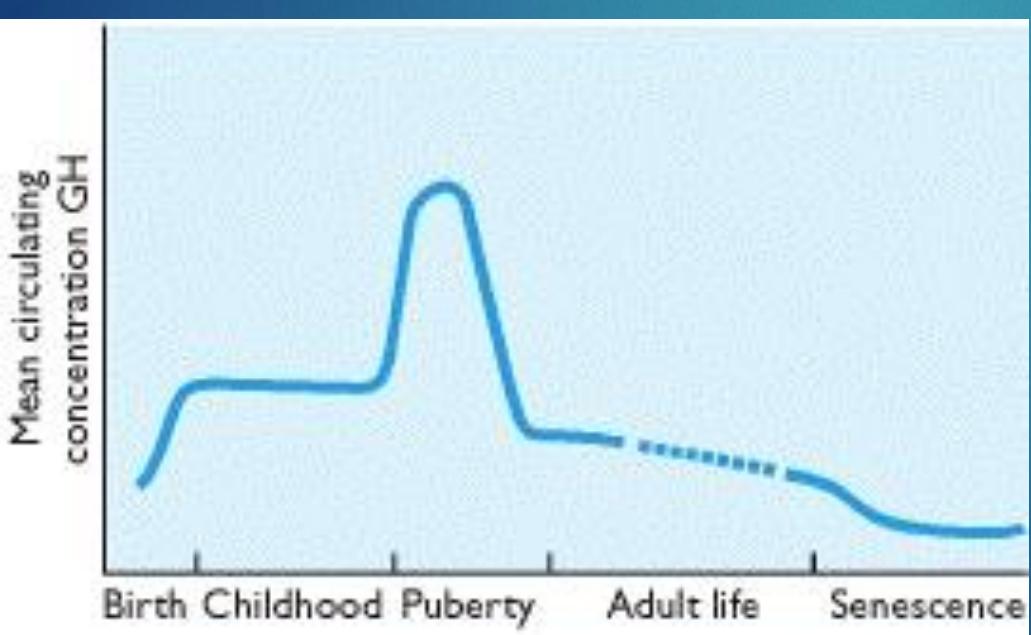
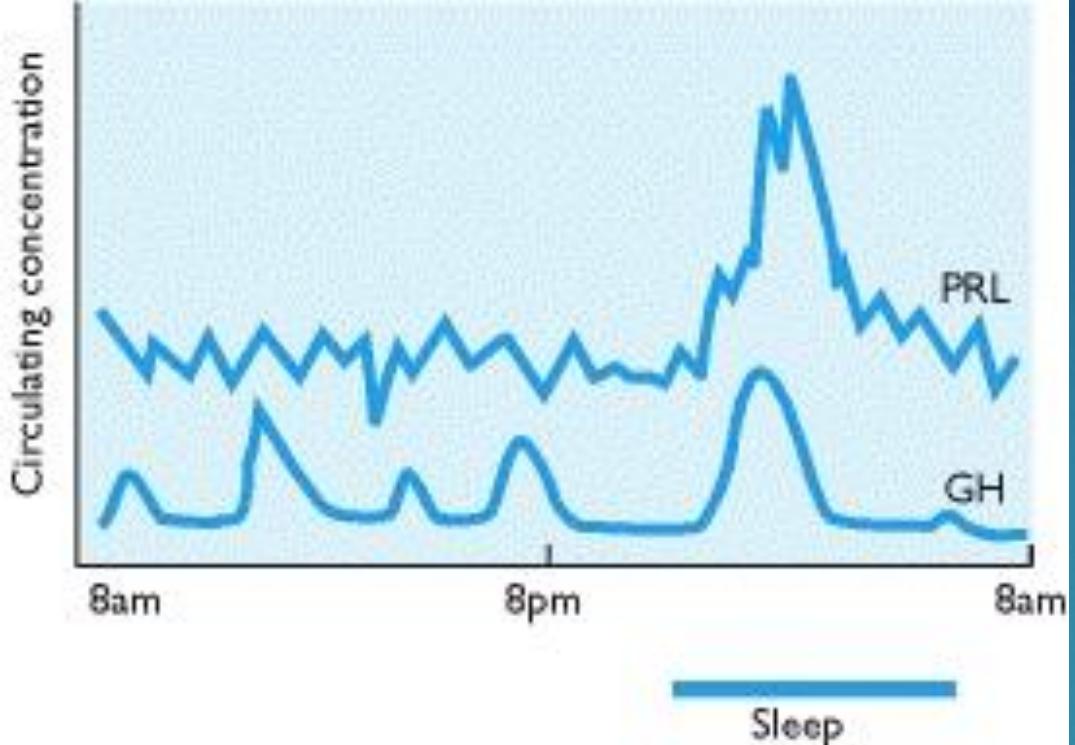
GHRH



