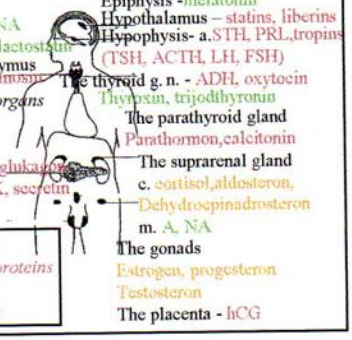
Endocrine system

Hierarchy

I. *Hypothalamus*
II. *Hypophysis*
III. *Hormons effeting organs*



A, NA
Prolactostatin
Thymus
Thymosine
Epiphysis -melatonin
Hypothalamus – statins, liberins
Hypophysis- a.STH, PRL,tropins (TSH, ACTH, LH, FSH)
The thyroid g. n. - ADH, oxytocin
Thyroxin, trijodthyronin
The parathyroid gland
Parathormon,calcitonin
The suprarenal gland
c. cortisol,aldosteron,
Dehydroepinadrosteron
m. A, NA
The gonads
Estrogen, progesteron
Testosteron
The placenta - hCG
Pancreas – insulin, glukagon
GIH – gastrin, CCK, secretin somatomedis

Chemic structure
Peptids, proteins, glykoproteins
Steroids
Derivates of aminoacids

GENERAL PRINCIPLES OF ENDOCRINE CONTROL

- SPECIFICITY

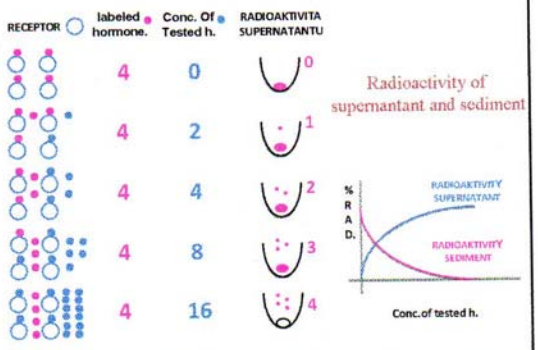
Ligand 1 ● **tissue 1**- specific receptor for 1
Ligand 2 ■ **tissue 2**- specific receptor for 2
tissue 3- specific receptors for 1 and 2

- Overlap of effects – 2 hormons the same effect
- Peptids, proteohormons – ↑ specificity, heterogenous
- Main and side effects
- General effect (insulin – glucose) – metabolic „target"
- Antihormons – competitive inhibition
- Syntetic derivates – 1 effect↑, another ↓
(proteoanabolics ↓virilisation, glukocorticoids↓mineral.)

EFFECTIVITY AND A DETERMINATION OF HORMONS

- conc in blood - secretion, metabolisation and excretion
- Binding to plasma proteins – steroids, thyroxin, balance between bound and free hormon
- Previous conc –up and down regulation
- Inactivation – antibodies against receptors –TSH hypo-hyperthyreosis, Ach-nikotin r. myastenia gravis)
- Antagonistic hormons – glycemia (*diab. pts - ↑ dosis of insulin →small hypoglycemia → ↑adrenalin, corticosteroids → ↑ need of insulin)*
- Pulse secretion
- Radioimunoassay, enzymoimunoanalysis

RADIOIMUNOASSAY



RECEPTORS for hormons, neurotransmiters, and other ligands

Binding of hormons to membrane receptors is in a dynamic balance $C_H \times C_R <=> C_{H-R}$

