

Psych 132: Hormones and Behavior

Hormones and receptors

July 9, 2013

Assignment

- **Chapter 2**
 - **Pg. 41-54**
 - **Can skip 50-51**
 - **Pg. 64-71 (more detailed than necessary)**

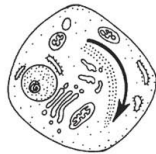
No quiz on this material

The major glands

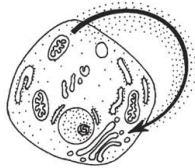
Hormones and receptors

Their functional organization

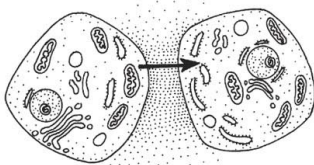
Intracrine mediation



Autocrine mediation

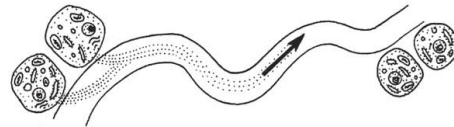


Paracrine mediation



e.g., neurotransmitters

Endocrine mediation



hormones

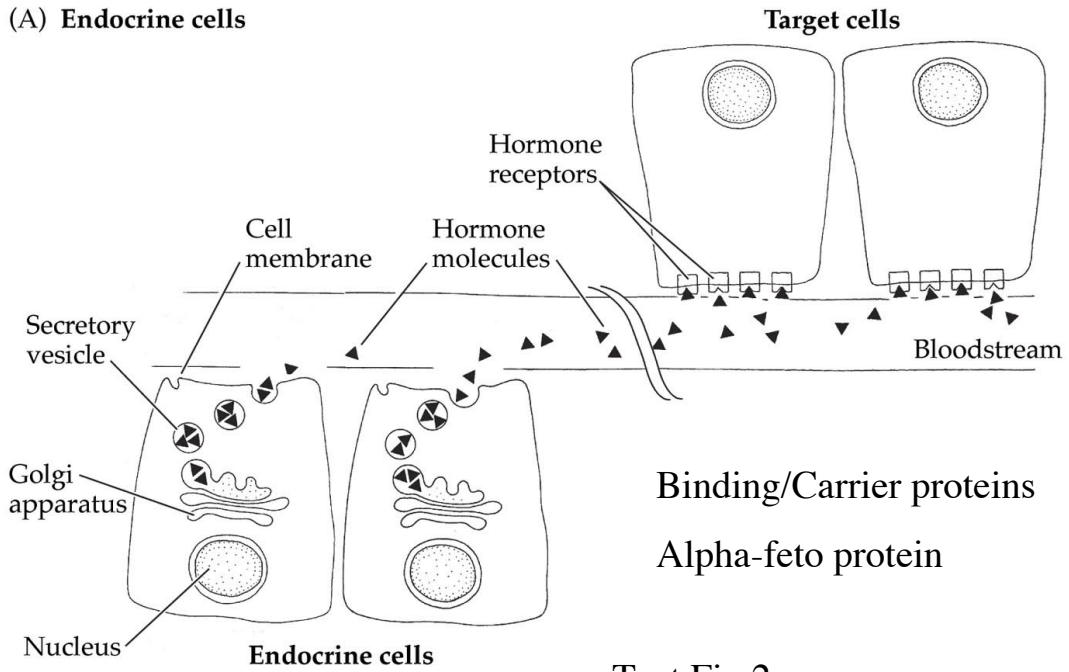
Ectocrine mediation



Text Figure 2.1

pheromones

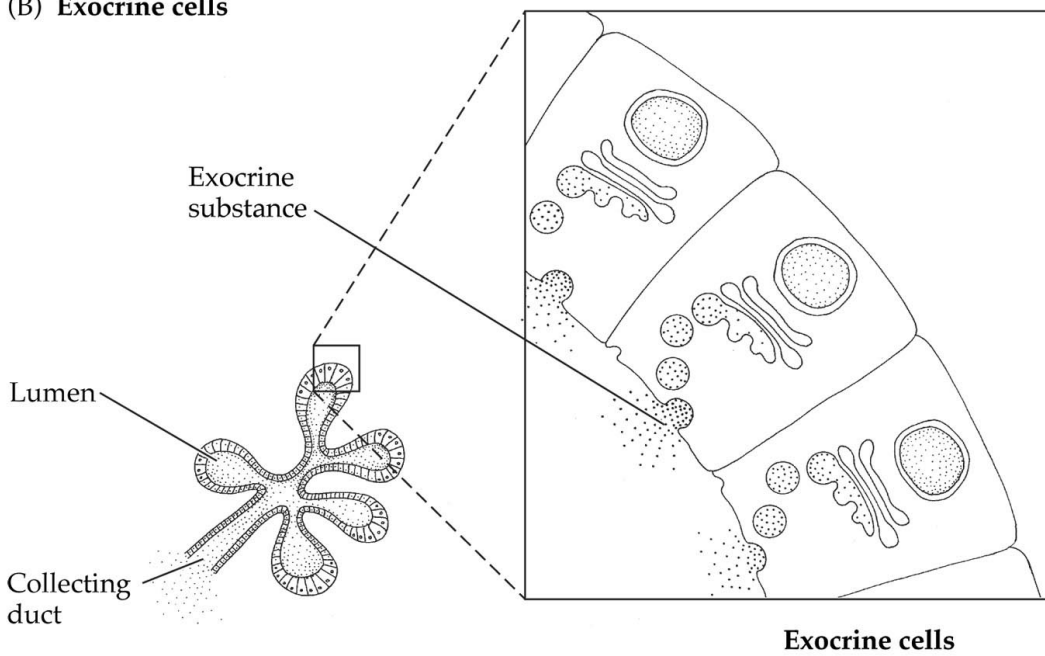
(A) Endocrine cells



Text Fig 2.x

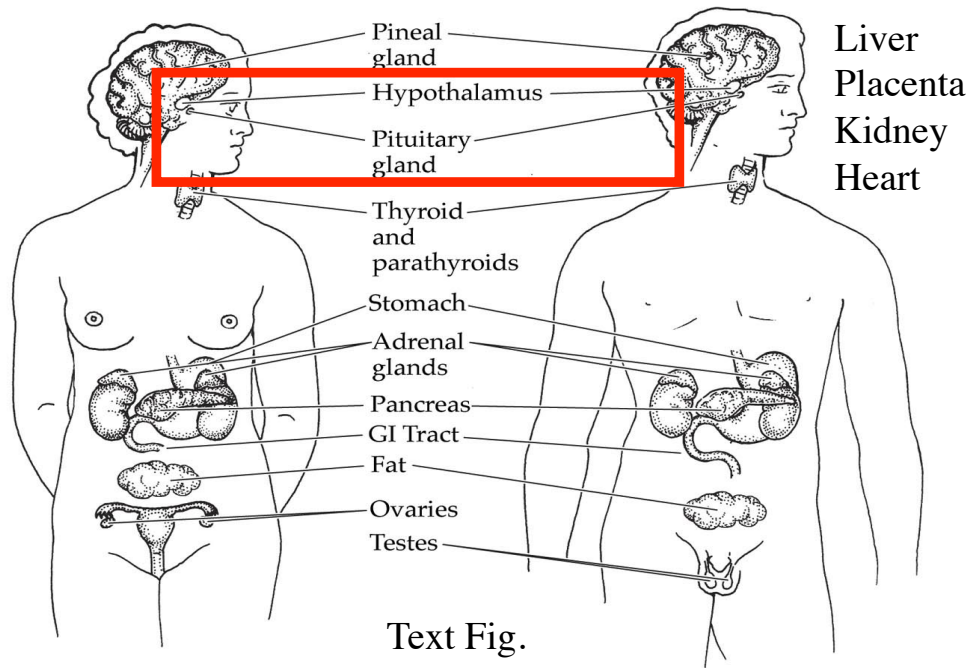
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(B) Exocrine cells



