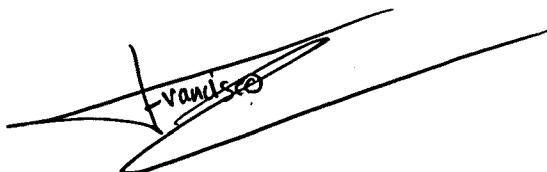


UNIVERSITAT DE BARCELONA
DIVISIÓ DE CIÈNCIES EXPERIMENTALS I MATEMÀTIQUES
FACULTAT DE QUÍMICA
DEPARTAMENT DE BIOQUÍMICA I BIOLOGIA MOLECULAR

**INTERACCIÓN FUNCIONAL ENTRE LAS PROTEÍNAS IMPLICADAS
EN EL RECONOCIMIENTO MOLECULAR DE ADENOSINA.**

Memoria presentada por el
Licenciado en Biología
FRANCISCO CIRUELA ALFÉREZ
para optar al grado de
Doctor en Biología

A handwritten signature in black ink, appearing to read "Francisco Ciruela Alférez". The signature is written diagonally across a thin horizontal line.

Barcelona, Noviembre de 1995.

E. BIBLIOGRAFÍA.

E. BIBLIOGRAFÍA.

- Abdellatif, M.M., Neubauer, C.F., Lederer, W.J. and Rogers, T.B. (1991). Angiotensin induced desensitization of the phosphoinositide pathway in cardiac cells occurs at the level of the receptor. *Circ. Res.* **69**, 800-809.
- Abiru, T., Yamaguchi, T., Watanabe, Y., Kogi, K., Aihara, K. and Matsuda, A. (1991). The anihypertensive effect of 2-alkyladenosines and their selective affinity for adenosine A₂ receptors. *Eur. J. Pharmacol.* **196**, 69-76.
- Abraham, E. H. (1994). P-glycoprotein serves as a transporter of cellular ATP. *Drug Develop. Res.* **31**, 247.
- Agarwal, R. P. and Parks Jr., R. E. (1975). A possible association between the nucleoside transport system of human erythrocytes and adenosine deaminase. *Biochem. Pharmacol.* **24**, 547-550.
- Agarwal, R. P., Spector, T. and Parks, R. E., (1977). Tight-binding inhibitors. Inhibition of adenosine deaminase by various inhibitors. *Biochem. Pharmacol.* **26**, 359-367.
- Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D. (1983). Molecular Biology of the Cell. Garland Publishing Inc., New York.
- Allende, G., Franco, R., Mallol, J., Lluís, C. and Canela, E. I. (1991). N-ethylmaleimide affects agonist binding to A₁ adenosine receptors differently in the presence than in the absence of ligand. *Biochem. Biophys. Res. Commun.* **181**, 213-218.
- Allende, G., Casadó, V., Mallol, J., Franco, R., Lluís, C. and Canela, E. I. (1992). Role of histidine residues in agonist and antagonist binding sites of A₁ adenosine receptor. *J. Neurochem.* **60**, 1525-1533.
- Akamizu, T., Ikuyama, S., Saji, M., Kosugi, S., Kozak, C., McBride, O.W. and Kohn, I. (1990). Cloning, chromosomal assignment, and regulation of the rat thyrotropin receptor. Expression of the gene is regulated by thyrotropin, agents that increase cAMP levels, and thyroid autoantibodies. *Proc. Natl. Acad. Sci. USA* **87**, 5677-5681.
- Andy, R. J. and Kornfeld, R. (1982). The adenosine deaminase binding protein of human skin fibroblasts is located on the cell surface. *J. Biol. Chem.* **257**, 7922-7927.
- Ansanay, H., Sebben, M., Bockaert, J. and Dumuis, A. (1992). Characterization of homologous 5-hydroxytryptamine (4) receptor desensitization in colliculi neurons. *Mol. Pharmacol.* **42**, 808-816.
- Aran, J. M., Colomer, D. , Matutes, E., Vives-Corrons, J. L. and Franco, R. (1991). Presence of adenosine desaminase on the surface of mononuclear blood cells. Immunochemical localization using light and electron microscopy. *J. Histochem. Cytochem.* **39**, 1001-1008.

Arch, J.R.S. and Newsholme, E.A. (1978). The control of the metabolism and the hormonal role of adenosine. *Essays Biochem.* **14**, 82-123.

Attwood, T. K., Eliopoulos, E. E. and Findlay, J. B. C. (1991). Multiple sequence alignment of protein families showing low sequence homology. A methodological approach using databases pattern-matching discriminators for G protein coupled receptors. *Gene* **98**, 153-159.

Axelrod, J., Burch, R.M. and Jelsema, C.L. (1988). Receptor-mediated activation of phospholipase A₂ via GTP-binding proteins: arachidonic acid and its metabolites as second messengers. *Trends Neurosci.* **11**, 117-123.

Bader, M.F., Hikita, t. and Trifaró, J.M. (1985). Calcium dependent calmodulin binding to chromaffin granule membranes. presence of a 65 kilodalton calmodulin binding protein. *J. Neurochem.* **44**, 526-539.

Baldwin, S.A. (1993). Mammalian passive glucose transporters. members of an ubiquitous family of active and passive transport proteins. *Biochim. Biophys. Acta* **1154**, 17-49.

Balmforth, A.J., Warburton, P. and Ball, S.G. (1990). Homologous desensitization of the D1 dopamine receptor. *J. Neurochem.* **55**, 2111-2116.

Balter, M. (1993). AIDS research. Skepticism greets HIV coreceptor. *Science*. **262**, 843-844.

Bañales, J. L., Pineda, P. R., Fitzgerald, J. M., Rubio, H., Selman, M. and Salazar-Lezama, M. (1991). Adenosine deaminase in the diagnosis of tuberculous pleural effusions. *CHEST*. **99**, 355-357.

Barrington, W. W., Jacobson, K. A., Hutchinson, A. J., Williams, M. and Stiles, G. L. (1989a). Identification of the A₂ adenosine receptor binding subunit by photoaffinity crosslinking. *Proc. Natl. Acad. Sci. U.S.A.* **86**, 6572-6576.