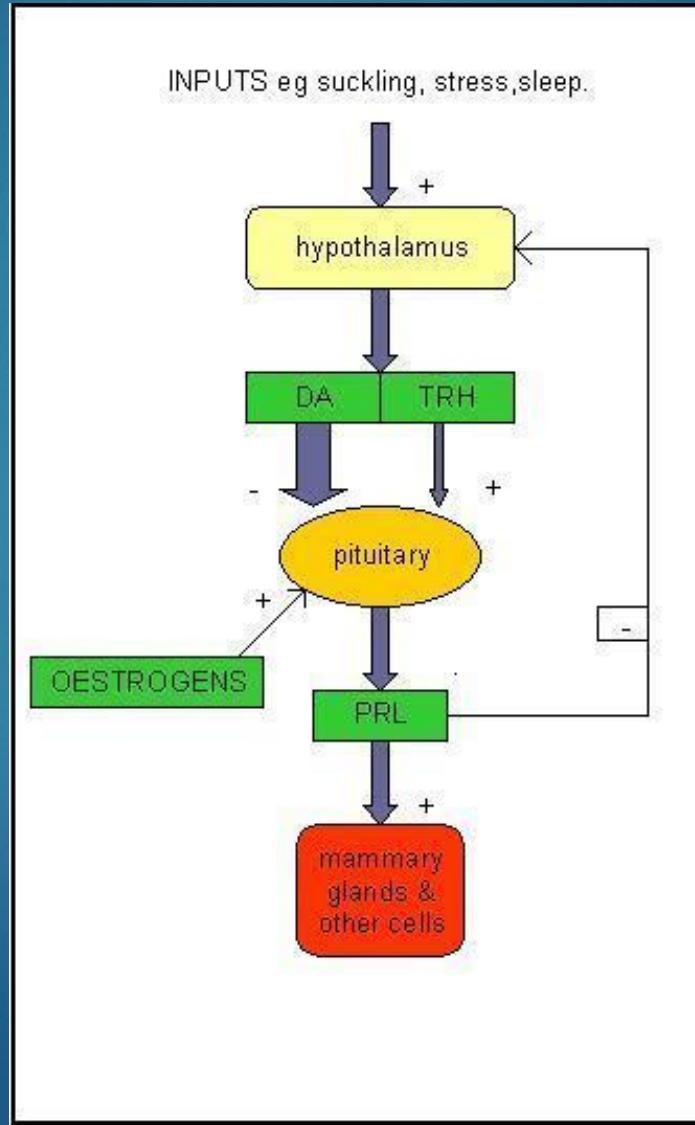


Physiological effects of growth hormone and IGF-1

Cells (tissue)	Active hormone(s)	Effect(s)
Chondrocytes (cartilage)	Growth hormone and IGF-1	Promote proliferation and growth
Myoblasts (muscle)	IGF-1	Promotes proliferation
		Increases amino acid uptake
Adipocytes (adipose tissue)	IGF-1	Stimulates adipose metabolism to release fatty acids
Hepatocytes (liver)	IGF-1	Increases gluconeogenesis