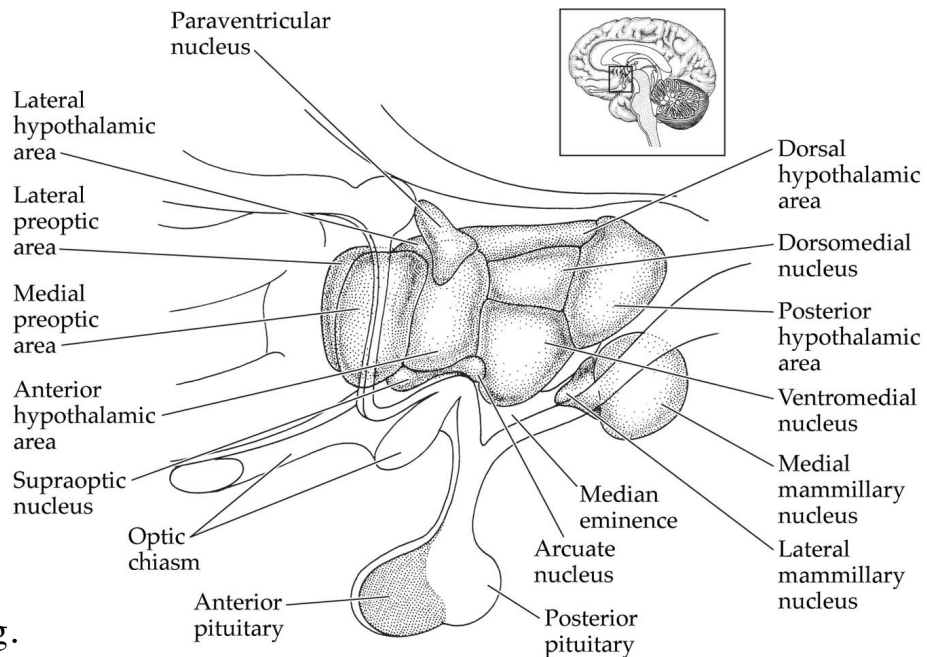
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Main endocrine glands



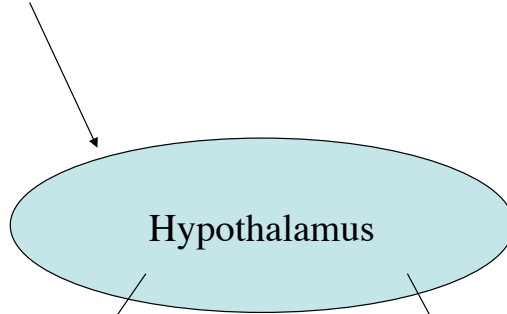
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Hypothalamus



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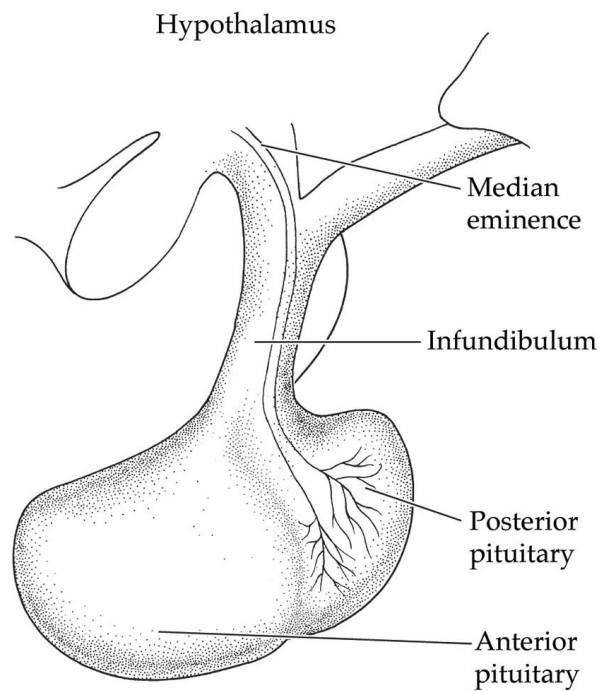
Neural inputs
Environmental inputs



