

5-Hydroxytryptamine receptors (version 2019.4) in the IUPHAR/BPS Guide to Pharmacology Database

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Abstract

5-HT receptors (**nomenclature as agreed by the NC-IUPHAR Subcommittee on 5-HT receptors [194] and subsequently revised [176]**) are, with the exception of the ionotropic 5-HT_B class, GPCRs where the endogenous agonist is **5-hydroxytryptamine**. The diversity of metabotropic 5-HT receptors is increased by alternative splicing that produces isoforms of the 5-HT_{2A} (non-functional), 5-HT_{2C} (non-functional), 5-HT₄, 5-HT₆ (non-functional) and 5-HT₇ receptors. Unique amongst the GPCRs, RNA editing produces 5-HT_{2C} receptor isoforms that differ in function, such as efficiency and specificity of coupling to G_{q/11} and also pharmacology [40, 482]. Most 5-HT receptors (except 5-HT_{1e} and 5-HT_{5b}) play specific roles mediating functional responses in different tissues (reviewed by [463, 382]).

Contents

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5-Hydroxytryptamine receptors

<http://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=1>

Introduction to 5-Hydroxytryptamine receptors

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Receptors

5-HT_{1A} receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=1>

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5-HT_{1D} receptor

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5-HT_{1e} receptor

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5-HT_{1F} receptor

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5-HT_{2A} receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=6>

5-HT_{2B} receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=7>

5-HT_{2C} receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=8>

5-HT₄ receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=9>

5-HT_{5A} receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=10>

5-HT_{5b} receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=648>

5-HT₆ receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=11>

5-HT₇ receptor

<http://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=12>

References

1. Adham N, Bard JA, Zgombick JM, Durkin MM, Kucharewicz S, Weinshank RL and Branchek TA. (1997) Cloning and characterization of the guinea pig 5-HT_{1F} receptor subtype: a comparison of the pharmacological profile to the human species homolog. *Neuropharmacology* **36**: 569-76 [PMID:9225282]
2. Adham N, Borden LA, Schechter LE, Gustafson EL, Cochran TL, Vaysse PJ, Weinshank RL and Branchek TA. (1993) Cell-specific coupling of the cloned human 5-HT_{1F} receptor to multiple signal transduction pathways. *Naunyn Schmiedebergs Arch. Pharmacol.* **348**: 566-75 [PMID:8133900]
3. Adham N, Gerald C, Schechter L, Vaysse P, Weinshank R and Branchek T. (1996) [³H]5-hydroxytryptamine labels the agonist high affinity state of the cloned rat 5-HT₄ receptor. *Eur. J. Pharmacol.* **304**: 231-5 [PMID:8813606]
4. Adham N, Kao HT, Schechter LE, Bard J, Olsen M, Urquhart D, Durkin M, Hartig PR, Weinshank RL and Branchek TA. (1993) Cloning of another human serotonin receptor (5-HT_{1F}): a fifth 5-HT₁ receptor subtype coupled to the inhibition of adenylate cyclase. *Proc. Natl. Acad. Sci. U.S.A.* **90**: 408-12 [PMID:8380639]
5. Adham N, Romanienko P, Hartig P, Weinshank RL and Branchek T. (1992) The rat 5-hydroxytryptamine_{1B} receptor is the species homologue of the human 5-hydroxytryptamine_{1D} beta receptor. *Mol. Pharmacol.* **41**: 1-7 [PMID:1732716]
6. Adham N, Vaysse PJ, Weinshank RL and Branchek TA. (1994) The cloned human 5-HT_{1E} receptor couples to inhibition and activation of adenylyl cyclase via two distinct pathways in transfected BS-C-1 cells. *Neuropharmacology* **33**: 403-10 [PMID:7984278]
7. Adham N, Zgombick JM, Bard J and Branchek TA. (1998) Functional characterization of the recombinant human 5-hydroxytryptamine_{7(a)} receptor isoform coupled to adenylate cyclase stimulation. *J. Pharmacol. Exp. Ther.* **287**: 508-14 [PMID:9808674]
8. Ahern GP. (2011) 5-HT and the immune system. *Curr Opin Pharmacol* **11**: 29-33 [PMID:21393060]
9. Albert PR, Sajedi N, Lemonde S and Ghahremani MH. (1999) Constitutive G(i2)-dependent activation of adenylyl cyclase type II by the 5-HT_{1A} receptor. Inhibition by anxiolytic partial agonists. *J. Biol. Chem.* **274**: 35469-74 [PMID:10585418]
10. Albert PR, Zhou QY, Van Tol HH, Bunzow JR and Civelli O. (1990) Cloning, functional expression, and mRNA tissue distribution of the rat 5-hydroxytryptamine_{1A} receptor gene. *J. Biol. Chem.* **265**: 5825-32 [PMID:2156831]
11. Almaula N, Ebersole BJ, Zhang D, Weinstein H and Sealfon SC. (1996) Mapping the binding site pocket of the serotonin 5-Hydroxytryptamine_{2A} receptor. Ser3.36(159) provides a second interaction site for the protonated amine of serotonin but not of lysergic acid diethylamide or bufotenin. *J. Biol. Chem.* **271**: 14672-5 [PMID:8663249]
12. Amlaiky N, Ramboz S, Boschert U, Plassat JL and Hen R. (1992) Isolation of a mouse "5HT_{1E}-like" serotonin receptor expressed predominantly in hippocampus. *J. Biol. Chem.* **267**: 19761-4 [PMID:1328180]

13. Asakawa A, Ueno N, Katagi M, Ijuin Y, Morita Y, Mizuno S, Inui T, Sakamaki R, Shinfuku N and Uemoto M. (2006) Mosapride improves food intake, while not worsening glycemic control and obesity, in ob/ob obese mice with decreased gastric emptying. *J. Diabetes Complicat.* **20**: 56-8 [PMID:16389169]
14. Ase AR, Reader TA, Hen R, Riad M and Descarries L. (2000) Altered serotonin and dopamine metabolism in the CNS of serotonin 5-HT(1A) or 5-HT(1B) receptor knockout mice. *J. Neurochem.* **75**: 2415-26 [PMID:11080193]
15. Ase AR, Reader TA, Hen R, Riad M and Descarries L. (2001) Regional changes in density of serotonin transporter in the brain of 5-HT1A and 5-HT1B knockout mice, and of serotonin innervation in the 5-HT1B knockout. *J. Neurochem.* **78**: 619-30 [PMID:11483665]
16. Ayme-Dietrich E, Lawson R, Côté F, de Tapia C, Da Silva S, Ebel C, Hechler B, Gachet C, Guyonnet J and Rouillard H *et al.*. (2017) The role of 5-HT_{2B} receptors in mitral valvulopathy: bone marrow mobilization of endothelial progenitors. *Br. J. Pharmacol.* **174**: 4123-4139 [PMID:28806488]
17. Aznar S, Qian Z, Shah R, Rahbek B and Knudsen GM. (2003) The 5-HT1A serotonin receptor is located on calbindin- and parvalbumin-containing neurons in the rat brain. *Brain Res.* **959**: 58-67 [PMID:12480158]
18. Bach T, Syversveen T, Kvingedal AM, Krobert KA, Brattelid T, Kaumann AJ and Levy FO. (2001) 5HT4(a) and 5-HT4(b) receptors have nearly identical pharmacology and are both expressed in human atrium and ventricle. *Naunyn Schmiedebergs Arch. Pharmacol.* **363**: 146-60 [PMID:11218067]
19. Bagdy G, Graf M, Anheuer ZE, Modos EA and Kantor S. (2001) Anxiety-like effects induced by acute fluoxetine, sertraline or m-CPP treatment are reversed by pretreatment with the 5-HT_{2C} receptor antagonist SB-242084 but not the 5-HT_{1A} receptor antagonist WAY-100635. *Int. J. Neuropsychopharmacol.* **4**: 399-408 [PMID:11806866]
20. Bai F, Yin T, Johnstone EM, Su C, Varga G, Little SP and Nelson DL. (2004) Molecular cloning and pharmacological characterization of the guinea pig 5-HT_{1E} receptor. *Eur. J. Pharmacol.* **484**: 127-39 [PMID:14744596]
21. Baker LP, Nielsen MD, Impey S, Metcalf MA, Poser SW, Chan G, Obrietan K, Hamblin MW and Storm DR. (1998) Stimulation of type 1 and type 8 Ca²⁺/calmodulin-sensitive adenylyl cyclases by the Gs-coupled 5-hydroxytryptamine subtype 5-HT_{7A} receptor. *J. Biol. Chem.* **273**: 17469-76 [PMID:9651336]
22. Banasr M, Hery M, Printemps R and Daszuta A. (2004) Serotonin-induced increases in adult cell proliferation and neurogenesis are mediated through different and common 5-HT receptor subtypes in the dentate gyrus and the subventricular zone. *Neuropsychopharmacology* **29**: 450-60 [PMID:14872203]
23. Banes A, Florian JA and Watts SW. (1999) Mechanisms of 5-hydroxytryptamine(2A) receptor activation of the mitogen-activated protein kinase pathway in vascular smooth muscle. *J. Pharmacol. Exp. Ther.* **291**: 1179-87 [PMID:10565840]
24. Bang-Andersen B, Ruhland T, Jørgensen M, Smith G, Frederiksen K, Jensen KG, Zhong H, Nielsen SM, Hogg S and Mørk A *et al.*. (2011) Discovery of 1-[2-(2,4-dimethylphenylsulfanyl)phenyl]piperazine (Lu AA21004): a novel multimodal compound for the treatment of major depressive disorder. *J. Med. Chem.* **54**: 3206-21 [PMID:21486038]
25. Bard JA, Zgombick J, Adham N, Vaysse P, Branchek TA and Weinshank RL. (1993) Cloning of a novel human serotonin receptor (5-HT₇) positively linked to adenylate cyclase. *J. Biol. Chem.* **268**: 23422-6 [PMID:8226867]
26. Bartsch T, Knight YE and Goadsby PJ. (2004) Activation of 5-HT(1B/1D) receptor in the periaqueductal gray inhibits nociception. *Ann. Neurol.* **56**: 371-81 [PMID:15349864]
27. Baxter GS, Craig DA and Clarke DE. (1991) 5-Hydroxytryptamine₄ receptors mediate relaxation of the rat oesophageal tunica muscularis mucosae. *Naunyn Schmiedebergs Arch. Pharmacol.* **343**: 439-46 [PMID:1881455]
28. Beattie DT, Smith JA, Marquess D, Vickery RG, Armstrong SR, Pulido-Rios T, McCullough JL, Sandlund C, Richardson C and Mai N *et al.*. (2004) The 5-HT₄ receptor agonist, tegaserod, is a potent 5-HT_{2B} receptor antagonist in vitro and in vivo. *Br. J. Pharmacol.* **143**: 549-60 [PMID:15466450]
29. Belenky MA and Pickard GE. (2001) Subcellular distribution of 5-HT(1B) and 5-HT(7) receptors in the mouse suprachiasmatic nucleus. *J. Comp. Neurol.* **432**: 371-88 [PMID:11246214]

30. Bender E, Pindon A, van Oers I, Zhang YB, Gommeren W, Verhasselt P, Jurzak M, Leysen J and Luyten W. (2000) Structure of the human serotonin 5-HT₄ receptor gene and cloning of a novel 5-HT₄ splice variant. *J. Neurochem.* **74**: 478-89 [PMID:10646498]
31. Bentley JC, Bourson A, Boess FG, Fone KC, Marsden CA, Petit N and Sleight AJ. (1999) Investigation of stretching behaviour induced by the selective 5-HT₆ receptor antagonist, Ro 04-6790, in rats. *Br. J. Pharmacol.* **126**: 1537-42 [PMID:10323584]
32. Berg KA, Cropper JD, Niswender CM, Sanders-Bush E, Emeson RB and Clarke WP. (2001) RNA-editing of the 5-HT_{2C} receptor alters agonist-receptor-effector coupling specificity. *Br. J. Pharmacol.* **134**: 386-92 [PMID:11564657]
33. Bergen AW, van den Bree MB, Yeager M, Welch R, Ganjei JK, Haque K, Bacanu S, Berrettini WH, Grice DE and Goldman D *et al.*. (2003) Candidate genes for anorexia nervosa in the 1p33-36 linkage region: serotonin 1D and delta opioid receptor loci exhibit significant association to anorexia nervosa. *Mol. Psychiatry* **8**: 397-406 [PMID:12740597]
34. Bernotas RC, Lenicek S, Antane S, Cole DC, Harrison BL, Robichaud AJ, Zhang GM, Smith D, Platt B and Lin Q *et al.*. (2009) Novel 1-aminoethyl-3-arylsulfonyl-1H-pyrrolo[2,3-b]pyridines are potent 5-HT₆ agonists. *Bioorg. Med. Chem.* **17**: 5153-63 [PMID:19523834]
35. Berque-Bestel I, Soulier JL, Giner M, Rivail L, Langlois M and Sicsic S. (2003) Synthesis and characterization of the first fluorescent antagonists for human 5-HT₄ receptors. *J. Med. Chem.* **46**: 2606-20 [PMID:12801225]
36. Bert B, Dere E, Wilhelmi N, Kusserow H, Theuring F, Huston JP and Fink H. (2005) Transient overexpression of the 5-HT_{1A} receptor impairs water-maze but not hole-board performance. *Neurobiol Learn Mem* **84**: 57-68 [PMID:15936683]
37. Blair JB, Kurrasch-Orbaugh D, Marona-Lewicka D, Cumbay MG, Watts VJ, Barker EL and Nichols DE. (2000) Effect of ring fluorination on the pharmacology of hallucinogenic tryptamines. *J. Med. Chem.* **43**: 4701-10 [PMID:11101361]
38. Blondel O, Gastineau M, Dahmoune Y, Langlois M and Fischmeister R. (1998) Cloning, expression, and pharmacology of four human 5-hydroxytryptamine 4 receptor isoforms produced by alternative splicing in the carboxyl terminus. *J. Neurochem.* **70**: 2252-61 [PMID:9603189]
39. Blondel O, Vandecasteele G, Gastineau M, Leclerc S, Dahmoune Y, Langlois M and Fischmeister R. (1997) Molecular and functional characterization of a 5-HT₄ receptor cloned from human atrium. *FEBS Lett.* **412**: 465-74 [PMID:9276448]
40. Bockaert J, Claeysen S, Bécamel C, Dumuis A and Marin P. (2006) Neuronal 5-HT metabotropic receptors: fine-tuning of their structure, signaling, and roles in synaptic modulation. *Cell Tissue Res.* **326**: 553-72 [PMID:16896947]
41. Bockaert J, Claeysen S, Compan V and Dumuis A. (2004) 5-HT₄ receptors. *Curr Drug Targets CNS Neurol Disord* **3**: 39-51 [PMID:14965243]
42. Bockaert J, Sebben M and Dumuis A. (1990) Pharmacological characterization of 5-hydroxytryptamine₄ (5-HT₄) receptors positively coupled to adenylate cyclase in adult guinea pig hippocampal membranes: effect of substituted benzamide derivatives. *Mol. Pharmacol.* **37**: 408-11 [PMID:2314390]
43. Boddeke HW, Hoffman BJ, Palacios JM, Knot H and Hoyer D. (1993) Characterization of functional responses in A9 cells transfected with cloned rat 5-HT_{1C} receptors. *Naunyn Schmiedeberg's Arch. Pharmacol.* **347**: 119-24 [PMID:8474532]
44. Boehme SA, Lio FM, Sikora L, Pandit TS, Lavrador K, Rao SP and Sriramarao P. (2004) Cutting edge: serotonin is a chemotactic factor for eosinophils and functions additively with eotaxin. *J. Immunol.* **173**: 3599-603 [PMID:15356103]
45. Boess FG, Monsma FJ, Meyer V, Zwingelstein C and Sleight AJ. (1997) Interaction of tryptamine and ergoline compounds with threonine 196 in the ligand binding site of the 5-hydroxytryptamine₆ receptor. *Mol Pharmacol* **52**: 515-523 [PMID:9284367]
46. Boess FG, Monsma Jr FJ, Carolo C, Meyer V, Rudler A, Zwingelstein C and Sleight AJ. (1997) Functional and radioligand binding characterization of rat 5-HT₆ receptors stably expressed in HEK293 cells.

- Neuropharmacology* **36**: 713-20 [PMID:9225298]
47. Boess FG, Monsma Jr FJ and Sleight AJ. (1998) Identification of residues in transmembrane regions III and VI that contribute to the ligand binding site of the serotonin 5-HT₆ receptor. *J. Neurochem.* **71**: 2169-77 [PMID:9798944]
 48. Boess FG, Riemer C, Bos M, Bentley J, Bourson A and Sleight AJ. (1998) The 5-hydroxytryptamine₆ receptor-selective radioligand [3H]Ro 63-0563 labels 5-hydroxytryptamine receptor binding sites in rat and porcine striatum. *Mol Pharmacol* **54**: 577-583 [PMID:9730917]
 49. Bonaventure P, Dugovic C, Kramer M, De Boer P, Singh J, Wilson S, Bertelsen K, Di J, Shelton J and Aluisio L *et al.*. (2012) Translational evaluation of JNJ-18038683, a 5-hydroxytryptamine type 7 receptor antagonist, on rapid eye movement sleep and in major depressive disorder. *J. Pharmacol. Exp. Ther.* **342**: 429-40 [PMID:22570363]
 50. Bonaventure P, Hall H, Gommeren W, Cras P, Langlois X, Jurzak M and Leysen JE. (2000) Mapping of serotonin 5-HT₄ receptor mRNA and ligand binding sites in the post-mortem human brain. *Synapse* **36**: 35-46 [PMID:10700024]
 51. Bonaventure P, Schotte A, Cras P and Leysen JE. (1997) Autoradiographic mapping of 5-HT_{1B}- and 5-HT_{1D} receptors in human brain using [3H]alniditan, a new radioligand. *Recept. Channels* **5**: 225-30 [PMID:9606727]
 52. Bonhaus DW, Berger J, Adham N, Branchek TA, Hsu SA, Louny DN, Leung E, Wong EH, Clark RD and Eglen RM. (1997) [3H]RS 57639, a high affinity, selective 5-HT₄ receptor partial agonist, specifically labels guinea-pig striatal and rat cloned (5-HT_{4S} and 5-HT_{4L}) receptors. *Neuropharmacology* **36**: 671-9 [PMID:9225293]
 53. Bonhaus DW, Flippin LA, Greenhouse RJ, Jaime S, Rocha C, Dawson M, Van Natta K, Chang LK, Pulido-Rios T and Webber A *et al.*. (1999) RS-127445: a selective, high affinity, orally bioavailable 5-HT_{2B} receptor antagonist. *Br. J. Pharmacol.* **127**: 1075-82 [PMID:10455251]
 54. Bonhaus DW, Weinhardt KK, Taylor M, DeSouza A, McNeeley PM, Szczepanski K, Fontana DJ, Trinh J, Rocha CL and Dawson MW *et al.*. (1997) RS-102221: a novel high affinity and selective, 5-HT_{2C} receptor antagonist. *Neuropharmacology* **36**: 621-9 [PMID:9225287]
 55. Borsini F, Evans K, Jason K, Rohde F, Alexander B and Pollentier S. (2002) Pharmacology of flibanserin. *CNS Drug Rev* **8**: 117-42 [PMID:12177684]
 56. Bortolozzi A, Amargós-Bosch M, Toth M, Artigas F and Adell A. (2004) In vivo efflux of serotonin in the dorsal raphe nucleus of 5-HT_{1A} receptor knockout mice. *J. Neurochem.* **88**: 1373-9 [PMID:15009637]
 57. Boulenguez P, Segu L, Chauveau J, Morel A, Lanoir J and Delaage M. (1992) Biochemical and pharmacological characterization of serotonin-O-carboxymethylglycyl[125I]iodotyrosinamide, a new radioiodinated probe for 5-HT_{1B} and 5-HT_{1D} binding sites. *J. Neurochem.* **58**: 951-9 [PMID:1738002]
 58. Bourson A, Boess FG, Bös M and Sleight AJ. (1998) Involvement of 5-HT₆ receptors in nigro-striatal function in rodents. *Br. J. Pharmacol.* **125**: 1562-6 [PMID:9884085]
 59. Bourson A, Borroni E, Austin RH, Monsma Jr FJ and Sleight AJ. (1995) Determination of the role of the 5-HT₆ receptor in the rat brain: a study using antisense oligonucleotides. *J. Pharmacol. Exp. Ther.* **274**: 173-80 [PMID:7616396]
 60. Boutrel B, Monaca C, Hen R, Hamon M and Adrien J. (2002) Involvement of 5-HT_{1A} receptors in homeostatic and stress-induced adaptive regulations of paradoxical sleep: studies in 5-HT_{1A} knock-out mice. *J. Neurosci.* **22**: 4686-92 [PMID:12040075]
 61. Branchek T, Adham N, Macchi M, Kao HT and Hartig PR. (1990) [3H]-DOB(4-bromo-2,5-dimethoxyphenylisopropylamine) and [3H] ketanserin label two affinity states of the cloned human 5-hydroxytryptamine₂ receptor. *Mol. Pharmacol.* **38**: 604-9 [PMID:2233697]
 62. Brattelid T, Kvingedal AM, Krobert KA, Andressen KW, Bach T, Hystad ME, Kaumann AJ and Levy FO. (2004) Cloning, pharmacological characterisation and tissue distribution of a novel 5-HT₄ receptor splice variant, 5-HT₄(i). *Naunyn Schmiedebergs Arch. Pharmacol.* **369**: 616-28 [PMID:15118808]
 63. Brenchat A, Romero L, García M, Pujol M, Burgueño J, Torrens A, Hamon M, Baeyens JM, Buschmann H and Zamanillo D *et al.*. (2009) 5-HT₇ receptor activation inhibits mechanical hypersensitivity secondary to