Peripheral tissues	IGF-1	Impairs glucose uptake
		Increases amino acid uptake and protein synthesis



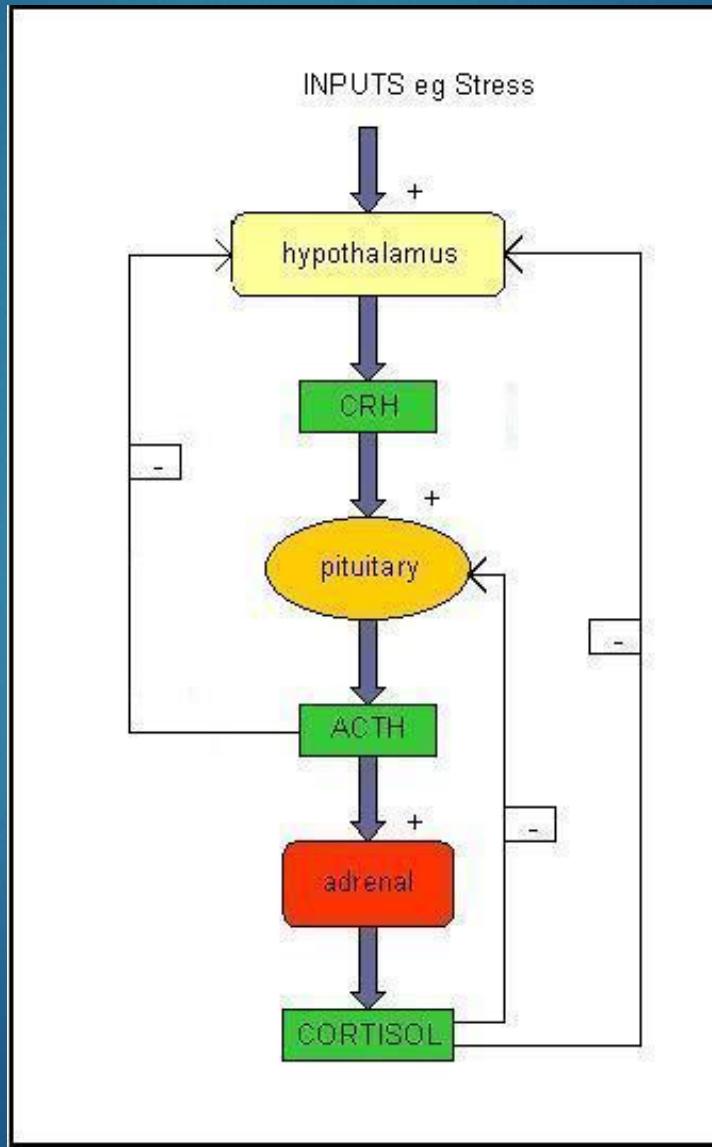
Prolactin



Prolactin functions

- ▶ Lactation
- ▶ Immunomodulation?
- ▶ Behavior?
- ▶ Water and electrolyte balance?
- ▶ Metabolism?
- ▶ Reproduction?

CRH



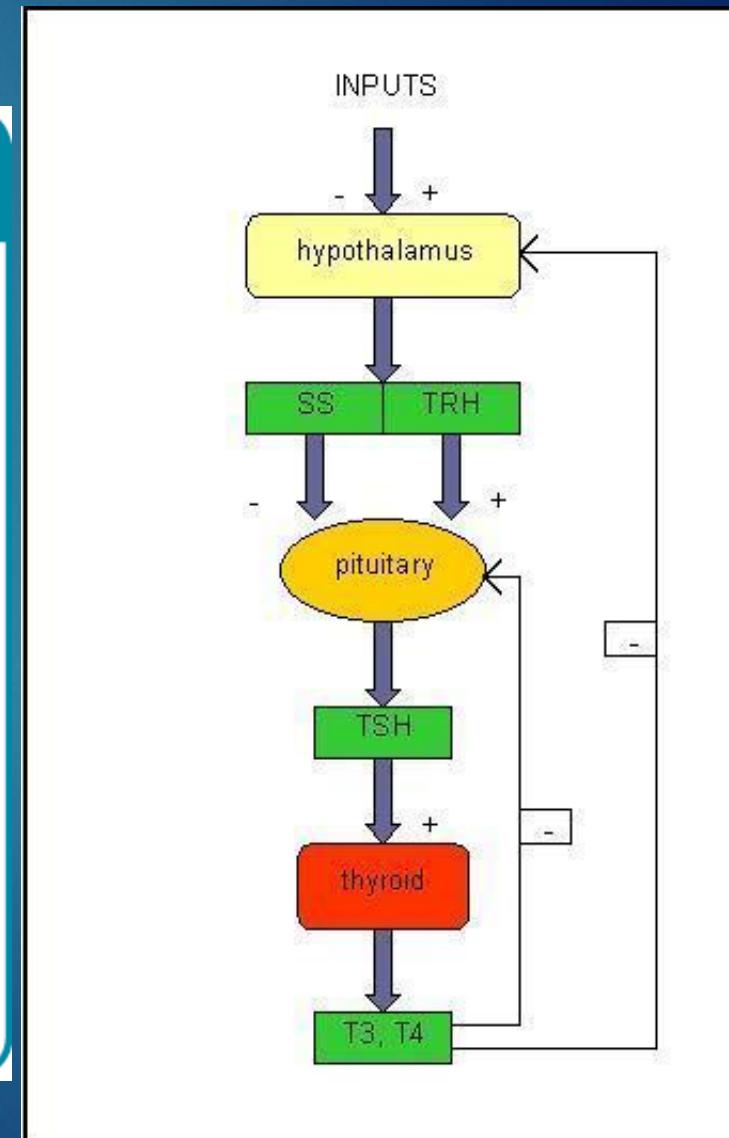
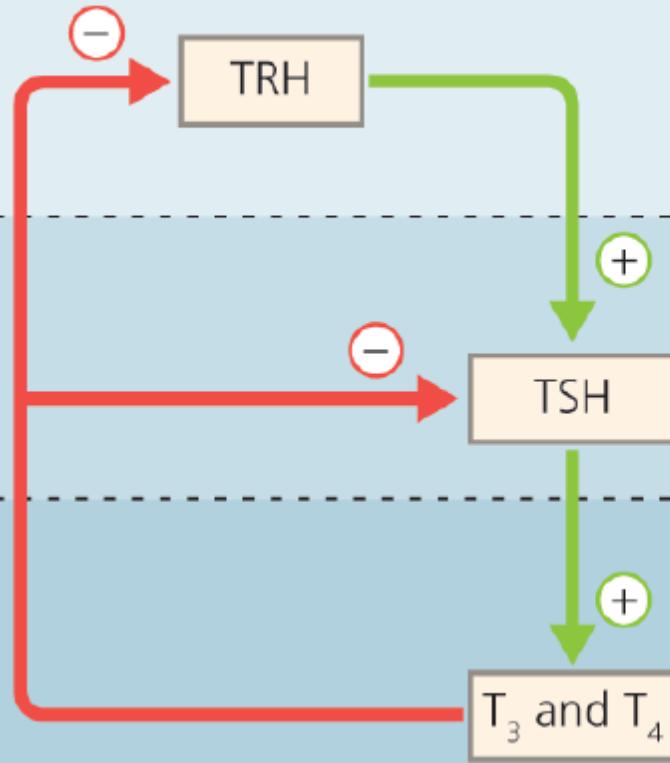
TRH