Barrington, W. W., Jacobson, K. A. and Stiles, G. L. (1990). Glycoprotein nature of the A₂ adenosine receptor binding subunit. *Mol Pharmacol.* **38**, 177-183.

Bates, M.D., Senogles, S.E., Bunzow, J.R., Liggett, S.B., Civelli, O. and Caron, M.G. (1991). Regulation of responsiveness at D2 dopamine receptors by receptor desensitization and adenylyl cyclase sensitization. *Mol. Pharmacol.* **39**, 55-63.

Beaven, M. A., Ramkumar, V. and Ali, H. (1994). Adenosine A₃ receptors in mast cells. *Trends Pharmacol. Sci.* **15**, 13-14.

Bellardinelli, L. and Isenberg, G. (1983). Isolated atrial myocytes. adenosine and acetylcholine increase potassium conductance. *Am. J. Physiol.* **244**, H734-H737.

Bellardinelli, L., Lindel, J. and Berne, R.M. (1989). The cardiac effects of adenosine. *Prog. Cardiovas. Dis.* **32**, 73-97.

Belt, J. A. (1983). Heterogeneity of nucleoside transport in mammalian cells. Two types of transport activity in L1210 and other cultured neoplastic-cells. *Mol. Pharmacol.* **24**, 479-484.

Belt, J. A., Schell, M.J. and Mirro, J. (1992). Closing comments on studies on nucleoside transport in AML. *Leukemia* **16**, 488-488.

Benovic, J.L., Shorr, R.G.L., Caron, M.G. and Lefkowitz, R.J. (1984). The mammalian β_2 -adrenergic receptor. purification and characterization. *Biochemistry* **23**, 4519-4525.

Benovic, J.L., Pike, L.J., Cerione, R.A., Staniszewski, C., Yoshimasa, T., Codina, J., Caron, M.G. and Lefkowitz, R.J. (1985). Phosphorylation of the mammalian β -adrenergic receptor by cyclic AMP dependent protein kinase. Regulation of the rate receptor phosphorylation and dephosphorylation by agonist occupancy and effects on coupling of the receptor to the stimulatory guanine nucleotide regulatory protein. *J. Biol. Chem.* **260**, 7094-7101.

Benovic, J.L., Strasser, R.H., Caron, M.G. and Lefkowitz, R.J. (1986). β -Adrenergic receptor kinase: Identification of a novel protein kinase that phosphorylates the agonist occupied receptor form of the receptor. *Proc. Natl. Acad. Sci. USA* **83**, 2797-2801.

Benovic, J.L., Onorato, J.J., Arriza, J.L., Stone, C.W., Lohse, M.J., Jenkins, N., Gilbert, N.G., Caron, M.G. and Lefkowitz, R.J. (1991). Cloning, expression and chromosomal localization of β -adrenergic receptor kinase 2. A new member of the receptor kinase family. *J. Biol. Chem.* **266**, 14939-14946.

Berne, R. M. (1963). Cardiac nucleotides in hypoxia, possible role in regulation of coronary blood flow. *Am. J. Physiol.* **204**, 317-322.

Berne, R. M., Knabb, R. M., Ely, S. W. and Rubio, R. (1983). Adenosine in the local regulation of blood flow. A brief overview. *Fedn. Proc.* **42**, 3136-3142.

Berstein, G., Blank, J.L., Jhon, D.-Y., Exton, J.H., Rhee, S.G. and Ross, E.M. (1992). Phospholipase C- β 1 is a GTPase-activating protein (GAP) for $G_{q/11}$, its physiologic regulator. *Cell* **70**, 411-418.

Birnbaum, M. J., Haspel, H. C. and Rosen, O.M. (1986). Cloning and characterization of a cDNA-encoding the rat brain glucose transporter protein. *Proc. Natl. Acad. Sci. U.S.A.* **83**, 5784-5788.

Birnbaumer, L., Phol, S.L., Michiel, H., Krans, J. and Rodbell, M. (1970). The actions of hormones on the adenyl cyclase system. *Adv. Biochem. Psychopharmacol.* **3**, 185-208.

Birnbaumer, L. (1990). G proteins in signal transduction. *Annu. Rev. Pharmacol. Toxicol.* **30**, 675-705.

Birnbaumer, L., Abramowitz, J. and Brown, A.M. (1990). Receptor-effector coupling by G proteins. *Biochim. Biophys. Acta* **1031**, 163-224.

- Birnbaumer, M., Antaramian, A., Themmen, A.P. and Gilbert, S. (1992). Desensitization of the human V₂ vasopressin receptor: homologous effects in the absence of heterologous desensitization. *J. Biol. Chem.* **267**, 11783-11788.
- Birnbaumer, L. (1993). Heterotrimeric G proteins: molecular diversity and functional correlates. *J. Receptor Res.* **13**, 19-26.
- Blanco, J., Mallol, J., Lluís, C., Canela, E. I. and Franco R. (1990). Adenosine metabolism in kidney slices under normoxic conditions. *J. Cell. Physiol.* **143**, 344-351.
- Blanco, J., Canela, E. I., Sayós, J., Mallol, J., Lluís, C. and Franco R. (1993). Adenine nucleotides and adenosine metabolism in pig kidney proximal tubule membranes. *J. Cell. Physiol.* **157**, 77-83.
- Blank, J.L., Brattain, K.A. and Exton, J.H. (1992). Activation of cytosolic phosphoinositide phospholipase C by G-protein β/γ subunits. *J. Biol. Chem.* **267**, 23069-23075.
- Blakeley, A.G.H., Dunn, P.M. and Petersen, S.A. (1988). A study of the actions of P₁-purinoreceptor agonist and antagonist in the mouse vas deferens *in vitro*. *Br. J. Pharmacol.* **94**, 37-46.
- Bockaert, J. (1991). G proteins and G-protein-coupled receptors: structure, function and interactions. *Curr. Opin. Neurobiol.* **1**, 32-42.
- Böhm, M., Brückner, R., Neumann, J., Schmitz, W., Scholz, H. and Starbatty, J. (1986). Role of guanine nucleotide-binding protein in the regulation by adenosine of cardiac potassium conductance and force of contraction. Evaluation with pertussis toxin. *Naunyn-Schmiedeberg's Arch. Pharmacol.* **332**, 403-405.
- Bollag, G. and McCormick, F. (1991). Regulators and effectors of ras proteins. *Annu. Rev. Cell. Biol.* **7**, 601-632.
- Bouvier, M., Leeb-Lundberg, L. M. F., Benovic, J. L., Caron, M. G. and Lefkowitz, R. J. (1987). Regulation of β-adrenergic receptor function by phosphorylation. *J. Biol. Chem.* **262**, 3106-3114.
- Bourne, H.R., Sanders, D.A. and McCormick, F. (1990). The GTPase superfamily: a conserved switch for diverse cell functions. *Nature* **348**, 125-132.
- Bourne, H.R., Sanders, D.A. and McCormick, F. (1991). The GTPase superfamily: conserved structure and molecular mechanisms. *Nature* **349**, 117-127.
- Bruns, R. F., Daly, J. V. and Snyder, S. H. (1980). Adenosine receptors in brain membranes: binding of N6-cyclohexyl-[³H]adenosine and 1,3-diethyl-8-[³H]phenylxanthine. *Proc. Natl. Acad. Sci. U.S.A.* **77**, 5547-5551.
- Bruns, R. F., (1981). Adenosine antagonism by purines, pteridines and denzopteridines in human fibroblasts. *Biochem. Pharmacol.* **30**, 325-333.