- capsaicin sensitization in mice. *Pain* **141**: 239-47 [PMID:19118950]
64. Brennan TJ, Seeley WW, Kilgard M, Schreiner CE and Tecott LH. (1997) Sound-induced seizures in serotonin 5-HT_{2c} receptor mutant mice. *Nat. Genet.* **16**: 387-90 [PMID:9241279]
 65. Briejer MR, Bosmans JP, Van Daele P, Jurzak M, Heylen L, Leysen JE, Prins NH and Schuurkes JA. (2001) The in vitro pharmacological profile of prucalopride, a novel enterokinetic compound. *Eur. J. Pharmacol.* **423**: 71-83 [PMID:11438309]
 66. Brodney MA, Johnson DE, Sawant-Basak A, Coffman KJ, Drummond EM, Hudson EL, Fisher KE, Noguchi H, Waizumi N and McDowell LL *et al.*. (2012) Identification of multiple 5-HT₄ partial agonist clinical candidates for the treatment of Alzheimer's disease. *J. Med. Chem.* **55**: 9240-54 [PMID:22974325]
 67. Bromidge SM, Brown AM, Clarke SE, Dodgson K, Gager T, Grassam HL, Jeffrey PM, Joiner GF, King FD and Middlemiss DN *et al.*. (1999) 5-Chloro-N-(4-methoxy-3-piperazin-1-yl-phenyl)-3-methyl-2-benzothiophenesulfonamide (SB-271046): a potent, selective, and orally bioavailable 5-HT₆ receptor antagonist. *J. Med. Chem.* **42**: 202-5 [PMID:9925723]
 68. Bromidge SM, Clarke SE, Gager T, Griffith K, Jeffrey P, Jennings AJ, Joiner GF, King FD, Lovell PJ and Moss SF *et al.*. (2001) Phenyl benzenesulfonamides are novel and selective 5-HT₆ antagonists: identification of N-(2,5-dibromo-3-fluorophenyl)-4-methoxy-3-piperazin-1-ylbenzenesulfonamide (SB-357134). *Bioorg. Med. Chem. Lett.* **11**: 55-8 [PMID:11140733]
 69. Bromidge SM, Dabbs S, Davies DT, Davies S, Duckworth DM, Forbes IT, Gaster LM, Ham P, Jones GE and King FD *et al.*. (2000) Biarylcarbamoylindolines are novel and selective 5-HT_{2C} receptor inverse agonists: identification of 5-methyl-1-[[2-[(2-methyl-3-pyridyl)oxy]-5-pyridyl]carbamoyl]-6-trifluoromethylindoline (SB-243213) as a potential antidepressant/anxiolytic agent. *J. Med. Chem.* **43**: 1123-34 [PMID:10737744]
 70. Brown AM, Avenell K, Young TJ, Ho M, Porter RA, Vimal M and Middlemiss DN. (1998) BRL 54443, a potent agonist with selectivity for human cloned 5-HT_{1E} and 5-HT_{1F} receptors. *British Journal of Pharmacology* **123**: 233
 71. Brown AM, Young TJ, Patch TL, Cheung CW, Kaumann AJ, Gaster L and King FD. (1993) [¹²⁵I]-SB 207710, A potent, selective radioligand for 5-HT₄ receptors. *Br J Pharmacol* **110**: 10
 72. Bruinvels AT, Landwehrmeyer B, Gustafson EL, Durkin MM, Mengod G, Branchek TA, Hoyer D and Palacios JM. (1994) Localization of 5-HT_{1B}, 5-HT_{1D} alpha, 5-HT_{1E} and 5-HT_{1F} receptor messenger RNA in rodent and primate brain. *Neuropharmacology* **33**: 367-86 [PMID:7984275]
 73. Bruinvels AT, Palacios JM and Hoyer D. (1993) Autoradiographic characterisation and localisation of 5-HT_{1D} compared to 5-HT_{1B} binding sites in rat brain. *Naunyn Schmiedebergs Arch. Pharmacol.* **347**: 569-82 [PMID:8361548]
 74. Bryant HU, Nelson DL, Button D, Cole HW, Baez MB, Lucaites VL, Wainscott DB, Whitesitt C, Reel J and Simon R *et al.*. (1996) A novel class of 5-HT_{2A} receptor antagonists: aryl aminoguanidines. *Life Sci.* **59**: 1259-68 [PMID:8845011]
 75. Brüss M, Kiel S, Bönisch H, Kostanian A and Göthert M. (2005) Decreased agonist, but not antagonist, binding to the naturally occurring Thr92Lys variant of the h5-HT_{7(a)} receptor. *Neurochem. Int.* **47**: 196-203 [PMID:15896881]
 76. Buckland PR, Hoogendoorn B, Guy CA, Smith SK, Coleman SL and O'Donovan MC. (2005) Low gene expression conferred by association of an allele of the 5-HT_{2C} receptor gene with antipsychotic-induced weight gain. *Am J Psychiatry* **162**: 613-5 [PMID:15741483]
 77. Budhoo MR and Kellum JM. (1994) Evidence for a 5-HT₄ receptor pathway mediating chloride secretion in the rat distal colon. *J. Surg. Res.* **57**: 44-8 [PMID:8041147]
 78. Buhot MC and Naili S. (1995) Changes in exploratory activity following stimulation of hippocampal 5-HT_{1A} and 5-HT_{1B} receptors in the rat. *Hippocampus* **5**: 198-208 [PMID:7550615]
 79. Burnet PW, Eastwood SL, Lacey K and Harrison PJ. (1995) The distribution of 5-HT_{1A} and 5-HT_{2A} receptor mRNA in human brain. *Brain Res.* **676**: 157-68 [PMID:7796165]
 80. Burns CM, Chu H, Rueter SM, Hutchinson LK, Canton H, Sanders-Bush E and Emeson RB. (1997) Regulation of serotonin-2C receptor G-protein coupling by RNA editing. *Nature* **387**: 303-8 [PMID:9153397]

81. Bymaster FP, Dreshfield-Ahmad LJ, Threlkeld PG, Shaw JL, Thompson L, Nelson DL, Hemrick-Luecke SK and Wong DT. (2001) Comparative affinity of duloxetine and venlafaxine for serotonin and norepinephrine transporters in vitro and in vivo, human serotonin receptor subtypes, and other neuronal receptors. *Neuropsychopharmacology* **25**: 871-80 [PMID:11750180]
82. Canton H, Emeson RB, Barker EL, Backstrom JR, Lu JT, Chang MS and Sanders-Bush E. (1996) Identification, molecular cloning, and distribution of a short variant of the 5-hydroxytryptamine_{2C} receptor produced by alternative splicing. *Mol. Pharmacol.* **50**: 799-807 [PMID:8863824]
83. Carson MJ, Thomas EA, Danielson PE and Sutcliffe JG. (1996) The 5HT_{5A} serotonin receptor is expressed predominantly by astrocytes in which it inhibits cAMP accumulation: a mechanism for neuronal suppression of reactive astrocytes. *Glia* **17**: 317-26 [PMID:8856328]
84. Castro L, Mialet-Perez J, Guillemeau A, Stillitano F, Zolk O, Eschenhagen T, Lezoualc'h F, Bochet P and Fischmeister R. (2005) Differential functional effects of two 5-HT₄ receptor isoforms in adult cardiomyocytes. *J. Mol. Cell. Cardiol.* **39**: 335-44 [PMID:15950987]
85. Centurión D, Glusa E, Sánchez-López A, Valdivia LF, Saxena PR and Villalón CM. (2004) 5-HT₇, but not 5-HT_{2B}, receptors mediate hypotension in vagosympathectomized rats. *Eur. J. Pharmacol.* **502**: 239-42 [PMID:15476750]
86. Chadha A, Sur C, Atack J and Duty S. (2000) The 5HT_{1B} receptor agonist, CP-93129, inhibits [(3)H]-GABA release from rat globus pallidus slices and reverses akinesia following intrapallidal injection in the reserpine-treated rat. *Br. J. Pharmacol.* **130**: 1927-32 [PMID:10952684]
87. Chapin EM and Andrade R. (2001) A 5-HT₇ receptor-mediated depolarization in the anterodorsal thalamus. II. Involvement of the hyperpolarization-activated current I(h). *J. Pharmacol. Exp. Ther.* **297**: 403-9 [PMID:11259569]
88. Charest A, Wainer BH and Albert PR. (1993) Cloning and differentiation-induced expression of a murine serotonin_{1A} receptor in a septal cell line. *J. Neurosci.* **13**: 5164-71 [PMID:8254366]
89. Chen J, Shen C and Meller E. (2002) 5-HT_{1A} receptor-mediated regulation of mitogen-activated protein kinase phosphorylation in rat brain. *Eur. J. Pharmacol.* **452**: 155-62 [PMID:12354565]
90. Choi DS and Maroteaux L. (1996) Immunohistochemical localisation of the serotonin 5-HT_{2B} receptor in mouse gut, cardiovascular system, and brain. *FEBS Lett.* **391**: 45-51 [PMID:8706927]
91. Choi S, Haggart D, Toll L and Cuny GD. (2004) Synthesis, receptor binding and functional studies of mesoridazine stereoisomers. *Bioorg. Med. Chem. Lett.* **14**: 4379-82 [PMID:15357957]
92. Chojnacka-Wójcik E, Kłodzińska A and Dereń-Wesołek A. (1994) Involvement of 5-HT_{2C} receptors in the m-CPP-induced antinociception in mice. *Pol J Pharmacol* **46**: 423-8 [PMID:7894529]
93. Chou-Green JM, Holscher TD, Dallman MF and Akana SF. (2003) Repeated stress in young and old 5-HT_{2C} receptor knockout mice. *Physiol. Behav.* **79**: 217-26 [PMID:12834793]
94. Chou-Green JM, Holscher TD, Dallman MF and Akana SF. (2003) Compulsive behavior in the 5-HT_{2C} receptor knockout mouse. *Physiol. Behav.* **78**: 641-9 [PMID:12782219]
95. Claeysen S, Faye P, Sebben M, Lemaire S, Bockaert J and Dumuis A. (1997) Cloning and expression of human 5-HT_{4S} receptors. Effect of receptor density on their coupling to adenylyl cyclase. *Neuroreport* **8**: 3189-96 [PMID:9351641]
96. Claeysen S, Sebben M, Becamel C, Bockaert J and Dumuis A. (1999) Novel brain-specific 5-HT₄ receptor splice variants show marked constitutive activity: role of the C-terminal intracellular domain. *Mol. Pharmacol.* **55**: 910-20 [PMID:10220570]
97. Claeysen S, Sebben M, Journot L, Bockaert J and Dumuis A. (1996) Cloning, expression and pharmacology of the mouse 5-HT_{4L} receptor. *FEBS Lett.* **398**: 19-25 [PMID:8946946]
98. Commery TA. (2010) SAM-531, N,N-dimethyl-3-[[3-(1-naphthylsulfonyl)-1H-indazol-5-yl]oxy] propan-1-amine, a novel serotonin-6 receptor antagonist with preclinical pro-cognitive efficacy. *Alzheimer's & Dementia* **6**: S548-S549
99. Compan V, Charnay Y, Dustificier N, Daszuta A, Hen R and Bockaert J. (2004) [Feeding disorders in 5-HT₄ receptor knockout mice]. *J. Soc. Biol.* **198**: 37-49 [PMID:15146954]
100. Compan V, Daszuta A, Salin P, Sebben M, Bockaert J and Dumuis A. (1996) Lesion study of the

- distribution of serotonin 5-HT₄ receptors in rat basal ganglia and hippocampus. *Eur. J. Neurosci.* **8**: 2591-8 [PMID:8996808]
101. Compan V, Zhou M, Grailhe R, Gazzara RA, Martin R, Gingrich J, Dumuis A, Brunner D, Bockaert J and Hen R. (2004) Attenuated response to stress and novelty and hypersensitivity to seizures in 5-HT₄ receptor knock-out mice. *J. Neurosci.* **24**: 412-9 [PMID:14724239]
 102. Conn PJ, Sanders-Bush E, Hoffman BJ and Hartig PR. (1986) A unique serotonin receptor in choroid plexus is linked to phosphatidylinositol turnover. *Proc. Natl. Acad. Sci. U.S.A.* **83**: 4086-8 [PMID:2940597]
 103. Corbett DF, Heightman TD, Moss SF, Bromidge SM, Coggon SA, Longley MJ, Roa AM, Williams JA and Thomas DR. (2005) Discovery of a potent and selective 5-HT_{5A} receptor antagonist by high-throughput chemistry. *Bioorg. Med. Chem. Lett.* **15**: 4014-8 [PMID:16002289]
 104. Costes N, Merlet I, Ostrowsky K, Faillenot I, Lavenne F, Zimmer L, Ryvlin P and Le Bars D. (2005) A 18F-MPPF PET normative database of 5-HT_{1A} receptor binding in men and women over aging. *J. Nucl. Med.* **46**: 1980-9 [PMID:16330560]
 105. Cox DA and Cohen ML. (1995) 5-Hydroxytryptamine_{2B} receptor signaling in rat stomach fundus: role of voltage-dependent calcium channels, intracellular calcium release and protein kinase C. *J. Pharmacol. Exp. Ther.* **272**: 143-50 [PMID:7815326]
 106. Crowell MD, Mathis C, Schettler VA, Yunus T and Lacy BE. (2005) The effects of tegaserod, a 5-HT receptor agonist, on gastric emptying in a murine model of diabetes mellitus. *Neurogastroenterol. Motil.* **17**: 738-43 [PMID:16185313]
 107. Darblade B, Behr-Roussel D, Gorny D, Leuret T, Benoit G, Hieble JP, Brooks D, Alexandre L and Giuliano F. (2005) Piboserod (SB 207266), a selective 5-HT₄ receptor antagonist, reduces serotonin potentiation of neurally-mediated contractile responses of human detrusor muscle. *World J Urol* **23**: 147-51 [PMID:15902472]
 108. Davidson C, Ho M, Price GW, Jones BJ and Stamford JA. (1997) (+)-WAY 100135, a partial agonist, at native and recombinant 5-HT_{1B/1D} receptors. *Br. J. Pharmacol.* **121**: 737-42 [PMID:9208142]
 109. Dawson LA and Watson JM. (2009) Vilazodone: a 5-HT_{1A} receptor agonist/serotonin transporter inhibitor for the treatment of affective disorders. *CNS Neurosci Ther* **15**: 107-17 [PMID:19499624]
 110. Day M, Olson PA, Platzer J, Striessnig J and Surmeier DJ. (2002) Stimulation of 5-HT₍₂₎ receptors in prefrontal pyramidal neurons inhibits Ca_v(1.2) L type Ca²⁺ currents via a PLC β /IP₃/calcineurin signaling cascade. *J. Neurophysiol.* **87**: 2490-504 [PMID:11976386]
 111. de las Casas-Engel M, Domínguez-Soto A, Sierra-Filardi E, Bragado R, Nieto C, Puig-Kroger A, Samaniego R, Loza M, Corcuera MT and Gómez-Aguado F *et al.*. (2013) Serotonin skews human macrophage polarization through HTR_{2B} and HTR₇. *J. Immunol.* **190**: 2301-10 [PMID:23355731]
 112. De Vry J, Schohe-Loop R, Heine HG, Greuel JM, Mauler F, Schmidt B, Sommermeyer H and Glaser T. (1998) Characterization of the aminomethylchroman derivative BAY x 3702 as a highly potent 5-hydroxytryptamine_{1A} receptor agonist. *J. Pharmacol. Exp. Ther.* **284**: 1082-94 [PMID:9495870]
 113. Degen L, Matzinger D, Merz M, Appel-Dingemanse S, Osborne S, Lüchinger S, Bertold R, Maecke H and Beglinger C. (2001) Tegaserod, a 5-HT₄ receptor partial agonist, accelerates gastric emptying and gastrointestinal transit in healthy male subjects. *Aliment. Pharmacol. Ther.* **15**: 1745-51 [PMID:11683688]
 114. Del Tredici AL, Schiffer HH, Burstein ES, Lameh J, Mohell N, Hacksell U, Brann MR and Weiner DM. (2004) Pharmacology of polymorphic variants of the human 5-HT_{1A} receptor. *Biochem. Pharmacol.* **67**: 479-90 [PMID:15037200]
 115. Dizzei N, Bjartell A, Nilsson E, Hansson J, Gadaleanu V, Cross N and Abrahamsson PA. (2004) Expression of serotonin receptors and role of serotonin in human prostate cancer tissue and cell lines. *Prostate* **59**: 328-36 [PMID:15042609]
 116. Doly S, Fischer J, Brisorgueil MJ, Vergé D and Conrath M. (2004) 5-HT_{5A} receptor localization in the rat spinal cord suggests a role in nociception and control of pelvic floor musculature. *J. Comp. Neurol.* **476**: 316-29 [PMID:15282708]
 117. Doménech T, Beleta J, Fernández AG, Gristwood RW, Cruz Sánchez F, Tolosa E and Palacios JM. (1994) Identification and characterization of serotonin 5-HT₄ receptor binding sites in human brain:

