

**6 REFERENCES**

- Aarons EJ, Beddows S, Willingham T, Wu L, and Koup, RA. Adaptation to blockade of human immunodeficiency virus type 1 entry imposed by the anti-CCR5 monoclonal antibody 2D7 2001 Virology 287, 382-390
- Abagyan R., Totrov M., Kuznetsov D. ICM-A new Method for protein Modeling and Design.Applications to Docking and structure Prediction from the Distorted native Conformation. 1994 J. Comp. Chem. 15, 488-506
- Abagyan RA, Totrov M, Ab initio folding of peptides by the optimal-bias monte-Carlo minimization procedure. J Comp Phys, 1999, 151:402-421
- Abagyan R., Totrov M, High-throughput docking for lead generation, 2001 Curr. Opin. Chem. Biol., 5, 375-382
- Ascoli M, Fanelli F, Segaloff DL. The Lutropin/Choriogonadotropin Receptor, A 2002 Perspective. 2002 Endocr Rev. 23:141-74
- Ballesteros JA, Weinstein H Integrated Methods for the Construction of Three-Dimensional Models and Computational Probing of Structure-Function Relationships in G-Protein Coupled Receptors. 1995 Methods Neurosci. 25, 366-428
- Berman HM, Westbrook J, Feng Z, Gilliland G, T.N. Bhat TN, H. Weissig H, Shindyalov IN, Bourne PE: [The Protein Data Bank](#). 2000 Nucleic Acids Research, 28, 235-242
- Berridge M.J. Rapid accumulation of inositol trisphosphate reveals that agonists hydrolyse polyphosphoinositides instead of phosphatidylinositol. 1983 Biochem J 212, 849-858
- Bhowmick N, Huang J, Puett D, Isaacs NW, Lapthorn AJ. Determination of residues important in hormone binding to the extracellular domain of the luteinizing hormone/chorionic gonadotropin receptor by site-directed mutagenesis and modeling. 1996 Mol Endocrinol. 10,1147-59
- Biebermann H, Schoneberg T, Schulz A, Krause G, Gruters A, Schultz G, Gudermann T. A conserved tyrosine residue (Y601) in transmembrane domain 5 of the human thyrotropin receptor serves as a molecular switch to determine G-protein coupling. 1998 FASEB J. 12, 1461-71
- Blanpain C, Doranz BJ, Vakili J, Rucker J, Govaerts C, Baik SS, Lorthioir O, Migeotte I, Libert F, Baleux F, Vassart G, Doms RW, Parmentier M. Multiple charged and aromatic residues in CCR5 amino-terminal domain are involved in high affinity binding of both chemokines and HIV-1 Env protein. 1999 J Biol Chem. 274, 34719-27
- Bond RA, Ijzerman AP. Recent developments in constitutive receptor activity and inverse agonism, and their potential for GPCR drug discovery. 2006 Trends Pharmacol Sci. 27, 92-6

Bozon V, Couture L, Pajot-Augy E, Richard F, Remy JJ, Salesse R. Rescue of intracellularly trapped lutropin receptor exodomain by endodomain and reconstitution of a functional membrane receptor: interaction between exo- and endodomains. 2002 Protein Expr Purif. 25,114-23

Braun T, Schofield PR, Sprengel R. Amino-terminal leucine-rich repeats in gonadotropin receptors determine hormone selectivity. 1991 EMBO J. 10, 1885-90

Camacho P, Gordon D, Chiefari E, Yong S, DeJong S, Pitale S, Russo D, Filetti S. A Phe 486 thyrotropin receptor mutation in an autonomously functioning follicular carcinoma that was causing hyperthyroidism. 2000 Thyroid 10, 1009-1012

Case DA, Pearlman DA, Caldwell JW, Cheatham III TE, Wang J, Ross WS, Simmerling CL, Darden TA, Merz K.M, Stanton RV, Cheng AL, Vincent JJ, Crowley M, Tsui V, Gohlke H, Radmer RJ, Duan Y, Pitera J, Massova I, Seibel GL, Singh UC, Weiner PK and Kollman PA. AMBER 7. 2002 University of California, San Francisco

Chazenbalk GD, Tanaka K, Nagayama Y, Kakinuma A, Jaume JC, McLachlan SM, Rapoport B. Evidence that the thyrotropin receptor ectodomain contains not one, but two, cleavage sites. 1997 Endocrinology 138, 2893-9

Chazenbalk GD, McLachlan SM, Chen CR, Rapoport B. Insight into thyrotropin receptor cleavage by engineering the single polypeptide chain luteinizing hormone receptor into a cleaving, two subunit receptor. 2001 Eur J Biochem. 268, 2261-9

(a) Chen CR, Chazenbalk GD, McLachlan SM, Rapoport B. Evidence that the C terminus of the A subunit suppresses thyrotropin receptor constitutive activity. 2003 Endocrinology. 144, 3821-7

