

Angiotensin receptors in GtoPdb v.2025.3

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Abstract

The actions of [angiotensin II](#) (Ang II) are mediated by AT₁ and AT₂ receptors (**nomenclature as agreed by the NC-IUPHAR Subcommittee on Angiotensin receptors [63, 155]**), which have around 30% sequence similarity. The octapeptide [angiotensin II](#) and the heptapeptide [angiotensin III](#) are endogenous ligands. The "sartan" family drugs such as [losartan](#), [candesartan](#), [olmesartan](#), [telmisartan](#), *etc.* are clinically used AT₁ receptor blockers.

Contents

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AT₂ receptor

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References

1. AbdAlla S, Lother H, el Massiery A and Quitterer U. (2001) Increased AT(1) receptor heterodimers in preeclampsia mediate enhanced angiotensin II responsiveness. *Nat Med* **7**: 1003-9 [PMID:11533702]
2. AbdAlla S, Lother H and Quitterer U. (2000) AT1-receptor heterodimers show enhanced G-protein activation and altered receptor sequestration. *Nature* **407**: 94-8 [PMID:10993080]
3. Agelis G, Resvani A, Durdagi S, Spyridaki K, Tůmová T, Slaninová J, Giannopoulos P, Vlahakos D, Liapakis G and Mavromoustakos T *et al.*. (2012) The discovery of new potent non-peptide Angiotensin II AT1 receptor blockers: a concise synthesis, molecular docking studies and biological evaluation of N-substituted 5-butyrimidazole derivatives. *Eur J Med Chem* **55**: 358-74 [PMID:22889560]
4. Agelis G, Resvani A, Koukoulitsa C, Tůmová T, Slaninová J, Kalavrizioti D, Spyridaki K, Afantitis A, Melagraki G and Sifakia A *et al.*. (2013) Rational design, efficient syntheses and biological evaluation of N,N'-symmetrically bis-substituted butylimidazole analogs as a new class of potent Angiotensin II receptor blockers. *Eur J Med Chem* **62**: 352-70 [PMID:23376252]
5. Ahn S, Shenoy SK, Wei H and Lefkowitz RJ. (2004) Differential kinetic and spatial patterns of beta-arrestin and G protein-mediated ERK activation by the angiotensin II receptor. *J Biol Chem* **279**: 35518-25 [PMID:15205453]
6. Aiyar N, Griffin E, Shu A, Heys R, Bergsma DJ, Weinstock J and Edwards R. (1993) Characterization of [3H]SK&F 108566 as a radioligand for angiotensin type-1 receptor. *J Recept Res* **13**: 849-61 [PMID:8463997]
7. Akishita M, Horiuchi M, Yamada H, Zhang L, Shirakami G, Tamura K, Ouchi Y and Dzau VJ. (2000) Inflammation influences vascular remodeling through AT2 receptor expression and signaling. *Physiol Genomics* **2**: 13-20 [PMID:11015577]
8. Akishita M, Iwai M, Wu L, Zhang L, Ouchi Y, Dzau VJ and Horiuchi M. (2000) Inhibitory effect of angiotensin II type 2 receptor on coronary arterial remodeling after aortic banding in mice. *Circulation* **102**: 1684-9 [PMID:11015348]
9. Albiston AL, McDowall SG, Matsacos D, Sim P, Clune E, Mustafa T, Lee J, Mendelsohn FA, Simpson RJ and Connolly LM *et al.*. (2001) Evidence that the angiotensin IV (AT(4)) receptor is the enzyme insulin-regulated aminopeptidase. *J Biol Chem* **276**: 48623-6 [PMID:11707427]
10. Albiston AL, Mustafa T, McDowall SG, Mendelsohn FA, Lee J and Chai SY. (2003) AT4 receptor is insulin-regulated membrane aminopeptidase: potential mechanisms of memory enhancement. *Trends Endocrinol Metab* **14**: 72-7 [PMID:12591177]
11. Alfakih K, Maqbool A, Sivananthan M, Walters K, Bainbridge G, Ridgway J, Balmforth AJ and Hall AS. (2004) Left ventricle mass index and the common, functional, X-linked angiotensin II type-2 receptor gene polymorphism (-1332 G/A) in patients with systemic hypertension. *Hypertension* **43**: 1189-94 [PMID:15123577]
12. Allen AM, Moeller I, Jenkins TA, Zhuo J, Aldred GP, Chai SY and Mendelsohn FA. (1998) Angiotensin receptors in the nervous system. *Brain Res Bull* **47**: 17-28 [PMID:9766385]
13. Anand U, Yiangou Y, Sinisi M, Fox M, MacQuillan A, Quick T, Korchev YE, Bountra C, McCarthy T and Anand P. (2015) Mechanisms underlying clinical efficacy of Angiotensin II type 2 receptor (AT2R) antagonist EMA401 in neuropathic pain: clinical tissue and in vitro studies. *Mol Pain* **11**: 38 [PMID:26111701]
14. Asada H, Horita S, Hirata K, Shiroishi M, Shiimura Y, Iwanari H, Hamakubo T, Shimamura T, Nomura N and Kusano-Arai O *et al.*. (2018) Crystal structure of the human angiotensin II type 2 receptor bound to an angiotensin II analog. *Nat Struct Mol Biol* **25**: 570-576 [PMID:29967536]
15. Asada H, Inoue A, Ngako Kadji FM, Hirata K, Shiimura Y, Im D, Shimamura T, Nomura N, Iwanari H and Hamakubo T *et al.*. (2020) The Crystal Structure of Angiotensin II Type 2 Receptor with Endogenous Peptide Hormone. *Structure* **28**: 418-425.e4 [PMID:31899086]
16. Asico LD, Ladines C, Fuchs S, Accili D, Carey RM, Semeraro C, Pocchiari F, Felder RA, Eisner GM and Jose PA. (1998) Disruption of the dopamine D3 receptor gene produces renin-dependent hypertension. *J Clin Invest* **102**: 493-8 [PMID:9691085]
17. Ayadi Kabadou I, Soualmiaa H, Jemaa R, Feki M, Kallel A, Souheil O, Haj Taieb S, Sanhaji H and Kaabachi N. (2012) Lack of association between C3123A polymorphism of the angiotensin II type 2 receptor gene and hypertension in Tunisian population. *Tunis Med* **90**: 619-24 [PMID:22987376]

18. Baiardi G, Macova M, Armando I, Ando H, Tyurmin D and Saavedra JM. (2005) Estrogen upregulates renal angiotensin II AT1 and AT2 receptors in the rat. *Regul Pept* **124**: 7-17 [PMID:15544836]
19. Baker KM, Chernin MI, Wixson SK and Aceto JF. (1990) Renin-angiotensin system involvement in pressure-overload cardiac hypertrophy in rats. *Am J Physiol* **259**: H324-32 [PMID:2143633]
20. Baleanu-Gogonea C and Karnik S. (2006) Model of the whole rat AT1 receptor and the ligand-binding site. *J Mol Model* **12**: 325-37 [PMID:16404618]
21. Barber MN, Sampey DB and Widdop RE. (1999) AT(2) receptor stimulation enhances antihypertensive effect of AT(1) receptor antagonist in hypertensive rats. *Hypertension* **34**: 1112-6 [PMID:10567191]
22. Batenburg WW, Garrelts IM, Bernasconi CC, Juillerat-Jeanneret L, van Kats JP, Saxena PR and Danser AH. (2004) Angiotensin II type 2 receptor-mediated vasodilation in human coronary microarteries. *Circulation* **109**: 2296-301 [PMID:15117835]
23. Bergsma DJ, Ellis C, Kumar C, Nuthulaganti P, Kersten H, Elshourbagy N, Griffin E, Stadel JM and Aiyar N. (1992) Cloning and characterization of a human angiotensin II type 1 receptor. *Biochem Biophys Res Commun* **183**: 989-95 [PMID:1567413]
24. Berk BC and Corson MA. (1997) Angiotensin II signal transduction in vascular smooth muscle: role of tyrosine kinases. *Circ Res* **80**: 607-16 [PMID:9130441]
25. Bhatnagar A, Unal H, Jagannathan R, Kaveti S, Duan ZH, Yong S, Vasanji A, Kinter M, Desnoyer R and Karnik SS. (2013) Interaction of G-protein $\beta\gamma$ complex with chromatin modulates GPCR-dependent gene regulation. *PLoS ONE* **8**: e52689 [PMID:23326349]
26. Bienvenu T, Poirier K, Van Esch H, Hamel B, Moraine C, Fryns JP, Ropers HH, Beldjord C, Yntema HG and Chelly J. (2003) Rare polymorphic variants of the AGTR2 gene in boys with non-specific mental retardation. *J Med Genet* **40**: 357-9 [PMID:12746399]
27. Bonnardeaux A, Davies E, Jeunemaitre X, Féry I, Charru A, Clauser E, Tiret L, Cambien F, Corvol P and Soubrier F. (1994) Angiotensin II type 1 receptor gene polymorphisms in human essential hypertension. *Hypertension* **24**: 63-9 [PMID:8021009]
28. Booz GW and Baker KM. (1996) Role of type 1 and type 2 angiotensin receptors in angiotensin II-induced cardiomyocyte hypertrophy. *Hypertension* **28**: 635-40 [PMID:8843890]
29. Bosnyak S, Jones ES, Christopoulos A, Aguilar MI, Thomas WG and Widdop RE. (2011) Relative affinity of angiotensin peptides and novel ligands at AT1 and AT2 receptors. *Clin Sci* **121**: 297-303 [PMID:21542804]
30. Bottari SP, Taylor V, King IN, Bogdal Y, Whitebread S and de Gasparo M. (1991) Angiotensin II AT2 receptors do not interact with guanine nucleotide binding proteins. *Eur J Pharmacol* **207**: 157-63 [PMID:1908781]
31. Brechler V, Jones PW, Levens NR, de Gasparo M and Bottari SP. (1993) Agonistic and antagonistic properties of angiotensin analogs at the AT2 receptor in PC12W cells. *Regul Pept* **44**: 207-13 [PMID:8385791]
32. Brede M, Hadamek K, Meinel L, Wiesmann F, Peters J, Engelhardt S, Simm A, Haase A, Lohse MJ and Hein L. (2001) Vascular hypertrophy and increased P70S6 kinase in mice lacking the angiotensin II AT(2) receptor. *Circulation* **104**: 2602-7 [PMID:11714657]
33. Brogelli L, Parenti A and Ledda F. (2002) Inhibition of vascular smooth muscle cell growth by angiotensin type 2 receptor stimulation for in vitro organ culture model. *J Cardiovasc Pharmacol* **39**: 739-45 [PMID:11973418]
34. Buisson B, Laflamme L, Bottari SP, de Gasparo M, Gallo-Payet N and Payet MD. (1995) A G protein is involved in the angiotensin AT2 receptor inhibition of the T-type calcium current in non-differentiated NG108-15 cells. *J Biol Chem* **270**: 1670-4 [PMID:7829501]
35. Bullock GR, Steyaert I, Bilbe G, Carey RM, Kips J, De Paepe B, Pauwels R, Praet M, Siragy HM and de Gasparo M. (2001) Distribution of type-1 and type-2 angiotensin receptors in the normal human lung and in lungs from patients with chronic obstructive pulmonary disease. *Histochem Cell Biol* **115**: 117-24 [PMID:11444146]
36. Bumpus FM, Catt KJ, Chiu AT, DeGasparo M, Goodfriend T, Husain A, Peach MJ, Taylor Jr DG and Timmermans PB. (1991) Nomenclature for angiotensin receptors. A report of the Nomenclature Committee of the Council for High Blood Pressure Research. *Hypertension* **17**: 720-1 [PMID:2022414]
37. Buneman P, Christie G, Davies JA, Dimitrellou R, Harding SD, Pawson AJ, Sharman JL and Wu Y. (2020) Why data citation isn't working, and what to do about it *Database* **2020** [PMID:32367113]
38. Burns KD and Li N. (2003) The role of angiotensin II-stimulated renal tubular transport in hypertension. *Curr Hypertens Rep* **5**: 165-71 [PMID:12642017]
39. Carey RM, Wang ZQ and Siragy HM. (2000) Role of the angiotensin type 2 receptor in the regulation of blood pressure and renal function. *Hypertension* **35**: 155-63 [PMID:10642292]
40. Catt KJ, Mendelsohn FA, Millan MA and Aguilera G. (1984) The role of angiotensin II receptors in vascular regulation. *J Cardiovasc Pharmacol* **6 Suppl 4**: S575-86 [PMID:6083400]
41. Catt KJ, Sandberg K and Balla T. (1993) Angiotensin II receptor and signal transduction

mechanisms. *In Cellular and molecular biology of the renin-angiotensin system* Edited by Raizada MK, Phillips MI, Sumners C: CRC Press: 307-356 [ISBN: 0849346223]