- comparison with other mammalian species. *Brain Res. Mol. Brain Res.* **21**: 176-80 [PMID:8164518]
118. Doménech T, Beleta J and Palacios JM. (1997) Characterization of human serotonin 1D and 1B receptors using [3H]-GR-125743, a novel radiolabelled serotonin 5HT1D/1B receptor antagonist. *Naunyn Schmiedebergs Arch. Pharmacol.* **356**: 328-34 [PMID:9303569]
 119. Dukat M, Smith C, Herrick-Davis K, Teitler M and Glennon RA. (2004) Binding of tryptamine analogs at h5-HT1E receptors: a structure-affinity investigation. *Bioorg. Med. Chem.* **12**: 2545-52 [PMID:15110837]
 120. Dumuis A, Bouhelal R, Sebben M, Cory R and Bockaert J. (1988) A nonclassical 5-hydroxytryptamine receptor positively coupled with adenylate cyclase in the central nervous system. *Mol. Pharmacol.* **34**: 880-7 [PMID:2849052]
 121. Dunlop J, Sabb AL, Mazandarani H, Zhang J, Kalgaonker S, Shukhina E, Sukoff S, Vogel RL, Stack G and Schechter L *et al.*. (2005) WAY-163909 [(7bR, 10aR)-1,2,3,4,8,9,10,10a-octahydro-7bH-cyclopenta-[b][1,4]diazepino[6,7,1hi]indole], a novel 5-hydroxytryptamine 2C receptor-selective agonist with anorectic activity. *J. Pharmacol. Exp. Ther.* **313**: 862-9 [PMID:15705738]
 122. Egan C, Grinde E, Dupre A, Roth BL, Hake M, Teitler M and Herrick-Davis K. (2000) Agonist high and low affinity state ratios predict drug intrinsic activity and a revised ternary complex mechanism at serotonin 5-HT(2A) and 5-HT(2C) receptors. *Synapse* **35**: 144-150 [PMID:10611640]
 123. Egan CT, Herrick-Davis K and Teitler M. (1998) Creation of a constitutively activated state of the 5-hydroxytryptamine2A receptor by site-directed mutagenesis: inverse agonist activity of antipsychotic drugs. *J. Pharmacol. Exp. Ther.* **286**: 85-90 [PMID:9655845]
 124. El-Khodori BF, Dimmler MH, Amara DA, Hofer M, Hen R and Brunner D. (2004) Juvenile 5HT(1B) receptor knockout mice exhibit reduced pharmacological sensitivity to 5HT(1A) receptor activation. *Int. J. Dev. Neurosci.* **22**: 405-13 [PMID:15380839]
 125. Ellis ES, Byrne C, Murphy OE, Tilford NS and Baxter GS. (1995) Mediation by 5-hydroxytryptamine2B receptors of endothelium-dependent relaxation in rat jugular vein. *Br. J. Pharmacol.* **114**: 400-4 [PMID:7881740]
 126. Ennis MD, Ghazal NB, Hoffman RL, Smith MW, Schlachter SK, Lawson CF, Im WB, Pregonzer JF, Svensson KA and Lewis RA *et al.*. (1998) Isochroman-6-carboxamides as highly selective 5-HT1D agonists: potential new treatment for migraine without cardiovascular side effects. *J. Med. Chem.* **41**: 2180-3 [PMID:9632349]
 127. Erlander MG, Lovenberg TW, Baron BM, de Lecea L, Danielson PE, Racke M, Slone AL, Siegel BW, Foye PE and Cannon K *et al.*. (1993) Two members of a distinct subfamily of 5-hydroxytryptamine receptors differentially expressed in rat brain. *Proc. Natl. Acad. Sci. U.S.A.* **90**: 3452-6 [PMID:7682702]
 128. Fargin A, Raymond JR, Regan JW, Cotecchia S, Lefkowitz RJ and Caron MG. (1989) Effector coupling mechanisms of the cloned 5-HT1A receptor. *J. Biol. Chem.* **264**: 14848-52 [PMID:2549039]
 129. Fedouloff M, Hossner F, Voyle M, Ranson J, Powles J, Riley G and Sanger G. (2001) Synthesis and pharmacological activity of metabolites of the 5-HT(4) receptor antagonist SB-207266. *Bioorg. Med. Chem.* **9**: 2119-28 [PMID:11504648]
 130. Fernández J, Alonso JM, Andrés JI, Cid JM, Díaz A, Iturrino L, Gil P, Megens A, Sipido VK and Trabanco AA. (2005) Discovery of new tetracyclic tetrahydrofuran derivatives as potential broad-spectrum psychotropic agents. *J. Med. Chem.* **48**: 1709-12 [PMID:15771415]
 131. Fiorica-Howells E, Hen R, Gingrich J, Li Z and Gershon MD. (2002) 5-HT(2A) receptors: location and functional analysis in intestines of wild-type and 5-HT(2A) knockout mice. *Am. J. Physiol. Gastrointest. Liver Physiol.* **282**: G877-93 [PMID:11960784]
 132. Fiorino F, Magli E, Kędzierska E, Ciano A, Corvino A, Severino B, Perissutti E, Frecentese F, Di Vaio P and Saccone I *et al.*. (2017) New 5-HT_{1A}, 5HT_{2A} and 5HT_{2C} receptor ligands containing a picolinic nucleus: Synthesis, in vitro and in vivo pharmacological evaluation. *Bioorg. Med. Chem.* **25**: 5820-5837 [PMID:28943244]
 133. Fitzgerald LW, Conklin DS, Krause CM, Marshall AP, Patterson JP, Tran DP, Iyer G, Kostich WA, Largent BL and Hartig PR. (1999) High-affinity agonist binding correlates with efficacy (intrinsic activity) at the human serotonin 5-HT2A and 5-HT2C receptors: evidence favoring the ternary complex and two-state

- models of agonist action. *J. Neurochem.* **72**: 2127-34 [PMID:10217294]
134. Fitzgerald LW, Iyer G, Conklin DS, Krause CM, Marshall A, Patterson JP, Tran DP, Jonak GJ and Hartig PR. (1999) Messenger RNA editing of the human serotonin 5-HT_{2C} receptor. *Neuropsychopharmacology* **21**: 82S-90S [PMID:10432493]
 135. Foguet M, Nguyen H, Le H and Lübbert H. (1992) Structure of the mouse 5-HT_{1C}, 5-HT₂ and stomach fundus serotonin receptor genes. *Neuroreport* **3**: 345-8 [PMID:1381232]
 136. Fone KC, Austin RH, Topham IA, Kennett GA and Punhani T. (1998) Effect of chronic m-CPP on locomotion, hypophagia, plasma corticosterone and 5-HT_{2C} receptor levels in the rat. *Br. J. Pharmacol.* **123**: 1707-15 [PMID:9605579]
 137. Fonseca MI, Ni YG, Dunning DD and Miledi R. (2001) Distribution of serotonin 2A, 2C and 3 receptor mRNA in spinal cord and medulla oblongata. *Brain Res. Mol. Brain Res.* **89**: 11-9 [PMID:11311971]
 138. Forbes IT, Douglas S, Gribble AD, Ife RJ, Lightfoot AP, Garner AE, Riley GJ, Jeffrey P, Stevens AJ and Stean TO *et al.*. (2002) SB-656104-A: a novel 5-HT₇ receptor antagonist with improved in vivo properties. *Bioorg. Med. Chem. Lett.* **12**: 3341-4 [PMID:12392747]
 139. Ford AP, Baxter GS, Eglén RM and Clarke DE. (1992) 5-Hydroxytryptamine stimulates cyclic AMP formation in the tunica muscularis mucosae of the rat oesophagus via 5-HT₄ receptors. *Eur. J. Pharmacol.* **211**: 117-20 [PMID:1319906]
 140. Foxx-Orenstein AE, Kuemmerle JF and Grider JR. (1996) Distinct 5-HT receptors mediate the peristaltic reflex induced by mucosal stimuli in human and guinea pig intestine. *Gastroenterology* **111**: 1281-90 [PMID:8898642]
 141. Francken BJ, Jurzak M, Vanhauwe JF, Luyten WH and Leysen JE. (1998) The human 5-HT_{5A} receptor couples to Gi/Go proteins and inhibits adenylate cyclase in HEK 293 cells. *Eur. J. Pharmacol.* **361**: 299-309 [PMID:9865521]
 142. Frank MG, Stryker MP and Tecott LH. (2002) Sleep and sleep homeostasis in mice lacking the 5-HT_{2c} receptor. *Neuropsychopharmacology* **27**: 869-73 [PMID:12431861]
 143. Freire-Garabal M, Núñez MJ, Balboa J, López-Delgado P, Gallego R, García-Caballero T, Fernández-Roel MD, Brenlla J and Rey-Méndez M. (2003) Serotonin upregulates the activity of phagocytosis through 5-HT_{1A} receptors. *Br. J. Pharmacol.* **139**: 457-63 [PMID:12770951]
 144. Fujiwara Y, Nelson DL, Kashihara K, Varga E, Roeske WR and Yamamura HI. (1990) The cloning and sequence analysis of the rat serotonin-1A receptor gene. *Life Sci.* **47**: PL127-32 [PMID:2273937]
 145. Gaietta GM, Yoder EJ, Deerinck T, Kinder K, Hanono A, Han A, Wu C and Ellisman MH. (2003) 5-HT_{2a} receptors in rat sciatic nerves and Schwann cell cultures. *J. Neurocytol.* **32**: 373-80 [PMID:14724380]
 146. Galeotti N, Ghelardini C and Bartolini A. (1998) Role of 5-HT₄ receptors in the mouse passive avoidance test. *J. Pharmacol. Exp. Ther.* **286**: 1115-21 [PMID:9732367]
 147. Gardell LR, Vanover KE, Pounds L, Johnson RW, Barido R, Anderson GT, Veinbergs I, Dyssegaard A, Brunmark P and Tabatabaei A *et al.*. (2007) ACP-103, a 5-hydroxytryptamine 2A receptor inverse agonist, improves the antipsychotic efficacy and side-effect profile of haloperidol and risperidone in experimental models. *J. Pharmacol. Exp. Ther.* **322**: 862-70 [PMID:17519387]
 148. Garlow SJ, Chin AC, Marinovich AM, Heller MR and Ciaranello RD. (1994) Cloning and functional promoter mapping of the rat serotonin-2 receptor gene. *Mol. Cell. Neurosci.* **5**: 291-300 [PMID:8087427]
 149. Garnovskaya MN, Gettys TW, van Biesen T, Prpic V, Chuprun JK and Raymond JR. (1997) 5-HT_{1A} receptor activates Na⁺/H⁺ exchange in CHO-K1 cells through G_{α2} and G_{α3}. *J. Biol. Chem.* **272**: 7770-6 [PMID:9065439]
 150. Garnovskaya MN, Nebigil CG, Arthur JM, Spurney RF and Raymond JR. (1995) 5-Hydroxytryptamine_{2A} receptors expressed in rat renal mesangial cells inhibit cyclic AMP accumulation. *Mol. Pharmacol.* **48**: 230-7 [PMID:7651356]
 151. Gaster LM, Blaney FE, Davies S, Duckworth DM, Ham P, Jenkins S, Jennings AJ, Joiner GF, King FD and Mulholland KR *et al.*. (1998) The selective 5-HT_{1B} receptor inverse agonist 1'-methyl-5-[[2'-methyl-4'-(5-methyl-1,2,4-oxadiazol-3-yl)biphenyl-4-yl]carbonyl]-2,3,6,7-tetrahydro-spiro[furo[2,3-f]indole-3,4'-piperidine] (SB-224289) potently blocks terminal 5-HT autoreceptor function both in vitro and in vivo. *J.*

- Med. Chem.* **41**: 1218-35 [PMID:9548813]
152. Gerald C, Adham N, Kao HT, Olsen MA, Laz TM, Schechter LE, Bard JA, Vaysse PJ, Hartig PR and Branchek TA *et al.*. (1995) The 5-HT₄ receptor: molecular cloning and pharmacological characterization of two splice variants. *EMBO J.* **14**: 2806-15 [PMID:7796807]
 153. Gershon MD. (1999) Review article: roles played by 5-hydroxytryptamine in the physiology of the bowel. *Aliment. Pharmacol. Ther.* **13 Suppl 2**: 15-30 [PMID:10429737]
 154. Ghia JE, Li N, Wang H, Collins M, Deng Y, El-Sharkawy RT, Côté F, Mallet J and Khan WI. (2009) Serotonin has a key role in pathogenesis of experimental colitis. *Gastroenterology* **137**: 1649-60 [PMID:19706294]
 155. Gibson EL, Barnfield AM and Curzon G. (1994) Evidence that mCPP-induced anxiety in the plus-maze is mediated by postsynaptic 5-HT_{2C} receptors but not by sympathomimetic effects. *Neuropharmacology* **33**: 457-65 [PMID:7984284]
 156. Gilet M, Eutamene H, Han H, Kim HW and Bueno L. (2014) Influence of a new 5-HT₄ receptor partial agonist, YKP10811, on visceral hypersensitivity in rats triggered by stress and inflammation. *Neurogastroenterol. Motil.* **26**: 1761-70 [PMID:25316608]
 157. Glennon RA. (2003) Higher-end serotonin receptors: 5-HT(5), 5-HT(6), and 5-HT(7). *J. Med. Chem.* **46**: 2795-812 [PMID:12825922]
 158. Glennon RA, Lee M, Rangisetty JB, Dukat M, Roth BL, Savage JE, McBride A, Rauser L, Hufeisen S and Lee DK. (2000) 2-Substituted tryptamines: agents with selectivity for 5-HT(6) serotonin receptors. *J. Med. Chem.* **43**: 1011-8 [PMID:10715164]
 159. Goodfellow NM, Bailey CD and Lambe EK. (2012) The native serotonin 5-HT(5A) receptor: electrophysiological characterization in rodent cortex and 5-HT(1A)-mediated compensatory plasticity in the knock-out mouse. *J. Neurosci.* **32**: 5804-9 [PMID:22539842]
 160. Grailhe R, Grabtree GW and Hen R. (2001) Human 5-HT(5) receptors: the 5-HT(5A) receptor is functional but the 5-HT(5B) receptor was lost during mammalian evolution. *Eur. J. Pharmacol.* **418**: 157-67 [PMID:11343685]
 161. Grailhe R, Waeber C, Dulawa SC, Hornung JP, Zhuang X, Brunner D, Geyer MA and Hen R. (1999) Increased exploratory activity and altered response to LSD in mice lacking the 5-HT(5A) receptor. *Neuron* **22**: 581-91 [PMID:10197537]
 162. Grider JR. (2003) Neurotransmitters mediating the intestinal peristaltic reflex in the mouse. *J. Pharmacol. Exp. Ther.* **307**: 460-7 [PMID:12966154]
 163. Grånäs C and Larhammar D. (1999) Identification of an amino acid residue important for binding of methiothepin and sumatriptan to the human 5-HT(1B) receptor. *Eur. J. Pharmacol.* **380**: 171-81 [PMID:10513577]
 164. Guptan P, Dhingra A and Panicker MM. (1997) Multiple transcripts encode the 5-HT_{1F} receptor in rodent brain. *Neuroreport* **8**: 3317-21 [PMID:9351664]
 165. Guscott M, Bristow LJ, Hadingham K, Rosahl TW, Beer MS, Stanton JA, Bromidge F, Owens AP, Huscroft I and Myers J *et al.*. (2005) Genetic knockout and pharmacological blockade studies of the 5-HT₇ receptor suggest therapeutic potential in depression. *Neuropharmacology* **48**: 492-502 [PMID:15755477]
 166. Guscott MR, Egan E, Cook GP, Stanton JA, Beer MS, Rosahl TW, Hartmann S, Kulagowski J, McAllister G and Fone KC *et al.*. (2003) The hypothermic effect of 5-CT in mice is mediated through the 5-HT₇ receptor. *Neuropharmacology* **44**: 1031-7 [PMID:12763096]
 167. Hall H, Farde L, Halldin C, Lundkvist C and Sedvall G. (2000) Autoradiographic localization of 5-HT(2A) receptors in the human brain using [(3)H]M100907 and [(11)C]M100907. *Synapse* **38**: 421-31 [PMID:11044889]
 168. Hamada S, Senzaki K, Hamaguchi-Hamada K, Tabuchi K, Yamamoto H, Yamamoto T, Yoshikawa S, Okano H and Okado N. (1998) Localization of 5-HT_{2A} receptor in rat cerebral cortex and olfactory system revealed by immunohistochemistry using two antibodies raised in rabbit and chicken. *Brain Res. Mol. Brain Res.* **54**: 199-211 [PMID:9555012]
 169. Hamblin MW, McGuffin RW, Metcalf MA, Dorsa DM and Merchant KM. (1992) Distinct 5-HT_{1B} and 5-

- HT1D serotonin receptors in rat: structural and pharmacological comparison of the two cloned receptors. *Mol. Cell. Neurosci.* **3**: 578-587
170. Hamblin MW and Metcalf MA. (1991) Primary structure and functional characterization of a human 5-HT1D-type serotonin receptor. *Mol. Pharmacol.* **40**: 143-8 [PMID:1652050]
 171. Hamblin MW, Metcalf MA, McGuffin RW and Karpells S. (1992) Molecular cloning and functional characterization of a human 5-HT1B serotonin receptor: a homologue of the rat 5-HT1B receptor with 5-HT1D-like pharmacological specificity. *Biochem. Biophys. Res. Commun.* **184**: 752-9 [PMID:1315531]
 172. Hameg A, Bayle F, Nuss P, Dupuis P, Garay RP and Dib M. (2003) Affinity of cyamemazine, an anxiolytic antipsychotic drug, for human recombinant dopamine vs. serotonin receptor subtypes. *Biochem. Pharmacol.* **65**: 435-40 [PMID:12527336]
 173. Hannon J and Hoyer D. (2008) Molecular biology of 5-HT receptors. *Behav. Brain Res.* **195**: 198-213 [PMID:18571247]
 174. Harada K, Aota M, Inoue T, Matsuda R, Mihara T, Yamaji T, Ishibashi K and Matsuoka N. (2006) Anxiolytic activity of a novel potent serotonin 5-HT2C receptor antagonist FR260010: a comparison with diazepam and buspirone. *Eur. J. Pharmacol.* **553**: 171-84 [PMID:17074317]
 175. Harte SE, Kender RG and Borszcz GS. (2005) Activation of 5-HT1A and 5-HT7 receptors in the parafascicular nucleus suppresses the affective reaction of rats to noxious stimulation. *Pain* **113**: 405-15 [PMID:15661450]
 176. Hartig PR, Hoyer D, Humphrey PP and Martin GR. (1996) Alignment of receptor nomenclature with the human genome: classification of 5-HT1B and 5-HT1D receptor subtypes. *Trends Pharmacol. Sci.* **17**: 103-5 [PMID:8936345]
 177. Hasegawa Y, Higuchi S, Matsushita S and Miyaoka H. (2002) Association of a polymorphism of the serotonin 1B receptor gene and alcohol dependence with inactive aldehyde dehydrogenase-2. *J Neural Transm (Vienna)* **109**: 513-21 [PMID:11956970]
 178. Hawi Z, Dring M, Kirley A, Foley D, Kent L, Craddock N, Asherson P, Curran S, Gould A and Richards Set al.. (2002) Serotonergic system and attention deficit hyperactivity disorder (ADHD): a potential susceptibility locus at the 5-HT(1B) receptor gene in 273 nuclear families from a multi-centre sample. *Mol. Psychiatry* **7**: 718-25 [PMID:12192616]
 179. Hedlund PB, Carson MJ, Sutcliffe JG and Thomas EA. (1999) Allosteric regulation by oleamide of the binding properties of 5-hydroxytryptamine7 receptors. *Biochem. Pharmacol.* **58**: 1807-13 [PMID:10571256]
 180. Hedlund PB, Kelly L, Mazur C, Lovenberg T, Sutcliffe JG and Bonaventure P. (2004) 8-OH-DPAT acts on both 5-HT1A and 5-HT7 receptors to induce hypothermia in rodents. *Eur. J. Pharmacol.* **487**: 125-32 [PMID:15033384]
 181. Hegde SS and Eglen RM. (1996) Peripheral 5-HT4 receptors. *FASEB J.* **10**: 1398-407 [PMID:8903510]
 182. Hegde SS, Wong AG, Perry MR, Ku P, Moy TM, Loeb M and Eglen RM. (1995) 5-HT4 receptor mediated stimulation of gastric emptying in rats. *Naunyn Schmiedebergs Arch. Pharmacol.* **351**: 589-95 [PMID:7675116]
 183. Heidmann DE, Szot P, Kohen R and Hamblin MW. (1998) Function and distribution of three rat 5-hydroxytryptamine7 (5-HT7) receptor isoforms produced by alternative splicing. *Neuropharmacology* **37**: 1621-32 [PMID:9886685]
 184. Heinrich T, Böttcher H, Gericke R, Bartoszyk GD, Anzali S, Seyfried CA, Greiner HE and Van Amsterdam C. (2004) Synthesis and structure--activity relationship in a class of indolebutylpiperazines as dual 5-HT(1A) receptor agonists and serotonin reuptake inhibitors. *J. Med. Chem.* **47**: 4684-92 [PMID:15341484]
 185. Heisler LK, Chu HM, Brennan TJ, Danao JA, Bajwa P, Parsons LH and Tecott LH. (1998) Elevated anxiety and antidepressant-like responses in serotonin 5-HT1A receptor mutant mice. *Proc. Natl. Acad. Sci. U.S.A.* **95**: 15049-54 [PMID:9844013]
 186. Herrick-Davis K, Egan C and Teitler M. (1997) Activating mutations of the serotonin 5-HT2C receptor. *J. Neurochem.* **69**: 1138-44 [PMID:9282936]
 187. Herrick-Davis K, Grinde E and Niswender CM. (1999) Serotonin 5-HT2C receptor RNA editing alters receptor basal activity: implications for serotonergic signal transduction. *J. Neurochem.* **73**: 1711-7