Releasing Hormones/Factors

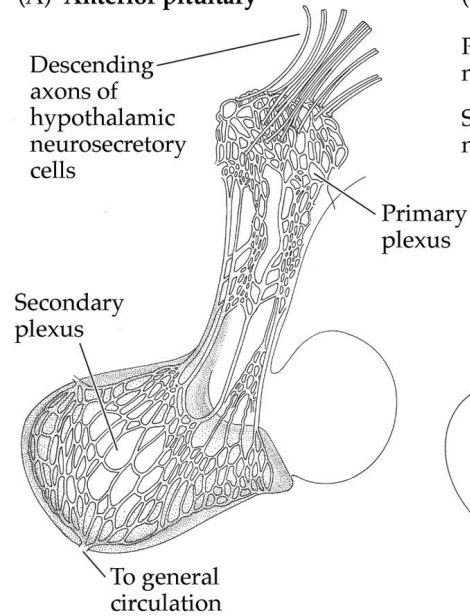
Inhibiting Hormones/Factors

Pituitary

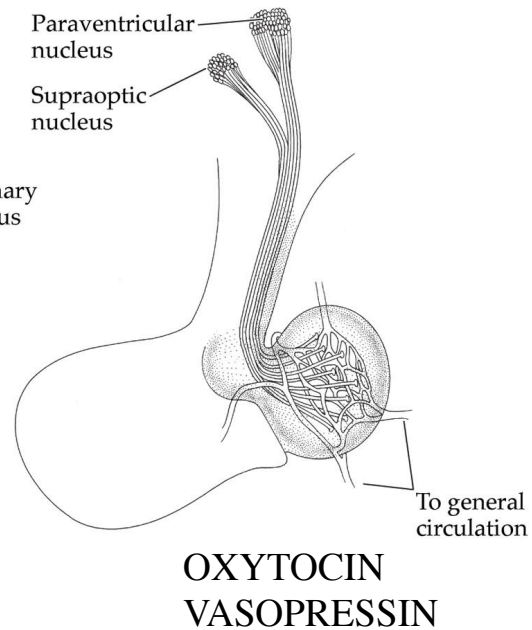


Divisions

(A) Anterior pituitary



(B) Posterior pituitary



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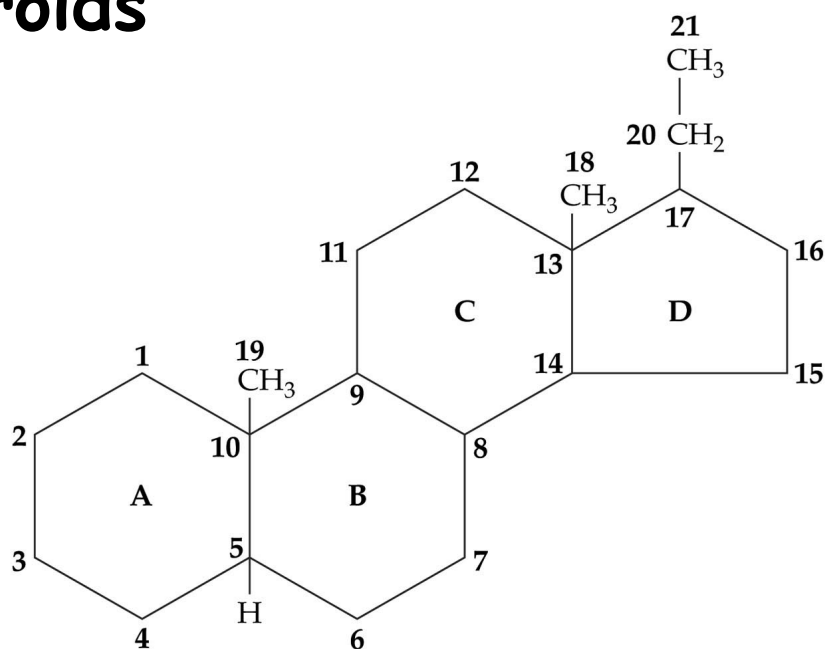
Hormones and Receptors

- What do Hs and Rs look like?
- How are they made?
- How do they act?

Two main classes of Hs

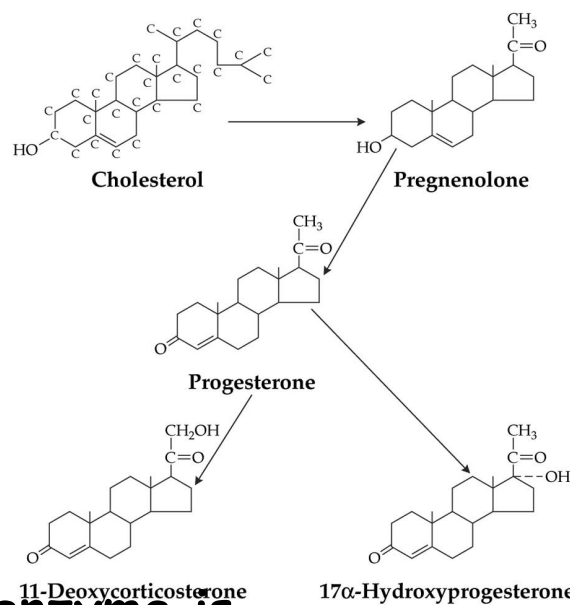
Steroids
Proteins

Steroids



Features

- Lipid soluble - pass through cell membranes
- Relatively long-lasting/slow

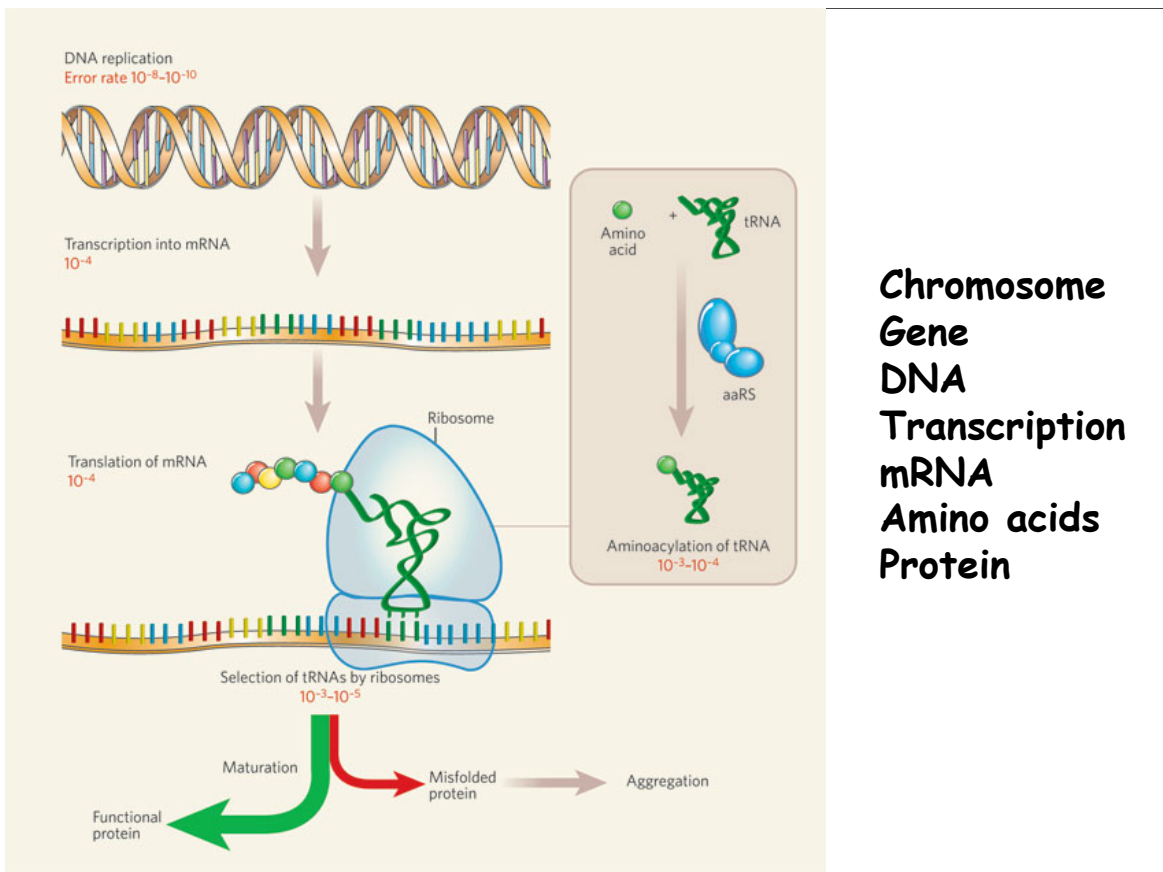
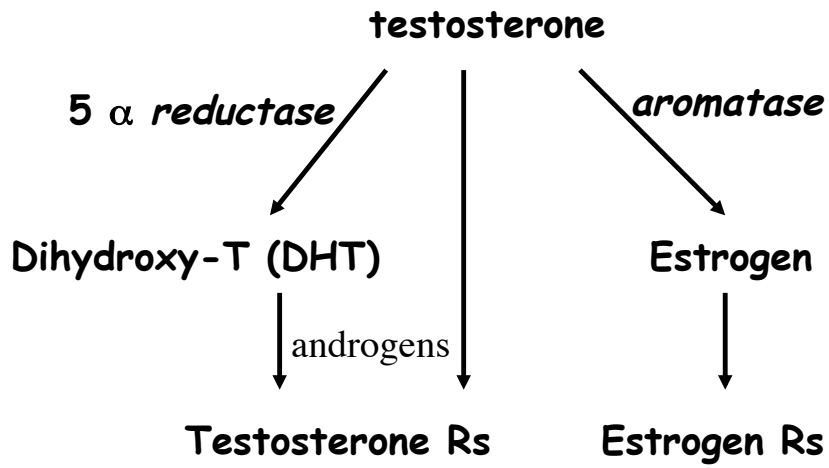