42. Chaki S and Inagami T. (1992) A newly found angiotensin II receptor subtype mediates cyclic GMP formation in differentiated Neuro-2A cells. *Eur J Pharmacol* **225**: 355-6 [PMID:1323479]
43. Chakrabarty A, Blacklock A, Svojanovsky S and Smith PG. (2008) Estrogen elicits dorsal root ganglion axon sprouting via a renin-angiotensin system. *Endocrinology* **149**: 3452-60 [PMID:18388195]
44. Chang RS and Lotti VJ. (1990) Two distinct angiotensin II receptor binding sites in rat adrenal revealed by new selective nonpeptide ligands. *Mol Pharmacol* **37**: 347-51 [PMID:2314387]
45. Chansel D, Vandermeersch S, Pham P and Ardaillou R. (1993) Characterization of [3H]losartan receptors in isolated rat glomeruli. *Eur J Pharmacol* **247**: 193-8 [PMID:8282008]
46. Chaves FJ, Corella D, Sorli JV, Marin-Garcia P, Guillen M and Redon J. (2004) Polymorphisms of the renin-angiotensin system influence height in normotensive women in a Spanish population. *J Clin Endocrinol Metab* **89**: 2301-5 [PMID:15126556]
47. Chen D, Bassi JK, Walther T, Thomas WG and Allen AM. (2010) Expression of angiotensin type 1A receptors in C1 neurons restores the sympathoexcitation to angiotensin in the rostral ventrolateral medulla of angiotensin type 1A knockout mice. *Hypertension* **56**: 143-50 [PMID:20458002]
48. Chen J, Guo L, Peiffer DA, Zhou L, Chan OT, Bibikova M, Wickham-Garcia E, Lu SH, Zhan Q and Wang-Rodriguez J *et al.*. (2008) Genomic profiling of 766 cancer-related genes in archived esophageal normal and carcinoma tissues. *Int J Cancer* **122**: 2249-54 [PMID:18241037]
49. Chen TB, Lotti VJ and Chang RS. (1992) Characterization of the binding of [3H]L-158,809: a new potent and selective nonpeptide angiotensin II receptor (AT1) antagonist radioligand. *Mol Pharmacol* **42**: 1077-82 [PMID:1480133]
50. Chiu AT, Herblin WF, McCall DE, Ardecky RJ, Carini DJ, Duncia JV, Pease LJ, Wong PC, Wexler RR and Johnson AL *et al.*. (1989) Identification of angiotensin II receptor subtypes. *Biochem Biophys Res Commun* **165**: 196-203 [PMID:2590220]
51. Chiu AT, McCall DE and Roscoe WA. (1992) [125I]EXP985: a highly potent and specific nonpeptide radioligand antagonist for the AT1 angiotensin receptor. *Biochem Biophys Res Commun* **188**: 1030-9 [PMID:1445340]
52. Chow LH, Tao PL, Chen JC, Liao RM, Chang EP and Huang EY. (2013) A possible correlation between oxytocin-induced and angiotensin IV-induced anti-hyperalgesia at the spinal level in rats. *Peptides* **39**: 21-8 [PMID:23142109]
53. Christensen GL, Kelstrup CD, Lyngsø C, Sarwar U, Bøgebo R, Sheikh SP, Gammeltoft S, Olsen JV and Hansen JL. (2010) Quantitative phosphoproteomics dissection of seven-transmembrane receptor signaling using full and biased agonists. *Mol Cell Proteomics* **9**: 1540-53 [PMID:20363803]
54. Criscione L, de Gasparo M, Bühlmayer P, Whitebread S, Ramjoué HP and Wood J. (1993) Pharmacological profile of valsartan: a potent, orally active, nonpeptide antagonist of the angiotensin II AT1-receptor subtype. *Br J Pharmacol* **110**: 761-71 [PMID:8242249]
55. Cui T, Nakagami H, Iwai M, Takeda Y, Shiuchi T, Daviet L, Nahmias C and Horiuchi M. (2001) Pivotal role of tyrosine phosphatase SHP-1 in AT₂ receptor-mediated apoptosis in rat foetal vascular smooth muscle cell. *Cardiovasc Res* **49**: 863-871 [PMID:11230986]
56. Cullinane AB, Leung PS, Ortego J, Coca-Prados M and Harvey BJ. (2002) Renin-angiotensin system expression and secretory function in cultured human ciliary body non-pigmented epithelium. *Br J Ophthalmol* **86**: 676-83 [PMID:12034692]
57. Curnow KM, Pascoe L, Davies E, White PC, Corvol P and Clauser E. (1995) Alternatively spliced human type 1 angiotensin II receptor mRNAs are translated at different efficiencies and encode two receptor isoforms. *Mol Endocrinol* **9**: 1250-62 [PMID:7491117]
58. Curnow KM, Pascoe L and White PC. (1992) Genetic analysis of the human type-1 angiotensin II receptor. *Mol Endocrinol* **6**: 1113-8 [PMID:1508224]
59. da Silva OG, Rossignoli Pde S, Carrillo-Sepúlveda MA, Barreto-Chaves ML and Chies AB. (2011) Involvement of the AT1 receptor in the venoconstriction induced by angiotensin II in both the inferior vena cava and femoral vein. *Peptides* **32**: 112-7 [PMID:20955746]
60. Davies E, Bonnardeaux A, Lathrop GM, Corvol P, Clauser E and Soubrier F. (1994) Angiotensin II (type-1) receptor locus: CA repeat polymorphism and genetic mapping. *Hum Mol Genet* **3**: 838 [PMID:8081376]
61. Davisson RL, Oliverio MI, Coffman TM and Sigmund CD. (2000) Divergent functions of angiotensin II receptor isoforms in the brain. *J Clin Invest* **106**: 103-6 [PMID:10880053]
62. de Boer RA, Pinto YM, Suurmeijer AJ, Pokharel S, Scholtens E, Humler M, Saavedra JM, Boomsma F, van Gilst WH and van Veldhuisen DJ. (2003) Increased expression of cardiac angiotensin II type 1 (AT(1)) receptors decreases myocardial microvessel density after experimental myocardial infarction. *Cardiovasc Res* **57**: 434-42 [PMID:12566116]
63. de Gasparo M, Catt KJ, Inagami T, Wright JW and Unger T. (2000) International union of pharmacology. XXIII. The angiotensin II receptors. *Pharmacol Rev* **52**: 415-72 [PMID:10977869]

64. de Gasparo M, Husain A, Alexander W, Catt KJ, Chiu AT, Drew M, Goodfriend T, Harding JW, Inagami T and Timmermans PB. (1995) Proposed update of angiotensin receptor nomenclature. *Hypertension* **25**: 924-7 [PMID:7737728]
65. de Gasparo M and Siragy HM. (1999) The AT₂ receptor: fact, fancy and fantasy. *Regul Pept* **81**: 11-24 [PMID:10395404]
66. de Gasparo M and Whitebread S. (1995) Binding of valsartan to mammalian angiotensin AT₁ receptors. *Regul Pept* **59**: 303-11 [PMID:8577935]
67. de Gasparo M, Whitebread S, Bottari SP and Levens NR. (1994) Heterogeneity of angiotensin receptor subtypes. In *Medicinal Chemistry of the Renin-Angiotensin System*. Edited by Timmermanns PBMW, Wexler RR: Elsevier: 269-294 [ISBN: 0444820531]
68. de Gasparo MBottari. (1995) Characteristics of angiotensin II receptors and their role in cell and organ physiology. In *Hypertension: Pathophysiology, Diagnosis, and Management* **1**: Edited by Laragh JH, Brenner BM: Raven Press Ltd.: 1695-1720 [ISBN: 0781701570]
69. De Paolis P, Porcellini A, Savoia C, Lombardi A, Gigante B, Frati G, Rubattu S, Musumeci B and Volpe M. (2002) Functional cross-talk between angiotensin II and epidermal growth factor receptors in NIH3T3 fibroblasts. *J Hypertens* **20**: 693-9 [PMID:11910305]
70. Demaegdt H, Lukaszuk A, De Buyser E, De Backer JP, Szemenyei E, Tóth G, Chakravarthy S, Panicker M, Michotte Y and Tourwé D *et al.*. (2009) Selective labeling of IRAP by the tritiated AT₄ receptor ligand [3H]Angiotensin IV and its stable analog [3H]AL-11. *Mol Cell Endocrinol* **311**: 77-86 [PMID:19643163]
71. Dimitropoulou C, White RE, Fuchs L, Zhang H, Catravas JD and Carrier GO. (2001) Angiotensin II relaxes microvessels via the AT₂ receptor and Ca²⁺-activated K⁺ (BK(Ca)) channels. *Hypertension* **37**: 301-7 [PMID:11230289]
72. Dimmeler S, Rippmann V, Weiland U, Haendeler J and Zeiher AM. (1997) Angiotensin II induces apoptosis of human endothelial cells. Protective effect of nitric oxide. *Circ Res* **81**: 970-6 [PMID:9400377]
73. Doan TN, Ali MS and Bernstein KE. (2001) Tyrosine kinase activation by the angiotensin II receptor in the absence of calcium signaling. *J Biol Chem* **276**: 20954-8 [PMID:11319216]
74. Dudley DT, Hubbell SE and Summerfelt RM. (1991) Characterization of angiotensin II (AT₂) binding sites in R3T3 cells. *Mol Pharmacol* **40**: 360-7 [PMID:1896025]
75. Dudley DT, Panek RL, Major TC, Lu GH, Bruns RF, Klinkefus BA, Hodges JC and Weishaar RE. (1990) Subclasses of angiotensin II binding sites and their functional significance. *Mol Pharmacol* **38**: 370-7 [PMID:2402226]
76. Dudley DT and Summerfelt RM. (1993) Regulated expression of angiotensin II (AT₂) binding sites in R3T3 cells. *Regul Pept* **44**: 199-206 [PMID:8469774]
77. Dzau VJ and Horiuchi M. (1996) Differential expression of angiotensin receptor subtypes in the myocardium: a hypothesis. *Eur Heart J* **17**: 978-80 [PMID:8809509]
78. Dzau VJ, Mukoyama M and Pratt RE. (1994) Molecular biology of angiotensin receptors: target for drug research? *J Hypertens Suppl* **12**: S1-5 [PMID:7965260]
79. Díez J, Laviades C, Orbe J, Zalba G, López B, González A, Mayor G, Páramo JA and Beloqui O. (2003) The A1166C polymorphism of the AT₁ receptor gene is associated with collagen type I synthesis and myocardial stiffness in hypertensives. *J Hypertens* **21**: 2085-92 [PMID:14597852]
80. Edwards RM, Aiyar N, Ohlstein EH, Weidley EF, Griffin E, Ezekiel M, Keenan RM, Ruffolo RR and Weinstock J. (1992) Pharmacological characterization of the nonpeptide angiotensin II receptor antagonist, SK&F 108566. *J Pharmacol Exp Ther* **260**: 175-81 [PMID:1309870]
81. Eguchi S, Dempsey PJ, Frank GD, Motley ED and Inagami T. (2001) Activation of MAPKs by angiotensin II in vascular smooth muscle cells. Metalloprotease-dependent EGF receptor activation is required for activation of ERK and p38 MAPK but not for JNK. *J Biol Chem* **276**: 7957-62 [PMID:11116149]
82. Elton TS, Stephan CC, Taylor GR, Kimball MG, Martin MM, Durand JN and Oparil S. (1992) Isolation of two distinct type I angiotensin II receptor genes. *Biochem Biophys Res Commun* **184**: 1067-73 [PMID:1575725]
83. Esteban V, Heringer-Walther S, Sterner-Kock A, de Bruin R, van den Engel S, Wang Y, Mezzano S, Egido J, Schultheiss HP and Ruiz-Ortega M *et al.*. (2009) Angiotensin-(1-7) and the G protein-coupled receptor MAS are key players in renal inflammation. *PLoS ONE* **4**: e5406 [PMID:19404405]
84. Esteban V, Lorenzo O, Rupérez M, Suzuki Y, Mezzano S, Blanco J, Kretzler M, Sugaya T, Egido J and Ruiz-Ortega M. (2004) Angiotensin II, via AT₁ and AT₂ receptors and NF- κ B pathway, regulates the inflammatory response in unilateral ureteral obstruction. *J Am Soc Nephrol* **15**: 1514-29 [PMID:15153562]
85. Esteban V, Ruperez M, Vita JR, López ES, Mezzano S, Plaza JJ, Egido J and Ruiz-Ortega M. (2003) Effect of simultaneous blockade of AT₁ and AT₂ receptors on the NF κ B pathway and renal inflammatory response. *Kidney Int Suppl*: S33-8 [PMID:12969125]
86. Eto H, Biro S, Miyata M, Kaieda H, Obata H, Kihara T, Orihara K and Tei C. (2003) Angiotensin II type 1 receptor participates in extracellular matrix production in the late stage of remodeling