Effects and control of TRH

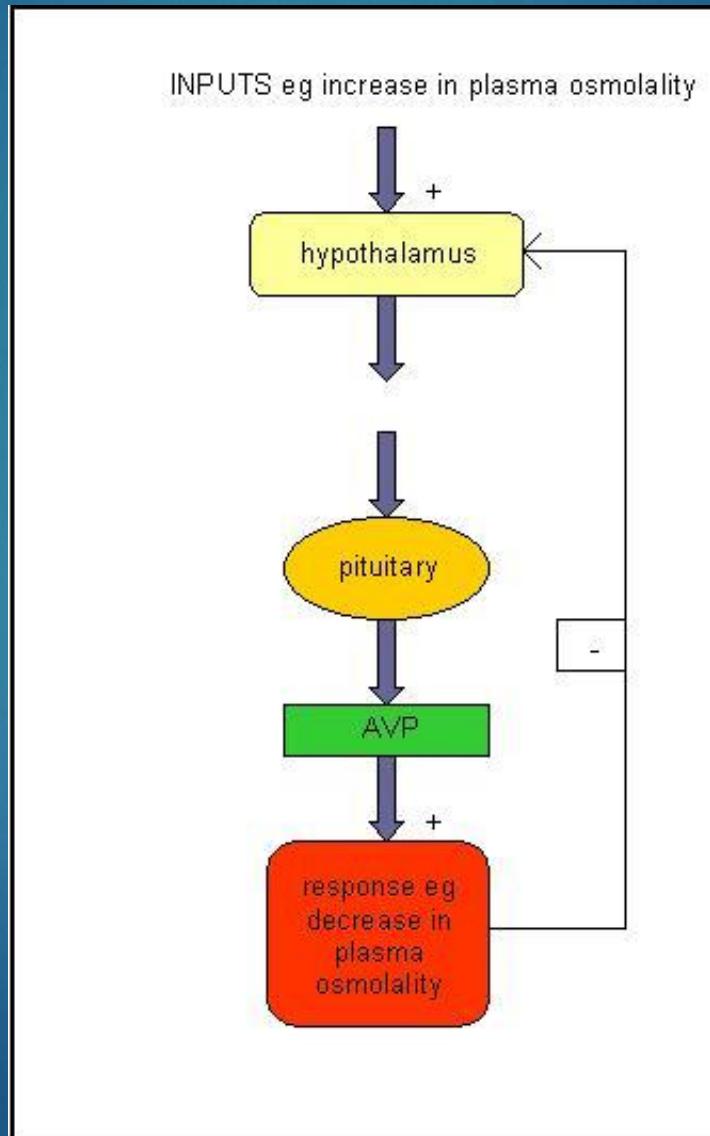
Hypothalamus

Pituitary

Thyroid



ADH - vasopressin

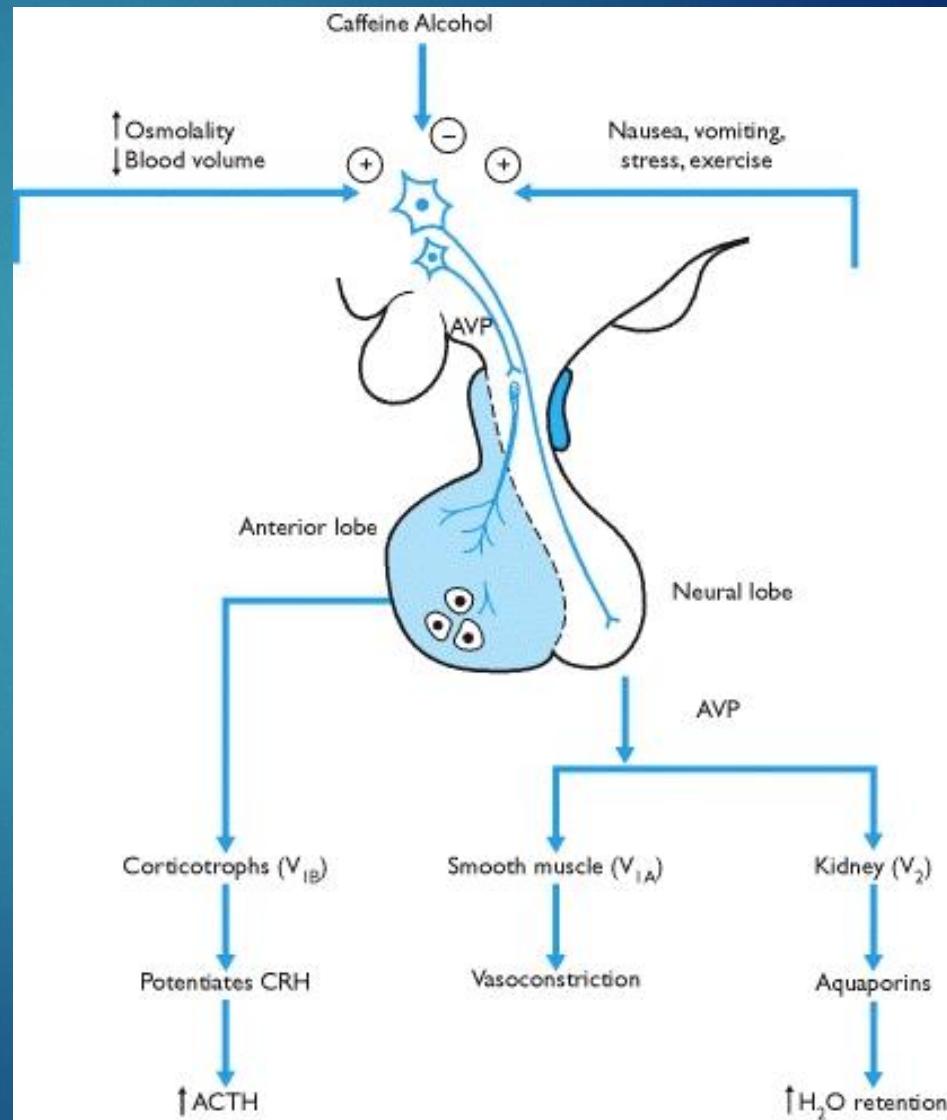


ADH - vasopressin

Antidiuretic hormone receptors: locations and effects

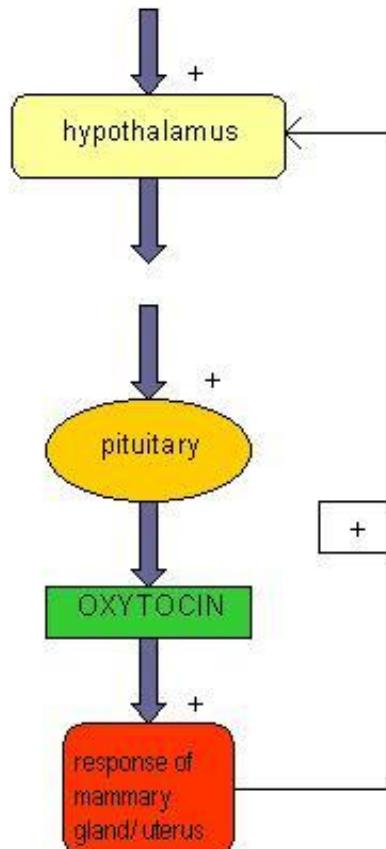
Type of receptor	Location	Effect
ADH 1a	Vascular smooth muscle	Increases blood pressure
ADH 1b	Corticotrophs (cells in the anterior pituitary gland that produce ACTH)	Increases ACTH secretion
ADH 2	Collecting duct of kidney	Increases water reabsorption

ACTH, adrenocorticotropic hormone; ADH, antidiuretic hormone.