How made?

Enzymes convert
What happens if enzyme is
deficient (e.g., gene mutation)?

How metabolized?

Interesting conversions (memorize)



Peptide/Protein Hs

TRH

pGLU-HIS-PRO-NH₂

Thyrotropin releasing hormone
Gonadotropin

GnRH

1 3 10
pGlu-His-Trp-Ser-Tyr-Gly-Leu-Arg-Pro-Gly-NH₂

Somatostatin

1 ┌──┐ 14
Ala-Gly-Cys-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Phe-Thr-Ser-Cys

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Can also be similar

Oxytocin

┌──────────────────────────────────┐
Cys-Tyr-Ile-Gln-Asn-Cys-Pro-Leu-Gly-NH₂
1 2 3 4 5 6 7 8 9

But not convertible – could have some effects on same receptor, though

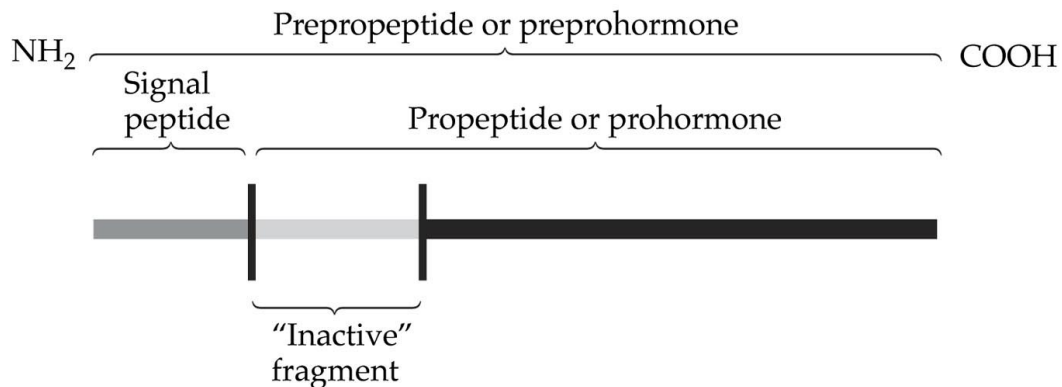
Vasopressin

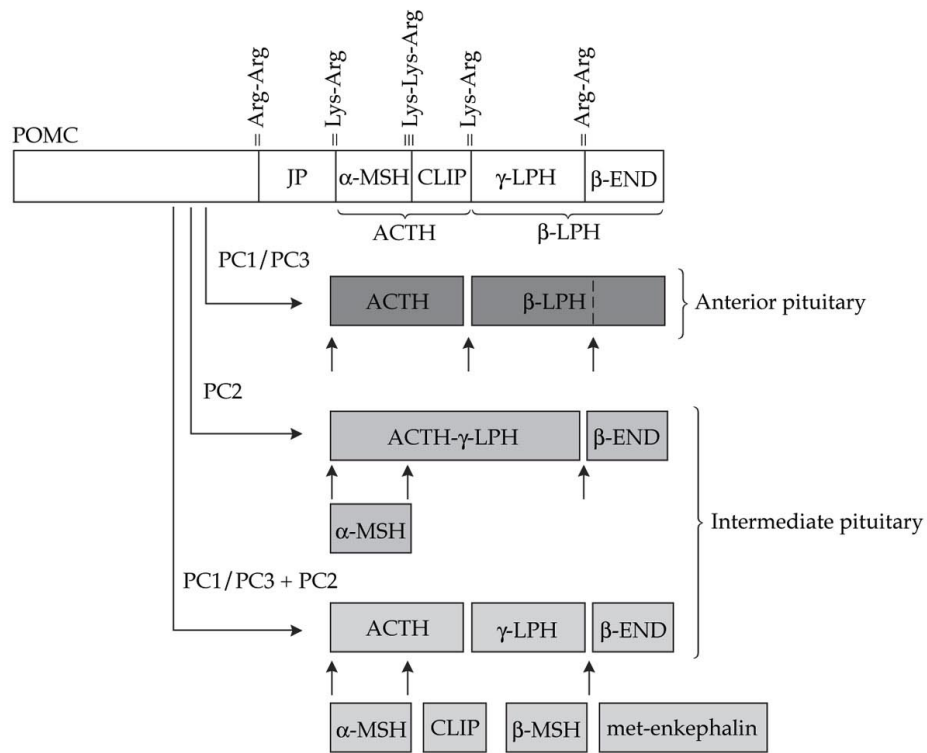
┌──────────────────────────────────┐
Cys-Tyr-Phe-Gln-Asn-Cys-Pro-Arg-Gly-NH₂
1 2 3 4 5 6 7 8 9

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Evolutionary changes (GnRH)

	1	2	3	4	5	6	7	8	9	10	
Mammal	pGlu	-His	-Trp	-Ser	-Tyr	-Gly	-Leu	-Arg	-Pro	-Gly	-NH ₂
Chicken I	pGlu	-His	-Trp	-Ser	-Tyr	-Gly	-Leu	-Gln	-Pro	-Gly	-NH ₂
Catfish	pGlu	-His	-Trp	-Ser	-His	-Gly	-Leu	-Asn	-Pro	-Gly	-NH ₂
Chicken II	pGlu	-His	-Trp	-Ser	-His	-Gly	-Trp	-Tyr	-Pro	-Gly	-NH ₂
Dogfish	pGlu	-His	-Trp	-Ser	-His	-Gly	-Trp	-Leu	-Pro	-Gly	-NH ₂
Salmon	pGlu	-His	-Trp	-Ser	-Tyr	-Gly	-Trp	-Leu	-Pro	-Gly	-NH ₂
Lamprey	pGlu	-His	-Tyr	-Ser	-Leu	-Glu	-Trp	-Lys	-Pro	-Gly	-NH ₂