[PMID:10501219]

188. Herrick-Davis K, Grinde E and Teitler M. (2000) Inverse agonist activity of atypical antipsychotic drugs at human 5-hydroxytryptamine_{2C} receptors. *J. Pharmacol. Exp. Ther.* **295**: 226-32 [PMID:10991983]
189. Heusler P, Palmier C, Tardif S, Bernois S, Colpaert FC and Cussac D. (2010) [(3)H]-F13640, a novel, selective and high-efficacy serotonin 5-HT_{1A} receptor agonist radioligand. *Naunyn Schmiedebergs Arch. Pharmacol.* **382**: 321-30 [PMID:20799027]
190. Hirst WD, Minton JA, Bromidge SM, Moss SF, Latter AJ, Riley G, Routledge C, Middlemiss DN and Price GW. (2000) Characterization of [(125)I]-SB-258585 binding to human recombinant and native 5-HT₆ receptors in rat, pig and human brain tissue. *Br. J. Pharmacol.* **130**: 1597-605 [PMID:10928963]
191. Hirst WD, Stean TO, Rogers DC, Sunter D, Pugh P, Moss SF, Bromidge SM, Riley G, Smith DR and Bartlett S *et al.* (2006) SB-399885 is a potent, selective 5-HT₆ receptor antagonist with cognitive enhancing properties in aged rat water maze and novel object recognition models. *Eur. J. Pharmacol.* **553**: 109-19 [PMID:17069795]
192. Holenz J, Mercè R, Díaz JL, Guitart X, Codony X, Dordal A, Romero G, Torrens A, Mas J and Andaluz B *et al.* (2005) Medicinal chemistry driven approaches toward novel and selective serotonin 5-HT₆ receptor ligands. *J. Med. Chem.* **48**: 1781-95 [PMID:15771424]
193. Hou M, Kanje M, Longmore J, Tajti J, Uddman R and Edvinsson L. (2001) 5-HT_{1B} and 5-HT_{1D} receptors in the human trigeminal ganglion: co-localization with calcitonin gene-related peptide, substance P and nitric oxide synthase. *Brain Res.* **909**: 112-20 [PMID:11478927]
194. Hoyer D, Clarke DE, Fozard JR, Hartig PR, Martin GR, Mylecharane EJ, Saxena PR and Humphrey PP. (1994) International Union of Pharmacology classification of receptors for 5-hydroxytryptamine (Serotonin). *Pharmacol. Rev.* **46**: 157-203 [PMID:7938165]
195. Hoyer D, Hannon JP and Martin GR. (2002) Molecular, pharmacological and functional diversity of 5-HT receptors. *Pharmacol. Biochem. Behav.* **71**: 533-54 [PMID:11888546]
196. Huang YY, Oquendo MA, Friedman JM, Greenhill LL, Brodsky B, Malone KM, Khait V and Mann JJ. (2003) Substance abuse disorder and major depression are associated with the human 5-HT_{1B} receptor gene (HTR1B) G861C polymorphism. *Neuropsychopharmacology* **28**: 163-9 [PMID:12496953]
197. Hurley PT, McMahon RA, Fanning P, O'Boyle KM, Rogers M and Martin F. (1998) Functional coupling of a recombinant human 5-HT_{5A} receptor to G-proteins in HEK-293 cells. *Br. J. Pharmacol.* **124**: 1238-44 [PMID:9720796]
198. Ishibashi T, Horisawa T, Tokuda K, Ishiyama T, Ogasa M, Tagashira R, Matsumoto K, Nishikawa H, Ueda Y and Toma S *et al.* (2010) Pharmacological profile of lurasidone, a novel antipsychotic agent with potent 5-hydroxytryptamine₇ (5-HT₇) and 5-HT_{1A} receptor activity. *J. Pharmacol. Exp. Ther.* **334**: 171-81 [PMID:20404009]
199. Jasper JR, Kosaka A, To ZP, Chang DJ and Eglen RM. (1997) Cloning, expression and pharmacology of a truncated splice variant of the human 5-HT₇ receptor (h5-HT_{7b}). *Br. J. Pharmacol.* **122**: 126-32 [PMID:9298538]
200. Jerning E, Svantesson GT and Mohell N. (1998) Receptor binding characteristics of [3H]NAD-299, a new selective 5-HT_{1A} receptor antagonist. *Eur. J. Pharmacol.* **360**: 219-25 [PMID:9851589]
201. Jin H, Oksenberg D, Ashkenazi A, Peroutka SJ, Duncan AM, Rozmahel R, Yang Y, Mengod G, Palacios JM and O'Dowd BF. (1992) Characterization of the human 5-hydroxytryptamine_{1B} receptor. *J. Biol. Chem.* **267**: 5735-8 [PMID:1348246]
202. Johansson L, Sohn D, Thorberg SO, Jackson DM, Kelder D, Larsson LG, Rényi L, Ross SB, Wallsten C and Eriksson H *et al.* (1997) The pharmacological characterization of a novel selective 5-hydroxytryptamine_{1A} receptor antagonist, NAD-299. *J. Pharmacol. Exp. Ther.* **283**: 216-25 [PMID:9336327]
203. John GW, Pauwels PJ, Perez M, Halazy S, Le Grand B, Verscheure Y, Valentin JP, Palmier C, Wurch T and Chopin P *et al.* (1999) F 11356, a novel 5-hydroxytryptamine (5-HT) derivative with potent, selective, and unique high intrinsic activity at 5-HT_{1B/1D} receptors in models relevant to migraine. *J. Pharmacol. Exp. Ther.* **290**: 83-95 [PMID:10381763]

204. Johnson MP, Loncharich RJ, Baez M and Nelson DL. (1994) Species variations in transmembrane region V of the 5-hydroxytryptamine type 2A receptor alter the structure-activity relationship of certain ergolines and tryptamines. *Mol. Pharmacol.* **45**: 277-86 [PMID:8114677]
205. Johnson SW, Mercuri NB and North RA. (1992) 5-hydroxytryptamine_{1B} receptors block the GABA_B synaptic potential in rat dopamine neurons. *J. Neurosci.* **12**: 2000-6 [PMID:1578282]
206. Jorand-Lebrun C, Pauwels PJ, Palmier C, Moret C, Chopin P, Perez M, Marien M and Halazy S. (1997) 5-HT_{1B} receptor antagonist properties of novel arylpiperazine derivatives of 1-naphthylpiperazine. *J. Med. Chem.* **40**: 3974-8 [PMID:9397179]
207. Joubert L, Claeysen S, Sebben M, Bessis AS, Clark RD, Martin RS, Bockaert J and Dumuis A. (2002) A 5-HT₄ receptor transmembrane network implicated in the activity of inverse agonists but not agonists. *J. Biol. Chem.* **277**: 25502-11 [PMID:11976337]
208. Kadowaki M, Wang XO, Shimatani H, Yoneda S and Takaki M. (2002) 5-HT₄ receptor enhances the propulsive power of the peristaltic reflex in the rat distal colon. *Auton Neurosci* **99**: 62-5 [PMID:12171259]
209. Kalipatnapu S, Pucadyil TJ, Harikumar KG and Chattopadhyay A. (2004) Ligand binding characteristics of the human serotonin_{1A} receptor heterologously expressed in CHO cells. *Biosci. Rep.* **24**: 101-15 [PMID:15628665]
210. Kalkman HO, Subramanian N and Hoyer D. (2001) Extended radioligand binding profile of iloperidone: a broad spectrum dopamine/serotonin/norepinephrine receptor antagonist for the management of psychotic disorders. *Neuropsychopharmacology* **25**: 904-14 [PMID:11750183]
211. Kaumann AJ and Sanders L. (1994) 5-Hydroxytryptamine causes rate-dependent arrhythmias through 5-HT₄ receptors in human atrium: facilitation by chronic beta-adrenoceptor blockade. *Naunyn Schmiedebergs Arch. Pharmacol.* **349**: 331-7 [PMID:7914677]
212. Kaumann AJ, Sanders L, Brown AM, Murray KJ and Brown MJ. (1990) A 5-hydroxytryptamine receptor in human atrium. *Br. J. Pharmacol.* **100**: 879-85 [PMID:2169944]
213. Kawano H, Tsuji H, Nishimura H, Kimura S, Yano S, Ukimura N, Kunieda Y, Yoshizumi M, Sugano T and Nakagawa K *et al.*. (2001) Serotonin induces the expression of tissue factor and plasminogen activator inhibitor-1 in cultured rat aortic endothelial cells. *Blood* **97**: 1697-702 [PMID:11238110]
214. Kaya N, Shen T, Lu SG, Zhao FL and Herness S. (2004) A paracrine signaling role for serotonin in rat taste buds: expression and localization of serotonin receptor subtypes. *Am. J. Physiol. Regul. Integr. Comp. Physiol.* **286**: R649-58 [PMID:14715493]
215. Kellett DO, Ramage AG and Jordan D. (2005) Central 5-HT₇ receptors are critical for reflex activation of cardiac vagal drive in anaesthetized rats. *J. Physiol. (Lond.)* **563**: 319-31 [PMID:15611034]
216. Kemp A and Manahan-Vaughan D. (2005) The 5-hydroxytryptamine₄ receptor exhibits frequency-dependent properties in synaptic plasticity and behavioural metaplasticity in the hippocampal CA1 region in vivo. *Cereb. Cortex* **15**: 1037-43 [PMID:15537670]
217. Kennett GA, Wood MD, Bright F, Cilia J, Piper DC, Gager T, Thomas D, Baxter GS, Forbes IT and Ham P *et al.*. (1996) In vitro and in vivo profile of SB 206553, a potent 5-HT_{2C}/5-HT_{2B} receptor antagonist with anxiolytic-like properties. *Br. J. Pharmacol.* **117**: 427-434 [PMID:8821530]
218. Kennett GA, Wood MD, Bright F, Trail B, Riley G, Holland V, Avenell KY, Stean T, Upton N and Bromidge S *et al.*. (1997) SB 242084, a selective and brain penetrant 5-HT_{2C} receptor antagonist. *Neuropharmacology* **36**: 609-20 [PMID:9225286]
219. Khawaja X, Ennis C and Minchin MC. (1997) Pharmacological characterization of recombinant human 5-hydroxytryptamine_{1A} receptors using a novel antagonist radioligand, [³H]WAY-100635. *Life Sci.* **60**: 653-65 [PMID:9048968]
220. Kikuchi C, Nagaso H, Hiranuma T and Koyama M. (1999) Tetrahydrobenzindoles: selective antagonists of the 5-HT₇ receptor. *J. Med. Chem.* **42**: 533-5 [PMID:10052959]
221. Kim JJ, Bridle BW, Ghia JE, Wang H, Syed SN, Manocha MM, Rengasamy P, Shajib MS, Wan Y and Hedlund PB *et al.*. (2013) Targeted inhibition of serotonin type 7 (5-HT₇) receptor function modulates immune responses and reduces the severity of intestinal inflammation. *J. Immunol.* **190**: 4795-804 [PMID:23554310]

222. Kim Y, Kim J, Tae J, Roth BL, Rhim H, Keum G, Nam G and Choo H. (2013) Discovery of aryl-biphenyl-2-ylmethylpiperazines as novel scaffolds for 5-HT(7) ligands and role of the aromatic substituents in binding to the target receptor. *Bioorg. Med. Chem.* **21**: 2568-76 [PMID:23541835]
223. Kimura Y, Hatanaka K, Naitou Y, Maeno K, Shimada I, Koakutsu A, Wanibuchi F and Yamaguchi T. (2004) Pharmacological profile of YM348, a novel, potent and orally active 5-HT_{2C} receptor agonist. *Eur. J. Pharmacol.* **483**: 37-43 [PMID:14709324]
224. Klein MT, Dukat M, Glennon RA and Teitler M. (2011) Toward selective drug development for the human 5-hydroxytryptamine 1E receptor: a comparison of 5-hydroxytryptamine 1E and 1F receptor structure-affinity relationships. *J. Pharmacol. Exp. Ther.* **337**: 860-7 [PMID:21422162]
225. Knight AR, Misra A, Quirk K, Benwell K, Revell D, Kennett G and Bickerdike M. (2004) Pharmacological characterisation of the agonist radioligand binding site of 5-HT(2A), 5-HT(2B) and 5-HT(2C) receptors. *Naunyn Schmiedebergs Arch. Pharmacol.* **370**: 114-23 [PMID:15322733]
226. Koe BK, Nielsen JA, Macor JE and Heym J. (1992) Biochemical and behavioural studies of the 5-HT_B receptor agonist, CP-94,253. *Drug Development Research* **26**: 241-250
227. Kohen R, Fashingbauer LA, Heidmann DE, Guthrie CR and Hamblin MW. (2001) Cloning of the mouse 5-HT₆ serotonin receptor and mutagenesis studies of the third cytoplasmic loop. *Brain Res. Mol. Brain Res.* **90**: 110-7 [PMID:11406289]
228. Kohen R, Metcalf MA, Khan N, Druck T, Huebner K, Lachowicz JE, Meltzer HY, Sibley DR, Roth BL and Hamblin MW. (1996) Cloning, characterization, and chromosomal localization of a human 5-HT₆ serotonin receptor. *J. Neurochem.* **66**: 47-56 [PMID:8522988]
229. Kongsamut S, Kang J, Chen XL, Roehr J and Rampe D. (2002) A comparison of the receptor binding and HERG channel affinities for a series of antipsychotic drugs. *Eur. J. Pharmacol.* **450**: 37-41 [PMID:12176106]
230. Kongsamut S, Roehr JE, Cai J, Hartman HB, Weissensee P, Kerman LL, Tang L and Sandrasagra A. (1996) Iloperidone binding to human and rat dopamine and 5-HT receptors. *Eur. J. Pharmacol.* **317**: 417-23 [PMID:8997630]
231. Kovács A, Gacsályi I, Wellmann J, Schmidt E, Szűcs Z, Dubreuil V, Nicolas JP, Boutin J, Bózsing D and Egyed A *et al.*. (2003) Effects of EGIS-7625, a selective and competitive 5-HT_{2B} receptor antagonist. *Cardiovasc Drugs Ther* **17**: 427-34 [PMID:15107597]
232. Krobert KA, Bach T, Syversveen T, Kvingedal AM and Levy FO. (2001) The cloned human 5-HT₇ receptor splice variants: a comparative characterization of their pharmacology, function and distribution. *Naunyn Schmiedebergs Arch. Pharmacol.* **363**: 620-32 [PMID:11414657]
233. Krobert KA and Levy FO. (2002) The human 5-HT₇ serotonin receptor splice variants: constitutive activity and inverse agonist effects. *Br. J. Pharmacol.* **135**: 1563-71 [PMID:11906971]
234. Kroeze WK, Hufeisen SJ, Popadak BA, Renock SM, Steinberg S, Ernsberger P, Jayathilake K, Meltzer HY and Roth BL. (2003) H₁-histamine receptor affinity predicts short-term weight gain for typical and atypical antipsychotic drugs. *Neuropsychopharmacology* **28**: 519-26 [PMID:12629531]
235. Krogsgaard-Larsen N, Jensen AA, Schrøder TJ, Christoffersen CT and Kehler J. (2014) Novel aza-analogous ergoline derived scaffolds as potent serotonin 5-HT₆ and dopamine D₂ receptor ligands. *J. Med. Chem.* **57**: 5823-8 [PMID:24878269]
236. Kulla A and Manahan-Vaughan D. (2002) Modulation by serotonin 5-HT(4) receptors of long-term potentiation and depotentiation in the dentate gyrus of freely moving rats. *Cereb. Cortex* **12**: 150-62 [PMID:11739263]
237. Kursar JD, Nelson DL, Wainscott DB and Baez M. (1994) Molecular cloning, functional expression, and mRNA tissue distribution of the human 5-hydroxytryptamine_{2B} receptor. *Mol. Pharmacol.* **46**: 227-34 [PMID:8078486]
238. Kursar JD, Nelson DL, Wainscott DB, Cohen ML and Baez M. (1992) Molecular cloning, functional expression, and pharmacological characterization of a novel serotonin receptor (5-hydroxytryptamine_{2F}) from rat stomach fundus. *Mol. Pharmacol.* **42**: 549-57 [PMID:1331748]
239. Kushnir-Sukhov NM, Gilfillan AM, Coleman JW, Brown JM, Bruening S, Toth M and Metcalfe DD. (2006)