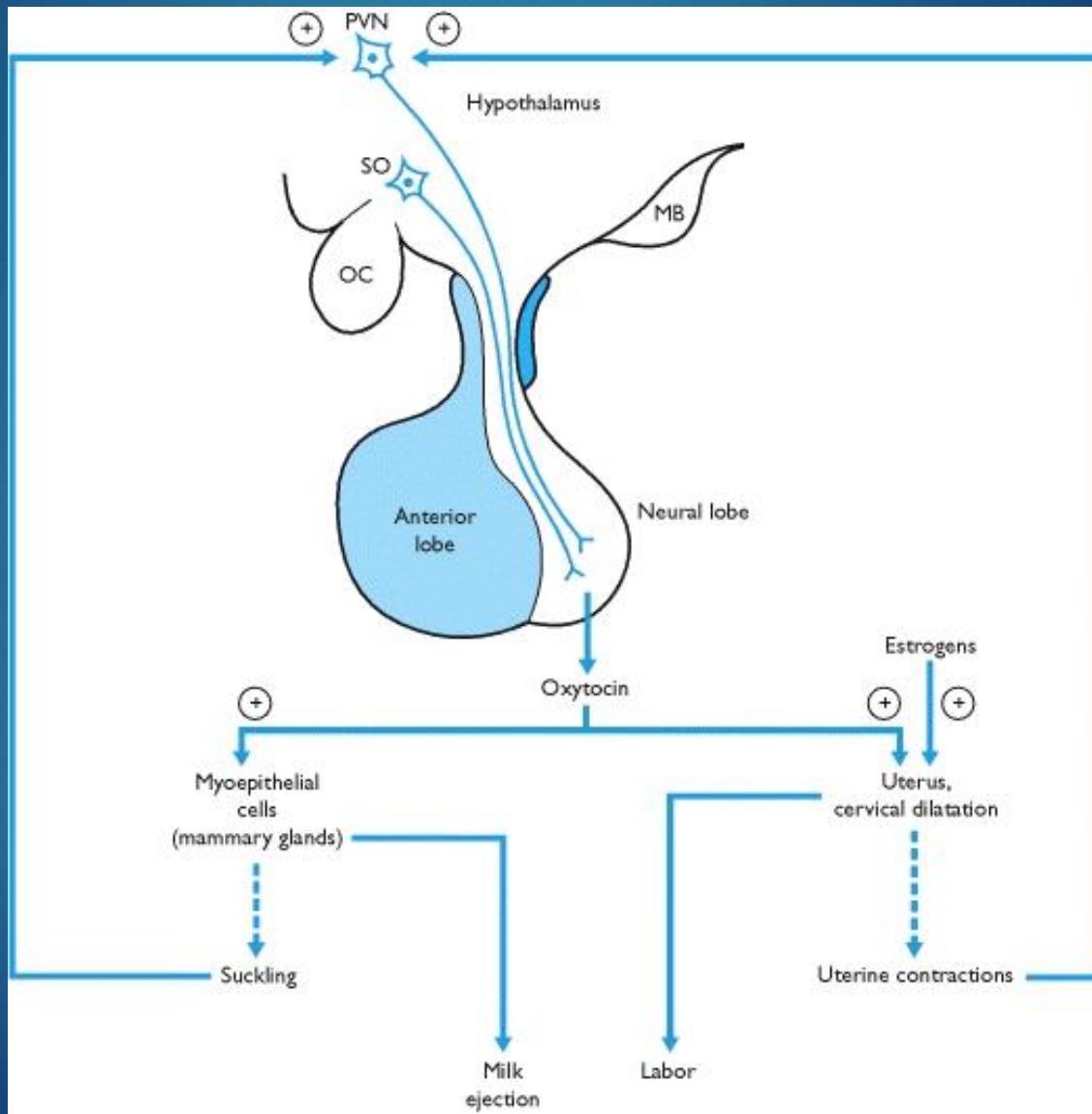


Oxytocin

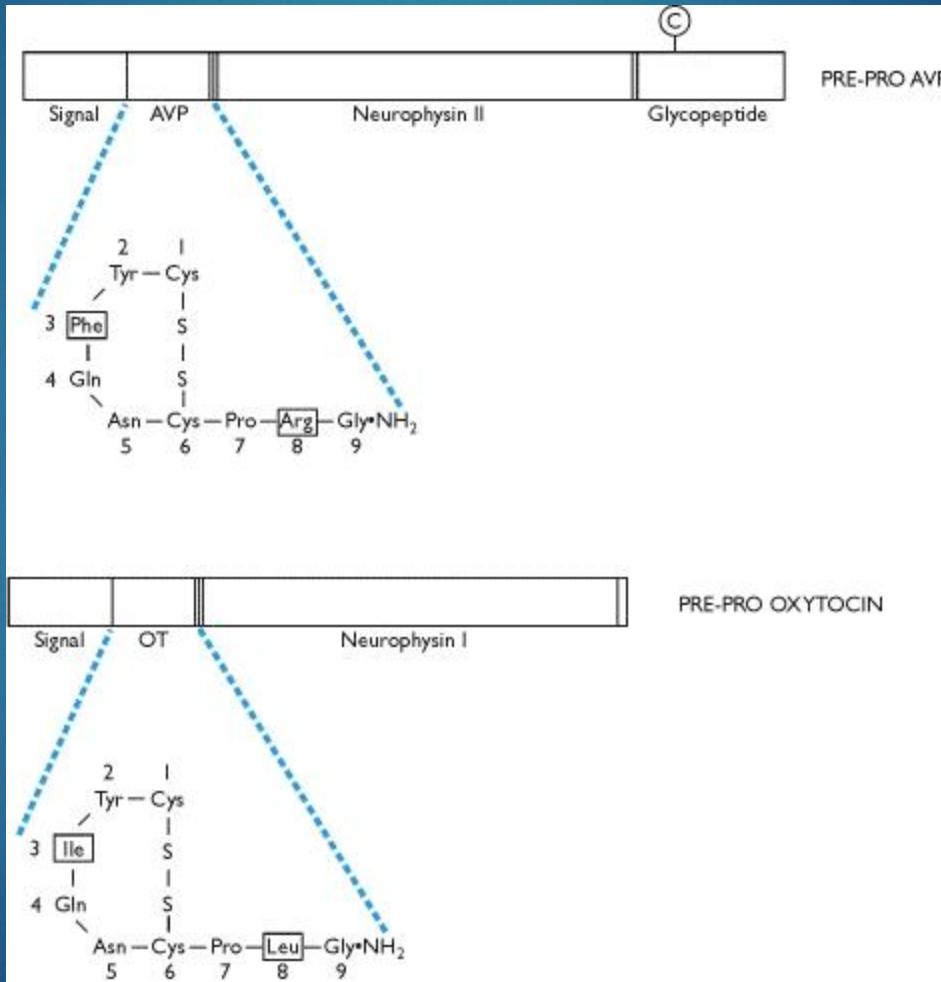
INPUTS eg suckling, distention of cervix.