(b) Chen CR, Chazenbalk GD, McLachlan SM, Rapoport B. Targeted restoration of cleavage in a noncleaving thyrotropin receptor demonstrates that cleavage is insufficient to enhance ligand-independent activity. 2003 Endocrinology 144, 1324-30

Chen CR, Chazenbalk GD, Wawrowsky KA, McLachlan SM, Rapoport B. Evidence that human thyroid cells express uncleaved, single-chain thyrotropin receptors on their surface. 2006 Endocrinology. 147, 3107-13

Ciullo I, Latif R, Graves P, Davies TF. Functional assessment of the thyrotropin receptor-beta subunit. 2003 Endocrinology 144, 3176-81

Claus M, Maier J, Paschke R, Kujat C, Stumvoll M, Fuhrer D. Novel Thyrotropin Receptor Germline Mutation (Ile568Val) in a Saxonian Family with Hereditary Nonautoimmune Hyperthyroidism. 2005 Thyroid 15, 1089-94

Claus M, Neumann S, Kleinau G, Krause G, Paschke R. Structural determinants for G-protein activation and specificity in the third intracellular loop of the TSH receptor. 2005 Endocrinology 146, 5197-203

Costagliola S, Panneels V, Bonomi M, Koch J, Many MC, Smits G, Vassart G, Tyrosine sulfation is required for agonist recognition by glycoprotein hormone receptors, 2002 EMBO J. 21, 504-13

Costagliola S, Urizar E, Mendive F, Vassart G. Specificity and promiscuity of gonadotropin receptors. 2005 Reproduction 130, 275-81

Costanzi S, Mamedova L, Gao ZG, Jacobson KA. Architecture of P2Y nucleotide receptors: structural comparison based on sequence analysis, mutagenesis, and homology modeling. 2004 J. Med. Chem. 47, 5393-5404

Cotecchia S, Fanelli F, Costa T Constitutively active G protein-coupled receptor mutants: implications on receptor function and drug action. 2003 Assay Drug Dev Technol. 1, 311-6

(a) Couet J, Sar S, Jolivet A, Hai MT, Milgrom E, Misrahi M. Shedding of human thyrotropin receptor ectodomain. Involvement of a matrix metalloprotease. 1996 J Biol Chem. 271, 4545-52

(b) Couet J, de Bernard S, Loosfelt H, Saunier B, Milgrom E, Misrahi M. Cell surface protein disulfide-isomerase is involved in the shedding of human thyrotropin receptor ectodomain. 1996 Biochemistry 35, 14800-5

Couture L, Remy JJ, Rabesona H, Troalen F, Pajot-Augy E, Bozon V, Haertle T, Bidart JM, Salesse R. A defined epitope on the human choriogonadotropin alpha-subunit interacts with the second extracellular loop of the transmembrane domain of the lutropin/choriogonadotropin receptor. 1996 Eur J Biochem. 241, 627-32

Davies TF, Ando T, Lin RY, Tomer Y, Latif R. Thyrotropin receptor-associated diseases: from adenomata to Graves disease. 2005 J Clin Invest. 115, 1972-83

de Roux N, Misrahi M, Brauner R, Houang M, Carel JC, Granier M, Le Bouc Y, Ghinea N, Boumedienne A, Toublanc JE, Milgrom E, Four families with loss of function mutations of the thyrotropin receptor. 1996 J Clin Endocrinol Metab. 81, 4229-35

Dragic, T., Trkola, A., Lin, S. W., Nagashima, K. A., Kajumo, F., Zhao, L., Olson, W. C., Wu, L., Mackay, C. R., Allaway, G. P., Sakmar, T. P., Moore, J. P., and Maddon, P. J. 1998 J. Virol. 72, 279-285

Dufau ML. The luteinizing hormone receptor. 1998 Annu Rev Physiol. 60, 461-96

Duprez L, Parma J, Costagliola S, Hermans J, Van Sande J, Dumont JE, Vassart G, Constitutive activation of the TSH receptor by spontaneous mutations affecting the N-terminal extracellular domain, 1997 FEBS Lett. 409, 469-74

Enkhbayar P, Kamiya M, Osaki M, Matsumoto T, Matsushima N. Structural Principles of Leucine-Rich Repeat (LRR) Proteins. 2003 Proteins: Structure, Function, and Bioinformatics 54, 394-403

(a) Fan QR, Hendrickson WA Structure of human follicle-stimulating hormone in complex with its receptor. 2005 Nature 433, 203-4

(b) Fan QR, Hendrickson WA. Structural biology of glycoprotein hormones and their receptors. 2005 Endocrine. 26, 179-88

Fan QR, Hendrickson WA, Assembly and structural characterization of an authentic complex between human follicle stimulating hormone and a hormone-binding ectodomain of its receptor. 2007 Mol Cell Endocrinol. 260-262, 73-82

Farzan M, Schnitzler CE, Vasilieva N, Leung D, Kuhn J, Gerard C, Gerard NP, Choe H. Sulfated tyrosines contribute to the formation of the C5a docking site of the human C5a anaphylatoxin receptor. 2001 J Exp Med. 193, 1059-66