- 5-hydroxytryptamine induces mast cell adhesion and migration. *J. Immunol.* **177**: 6422-32
[PMID:17056574]
240. Kusserow H, Davies B, Hörtnagl H, Voigt I, Stroh T, Bert B, Deng DR, Fink H, Veh RW and Theuring F. (2004) Reduced anxiety-related behaviour in transgenic mice overexpressing serotonin 1A receptors. *Brain Res. Mol. Brain Res.* **129**: 104-16 [PMID:15469887]
241. Lacroix LP, Dawson LA, Hagan JJ and Heidbreder CA. (2004) 5-HT₆ receptor antagonist SB-271046 enhances extracellular levels of monoamines in the rat medial prefrontal cortex. *Synapse* **51**: 158-64 [PMID:14618683]
242. Lam S, Shen Y, Nguyen T, Messier TL, Brann M, Comings D, George SR and O'Dowd BF. (1996) A serotonin receptor gene (5HT1A) variant found in a Tourette's syndrome patient. *Biochem. Biophys. Res. Commun.* **219**: 853-8 [PMID:8645269]
243. Langlois M and Fischmeister R. (2003) 5-HT₄ receptor ligands: applications and new prospects. *J. Med. Chem.* **46**: 319-44 [PMID:12540230]
244. Laporte AM, Doyen C, Nevo IT, Chauveau J, Hauw JJ and Hamon M. (1996) Autoradiographic mapping of serotonin 5-HT_{1A}, 5-HT_{1D}, 5-HT_{2A} and 5-HT₃ receptors in the aged human spinal cord. *J. Chem. Neuroanat.* **11**: 67-75 [PMID:8841890]
245. Launay JM, Birraux G, Bondoux D, Callebert J, Choi DS, Loric S and Maroteaux L. (1996) Ras involvement in signal transduction by the serotonin 5-HT_{2B} receptor. *J. Biol. Chem.* **271**: 3141-7 [PMID:8621713]
246. Law H, Dukat M, Teitler M, Lee DK, Mazzocco L, Kamboj R, Rampersad V, Prisinzano T and Glennon RA. (1998) Benzylimidazolines as h5-HT_{1B/1D} serotonin receptor ligands: a structure-affinity investigation. *J. Med. Chem.* **41**: 2243-51 [PMID:9632357]
247. Lawler CP, Prioleau C, Lewis MM, Mak C, Jiang D, Schetz JA, Gonzalez AM, Sibley DR and Mailman RB. (1999) Interactions of the novel antipsychotic aripiprazole (OPC-14597) with dopamine and serotonin receptor subtypes. *Neuropsychopharmacology* **20**: 612-27 [PMID:10327430]
248. Le Coniat M, Choi DS, Maroteaux L, Launay JM and Berger R. (1996) The 5-HT_{2B} receptor gene maps to 2q36.3-2q37.1. *Genomics* **32**: 172-3 [PMID:8786115]
249. Lee MD, Kennett GA, Dourish CT and Clifton PG. (2002) 5-HT_{1B} receptors modulate components of satiety in the rat: behavioural and pharmacological analyses of the selective serotonin_{1B} agonist CP-94,253. *Psychopharmacology (Berl.)* **164**: 49-60 [PMID:12373419]
250. Lefebvre H, Gonzalez KN, Contesse V, Delarue C, Vaudry H and Kuhn JM. (1998) Effect of prolonged administration of the serotonin₄ (5-HT₄) receptor agonist cisapride on aldosterone secretion in healthy volunteers. *Endocr. Res.* **24**: 749-52 [PMID:9888571]
251. Lejeune F, Newman-Tancredi A, Audinot V and Millan MJ. (1997) Interactions of (+)- and (-)-8- and 7-hydroxy-2-(di-n-propylamino)tetralin at human (h)D₃, hD₂ and h serotonin_{1A} receptors and their modulation of the activity of serotonergic and dopaminergic neurones in rats. *J. Pharmacol. Exp. Ther.* **280**: 1241-9 [PMID:9067310]
252. Leonardi A, Guarneri L, Poggesi E, Angelico P, Velasco C, Cilia A and Testa R. (2001) N-[2-[4-(2-methoxyphenyl)-1-piperazinyl]ethyl]-N-(2-nitrophenyl) cyclohexanecarboxamide: a novel pre- and postsynaptic 5-hydroxytryptamine(1A) receptor antagonist active on the lower urinary tract. *J. Pharmacol. Exp. Ther.* **299**: 1027-37 [PMID:11714892]
253. Leopoldo M, Lacivita E, Contino M, Colabufo NA, Berardi F and Perrone R. (2007) Structure-activity relationship study on N-(1,2,3,4-tetrahydronaphthalen-1-yl)-4-aryl-1-piperazinehexanamides, a class of 5-HT₇ receptor agents. 2. *J. Med. Chem.* **50**: 4214-21 [PMID:17649988]
254. Leopoldo M, Lacivita E, De Giorgio P, Fracasso C, Guzzetti S, Caccia S, Contino M, Colabufo NA, Berardi F and Perrone R. (2008) Structural modifications of N-(1,2,3,4-tetrahydronaphthalen-1-yl)-4-aryl-1-piperazinehexanamides: influence on lipophilicity and 5-HT₇ receptor activity. Part III. *J. Med. Chem.* **51**: 5813-22 [PMID:18800769]
255. Lesage AS, Wouters R, Van Gompel P, Heylen L, Vanhoenacker P, Haegeman G, Luyten WH and Leysen JE. (1998) Agonistic properties of alniditan, sumatriptan and dihydroergotamine on human 5-HT_{1B} and 5-

- HT1D receptors expressed in various mammalian cell lines. *Br. J. Pharmacol.* **123**: 1655-65
[PMID:9605573]
256. Levy FO, Holtgreve-Grez H, Taskén K, Solberg R, Ried T and Gudermann T. (1994) Assignment of the gene encoding the 5-HT1E serotonin receptor (S31) (locus HTR1E) to human chromosome 6q14-q15. *Genomics* **22**: 637-40 [PMID:8001977]
257. Leysen JE, Gommeren W, Heylen L, Luyten WH, Van de Weyer I, Vanhoenacker P, Haegeman G, Schotte A, Van Gompel P and Wouters R *et al.* (1996) Alniditan, a new 5-hydroxytryptamine1D agonist and migraine-abortive agent: ligand-binding properties of human 5-hydroxytryptamine1D alpha, human 5-hydroxytryptamine1D beta, and calf 5-hydroxytryptamine1D receptors investigated with [3H]5-hydroxytryptamine and [3H]alniditan. *Mol. Pharmacol.* **50**: 1567-80 [PMID:8967979]
258. Li N, Ghia JE, Wang H, McClemens J, Cote F, Suehiro Y, Mallet J and Khan WI. (2011) Serotonin activates dendritic cell function in the context of gut inflammation. *Am. J. Pathol.* **178**: 662-71
[PMID:21281798]
259. Li N, Wallén NH, Ladjevardi M and Hjemdahl P. (1997) Effects of serotonin on platelet activation in whole blood. *Blood Coagul. Fibrinolysis* **8**: 517-23 [PMID:9491270]
260. Li P, Zhang Q, Robichaud AJ, Lee T, Tomesch J, Yao W, Beard JD, Snyder GL, Zhu H and Peng Y *et al.* (2014) Discovery of a tetracyclic quinoxaline derivative as a potent and orally active multifunctional drug candidate for the treatment of neuropsychiatric and neurological disorders. *J. Med. Chem.* **57**: 2670-82
[PMID:24559051]
261. Li Q, Holmes A, Ma L, Van de Kar LD, Garcia F and Murphy DL. (2004) Medial hypothalamic 5-hydroxytryptamine (5-HT)1A receptors regulate neuroendocrine responses to stress and exploratory locomotor activity: application of recombinant adenovirus containing 5-HT1A sequences. *J. Neurosci.* **24**: 10868-77 [PMID:15574737]
262. Lin SL, Setya S, Johnson-Farley NN and Cowen DS. (2002) Differential coupling of 5-HT(1) receptors to G proteins of the G(i) family. *Br. J. Pharmacol.* **136**: 1072-8 [PMID:12145108]
263. Liu M, Geddis MS, Wen Y, Setlik W and Gershon MD. (2005) Expression and function of 5-HT4 receptors in the mouse enteric nervous system. *Am. J. Physiol. Gastrointest. Liver Physiol.* **289**: G1148-63
[PMID:16037544]
264. Long DD, Armstrong SR, Beattie DT, Choi SK, Fatheree PR, Gendron RA, Genov D, Goldblum AA, Humphrey PP and Jiang L *et al.* (2012) Discovery, oral pharmacokinetics and in vivo efficacy of velusetrag, a highly selective 5-HT(4) receptor agonist that has achieved proof-of-concept in patients with chronic idiopathic constipation. *Bioorg. Med. Chem. Lett.* **22**: 6048-52 [PMID:22959244]
265. Lopez-Gimenez JF, Villazon M, Brea J, Loza MI, Palacios JM, Mengod G and Vilaro MT. (2001) Multiple conformations of native and recombinant human 5-hydroxytryptamine(2a) receptors are labeled by agonists and discriminated by antagonists. *Mol Pharmacol* **60**: 690-699 [PMID:11562430]
266. Loric S, Launay JM, Colas JF and Maroteaux L. (1992) New mouse 5-HT2-like receptor. Expression in brain, heart and intestine. *FEBS Lett.* **312**: 203-7 [PMID:1426253]
267. Loric S, Maroteaux L, Kellermann O and Launay JM. (1995) Functional serotonin-2B receptors are expressed by a teratocarcinoma-derived cell line during serotonergic differentiation. *Mol. Pharmacol.* **47**: 458-66 [PMID:7700243]
268. Lovenberg TW, Baron BM, de Lecea L, Miller JD, Prosser RA, Rea MA, Foye PE, Racke M, Slone AL and Siegel BW *et al.* (1993) A novel adenylyl cyclase-activating serotonin receptor (5-HT7) implicated in the regulation of mammalian circadian rhythms. *Neuron* **11**: 449-58 [PMID:8398139]
269. Lovenberg TW, Erlander MG, Baron BM, Racke M, Slone AL, Siegel BW, Craft CM, Burns JE, Danielson PE and Sutcliffe JG. (1993) Molecular cloning and functional expression of 5-HT1E-like rat and human 5-hydroxytryptamine receptor genes. *Proc. Natl. Acad. Sci. U.S.A.* **90**: 2184-8 [PMID:8384716]
270. Lucaites VL, Nelson DL, Wainscott DB and Baez M. (1996) Receptor subtype and density determine the coupling repertoire of the 5-HT2 receptor subfamily. *Life Sci.* **59**: 1081-95 [PMID:8809227]
271. Lucas JJ, Segu L and Hen R. (1997) 5-Hydroxytryptamine1B receptors modulate the effect of cocaine on c-fos expression: converging evidence using 5-hydroxytryptamine1B knockout mice and the 5-

- hydroxytryptamine1B/1D antagonist GR127935. *Mol. Pharmacol.* **51**: 755-63 [PMID:9145913]
272. López-Meraz ML, González-Trujano ME, Neri-Bazán L, Hong E and Rocha LL. (2005) 5-HT_{1A} receptor agonists modify epileptic seizures in three experimental models in rats. *Neuropharmacology* **49**: 367-75 [PMID:15993434]
273. Ma QP. (2001) Co-localization of 5-HT(1B/1D/1F) receptors and glutamate in trigeminal ganglia in rats. *Neuroreport* **12**: 1589-91 [PMID:11409721]
274. Madjid N, Tottie EE, Lüttgen M, Meister B, Sandin J, Kuzmin A, Stiedl O and Ogren SO. (2006) 5-Hydroxytryptamine 1A receptor blockade facilitates aversive learning in mice: interactions with cholinergic and glutamatergic mechanisms. *J. Pharmacol. Exp. Ther.* **316**: 581-91 [PMID:16223872]
275. Madsen K, Marnier L, Haahr M, Gillings N and Knudsen GM. (2011) Mass dose effects and in vivo affinity in brain PET receptor studies--a study of cerebral 5-HT₄ receptor binding with [¹¹C]SB207145. *Nucl. Med. Biol.* **38**: 1085-91 [PMID:21831646]
276. Maier DL, Sobotka-Briner C, Ding M, Powell ME, Jiang Q, Hill G, Heys JR, Elmore CS, Pierson ME and Mrzljak L. (2009) [N-methyl-³H]AZ10419369 binding to the 5-HT_{1B} receptor: in vitro characterization and in vivo receptor occupancy. *J. Pharmacol. Exp. Ther.* **330**: 342-51 [PMID:19401496]
277. Maillet M, Robert SJ, Cacquevel M, Gastineau M, Vivien D, Bertoglio J, Zugaza JL, Fischmeister R and Lezoualc'h F. (2003) Crosstalk between Rap1 and Rac regulates secretion of sAPP α . *Nat. Cell Biol.* **5**: 633-9 [PMID:12819788]
278. Makarenko IG, Meguid MM and Ugrumov MV. (2002) Distribution of serotonin 5-hydroxytryptamine 1B (5-HT_{1B}) receptors in the normal rat hypothalamus. *Neurosci. Lett.* **328**: 155-9 [PMID:12133578]
279. Malgouris C, Flamand F and Doble A. (1993) Autoradiographic studies of RP 62203, a potent 5-HT₂ receptor antagonist. Pharmacological characterization of [³H]RP 62203 binding in the rat brain. *Eur. J. Pharmacol.* **233**: 37-45 [PMID:8472747]
280. Manrique C, Héry F, Faudon M and François-Bellan AM. (1999) Indirect evidence for an association of 5-HT_{1B} binding sites with retinal and geniculate axon terminals in the rat suprachiasmatic nucleus. *Synapse* **33**: 314-23 [PMID:10421712]
281. Manzke T, Guenther U, Ponimaskin EG, Haller M, Dutschmann M, Schwarzacher S and Richter DW. (2003) 5-HT₄(a) receptors avert opioid-induced breathing depression without loss of analgesia. *Science* **301**: 226-9 [PMID:12855812]
282. Marazziti D, Ori M, Nardini M, Rossi A, Nardi I and Cassano GB. (2001) mRNA expression of serotonin receptors of type 2C and 5A in human resting lymphocytes. *Neuropsychobiology* **43**: 123-6 [PMID:11287788]
283. Marchetti E, Dumuis A, Bockaert J, Soumireu-Mourat B and Roman FS. (2000) Differential modulation of the 5-HT₄ receptor agonists and antagonist on rat learning and memory. *Neuropharmacology* **39**: 2017-27 [PMID:10963745]
284. Marin P, Becamel C, Dumuis A and Bockaert J. (2012) 5-HT receptor-associated protein networks: new targets for drug discovery in psychiatric disorders? *Curr Drug Targets* **13**: 28-52 [PMID:21777185]
285. Markstein R, Matsumoto M, Kohler C, Togashi H, Yoshioka M and Hoyer D. (1999) Pharmacological characterisation of 5-HT receptors positively coupled to adenylyl cyclase in the rat hippocampus. *Naunyn Schmiedebergs Arch. Pharmacol.* **359**: 454-9 [PMID:10431755]
286. Maroteaux L, Saudou F, Amlaiky N, Boschert U, Plassat JL and Hen R. (1992) Mouse 5HT_{1B} serotonin receptor: cloning, functional expression, and localization in motor control centers. *Proc. Natl. Acad. Sci. U.S.A.* **89**: 3020-4 [PMID:1557407]
287. Matthes H, Boschert U, Amlaiky N, Grailhe R, Plassat JL, Muscatelli F, Mattei MG and Hen R. (1993) Mouse 5-hydroxytryptamine_{5A} and 5-hydroxytryptamine_{5B} receptors define a new family of serotonin receptors: cloning, functional expression, and chromosomal localization. *Mol. Pharmacol.* **43**: 313-9 [PMID:8450829]
288. Mattsson C, Sonesson C, Sandahl A, Greiner HE, Gassen M, Plaschke J, Leibrock J and Böttcher H. (2005) 2-Alkyl-3-(1,2,3,6-tetrahydropyridin-4-yl)-1H-indoles as novel 5-HT₆ receptor agonists. *Bioorg. Med. Chem. Lett.* **15**: 4230-4 [PMID:16055331]

289. Maura G and Raiteri M. (1986) Cholinergic terminals in rat hippocampus possess 5-HT_{1B} receptors mediating inhibition of acetylcholine release. *Eur. J. Pharmacol.* **129**: 333-7 [PMID:3780847]
290. May JA, Chen HH, Rusinko A, Lynch VM, Sharif NA and McLaughlin MA. (2003) A novel and selective 5-HT₂ receptor agonist with ocular hypotensive activity: (S)-(+)-1-(2-aminopropyl)-8,9-dihydroprano[3,2-e]indole. *J. Med. Chem.* **46**: 4188-95 [PMID:12954071]
291. McAllister G, Charlesworth A, Snodin C, Beer MS, Noble AJ, Middlemiss DN, Iversen LL and Whiting P. (1992) Molecular cloning of a serotonin receptor from human brain (5HT_{1E}): a fifth 5HT₁-like subtype. *Proc. Natl. Acad. Sci. U.S.A.* **89**: 5517-21 [PMID:1608964]
292. McCall RB, Romero AG, Bienkowski MJ, Harris DW, McGuire JC, Piercey MF, Shuck ME, Smith MW, Svensson KA and Schreur PJ *et al.* (1994) Characterization of U-92016A as a selective, orally active, high intrinsic activity 5-hydroxytryptamine_{1A} agonist. *J. Pharmacol. Exp. Ther.* **271**: 875-83 [PMID:7965808]
293. McKinnell RM, Armstrong SR, Beattie DT, Fatheree PR, Long DD, Marquess DG, Shaw JP and Vickery RG. (2013) Discovery of TD-8954, a clinical stage 5-HT₄ receptor agonist with gastrointestinal prokinetic properties. *Bioorg. Med. Chem. Lett.* **23**: 4210-5 [PMID:23756062]
294. McLean PG and Coupar IM. (1996) Stimulation of cyclic AMP formation in the circular smooth muscle of human colon by activation of 5-HT₄-like receptors. *Br. J. Pharmacol.* **117**: 238-9 [PMID:8789374]
295. McLean PG and Coupar IM. (1996) Further investigation into the signal transduction mechanism of the 5-HT₄-like receptor in the circular smooth muscle of human colon. *Br. J. Pharmacol.* **118**: 1058-64 [PMID:8799582]
296. Medhurst AD, Lezoualc'h F, Fischmeister R, Middlemiss DN and Sanger GJ. (2001) Quantitative mRNA analysis of five C-terminal splice variants of the human 5-HT₄ receptor in the central nervous system by TaqMan real time RT-PCR. *Brain Res. Mol. Brain Res.* **90**: 125-34 [PMID:11406291]
297. Mialet J, Berque-Bestel I, Eftekhari P, Gastineau M, Giner M, Dahmoune Y, Donzeau-Gouge P, Hoebeke J, Langlois M and Sicsic S *et al.* (2000) Isolation of the serotonergic 5-HT_{4(e)} receptor from human heart and comparative analysis of its pharmacological profile in C6-glia and CHO cell lines. *Br. J. Pharmacol.* **129**: 771-81 [PMID:10683202]
298. Mialet J, Berque-Bestel I, Sicsic S, Langlois M, Fischmeister R and Lezoualc'h F. (2000) Pharmacological characterization of the human 5-HT_{4(d)} receptor splice variant stably expressed in Chinese hamster ovary cells. *Br. J. Pharmacol.* **131**: 827-35 [PMID:11030734]
299. Mialet J, Dahmoune Y, Lezoualc'h F, Berque-Bestel I, Eftekhari P, Hoebeke J, Sicsic S, Langlois M and Fischmeister R. (2000) Exploration of the ligand binding site of the human 5-HT₄ receptor by site-directed mutagenesis and molecular modeling. *Br. J. Pharmacol.* **130**: 527-38 [PMID:10821780]
300. Middlemiss DN, Göthert M, Schlicker E, Scott CM, Selkirk JV, Watson J, Gaster LM, Wyman P, Riley G and Price GW. (1999) SB-236057, a selective 5-HT_{1B} receptor inverse agonist, blocks the 5-HT human terminal autoreceptor. *Eur. J. Pharmacol.* **375**: 359-65 [PMID:10443589]
301. Mijster MJ, Raimundo AG, Koskuba K, Klop H, Docter GJ, Groenewegen HJ and Voorn P. (1997) Regional and cellular distribution of serotonin 5-hydroxytryptamine_{2a} receptor mRNA in the nucleus accumbens, olfactory tubercle, and caudate putamen of the rat. *J. Comp. Neurol.* **389**: 1-11 [PMID:9390756]
302. Millan MJ, Gobert A, Lejeune F, Dekeyne A, Newman-Tancredi A, Pasteau V, Rivet JM and Cussac D. (2003) The novel melatonin agonist agomelatine (S20098) is an antagonist at 5-hydroxytryptamine_{2C} receptors, blockade of which enhances the activity of frontocortical dopaminergic and adrenergic pathways. *J. Pharmacol. Exp. Ther.* **306**: 954-64 [PMID:12750432]
303. Millan MJ, Gobert A, Newman-Tancredi A, Audinot V, Lejeune F, Rivet JM, Cussac D, Nicolas JP, Muller O and Lavielle G. (1998) S 16924 ((R)-2-[1-[2-(2,3-dihydro-benzo[1,4] dioxin-5-Yloxy)-ethyl]-pyrrolidin-3yl]-1-(4-fluoro-phenyl)-ethanone), a novel, potential antipsychotic with marked serotonin (5-HT)_{1A} agonist properties: I. Receptorial and neurochemical profile in comparison with clozapine and haloperidol. *J. Pharmacol. Exp. Ther.* **286**: 1341-55 [PMID:9732398]
304. Millan MJ, Gobert A, Newman-Tancredi A, Lejeune F, Cussac D, Rivet JM, Audinot V, Dubuffet T and Lavielle G. (2000) S33084, a novel, potent, selective, and competitive antagonist at dopamine D₃-