Oxytocin

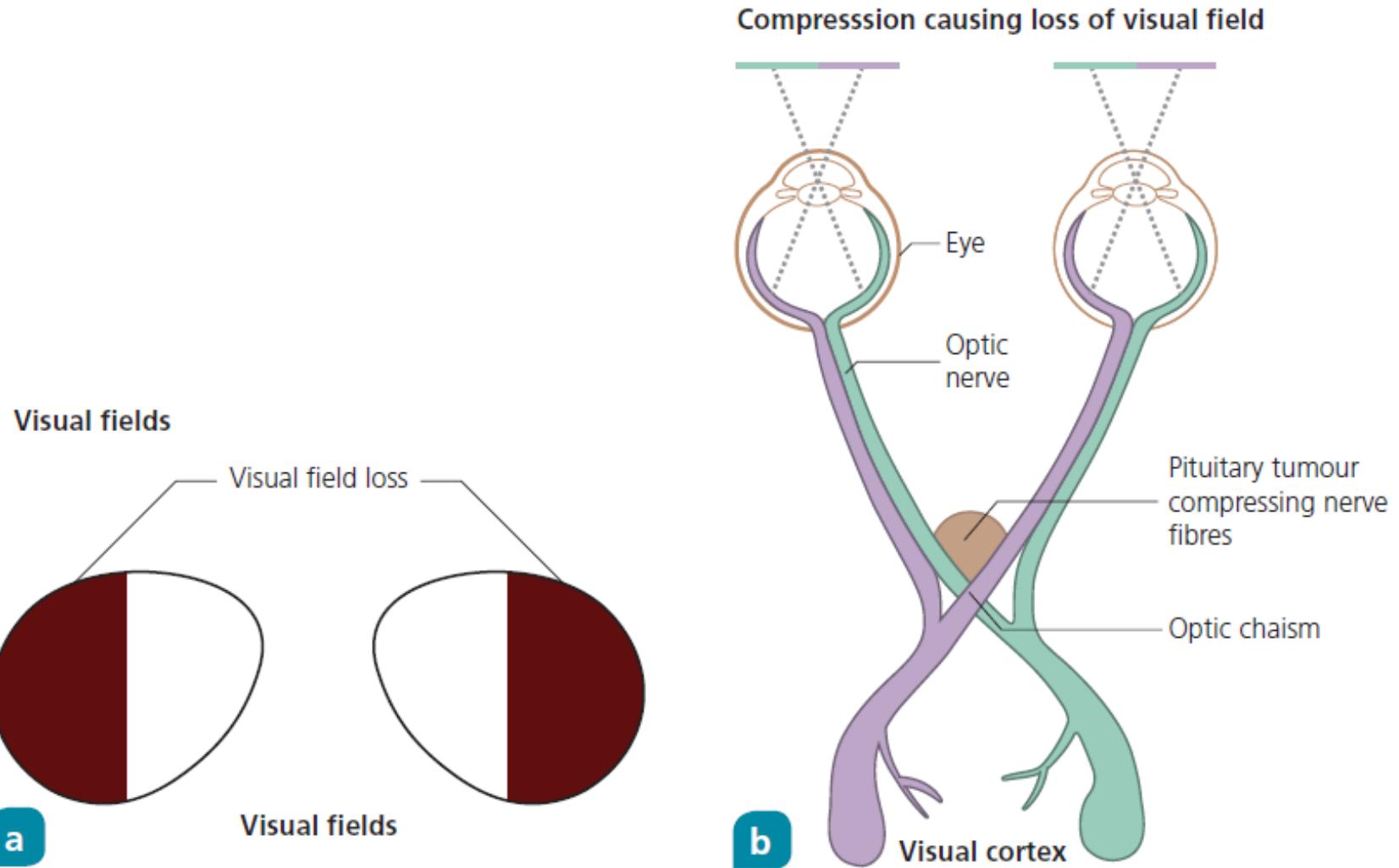


ADH & oxytocin



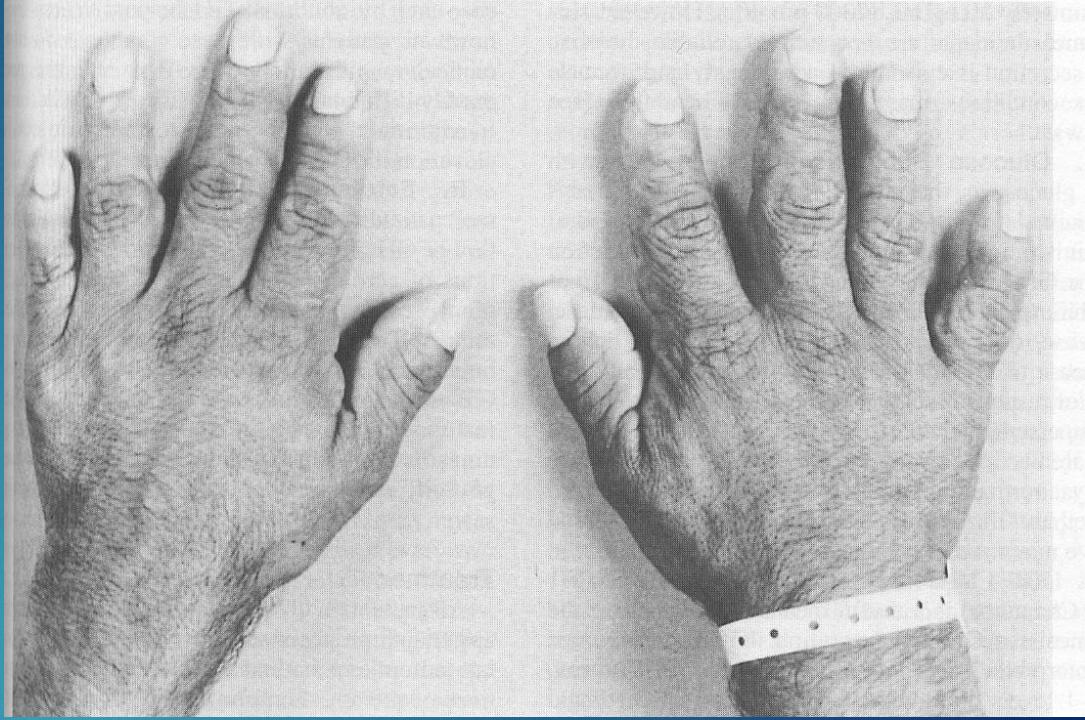
Pathology

Pituitary masses and bitemporal hemianopia

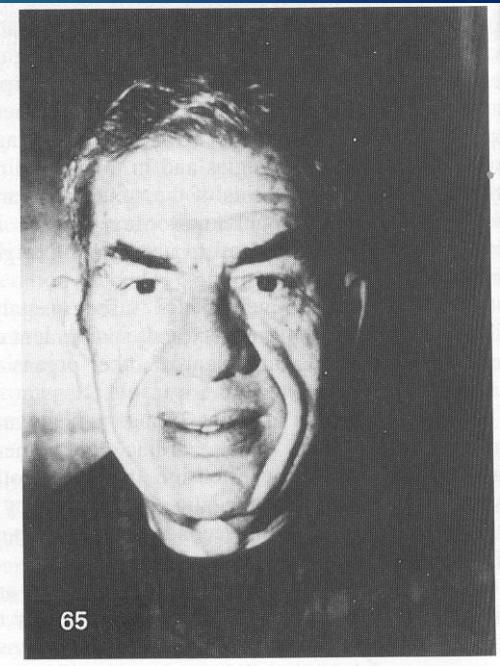


GH

- ▶ Overproduction of GH
 - ▶ Gigantism
 - ▶ Acromegaly
- ▶ GH deficiency
 - ▶ Nanism
 - ▶ GH deficiency syndrome
 - ▶ Somatopause