(a) Fernandez LM, Puett D. Lys583 in the third extracellular loop of the lutropin/choriogonadotropin receptor is critical for signaling. 1996 J Biol Chem 271, 925-930

(b) Fernandez LM, Puett D. Additions and Corrections to Lys583 in the third extracellular loop of the lutropin/choriogonadotropin receptor is critical for signaling. 1996 J Biol Chem 271, 13925B-13926

Fricke-Otto S, Pfarr N, Muhlenberg R, Pohlenz J. Mild Congenital Primary Hypothyroidism in a Turkish Family Caused by a Homozygous Missense Thyrotropin Receptor (TSHR) Gene Mutation (A593 V). 2005 Exp Clin Endocrinol Diabetes 113, 582-5

Führer D, Holzapfel HP, Wonerow P, Scherbaum WA, Paschke R, Somatic mutations in the thyrotropin receptor gene and not in the Gs alpha protein gene in 31 toxic thyroid nodules. 1997 J Clin Endocrinol Metab. 82, 3885-91

Gilchrist RL, Ryu KS, Ji I, Ji TH. The luteinizing hormone/chorionic gonadotropin receptor has distinct transmembrane conductors for cAMP and inositol phosphate signals. 1996 J Biol Chem 271, 19283-19287

Graves PN, Vlase H, Davies TF. Folding of the recombinant human thyrotropin (TSH) receptor extracellular domain: identification of folded monomeric and tetrameric complexes that bind TSH receptor autoantibodies. 1995 Endocrinology 136, 521-7

Graves PN, Vlase H, Bobovnikova Y, Davies TF. Multimeric complex formation by the thyrotropin receptor in solubilized thyroid membranes. 1996 Endocrinology 137, 3915-20

Gromoll J, Schulz A, Borta H, Gudermann T, Teerds KJ, Greschniok A, Nieschlag E, Seif FJ. Homozygous mutation within the conserved Ala-Phe-Asn-Glu-Thr motif of exon 7 of the LH receptor causes male pseudohermaphroditism. 2002 Eur J Endocrinol. 147, 597-608

Gromoll J, Wistuba J, Terwort N, Godmann M, Muller T, Simoni M. A new subclass of the luteinizing hormone/chorionic gonadotropin receptor lacking exon 10 messenger RNA in the New World monkey (Platyrrhini) lineage. 2003 Biol Reprod. 69, 75-80

Govaerts C, Lefort A, Costagliola S, Wodak SJ, Ballesteros JA, Van Sande J, Pardo L, Vassart G. A conserved Asn in transmembrane helix 7 is an on/off switch in the activation of the thyrotropin receptor. 2001 J Biol Chem. 276, 22991-9

He XL, Bazan JF, McDermott G, Park JB, Wang K, Tessier-Lavigne M, He Z, Garcia KC. Structure of the Nogo receptor ectodomain: a recognition module implicated in myelin inhibition. 2003 Neuron 38, 177-185

Hearn MT, Gomme PT. Molecular architecture and biorecognition processes of the cystine knot protein superfamily: part I. The glycoprotein hormones. 2000 J Mol Recognit. 13, 223-78

Herold CL, Qi AD, Harden TK, Nicholas RA. Agonist versus antagonist action of ATP at the P2Y4 receptor is determined by the second extracellular loop. 2004 J Biol Chem. 279, 11456-64

Ho SC, Van Sande J, Lefort A, Vassart G, Costagliola S. Effects of mutations involving the highly conserved S281HCC motif in the extracellular domain of the thyrotropin (TSH) receptor on TSH binding and constitutive activity. 2001 Endocrinology 142, 2760-2767

Hong S, Ji I, Ji TH. The alpha-subunit of human choriogonadotropin interacts with the exodomain of the luteinizing hormone/choriogonadotropin receptor. 1999 Endocrinology 140, 2486-93

Horn F, Weare J, Beukers MW, Hörsch S, Bairoch A., Chen W, Edvardsen Ø, Campagne F, and Vriend G. GPCRDB: an information system for G protein-coupled receptors. 1998 Nucleic Acids Res. 26, 277-281

<http://www.uni-leipzig.de/innere/TSH>

<http://www.jmol.org>

<http://www.php.net>

<http://www.mysql.com>

Huang JD. Identification of two amino acid residues on the extracellular domain of the lutropin/choriogonadotropin receptor important in signaling. 1995 J Biol Chem 270, 30023-8

(a) Jaeschke H, Neumann S, Kleinau G, Mueller S, Claus M, Krause G, Paschke R. An aromatic environment in the vicinity of serine 281 is a structural requirement for thyrotropin receptor function. 2006 Endocrinology. 147, 1753-60