- receptors: I. Receptorial, electrophysiological and neurochemical profile compared with GR218,231 and L741,626. *J. Pharmacol. Exp. Ther.* **293**: 1048-62 [PMID:10869410]
305. Millan MJ, Maiofiss L, Cussac D, Audinot V, Boutin JA and Newman-Tancredi A. (2002) Differential actions of antiparkinson agents at multiple classes of monoaminergic receptor. I. A multivariate analysis of the binding profiles of 14 drugs at 21 native and cloned human receptor subtypes. *J. Pharmacol. Exp. Ther.* **303**: 791-804 [PMID:12388666]
306. Millan MJ, Newman-Tancredi A, Audinot V, Cussac D, Lejeune F, Nicolas JP, Cogé F, Galizzi JP, Boutin JA and Rivet JM *et al.*. (2000) Agonist and antagonist actions of yohimbine as compared to fluparoxan at alpha(2)-adrenergic receptors (AR)s, serotonin (5-HT)(1A), 5-HT(1B), 5-HT(1D) and dopamine D(2) and D(3) receptors. Significance for the modulation of frontocortical monoaminergic transmission and depressive states. *Synapse* **35**: 79-95 [PMID:10611634]
307. Miller KJ and Teitler M. (1992) Quantitative autoradiography of 5-CT-sensitive (5-HT1D) and 5-CT-insensitive (5-HT1E) serotonin receptors in human brain. *Neurosci. Lett.* **136**: 223-6 [PMID:1641195]
308. Mitsui R, Ono S, Karaki S and Kuwahara A. (2005) Neural and non-neural mediation of propionate-induced contractile responses in the rat distal colon. *Neurogastroenterol. Motil.* **17**: 585-94 [PMID:16078948]
309. Mlinar B and Corradetti R. (2003) Endogenous 5-HT, released by MDMA through serotonin transporter- and secretory vesicle-dependent mechanisms, reduces hippocampal excitatory synaptic transmission by preferential activation of 5-HT1B receptors located on CA1 pyramidal neurons. *Eur. J. Neurosci.* **18**: 1559-71 [PMID:14511335]
310. Mochizuki D, Yuyama Y, Tsujita R, Komaki H and Sagai H. (1992) Cloning and expression of the human 5-HT1B-type receptor gene. *Biochem. Biophys. Res. Commun.* **185**: 517-23 [PMID:1610347]
311. Monsma Jr FJ, Shen Y, Ward RP, Hamblin MW and Sibley DR. (1993) Cloning and expression of a novel serotonin receptor with high affinity for tricyclic psychotropic drugs. *Mol. Pharmacol.* **43**: 320-7 [PMID:7680751]
312. Monti JM and Jantos H. (2004) Effects of the 5-HT1A receptor ligands flesinoxan and WAY 100635 given systemically or microinjected into the laterodorsal tegmental nucleus on REM sleep in the rat. *Behav. Brain Res.* **151**: 159-66 [PMID:15084431]
313. Monti JM and Jantos H. (2003) Differential effects of the 5-HT1A receptor agonist flesinoxan given locally or systemically on REM sleep in the rat. *Eur. J. Pharmacol.* **478**: 121-30 [PMID:14575796]
314. Morikawa H, Manzoni OJ, Crabbe JC and Williams JT. (2000) Regulation of central synaptic transmission by 5-HT(1B) auto- and heteroreceptors. *Mol. Pharmacol.* **58**: 1271-8 [PMID:11093763]
315. Moser PC, Bergis OE, Jegham S, Lochead A, Duconseille E, Terranova JP, Caille D, Berque-Bestel I, Lezoualc'h F and Fischmeister R *et al.*. (2002) SL65.0155, a novel 5-hydroxytryptamine(4) receptor partial agonist with potent cognition-enhancing properties. *J. Pharmacol. Exp. Ther.* **302**: 731-41 [PMID:12130738]
316. Mota A, Bento A, Peñalva A, Pombo M and Dieguez C. (1995) Role of the serotonin receptor subtype 5-HT1D on basal and stimulated growth hormone secretion. *J. Clin. Endocrinol. Metab.* **80**: 1973-7 [PMID:7775648]
317. Moumni C, Yang DC and Gullikson GW. (1992) 5-HT4 receptor activation induces relaxation and associated cAMP generation in rat esophagus. *Eur. J. Pharmacol.* **216**: 47-52 [PMID:1326439]
318. Muraki Y, Yamanaka A, Tsujino N, Kilduff TS, Goto K and Sakurai T. (2004) Serotonergic regulation of the orexin/hypocretin neurons through the 5-HT1A receptor. *J. Neurosci.* **24**: 7159-66 [PMID:15306649]
319. Nagakura Y, Akuzawa S, Miyata K, Kamato T, Suzuki T, Ito H and Yamaguchi T. (1999) Pharmacological properties of a novel gastrointestinal prokinetic benzamide selective for human 5-HT4 receptor versus human 5-HT3 receptor. *Pharmacol. Res.* **39**: 375-82 [PMID:10328995]
320. Nagakura Y, Ito H, Kiso T, Naitoh Y and Miyata K. (1997) The selective 5-hydroxytryptamine (5-HT)4-receptor agonist RS67506 enhances lower intestinal propulsion in mice. *Jpn. J. Pharmacol.* **74**: 209-12 [PMID:9243330]
321. Nakhai B, Nielsen DA, Linnoila M and Goldman D. (1995) Two naturally occurring amino acid substitutions

- in the human 5-HT_{1A} receptor: glycine 22 to serine 22 and isoleucine 28 to valine 28. *Biochem. Biophys. Res. Commun.* **210**: 530-6 [PMID:7755630]
322. Napier C, Stewart M, Melrose H, Hopkins B, McHarg A and Wallis R. (1999) Characterisation of the 5-HT receptor binding profile of eletriptan and kinetics of [³H]eletriptan binding at human 5-HT_{1B} and 5-HT_{1D} receptors. *Eur. J. Pharmacol.* **368**: 259-68 [PMID:10193663]
323. Nebigil CG, Choi DS, Dierich A, Hickel P, Le Meur M, Messaddeq N, Launay JM and Maroteaux L. (2000) Serotonin 2B receptor is required for heart development. *Proc. Natl. Acad. Sci. U.S.A.* **97**: 9508-13 [PMID:10944220]
324. Nebigil CG, Hickel P, Messaddeq N, Vonesch JL, Douchet MP, Monassier L, György K, Matz R, Andriantsitohaina R and Manivet P *et al.*. (2001) Ablation of serotonin 5-HT(2B) receptors in mice leads to abnormal cardiac structure and function. *Circulation* **103**: 2973-9 [PMID:11413089]
325. Nebigil CG, Jaffré F, Messaddeq N, Hickel P, Monassier L, Launay JM and Maroteaux L. (2003) Overexpression of the serotonin 5-HT_{2B} receptor in heart leads to abnormal mitochondrial function and cardiac hypertrophy. *Circulation* **107**: 3223-9 [PMID:12810613]
326. Nelson DL, Lucaites VL, Wainscott DB and Glennon RA. (1999) Comparisons of hallucinogenic phenylisopropylamine binding affinities at cloned human 5-HT_{2A}, -HT(2B) and 5-HT_{2C} receptors. *Naunyn Schmiedebergs Arch. Pharmacol.* **359**: 1-6 [PMID:9933142]
327. Nelson DL, Phebus LA, Johnson KW, Wainscott DB, Cohen ML, Calligaro DO and Xu YC. (2010) Preclinical pharmacological profile of the selective 5-HT_{1F} receptor agonist lasmiditan. *Cephalalgia* **30**: 1159-69 [PMID:20855361]
328. Newman-Tancredi A, Audinot V, Moreira C, Verrière L and Millan MJ. (2000) Inverse agonism and constitutive activity as functional correlates of serotonin h5-HT(1B) receptor/G-protein stoichiometry. *Mol. Pharmacol.* **58**: 1042-9 [PMID:11040052]
329. Newman-Tancredi A, Conte C, Chaput C, Verrière L, Audinot-Bouchez V, Lochon S, Lavielle G and Millan MJ. (1997) Agonist activity of antimigraine drugs at recombinant human 5-HT_{1A} receptors: potential implications for prophylactic and acute therapy. *Naunyn Schmiedebergs Arch. Pharmacol.* **355**: 682-8 [PMID:9205951]
330. Newman-Tancredi A, Cussac D, Audinot V and Millan MJ. (1999) Actions of roxindole at recombinant human dopamine D₂, D₃ and D₄ and serotonin 5-HT_{1A}, 5-HT_{1B} and 5-HT_{1D} receptors. *Naunyn Schmiedebergs Arch. Pharmacol.* **359**: 447-53 [PMID:10431754]
331. Newman-Tancredi A, Gavaudan S, Conte C, Chaput C, Touzard M, Verrière L, Audinot V and Millan MJ. (1998) Agonist and antagonist actions of antipsychotic agents at 5-HT_{1A} receptors: a [³⁵S]GTPγS binding study. *Eur. J. Pharmacol.* **355**: 245-56 [PMID:9760039]
332. Newman-Tancredi A, Martel JC, Assié MB, Buritova J, Laressergues E, Cosi C, Heusler P, Bruins Slot L, Colpaert FC and Vacher B *et al.*. (2009) Signal transduction and functional selectivity of F15599, a preferential post-synaptic 5-HT_{1A} receptor agonist. *Br. J. Pharmacol.* **156**: 338-53 [PMID:19154445]
333. Newman-Tancredi A, Verrière L, Chaput C and Millan MJ. (1998) Labelling of recombinant human and native rat serotonin 5-HT_{1A} receptors by a novel, selective radioligand, [³H]-S 15535: definition of its binding profile using agonists, antagonists and inverse agonists. *Naunyn Schmiedebergs Arch. Pharmacol.* **357**: 205-17 [PMID:9550290]
334. Newman-Tancredi A, Wootton R and Strange PG. (1992) High-level stable expression of recombinant 5-HT_{1A} 5-hydroxytryptamine receptors in Chinese hamster ovary cells. *Biochem. J.* **285 (Pt 3)**: 933-8 [PMID:1386736]
335. Nichols DE, Frescas S, Marona-Lewicka D and Kurrasch-Orbaugh DM. (2002) Lysergamides of isomeric 2,4-dimethylazetidines map the binding orientation of the diethylamide moiety in the potent hallucinogenic agent N,N-diethyllysergamide (LSD). *J. Med. Chem.* **45**: 4344-9 [PMID:12213075]
336. Nilsson T, Longmore J, Shaw D, Olesen IJ and Edvinsson L. (1999) Contractile 5-HT_{1B} receptors in human cerebral arteries: pharmacological characterization and localization with immunocytochemistry. *Br. J. Pharmacol.* **128**: 1133-40 [PMID:10578124]
337. Nilsson T, Longmore J, Shaw D, Pantev E, Bard JA, Branchek T and Edvinsson L. (1999) Characterisation

- of 5-HT receptors in human coronary arteries by molecular and pharmacological techniques. *Eur. J. Pharmacol.* **372**: 49-56 [PMID:10374714]
338. Ning Y, Zhu JX and Chan HC. (2004) Regulation of ion transport by 5-hydroxytryptamine in rat colon. *Clin. Exp. Pharmacol. Physiol.* **31**: 424-8 [PMID:15236628]
339. Niswender CM, Copeland SC, Herrick-Davis K, Emeson RB and Sanders-Bush E. (1999) RNA editing of the human serotonin 5-hydroxytryptamine 2C receptor silences constitutive activity. *J. Biol. Chem.* **274**: 9472-8 [PMID:10092629]
340. Noda M, Higashida H, Aoki S and Wada K. (2004) Multiple signal transduction pathways mediated by 5-HT receptors. *Mol. Neurobiol.* **29**: 31-9 [PMID:15034221]
341. Noda M, Yasuda S, Okada M, Higashida H, Shimada A, Iwata N, Ozaki N, Nishikawa K, Shirasawa S and Uchida M *et al.*. (2003) Recombinant human serotonin 5A receptors stably expressed in C6 glioma cells couple to multiple signal transduction pathways. *J. Neurochem.* **84**: 222-32 [PMID:12558985]
342. Nonogaki K, Abdallah L, Goulding EH, Bonasera SJ and Tecott LH. (2003) Hyperactivity and reduced energy cost of physical activity in serotonin 5-HT(2C) receptor mutant mice. *Diabetes* **52**: 315-20 [PMID:12540602]
343. Nonogaki K, Memon RA, Grunfeld C, Feingold KR and Tecott LH. (2002) Altered gene expressions involved in energy expenditure in 5-HT(2C) receptor mutant mice. *Biochem. Biophys. Res. Commun.* **295**: 249-54 [PMID:12150939]
344. Norum JH, Hart K and Levy FO. (2003) Ras-dependent ERK activation by the human G(s)-coupled serotonin receptors 5-HT4(b) and 5-HT7(a). *J. Biol. Chem.* **278**: 3098-104 [PMID:12446729]
345. Ochi T, Sakamoto M, Minamida A, Suzuki K, Ueda T, Une T, Toda H, Matsumoto K and Terauchi Y. (2005) Syntheses and properties of the major hydroxy metabolites in humans of blonanserin AD-5423, a novel antipsychotic agent. *Bioorg. Med. Chem. Lett.* **15**: 1055-9 [PMID:15686911]
346. Okamoto K, Imbe H, Morikawa Y, Itoh M, Sekimoto M, Nemoto K and Senba E. (2002) 5-HT2A receptor subtype in the peripheral branch of sensory fibers is involved in the potentiation of inflammatory pain in rats. *Pain* **99**: 133-43 [PMID:12237191]
347. Olsen MA, Nawoschik SP, Schurman BR, Schmitt HL, Burno M, Smith DL and Schechter LE. (1999) Identification of a human 5-HT6 receptor variant produced by alternative splicing. *Brain Res Mol Brain Res* **64**: 255-263 [PMID:9931499]
348. Ono S, Mitsui R, Karaki S and Kuwahara A. (2005) Muscarinic and 5-HT4 receptors participate in the regulation of the frequency of spontaneous contractions of the longitudinal muscle in rat distal colon. *Biomed. Res.* **26**: 173-7 [PMID:16152733]
349. Osei-Owusu P, James A, Crane J and Scrogin KE. (2005) 5-Hydroxytryptamine 1A receptors in the paraventricular nucleus of the hypothalamus mediate oxytocin and adrenocorticotropin hormone release and some behavioral components of the serotonin syndrome. *J. Pharmacol. Exp. Ther.* **313**: 1324-30 [PMID:15743927]
350. Ouadid H, Seguin J, Dumuis A, Bockaert J and Nargeot J. (1992) Serotonin increases calcium current in human atrial myocytes via the newly described 5-hydroxytryptamine4 receptors. *Mol. Pharmacol.* **41**: 346-51 [PMID:1311410]
351. Palacios JM, Pazos A and Hoyer D. (2017) A short history of the 5-HT_{2C} receptor: from the choroid plexus to depression, obesity and addiction treatment. *Psychopharmacology (Berl.)* **234**: 1395-1418 [PMID:28265714]
352. Parker CA, Gunn RN, Rabiner EA, Slifstein M, Comley R, Salinas C, Johnson CN, Jakobsen S, Houle S and Laruelle M *et al.*. (2012) Radiosynthesis and characterization of ¹¹C-GSK215083 as a PET radioligand for the 5-HT6 receptor. *J. Nucl. Med.* **53**: 295-303 [PMID:22223878]
353. Parker EM, Izzarelli DG, Lewis-Higgins L, Palmer D and Shapiro RA. (1996) Two amino acid differences in the sixth transmembrane domain are partially responsible for the pharmacological differences between the 5-HT1D beta and 5-HT1E 5-hydroxytryptamine receptors. *J. Neurochem.* **67**: 2096-103 [PMID:8863519]
354. Parker MA, Marona-Lewicka D, Lucaites VL, Nelson DL and Nichols DE. (1998) A novel (benzodifuranyl)aminoalkane with extremely potent activity at the 5-HT2A receptor. *J. Med. Chem.* **41**:

- 5148-9 [PMID:9857084]
355. Parks CL, Robinson PS, Sibille E, Shenk T and Toth M. (1998) Increased anxiety of mice lacking the serotonin_{1A} receptor. *Proc. Natl. Acad. Sci. U.S.A.* **95**: 10734-9 [PMID:9724773]
 356. Pasqualetti M, Ori M, Nardi I, Castagna M, Cassano GB and Marazziti D. (1998) Distribution of the 5-HT_{5A} serotonin receptor mRNA in the human brain. *Brain Res. Mol. Brain Res.* **56**: 1-8 [PMID:9602024]
 357. Pattij T, Broersen LM, van der Linde J, Groenink L, van der Gugten J, Maes RA and Olivier B. (2003) Operant learning and differential-reinforcement-of-low-rate 36-s responding in 5-HT_{1A} and 5-HT_{1B} receptor knockout mice. *Behav. Brain Res.* **141**: 137-45 [PMID:12742250]
 358. Pauwels PJ, Wurch T, Amoureux MC, Palmier C and Colpaert FC. (1996) Stimulation of cloned human serotonin 5-HT_{1D} beta receptor sites in stably transfected C6 glial cells promotes cell growth. *J. Neurochem.* **66**: 65-73 [PMID:8522991]
 359. Pazos A, Hoyer D and Palacios JM. (1984) The binding of serotonergic ligands to the porcine choroid plexus: characterization of a new type of serotonin recognition site. *Eur. J. Pharmacol.* **106**: 539-46 [PMID:6519175]
 360. Peng Y, McCorvy JD, Harpsøe K, Lansu K, Yuan S, Popov P, Qu L, Pu M, Che T and Nikolajsen L *et al.*. (2018) 5-HT_{2C} Receptor Structures Reveal the Structural Basis of GPCR Polypharmacology. *Cell* **172**: 719-730.e14 [PMID:29398112]
 361. Perez-Garcia GS and Meneses A. (2005) Effects of the potential 5-HT₇ receptor agonist AS 19 in an autoshaping learning task. *Behav Brain Res* **163**: 136-140 [PMID:15936093]
 362. Perez-García G and Meneses A. (2005) Oral administration of the 5-HT₆ receptor antagonists SB-357134 and SB-399885 improves memory formation in an autoshaping learning task. *Pharmacol. Biochem. Behav.* **81**: 673-82 [PMID:15964617]
 363. Pesonen U, Rouru J, Huupponen R and Koulu M. (1991) Effects of repeated administration of mifepristone and 8-OH-DPAT on expression of preproneuropeptide Y mRNA in the arcuate nucleus of obese Zucker rats. *Brain Res. Mol. Brain Res.* **10**: 267-72 [PMID:1653393]
 364. Phebus LA, Johnson KW, Zgombick JM, Gilbert PJ, Van Belle K, Mancuso V, Nelson DL, Calligaro DO, Kiefer Jr AD and Branchek TA *et al.*. (1997) Characterization of LY344864 as a pharmacological tool to study 5-HT_{1F} receptors: binding affinities, brain penetration and activity in the neurogenic dural inflammation model of migraine. *Life Sci.* **61**: 2117-26 [PMID:9395253]
 365. Pickard GE, Smith BN, Belenky M, Rea MA, Dudek FE and Sollars PJ. (1999) 5-HT_{1B} receptor-mediated presynaptic inhibition of retinal input to the suprachiasmatic nucleus. *J. Neurosci.* **19**: 4034-45 [PMID:10234032]
 366. Pierce PA, Xie GX, Levine JD and Peroutka SJ. (1996) 5-Hydroxytryptamine receptor subtype messenger RNAs in rat peripheral sensory and sympathetic ganglia: a polymerase chain reaction study. *Neuroscience* **70**: 553-9 [PMID:8848158]
 367. Pierce PA, Xie GX, Peroutka SJ, Green PG and Levine JD. (1995) 5-Hydroxytryptamine-induced synovial plasma extravasation is mediated via 5-hydroxytryptamine_{2A} receptors on sympathetic efferent terminals. *J. Pharmacol. Exp. Ther.* **275**: 502-8 [PMID:7562592]
 368. Pindon A, van Hecke G, van Gompel P, Lesage AS, Leysen JE and Jurzak M. (2002) Differences in signal transduction of two 5-HT₄ receptor splice variants: compound specificity and dual coupling with G α phs- and G α phai/o-proteins. *Mol. Pharmacol.* **61**: 85-96 [PMID:11752209]
 369. Piñeyro G, de Montigny C and Blier P. (1995) 5-HT_{1D} receptors regulate 5-HT release in the rat raphe nuclei. In vivo voltammetry and in vitro superfusion studies. *Neuropsychopharmacology* **13**: 249-60 [PMID:8602897]
 370. Plassat JL, Amlaiky N and Hen R. (1993) Molecular cloning of a mammalian serotonin receptor that activates adenylate cyclase. *Mol. Pharmacol.* **44**: 229-36 [PMID:8394987]
 371. Pompeiano M, Palacios JM and Mengod G. (1992) Distribution and cellular localization of mRNA coding for 5-HT_{1A} receptor in the rat brain: correlation with receptor binding. *J. Neurosci.* **12**: 440-53 [PMID:1531498]
 372. Pompeiano M, Palacios JM and Mengod G. (1994) Distribution of the serotonin 5-HT₂ receptor family