55



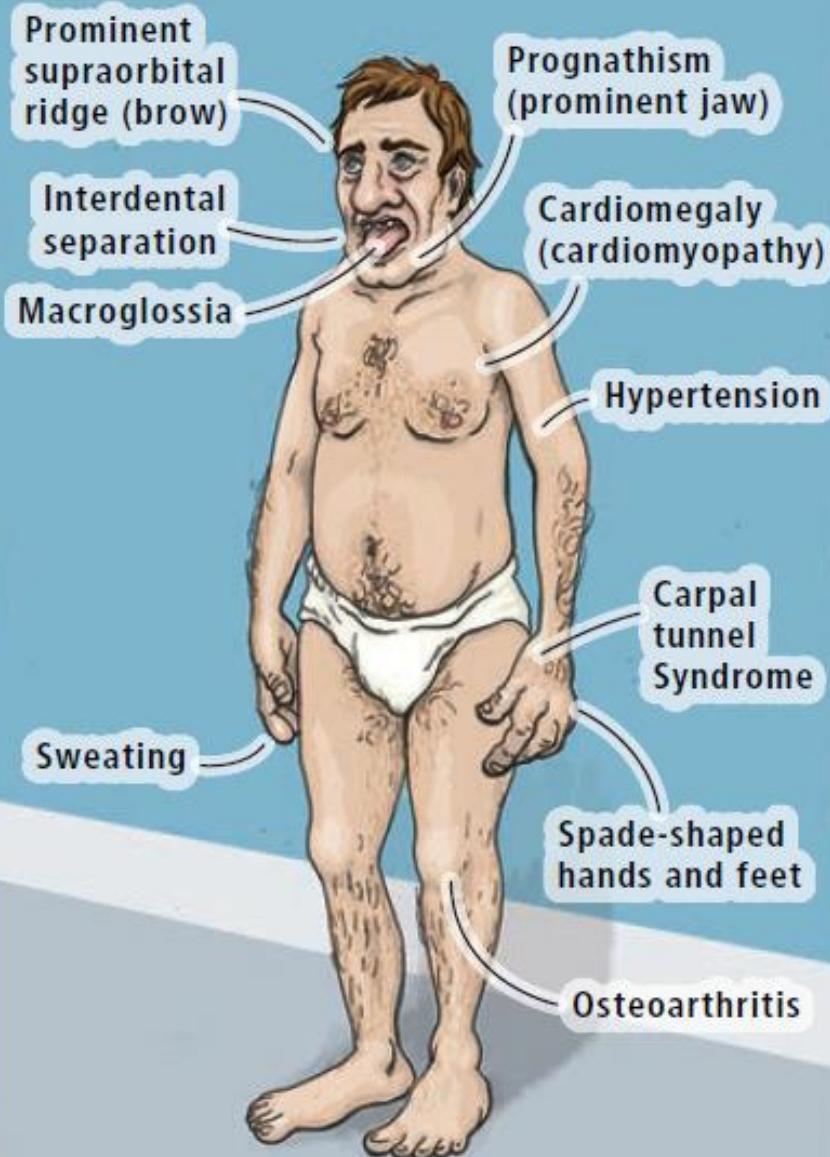
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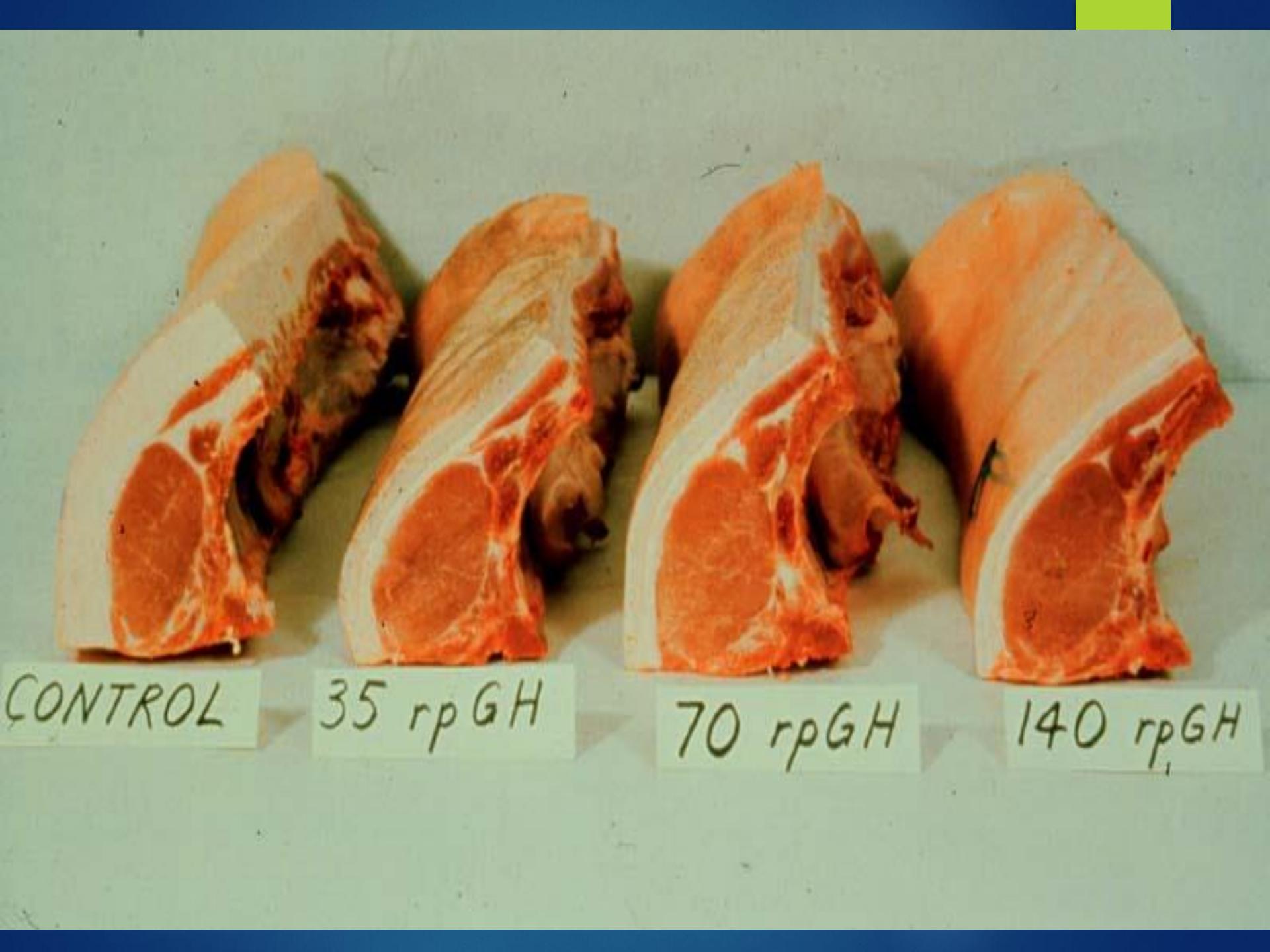