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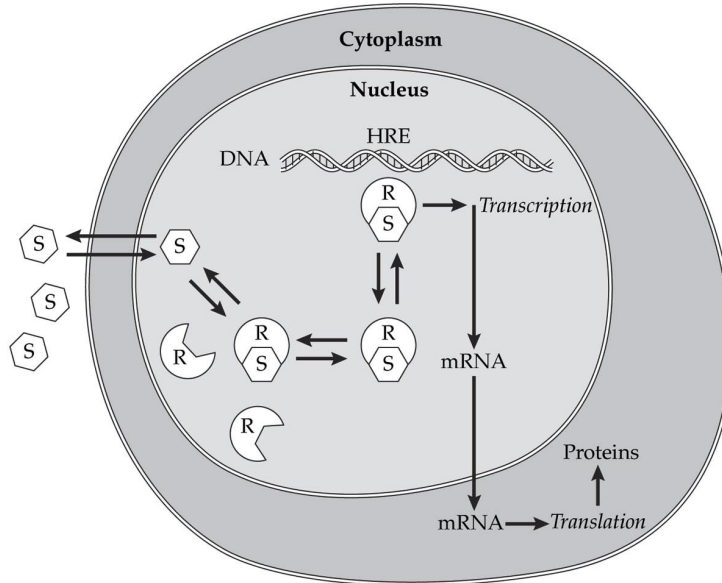
Bind to Receptors (Rs)

- In nucleus
- On membrane

Steroids

Binding proteins

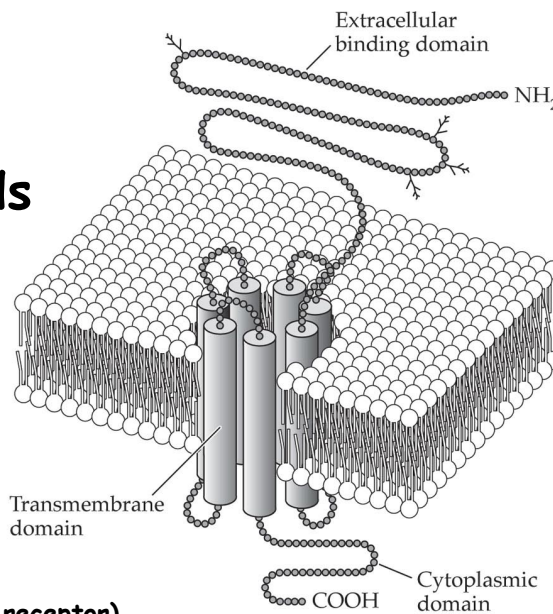
ER alpha
ER beta



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Receptor

- Most peptide Hs
- Big
- Faster acting
- (GPR30 is membrane estrogen receptor)



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- How is the R made?
- Does it vary between individuals?
 - Mutations
 - Polymorphisms (SNPs)

Oxytocin Receptor Polymorphisms

Variable	Minor Allele	Minor Allele Frequency	# Obs	Hardy-Weinberg	SNP Position	Position
rs75775	T	0.169	645	0.785	8795732	5'
rs4686302	T	0.135	676	0.858	8784222	exon 3
rs237897	A	0.405	660	0.414	8783285	intron 3
rs53576	A	0.347	645	0.328	8779371	intron 3
rs2254298	A	0.088	674	0.366	8777228	intron 3
rs2268493	C	0.348	664	0.908	8775840	intron 3
rs237887	G	0.380	665	0.242	8772042	intron 3
rs1042778	T	0.412	642	0.630	8769545	exon 4/3utr
rs7632287	A	0.264	663	0.716	8766446	3'

Notes: Tests of Hardy-Weinberg conducted using likelihood ratio tests using only a sample of genetically selected if genotypic data was available for both twins).

doi:10.1371/journal.pone.0011153.t001

<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0011153>

Testosterone/androgen receptor

- CAG repeats
- Most people have ~20
- Receptor less effective with more repeats

Some variation in hormone sequence

Fertil Steril. 1997 Jun;67(6):998-1004.