- after vascular injury. *Cardiovasc Res* **59**: 200-11 [PMID:12829191]
87. Feng YH, Noda K, Saad Y, Liu XP, Husain A and Karnik SS. (1995) The docking of Arg2 of angiotensin II with Asp281 of AT1 receptor is essential for full agonism. *J Biol Chem* **270**: 12846-50 [PMID:7759541]
 88. Feng YH, Saad Y and Karnik SS. (2000) Reversible inactivation of AT(2) angiotensin II receptor from cysteine-disulfide bond exchange. *FEBS Lett* **484**: 133-8 [PMID:11068047]
 89. Feng YH, Sun Y and Douglas JG. (2002) Gbeta gamma -independent constitutive association of Galpha s with SHP-1 and angiotensin II receptor AT2 is essential in AT2-mediated ITIM-independent activation of SHP-1. *Proc Natl Acad Sci USA* **99**: 12049-54 [PMID:12221292]
 90. Ferri C, Desideri G, Baldoncini R, Bellini C, Valenti M, Santucci A and De Mattia G. (1999) Angiotensin II increases the release of endothelin-1 from human cultured endothelial cells but does not regulate its circulating levels. *Clin Sci* **96**: 261-70 [PMID:10029562]
 91. Fierens F, Vanderheyden PM, De Backer JP and Vauquelin G. (1999) Binding of the antagonist [3H]candesartan to angiotensin II AT1 receptor-transfected [correction of tranfected] Chinese hamster ovary cells. *Eur J Pharmacol* **367**: 413-22 [PMID:10079018]
 92. Fierens FL, Vanderheyden PM, De Backer JP and Vauquelin G. (1999) Insurmountable angiotensin AT1 receptor antagonists: the role of tight antagonist binding. *Eur J Pharmacol* **372**: 199-206 [PMID:10395100]
 93. Fillion D, Cabana J, Guillemette G, Leduc R, Lavigne P and Escher E. (2013) Structure of the human angiotensin II type 1 (AT1) receptor bound to angiotensin II from multiple chemoselective photoprobe contacts reveals a unique peptide binding mode. *J Biol Chem* **288**: 8187-97 [PMID:23386604]
 94. Finnerup NB and Baastrop C. (2014) Angiotensin II: from blood pressure to pain control. *Lancet* **383**: 1613-4 [PMID:24507378]
 95. Fischer TA, Singh K, O'Hara DS, Kaye DM and Kelly RA. (1998) Role of AT₁ and AT₂ receptors in regulation of MAPKs and MKP-1 by Ang II in adult cardiac myocytes. *Am J Physiol* **275**: H906-H916 [PMID:9724295]
 96. Friedman RC, Farh KK, Burge CB and Bartel DP. (2009) Most mammalian mRNAs are conserved targets of microRNAs. *Genome Res* **19**: 92-105 [PMID:18955434]
 97. Furuta H, Guo DF and Inagami T. (1992) Molecular cloning and sequencing of the gene encoding human angiotensin II type 1 receptor. *Biochem Biophys Res Commun* **183**: 8-13 [PMID:1543512]
 98. Gallinat S, Yu M, Dorst A, Unger T and Herdegen T. (1998) Sciatic nerve transection evokes lasting up-regulation of angiotensin AT2 and AT1 receptor mRNA in adult rat dorsal root ganglia and sciatic nerves. *Brain Res Mol Brain Res* **57**: 111-22 [PMID:9630555]
 99. Gao L and Zucker IH. (2011) AT2 receptor signaling and sympathetic regulation. *Curr Opin Pharmacol* **11**: 124-30 [PMID:21159555]
 100. Gasc JM, Shanmugam S, Sibony M and Corvol P. (1994) Tissue-specific expression of type 1 angiotensin II receptor subtypes. An *in situ* hybridization study. *Hypertension* **24**: 531-537 [PMID:7960011]
 101. Geerts H, de Brabander M and Nuydens R. (1991) Nanovid microscopy. *Nature* **351**: 765-6 [PMID:1712078]
 102. Gohlke P, Pees C and Unger T. (1998) AT2 receptor stimulation increases aortic cyclic GMP in SHRSP by a kinin-dependent mechanism. *Hypertension* **31**: 349-55 [PMID:9453327]
 103. Gold S, Haran I, Attias J, Shapira I and Shahrar A. (1989) Biochemical and cardiovascular measures in subjects with noise-induced hearing loss. *J Occup Med* **31**: 933-7 [PMID:2809800]
 104. Goodfriend TL, Elliott ME and Catt KJ. (1996) Angiotensin receptors and their antagonists. *N Engl J Med* **334**: 1649-54 [PMID:8628362]
 105. Gribouval O, Gonzales M, Neuhaus T, Aziza J, Bieth E, Laurent N, Bouton JM, Feuillet F, Makni S and Ben Amar H *et al.*. (2005) Mutations in genes in the renin-angiotensin system are associated with autosomal recessive renal tubular dysgenesis. *Nat Genet* **37**: 964-8 [PMID:16116425]
 106. Griendling KK, Lassègue B and Alexander RW. (1996) Angiotensin receptors and their therapeutic implications. *Annu Rev Pharmacol Toxicol* **36**: 281-306 [PMID:8725391]
 107. Griendling KK and Ushio-Fukai M. (2000) Reactive oxygen species as mediators of angiotensin II signaling. *Regul Pept* **91**: 21-7 [PMID:10967199]
 108. Griendling KK, Ushiofukai M, Lassegue B and Alexander RW. (1997) Angiotensin II signaling in vascular smooth muscle - new concepts. *Hypertension* **29**: 366-373 [PMID:9039129]
 109. Haithcock D, Jiao H, Cui XL, Hopfer U and Douglas JG. (1999) Renal proximal tubular AT₂ receptor: signaling and transport. *J Am Soc Nephrol* **10**: S69-S74 [PMID:9892143]
 110. Hallberg M. (2009) Targeting the insulin-regulated aminopeptidase/AT4 receptor for cognitive disorders. *Drug News Perspect* **22**: 133-9 [PMID:19440555]
 111. Hancock AA, Surber BW, Rotert G, Thomas S, Tasker AS, Sorensen BK, Vodenlich AD, Opgenorth TJ, Kerkman DJ and DeBernardis JF. (1994) [3H]A-81988, a potent, selective, competitive antagonist radioligand for angiotensin AT1 receptors. *Eur J Pharmacol* **267**: 49-54

[PMID:8206129]

112. Handa RK, Krebs LT, Harding JW and Handa SE. (1998) Angiotensin IV AT₄-receptor system in the rat kidney. *Am J Physiol* **274**: F290-9 [PMID:9486224]
113. Hanley MR, Cheung WT, Hawkins P, Poyner D, Benton HP, Blair L, Jackson TR and Goedert M. (1990) The mas oncogene as a neural peptide receptor: expression, regulation and mechanism of action. *Ciba Found Symp* **150**: 23-38; discussion 38-46 [PMID:2197067]
114. Hansen JL, Servant G, Baranski TJ, Fujita T, Iiri T and Sheikh SP. (2000) Functional reconstitution of the angiotensin II type 2 receptor and G(i) activation. *Circ Res* **87**: 753-9 [PMID:11055978]
115. Harada K, Sugaya T, Murakami K, Yazaki Y and Komuro I. (1999) Angiotensin II type 1A receptor knockout mice display less left ventricular remodeling and improved survival after myocardial infarction. *Circulation* **100**: 2093-9 [PMID:10562266]
116. Harding JW, Cook VI, Miller-Wing AV, Hanesworth JM, Sardinia MF, Hall KL, Stobb JW, Swanson GN, Coleman JK and Wright JW *et al.*. (1992) Identification of an AII(3-8) [AIV] binding site in guinea pig hippocampus. *Brain Res* **583**: 340-3 [PMID:1504842]
117. Hein L, Barsh GS, Pratt RE, Dzau VJ and Kobilka BK. (1995) Behavioural and cardiovascular effects of disrupting the angiotensin II type-2 receptor in mice. *Nature* **377**: 744-7 [PMID:7477266]
118. Hein L, Dzau VJ and Barsh GS. (1995) Linkage mapping of the angiotensin AT₂ receptor gene (Agtr2) to the mouse X chromosome. *Genomics* **30**: 369-371 [PMID:8586443]
119. Hein L, Stevens ME, Barsh GS, Pratt RE, Kobilka BK and Dzau VJ. (1997) Overexpression of angiotensin AT₁ receptor transgene in the mouse myocardium produces a lethal phenotype associated with myocyte hyperplasia and heart block. *Proc Natl Acad Sci USA* **94**: 6391-6 [PMID:9177228]
120. Hernandez Schulman I, Zhou MS and Raj L. (2007) Cross-talk between angiotensin II receptor types 1 and 2: potential role in vascular remodeling in humans. *Hypertension* **49**: 270-1 [PMID:17159080]
121. Herradon G, Ezquerro L, Nguyen T, Vogt TF, Bronson R, Silos-Santiago I and Deuel TF. (2004) Pleiotrophin is an important regulator of the renin-angiotensin system in mouse aorta. *Biochem Biophys Res Commun* **324**: 1041-7 [PMID:15485659]
122. Herzig TC, Jobe SM, Aoki H, Molkenin JD, Cowley Jr AW, Izumo S and Markham BE. (1997) Angiotensin II type1a receptor gene expression in the heart: AP-1 and GATA-4 participate in the response to pressure overload. *Proc Natl Acad Sci USA* **94**: 7543-8 [PMID:9207128]
123. Hilditch A, Hunt AA, Travers A, Polley J, Drew GM, Middlemiss D, Judd DB, Ross BC and Robertson MJ. (1995) Pharmacological effects of GR138950, a novel angiotensin AT₁ receptor antagonist. *J Pharmacol Exp Ther* **272**: 750-7 [PMID:7853190]
124. Hoffmann S, Krause T, van Geel PP, Willenbrock R, Pagel I, Pinto YM, Buikema H, van Gilst WH, Lindschau C and Paul M *et al.*. (2001) Overexpression of the human angiotensin II type 1 receptor in the rat heart augments load induced cardiac hypertrophy. *J Mol Med* **79**: 601-8 [PMID:11692158]
125. Hoffmann S, Podlich D, Hähnel B, Kriz W and Gretz N. (2004) Angiotensin II type 1 receptor overexpression in podocytes induces glomerulosclerosis in transgenic rats. *J Am Soc Nephrol* **15**: 1475-87 [PMID:15153558]
126. Hollon TR, Bek MJ, Lachowicz JE, Ariano MA, Mezey E, Ramachandran R, Wersinger SR, Soares-da-Silva P, Liu ZF and Grinberg A *et al.*. (2002) Mice lacking D5 dopamine receptors have increased sympathetic tone and are hypertensive. *J Neurosci* **22**: 10801-10 [PMID:12486173]
127. Holloway AC, Qian H, Pipolo L, Ziogas J, Miura S, Karnik S, Southwell BR, Lew MJ and Thomas WG. (2002) Side-chain substitutions within angiotensin II reveal different requirements for signaling, internalization, and phosphorylation of type 1A angiotensin receptors. *Mol Pharmacol* **61**: 768-77 [PMID:11901215]
128. Holycross BJ, Peach MJ and Owens GK. (1993) Angiotensin II stimulates increased protein synthesis, not increased DNA synthesis, in intact rat aortic segments, in vitro. *J Vasc Res* **30**: 80-6 [PMID:8504199]
129. Horiuchi M, Akishita M and Dzau VJ. (1999) Recent progress in angiotensin II type 2 receptor research in the cardiovascular system. *Hypertension* **33**: 613-21 [PMID:10024316]
130. Horiuchi M, Hayashida W, Kambe T, Yamada T and Dzau VJ. (1997) Angiotensin type 2 receptor dephosphorylates Bcl-2 by activating mitogen-activated protein kinase phosphatase-1 and induces apoptosis. *J Biol Chem* **272**: 19022-6 [PMID:9228085]
131. Horiuchi M, Lehtonen JY and Daviet L. (1999) Signaling Mechanism of the AT₂ Angiotensin II Receptor: Crosstalk between AT₁ and AT₂ Receptors in Cell Growth. *Trends Endocrinol Metab* **10**: 391-396 [PMID:10542395]
132. Ichihara S, Senbonmatsu T, Price E Jr, Ichiki T, Gaffney FA and Inagami T. (2002) Targeted deletion of angiotensin II type 2 receptor caused cardiac rupture after acute myocardial infarction. *Circulation* **106**: 2244-2249 [PMID:12390955]

133. Ichihara S, Senbonmatsu T, Price Jr E, Ichiki T, Gaffney FA and Inagami T. (2001) Angiotensin II type 2 receptor is essential for left ventricular hypertrophy and cardiac fibrosis in chronic angiotensin II-induced hypertension. *Circulation* **104**: 346-51 [PMID:11457756]
134. Ichiki T and Inagami T. (1995) Expression, genomic organization, and transcription of the mouse angiotensin II type 2 receptor gene. *Circ Res* **76**: 693-700 [PMID:7728985]
135. Ichiki T, Labosky PA, Shiota C, Okuyama S, Imagawa Y, Fogo A, Niimura F, Ichikawa I, Hogan BL and Inagami T. (1995) Effects on blood pressure and exploratory behaviour of mice lacking angiotensin II type-2 receptor. *Nature* **377**: 748-50 [PMID:7477267]
136. Inagami T, Iwai N, Sasaki K, Guo DF, Furuta H, Yamano Y, Bardhan S, Chaki S, Makito N and Badr K. (1993) Angiotensin II receptors: cloning and regulation. *Arzneimittelforschung* **43**: 226-8 [PMID:8498969]
137. Inagami T, Iwai N, Sasaki K, Yamano Y, Bardhan S, Chaki S, Guo DF, Furuta H, Ohyama K and Kambayashi Y *et al.*. (1994) Cloning, expression and regulation of angiotensin II receptors. *Eur Heart J* **15 Suppl D**: 104-7 [PMID:7713098]
138. Inokuchi S, Kimura K, Sugaya T, Inokuchi K, Murakami K and Sakai T. (2001) Hyperplastic vascular smooth muscle cells of the intrarenal arteries in angiotensin II type 1a receptor null mutant mice. *Kidney Int* **60**: 722-31 [PMID:11473655]
139. Ishida M, Marrero MB, Schieffer B, Ishida T, Bernstein KE and Berk BC. (1995) Angiotensin II activates pp60c-src in vascular smooth muscle cells. *Circ Res* **77**: 1053-9 [PMID:7586216]
140. Itoh S, Ding B, Shishido T, Lerner-Marmarosh N, Wang N, Maekawa N, Berk BC, Takeishi Y, Yan C and Blaxall BC *et al.*. (2006) Role of p90 ribosomal S6 kinase-mediated prorenin-converting enzyme in ischemic and diabetic myocardium. *Circulation* **113**: 1787-98 [PMID:16585392]
141. Iwai N and Inagami T. (1992) Identification of two subtypes in the rat type I angiotensin II receptor. *FEBS Lett* **298**: 257-60 [PMID:1544458]
142. Iwai N, Yamano Y, Chaki S, Konishi F, Bardhan S, Tibbetts C, Sasaki K, Hasegawa M, Matsuda Y and Inagami T. (1991) Rat angiotensin II receptor: cDNA sequence and regulation of the gene expression. *Biochem Biophys Res Commun* **177**: 299-304 [PMID:2043116]
143. Jaffré F, Bonnin P, Callebort J, Debbabi H, Setola V, Doly S, Monassier L, Mettauer B, Blaxall BC and Launay JM *et al.*. (2009) Serotonin and angiotensin receptors in cardiac fibroblasts coregulate adrenergic-dependent cardiac hypertrophy. *Circ Res* **104**: 113-23 [PMID:19023134]
144. Jagannathan R, Kaveti S, Desnoyer RW, Willard B, Kinter M and Karnik SS. (2010) AT1 receptor induced alterations in histone H2A reveal novel insights into GPCR control of chromatin remodeling. *PLoS ONE* **5**: e12552 [PMID:20838438]
145. Jaiswal N, Tallant EA, Jaiswal RK, Diz DI and Ferrario CM. (1993) Differential regulation of prostaglandin synthesis by angiotensin peptides in porcine aortic smooth muscle cells: subtypes of angiotensin receptors involved. *J Pharmacol Exp Ther* **265**: 664-73 [PMID:8496814]
146. Jankowski V, Vanholder R, van der Giet M, Tölle M, Karadogan S, Gobom J, Furkert J, Oksche A, Krause E and Tran TN *et al.*. (2007) Mass-spectrometric identification of a novel angiotensin peptide in human plasma. *Arterioscler Thromb Vasc Biol* **27**: 297-302 [PMID:17138938]
147. Jara ZP, Harford TJ, Singh KD, Desnoyer R, Kumar A, Srinivasan D and Karnik SS. (2023) Distinct Mechanisms of β -Arrestin-Biased Agonist and Blocker of AT1R in Preventing Aortic Aneurysm and Associated Mortality. *Hypertension* **80**: 385-402 [PMID:36440576]
148. Jin W, Liu Y, Sheng HH, Jin L, Shen YY, Hua Q, Lu L, Yu JD and Huang W. (2003) Single nucleotide polymorphisms in promoter of angiotensin II type 1 receptor gene associated with essential hypertension and coronary heart disease in Chinese population. *Acta Pharmacol Sin* **24**: 1083-8 [PMID:14627489]
149. Jin XQ, Fukuda N, Su JZ, Lai YM, Suzuki R, Tahira Y, Takagi H, Ikeda Y, Kanmatsuse K and Miyazaki H. (2002) Angiotensin II type 2 receptor gene transfer downregulates angiotensin II type 1a receptor in vascular smooth muscle cells. *Hypertension* **39**: 1021-7 [PMID:12019286]
150. Jones A, Dhamrait SS, Payne JR, Hawe E, Li P, Toor IS, Luong L, Wootton PT, Miller GJ and Humphries SE *et al.*. (2003) Genetic variants of angiotensin II receptors and cardiovascular risk in hypertension. *Hypertension* **42**: 500-6 [PMID:12925562]
151. Kakar SS, Sellers JC, Devor DC, Musgrove LC and Neill JD. (1992) Angiotensin II type-1 receptor subtype cDNAs: differential tissue expression and hormonal regulation. *Biochem Biophys Res Commun* **183**: 1090-6 [PMID:1567388]
152. Kambayashi Y, Bardhan S, Takahashi K, Tsuzuki S, Inui H, Hamakubo T and Inagami T. (1993) Molecular cloning of a novel angiotensin II receptor isoform involved in phosphotyrosine phosphatase inhibition. *J Biol Chem* **268**: 24543-6 [PMID:8227011]
153. Kang J, Richards EM, Posner P and Sumners C. (1995) Modulation of the delayed rectifier K⁺ current in neurons by an angiotensin II type 2 receptor fragment. *Am J Physiol* **268**: C278-82 [PMID:7840157]
154. Kanome T, Watanabe T, Nishio K, Takahashi K, Hongo S and Miyazaki A. (2008) Angiotensin II upregulates acyl-CoA:cholesterol acyltransferase-1 via the angiotensin II Type 1 receptor in human monocyte-macrophages. *Hypertens Res* **31**: 1801-10 [PMID:18971559]
155. Karnik SS, Unal H, Kemp JR, Tirupula KC, Eguchi S, Vanderheyden PM and Thomas WG. (2015)