Bruns, R. F., Lu, G. H. and Pugsley, T. A. (1986). Characterization of the A₂ adenosine receptor labeled by [³H]NECA in rat striatal membranes. *Mol. Pharmacol.* **29**, 331-346.

Bruns, R. F. (1988). En "Role of Adenosine in Cerebral Metabolism and Blood Flow" pp. 57-80, (Eds. V. Stefanovich and I. Okyayuz-Baklouti). VSP BV, Utrecht.

Burgoyne, R.D. (1984). Mechanism of secretion from adrenal chromaffin cells. *Biochim. Biophys. Acta* **779**, 201-216.

Burnstock, G., Campbell, G., Satchell, D.G. and Smythe, A. (1970). Evidence that adenosine triphosphate or a related nucleotide is the transmitter substance released by non-adrenergic inhibitory nerves in gut. *Br. J. Pharmacol.* **40**, 668-688.

Burnstock, G. (1972). Purinergic nerves. *Pharmacol. Rev.* **24**, 509-581.

Burnstock, G. (1976). Purinergic receptors. *J. Theor. Biol.* **62**, 491-503.

Burnstock, G. (1978). En "Cell Membrane Receptors for Drugs and Hormones. A Multidisciplinary Approach" pp. 107-118 (Eds. R. W. Straub and L. Bolis). Raven Press, New York.

Burnstock, G. and Buckley, N.J. (1985). The classification of receptors for adenosine and adenine nucleotides. In *Methods in Pharmacology*, vol. 6, ed. by Paton M., Chapter 11, pp. 193-212, Plenum Publishing Corporation New York.

Callebaut, C., Krust, B., Jacotot, E. and Hovanessian, A. G. (1993). T-cell activation antigen, CD26, as a cofactor for entry of HIV in CD4⁺ cells. *Science*. **262**, 2045-2050.

Campbell, P.T., Hnatowich, M., O'Dowd, B.F., Caron, M.G., Lefkowitz, R.J. and Hausdorff, W.P. (1991). Mutations of the human β₂-adrenergic receptor that impair coupling to G_s interfere with receptor down regulation but not sequestration. *Mol. Pharmacol.* **39**, 192-198.

Carozzi, A., Camps, M., Gierschik, P. and Parker, P.J. (1993). Activation of phosphatidyl-inositon lipid-specific phospholipase C-β3 by G-protein β/γ subunits. *FEBS Lett.* **315**, 340-342.

Carruthers, A. (1990). Facilitated diffusion of glucose. *Physiol. Rev.* **70**, 1135-1176.

Carruthers, A. M. and Fozard, R. F. (1993a). Effect of pertussis toxin treatment on the putative adenosine A₃ receptor-mediated hypotensive response in the rat. *Eur. J. Pharmacol.* **250**, 185-188.

Carruthers, A. M. and Fozard, R. F. (1993b). Adenosine A₃ receptors. Two into one won't go. *Trends Pharmacol. Sci.* **14**, 290-291.

Carruthers, A. M. and Fozard, R. F. (1994). Carruthers and Fozard reply. *Trends Pharmacol. Sci.* **15**, 14.

Carson, D.A., Kaye, J. and Seegmiller, J.E. (1987). Lymphospecific toxicity in adenosine deaminase deficiency and purine nucleoside phosphorylase deficiency: possible role of nucleoside kinase(s). *Proc. Natl. Acad. Sci. U.S.A.* **74**, 5677-5681.

Casadó, V., Cantí, C., Mallol, J., Canela E. I., Lluís, C. and Franco, R. (1990). Solubilization of A₁ adenosine receptors from pig brain. characterization and evidence of the role of the cell membrane on the coexistence of high- and low-affinity states. *J. Neurosci. Res.* **26**, 461-473.

Casadó, V., Mallol, J., Canela, E. I., Lluís, C. and Franco, R. (1991). Effect of phospholipases and proteases on the [³H]R-PIA binding to adenosine A₁ receptors from pig cerebral cortex. *J. Cell. Biochem.* **47**, 278-288

Casadó, V., Casillas, T., Mallol, J., Canela, E. I., Lluis, C. and Franco, R. (1992). The adenosine receptors present on the plasma membrane of chromaffin are of the A_{2b} subtype. *J. Neurochem.* **59**, 425-431.

Casey, P. J. and Gilman, A.G. (1988). G protein involvement in receptor-effector coupling. *J. Biol. Chem.* **263**, 2577-2580.

Casey, P. J. (1994). Lipid modifications of G proteins. *Current Opinion in Cell Biol.* **6**, 219-225.

Casillas, T., Delicado, E. G. and Miras-Portugal, M. T. (1993). Adenosine-5'-triphosphate modulation of nitrobenzylthioinosine binding sites in plasma membranes of bovine chromaffin cells. *Neuro. Lett.* **164**, 51-54.

Chang, Z., Nygaard, P., Chinault, A. C. and Kellems, R. E. (1991). Dduced aminoacid sequence of E. coli adenosine deaminase reveals evolutionary conserved aminoacids residues: Implication for catalytic function. *Biochemistry.* **30**, 2273-2280.

