

Gonadotropin

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(Redirected from Gonadotropins)

Gonadotropins (or **glycoprotein hormones**) are protein hormones secreted by gonadotrope cells of the pituitary gland of vertebrates.^{[1][2][3]} This is a family of proteins, which include the mammalian hormones follitropin (FSH), lutropin (LH), placental chorionic gonadotropins hCG and eCG^[4] and chorionic gonadotropin (CG), as well as at least two forms of fish gonadotropins. These hormones are central to the complex endocrine system that regulates normal growth, sexual development, and reproductive function.^[5] The hormones LH and FSH are secreted by the anterior pituitary gland, while hCG and eCG are secreted by the placenta.^[6]

Gonadotropin is sometimes abbreviated *Gn*. The British spelling is *gonadotrophin*.

Contents

- 1 Natural types and subunit structure
- 2 Mechanism
- 3 Diseases
- 4 Pharmacologic preparations
- 5 References
- 6 External links

Natural types and subunit structure

The two principal gonadotropins in vertebrates are luteinizing hormone (LH) and follicle-stimulating hormone (FSH), although primates produce a third gonadotropin called chorionic gonadotropin (CG). LH and FSH are heterodimers consisting of two peptide chains, an alpha chain and a beta chain. LH and FSH share nearly identical alpha chains (about 100 amino acids long), whereas the beta chain provides specificity for receptor interactions. These subunits are heavily modified by glycosylation.

The alpha subunit is common to each protein dimer (well conserved within species, but differing between them^[5]), and a unique beta subunit, which confers biological specificity.^[4] The alpha chains are highly conserved proteins of about 100 amino acid residues which contain ten conserved cysteines all involved in disulfide bonds,^[7] as shown in the following schematic representation.

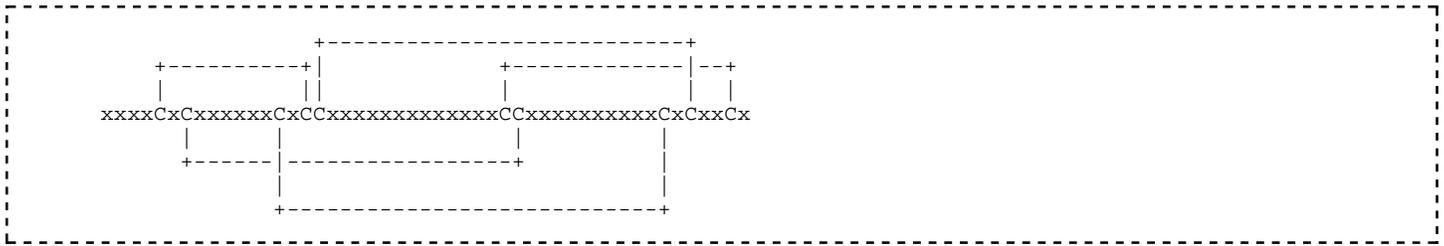
Glycoprotein hormone

Identifiers

Symbol	Hormone_6
Pfam	PF00236 (http://pfam.sanger.ac.uk/family?acc=PF00236)
InterPro	IPR000476 (http://www.ebi.ac.uk/interpro/DisplayIproEntry?ac=IPR000476)
PROSITE	PDOC00623 (http://www.expasy.org/cgi-bin/prosite-search-ac?PDOC00623)
SCOP	1hcn (http://scop.mrc-lmb.cam.ac.uk/scop/search.cgi?tlev=fa;&pdb=1hcn)
OPM protein	1fl7 (http://opm.phar.umich.edu/protein.php?search=1fl7)

Available protein structures:

Pfam	structures (http://pfam.sanger.ac.uk/family/PF00236#tabview=tab9)
PDB	RCSB PDB (http://www.rcsb.org/pdb/search/smartSubquery.do?smartSearchSubtype=PfamIdQuery&pfamID=PF00236) ; PDBe (http://www.ebi.ac.uk/pdbe-srv/view/search?PFAM_domain=PF00236&id_type=PFAM_domain&id_value=PF00236&search_type=advanced)
PDBsum	structure summary (http://www.ebi.ac.uk/thornton-srv/databases/cgi-bin/pdbsum/GetPfamStr.pl?pfam_id=PF00236)



'C': conserved cysteine involved in a disulphide bond.