(b) Jaschke H, Neumann S, Moore S, Thomas CJ, Colson AO, Costanzi S, Kleinau G, Jiang JK, Paschke R, Raaka BM, Krause G, Gershengorn MC. A low molecular weight agonist signals by binding to the transmembrane domain of thyroid-stimulating hormone receptor (TSHR) and luteinizing hormone/chorionic gonadotropin receptor (LHCGR). 2006 J Biol Chem. 281, 9841-4

Jiang X, Dreano M, Buckler DR, Cheng S, Ythier A, Wu H, Hendrickson WA, el Tayar N. Structural predictions for the ligand-binding region of glycoprotein hormone receptors and the nature of hormone-receptor interactions. 1995 Structure 3, 1341-53

Ji I, Ji TH. Differential roles of exoloop 1 of the human follicle-stimulating hormone receptor in hormone binding and receptor activation. 1995 J Biol Chem 270, 15970-15973

Ji I, Lee C, Song Y, Conn PM, Ji TH. Cis- and trans-activation of hormone receptors: the LH receptor. 2002 Mol Endocrinol. 16, 1299-308

Ji I, Lee C, Jeoung M, Koo Y, Sievert GA, Ji TH. Trans-activation of mutant follicle-stimulating hormone receptors selectively generates only one of two hormone signals. 2004 Mol Endocrinol. 18, 968-78

Kajava AV, Kobe B. Assessment of the ability to model proteins with leucine-rich repeats in light of the latest structural information. 2002 Protein Sci. 11, 1082-90

Kleinau G, Jaschke H, Neumann S, Lattig J, Paschke R, Krause G Identification of a novel epitope in the thyroid-stimulating hormone receptor ectodomain acting as intramolecular signalling interface. 2004 J Biol Chem 279, 51590-51600

(a) Kleinau G, Claus M, Jaeschke H, Mueller S, Neumann S, Paschke R, Krause G. Contacts between extracellular loop two and transmembrane helix six determine basal and hormone induced activity of the TSHR. 2007 J Biol Chem., 282, 518-25

(b) Kleinau G, Brehm M, Leser U, Eisenmenger F, Labudde D, Wiedemann U, Krause G. Implications for molecular mechanisms of glycoprotein hormone receptors using a new Sequence-Structure-Function Analysis resource. 2007 Endocrinol., 21, 574-80

Kobe B, Deisenhofer J. Crystal structure of porcine ribonuclease inhibitor, a protein with leucine-rich repeats. 1993 Nature 366, 751-6.

Kolakowski LF Jr. GCRDb: a G-protein-coupled receptor database. 1994 Recept Channels 2, 1-7

Kopp P, Muirhead S, Jourdain N, Gu WX, Jameson JL, Rodd C, Congenital hyperthyroidism caused by a solitary toxic adenoma harboring a novel somatic mutation (serine281-->isoleucine) in the extracellular domain of the thyrotropin receptor, 1997 J Clin Invest. 100, 1634-9

Kosugi S, Ban T, Akamizu T, Kohn LD. Role of cysteine residues in the extracellular domain and exoplasmic loops of the transmembrane domain of the TSH receptor: effect of mutation to serine on TSH receptor activity and response to thyroid stimulating autoantibodies. 1992 Biochem Biophys Res Commun. 189, 1754-62

Kosugi S, Ban T, Akamizu T, Kohn LD. Site-directed mutagenesis of a portion of the extracellular domain of the rat thyrotropin receptor important in autoimmune thyroid disease and nonhomologous with gonadotropin receptors. Relationship of functional and immunogenic domains. 1991 J Biol Chem. 266, 19413-8

(a) Kosugi S, Sugawa H, Mori T. TSH receptor and LH receptor. 1996 Endocr J. 43, 595-604

(b) Kosugi S, Mori T. Cysteine-699, a possible palmitoylation site of the thyrotropin receptor, is not crucial for cAMP or phosphoinositide signaling but is necessary for full surface expression. 1996 Biochem Biophys Res Commun 221, 636-40

Kristiansen K, Dahl SG, Edvardsen O. A database of mutants and effects of site-directed mutagenesis experiments on G protein-coupled receptors. 1996 Proteins. 26, 81-94

Kristiansen K. Molecular mechanisms of ligand binding, signalling, and regulation within the superfamily of G-protein-coupled receptors: molecular modeling and mutagenesis approaches to receptor structure and function. 2004 Pharmacol Ther. 103, 21-80

Laskowski RA, MacArthur MW, Moss DS, Thornton JM. Main-chain bond lengths and bond angles in protein structures. 1993 J Appl Cryst 26, 283-291

Latif R, Graves P, Davies TF. Ligand-dependent inhibition of oligomerization at the human thyrotropin receptor. 2002 J Biol Chem. 277, 45059-67

Laugwitz KL, Allgeier A, Offermanns S, Spicher K, Van Sande J, Dumont JE, Schultz G. The human thyrotropin receptor: a heptahelical receptor capable of stimulating members of all four G protein families. 1996 Proc Natl Acad Sci U S A. 93, 116-20