Choca, J. I., Kwatra, M. M., Hosey, M. M. and Green, R. D. (1985). Specific photoaffinity labeling of inhibitory adenosine receptors. *Biochem. Biophys. Res. Commun.* **131**, 115-121.

Chottiner, E. G., Cloft, H. J., Tartaglia, A. P. and Mitchel, B. S. (1987). Elevated adenosine deaminase activity and hereditary hemolytic anemia. *J. Clin. Inves.* **79**, 1001-1005.

Christensen, L. D., Svenson, M., Nygaard, P., Andersen, V. and Faber, V. (1991). Decreased B lymphocyte ecto-5'-nucleotidase and increased adenosine deaminase in mononuclear cells from patients with human immunodeficiency virus. *APMIS.* **96**, 882-888.

Clanahan, A.S., Johns, A. and Paton, D.M. (1977). Presynaptic inhibitory actions of adenine nucleotides and adenosine on neurotransmission in the rat vas deferens. *Neuroscience* **2**, 597-602.

Collison, A.R., Peuhkurinen, K.J. and Lowenstein, J.M. (1987). Regulation and function of 5'-nucleotidases. In *Topics and perspectives in adenosine research.* (Gerlach, E. and Becker, B.F., eds.) 133-144. Springer-Verlag, Berlin.

Conklin, B.R. and Bourne, H.R. (1993). Structural elements of G_s subunits that interactwith G_{βγ},

receptors, and effectors. *Cell* **73**, 631-641.

Cooper, D. M. F. and Caldwell, K. K. (1990). Signal transduction mechanisms for adenosine. En "Adenosine and adenosine receptors". pp 105-141 (Ed. M. Williams). The Humana Press Inc.

Cornfield, L. J., Hu, S., Hurt, S. D. and Sills, M. A. (1992). [³H]2-phenylaminoadenosine (³H]CV18080) labels a novel adenosine receptor in rat brain. *J. Pharmacol. Exp. Ther.* **263**, 552-561.

Crawford, C. R. and Belt, J. A. (1991). Sodium-dependent, concentrative nucleoside transport in Walker 256 rat carcinosarcoma cells. *Biochem. Biophys. Res. Commun.* **175**, 846-851.

Creagen, R.P., Tischfield, J.A., Nichols, E.A. and Ruddle, F.H. (1974). Autosomal assignment of gene for the form of adenosine deaminase which is deficient in patients with combined immunodeficiency syndrome. *Lancet* **2**, 1449.

Cronstein, B.N., Daguma, L., Nichols, D., Hutchinson, A.J. and Williams, M. (1990). The adenosine/neutrophil paradox resolved: Human neutrophils possess both A₁ and A₂ receptors that promote chemotaxis and inhibit O₂⁻ generation, respectively. *J. Clin. Invest.* **85**, 1150-1157.

Cusack, N.J. and Hourani, S.M.O. (1981). 5'-N-Ethylcarboxamidoadenosine: A potent inhibitor of human platelet aggregation. *Br. J. Pharmacol.* **72**, 443-447.

Cusack, N.J. (1993). P₂ receptor: subclassification and structure-activity relationships. *Drug. Dev. Res.* **28**, 244-252.

Daddona, P. E. and Kelley, W. N. (1978). Human adenosine deaminase. Binding protein. Assay, purification and properties. *J. Biol. Chem.* **253**, 4617-4623.

Daddona, P. E., Shewach, D. S., Kelley, W. N., Argos, P., Markham, A. F. and Orkin, S. H. (1984). Human adenosine deaminase: cDNA and complete primary amino acid sequence. *J. Biol. Chem.* **259**, 12101-12106.

Dagnino, L., Bennett, L.L. and Paterson, A.R.P. (1991). Sodium dependent nucleoside transport in mouse leukemia L1210 cells. *J. Biol. Chem.* **266**, 6308-6311.

Daly, J. W., Butts-Lamp, P and Padgett, W. (1983). Subclasses of adenosine receptors in the central nervous system. Interaction with caffeine and related methylxanthines. *Cell. Mol. Neurobiol.* **3**, 69-80.

Dalziel, H.H. and Westfall, D.P. (1994). Receptors for adenine nucleotides and nucleosides: subdivision, distribution, and molecular characterization. *Pharmacological Reviews* **46**, 449-466.

Darmoul, D., Lacasa, M., Baricault, L., Marguet, D., Sapin, C., Trotot, P., Barbat, A. and Trugnan, G. (1992). Dipeptidyl Peptidase IV (CD26) gene-expression in enterocyte-like colon cancer cell-lines HT-29 and Caco-2. Cloning of the complete human coding sequence and changes

of Dipeptidyl Peptidase IV messenger-RNA levels during cell differentiation. *J. Biol. Chem.* **267**, 4824-4833.

De Gubareff, T. and Sleator Jr, W. (1965). Effects of caffeine on mammalian atrial muscle, and its interaction with adenosine and calcium. *J. Pharmacol. Exp. Ther.* **148**, 202-214.

De La Haba, G. and Cantoni, G.L. (1959). The enzymatic synthesis of S-adenosyl-L-homocysteine from adenosine and homocysteine. *J. Biol. Chem.* **234**, 603-608.

De Meester, I., Vanham, G., Kestens, L., Vanhoof, G., Bosmans, E., Gigase, P. and Scharpé, S. (1994). Binding of adenosine deaminase to the lymphocyte surface via CD26. *Eur. J. Immunol.* **24**, 566-570.

Delicado, E.G., Rodrigues, A., Sen, R.P., Sebastiao, A.M., Ribeiro, J.A. and Miras-Portugal, M.T.(1990). Effect of 5'-(N-Etulcarboxamido)adenosine on adenosine transport in cultured chromaffin cells. *J. Neurochem.* **54**, 1941-1946.

Delicado, E. G., Sen, R. P. and Miras-Portugal, M. T. (1991). Effects of forbol esters and secretagogues on nitrobenzylthioinosine binding to nucleoside transporters and nucleoside uptake in cultured chromaffin cell. *Biochem. J.* **279**, 651-655.

Dillman, R. O. (1994). A new chemotherapeutic agent: deoxycoformycin (pentostatin). *Seminars in Hematology*. **1**, 16-27.