International Union of Basic and Clinical Pharmacology. XCIX. Angiotensin Receptors: Interpreters of Pathophysiological Angiotensinergic Stimuli [corrected]. *Pharmacol Rev* **67**: 754-819 [PMID:26315714]

156. Katada J and Majima M. (2002) AT(2) receptor-dependent vasodilation is mediated by activation of vascular kinin generation under flow conditions. *Br J Pharmacol* **136**: 484-91 [PMID:12055126]
157. Kemp BA, Bell JF, Rottkamp DM, Howell NL, Shao W, Navar LG, Padia SH and Carey RM. (2012) Intrarenal angiotensin III is the predominant agonist for proximal tubule angiotensin type 2 receptors. *Hypertension* **60**: 387-95 [PMID:22689743]
158. Kim JM, Heo HS, Ha YM, Ye BH, Lee EK, Choi YJ, Yu BP and Chung HY. (2012) Mechanism of Ang II involvement in activation of NF- κ B through phosphorylation of p65 during aging. *Age (Dordr)* **34**: 11-25 [PMID:21318332]
159. Kim NH, Ahn Y, Oh SK, Cho JK, Park HW, Kim YS, Hong MH, Nam KI, Park WJ and Jeong MH *et al.*. (2005) Altered patterns of gene expression in response to chronic atrial fibrillation. *Int Heart J* **46**: 383-95 [PMID:16043935]
160. Kobashi G, Hata A, Ohta K, Yamada H, Kato EH, Minakami H, Fujimoto S and Kondo K. (2004) A1166C variant of angiotensin II type 1 receptor gene is associated with severe hypertension in pregnancy independently of T235 variant of angiotensinogen gene. *J Hum Genet* **49**: 182-6 [PMID:15042429]
161. Koerten HK, de Bruijn JD and Daems WT. (1990) The formation of asbestos bodies by mouse peritoneal macrophages. An in vitro study. *Am J Pathol* **137**: 121-34 [PMID:2372038]
162. Koike G, Horiuchi M, Yamada T, Szpirer C, Jacob HJ and Dzau VJ. (1994) Human type 2 angiotensin II receptor gene cloned, mapped to the x chromosome, and its mRNA is expressed in the human lung. *Biochem Biophys Res Commun* **203**: 1842-1850 [PMID:7945336]
163. Koike H, Sada T and Mizuno M. (2001) In vitro and in vivo pharmacology of olmesartan medoxomil, an angiotensin II type AT1 receptor antagonist. *J Hypertens Suppl* **19**: S3-14 [PMID:11451212]
164. Konishi H, Kuroda S, Inada Y and Fujisawa Y. (1994) Novel subtype of human angiotensin II type 1 receptor: cDNA cloning and expression. *Biochem Biophys Res Commun* **199**: 467-74 [PMID:8135787]
165. Kotani K, Sakane N and Taniguchi N. (2013) Association between angiotensin II Type 2 receptor gene A/C3123 polymorphism and high-density lipoprotein cholesterol with hypertension in asymptomatic women. *Med Princ Pract* **22**: 65-9 [PMID:22869520]
166. Krause LMH, Kemp BA, Tan ASJ, Jones ES, Del Borgo MP, Aguilar MI, Denton KM, Carey RM and Widdop RE. (2020) Renal functional effects of the highly selective AT2R agonist, β -Pro7 Ang III, in normotensive rats. *Clin Sci (Lond.)* **134**: 871-884 [PMID:32202299]
167. Kurisu S, Ozono R, Oshima T, Kambe M, Ishida T, Sugino H, Matsuura H, Chayama K, Teranishi Y and Iba O *et al.*. (2003) Cardiac angiotensin II type 2 receptor activates the kinin/NO system and inhibits fibrosis. *Hypertension* **41**: 99-107 [PMID:12511537]
168. Kurland L, Melhus H, Karlsson J, Kahan T, Malmqvist K, Ohman P, Nyström F, Hägg A and Lind L. (2002) Polymorphisms in the angiotensinogen and angiotensin II type 1 receptor gene are related to change in left ventricular mass during antihypertensive treatment: results from the Swedish Irbesartan Left Ventricular Hypertrophy Investigation versus Atenolol (SILVHIA) trial. *J Hypertens* **20**: 657-63 [PMID:11910301]
169. Kuroda S, Konishi H, Okishio M and Fujisawa Y. (1994) Novel subtype of human angiotensin II type 1 receptor: analysis of signal transduction mechanism in transfected Chinese hamster ovary cells. *Biochem Biophys Res Commun* **199**: 475-481 [PMID:8135788]
170. Kurosaka M, Suzuki T, Hosono K, Kamata Y, Fukamizu A, Kitasato H, Fujita Y and Majima M. (2009) Reduced angiogenesis and delay in wound healing in angiotensin II type 1a receptor-deficient mice. *Biomed Pharmacother* **63**: 627-34 [PMID:19464844]
171. Kwon TH, Nielsen J, Kim YH, Knepper MA, Frokiaer J and Nielsen S. (2003) Regulation of sodium transporters in the thick ascending limb of rat kidney: response to angiotensin II. *Am J Physiol Renal Physiol* **285**: F152-F165 [PMID:12657563]
172. Langford K, Frenzel K, Martin BM and Bernstein KE. (1992) The genomic organization of the rat AT1 angiotensin receptor. *Biochem Biophys Res Commun* **183**: 1025-32 [PMID:1533121]
173. Lawnicka H, Ptasińska-Wnuk D, Mucha S, Kunert-Radek J, Pawlikowski M and Stepień H. (2012) The involvement of angiotensin type 1 and type 2 receptors in estrogen-induced cell proliferation and vascular endothelial growth factor expression in the rat anterior pituitary. *ScientificWorldJournal* **2012**: 358102 [PMID:22645419]
174. Lazartigues E, Dunlay SM, Loihl AK, Sinnayah P, Lang JA, Espelund JJ, Sigmund CD and Davisson RL. (2002) Brain-selective overexpression of angiotensin (AT1) receptors causes enhanced cardiovascular sensitivity in transgenic mice. *Circ Res* **90**: 617-24 [PMID:11909827]
175. Lazartigues E, Lawrence AJ, Lamb FS and Davisson RL. (2004) Renovascular hypertension in mice with brain-selective overexpression of AT1a receptors is buffered by increased nitric oxide production in the periphery. *Circ Res* **95**: 523-31 [PMID:15284190]

176. Lazartigues E, Sinnayah P, Augoyard G, Gharib C, Johnson AK and Davisson RL. (2008) Enhanced water and salt intake in transgenic mice with brain-restricted overexpression of angiotensin (AT1) receptors. *Am J Physiol Regul Integr Comp Physiol* **295**: R1539-45 [PMID:18753266]
177. Le MT, Vanderheyden PM, Szaszák M, Hunyady L and Vauquelin G. (2002) Angiotensin IV is a potent agonist for constitutive active human AT1 receptors. Distinct roles of the N- and C-terminal residues of angiotensin II during AT1 receptor activation. *J Biol Chem* **277**: 23107-10 [PMID:12006574]
178. Lee HB, Yu MR, Yang Y, Jiang Z and Ha H. (2003) Reactive oxygen species-regulated signaling pathways in diabetic nephropathy. *J Am Soc Nephrol* **14**: S241-5 [PMID:12874439]
179. Leung KH, Smith RD, Timmermans BM and Chiu AT. (1991) Regional distribution of the two subtypes of angiotensin II receptor in rat brain using selective nonpeptide antagonists. *Neurosci Lett* **123**: 95-98 [PMID:2062460]
180. Lewis BP, Burge CB and Bartel DP. (2005) Conserved seed pairing, often flanked by adenosines, indicates that thousands of human genes are microRNA targets. *Cell* **120**: 15-20 [PMID:15652477]
181. Li H, Qi Y, Li C, Braseth LN, Gao Y, Shabashvili AE, Katovich MJ and Sumners C. (2009) Angiotensin type 2 receptor-mediated apoptosis of human prostate cancer cells. *Mol Cancer Ther* **8**: 3255-65 [PMID:19996275]
182. Li H, Weatherford ET, Davis DR, Keen HL, Grobe JL, Daugherty A, Cassis LA, Allen AM and Sigmund CD. (2011) Renal proximal tubule angiotensin AT1A receptors regulate blood pressure. *Am J Physiol Regul Integr Comp Physiol* **301**: R1067-77 [PMID:21753145]
183. Li XC, Shao Y and Zhuo JL. (2009) AT1a receptor knockout in mice impairs urine concentration by reducing basal vasopressin levels and its receptor signaling proteins in the inner medulla. *Kidney Int* **76**: 169-77 [PMID:19387470]
184. Lokuta AJ, Cooper C, Gaa ST, Wang HE and Rogers TB. (1994) Angiotensin II stimulates the release of phospholipid-derived second messenger through multiple receptor subtypes in heart cells. *J Biol Chem* **269**: 4832-4838 [PMID:8106454]
185. Loyens E, De Bundel D, Demaegdt H, Chai SY, Vanderheyden P, Michotte Y, Gard P and Smolders I. (2013) Antidepressant-like effects of oxytocin in mice are dependent on the presence of insulin-regulated aminopeptidase. *Int J Neuropsychopharmacol* **16**: 1153-63 [PMID:23177092]
186. Loyens E, Schallier A, Chai SY, De Bundel D, Vanderheyden P, Michotte Y and Smolders I. (2011) Deletion of insulin-regulated aminopeptidase in mice decreases susceptibility to pentylenetetrazol-induced generalized seizures. *Seizure* **20**: 602-5 [PMID:21612947]
187. Luchtefeld M, Bandlow N, Tietge UJ, Grote K, Pfeilschifter J, Kaszkin M, Beck S, Drexler H and Schieffer B. (2007) Angiotensin II type 1-receptor antagonism prevents type IIA secretory phospholipase A2-dependent lipid peroxidation. *Atherosclerosis* **194**: 62-70 [PMID:17069818]
188. Lucius R, Gallinat S, Rosenstiel P, Herdegen T, Sievers J and Unger T. (1998) The angiotensin II type 2 (AT2) receptor promotes axonal regeneration in the optic nerve of adult rats. *J Exp Med* **188**: 661-70 [PMID:9705948]
189. Luttrell LM and Gesty-Palmer D. (2010) Beyond desensitization: physiological relevance of arrestin-dependent signaling. *Pharmacol Rev* **62**: 305-30 [PMID:20427692]
190. Madhur MS, Lob HE, McCann LA, Iwakura Y, Blinder Y, Guzik TJ and Harrison DG. (2010) Interleukin 17 promotes angiotensin II-induced hypertension and vascular dysfunction. *Hypertension* **55**: 500-7 [PMID:20038749]
191. Maillard MP, Rossat J, Brunner HR and Burnier M. (2000) Tasosartan, enoltasartan, and angiotensin II receptor blockade: the confounding role of protein binding. *J Pharmacol Exp Ther* **295**: 649-54 [PMID:11046101]
192. Mangrum AJ, Gomez RA and Norwood VF. (2002) Effects of AT(1A) receptor deletion on blood pressure and sodium excretion during altered dietary salt intake. *Am J Physiol Renal Physiol* **283**: F447-53 [PMID:12167595]
193. Marrero MB, Schieffer B, Paxton WG, Heerdt L, Berk BC, Delafontaine P and Bernstein KE. (1995) Direct stimulation of Jak/STAT pathway by the angiotensin II AT1 receptor. *Nature* **375**: 247-50 [PMID:7746328]
194. Marrero MB, Schieffer B, Paxton WG, Schieffer E and Bernstein KE. (1995) Electroporation of pp60c-src antibodies inhibits the angiotensin II activation of phospholipase C-gamma 1 in rat aortic smooth muscle cells. *J Biol Chem* **270**: 15734-8 [PMID:7541047]
195. Martin MM, Willardson BM, Burton GF, White CR, McLaughlin JN, Bray SM, Ogilvie JW Jr and Elton TS. (2001) Human angiotensin II type 1 receptor isoforms encoded by messenger RNA splice variants are functionally distinct. *Mol Endocrinol* **15**: 281-293 [PMID:11158334]
196. Matsubara H. (1998) Pathophysiological role of angiotensin II type 2 receptor in cardiovascular and renal diseases. *Circ Res* **83**: 1182-91 [PMID:9851935]
197. Matsusaka T and Ichikawa I. (1997) Biological functions of angiotensin and its receptors. *Annu Rev Physiol* **59**: 395-412 [PMID:9074770]