↑H. - Down regulation of receptors

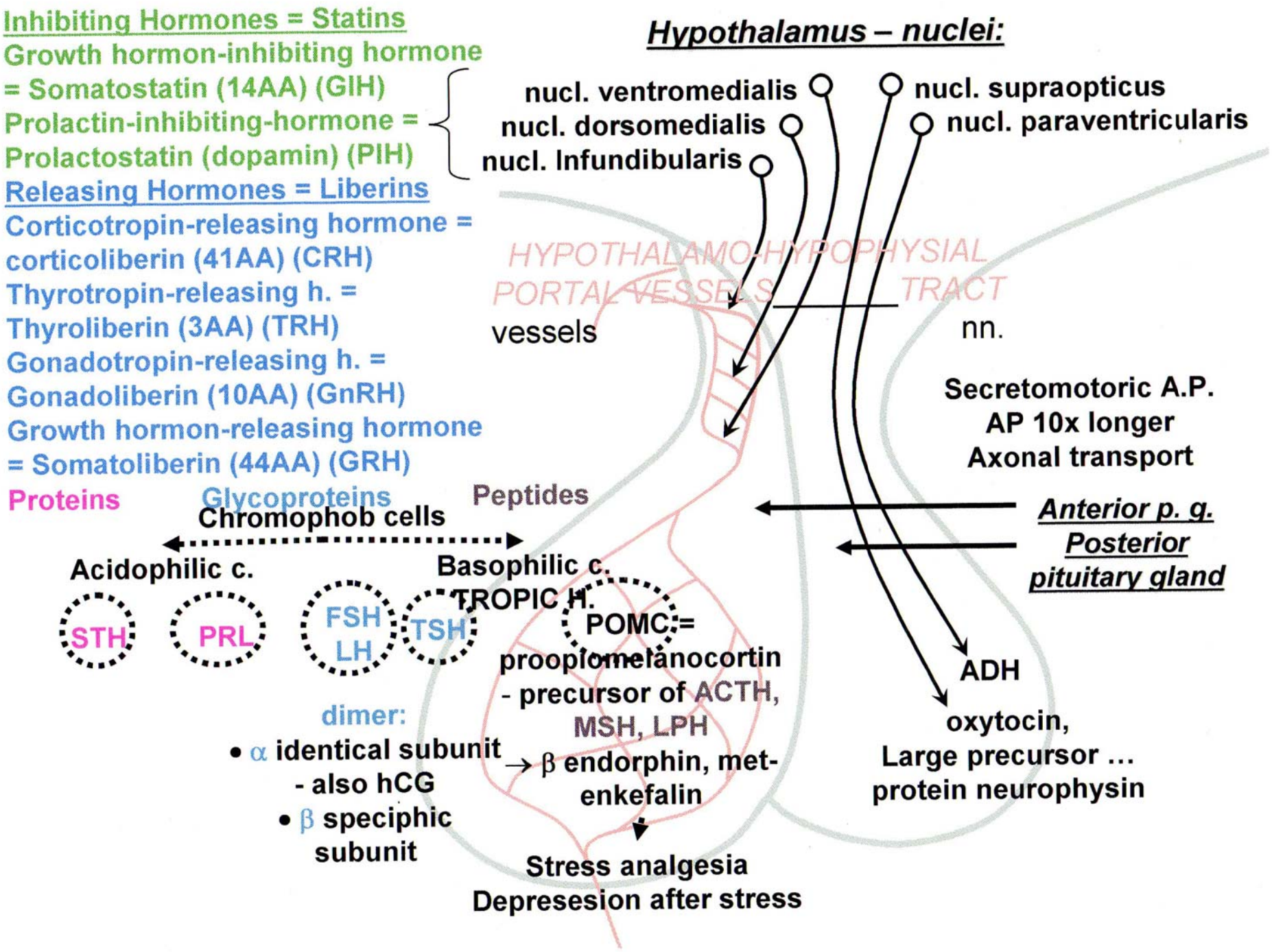
1. Internalization = receptor mediated endocytosis
2. Desensitisation – changes in properties of a receptor →↓sensitivity (*homolog - for 1 ligand, heterolog – for more ligands)*

↓H. - Up regulation of receptors

1. Recycling of an internalized receptor
2. Synthesis de novo

CONSEQUENCE

Denervation hypersensitivity, insulinoresist diabetes, tolerance to morfin


Inhibiting Hormones = Statins
Growth hormon-inhibiting hormone
= Somatostatin (14AA) (GIH)
Prolactin-inhibiting-hormone =
Prolactostatin (dopamin) (PIH)
Releasing Hormones = Liberins
Corticotropin-releasing hormone =
corticoliberin (41AA) (CRH)
Thyrotropin-releasing h. =
Thyroliberin (3AA) (TRH)
Gonadotropin-releasing h. =
Gonadoliberin (10AA) (GnRH)
Growth hormon-releasing hormone
= Somatoliberin (44AA) (GRH)
Hypothalamus – nuclei:
nucl. ventromedialis
nucl. dorsomedialis
nucl. Infundibularis
nucl. supraopticus
nucl. paraventricularis
HYPOTHALAMO-HYPOPHYSIAL PORTAL VESSELS TRACT
vessels
nn.
Secretomotoric A.P.
AP 10x longer
Axonal transport
Anterior p. g.
Posterior
pituitary gland
Proteins
Glycoproteins
Peptides
Chromophob cells
Acidophilic c.
Basophilic c.
TROPIC H.
STH
PRL
FSH
LH
TSH
POMC:=
proopiomelanocortin
- precursor of ACTH,
MSH, LPH
dimer:
• α identical subunit
- also hCG
• β speciphic
subunit
→ β endorphin, met-
enkefalin
Stress analgesia
Depresesion after stress
ADH
oxytocin,
Large precursor …
protein neurophysin