Doherty, A. J. and Jarvis, S. M. (1993). Na⁺-dependent and -independent uridine uptake in a established renal epithelial cell line, OK, from the opossum kidney. *Biochim. Biophys. Acta.* **1147**, 214-222.

Dohlman, H. G., Caron, M. G., Deblasi, A., Frielle, T. and Lefkowitz, R. J. (1990). Role of extracellular disulfide-bonded cysteines in the ligand binding function of the β₂-adrenergic receptor. *Biochemistry* **29**, 2335-2342.

Dohlman, H. G., Thorner, J., Caron, M. G. and Lefkowitz, R. J. (1991). Models system for the study of seven-tansmembrane-segments receptors. *Annu. Rev. Biochem.* **60**, 653-659.

Dolphin, A.C., Forda, S.R. and Scott, R.H. (1986). Calcium-dependent currents in cultured rat dorsal root ganglion neurones are inhibited by an adenosine analogue. *J. Physiol.* **373**, 47-61.

Dragunow, M., Murphy, K., Leslie, R. A. and Robertson, H. A. (1988). Localization of A₁ adenosine receptors to the terminals of the perforant path. *Brain Res.* **46**, 252-257.

Drinnan, S.L., Hope, B.T., Snutch, T.P. and Vincent, S.R. (1991). G_{olf} in basal ganglia. *Mol. Cell. Neurosci.* **2**, 66-70.

Drury, A. N. and Szent-Györgyi, A. (1929). The physiological activity of adenine compounds with special reference to their action upon the mammalian heart. *J. Physiol.* **68**, 213-237.

Dubyak, R.G. and Fedan, J.S. (eds.) (1990). Biological actions of extracellular ATP. Annals of the New York Academy of Sciences, vol. 603.

Dunwiddie, T. V. and Worth, T. (1982). Sedative and anticonvulsant actions of adenosine analogs in mouse and rat. *J. Pharmacol. Exp. Ther.* **220**, 70-76.

Ebert, R. and Schwabe, U. (1973). Studies on the antilipolytic effect of adenosine and related compounds in isolated fat cells. *Naunyn-Schmiedeberg's Arch. Pharmacol.* **278**, 247-259.

Edwards, F. A., Gibb, A. J. and Colquhoun, D. (1992). ATP-receptor-mediated synaptic currents in the central nervous system. *Nature* **359**, 144-147.

Elgavish, A. and Elgavish, G. A. (1985). Evidence for the presence of an ATP transport system in brush-border membrane vesicles isolated from the kidney cortex. *Biochim. Biophys. Acta.* **812**, 595-599.

Evans, D. B., Schenden, J. A. and Bristol, J. A. (1982). Adenosine receptors mediating cardiac depression. *Life Sci.* **31**, 2425-2432.

Fain, J.N. (1973). Inhibition of adenosine cyclic 3',5'-monophosphate accumulation in fat cells by adenosine, N⁶-(phenylisopropyl) adenosine and related compounds. *Mol. Pharmacol.* **9**, 595-604.

Federman, A.D., Conklin, B.R., Schrader, K.A., Reed, R.R. and Bourne, H.R. (1992). Hormonal stimulation of adenylyl cyclase through G_i-protein β/γ subunits. *Nature* **356**, 159-161.

Fideu, M. D. and Miras-Portugal, M. T. (1992). Long term regulation of nucleoside transport by thyroid hormone (T3) in cultured chromaffin cells. *Neurochem. Res.* **17**, 1099-1104.

Fideu, M. D. and Miras-Portugal, M. T. (1993). Steroid-induced inhibition of adenosine transport in cultured chromaffin cells. *Cell. Mol. Neurobiol.* **13**, 493-501.

Fong, H.K., Hurley, J.B., Hopkins, R.S., Miake-Lye, R., Johnson, M.S., Doolittle, R.F. and Simon, M.I. (1986). Repetitive segmental structure of the transducin β subunit: Homology with the *CDC4* gene and identification of related mRNAs. *Proc. Natl. Acad. Sci. U.S.A.* **83**, 2162-2166.

Fonoll, C., Canela, E. I. and Bozal, J. (1982). Characterization of the forms of bovine liver adenosine deaminase. *Int. J. Biochem.* **14**, 679-683.

Formeister, J. F. and Tristch, G. L. (1976). Adenosine deaminase levels in blood type A patients with metastatic tumor. *Surgery*. **79**, 111-117.

Forsyth, K.M., Bjur, R.A. and Westfall, D.P. (1991). Nucleotide modulation of norepinephrine release from sympathetic nerves in the rat vas deferens. *J. Pharmacol. Exp. Ther.* **256**, 831-826.

Frame, L. T.. Yeung, S. M. H., Venter, J. C. and Cooper, D. M. F. (1986). Target size of the adenosine A₁ receptor. *Biochem. J.* **235**, 621-624.