Lee, B., Sharron, M., Blanpain, C., Doranz, B. J., Vakili, J., Setoh, P., Berg, E., Liu, G., Guy, H. R., Durell, S. R., Parmentier, M., Chang, C. N., Price, K., Tsang, M., and Doms, R. W. 1999 J. Biol. Chem. 274, 9617-9626

Li J, Edwards PC, Burghammer M, Villa C, Schertler GF. Structure of bovine rhodopsin in a trigonal crystal form. 2004 J Mol Biol. 343, 1409-38

Li S, Liu X, Min L, Ascoli M. Mutations of the second extracellular loop of the human lutropin receptor emphasize the importance of receptor activation and de-emphasize the importance of receptor phosphorylation in agonist-induced internalization. 2001 J Biol Chem 276, 7968-7973

Libert F, Lefort A, Gerard C, Parmentier M, Perret J, Ludgate M, Dumont JE, Vassart G. Cloning, sequencing and expression of the human thyrotropin (TSH) receptor: evidence for binding of autoantibodies. 1989 Biochemical and Biophysical Research Communications 165, 1250-1255

Liu S, Fan S, Sun Z. Structural and functional characterization of the human CCR5 receptor in complex with HIV gp120 envelope glycoprotein and CD4 receptor by molecular modeling studies 2003 J. Mol. Model. (Online) 9, 329-36

Loosfelt H, Pichon C, Jolivet A, Misrahi M, Caillou B, Jamous M, Vannier B, Milgrom E. Two-subunit structure of the human thyrotropin receptor. 1992 Proc Natl Acad Sci U S A. 89, 3765-9

Matsushima N, Tachi N, Kuroki Y, Enkhbayar P, Osaki M, Kamiya M, Kretsinger RH. Structural analysis of leucine-rich-repeat variants in proteins associated with human diseases. 2005 Cell Mol Life Sci. 62, 2771-91

McLachlan SM, Nagayama Y, Rapoport B. Insight into Graves' hyperthyroidism from animal models. 2005 Endocr. Rev. 26, 800-32

Meduri G, Touraine P, Beau I, Lahuna O, Desroches A, Vacher-Lavenu MC, Kuttenn F, Misrahi M. Delayed puberty and primary amenorrhea associated with a novel mutation of the human follicle-stimulating hormone receptor: clinical, histological, and molecular studies. 2003 J Clin Endocrinol Metab. 88, 3491-8

Miehle K, Paschke R. Therapy of hyperthyroidism. 2003 Exp Clin Endocrinol Diabetes. 111, 305-18

Moyle WR, Campbell RK, Rao SN, Ayad NG, Bernard MP, Han Y, Wang Y. Model of human chorionic gonadotropin and lutropin receptor interaction that explains signal transduction of the glycoprotein hormones. 1995 J Biol Chem. 270, 20020-31

Moyle WR, Xing Y, Lin W, Cao D, Myers RV, Kerrigan JE, Bernard MP, Model of glycoprotein hormone receptor ligand binding and signaling, J Biol Chem. 2004 279, 44442-59

Mueller S, Kleinau G, Jaeschke H, Neumann S, Krause G, Paschke R. Significance of ectodomain cysteine-boxes 2 and 3 for the activation mechanism of the thyroid stimulating hormone receptor. 2006 J Biol Chem. 281, 31638-46

Nagayama Y, Wadsworth HL, Chazenbalk GD, Russo D, Seto P, Rapoport B. Thyrotropin-luteinizing hormone/chorionic gonadotropin receptor extracellular domain chimeras as probes for thyrotropin receptor function. 1991 Proc Natl Acad Sci U S A. 88, 902-5

Nagayama Y, Rapoport B. Role of the carboxyl-terminal half of the extracellular domain of the human thyrotropin receptor in signal transduction. 1992 Endocrinology 131, 548-52

Nakabayashi K, Kudo M, Kobilka B, Hsueh AJ. Activation of the luteinizing hormone receptor following substitution of Ser-277 with selective hydrophobic residues in the ectodomain hinge region. 2000 J Biol Chem 275, 30264-30271

Nakabayashi K, Matsumi H, Bhalla A, Bae J, Mosselman S, Hsu SY, Hsueh AJ. Thyrostimulin, a heterodimer of two new human glycoprotein hormone subunits, activates the thyroid-stimulating hormone receptor. 2002 J Clin Invest. Jun;109(11):1445-52

Nakabayashi K, Kudo M, Hsueh AJ, Maruo T. Activation of the luteinizing hormone receptor in the extracellular domain. 2003 Mol Cell Endocrinol. 202, 139-44

Nechamen CA, Dias JA. Human follicle stimulating hormone receptor trafficking and hormone binding sites in the amino terminus. 2000 Mol Cell Endocrinol. 166, 101-10

Neumann S, Krause G, Chey S, Paschke R. A free carboxylate oxygen in the side chain of position 674 in transmembrane domain 7 is necessary for TSH receptor activation. 2001 Mol Endocrinol. 15, 1294-305