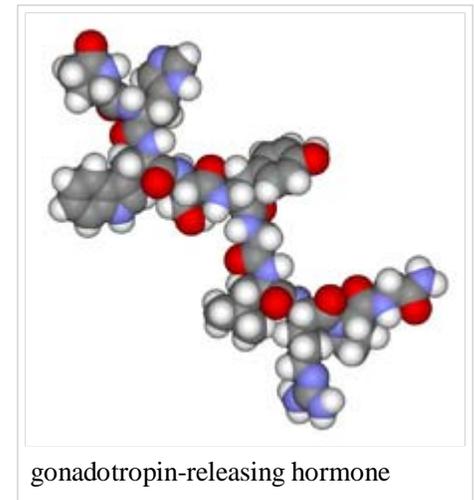
Intracellular levels of free alpha subunits are greater than those of the mature glycoprotein, implying that hormone assembly is limited by the appearance of the specific beta subunits, and hence that synthesis of alpha and beta is independently regulated.^[4]

Another human gonadotropin is human chorionic gonadotropin (hCG), produced by the placenta during pregnancy.

Mechanism

Gonadotropin receptors are embedded in the surface of the target cell membranes and coupled to the G-protein system. Signals triggered by binding to the receptor are relayed within the cells by the cyclic AMP second messenger system.

Gonadotropins are released under the control of gonadotropin-releasing hormone (GnRH) from the arcuate nucleus and preoptic area of the hypothalamus. The gonads — testes and ovaries — are the primary target organs for LH and FSH. The gonadotropins affect multiple cell types and elicit multiple responses from the target organs. As a simplified generalization, LH stimulates the Leydig cells of the testes and the theca cells of the ovaries to produce testosterone (and indirectly estradiol), whereas FSH stimulates the spermatogenic tissue of the testes and the granulosa cells of ovarian follicles.



gonadotropin-releasing hormone

Diseases

Gonadotropin deficiency due to pituitary disease results in hypogonadism, which can lead to infertility. Treatment includes administered gonadotropins, which, therefore, work as fertility medication. Such can either be produced by extraction and purification from urine or be produced by recombinant DNA.

Failure or loss of the gonads usually results in elevated levels of LH and FSH in the blood.

Pharmacologic preparations

Main article: Gonadotropin preparations

There are various preparations of gonadotropins for therapeutic use, mainly as fertility medication. For example, the so called menotropins (also called *human menopausal gonadotropins*) consist of LH and FSH extracted from human urine from menopausal women.^[8] There are also recombinant variants.

References

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- [^] ^a ^b ^c Goodwin RG, Moncman CL, Rottman FM, Nilson JH (1983). "Characterization and nucleotide sequence of the gene for the common alpha subunit of the bovine pituitary glycoprotein hormones" (http://www.pubmedcentral.nih.gov/articlerender.fcgi?tool=pmcentrez&artid=326420) . *Nucleic Acids Res.* **11** (19): 6873–6882. doi:10.1093/nar/11.19.6873 (http://dx.doi.org/10.1093%2Fnar%2F11.19.6873) . PMC 326420 (http://www.pubmedcentral.gov/articlerender.fcgi?tool=pmcentrez&artid=326420) . PMID 6314263 (http://www.ncbi.nlm.nih.gov/pubmed/6314263) . http://www.pubmedcentral.nih.gov/articlerender.fcgi?tool=pmcentrez&artid=326420.
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- [^] Isaacs NW, Laphorn AJ, Harris DC, Littlejohn A, Lustbader JW, Canfield RE, Machin KJ, Morgan FJ (1994). "Crystal structure of human chorionic gonadotropin". *Nature* **369** (6480): 455–461. doi:10.1038/369455a0 (http://dx.doi.org/10.1038%2F369455a0) . PMID 8202136 (http://www.ncbi.nlm.nih.gov/pubmed/8202136) .
- [^] MeSH *Menotropins* (http://www.nlm.nih.gov/cgi/mesh/2011/MB_cgi?mode=&term=Menotropins)

External links

- MeSH *Gonadotropins* (http://www.nlm.nih.gov/cgi/mesh/2011/MB_cgi?mode=&term=Gonadotropins)
- *Gonadotropin* (http://www.emedicinehealth.com/script/main/srchcont_dict.asp?src=Gonadotropin) at eMedicine Dictionary
- 10th International Symposium on GnRH (http://www.kenes.com/gnrh)

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Categories: Peptide hormones | Hormones of the hypothalamus-pituitary-gonad axis

| Reproductive system

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