198. Maul B, von Bohlen und Halbach O, Becker A, Sterner-Kock A, Voigt JP, Siems WE, Grecksch G and Walther T. (2008) Impaired spatial memory and altered dendritic spine morphology in angiotensin II type 2 receptor-deficient mice. *J Mol Med* **86**: 563-71 [PMID:18335189]
199. Mauzy CA, Hwang O, Egloff AM, Wu LH and Chung FZ. (1992) Cloning, expression, and characterization of a gene encoding the human angiotensin II type 1A receptor. *Biochem Biophys Res Commun* **186**: 277-84 [PMID:1378723]
200. McAllister-Lucas LM, Ruland J, Siu K, Jin X, Gu S, Kim DS, Kuffa P, Kohrt D, Mak TW and Nuñez G *et al.*. (2007) CARMA3/Bcl10/MALT1-dependent NF-kappaB activation mediates angiotensin II-responsive inflammatory signaling in nonimmune cells. *Proc Natl Acad Sci USA* **104**: 139-44 [PMID:17101977]
201. McClellan KJ and Markham A. (1998) Telmisartan. *Drugs* **56**: 1039-44; discussion 1045-6 [PMID:9878991]
202. Menk M, Graw JA, von Haefen C, Siffringer M, Schwaiberger D, Unger T, Steckelings U and Spies CD. (2015) Stimulation of the Angiotensin II AT2 Receptor is Anti-inflammatory in Human Lipopolysaccharide-Activated Monocytic Cells. *Inflammation* **38**: 1690-9 [PMID:25758542]
203. Mertens B, Vanderheyden P, Michotte Y and Sarre S. (2010) Direct angiotensin II type 2 receptor stimulation decreases dopamine synthesis in the rat striatum. *Neuropharmacology* **58**: 1038-44 [PMID:20097214]
204. Michel MC, Foster C, Brunner HR and Liu L. (2013) A systematic comparison of the properties of clinically used angiotensin II type 1 receptor antagonists. *Pharmacol Rev* **65**: 809-48 [PMID:23487168]
205. Mifune M, Sasamura H, Shimizu-Hirota R, Miyazaki H and Saruta T. (2000) Angiotensin II type 2 receptors stimulate collagen synthesis in cultured vascular smooth muscle cells. *Hypertension* **36**: 845-50 [PMID:11082154]
206. Mii S, Ware JA, Mallette SA and Kent KC. (1994) Effect of angiotensin II on human vascular smooth muscle cell growth. *J Surg Res* **57**: 174-8 [PMID:8041134]
207. Millatt LJ, Abdel-Rahman EM and Siragy HM. (1999) Angiotensin II and nitric oxide: a question of balance. *Regul Pept* **81**: 1-10 [PMID:10395403]
208. Miura S, Feng YH, Husain A and Karnik SS. (1999) Role of aromaticity of agonist switches of angiotensin II in the activation of the AT1 receptor. *J Biol Chem* **274**: 7103-10 [PMID:10066768]
209. Miura S and Karnik SS. (2000) Ligand-independent signals from angiotensin II type 2 receptor induce apoptosis. *EMBO J* **19**: 4026-35 [PMID:10921883]
210. Miura S, Karnik SS and Saku K. (2011) Review: angiotensin II type 1 receptor blockers: class effects versus molecular effects. *J Renin Angiotensin Aldosterone Syst* **12**: 1-7 [PMID:20603272]
211. Moeller I, Lew RA, Mendelsohn FA, Smith AI, Brennan ME, Tetaz TJ and Chai SY. (1997) The globin fragment LVV-hemorphin-7 is an endogenous ligand for the AT4 receptor in the brain. *J Neurochem* **68**: 2530-7 [PMID:9166749]
212. Morphy R and Rankovic Z. (2005) Designed multiple ligands. An emerging drug discovery paradigm. *J Med Chem* **48**: 6523-43 [PMID:16220969]
213. Mueller CF, Berger A, Zimmer S, Tiyerili V and Nickenig G. (2009) The heterogenous nuclear riboprotein S1-1 regulates AT1 receptor gene expression via transcriptional and posttranscriptional mechanisms. *Arch Biochem Biophys* **488**: 76-82 [PMID:19508861]
214. Mukohda M, Yamawaki H, Okada M and Hara Y. (2010) Methylglyoxal augments angiotensin II-induced contraction in rat isolated carotid artery. *J Pharmacol Sci* **114**: 390-8 [PMID:21076237]
215. Mukoyama M, Nakajima M, Horiuchi M, Sasamura H, Pratt RE and Dzau VJ. (1993) Expression cloning of type 2 angiotensin II receptor reveals a unique class of seven-transmembrane receptors. *J Biol Chem* **268**: 24539-42 [PMID:8227010]
216. Murphy TJ, Alexander RW, Griendling KK, Runge MS and Bernstein KE. (1991) Isolation of a cDNA encoding the vascular type-1 angiotensin II receptor. *Nature* **351**: 233-6 [PMID:2041570]
217. Nakajima M, Hutchinson HG, Fujinaga M, Hayashida W, Morishita R, Zhang L, Horiuchi M, Pratt RE and Dzau VJ. (1995) The angiotensin II type 2 (AT2) receptor antagonizes the growth effects of the AT1 receptor: gain-of-function study using gene transfer. *Proc Natl Acad Sci USA* **92**: 10663-7 [PMID:7479861]
218. Nakanishi M, Harada M, Kishimoto I, Kuwahara K, Kawakami R, Nakagawa Y, Yasuno S, Usami S, Kinoshita H and Adachi Y *et al.*. (2007) Genetic disruption of angiotensin II type 1a receptor improves long-term survival of mice with chronic severe aortic regurgitation. *Circ J* **71**: 1310-6 [PMID:17652901]
219. Namsolleck P, Boato F, Schwengel K, Paulis L, Matho KS, Geurts N, Thöne-Reineke C, Lucht K, Seidel K and Hallberg A *et al.*. (2013) AT2-receptor stimulation enhances axonal plasticity after spinal cord injury by upregulating BDNF expression. *Neurobiol Dis* **51**: 177-91 [PMID:23174180]
220. Natarajan K, Yin G and Berk BC. (2004) Scaffolds direct Src-specific signaling in response to angiotensin II: new roles for Cas and GIT1. *Mol Pharmacol* **65**: 822-5 [PMID:15044610]
221. Navar LG, Kobori H and Prieto-Carrasquero M. (2003) Intrarenal angiotensin II and hypertension. *Curr Hypertens Rep* **5**: 135-43 [PMID:12642013]

222. Nazzaro P, Manzari M, Merlo M, Triggiani R, Scarano A, Ciancio L and Pirrelli A. (1999) Distinct and combined vascular effects of ACE blockade and HMG-CoA reductase inhibition in hypertensive subjects. *Hypertension* **33**: 719-25 [PMID:10024335]
223. Nie YY, Da YJ, Zheng H, Yang XX, Jia L, Wen CH, Liang LS, Tian J and Chen ZL. (2012) Synthesis and biological evaluation of novel potent angiotensin II receptor antagonists with anti-hypertension effect. *Bioorg Med Chem* **20**: 2747-61 [PMID:22410249]
224. Nishimura H, Yerkes E, Hohenfellner K, Miyazaki Y, Ma J, Hunley TE, Yoshida H, Ichiki T, Threadgill D and Phillips 3rd JA *et al.*. (1999) Role of the angiotensin type 2 receptor gene in congenital anomalies of the kidney and urinary tract, CAKUT, of mice and men. *Mol Cell* **3**: 1-10 [PMID:10024874]
225. Noda K, Saad Y and Karnik SS. (1995) Interaction of Phe8 of angiotensin II with Lys199 and His256 of AT1 receptor in agonist activation. *J Biol Chem* **270**: 28511-4 [PMID:7499361]
226. Noda K, Saad Y, Kinoshita A, Boyle TP, Graham RM, Husain A and Karnik SS. (1995) Tetrazole and carboxylate groups of angiotensin receptor antagonists bind to the same subsite by different mechanisms. *J Biol Chem* **270**: 2284-9 [PMID:7530721]
227. Northcott CA, Watts S, Chen Y, Morris M, Chen A and Haywood JR. (2010) Adenoviral inhibition of AT1a receptors in the paraventricular nucleus inhibits acute increases in mean arterial blood pressure in the rat. *Am J Physiol Regul Integr Comp Physiol* **299**: R1202-11 [PMID:20702798]
228. Nouet S, Amzallag N, Li JM, Louis S, Seitz I, Cui TX, Alleaume AM, Di Benedetto M, Boden C and Masson M *et al.*. (2004) Trans-inactivation of receptor tyrosine kinases by novel angiotensin II AT2 receptor-interacting protein, ATIP. *J Biol Chem* **279**: 28989-97 [PMID:15123706]
229. Nouet S and Nahmias C. (2000) Signal transduction from the angiotensin II AT2 receptor. *Trends Endocrinol Metab* **11**: 1-6 [PMID:10652498]
230. Ohkubo N, Matsubara H, Nozawa Y, Mori Y, Murasawa S, Kijima K, Maruyama K, Masaki H, Tsutsumi Y and Shibasaki Y *et al.*. (1997) Angiotensin type 2 receptors are reexpressed by cardiac fibroblasts from failing myopathic hamster hearts and inhibit cell growth and fibrillar collagen metabolism. *Circulation* **96**: 3954-62 [PMID:9403620]
231. Ohlstein EH, Brooks DP, Feuerstein GZ and Ruffolo RR Jr. (1997) Inhibition of sympathetic outflow by the angiotensin II receptor antagonist, eprosartan, but not by losartan, valsartan or irbesartan: relationship to differences in prejunctional angiotensin II receptor blockade. *Pharmacology* **55**: 244-251 [PMID:9399334]
232. Ohyama K, Yamano Y, Sano T, Nakagomi Y, Wada M and Inagami T. (2002) Role of the conserved DRY motif on G protein activation of rat angiotensin II receptor type 1A. *Biochem Biophys Res Commun* **292**: 362-7 [PMID:11906170]
233. Olins GM, Corpus VM, Chen ST, McMahon EG, Palomo MA, McGraw DE, Smits GJ, Null CL, Brown MA and Bittner SE *et al.*. (1993) Pharmacology of SC-52458, an orally active, nonpeptide angiotensin AT1 receptor antagonist. *J Cardiovasc Pharmacol* **22**: 617-25 [PMID:7505365]
234. Oriji GK. (1999) Nitric oxide in cyclosporine A-induced hypertension: endothelin receptors gene expression. *Prostaglandins Leukot Essent Fatty Acids* **61**: 41-4 [PMID:10477041]
235. Ott C, Titze SI, Schwarz TK, Kreutz R, Hilgers KF, Schmidt BM, Schlaich MP and Schmieder RE. (2007) High sodium intake modulates left ventricular mass in patients with G expression of +1675 G/A angiotensin II receptor type 2 gene. *J Hypertens* **25**: 1627-32 [PMID:17620959]
236. Padia SH, Kemp BA, Howell NL, Fournie-Zaluski MC, Roques BP and Carey RM. (2008) Conversion of renal angiotensin II to angiotensin III is critical for AT2 receptor-mediated natriuresis in rats. *Hypertension* **51**: 460-5 [PMID:18158338]
237. Pang J, Yan C, Natarajan K, Cavet ME, Massett MP, Yin G and Berk BC. (2008) GIT1 mediates HDAC5 activation by angiotensin II in vascular smooth muscle cells. *Arterioscler Thromb Vasc Biol* **28**: 892-8 [PMID:18292392]
238. Paradis P, Dali-Youcef N, Paradis FW, Thibault G and Nemer M. (2000) Overexpression of angiotensin II type I receptor in cardiomyocytes induces cardiac hypertrophy and remodeling. *Proc Natl Acad Sci USA* **97**: 931-6 [PMID:10639182]
239. Perlman S, Schambye HT, Rivero RA, Greenlee WJ, Hjorth SA and Schwartz TW. (1995) Non-peptide angiotensin agonist. Functional and molecular interaction with the AT1 receptor. *J Biol Chem* **270**: 1493-6 [PMID:7829475]
240. Perryman R, Renziehausen A, Shaye H, Kostagianni AD, Tsailanis AD, Thorne T, Chatziathanasiadou MV, Sivolapenko GB, El Mubarak MA and Han GW *et al.*. (2022) Inhibition of the angiotensin II type 2 receptor AT₂R is a novel therapeutic strategy for glioblastoma. *Proc Natl Acad Sci U S A* **119**: e2116289119 [PMID:35917342]
241. Petracco RG, Kong A, Grechukhina O, Krikun G and Taylor HS. (2012) Global gene expression profiling of proliferative phase endometrium reveals distinct functional subdivisions. *Reprod Sci* **19**: 1138-45 [PMID:22623515]
242. Porrello ER, D'Amore A, Curl CL, Allen AM, Harrap SB, Thomas WG and Delbridge LM. (2009) Angiotensin II type 2 receptor antagonizes angiotensin II type 1 receptor-mediated cardiomyocyte autophagy. *Hypertension* **53**: 1032-40 [PMID:19433781]
243. Prescott MF, Webb RL and Reidy MA. (1991) Angiotensin-converting enzyme inhibitor versus