- Franco, M., Bell, P. D. and Navar, L. G. (1989). Effect of adenosine A₁ analogues on tubuloglomerular feedback mechanism. *Am. J. Physiol.* **257**, F231-F236.
- Franco, R., Canela, E. I. and Bozal, J. (1986a). Enzymes of the purine metabolism in rat brain microsomes. *Neurochem. Res.* **11**, 407-422.
- Franco, R., Canela, E. I. and Bozal, J. (1986b). Heterogeneous localization of some purine enzymes in subcellular fractions of rat brain and cerebellum. *Neurochem. Res.* **11**, 423-435.
- Franco, R., Hoyle, C. H. V., Centelles, J. J. and Burnstock, G. (1988). Degradation of adenosine by extracellular adenosine deaminase in the rat duodenum source. *Gen. Pharmacol.* **19**, 679-681.
- Franco, R., Aran, J. M., Colomer, D., Matutes, E. and Vives-Corrons, J. L. (1990a). Association of adenosine deaminase with erythrocyte and platelet plasma membrane. *J. Histochem. Cytochem.* **38**, 653-658.
- Franco, R., Centelles, J. J. and Kinne, R. K. H. (1990b). Further characterization of adenosine transport in renal brush-border membranes. *Biochim. Biophys. Acta.* **1024**, 241-248.
- Franco, R. (1991). New possibilities in the therapy of immunodeficiency diseases. *Immunol. Lett.* **29**, 277-280.
- Fredholm, B. B., Fried, G. and Hedqvist, P. (1982). Origin of adenosine released from rat vas deferens by nerve stimulation. *Eur. J. Pharmacol.* **79**, 233-243.
- Fredholm, B. B. and Dunwiddie, T. V. (1988b). Subtypes of adenosine receptors. *Trends Pharmacol. Sci.* **9**, 280.
- Freissmuth, M., Casey, P.J. and Gilman, A.G. (1989). G proteins control diverse pathways of transmembrane signalling. *FASEB J.* **3**, 2125-2131.
- Freissmuth, M., Schutz, W. and Linder, M. (1991). Interactions of bovine brain A₁-adenosine receptor with recombinant protein a subunits. Selectivity for rG_{iα-3}. *J. Biol. Chem.* **266**, 17778-17783.
- Frick, L., Wolfenden, L., Smal, E. and Baker, D. C. (1986). Transition-state stabilization by adenosine: structural studies of its inhibitory complex with deoxycoformycin. *Biochemistry.* **25**, 1616-1621.
- Fuder, H., Brink, A., Meincke, M. and Tauber, U. (1992). Purinoreceptor-mediated modulation by endogenous and exogenous agonist of stimulated-evoked [³H]-noradrenaline release on rat iris. *Naunyn-Scheideberg's Arch. Pharmacol.* **345**, 471-423.
- Fukamauchi, F., Hough, C. and Chuang, D.M. (1991). Agonist induced an antagonist induced modulation of M₂ muscarinic and M₃-muscarinic cholinergic receptor messenger RNA in cultured cerebellar neurons. *FASEB J.* **5**, A512-A512.

Furlong, T.J., Pierce, K.D., Selbie, L.A. and Shine, J. (1992). Molecular characterization of human brain adenosine A₂ receptor. *Mol. Brain. Res.* **15**, 62-66.

Gagne, D., Homo, F. and Duval, D. (1980). Steroid-induced inhibition of nucleoside uptake in isolated mouse thymocytes. *Biochim. Biophys. Acta.* **603**, 27-35.

Gati, W. P., Belt, J. A., Jakobs, E. S., Jarvis, S. M., Paterson, A. R. P. and Young, J. D. (1986). Photoaffinity-labeling of a nitrobenzylthioinosine-binding polypeptide from cultured Novikoff hepatoma cells. *Biochem. J.* **236**, 665-670.

Gautam, N., Baetscher, M., Aebersold, R. and Simon, M.I. (1989). A G protein γ -subunit shares homology with ras proteins *Science* **244**, 972-974.

Gavish, M., Goodman, R. R. and Snyder, S. H. (1982). Solubilized adenosine receptors in the brain, regulation by guanine-nucleotides. *Science*. **215**, 1633-1635.

Geiger, J. D., LaBella, F. S. and Nagy, J. I. (1985). Characterization of nitrobenzylthioinosine binding to nucleoside transport sites selective for adenosine in rat brain. *J. Neurosci.* **5**, 735-740.

Geiger, J. D. and Nagy, J. I. (1986). Distribution of adenosine deaminase activity in rat brain and spinal cord. *J. Neurosci.* **6**, 2707-2714.

Geiger, J.D. and Fyda, D.M. (1991). Adenosine transport in nervous system tissues. In *Adenosine in the nervous system*. (Stone, T., ed) 1-24. Academic Press, London.

Gerlach, E., Deuticke, B. and Dreisbach, R.H. (1963). Nucleotid-abbau in herzmuskel bei austoffmangel und seine mögliche bedeutung fur die coronar durch blutung. *Naturwissenschaft*. **50**, 228-229.

Gerwins, P., Nordstedt, C. and Fredholm, B.B. (1990). Characterization of adenosine A₁ receptors in intact DDT₁MF-2 smooth muscle cells. *Mol. Pharmacol.* **38**, 660-666.

Gerwins, P. and Fredholm, B.B. (1992). Stimulation of A₁ adenosine receptors and bradykinin receptors, which act via different G proteins, synergistically raises inositol 1,4,5-triphosphate and intracellular free calcium in DDT₁MF-2 smooth muscle cells. *Proc. Natl. Acad. Sci. U.S.A.* **89**, 7330-7334.

Giblett, E. R., Anderson, J. E., Cohen, F., Pollara, B. and Meuwissen, H. J. (1972). Adenosine deaminase deficiency in two patients with severely impaired cellular immunity. *Lancet.* **2**, 1067-1069.

Gierschik, P. (1992). ADP-ribosylation of signal-transducing guanine nucleotide-binding proteins by pertussis toxin. *Curr. Topics Microbiol. Immunol.* **175**, 69-96.

Gilman, A.G. (1984). G proteins and dual control of adenylylate cyclase. *Cell* **36**, 577-579.

Gilman, A.G. (1987). G proteins: Transducer of receptor-generated signals. *Ann. Rev. Biochem.*

56, 615-649.

Ginsborg, B. L. and Hirst, G. D. S. (1972). The effect of adenosine on the release of transmitter from the phrenic nerve of the rat. *J. Physiol.* **224**, 629-645.

Glavin, G.B., Westerberg, V.S. and Geiger, J.D. (1987). Modulation of gastric acid secretion by adenosine in conscious rats. *Can. J. Physiol. Pharmacol.* **65**, 1182-1185.

Glowa, J.R. and Spealman, R.D. (1984). Behavioral effects of caffeine, N⁶-(L-Phenylisopropyl) adenosine and their combination in the Squirrel Monkey. *J. Pharmacol. Exp. Therap.* **231**, 665-670.

Gold, M.S., Pottash, A.C., Sweeney, D.R. and Kleber, H.D. (1980). Opiate withdrawal using clonidine. A safe, effective and rapid nonopiate treatment. *J. Am. Med. Assoc.* **243**, 343-346.

Gordon, J.L. (1986). Extracellular STP. effects, sources and fate. *Biochem. J.* **233**, 309-319.

Gould, G.W. and Holman, G.D. (1993). The glucose transporter family. structure, function and tissue specific expression. *Biochem. J.* **295**, 193-205.