(a) Neumann S, Claus M, Paschke R. Interactions between the extracellular domain and the extracellular loops as well as the 6th transmembrane domain are necessary for TSH receptor activation. 2005 Eur J Endocrinol. 152, 625-34

(b) Neumann S, Krause G, Claus M, Paschke R. Structural determinants for g protein activation and selectivity in the second intracellular loop of the thyrotropin receptor. 2005 Endocrinology 146, 477-85

Nunez Miguel R, Sanders J, Jeffreys J, Depraetere H, Evans M, Richards T, Blundell TL, Rees Smith B, Furmaniak J. Analysis of the thyrotropin receptor-thyrotropin interaction by comparative modeling. 2004 Thyroid 14, 991-1011

Okada T, Sugihara M, Bondar AN, Elstner M, Entel P, Buss V. The retinal conformation and its environment in rhodopsin in light of a new 2.2 Å crystal structure. 2004 J Mol Biol. 342, 71-83

Osuga Y, Hayashi M, Kudo M, Conti M, Kobilka B, Hsueh AJ. Co-expression of defective luteinizing hormone receptor fragments partially reconstitutes ligand-induced signal generation. 1997 J Biol Chem. 272, 25006-12

Palczewski K, Kumashita T, Hori T, Behnke CA, Motoshima H, Fox BA, Le Trong I, Teller DC, Okada T, Stenkamp RE, Yamamoto M, Miyano M. Crystal structure of rhodopsin: A G protein-coupled receptor. 2000 Science 289, 739-745

Parma J, Van Sande J, Swillens S, Tonacchera M, Dumont J, Vassart G. Somatic mutations causing constitutive activity of the thyrotropin receptor are the major cause of hyperfunctioning thyroid adenomas: identification of additional mutations activating both the cyclic adenosine 3',5'-monophosphate and inositol phosphate-Ca<sup>2+</sup> cascades. 1995 Mol Endocrinol 9, 725-733

Rapoport B, Chazenbalk GD, Jaume JC, McLachlan SM. The thyrotropin (TSH) receptor: interaction with TSH and autoantibodies. 1998 Endocr Rev. 19, 673-716

Rodien P, Ho SC, Vlaeminck V, Vassart G, Costagliola S. 2003 Activating mutations of TSH receptor. Ann Endocrinol (Paris) 64, 12-6

Puett D, Li Y, Angelova K, Demars G, Meehan TP, Fanelli F, Narayan P. Structure-function relationships of the luteinizing hormone receptor, 2005 Ann N Y Acad Sci. 1061, 41-54

Ryu KS, Gilchrist RL, Ji I, Kim SJ, Ji TH. Exoloop 3 of the luteinizing hormone/choriogonadotropin receptor. Lys583 is essential and irreplaceable for human choriogonadotropin (hCG)-dependent receptor activation but not for high affinity hCG binding. 1996 J Biol Chem 271, 7301-7304

(a) Ryu KS, Lee H, Kim S, Beauchamp J, Tung CS, Isaacs NW, Ji I, Ji TH. Modulation of high affinity hormone binding. Human choriogonadotropin binding to the exodomain of the receptor is influenced by exoloop 2 of the receptor. 1998 J Biol Chem 273, 6285-6291

(b) Ryu KS, Gilchrist RL, Tung CS, Ji I, Ji TH. High affinity hormone binding to the extracellular N-terminal exodomain of the follicle-stimulating hormone receptor is critically modulated by exoloop 3. 1998 J Biol Chem 273, 28953-28958