- angiotensin II, AT1 receptor antagonist. Effects on smooth muscle cell migration and proliferation after balloon catheter injury. *Am J Pathol* **139**: 1291-6 [PMID:1750504]
244. Putnam K, Batifoulier-Yiannikouris F, Bharadwaj KG, Lewis E, Karounos M, Daugherty A and Cassis LA. (2012) Deficiency of angiotensin type 1a receptors in adipocytes reduces differentiation and promotes hypertrophy of adipocytes in lean mice. *Endocrinology* **153**: 4677-86 [PMID:22919058]
 245. Qadri F, Culman J, Veltmar A, Maas K, Rascher W and Unger T. (1993) Angiotensin II-induced vasopressin release is mediated through alpha-1 adrenoceptors and angiotensin II AT1 receptors in the supraoptic nucleus. *J Pharmacol Exp Ther* **267**: 567-74 [PMID:8246129]
 246. Qitterer U, Fu X, Pohl A, Bayoumy KM, Langer A and Abdalla S. (2019) Beta-Arrestin1 Prevents Preeclampsia by Downregulation of Mechanosensitive AT1-B2 Receptor Heteromers. *Cell* **176**: 318-333.e19 [PMID:30503206]
 247. Rakugi H, Nakata E, Sasaki E and Kagawa T. (2014) Evaluation of the efficacy and tolerability of fixed-dose combination therapy of azilsartan and amlodipine besylate in Japanese patients with grade I to II essential hypertension. *Clin Ther* **36**: 711-21 [PMID:24742498]
 248. Ramchandran R, Takezako T, Saad Y, Stull L, Fink B, Yamada H, Dikalov S, Harrison DG, Moravec C and Karnik SS. (2006) Angiotensinergic stimulation of vascular endothelium in mice causes hypotension, bradycardia, and attenuated angiotensin response. *Proc Natl Acad Sci USA* **103**: 19087-92 [PMID:17148616]
 249. Reaux A, Iturrioz X, Vazeux G, Fournie-Zaluski MC, David C, Roques BP, Corvol P and Llorens-Cortes C. (2000) Aminopeptidase A, which generates one of the main effector peptides of the brain renin-angiotensin system, angiotensin III, has a key role in central control of arterial blood pressure. *Biochem Soc Trans* **28**: 435-40 [PMID:10961935]
 250. Reinecke K, Lucius R, Reinecke A, Rickert U, Herdegen T and Unger T. (2003) Angiotensin II accelerates functional recovery in the rat sciatic nerve in vivo: role of the AT2 receptor and the transcription factor NF-kappaB. *FASEB J* **17**: 2094-6 [PMID:14500552]
 251. Renieri A, Pescucci C, Longo I, Ariani F, Mari F and Meloni I. (2005) Non-syndromic X-linked mental retardation: from a molecular to a clinical point of view. *J Cell Physiol* **204**: 8-20 [PMID:15690397]
 252. Rhodes DR, Ateeq B, Cao Q, Tomlins SA, Mehra R, Laxman B, Kalyana-Sundaram S, Lonigro RJ, Helgeson BE and Bhojani MS *et al.*. (2009) AGTR1 overexpression defines a subset of breast cancer and confers sensitivity to losartan, an AGTR1 antagonist. *Proc Natl Acad Sci USA* **106**: 10284-9 [PMID:19487683]
 253. Rice AS, Dworkin RH, McCarthy TD, Anand P, Bountra C, McCloud PI, Hill J, Cutter G, Kitson G and Desem N *et al.*. (2014) EMA401, an orally administered highly selective angiotensin II type 2 receptor antagonist, as a novel treatment for postherpetic neuralgia: a randomised, double-blind, placebo-controlled phase 2 clinical trial. *Lancet* **383**: 1637-47 [PMID:24507377]
 254. Rivard K, Grandy SA, Douillette A, Paradis P, Nemer M, Allen BG and Fiset C. (2011) Overexpression of type 1 angiotensin II receptors impairs excitation-contraction coupling in the mouse heart. *Am J Physiol Heart Circ Physiol* **301**: H2018-27 [PMID:21856918]
 255. Ruan X, Oliverio MI, Coffman TM and Arendshorst WJ. (1999) Renal vascular reactivity in mice: AngII-induced vasoconstriction in AT1A receptor null mice. *J Am Soc Nephrol* **10**: 2620-30 [PMID:10589703]
 256. Rueckschloss U, Quinn MT, Holtz J and Morawietz H. (2002) Dose-dependent regulation of NAD(P)H oxidase expression by angiotensin II in human endothelial cells: protective effect of angiotensin II type 1 receptor blockade in patients with coronary artery disease. *Arterioscler Thromb Vasc Biol* **22**: 1845-51 [PMID:12426214]
 257. Ruiz-Ortega M, Ruperez M, Esteban V and Egido J. (2003) Molecular mechanisms of angiotensin II-induced vascular injury. *Curr Hypertens Rep* **5**: 73-9 [PMID:12530939]
 258. Saavedra JM, Armando I, Terrón JA, Falcón-Neri A, Jöhren O, Häuser W and Inagami T. (2001) Increased AT(1) receptors in adrenal gland of AT(2) receptor gene-disrupted mice. *Regul Pept* **102**: 41-7 [PMID:11600209]
 259. Sadoshima J. (2000) Cytokine actions of angiotensin II. *Circ Res* **86**: 1187-9 [PMID:10864905]
 260. Sahylí Ortega Pijeira M, Sérgio Gonçalves Nunes P, Nascimento Dos Santos S, Zhang Z, Pérez Nario A, Araujo Perini E, Miguel Turato W, Rodríguez Riera Z, Chammas R and H Elsinga P *et al.*. (2020) Synthesis and Evaluation of [¹⁸F]FETLos and [¹⁸F]AMBF₃Los as Novel ¹⁸F-Labelled Losartan Derivatives for Molecular Imaging of Angiotensin II Type 1 Receptors. *Molecules* **25** [PMID:32325695]
 261. Sampson AK, Moritz KM, Jones ES, Flower RL, Widdop RE and Denton KM. (2008) Enhanced angiotensin II type 2 receptor mechanisms mediate decreases in arterial pressure attributable to chronic low-dose angiotensin II in female rats. *Hypertension* **52**: 666-71 [PMID:18711010]
 262. Sandberg K, Ji H, Clark AJ, Shapira H and Catt KJ. (1992) Cloning and expression of a novel angiotensin II receptor subtype. *J Biol Chem* **267**: 9455-8 [PMID:1374402]
 263. Santos RA, Simoes e Silva AC, Maric C, Silva DM, Machado RP, de Buhr I, Heringer-Walther S, Pinheiro SV, Lopes MT and Bader M *et al.*. (2003) Angiotensin-(1-7) is an endogenous ligand for

- the G protein-coupled receptor Mas. *Proc Natl Acad Sci USA* **100**: 8258-63 [PMID:12829792]
264. Sasaki K, Murohara T, Ikeda H, Sugaya T, Shimada T, Shintani S and Imaizumi T. (2002) Evidence for the importance of angiotensin II type 1 receptor in ischemia-induced angiogenesis. *J Clin Invest* **109**: 603-11 [PMID:11877468]
 265. Sasamura H, Hein L, Krieger JE, Pratt RE, Kobilka BK and Dzau VJ. (1992) Cloning, characterization, and expression of two angiotensin receptor (AT-1) isoforms from the mouse genome. *Biochem Biophys Res Commun* **185**: 253-9 [PMID:1599461]
 266. Satoh K, Ichihara K, Landon EJ, Inagami T and Tang H. (2001) 3-Hydroxy-3-methylglutaryl-CoA reductase inhibitors block calcium-dependent tyrosine kinase Pyk2 activation by angiotensin II in vascular endothelial cells. involvement of geranylgeranylation of small G protein Rap1. *J Biol Chem* **276**: 15761-7 [PMID:11278472]
 267. Saulière A, Bellot M, Paris H, Denis C, Finana F, Hansen JT, Altié MF, Seguelas MH, Pathak A and Hansen JL *et al.*. (2012) Deciphering biased-agonism complexity reveals a new active AT1 receptor entity. *Nat Chem Biol* **8**: 622-30 [PMID:22634635]
 268. Sayeski PP, Ali MS, Hawks K, Frank SJ and Bernstein KE. (1999) The angiotensin II-dependent association of Jak2 and c-Src requires the N-terminus of Jak2 and the SH2 domain of c-Src. *Circ Res* **84**: 1332-8 [PMID:10364571]
 269. Sayeski PP, Ali MS, Semeniuk DJ, Doan TN and Bernstein KE. (1998) Angiotensin II signal transduction pathways. *Regul Pept* **78**: 19-29 [PMID:9879743]
 270. Schiffrin EL and Touyz RM. (1998) Vascular biology of endothelin. *J Cardiovasc Pharmacol* **32 Suppl 3**: S2-13 [PMID:9883741]
 271. Senbonmatsu T, Saito T, Landon EJ, Watanabe O, Price Jr E, Roberts RL, Imboden H, Fitzgerald TG, Gaffney FA and Inagami T. (2003) A novel angiotensin II type 2 receptor signaling pathway: possible role in cardiac hypertrophy. *EMBO J* **22**: 6471-82 [PMID:14657020]
 272. Seyedi N, Xu X, Nasjletti A and Hintze TH. (1995) Coronary kinin generation mediates nitric oxide release after angiotensinreceptor stimulation. *Hypertension* **26**: 164-170 [PMID:7607720]
 273. Sharma N, Belenchia AM, Toedebusch R, Pulakat L and Hans CP. (2020) AT2R agonist NP-6A4 mitigates aortic stiffness and proteolytic activity in mouse model of aneurysm. *J Cell Mol Med* **24**: 7393-7404 [PMID:32420690]
 274. Shetty SS and DelGrande D. (2000) Differential inhibition of the prejunctional actions of angiotensin II in rat atria by valsartan, irbesartan, eprosartan, and losartan. *J Pharmacol Exp Ther* **294**: 179-86 [PMID:10871310]
 275. Silvestre JS, Tamarat R, Senbonmatsu T, Icchiki T, Ebrahimian T, Iglarz M, Besnard S, Duriez M, Inagami T and Lévy BI. (2002) Antiangiogenic effect of angiotensin II type 2 receptor in ischemia-induced angiogenesis in mice hindlimb. *Circ Res* **90**: 1072-9 [PMID:12039796]
 276. Singh KD and Karnik SS. (2022) Structural perspectives on the mechanism of signal activation, ligand selectivity and allosteric modulation in angiotensin receptors: IUPHAR Review 34. *Br J Pharmacol* **179**: 4461-4472 [PMID:35318654]
 277. Siragy HM and Carey RM. (1997) The subtype 2 (AT2) angiotensin receptor mediates renal production of nitric oxide in conscious rats. *J Clin Invest* **100**: 264-9 [PMID:9218502]
 278. Siragy HM, de Gasparo M and Carey RM. (2000) Angiotensin type 2 receptor mediates valsartan-induced hypotension in conscious rats. *Hypertension* **35**: 1074-7 [PMID:10818067]
 279. Siragy HM, El-Kersh MA, De Gasparo M, Webb RL and Carey RM. (2002) Differences in AT2 -receptor stimulation between AT1 -receptor blockers valsartan and losartan quantified by renal interstitial fluid cGMP. *J Hypertens* **20**: 1157-63 [PMID:12023686]
 280. Siragy HM, Inagami T, Ichiki T and Carey RM. (1999) Sustained hypersensitivity to angiotensin II and its mechanism in mice lacking the subtype-2 (AT2) angiotensin receptor. *Proc Natl Acad Sci USA* **96**: 6506-10 [PMID:10339618]
 281. Skiba MA, Canavan C, Nemeth GR, Liu J, Kanso A and Kruse AC. (2025) Epitope-directed selection of GPCR nanobody ligands with evolvable function. *Proc Natl Acad Sci U S A* **122**: e2423931122 [PMID:40067891]
 282. Skiba MA, Sterling SM, Rawson S, Zhang S, Xu H, Jiang H, Nemeth GR, Gilman MSA, Hurley JD and Shen P *et al.*. (2024) Antibodies expand the scope of angiotensin receptor pharmacology. *Nat Chem Biol* **20**: 1577-1585 [PMID:38744986]
 283. Smith GR and Missailidis S. (2004) Cancer, inflammation and the AT1 and AT2 receptors. *J Inflamm (Lond.)* **1**: 3 [PMID:15813980]
 284. Smith MT, Anand P and Rice ASC. (2016) Selective small molecule angiotensin II type 2 receptor antagonists for neuropathic pain: preclinical and clinical studies. *Pain* **157 Suppl 1**: S33-S41 [PMID:26785154]
 285. Smith MT, Wyse BD and Edwards SR. (2013) Small molecule angiotensin II type 2 receptor (AT₂R) antagonists as novel analgesics for neuropathic pain: comparative pharmacokinetics, radioligand binding, and efficacy in rats. *Pain Med* **14**: 692-705 [PMID:23489258]
 286. Smith RD and Timmermans PB. (1994) Human angiotensin receptor subtypes. *Curr Opin Nephrol Hypertens* **3**: 112-22 [PMID:7850406]
 287. Smith S and Ramirez VD. (2002) Direct visualization of internalization and intracellular

trafficking of dopamine-releasing protein-36aa. *Neuroendocrinology* **75**: 98-112