Green, H.N. and Stoner, H.B. (1950). Biological actions of the adenine nucleotides. *H.K. Lewis and Co. Ltd, London.* 1-221.

Griffith, D. A., Doherty, A. J. and Jarvis, S. M. (1992). Nucleoside transport in cultured LLC-PK₁ epithelia. *Biochim. Biophys. Acta.* **1106**, 303-310.

Gustafsson, L.E., Wiklund, C.U., Wicklund, N.P. and Stelius, L. (1990). Subclassification of neuronal adenosine receptors. In *Purines in Cellular Signalling: Targets for New Drugs*. ed. by Jacobson, K.A., Daly, J.W. and Manganiello, V. pp. 200-205, Springer-Verlag, New York.

Hadcock, J.R. and Malbon, C.C. (1988). Down regulation of β-adrenergic receptors. agonist induced reduction in receptor messenger RNA levels. *Proc. Natl. Acad. Sci. USA* **85**, 5021-5025.

Hadcock, J.R., Ros, M. and Malbon, C.C. (1989a). Agonist regulation of β-adrenergic receptor messenger RNA. Analysis in S49 mouse lymphoma mutants. *J. Biol. Chem.* **264**, 13956-13961.

Hadcock, J.R., Wang, H. and Malbon, C.C. (1989). Agonist induced destabilization of β-adrenergic receptor messenger RNA. Attenuation of glucocorticoid induced up-regulation of β-adrenergic receptors. *J. Biol. Chem.* **264**, 19928-19933.

Haga, K. and Haga, T. (1990). Dual regulation by G-proteins of agonist-dependent phosphorylation of muscarinic acetylcholine receptors. *FEBS Lett.* **268**, 43-47.

Haga, K. and Haga, T. (1992). Activation by G-protein βγ-subunits of agonist dependent or light dependent phosphorylation of muscarinic acetylcholine receptors and rhodopsin. *J. Biol. Chem.* **267**, 2222-2227.

Hammond, R. & Johnstone R. M. (1989). Solubilization and reconstitution of a nucleoside transport system from Erlich-ascites-tumor cells. *Biochem. J.* **262**, 109-118.

Harden, T.K., Cotton, C.V., Waldo, G.L., Lutton, J.K. and Perkins, J.P. (1980). Catecholamine induced alteration in sedimentation behavoir of membrane bound β -adrenergic receptors. *Science* **210**, 441-443.

Harden, T.K. (1983). Agonist-induced desensitization of the β -adrenergic receptor linked adenylate cyclase. *Pharmacol. Rev.* **35**, 5-32.

Haslam, R. J., Davidson, M. L. and Desjardins, J. W. (1978). Inhibition adenylate cyclase by adenosine analogs in preparations of broken and intact human platelets. Evidence for unidirectional control of platelet function by cyclic AMP. *Biochem. J.* **176**, 83-95.

Haslam, R. J. and Cuxack, N.J. (1981). Blood platelet receptors for ADP and for adenosine. In *Purinergic receptors*. (Burnstock, G., ed.) 221-285. Chapman and Hall, London.

Hausdorff, W.P., Bouvier, M., O'Dowd, B.F., Irons, G.P., J. L., Caron, M. G. and Lefkowitz, R. J. (1989). Phosphorylation sites on two domains of the β_2 -adrenergic receptor are involved in distinct pathways of receptor desensitization. *J. Biol. Chem.* **264**, 12657-12665.

Heaton, T. P. and Clanachan, A. S. (1987). Nucleoside transport in guinea pig myocytes; comparison of the affinities and transport velocities for adenosine and 2-chloroadenosine. *Biochem. Pharmacol.* **36**, 1275-1280.

Hebert, D. N. and Carruthers, A. (1986). Direct evidence for ATP modulation of sugar transport in human erythrocyte ghosts. *J. Biol. Chem.* **261**, 10093-10099.

Hedqvist, P., Fredholm, B. B. and Olundh, S. (1978). Antagonistic effects of theophylline and adenosine on adrenergic neuroeffector transmission in rabbit kidney. *Circ. Res.* **43**, 592-598.

Hepler, J. R. and Gilman, A. G. (1992). G proteins. *Trends Biochem. Sci.* **17**, 383-387.

Sternweis, P. C. and Gilman A. G. (1982) Aluminium. A requirement for activation of the regulatory component of adenylate cyclase by fluoride. *Proc. Natl. Acad. Sci. U.S.A.* **79**, 4888-4891.

Hermans, E., Gailly, P., Octave, J.N. and Maloteaux, J.M. (1994). Rapid desensitization of agonist-induced calcium mobilization in transfected PC12 cells expressing the rat neurotensin receptor. *Biochem. Biophys. Res. Com.* **198**, 400-407.

Hershfield, M.S. and Kredich, N.M. (1978). S-adenosylhomocysteine hydrolase is an adenosine-binding protein. a target for adenosine toxicity. *Science*. **202**, 757-760.

Hertel, C., Coulter, S.J. and Perkins, J.P. (1986). The involvement of cellular ATP in receptor mediated internalization of epidermal growth factor and hormone induced internalization of β -adrenergic receptors. *J. Biol. Chem.* **261**, 5974-5980.

Higgins, L.S. and Berg, D.K. (1988). Cyclic AMP dependent mechanism regulates acetylcholine receptor function on bovine adrenal chromaffin cells and discriminates between new and old receptors. *J. Cell. Biol.* **107**, 1157-1165.

Hikita, T., Bader, M.F. and Trifaró, J.M. (1984). Adrenal chromaffin cell calmodulin. its subcellular distribution and binding to chromaffin granule membrane proteins. *J. Neurochem.* **43**, 1087-1089.

Hirschhorn, R., Levytska, V., Pollara, B. and Meuwissen, H. J. (1973). Evidence for control of several different tissue-specific isozymes of adenosine deaminase by a single genetic locus. *Nature New Biol.* **246**, 200-202.

Hirschhorn, R. (1975). Conversion of human erythrocyte adenosine deaminase activity to different tissue-specific to isozymes. *J. Clin. Invest.* **55**, 661-667.

Hirschhorn, R., Ellenbogen, A. and Tzall, S. (1992). Five missense mutations at the adenosine deaminase locus (ADA) detected by altered restriction fragments and their frequency in ADA-patients with severe combined immunodeficiency (ADA-SCID). *Nature New Biol.* **246**, 200-202.