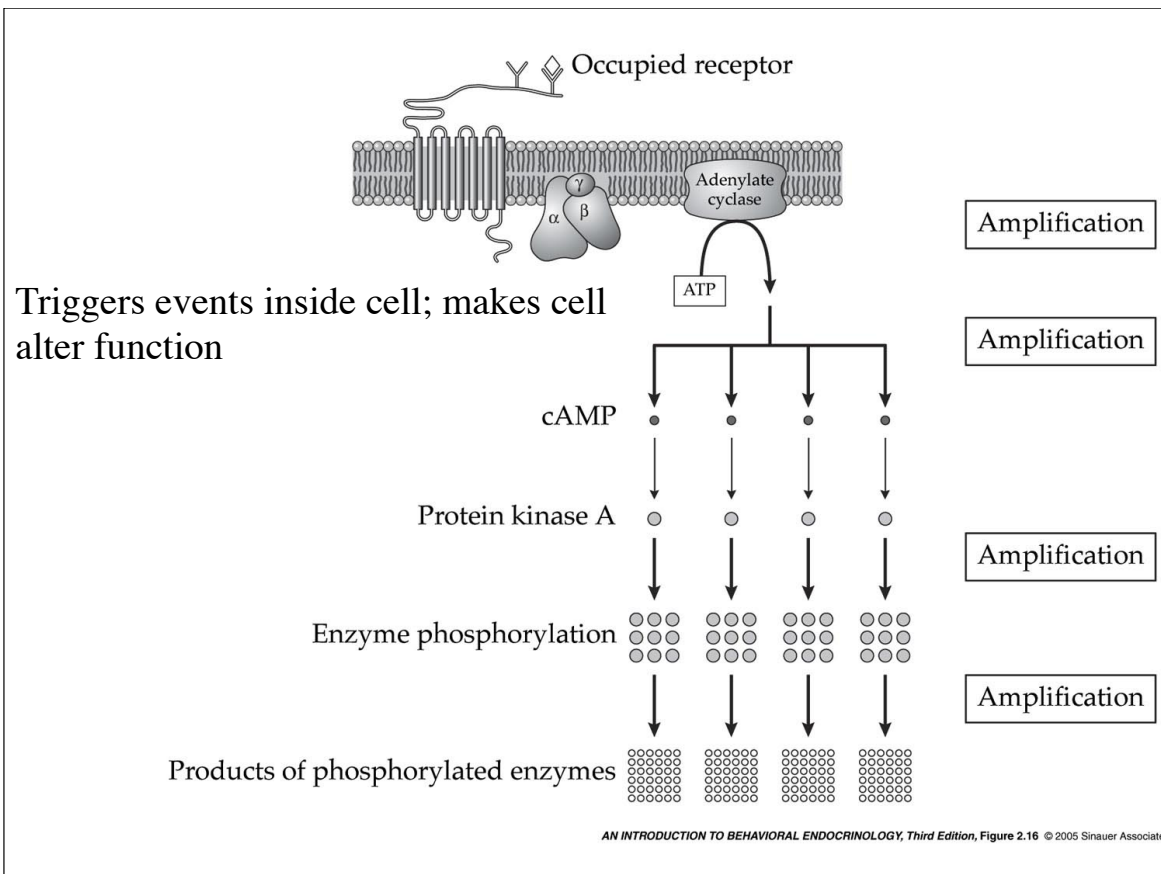
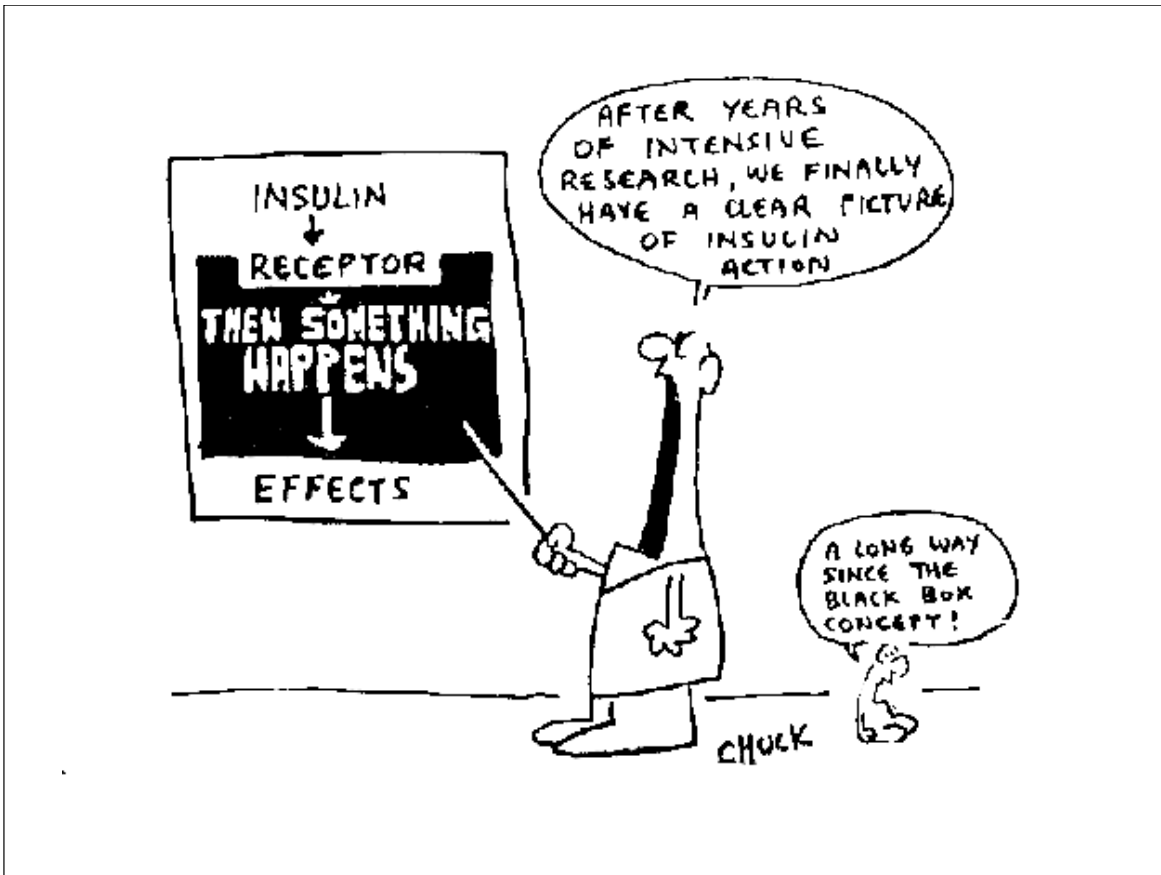
Worldwide frequency of a common genetic variant of luteinizing hormone: an international collaborative research. International Collaborative Research Group.

Nilsson C, Pettersson K, Millar RP, Coerver KA, Matzuk MM, Huhtaniemi IT.

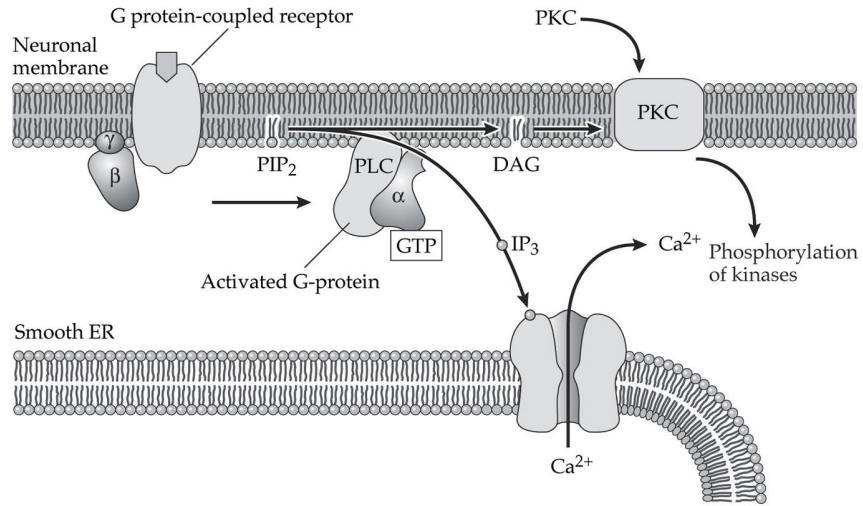
Department of Biotechnology, University of Turku, Finland.

RESULT(S): The carrier frequency of the variant LH beta allele varied from 7.1% in U.S. Hispanics to 41.9% in Lapps of northern Finland. The variant LH beta allele tended to be more common in populations from Northern Europe as compared with those from Asia.

CONCLUSION(S): The high frequency of the LH beta variant worldwide makes it an important confounding factor when obtaining disproportionately low LH levels with some immunometric assays. The LH variant may contribute to some pathologies of the pituitary-gonadal function.