[PMID:11867938]

288. Sohn HY, Raff U, Hoffmann A, Gloe T, Heermeier K, Galle J and Pohl U. (2000) Differential role of angiotensin II receptor subtypes on endothelial superoxide formation. *Br J Pharmacol* **131**: 667-72 [PMID:11030714]
289. Speth RC and Kim KH. (1990) Discrimination of two angiotensin II receptor subtypes with a selective agonist analogue of angiotensin II, p-aminophenylalanine⁶ angiotensin II. *Biochem Biophys Res Commun* **169**: 997-1006 [PMID:2194459]
290. Stoll M, Steckelings UM, Bottari SP, Paul M, Metzger R and Unger T. (1995) The Angiotensin AT₂-receptor mediates inhibition of cell proliferation in coronary endothelial cells. *J Clin Invest* **95**: 651-657 [PMID:7860748]
291. Storka A, Vojtassakova E, Mueller M, Kapiotis S, Haider DG, Jungbauer A and Wolzt M. (2008) Angiotensin inhibition stimulates PPAR γ and the release of visfatin. *Eur J Clin Invest* **38**: 820-6 [PMID:19021699]
292. Stroth U, Blume A, Mielke K and Unger T. (2000) Angiotensin AT(2) receptor stimulates ERK1 and ERK2 in quiescent but inhibits ERK in NGF-stimulated PC12W cells. *Brain Res Mol Brain Res* **78**: 175-80 [PMID:10891597]
293. Sugiura N, Hagiwara H and Hirose S. (1992) Molecular cloning of porcine soluble angiotensin-binding protein. *J Biol Chem* **267**: 18067-72 [PMID:1517239]
294. Sung CP, Arleth AJ, Storer BL and Ohlstein EH. (1994) Angiotensin type 1 receptors mediate smooth muscle proliferation and endothelin biosynthesis in rat vascular smooth muscle. *J Pharmacol Exp Ther* **271**: 429-37 [PMID:7965744]
295. Suomivuori CM, Latorraca NR, Wingler LM, Eismann S, King MC, Kleinhenz ALW, Skiba MA, Staus DP, Kruse AC and Lefkowitz RJ *et al.*. (2020) Molecular mechanism of biased signaling in a prototypical G protein-coupled receptor. *Science* **367**: 881-887 [PMID:32079767]
296. Swindle JD, Santos KL and Speth RC. (2013) Pharmacological characterization of a novel non-AT₁, non-AT₂ angiotensin binding site identified as neurolysin. *Endocrine* **44**: 525-31 [PMID:23412923]
297. Syed YY. (2023) Sparsentan: First Approval. *Drugs* **83**: 563-568 [PMID:37022667]
298. Takahara M, Shiraiwa T, Shindo M, Arai A, Kusuda Y, Katakami N, Kaneto H, Matsuoka TA and Shimomura I. (2014) Efficacy and safety of 10-mg azilsartan compared with 8-mg candesartan cilexetil in Japanese patients with hypertension: a randomized crossover non-inferiority trial. *Hypertens Res* **37**: 852-7 [PMID:24739538]
299. Takayanagi R, Ohnaka K, Sakai Y, Nakao R, Yanase T, Haji M, Inagami T, Furuta H, Gou DF and Nakamuta M *et al.*. (1992) Molecular cloning, sequence analysis and expression of a cDNA encoding human type-1 angiotensin II receptor. *Biochem Biophys Res Commun* **183**: 910-6 [PMID:1550596]
300. Takezako T, Gogonea C, Saad Y, Noda K and Karnik SS. (2004) "Network leaning" as a mechanism of insurmountable antagonism of the angiotensin II type 1 receptor by non-peptide antagonists. *J Biol Chem* **279**: 15248-57 [PMID:14754891]
301. Tamura M, Wanaka Y, Landon EJ and Inagami T. (1999) Intracellular sodium modulates the expression of angiotensin II subtype 2 receptor in PC12W cells. *Hypertension* **33**: 626-32 [PMID:10024318]
302. Tanaka M, Tsuchida S, Imai T, Fujii N, Miyazaki H, Ichiki T, Naruse M and Inagami T. (1999) Vascular response to angiotensin II is exaggerated through an upregulation of AT₁ receptor in AT₂ knockout mice. *Biochem Biophys Res Commun* **258**: 194-8 [PMID:10222259]
303. Tang SS, Rogg H, Schumacher R and Dzau VJ. (1992) Characterization of nuclear angiotensin-II-binding sites in rat liver and comparison with plasma membrane receptors. *Endocrinology* **131**: 374-80 [PMID:1612017]
304. Thomas WG, Qian H, Chang CS and Karnik S. (2000) Agonist-induced phosphorylation of the angiotensin II (AT₁A) receptor requires generation of a conformation that is distinct from the inositol phosphate-signaling state. *J Biol Chem* **275**: 2893-900 [PMID:10644757]
305. Timmermans PB. (1999) Pharmacological properties of angiotensin II receptor antagonists. *Can J Cardiol* **15 Suppl F**: 26F-8F [PMID:10579749]
306. Timmermans PB, Wong PC, Chiu AT, Herblin WF, Benfield P, Carini DJ, Lee RJ, Wexler RR, Saye JA and Smith RD. (1993) Angiotensin II receptors and angiotensin II receptor antagonists. *Pharmacol Rev* **45**: 205-51 [PMID:8372104]
307. Tissir F, Rivière M, Guo DF, Tsuzuki S, Inagami T, Levan G, Szpirer J and Szpirer C. (1995) Localization of the genes encoding the three rat angiotensin II receptors, Agtr1a, Agtr1b, Agtr2, and the human AGTR2 receptor respectively to rat chromosomes 17q12, 2q24 and Xq34, and the human Xq22. *Cytogenet Cell Genet* **71**: 77-80 [PMID:7606933]
308. Tohgo A, Choy EW, Gesty-Palmer D, Pierce KL, Laporte S, Oakley RH, Caron MG, Lefkowitz RJ and Luttrell LM. (2003) The stability of the G protein-coupled receptor-beta-arrestin interaction determines the mechanism and functional consequence of ERK activation. *J Biol Chem* **278**: 6258-67 [PMID:12473660]

309. Tourwé D, Tsialanis AD, Parisis N, Hirmiz B, Del Borgo M, Aguilar MI, Van der Poorten O, Ballet S, Widdop RE and Tzakos AG. (2021) Using conformational constraints at position 6 of Angiotensin II to generate compounds with enhanced AT2R selectivity and proteolytic stability. *Bioorg Med Chem Lett* **43**: 128086 [PMID:33965531]
310. Touyz RM, He G, El Mabrouk M and Schiffrin EL. (2001) p38 Map kinase regulates vascular smooth muscle cell collagen synthesis by angiotensin II in SHR but not in WKY. *Hypertension* **37**: 574-80 [PMID:11230337]
311. Tsuchida S, Matsusaka T, Chen X, Okubo S, Niimura F, Nishimura H, Fogo A, Utsunomiya H, Inagami T and Ichikawa I. (1998) Murine double nullizygotes of the angiotensin type 1A and 1B receptor genes duplicate severe abnormal phenotypes of angiotensinogen nullizygotes. *J Clin Invest* **101**: 755-60 [PMID:9466969]
312. Tsutsumi K and Saavedra JM. (1991) Differential development of angiotensin II receptor subtypes in the rat brain. *Endocrinology* **128**: 630-2 [PMID:1986946]
313. Tsutsumi Y, Matsubara H, Masaki H, Kurihara H, Murasawa S, Takai S, Miyazaki M, Nozawa Y, Ozono R and Nakagawa K *et al.*. (1999) Angiotensin II type 2 receptor overexpression activates the vascular kinin system and causes vasodilation. *J Clin Invest* **104**: 925-35 [PMID:10510333]
314. Unal H, Jagannathan R, Bhat MB and Karnik SS. (2010) Ligand-specific conformation of extracellular loop-2 in the angiotensin II type 1 receptor. *J Biol Chem* **285**: 16341-50 [PMID:20299456]
315. Unal H, Jagannathan R, Bhatnagar A, Tirupula K, Desnoyer R and Karnik SS. (2013) Long range effect of mutations on specific conformational changes in the extracellular loop 2 of angiotensin II type 1 receptor. *J Biol Chem* **288**: 540-51 [PMID:23139413]
316. Underwood DJ, Strader CD, Rivero R, Patchett AA, Greenlee W and Prendergast K. (1994) Structural model of antagonist and agonist binding to the angiotensin II, AT1 subtype, G protein coupled receptor. *Chem Biol* **1**: 211-21 [PMID:9383393]
317. Unger T. (1999) The angiotensin type 2 receptor: variations on an enigmatic theme. *J Hypertens* **17**: 1775-86 [PMID:10703869]
318. van Kesteren CA, van Heugten HA, Lamers JM, Saxena PR, Schalekamp MA and Danser AH. (1997) Angiotensin II-mediated growth and antigrowth effects in cultured neonatal rat cardiac myocytes and fibroblasts. *J Mol Cell Cardiol* **29**: 2147-57 [PMID:9281446]
319. Vanderheyden PM, Fierens FL, De Backer JP, Fraeyman N and Vauquelin G. (1999) Distinction between surmountable and insurmountable selective AT1 receptor antagonists by use of CHO-K1 cells expressing human angiotensin II AT1 receptors. *Br J Pharmacol* **126**: 1057-65 [PMID:10193788]
320. Vanderheyden PM, Verheijen I, Fierens FL, Backer JP and Vauquelin G. (2000) Binding characteristics of [(3)H]-irbesartan to human recombinant angiotensin type 1 receptors. *J Renin Angiotensin Aldosterone Syst* **1**: 159-65 [PMID:11967808]
321. Vanderheyden PM, Verheijen I, Fierens FL, DeBacker JP and Vauquelin G. (2000) Inhibition of angiotensin II-induced inositol phosphate production by triacid nonpeptide antagonists in CHO cells expressing human AT1 receptors. *Pharm Res* **17**: 1482-8 [PMID:11303957]
322. Vauquelin G, Michotte Y, Smolders I, Sarre S, Ebinger G, Dupont A and Vanderheyden P. (2002) Cellular targets for angiotensin II fragments: pharmacological and molecular evidence. *J Renin Angiotensin Aldosterone Syst* **3**: 195-204 [PMID:12584663]
323. Verdonk K, Durik M, Abd-Alla N, Batenburg WW, van den Bogaerdt AJ, van Veghel R, Roks AJ, Danser AH and van Esch JH. (2012) Compound 21 induces vasorelaxation via an endothelium- and angiotensin II type 2 receptor-independent mechanism. *Hypertension* **60**: 722-9 [PMID:22802221]
324. Verheijen I, Fierens FL, Debacker JP, Vauquelin G and Vanderheyden PM. (2000) Interaction between the partially insurmountable antagonist valsartan and human recombinant angiotensin II type 1 receptors. *Fundam Clin Pharmacol* **14**: 577-585 [PMID:11206708]
325. Vervoort VS, Beachem MA, Edwards PS, Ladd S, Miller KE, de Mollerat X, Clarkson K, DuPont B, Schwartz CE and Stevenson RE *et al.*. (2002) AGTR2 mutations in X-linked mental retardation. *Science* **296**: 2401-3 [PMID:12089445]
326. Violin JD, DeWire SM, Yamashita D, Rominger DH, Nguyen L, Schiller K, Whalen EJ, Gowen M and Lark MW. (2010) Selectively engaging β -arrestins at the angiotensin II type 1 receptor reduces blood pressure and increases cardiac performance. *J Pharmacol Exp Ther* **335**: 572-9 [PMID:20801892]
327. Vázquez J, Correa de Adjounian MF, Sumners C, González A, Diez-Freire C and Raizada MK. (2005) Selective silencing of angiotensin receptor subtype 1a (AT1aR) by RNA interference. *Hypertension* **45**: 115-9 [PMID:15569855]
328. Wallukat G, Nissen E, Neichel D and Harris J. (2002) Spontaneously beating neonatal rat heart myocyte culture-a model to characterize angiotensin II at(1) receptor autoantibodies in patients with preeclampsia. *In Vitro Cell Dev Biol Anim* **38**: 376-7 [PMID:12534336]
329. Wan Y, Wallinder C, Plouffe B, Beaudry H, Mahalingam AK, Wu X, Johansson B, Holm M, Botoros M and Karlén A *et al.*. (2004) Design, synthesis, and biological evaluation of the first