- Sangkuhl K, Schulz A, Schultz G, Schoneberg T. Structural requirements for mutational lutropin/choriogonadotropin receptor activation. 2002 J Biol Chem. 277, 47748-55
- Schapira M, Totrov M, Abagyan R. Prediction of the binding energy for small molecules, peptides and proteins. 1999 J Mol Recognit. 12, 177-90
- Schoneberg T, Schulz A, Gudermann T. The structural basis of G-protein-coupled receptor function and dysfunction in human diseases. 2002 Rev Physiol Biochem Pharmacol. 144, 143-227
- Schöneberg T, Schulz A, Biebermann H, Hermsdorf T, Römplter H, Sangkuhl K. Mutant G-protein-coupled receptors as a cause of human diseases. 2004 Pharmacology & Therapeutics 104, 173-206
- Schott M, Scherbaum WA, Morgenthaler N. Thyrotropin receptor autoantibodies in Graves' disease. 2005 Trends Endocrinol Metab 16, 243-248.
- Schwartz TW, Frimurer TM, Holst B, Rosenkilde MM., Elling CE. Molecular mechanism of 7TM receptor activation--a global toggle switch model. 2006 Annu. Rev. Pharmacol. Toxicol. 46, 481-519
- Seifert R, Wenzel-Seifert K. Constitutive activity of G-protein-coupled receptors: cause of disease and common property of wild-type receptors. 2002 Naunyn Schmiedebergs Arch Pharmacol. 366, 381-416
- Seong JY, Wang L, Oh DY, Yun O, Maiti K, Li JH, Soh JM, Choi HS, Kim K, Vaudry H, Kwon HB. Ala/Thr(201) in extracellular loop 2 and Leu/Phe(290) in transmembrane domain 6 of type 1 frog gonadotropin-releasing hormone receptor confer differential ligand sensitivity and signal transduction. 2003 Endocrinology 144, 454-66
- Shim JY, Welsh WJ, Howlett AC. Homology model of the CB1 cannabinoid receptor: sites critical for nonclassical cannabinoid agonist interaction. 2003 Biopolymers 71, 169-189.
- Simoni M, Gromoll J, Nieschlag E. The Follicle-Stimulating Hormone Receptor: Biochemistry, Molecular Biology, Physiology, and Pathophysiology. 1997 Endocr Rev 18, 739-773
- Skelton NJ, Quan C, Reilly D, Lowman H. Structure of a CXC chemokine-receptor fragment in complex with interleukin-8. 1999 Structure Fold Des 7, 157-68
- Smits G, Govaerts C, Nubourgh I, Pardo L, Vassart G, Costagliola S. Lysine 183 and glutamic acid 157 of the TSH receptor: two interacting residues with a key role in determining specificity toward TSH and human CG. 2002 Mol Endocrinol. 16, 722-35
- Smits G, Campillo M, Govaerts C, Janssens V, Richter C, Vassart G, Pardo L, Costagliola S. Glycoprotein hormone receptors: determinants in leucine-rich repeats responsible for ligand specificity. 2003 EMBO J. 22, 2692-703S
- Sohn J, Ryu K, Sievert G, Jeoung M, Ji I, Ji TH. Follicle-stimulating hormone interacts with exoloop 3 of the receptor. 2002 J Biol Chem 277, 50165-50175

Stavrou SS, Zhu YS, Cai LQ, Katz MD, Herrera C, Defillo-Ricart M, Imperato-McGinley J. A novel mutation of the human luteinizing hormone receptor in 46XY and 46XX sisters. 1998 J Clin Endocrinol Metab. 83, 2091-8

(a) Sudo S, Kumagai J, Nishi S, Layfield S, Ferraro T, Bathgate RA, Hsueh AJ. H3 relaxin is a specific ligand for LGR7 and activates the receptor by interacting with both the ectodomain and the exoloop 2. 2003 J Biol Chem. 278, 7855-62

Sun Y, Lu X, Gershengorn MC. Thyrotropin-releasing hormone receptors -- similarities and differences. 2003 J. Mol Endocrinol 30, 87-97.

Szkudlinski MW, Fremont V, Ronin C, Weintraub BD. Thyroid-stimulating hormone and thyroid-stimulating hormone receptor structure-function relationships. 2002 Physiol Rev. 82, 473-502

Szkudlinski MW. Past, presence and future of thyroid-stimulating hormone (TSH) superactive analogs. Cancer Treat Res. 2004;122:345-56

Tanaka K, Chazenbalk GD, McLachlan SM, Rapoport B. Thyrotropin receptor cleavage at site 1 does not involve a specific amino acid motif but instead depends on the presence of the unique, 50 amino acid insertion. 1998 J Biol Chem. 273, 1959-63.

Tao YX, Johnson NB, Segaloff DL. Constitutive and agonist-dependent self-association of the cell surface human lutropin receptor. 2004 J Biol Chem. 279, 5904-14

ter Laak AM, Kuhne R. Bacteriorhodopsin in a periodic boundary water-vacuum-water box as an example towards stable molecular dynamics simulations of G-protein coupled receptors. 1999 Receptors Channels 6, 295-308

Themmen APN, Huhtaniemi IT. Mutations of Gonadotropin and Gonadotropin Receptors: Elucidating the Physiology and Pathophysiology of Pituitary-Gonadal Function. 2000 Endocr Rev. 21, 551-83

Thompson JD, Higgins DG, Gibson TJ. CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. 1994 Nucleic Acids Res. 22, 4673-80

Tonacchera M, Van Sande J, Cetani F, Swillens S, Schwartz C, Winiszewski P, Portmann L, Dumont JE, Vassart G, Parma J. Functional characteristics of three new germline mutations of the thyrotropin receptor gene causing autosomal dominant toxic thyroid hyperplasia. 1996 J Clin Endocrinol Metab. 81, 547-54

Totrov M, Abagyan R., Flexible protein-ligand docking by global energy optimization in internal coordinates. 1997 Proteins. Suppl 1, 215-20.