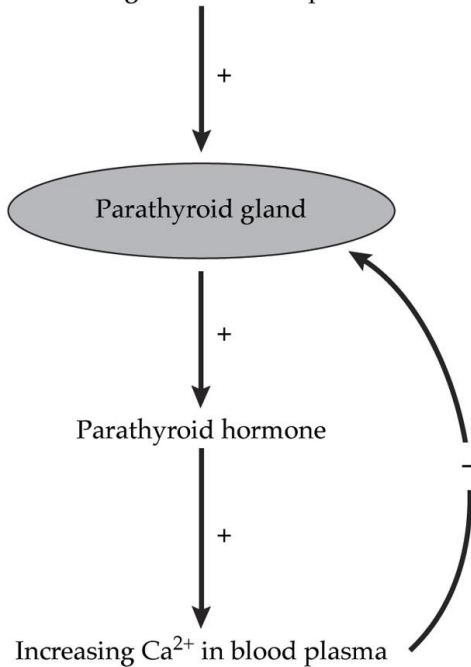
- **Multiple cell-signaling mechanisms**

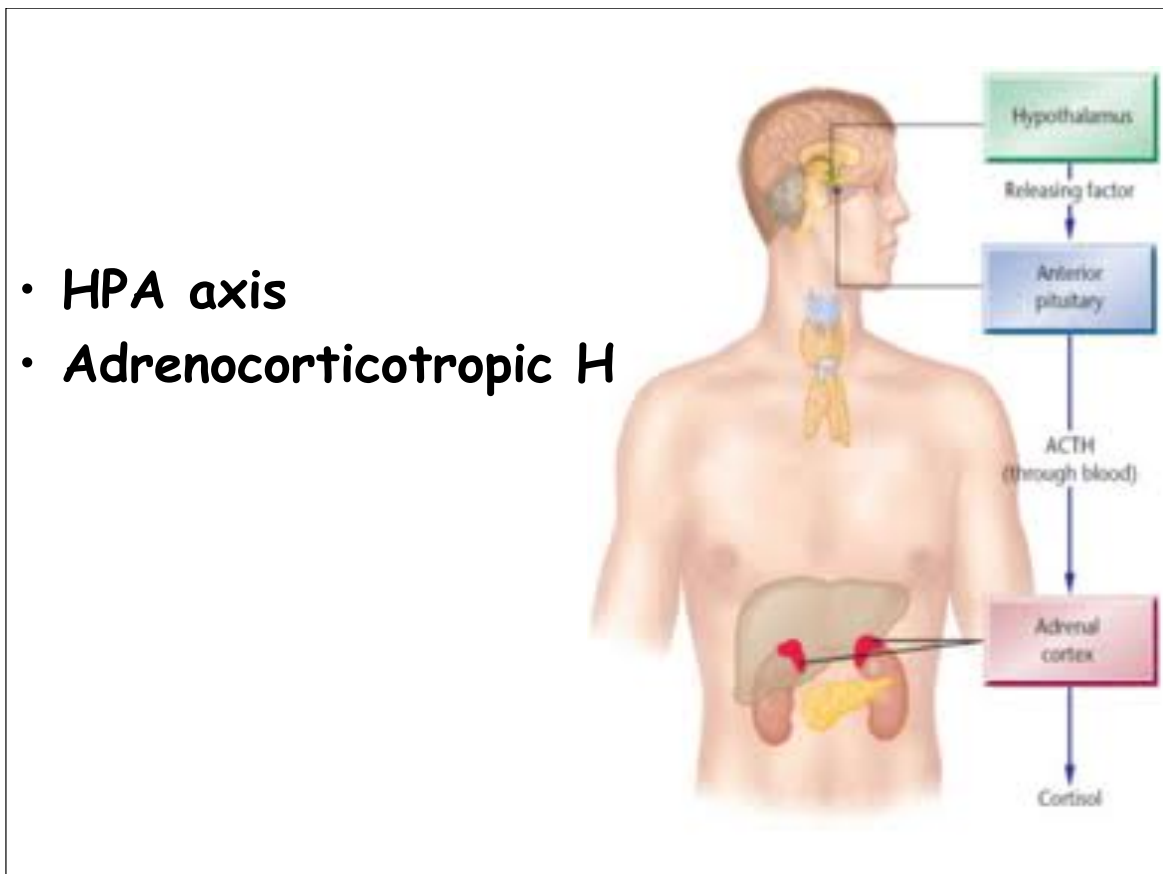
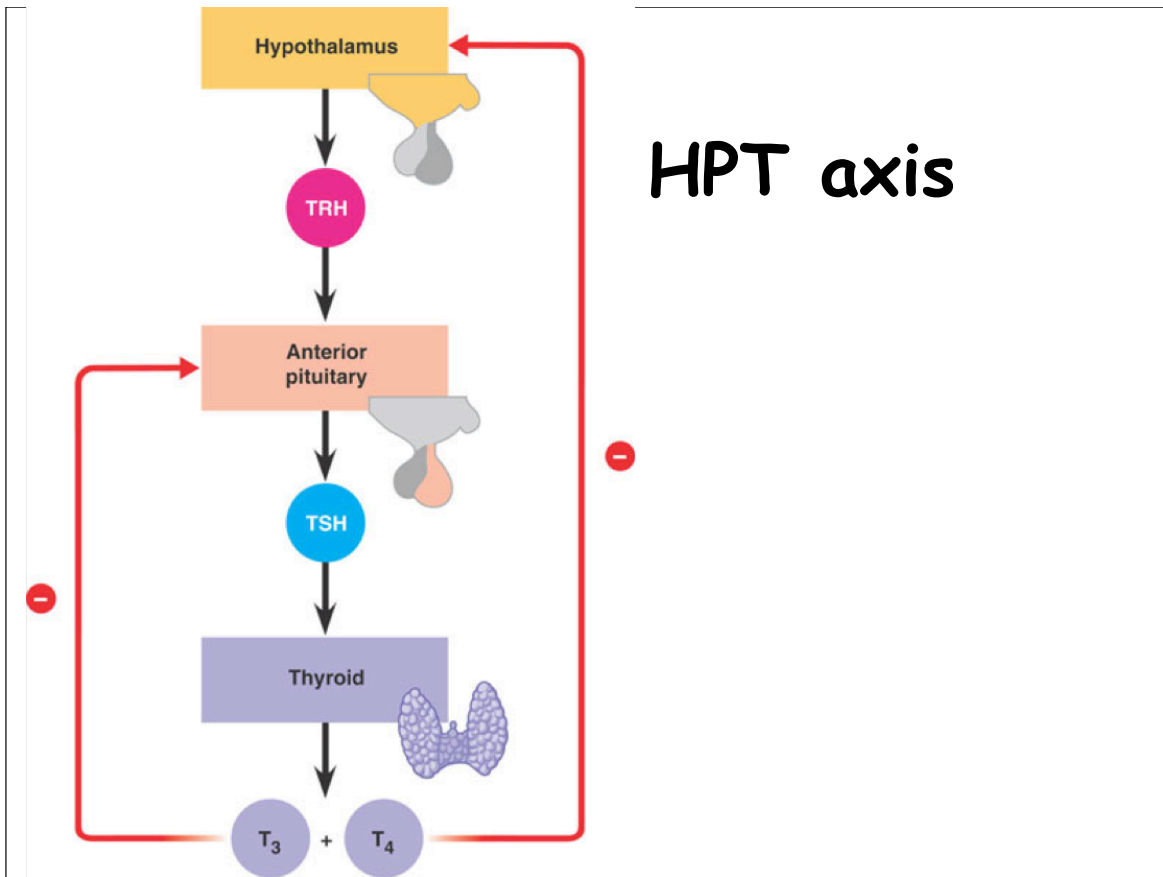