- selective nonpeptide AT₂ receptor agonist. *J Med Chem* **47**: 5995-6008 [PMID:15537354]
330. Wang WY, Zee RY and Morris BJ. (1997) Association of angiotensin II type 1 receptor gene polymorphism with essential hypertension. *Clin Genet* **51**: 31-4 [PMID:9084931]
 331. Wang Y, Del Borgo M, Lee HW, Baraldi D, Hirmiz B, Gaspari TA, Denton KM, Aguilar MI, Samuel CS and Widdop RE. (2017) Anti-fibrotic Potential of AT₂ Receptor Agonists. *Front Pharmacol* **8**: 564 [PMID:28912715]
 332. Wangler NJ, Santos KL, Schadock I, Hagen FK, Escher E, Bader M, Speth RC and Karamyan VT. (2012) Identification of membrane-bound variant of metalloendopeptidase neurolysin (EC 3.4.24.16) as the non-angiotensin type 1 (non-AT₁), non-AT₂ angiotensin binding site. *J Biol Chem* **287**: 114-22 [PMID:22039052]
 333. Webb ML, Liu EC, Cohen RB, Hedberg A, Bogosian EA, Monshizadegan H, Molloy C, Serafino R, Moreland S and Murphy TJ *et al.*. (1992) Molecular characterization of angiotensin II type II receptors in rat pheochromocytoma cells. *Peptides* **13**: 499-508 [PMID:1326103]
 334. Wei H, Ahn S, Shenoy SK, Karnik SS, Hunyady L, Luttrell LM and Lefkowitz RJ. (2003) Independent beta-arrestin 2 and G protein-mediated pathways for angiotensin II activation of extracellular signal-regulated kinases 1 and 2. *Proc Natl Acad Sci USA* **100**: 10782-7 [PMID:12949261]
 335. Wexler RR, Greenlee WJ, Irvin JD, Goldberg MR, Prendergast K, Smith RD and Timmermans PB. (1996) Nonpeptide angiotensin II receptor antagonists: the next generation in antihypertensive therapy. *J Med Chem* **39**: 625-56 [PMID:8576904]
 336. Whitebread S, Mele M, Kamber B and de Gasparo M. (1989) Preliminary biochemical characterization of two angiotensin II receptor subtypes. *Biochem Biophys Res Commun* **163**: 284-91 [PMID:2775266]
 337. Whitebread SE, Taylor V, Bottari SP, Kamber B and de Gasparo M. (1991) Radioiodinated CGP 42112A: a novel high affinity and highly selective ligand for the characterization of angiotensin AT₂ receptors. *Biochem Biophys Res Commun* **181**: 1365-71 [PMID:1764088]
 338. Wiemer G, Schölkens BA, Wagner A, Heitsch H and Linz W. (1993) The possible role of angiotensin II subtype AT₂ receptors in endothelial cells and isolated ischemic rat hearts. *J Hypertens Suppl* **11**: S234-5 [PMID:8158361]
 339. Wiest SA, Rampersaud A, Zimmerman K and Steinberg MI. (1991) Characterization of distinct angiotensin II binding sites in rat adrenal gland and bovine cerebellum using selective nonpeptide antagonists. *J Cardiovasc Pharmacol* **17**: 177-84 [PMID:1709220]
 340. Wingler LM, Elgeti M, Hilger D, Latorraca NR, Lerch MT, Staus DP, Dror RO, Kobilka BK, Hubbell WL and Lefkowitz RJ. (2019) Angiotensin Analogs with Divergent Bias Stabilize Distinct Receptor Conformations. *Cell* **176**: 468-478.e11 [PMID:30639099]
 341. Wingler LM, Skiba MA, McMahon C, Staus DP, Kleinhenz ALW, Suomivuori CM, Latorraca NR, Dror RO, Lefkowitz RJ and Kruse AC. (2020) Angiotensin and biased analogs induce structurally distinct active conformations within a GPCR. *Science* **367**: 888-892 [PMID:32079768]
 342. Wu L, Iwai M, Li Z, Shiuchi T, Min LJ, Cui TX, Li JM, Okumura M, Nahmias C and Horiuchi M. (2004) Regulation of inhibitory protein-kappaB and monocyte chemoattractant protein-1 by angiotensin II type 2 receptor-activated Src homology protein tyrosine phosphatase-1 in fetal vascular smooth muscle cells. *Mol Endocrinol* **18**: 666-78 [PMID:14684844]
 343. Wu L, Iwai M, Nakagami H, Chen R, Suzuki J, Akishita M, de Gasparo M and Horiuchi M. (2002) Effect of angiotensin II type 1 receptor blockade on cardiac remodeling in angiotensin II type 2 receptor null mice. *Arterioscler Thromb Vasc Biol* **22**: 49-54 [PMID:11788460]
 344. Wu L, Iwai M, Nakagami H, Li Z, Chen R, Suzuki J, Akishita M, de Gasparo M and Horiuchi M. (2001) Roles of angiotensin II type 2 receptor stimulation associated with selective angiotensin II type 1 receptor blockade with valsartan in the improvement of inflammation-induced vascular injury. *Circulation* **104**: 2716-21 [PMID:11723025]
 345. Wu Z, Maric C, Roesch DM, Zheng W, Verbalis JG and Sandberg K. (2003) Estrogen regulates adrenal angiotensin AT₁ receptors by modulating AT₁ receptor translation. *Endocrinology* **144**: 3251-61 [PMID:12810582]
 346. Xia Y, Wen H, Bobst S, Day MC and Kellems RE. (2003) Maternal autoantibodies from preeclamptic patients activate angiotensin receptors on human trophoblast cells. *J Soc Gynecol Invest* **10**: 82-93 [PMID:12593997]
 347. Xu J, Carretero OA, Liu YH, Shesely EG, Yang F, Kapke A and Yang XP. (2002) Role of AT₂ receptors in the cardioprotective effect of AT₁ antagonists in mice. *Hypertension* **40**: 244-50 [PMID:12215461]
 348. Yahata Y, Shirakata Y, Tokumaru S, Yang L, Dai X, Tohyama M, Tsuda T, Sayama K, Iwai M and Horiuchi M *et al.*. (2006) A novel function of angiotensin II in skin wound healing. Induction of fibroblast and keratinocyte migration by angiotensin II via heparin-binding epidermal growth factor (EGF)-like growth factor-mediated EGF receptor transactivation. *J Biol Chem* **281**: 13209-16 [PMID:16543233]
 349. Yamada H, Akishita M, Ito M, Tamura K, Daviet L, Lehtonen JY, Dzau VJ and Horiuchi M. (1999) AT₂ receptor and vascular smooth muscle cell differentiation in vascular development.

Hypertension **33**: 1414-9 [PMID:10373225]

350. Yamada T, Akishita M, Pollman MJ, Gibbons GH, Dzau VJ and Horiuchi M. (1998) Angiotensin II type 2 receptor mediates vascular smooth muscle cell apoptosis and antagonizes angiotensin II type 1 receptor action: an in vitro gene transfer study. *Life Sci* **63**: PL289-95 [PMID:9806232]
351. Yamada T, Horiuchi M and Dzau VJ. (1996) Angiotensin II type 2 receptor mediates programmed cell death. *Proc Natl Acad Sci USA* **93**: 156-60 [PMID:8552595]
352. Yamada Y, Yamauchi D, Usui H, Zhao H, Yokoo M, Ohinata K, Iwai M, Horiuchi M and Yoshikawa M. (2008) Hypotensive activity of novokin, a potent analogue of ovokin(2-7), is mediated by angiotensin AT(2) receptor and prostaglandin IP receptor. *Peptides* **29**: 412-8 [PMID:18207609]
353. Yamashita D and Chen XT. (2013) β -arrestin effectors and compositions and methods of use thereof Patent number: US8486885B2. Assignee: Trevena Inc. Priority date: 29/12/2008. Publication date: 16/07/2013.
354. Yan C, Kim D, Aizawa T and Berk BC. (2003) Functional interplay between angiotensin II and nitric oxide: cyclic GMP as a key mediator. *Arterioscler Thromb Vasc Biol* **23**: 26-36 [PMID:12524221]
355. Yang R, Smolders I, Vanderheyden P, Demaegdt H, Van Eeckhaut A, Vauquelin G, Lukaszuk A, Tourwé D, Chai SY and Albiston AL *et al.*. (2011) Pressor and renal hemodynamic effects of the novel angiotensin A peptide are angiotensin II type 1A receptor dependent. *Hypertension* **57**: 956-64 [PMID:21464395]
356. Yang R, Walther T, Gembardt F, Smolders I, Vanderheyden P, Albiston AL, Chai SY and Dupont AG. (2010) Renal vasoconstrictor and pressor responses to angiotensin IV in mice are AT1a-receptor mediated. *J Hypertens* **28**: 487-94 [PMID:19907343]
357. Yang Z, Bove CM, French BA, Epstein FH, Berr SS, DiMaria JM, Gibson JJ, Carey RM and Kramer CM. (2002) Angiotensin II type 2 receptor overexpression preserves left ventricular function after myocardial infarction. *Circulation* **106**: 106-11 [PMID:12093778]
358. Yasuda N, Akazawa H, Ito K, Shimizu I, Kudo-Sakamoto Y, Yabumoto C, Yano M, Yamamoto R, Ozasa Y and Minamino T *et al.*. (2012) Agonist-independent constitutive activity of angiotensin II receptor promotes cardiac remodeling in mice. *Hypertension* **59**: 627-33 [PMID:22291447]
359. Ye MQ and Healy DP. (1992) Characterization of an angiotensin type-1 receptor partial cDNA from rat kidney: evidence for a novel AT1B receptor subtype. *Biochem Biophys Res Commun* **185**: 204-10 [PMID:1599457]
360. Yerkes E, Nishimura H, Miyazaki Y, Tsuchida S, Brock 3rd JW and Ichikawa I. (1998) Role of angiotensin in the congenital anomalies of the kidney and urinary tract in the mouse and the human. *Kidney Int Suppl* **67**: S75-7 [PMID:9736258]
361. Ylisaukko-oja T, Rehnström K, Vanhala R, Tengström C, Lähdetie J and Järvelä I. (2004) Identification of two AGTR2 mutations in male patients with non-syndromic mental retardation. *Hum Genet* **114**: 211-3 [PMID:14598163]
362. Yoneda A, Cascio S, Green A, Barton D and Puri P. (2002) Angiotensin II type 2 receptor gene is not responsible for familial vesicoureteral reflux. *J Urol* **168**: 1138-41 [PMID:12187255]
363. Yoshida H, Kakuchi J, Guo DF, Furuta H, Iwai N, van der Meer-de Jong R, Inagami T and Ichikawa I. (1992) Analysis of the evolution of angiotensin II type 1 receptor gene in mammals (mouse, rat, bovine and human). *Biochem Biophys Res Commun* **186**: 1042-9 [PMID:1497638]
364. Yu L, Shao C and Gao L. (2014) Developmental expression patterns for angiotensin receptors in mouse skin and brain. *J Renin Angiotensin Aldosterone Syst* **15**: 139-49 [PMID:23204186]
365. Yue H, Li W, Desnoyer R and Karnik SS. (2010) Role of nuclear unphosphorylated STAT3 in angiotensin II type 1 receptor-induced cardiac hypertrophy. *Cardiovasc Res* **85**: 90-9 [PMID:19696070]
366. Zaccor NW, Sumner CJ and Snyder SH. (2020) The nonselective cation channel TRPV4 inhibits angiotensin II receptors. *J Biol Chem* **295**: 9986-9997 [PMID:32493776]
367. Zahradka P, Werner JP, Buhay S, Litchie B, Helwer G and Thomas S. (2002) NF-kappaB activation is essential for angiotensin II-dependent proliferation and migration of vascular smooth muscle cells. *J Mol Cell Cardiol* **34**: 1609-21 [PMID:12505059]
368. Zanaty M, Seara FAC, Nakagawa P, Deng G, Mathieu NM, Balapattabi K, Karnik SS, Grobe JL and Sigmund CD. (2021) β -Arrestin-Biased Agonist Targeting the Brain AT₁R (Angiotensin II Type 1 Receptor) Increases Aversion to Saline and Lowers Blood Pressure in Deoxycorticosterone Acetate-Salt Hypertension. *Hypertension* **77**: 420-431 [PMID:33249862]
369. Zhang D, Liu Y, Zaidi SA, Xu L, Zhan Y, Chen A, Guo J, Huang XP, Roth BL and Katritch V *et al.*. (2023) Structural insights into angiotensin receptor signaling modulation by balanced and biased agonists. *EMBO J* **42**: e112940 [PMID:37038975]
370. Zhang H, Han GW, Batyuk A, Ishchenko A, White KL, Patel N, Sadybekov A, Zamylny B, Rudd MT and Hollenstein K *et al.*. (2017) Structural basis for selectivity and diversity in angiotensin II receptors. *Nature* **544**: 327-332 [PMID:28379944]
371. Zhang H, Unal H, Desnoyer R, Han GW, Patel N, Katritch V, Karnik SS, Cherezov V and Stevens RC. (2015) Structural Basis for Ligand Recognition and Functional Selectivity at Angiotensin

- Receptor. *J Biol Chem* **290**: 29127-39 [PMID:26420482]
372. Zhang H, Unal H, Gati C, Han GW, Liu W, Zatsepin NA, James D, Wang D, Nelson G and Weierstall U *et al.*. (2015) Structure of the Angiotensin receptor revealed by serial femtosecond crystallography. *Cell* **161**: 833-44 [PMID:25913193]
373. Zhang J and Pratt RE. (1996) The AT2 receptor selectively associates with Gialpha2 and Gialpha3 in the rat fetus. *J Biol Chem* **271**: 15026-33 [PMID:8663053]
374. Zhao Y, Biermann T, Luther C, Unger T, Culman J and Gohlke P. (2003) Contribution of bradykinin and nitric oxide to AT2 receptor-mediated differentiation in PC12 W cells. *J Neurochem* **85**: 759-67 [PMID:12694402]
375. Zhou A, Dekker GA, Lumbers ER, Lee SY, Thompson SD, McCowan LM, Roberts CT and SCOPE consortium. (2013) The association of AGTR2 polymorphisms with preeclampsia and uterine artery bilateral notching is modulated by maternal BMI. *Placenta* **34**: 75-81 [PMID:23122839]
376. Zhu L, Carretero OA, Liao TD, Harding P, Li H, Sumners C and Yang XP. (2010) Role of prolylcarboxypeptidase in angiotensin II type 2 receptor-mediated bradykinin release in mouse coronary artery endothelial cells. *Hypertension* **56**: 384-90 [PMID:20606103]
377. Zhu M, Natarajan R, Nadler JL, Moore JM, Gelband CH and Sumners C. (2000) Angiotensin II increases neuronal delayed rectifier K(+) current: role of 12-lipoxygenase metabolites of arachidonic acid. *J Neurophysiol* **84**: 2494-501 [PMID:11067992]
378. Zhu Z, Zhang SH, Wagner C, Kurtz A, Maeda N, Coffman T and Arendshorst WJ. (1998) Angiotensin AT1B receptor mediates calcium signaling in vascular smooth muscle cells of AT1A receptor-deficient mice. *Hypertension* **31**: 1171-7 [PMID:9576131]
379. Zimpelmann J and Burns KD. (2001) Angiotensin II AT(2) receptors inhibit growth responses in proximal tubule cells. *Am J Physiol Renal Physiol* **281**: F300-8 [PMID:11457722]