(a) Urizar E, Claeysen S, Deipi X, Govaerts C, Costagliola S, Vassart G, Pardo L. An Activation Switch in the Rhodopsin Family of G Protein-coupled Receptors: THE THYROTROPIN RECEPTOR. 2005 J Biol Chem. 280, 17135-41

(b) Urizar E, Montanelli L, Loy T, Bonomi M, Swillens S, Gales C, Bouvier M, Smits G, Vassart G, Costagliola S. Glycoprotein hormone receptors: link between receptor homodimerization and negative cooperativity. 2005 EMBO J. 24, 1954-64

Van Durme J, Horn F, Costagliola S, Vriend G, Vassart G GRIS: Glycoprotein-hormone Receptor Information 2006 System. Mol Endocrinol. 20, 2247-55

Van Sande J, Parma J, Tonacchera M, Swillens S, Dumont J, Vassart G. Somatic and germline mutations of the TSH receptor gene in thyroid diseases. 1995 J Clin Endocrinol Metab 80, 2577-2585

Van Sande J, Massart C, Costagliola S, Allgeier A, Cetani F, Vassart G, Dumont JE. 1996 Mol Cell Endocrinology 119, 161-168

Van Sande J, Dequanter D, Lothaire P, Massart C, Dumont JE, Erneux C. Thyrotropin stimulates the generation of inositol 1,4,5-trisphosphate in human thyroid cells. 2006 J Clin Endocrinol Metab. 91, 1099-107

van Straten NC, Schoonus-Gerritsma GG, van Someren RG, Draaijer J, Adang AE, Timmers CM, Hanssen RG, van Boeckel CA. The first orally active low molecular weight agonists for the LH receptor: thienopyr(im)idines with therapeutic potential for ovulation induction. 2002 Chembiochem. 3, 1023-1026

a) Vassart G, Pardo L, Costagliola S. A molecular dissection of the glycoprotein hormone receptors. 2004 Trends Biochem Sci. 29, 119-26

b) Vassart G, Costagliola S. A physiological role for the posttranslational cleavage of the thyrotropin receptor? 2004 Endocrinology 145, 1-3

Vauquelin G, Van Liefde I. G protein-coupled receptors: a count of 1001 conformations. 2005 Fundam Clin Pharmacol. 19, 45-56

Vlaeminck-Guillem V, Ho SC, Rodien P, Vassart G, Costagliola S. Activation of the cAMP pathway by the TSH receptor involves switching of the ectodomain from a tethered inverse agonist to an agonist. 2002 Mol Endocrinol. 16, 736-46

Vischer HF, Granneman JCM, Bogerd J, Identification of follicle-stimulating hormone-selective beta-strands in the N-terminal hormone-binding exodomain of human gonadotropin receptors. 2006 Mol Endocrinology 20, 1880-93

Wonerow, P., Schoneberg, T., Schultz, G., Gudermann, T. and Paschke RJ. Deletions in the third intracellular loop of the thyrotropin receptor. A new mechanism for constitutive activation. 1998 Biol Chem 273, 7900-7905

Wonerow P, Chey S, Fuhrer D, Holzapfel HP, Paschke R. Functional characterization of five constitutively activating thyrotrophin receptor mutations. 2000 Clin Endocrinol (Oxf) 53, 461-468

Wonerow P, Neumann S, Gudermann T, Paschke R. Thyrotropin receptor mutations as a tool to understand thyrotropin receptor action. 2001 J. Mol. Med. 79, 707-721

Woodmansee WW, Haugen BR. Uses for recombinant human TSH in patients with thyroid cancer and nodular goiter. 2004 Clin. Endocrinol (Oxf) 61, 163-173

Wuller S, Wiesner B, Löffler A, Furkert J, Krause G, Hermosilla R, Schaefer M, Schülein R, Rosenthal W, Oksche A. Pharmacochaperones post-translationally enhance cell surface expression by increasing conformational stability of wild-type and mutant vasopressin V2 receptors. 2004 J. Biol. Chem. 279, 47254-47263

Zeng H, Phang T, Song YS, Ji I, Ji TH. The role of the hinge region of the luteinizing hormone receptor in hormone interaction and signal generation. 2001 J Biol Chem 276, 3451-8

Zhang ML, Sugawa H, Kosugi S, Mori T. Constitutive activation of the thyrotropin receptor by deletion of a portion of the extracellular domain. 1995 Biochem Biophys Res Commun 211, 205-210

Zhang R, Buczko E, Dufau ML. Requirement of cysteine residues in exons 1-6 of the extracellular domain of the luteinizing hormone receptor for gonadotropin binding. 1996 J Biol Chem. 271, 5755-60

Zhang M, Mizrahi D, Fanelli F, Segaloff DL. The formation of a salt bridge between helices 3 and 6 is responsible for the constitutive activity and lack of hormone responsiveness of the naturally occurring L457R mutation of the human lutropin receptor. 2005 J Biol Chem. 280, 26169-76

Zeng H, Ji I, Ji TH. Lys91 and His90 of the alpha-subunit are crucial for receptor binding and hormone action of follicle-stimulating hormone (FSH) and play hormone-specific roles in FSH and human chorionic gonadotropin. 1995 Endocrinology 136, 2948-53

Zoffmann S, Chollet A, Galzi JL. Identification of the extracellular loop 2 as the point of interaction between the N terminus of the chemokine MIP-1alpha and its CCR1 receptor. 2002 Mol Pharmacol. 62, 729-36