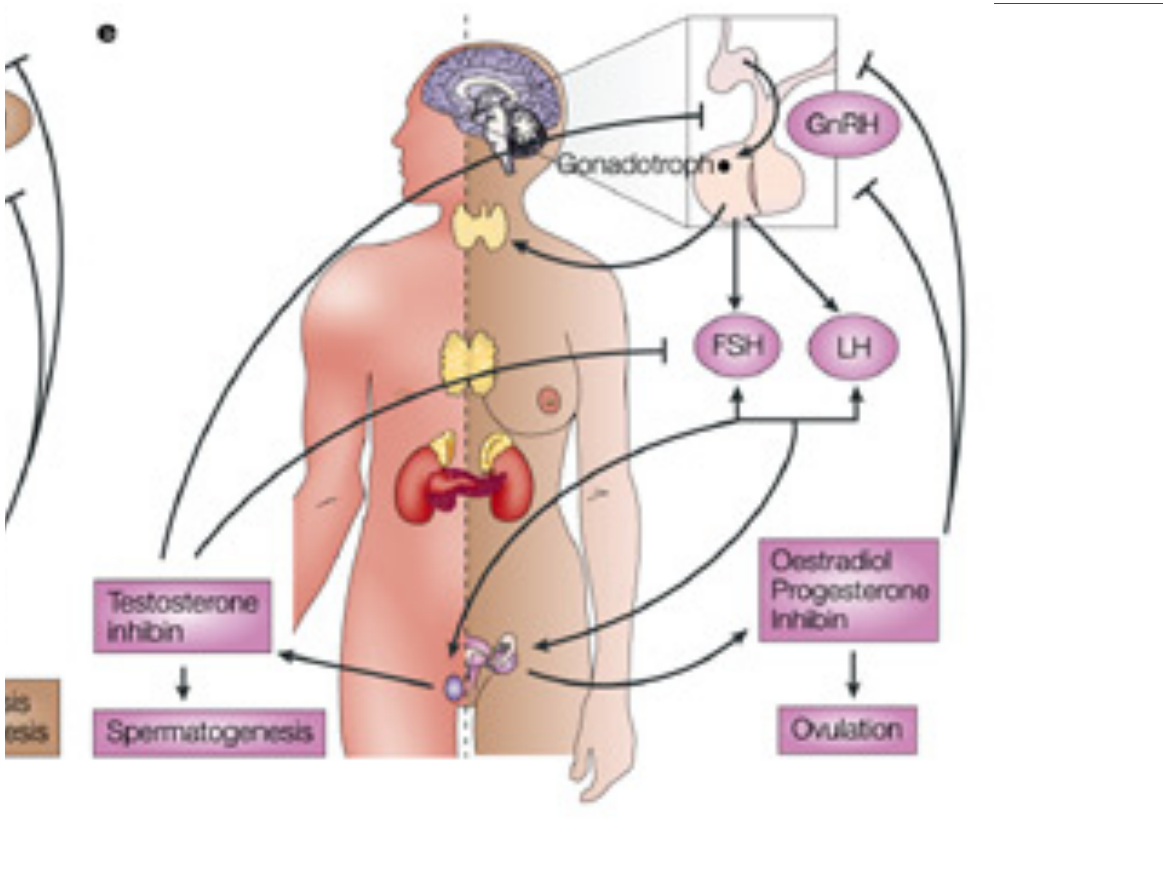
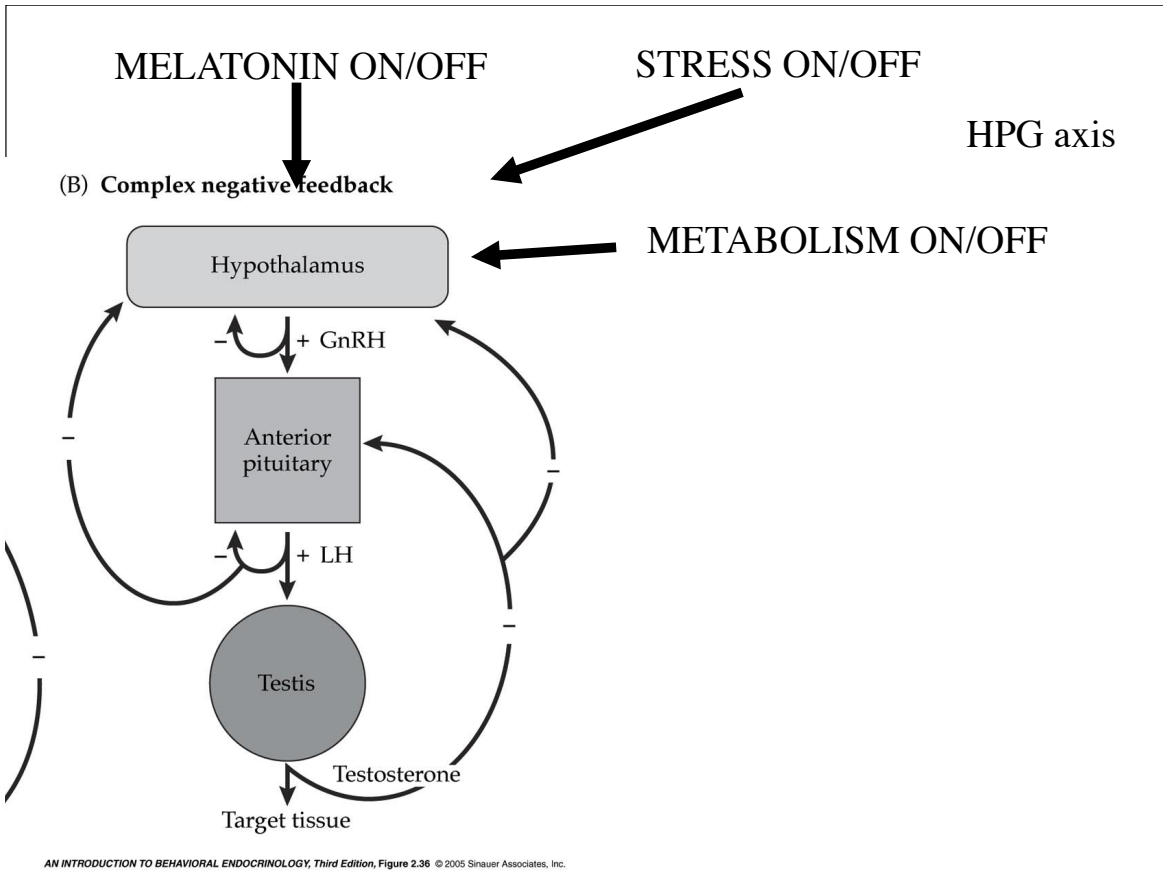
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(A) Simple negative feedback

Decreasing Ca²⁺ in blood plasma







Hormones and Receptors

- Pairing between signal and receiver
- Synthesis and processing of Hs
- Regulation of Hs. Receptors TOO!
- Many are closely related