- mRNAs: comparison between 5-HT_{2A} and 5-HT_{2C} receptors. *Brain Res. Mol. Brain Res.* **23**: 163-78 [PMID:8028479]
373. Ponimaskin EG, Profirovic J, Vaiskunaite R, Richter DW and Voyno-Yasenetskaya TA. (2002) 5-Hydroxytryptamine 4(a) receptor is coupled to the Galpha subunit of heterotrimeric G13 protein. *J. Biol. Chem.* **277**: 20812-9 [PMID:11923294]
374. Popova NK, Naumenko VS, Plyusnina IZ and Kulikov AV. (2005) Reduction in 5-HT_{1A} receptor density, 5-HT_{1A} mRNA expression, and functional correlates for 5-HT_{1A} receptors in genetically defined aggressive rats. *J. Neurosci. Res.* **80**: 286-92 [PMID:15765530]
375. Porter RH, Benwell KR, Lamb H, Malcolm CS, Allen NH, Revell DF, Adams DR and Sheardown MJ. (1999) Functional characterization of agonists at recombinant human 5-HT_{2A}, 5-HT_{2B} and 5-HT_{2C} receptors in CHO-K1 cells. *Br. J. Pharmacol.* **128**: 13-20 [PMID:10498829]
376. Potrebic S, Ahn AH, Skinner K, Fields HL and Basbaum AI. (2003) Peptidergic nociceptors of both trigeminal and dorsal root ganglia express serotonin 1D receptors: implications for the selective antimigraine action of triptans. *J. Neurosci.* **23**: 10988-97 [PMID:14645495]
377. Price GW, Burton MJ, Collin LJ, Duckworth M, Gaster L, Göthert M, Jones BJ, Roberts C, Watson JM and Middlemiss DN. (1997) SB-216641 and BRL-15572--compounds to pharmacologically discriminate h5-HT_{1B} and h5-HT_{1D} receptors. *Naunyn Schmiedebergs Arch. Pharmacol.* **356**: 312-20 [PMID:9303567]
378. Price RD, Weiner DM, Chang MS and Sanders-Bush E. (2001) RNA editing of the human serotonin 5-HT_{2C} receptor alters receptor-mediated activation of G13 protein. *J. Biol. Chem.* **276**: 44663-8 [PMID:11572865]
379. Purohit A, Smith C, Herrick-Davis K and Teitler M. (2005) Stable expression of constitutively activated mutant h5HT₆ and h5HT₇ serotonin receptors: inverse agonist activity of antipsychotic drugs. *Psychopharmacology (Berl.)* **179**: 461-9 [PMID:15821958]
380. Pälvimäki EP, Roth BL, Majasuo H, Laakso A, Kuoppamäki M, Syvälahti E and Hietala J. (1996) Interactions of selective serotonin reuptake inhibitors with the serotonin 5-HT_{2c} receptor. *Psychopharmacology (Berl.)* **126**: 234-40 [PMID:8876023]
381. Quist JF, Barr CL, Schachar R, Roberts W, Malone M, Tannock R, Basile VS, Beitchman J and Kennedy JL. (2003) The serotonin 5-HT_{1B} receptor gene and attention deficit hyperactivity disorder. *Mol. Psychiatry* **8**: 98-102 [PMID:12556913]
382. Ramage AG and Villalón CM. (2008) 5-hydroxytryptamine and cardiovascular regulation. *Trends Pharmacol. Sci.* **29**: 472-81 [PMID:19086344]
383. Ramboz S, Oosting R, Amara DA, Kung HF, Blier P, Mendelsohn M, Mann JJ, Brunner D and Hen R. (1998) Serotonin receptor 1A knockout: an animal model of anxiety-related disorder. *Proc. Natl. Acad. Sci. U.S.A.* **95**: 14476-81 [PMID:9826725]
384. Ramirez MJ, García-Garayoa E, Romero G, Monge A, Roca J, Del Río J and Lasheras B. (1997) VB20B7, a novel 5-HT-ergic agent with gastrokinetic activity. I. Interaction with 5-HT₃ and 5-HT₄ receptors. *J. Pharm. Pharmacol.* **49**: 58-65 [PMID:9120772]
385. Rashid M, Manivet P, Nishio H, Pratuangdejkul J, Rajab M, Ishiguro M, Launay JM and Nagatomo T. (2003) Identification of the binding sites and selectivity of sarpogrelate, a novel 5-HT₂ antagonist, to human 5-HT_{2A}, 5-HT_{2B} and 5-HT_{2C} receptor subtypes by molecular modeling. *Life Sci.* **73**: 193-207 [PMID:12738034]
386. Rauser L, Savage JE, Meltzer HY and Roth BL. (2001) Inverse agonist actions of typical and atypical antipsychotic drugs at the human 5-hydroxytryptamine(2C) receptor. *J. Pharmacol. Exp. Ther.* **299**: 83-9 [PMID:11561066]
387. Raymond JR, Kim J, Beach RE and Tisher CC. (1993) Immunohistochemical mapping of cellular and subcellular distribution of 5-HT_{1A} receptors in rat and human kidneys. *Am. J. Physiol.* **264**: F9-19 [PMID:8430834]
388. Reavill C, Kettle A, Holland V, Riley G and Blackburn TP. (1999) Attenuation of haloperidol-induced catalepsy by a 5-HT_{2C} receptor antagonist. *Br. J. Pharmacol.* **126**: 572-4 [PMID:10188965]
389. Reavill C, Taylor SG, Wood MD, Ashmeade T, Austin NE, Avenell KY, Boyfield I, Branch CL, Cilia J and

- Coldwell MC *et al.*. (2000) Pharmacological actions of a novel, high-affinity, and selective human dopamine D(3) receptor antagonist, SB-277011-A. *J. Pharmacol. Exp. Ther.* **294**: 1154-65 [PMID:10945872]
390. Rees S, den Daas I, Foord S, Goodson S, Bull D, Kilpatrick G and Lee M. (1994) Cloning and characterisation of the human 5-HT_{5A} serotonin receptor. *FEBS Lett.* **355**: 242-6 [PMID:7988681]
391. Reeves JJ, Bunce KT and Humphrey PP. (1991) Investigation into the 5-hydroxytryptamine receptor mediating smooth muscle relaxation in the rat oesophagus. *Br. J. Pharmacol.* **103**: 1067-72 [PMID:1878746]
392. Reynolds GP, Mason SL, Meldrum A, De Keczer S, Parnes H, Eglen RM and Wong EH. (1995) 5-Hydroxytryptamine (5-HT)₄ receptors in post mortem human brain tissue: distribution, pharmacology and effects of neurodegenerative diseases. *Br. J. Pharmacol.* **114**: 993-8 [PMID:7780656]
393. Rivail L, Giner M, Gastineau M, Berthouze M, Soulier JL, Fischmeister R, Lezoualc'h F, Maigret B, Sicsic S and Berque-Bestel I. (2004) New insights into the human 5-HT₄ receptor binding site: exploration of a hydrophobic pocket. *Br. J. Pharmacol.* **143**: 361-70 [PMID:15351779]
394. Rocha-González HI, Meneses A, Carlton SM and Granados-Soto V. (2005) Pronociceptive role of peripheral and spinal 5-HT₇ receptors in the formalin test. *Pain* **117**: 182-92 [PMID:16098671]
395. Rogers DC and Hagan JJ. (2001) 5-HT₆ receptor antagonists enhance retention of a water maze task in the rat. *Psychopharmacology (Berl.)* **158**: 114-9 [PMID:11702084]
396. Rosier A, Dupont P, Peuskens J, Bormans G, Vandenberghe R, Maes M, de Groot T, Schiepers C, Verbruggen A and Mortelmans L. (1996) Visualisation of loss of 5-HT_{2A} receptors with age in healthy volunteers using [¹⁸F]altanserin and positron emission tomographic imaging. *Psychiatry Res* **68**: 11-22 [PMID:9027929]
397. Roth BL, Craigo SC, Choudhary MS, Uluer A, Monsma Jr FJ, Shen Y, Meltzer HY and Sibley DR. (1994) Binding of typical and atypical antipsychotic agents to 5-hydroxytryptamine-6 and 5-hydroxytryptamine-7 receptors. *J. Pharmacol. Exp. Ther.* **268**: 1403-10 [PMID:7908055]
398. Roth BL, Ernsberger P, Steinberg SA, Rao S, Rauser L, Savage J, Hufeisen S, Berridge MS and Muzic Jr RF. (2001) The in vitro pharmacology of the beta-adrenergic receptor pet ligand (s)-fluorocarazolol reveals high affinity for cloned beta-adrenergic receptors and moderate affinity for the human 5-HT_{1A} receptor. *Psychopharmacology (Berl.)* **157**: 111-4 [PMID:11512051]
399. Rothman RB, Baumann MH, Savage JE, Rauser L, McBride A, Hufeisen SJ and Roth BL. (2000) Evidence for possible involvement of 5-HT_{2B} receptors in the cardiac valvulopathy associated with fenfluramine and other serotonergic medications. *Circulation* **102**: 2836-41 [PMID:11104741]
400. Rousselle JC, Plantefol M, Fillion MP, Massot O, Pauwels PJ and Fillion G. (1998) Specific interaction of 5-HT-moduline with human 5-HT_{1b} as well as 5-HT_{1d} receptors expressed in transfected cultured cells. *Naunyn Schmiedebergs Arch. Pharmacol.* **358**: 279-86 [PMID:9774213]
401. Ruat M, Traiffort E, Arrang JM, Tardivel-Lacombe J, Diaz J, Leurs R and Schwartz JC. (1993) A novel rat serotonin (5-HT₆) receptor: molecular cloning, localization and stimulation of cAMP accumulation. *Biochem. Biophys. Res. Commun.* **193**: 268-76 [PMID:8389146]
402. Ruat M, Traiffort E, Leurs R, Tardivel-Lacombe J, Diaz J, Arrang JM and Schwartz JC. (1993) Molecular cloning, characterization, and localization of a high-affinity serotonin receptor (5-HT₇) activating cAMP formation. *Proc. Natl. Acad. Sci. U.S.A.* **90**: 8547-51 [PMID:8397408]
403. Russell MG, Matassa VG, Pengilley RR, van Niel MB, Sohal B, Watt AP, Hitzel L, Beer MS, Stanton JA and Broughton HB *et al.*. (1999) 3-[3-(Piperidin-1-yl)propyl]indoles as highly selective h5-HT_{1D} receptor agonists. *J. Med. Chem.* **42**: 4981-5001 [PMID:10585208]
404. Sakurai-Yamashita Y, Takada K, Takemura K, Yamashita K, Enjoji A, Kanematsu T and Taniyama K. (1999) Ability of mosapride to bind to 5-HT₄ receptor in the human stomach. *Jpn. J. Pharmacol.* **79**: 493-6 [PMID:10361891]
405. Sakurai-Yamashita Y, Yamashita K, Kanematsu T and Taniyama K. (1999) Localization of the 5-HT₄ receptor in the human and the guinea pig colon. *Eur J Pharmacol* **383**: 281-285 [PMID:10594320]
406. Sakurai-Yamashita Y, Yamashita K, Yoshimura M and Taniyama K. (2000) Differential localization of 5-hydroxytryptamine₃ and 5-hydroxytryptamine₄ receptors in the human rectum. *Life Sci.* **66**: 31-4

[PMID:10658921]

407. Sari Y, Miquel MC, Brisorgueil MJ, Ruiz G, Doucet E, Hamon M and Vergé D. (1999) Cellular and subcellular localization of 5-hydroxytryptamine_{1B} receptors in the rat central nervous system: immunocytochemical, autoradiographic and lesion studies. *Neuroscience* **88**: 899-915 [PMID:10363826]
408. Sarnyai Z, Sibille EL, Pavlides C, Fenster RJ, McEwen BS and Toth M. (2000) Impaired hippocampal-dependent learning and functional abnormalities in the hippocampus in mice lacking serotonin_{1A} receptors. *Proc. Natl. Acad. Sci. U.S.A.* **97**: 14731-6 [PMID:11121072]
409. Saudou F, Amara DA, Dierich A, LeMeur M, Ramboz S, Segu L, Buhot MC and Hen R. (1994) Enhanced aggressive behavior in mice lacking 5-HT_{1B} receptor. *Science* **265**: 1875-8 [PMID:8091214]
410. Schaerlinger B, Hickel P, Etienne N, Guesnier L and Maroteaux L. (2003) Agonist actions of dihydroergotamine at 5-HT_{2B} and 5-HT_{2C} receptors and their possible relevance to antimigraine efficacy. *Br. J. Pharmacol.* **140**: 277-84 [PMID:12970106]
411. Schechter LE, Lin Q, Smith DL, Zhang G, Shan Q, Platt B, Brandt MR, Dawson LA, Cole D and Bernotas R *et al.* (2008) Neuropharmacological profile of novel and selective 5-HT₆ receptor agonists: WAY-181187 and WAY-208466. *Neuropsychopharmacology* **33**: 1323-35 [PMID:17625499]
412. Schmitz B, Ullmer C, Segelcke D, Gwarek M, Zhu XR and Lübbert H. (2015) BF-1--a novel selective 5-HT_{2B} receptor antagonist blocking neurogenic dural plasma protein extravasation in guinea pigs. *Eur. J. Pharmacol.* **751**: 73-80 [PMID:25666387]
413. Schmuck K, Ullmer C, Engels P and Lübbert H. (1994) Cloning and functional characterization of the human 5-HT_{2B} serotonin receptor. *FEBS Lett.* **342**: 85-90 [PMID:8143856]
414. Schotte A, Janssen PF, Gommeren W, Luyten WH, Van Gompel P, Lesage AS, De Loore K and Leysen JE. (1996) Risperidone compared with new and reference antipsychotic drugs: in vitro and in vivo receptor binding. *Psychopharmacology (Berl.)* **124**: 57-73 [PMID:8935801]
415. Seeman P, Chau-Wong M, Tedesco J and Wong K. (1975) Brain receptors for antipsychotic drugs and dopamine: direct binding assays. *Proc. Natl. Acad. Sci. U.S.A.* **72**: 4376-80 [PMID:1060115]
416. Selkirk JV, Scott C, Ho M, Burton MJ, Watson J, Gaster LM, Collin L, Jones BJ, Middlemiss DN and Price GW. (1998) SB-224289--a novel selective (human) 5-HT_{1B} receptor antagonist with negative intrinsic activity. *Br. J. Pharmacol.* **125**: 202-8 [PMID:9776361]
417. Seo HJ, Park EJ, Kim MJ, Kang SY, Lee SH, Kim HJ, Lee KN, Jung ME, Lee M and Kim M *Set al.* (2011) Design and synthesis of novel arylpiperazine derivatives containing the imidazole core targeting 5-HT_{2A} receptor and 5-HT transporter. *J. Med. Chem.* **54**: 6305-18 [PMID:21823597]
418. Serrats J, Mengod G and Cortés R. (2005) Expression of serotonin 5-HT_{2C} receptors in GABAergic cells of the anterior raphe nuclei. *J. Chem. Neuroanat.* **29**: 83-91 [PMID:15652696]
419. Shahid M, Walker GB, Zorn SH and Wong EH. (2009) Asenapine: a novel psychopharmacologic agent with a unique human receptor signature. *J. Psychopharmacol. (Oxford)* **23**: 65-73 [PMID:18308814]
420. Shajib MS and Khan WI. (2015) The role of serotonin and its receptors in activation of immune responses and inflammation. *Acta Physiol (Oxf)* **213**: 561-74 [PMID:25439045]
421. Shannon HE and Lutz EA. (2000) Yohimbine produces antinociception in the formalin test in rats: involvement of serotonin_{1A} receptors. *Psychopharmacology (Berl.)* **149**: 93-7 [PMID:10789888]
422. Shapiro DA, Kristiansen K, Kroeze WK and Roth BL. (2000) Differential modes of agonist binding to 5-hydroxytryptamine_{2A} serotonin receptors revealed by mutation and molecular modeling of conserved residues in transmembrane region 5. *Mol. Pharmacol.* **58**: 877-86 [PMID:11040033]
423. Shapiro DA, Renock S, Arrington E, Chiodo LA, Liu LX, Sibley DR, Roth BL and Mailman R. (2003) Aripiprazole, a novel atypical antipsychotic drug with a unique and robust pharmacology. *Neuropsychopharmacology* **28**: 1400-11 [PMID:12784105]
424. Shen Y, Monsma Jr FJ, Metcalf MA, Jose PA, Hamblin MW and Sibley DR. (1993) Molecular cloning and expression of a 5-hydroxytryptamine₇ serotonin receptor subtype. *J. Biol. Chem.* **268**: 18200-4 [PMID:8394362]
425. Shimron-Abarbanell D, Nöthen MM, Erdmann J and Propping P. (1995) Lack of genetically determined structural variants of the human serotonin-1E (5-HT_{1E}) receptor protein points to its evolutionary