B

C

Clinical features of acromegaly





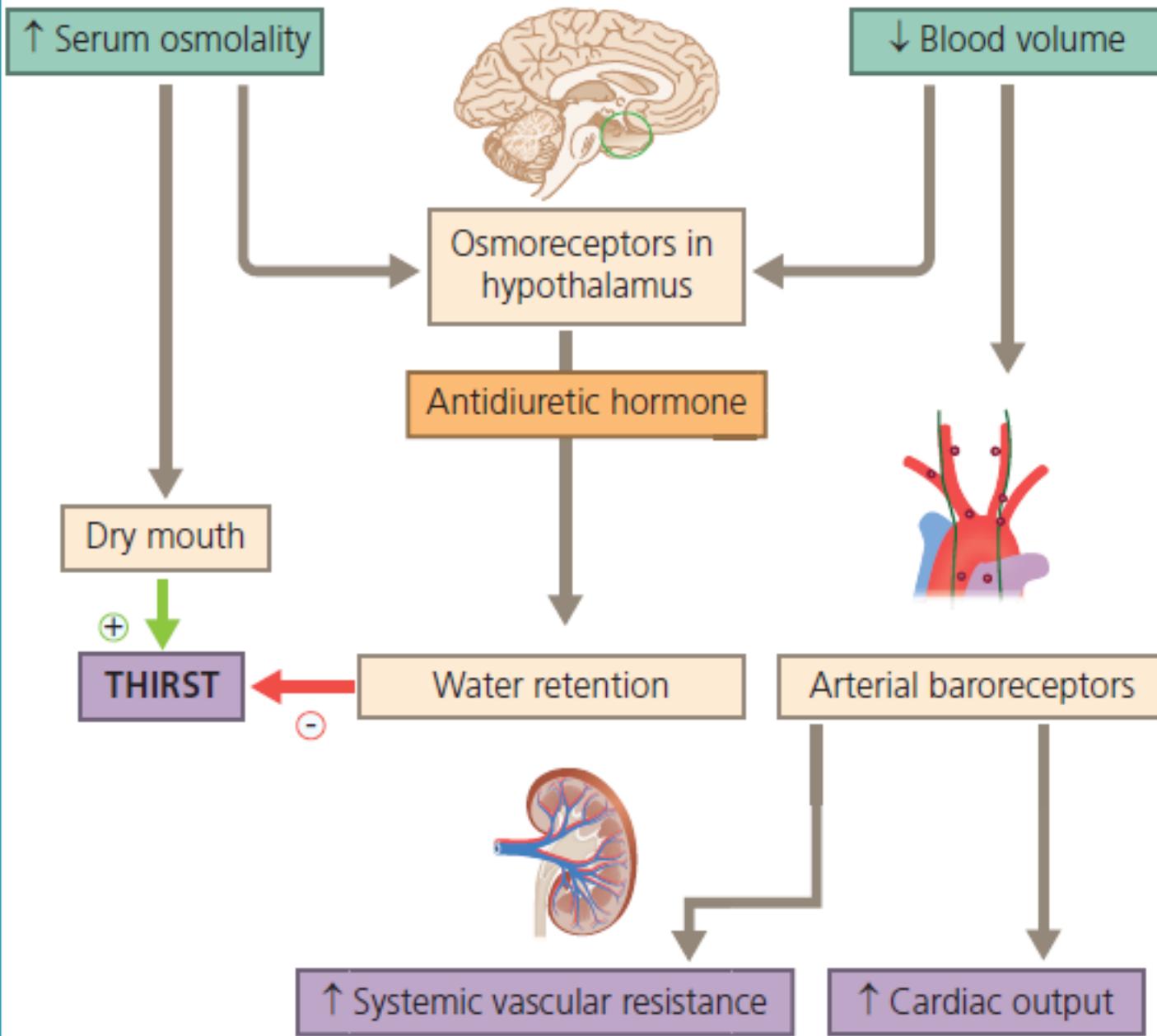
CONTROL

35 rpGH

70 rpGH

140 rpGH

Water homeostasis and thirst



ADH disorders

- ▶ Deficiency of ADH
 - ▶ Diabetes insipidus
 - ▶ Polydipsia, polyuria
 - ▶ Central
 - ▶ Renal
- ▶ Overproduction of ADH
 - ▶ Syndrome of IAD
 - ▶ Hypoosmolality of plasma, hyponatriemia, oliguria

ADH disorders

Interpretation of water deprivation test results

Condition	Urinary volume	Post-water deprivation urine osmolality (mOsm/kg)	Post-desmopressin urine osmolality (mOsm/kg)
Normal	Decreases	> 750	*
Cranial diabetes insipidus	Remains high	< 300	> 750
Nephrogenic diabetes insipidus	Remains high	< 300	< 300

*These patients do not receive desmopressin, because their urine osmolality is > 750 mOsm/kg after water deprivation.

Main causes of diabetes insipidus

Cranial	Nephrogenic
Idiopathic	Chronic renal failure
Tumours of the pituitary or hypothalamus	Lithium toxicity
Cranial surgery	Hypercalcaemia
Head trauma	Hypokalaemia
Infections (e.g. meningitis and encephalitis)	Glycosuria (glucose in the urine)
Granulomatous diseases (e.g. neurosarcoid or tuberculosis)	Tubulointerstitial disease

Hypopituitarism

- ▶ General
- ▶ Selective
- ▶ Trauma, infection, hemorrhage , tumors...
- ▶ Inborn errors
- ▶ Therapy - supplementation

Main causes of hypopituitarism	
Category	Cause
Neoplastic	Pituitary adenoma <ul style="list-style-type: none">■ Secretory (e.g. in Cushing's disease, acromegaly and prolactinoma)■ Non-secretory (non-functioning) Metastases (e.g. breast, renal and bronchial)
Peripituitary	<ul style="list-style-type: none">■ Craniopharyngioma■ Germ cell tumours■ Meningiomas
Inflammatory	Lymphocytic hypophysitis
Infectious	Tuberculosis Syphilis
Infiltrative	Haemochromatosis Sarcoidosis
Vascular	Sheehan's syndrome Pituitary apoplexy
Cystic	Rathke's cleft cyst
Post-irradiation	Pituitary radiotherapy Head and neck radiotherapy with pituitary in the field (some radiation affects the pituitary as an unwanted consequence of radiation to a wider area)
Miscellaneous	Traumatic brain injury Empty sella

Clinical features of hypopituitarism

Hormone deficiency	Clinical features in adults	Clinical features in children
Adrenocorticotropic hormone	Fatigue Weakness Dizziness Nausea Vomiting Weight loss Myalgia Hypoglycaemia	Same as in adults, but hypoglycaemia is more prominent
Thyroid-stimulating hormone	Fatigue Cold intolerance Constipation Weight gain Dry skin	Growth retardation Learning difficulties and delayed skeletal maturation
Growth hormone	Impaired psychological well-being Increased fat mass Reduced muscle mass Increased cardiovascular risk	Growth retardation
Luteinising hormone and follicle-stimulating hormone	Impaired fertility and amenorrhoea (women) Erectile dysfunction (men) Anaemia Reduced muscle mass and bone density	Delayed puberty
Prolactin	Failure of lactation (women)	
Antidiuretic hormone	Nocturia Polyuria Polydipsia	Enuresis (bed-wetting)

Sheehan's syndrome

- ▶ Intra-partum infarction of the pituitary gland
 - ▶ mother & child
- ▶ GH – LH/FSH – TSH
- ▶ Consequences?

Discussion

- ▶ Journal info, author info?
- ▶ Aim?
- ▶ Subject? Objects?
- ▶ Methods?
- ▶ Main results?
- ▶ Limitations?
- ▶ Conclusions?
- ▶ Application?