- conservation. *Brain Res. Mol. Brain Res.* **29**: 387-90 [PMID:7609628]
426. Shippenberg TS, Hen R and He M. (2000) Region-specific enhancement of basal extracellular and cocaine-evoked dopamine levels following constitutive deletion of the Serotonin(1B) receptor. *J. Neurochem.* **75**: 258-65 [PMID:10854269]
427. Siddiqui A, Abu-Amara M, Aldairy C, Hagan JJ and Wilson C. (2004) 5-HT₇ receptor subtype as a mediator of the serotonergic regulation of luteinizing hormone release in the zona incerta. *Eur. J. Pharmacol.* **491**: 77-84 [PMID:15102536]
428. Singer JH, Bellingham MC and Berger AJ. (1996) Presynaptic inhibition of glutamatergic synaptic transmission to rat motoneurons by serotonin. *J. Neurophysiol.* **76**: 799-807 [PMID:8871200]
429. Sleight AJ, Boess FG, Bös M, Levet-Trafit B, Riemer C and Bourson A. (1998) Characterization of Ro 04-6790 and Ro 63-0563: potent and selective antagonists at human and rat 5-HT₆ receptors. *Br. J. Pharmacol.* **124**: 556-62 [PMID:9647481]
430. Sleight AJ, Stam NJ, Mutel V and Vanderheyden PM. (1996) Radiolabelling of the human 5-HT_{2A} receptor with an agonist, a partial agonist and an antagonist: effects on apparent agonist affinities. *Biochem. Pharmacol.* **51**: 71-6 [PMID:8534270]
431. Smith B and Smith J. (2005) 5HT_{2C} receptor modulators. Patent number: US6953787 B2.
432. Smith JA, Beattie DT, Marquess D, Shaw JP, Vickery RG and Humphrey PP. (2008) The in vitro pharmacological profile of TD-5108, a selective 5-HT₄ receptor agonist with high intrinsic activity. *Naunyn Schmiedebergs Arch. Pharmacol.* **378**: 125-37 [PMID:18415081]
433. Snyder GL, Vanover KE, Zhu H, Miller DB, O'Callaghan JP, Tomesch J, Li P, Zhang Q, Krishnan V and Hendrick JP *et al.* (2015) Functional profile of a novel modulator of serotonin, dopamine, and glutamate neurotransmission. *Psychopharmacology (Berl.)* **232**: 605-21 [PMID:25120104]
434. Soyka M, Preuss UW, Koller G, Zill P and Bondy B. (2004) Association of 5-HT_{1B} receptor gene and antisocial behavior in alcoholism. *J Neural Transm (Vienna)* **111**: 101-9 [PMID:14714219]
435. Spedding M, Newman-Tancredi A, Millan MJ, Dacquet C, Michel AN, Jacoby E, Vickery B and Tallentire D. (1998) Interaction of the anxiogenic agent, RS-30199, with 5-HT_{1A} receptors: modulation of sexual activity in the male rat. *Neuropharmacology* **37**: 769-80 [PMID:9707291]
436. Sprouse J, Reynolds L, Braselton J and Schmidt A. (2004) Serotonin-induced phase advances of SCN neuronal firing in vitro: a possible role for 5-HT_{5A} receptors? *Synapse* **54**: 111-8 [PMID:15352136]
437. Sprouse J, Reynolds L, Li X, Braselton J and Schmidt A. (2004) 8-OH-DPAT as a 5-HT₇ agonist: phase shifts of the circadian biological clock through increases in cAMP production. *Neuropharmacology* **46**: 52-62 [PMID:14654097]
438. Stam NJ, Roesink C, Dijcks F, Garritsen A, van Herpen A and Olijve W. (1997) Human serotonin 5-HT₇ receptor: cloning and pharmacological characterisation of two receptor variants. *FEBS Lett.* **413**: 489-94 [PMID:9303561]
439. Stam NJ, Van Huizen F, Van Alebeek C, Brands J, Dijkema R, Tonnaer JA and Olijve W. (1992) Genomic organization, coding sequence and functional expression of human 5-HT₂ and 5-HT_{1A} receptor genes. *Eur. J. Pharmacol.* **227**: 153-62 [PMID:1330647]
440. Stam NJ, Vanderheyden P, van Alebeek C, Klomp J, de Boer T, van Delft AM and Olijve W. (1994) Genomic organisation and functional expression of the gene encoding the human serotonin 5-HT_{2C} receptor. *Eur. J. Pharmacol.* **269**: 339-48 [PMID:7895773]
441. Stefulj J, Jernej B, Cicin-Sain L, Rinner I and Schauenstein K. (2000) mRNA expression of serotonin receptors in cells of the immune tissues of the rat. *Brain Behav. Immun.* **14**: 219-24 [PMID:10970681]
442. Sánchez C and Hyttel J. (1999) Comparison of the effects of antidepressants and their metabolites on reuptake of biogenic amines and on receptor binding. *Cell. Mol. Neurobiol.* **19**: 467-89 [PMID:10379421]
443. Takeda H, Tsuji M, Ikoshi H, Yamada T, Masuya J, Iimori M and Matsumiya T. (2005) Effects of a 5-HT₇ receptor antagonist DR4004 on the exploratory behavior in a novel environment and on brain monoamine dynamics in mice. *Eur. J. Pharmacol.* **518**: 30-9 [PMID:16002064]
444. Terrón JA. (1997) Role of 5-HT₇ receptors in the long-lasting hypotensive response induced by 5-hydroxytryptamine in the rat. *Br. J. Pharmacol.* **121**: 563-71 [PMID:9179401]

445. Terrón JA, Bouchelet I and Hamel E. (2001) 5-HT7 receptor mRNA expression in human trigeminal ganglia. *Neurosci. Lett.* **302**: 9-12 [PMID:11278099]
446. Thomas DR, Atkinson PJ, Ho M, Bromidge SM, Lovell PJ, Villani AJ, Hagan JJ, Middlemiss DN and Price GW. (2000) [(3)H]-SB-269970--A selective antagonist radioligand for 5-HT(7) receptors. *Br. J. Pharmacol.* **130**: 409-17 [PMID:10807680]
447. Thomas DR, Gittins SA, Collin LL, Middlemiss DN, Riley G, Hagan J, Gloger I, Ellis CE, Forbes IT and Brown AM. (1998) Functional characterisation of the human cloned 5-HT7 receptor (long form); antagonist profile of SB-258719. *Br. J. Pharmacol.* **124**: 1300-6 [PMID:9720804]
448. Thomas DR, Melotto S, Massagrande M, Gribble AD, Jeffrey P, Stevens AJ, Deeks NJ, Eddershaw PJ, Fenwick SH and Riley G *et al.*. (2003) SB-656104-A, a novel selective 5-HT7 receptor antagonist, modulates REM sleep in rats. *Br. J. Pharmacol.* **139**: 705-14 [PMID:12812993]
449. Thomsen WJ, Grottick AJ, Menzaghi F, Reyes-Saldana H, Espitia S, Yuskin D, Whelan K, Martin M, Morgan M and Chen W *et al.*. (2008) Lorcaserin, a novel selective human 5-hydroxytryptamine_{2C} agonist: in vitro and in vivo pharmacological characterization. *J. Pharmacol. Exp. Ther.* **325**: 577-87 [PMID:18252809]
450. Torres GE, Holt IL and Andrade R. (1994) Antagonists of 5-HT₄ receptor-mediated responses in adult hippocampal neurons. *J. Pharmacol. Exp. Ther.* **271**: 255-61 [PMID:7965722]
451. Trillat AC, Malagié I, Scearce K, Pons D, Anmella MC, Jacquot C, Hen R and Gardier AM. (1997) Regulation of serotonin release in the frontal cortex and ventral hippocampus of homozygous mice lacking 5-HT_{1B} receptors: in vivo microdialysis studies. *J. Neurochem.* **69**: 2019-25 [PMID:9349547]
452. Tuladhar BR, Costall B and Naylor RJ. (1996) Pharmacological characterization of the 5-hydroxytryptamine receptor mediating relaxation in the rat isolated ileum. *Br. J. Pharmacol.* **119**: 303-10 [PMID:8886413]
453. Tuo BG, Sellers Z, Paulus P, Barrett KE and Isenberg JL. (2004) 5-HT induces duodenal mucosal bicarbonate secretion via cAMP- and Ca²⁺-dependent signaling pathways and 5-HT₄ receptors in mice. *Am. J. Physiol. Gastrointest. Liver Physiol.* **286**: G444-51 [PMID:14576083]
454. Turner MR, Rabiner EA, Hammers A, Al-Chalabi A, Grasby PM, Shaw CE, Brooks DJ and Leigh PN. (2005) [11C]-WAY100635 PET demonstrates marked 5-HT_{1A} receptor changes in sporadic ALS. *Brain* **128**: 896-905 [PMID:15689356]
455. Van den Wyngaert I, Gommeren W, Verhasselt P, Jurzak M, Leysen J, Luyten W and Bender E. (1997) Cloning and expression of a human serotonin 5-HT₄ receptor cDNA. *J. Neurochem.* **69**: 1810-9 [PMID:9349523]
456. Vanover KE, Harvey SC, Son T, Bradley SR, Kold H, Makhay M, Veinbergs I, Spalding TA, Weiner DM and Andersson CM *et al.*. (2004) Pharmacological characterization of AC-90179 [2-(4-methoxyphenyl)-N-(4-methyl-benzyl)-N-(1-methyl-piperidin-4-yl)-acetamide hydrochloride]: a selective serotonin 2A receptor inverse agonist. *J. Pharmacol. Exp. Ther.* **310**: 943-51 [PMID:15102927]
457. Varnäs K, Hall H, Bonaventure P and Sedvall G. (2001) Autoradiographic mapping of 5-HT(1B) and 5-HT(1D) receptors in the post mortem human brain using [(3)H]GR 125743. *Brain Res.* **915**: 47-57 [PMID:11578619]
458. Varnäs K, Hurd YL and Hall H. (2005) Regional expression of 5-HT_{1B} receptor mRNA in the human brain. *Synapse* **56**: 21-8 [PMID:15700286]
459. Varnäs K, Nyberg S, Halldin C, Varrone A, Takano A, Karlsson P, Andersson J, McCarthy D, Smith M and Pierson ME *et al.*. (2011) Quantitative analysis of [11C]AZ10419369 binding to 5-HT_{1B} receptors in human brain. *J. Cereb. Blood Flow Metab.* **31**: 113-23 [PMID:20424633]
460. Vilaró MT, Cortés R, Gerald C, Branchek TA, Palacios JM and Mengod G. (1996) Localization of 5-HT₄ receptor mRNA in rat brain by in situ hybridization histochemistry. *Brain Res. Mol. Brain Res.* **43**: 356-60 [PMID:9037555]
461. Vilaró MT, Cortés R and Mengod G. (2005) Serotonin 5-HT₄ receptors and their mRNAs in rat and guinea pig brain: distribution and effects of neurotoxic lesions. *J. Comp. Neurol.* **484**: 418-39 [PMID:15770652]
462. Vilaró MT, Doménech T, Palacios JM and Mengod G. (2002) Cloning and characterization of a novel

- human 5-HT₄ receptor variant that lacks the alternatively spliced carboxy terminal exon. RT-PCR distribution in human brain and periphery of multiple 5-HT₄ receptor variants. *Neuropharmacology* **42**: 60-73 [PMID:11750916]
463. Villalón CM and Centurión D. (2007) Cardiovascular responses produced by 5-hydroxytryptamine: a pharmacological update on the receptors/mechanisms involved and therapeutic implications. *Naunyn Schmiedebergs Arch. Pharmacol.* **376**: 45-63 [PMID:17703282]
464. Voigt MM, Laurie DJ, Seeburg PH and Bach A. (1991) Molecular cloning and characterization of a rat brain cDNA encoding a 5-hydroxytryptamine_{1B} receptor. *EMBO J.* **10**: 4017-23 [PMID:1836757]
465. Wacker D, Wang C, Katritch V, Han GW, Huang XP, Vardy E, McCorvy JD, Jiang Y, Chu M and Siu FY *et al.* (2013) Structural features for functional selectivity at serotonin receptors. *Science* **340**: 615-9 [PMID:23519215]
466. Waeber C, Grailhe R, Yu XJ, Hen R and Moskowitz MA. (1998) Putative 5-HT₅ receptors: localization in the mouse CNS and lack of effect in the inhibition of dural protein extravasation. *Ann. N. Y. Acad. Sci.* **861**: 85-90 [PMID:9928243]
467. Waeber C, Sebben M, Grossman C, Javoy-Agid F, Bockaert J and Dumuis A. (1993) [³H]-GR113808 labels 5-HT₄ receptors in the human and guinea-pig brain. *Neuroreport* **4**: 1239-42 [PMID:8219020]
468. Waeber C, Sebben M, Nieoullon A, Bockaert J and Dumuis A. (1994) Regional distribution and ontogeny of 5-HT₄ binding sites in rodent brain. *Neuropharmacology* **33**: 527-41 [PMID:7984292]
469. Wainscott DB, Cohen ML, Schenck KW, Audia JE, Nissen JS, Baez M, Kursar JD, Lucaites VL and Nelson DL. (1993) Pharmacological characteristics of the newly cloned rat 5-hydroxytryptamine_{2F} receptor. *Mol. Pharmacol.* **43**: 419-26 [PMID:8450835]
470. Wainscott DB, Krushinski Jr JH, Audia JE, Schaus JM, Zgombick JM, Lucaites VL and Nelson DL. (2005) [³H]LY334370, a novel radioligand for the 5-HT_{1F} receptor. I. In vitro characterization of binding properties. *Naunyn Schmiedebergs Arch. Pharmacol.* **371**: 169-77 [PMID:15900510]
471. Wainscott DB, Sasso DA, Kursar JD, Baez M, Lucaites VL and Nelson DL. (1998) [³H]Rauwolscine: an antagonist radioligand for the cloned human 5-hydroxytryptamine_{2b} (5-HT_{2B}) receptor. *Naunyn Schmiedebergs Arch. Pharmacol.* **357**: 17-24 [PMID:9459568]
472. Wang C, Jiang Y, Ma J, Wu H, Wacker D, Katritch V, Han GW, Liu W, Huang XP and Vardy E *et al.* (2013) Structural basis for molecular recognition at serotonin receptors. *Science* **340**: 610-4 [PMID:23519210]
473. Wang ZY, Keith IM, Beckman MJ, Brownfield MS, Vidruk EH and Bisgard GE. (2000) 5-HT_{5a} receptors in the carotid body chemoreception pathway of rat. *Neurosci. Lett.* **278**: 9-12 [PMID:10643788]
474. Ward SE, Harrington FP, Gordon LJ, Hopley SC, Scott CM and Watson JM. (2005) Discovery of the first potent, selective 5-hydroxytryptamine_{1D} receptor antagonist. *J. Med. Chem.* **48**: 3478-80 [PMID:15887956]
475. Watson J, Brough S, Coldwell MC, Gager T, Ho M, Hunter AJ, Jerman J, Middlemiss DN, Riley GJ and Brown AM. (1998) Functional effects of the muscarinic receptor agonist, xanomeline, at 5-HT₁ and 5-HT₂ receptors. *Br. J. Pharmacol.* **125**: 1413-20 [PMID:9884068]
476. Watson J, Roberts C, Scott C, Kendall I, Collin L, Day NC, Harries MH, Soffin E, Davies CH and Randall AD *et al.* (2001) SB-272183, a selective 5-HT_{1A}, 5-HT_{1B} and 5-HT_{1D} receptor antagonist in native tissue. *Br. J. Pharmacol.* **133**: 797-806 [PMID:11454652]
477. Watson JM, Burton MJ, Price GW, Jones BJ and Middlemiss DN. (1996) GR127935 acts as a partial agonist at recombinant human 5-HT_{1D} alpha and 5-HT_{1D} beta receptors. *Eur. J. Pharmacol.* **314**: 365-72 [PMID:8957260]
478. Watts SW, Gilbert L and Webb RC. (1995) 5-Hydroxytryptamine_{2B} receptor mediates contraction in the mesenteric artery of mineralocorticoid hypertensive rats. *Hypertension* **26**: 1056-9 [PMID:7498967]
479. Watts SW and Thompson JM. (2004) Characterization of the contractile 5-hydroxytryptamine receptor in the renal artery of the normotensive rat. *J. Pharmacol. Exp. Ther.* **309**: 165-72 [PMID:14724222]
480. Weinshank RL, Zgombick JM, Macchi MJ, Branchek TA and Hartig PR. (1992) Human serotonin 1D receptor is encoded by a subfamily of two distinct genes: 5-HT_{1D} alpha and 5-HT_{1D} beta. *Proc. Natl.*

- Acad. Sci. U.S.A.* **89**: 3630-4 [PMID:1565658]
481. Weiss HM, Haase W, Michel H and Reiländer H. (1995) Expression of functional mouse 5-HT_{5A} serotonin receptor in the methylotrophic yeast *Pichia pastoris*: pharmacological characterization and localization. *FEBS Lett.* **377**: 451-6 [PMID:8549774]
482. Werry TD, Loiacono R, Sexton PM and Christopoulos A. (2008) RNA editing of the serotonin 5HT_{2C} receptor and its effects on cell signalling, pharmacology and brain function. *Pharmacol. Ther.* **119**: 7-23 [PMID:18554725]
483. Weydert A, Cloez-Tayarani I, Fillion MP, Simon-Chazottes D, Guenet JL and Fillion G. (1992) Molecular cloning of two partial serotonin 5-HT_{1D} receptor sequences in mouse and one in guinea pig. *C. R. Acad. Sci. III, Sci. Vie* **314**: 429-35 [PMID:1521164]
484. Whale R, Bhagwagar Z and Cowen PJ. (1999) Zolmitriptan-induced growth hormone release in humans: mediation by 5-HT_{1D} receptors? *Psychopharmacology (Berl.)* **145**: 223-6 [PMID:10463324]
485. Wolff M, Benhassine N, Costet P, Hen R, Segu L and Buhot MC. (2003) Delay-dependent working memory impairment in young-adult and aged 5-HT_{1BKO} mice as assessed in a radial-arm water maze. *Learn. Mem.* **10**: 401-9 [PMID:14557613]
486. Woolley ML, Bentley JC, Sleight AJ, Marsden CA and Fone KC. (2001) A role for 5-HT₆ receptors in retention of spatial learning in the Morris water maze. *Neuropharmacology* **41**: 210-9 [PMID:11489457]
487. Wurch T, Colpaert FC and Pauwels PJ. (1998) Chimeric receptor analysis of the ketanserin binding site in the human 5-Hydroxytryptamine_{1D} receptor: importance of the second extracellular loop and fifth transmembrane domain in antagonist binding. *Mol. Pharmacol.* **54**: 1088-96 [PMID:9855638]
488. Xie Z, Lee SP, O'Dowd BF and George SR. (1999) Serotonin 5-HT_{1B} and 5-HT_{1D} receptors form homodimers when expressed alone and heterodimers when co-expressed. *FEBS Lett.* **456**: 63-7 [PMID:10452531]
489. Xu X, Wei Y, Guo Q, Zhao S, Liu Z, Xiao T, Liu Y, Qiu Y, Hou Y and Zhang G *et al.* (2018) Pharmacological Characterization of H05, a Novel Serotonin and Noradrenaline Reuptake Inhibitor with Moderate 5-HT_{2A} Antagonist Activity for the Treatment of Depression. *J. Pharmacol. Exp. Ther.* **365**: 624-635 [PMID:29615471]
490. Xu YC, Schaus JM, Walker C, Krushinski J, Adham N, Zgombick JM, Liang SX, Kohlman DT and Audia JE. (1999) N-Methyl-5-tert-butyltryptamine: A novel, highly potent 5-HT_{1D} receptor agonist. *J. Med. Chem.* **42**: 526-31 [PMID:9986723]
491. Yang W, Chen K, Lan NC, Gallaher TK and Shih JC. (1992) Gene structure and expression of the mouse 5-HT₂ receptor. *J. Neurosci. Res.* **33**: 196-204 [PMID:1333538]
492. Yoshioka M, Matsumoto M, Togashi H, Mori K and Saito H. (1998) Central distribution and function of 5-HT₆ receptor subtype in the rat brain. *Life Sci.* **62**: 1473-7 [PMID:9585121]
493. Yu L, Nguyen H, Le H, Bloem LJ, Kozak CA, Hoffman BJ, Snutch TP, Lester HA, Davidson N and Lübbert H. (1991) The mouse 5-HT_{1C} receptor contains eight hydrophobic domains and is X-linked. *Brain Res. Mol. Brain Res.* **11**: 143-9 [PMID:1661811]
494. Zgombick JM and Branchek TA. (1998) Native 5-HT_{1B} receptors expressed in OK cells display dual coupling to elevation of intracellular calcium concentrations and inhibition of adenylate cyclase. *Naunyn Schmiedebergs Arch. Pharmacol.* **358**: 503-8 [PMID:9840417]
495. Zgombick JM, Schechter LE, Macchi M, Hartig PR, Branchek TA and Weinshank RL. (1992) Human gene S31 encodes the pharmacologically defined serotonin 5-hydroxytryptamine_{1E} receptor. *Mol. Pharmacol.* **42**: 180-5 [PMID:1513320]
496. Zhang JY, Nawoschik S, Kowal D, Smith D, Spangler T, Ochalski R, Schechter L and Dunlop J. (2003) Characterization of the 5-HT₆ receptor coupled to Ca²⁺ signaling using an enabling chimeric G-protein. *Eur. J. Pharmacol.* **472**: 33-8 [PMID:12860470]