Hourani, S.M.O., Cussack, N.J. and Welfors, L.A. (1985). L-AMP-PCP, an ATP receptor agonist in guinea pig Blader, is inactive on taenia coli. *Eur. J. Pharmacol.* **108**, 197-200.

Holton, F.A. and Holton, P. (1954). The capillary dilator substances in dry powders of spinal roots. a possible role of ATP in chemical transmission from nerve endings. *J. Physiol.* **126**, 124-140.

Huang, Q.Q., Harvey, C.M., Paterson, A.R.P., Cass, C.E. and Young, J.D. (1993). Functional expression of Na⁺ dependent nucleoside transport systems of intestine in isolated oocytes of xenopus laevis. Demonstration that rat jejunum expresses the purine selective system N1 (*cif*) and a second novel system N3 having broad specificity for purine and pyrimidine nucleosides. *J. Biol. Chem.* **268**, 20613-20619.

Huang, Q.Q., Yao, S.Y.M., Ritzel, M.W.L., Paterson, A.R.P., Cass, c.E. and Young, J.D. (1994). Clonning and functional expression of a complementary DNA encoding a mammalian nucleoside transport protein. *J. Biol. Chem.* **269**, 17757-17760.

Husted, S.E. and Nedergaarg, O.A. (1981). Inhibition of adrenergic neuroeffector transmission in rabbit main pulmonary artery and aorta by adenosine and adenine nucleotides. *Acta Pharmacol. Toxicol.* **49**, 334-353.

Hutchinson, A.J., Williams, M., De Jesus, R., Yokoyama, R., Oei, H.H., Ghai, G.R., Webb, R.L., Zoganas, H.C., Stone, G.A. and Jarvis, M.F. (1990). 2-(Arylalkylamino)adenosin-5'-uronamides. a new class of highly selective adenosine A₂ receptor ligands. *J. Med. Chem.* **33**, 1919-1924.

Imai, S. and Nakazawa, M. (eds.) (1991). Role of adenosine and adenine nucleotides in the biological system. Elsevier science publishers BV, Amsterdam, The Netherlands.

Ivins, K.J. and Molinoff, P.B. (1991). Desensitization and down-regulation of 5-HT₂ receptors in P11 cells. *J. Pharmacol. Exp. Ther.* **259**, 423-429.

Izzo, N.J., Seidmann, C.E., Collins, S. and Colucci, W.S. (1990). α_1 -adrenergic receptor messenger RNA level is regulated by norepinephrine in rabbit aortic smooth muscle cells. *Proc. Natl. Acad. Sci. USA* **87**, 6268-6271.

Jacobson, K. A., Kirk, K. L., Padgett, W. L. and Daly, J. W. (1985). Functionalized congeners of 1,3-dialkylxanthines. Preparation of analogs with high affinity for adenosine receptors. *J. Med. Chem.* **28**, 1334-1340.

Jacobson, K. A., Trivedi, B.K., Churchill, P.C. and Williams, M. (1991). Novel therapeutics acting via purine receptors. *Biochem. Pharmacol.* **41**, 1399-1410.

Jacobson, K. A., Van Galen, P. J. M. and Williams M. (1992). Adenosine receptors. Pharmacology, structure-activity relationships, and therapeutic potential. *J. Med. Chem.* **35**, 407-422.

Jakobs, E.S. and Paterson, A.R.P. (1986). Sodium dependent concentrative nucleoside transport in cultured intestinal epithelial cells. *Biochem. Biophys. Res. Com.* **140**, 1028-1035.

James, D. E., Hiken, J. and Lawrence, J. C. (1989). Isoproterenol stimulates phosphorylation of the insulin-regulable glucose transporter in rat adipocytes. *Proc. Natl. Acad. Sci. U.S.A.* **86**, 8368-8372.

Jarvis, S. M. and Young, J. D. (1980). Nucleoside transport in human and sheep erythrocytes; evidence that nitrobenzylthioinosine binds specifically to functional nucleoside transport sites. *Biochem. J.* **190**, 377-383.

Jarvis, S. M. and Young, J. D. (1981). Extraction and partial purification of the nucleoside-transport system from human erythrocytes based on the assay of nitrobenzylthioinosine-binding activity. *Biochem. J.* **194**, 331-339.

Jarvis, S. M., Janmohamed, S. N. and Young, J. D. (1983). Kinetics of nitrobenzylthioinosine binding to the human erythrocyte nucleoside transporter. *Biochem. J.* **216**, 661-667.

Jarvis, S. M., Ellory, J. C. and Young, J. D. (1984). Radiation inactivation of the human erythrocyte nucleoside and glucose transporters. *Biochim. Biophys. Acta.* **855**, 312-315.

Jarvis, S. M. and Martin, B. W. (1986). Effects of temperature on the transport of nucleosides in guinea pig erythrocytes. *Can. J. Physiol. Pharmacol.* **13**, 320-325.

Jarvis, S. M. (1989). Characterization of sodium dependent nucleoside transport in rabbit intestinal Brush-border membrane-vesicles. *Biochim. Biophys. Acta.* **979**, 132-138.

Jelsema, C.L. and Axelrod, J. (1987). Stimulation of phospholipase A₂ activity in bovine rod outer segments by the β,γ -subunits of transducin and its inhibitor by the α -subunit. *Proc. Natl. Acad. Sci.*

U.S.A. **84**, 3623-3627.

Johnson, H.G., McNee, M.L. and Johnson, M.A. (1985). Secretagogue action of adenosine in the *in vivo* canine tracheal mucus model. *Int. J. Immunopharmac.* **7**, 159-163.

Johnson, R.A. and Shoshani, I. (1990). Kinetics of "P"-site-mediated inhibition of adenylyl cyclase and requirement for substrate. *J. Biol. Chem.* **265**, 11595-11600.

Kameoka, J., Tanaka, T., Nojima, Y., Schlossman, S. F. and Morimoto, C. (1993). Direct association of adenosine deaminase with a T cell activation antigen, CD26. *Science*. **261**, 466-473.

Kakiuchi, S., Rall, T.W. and McIlwain, H. (1968). The effect of electrical stimulation upon the accumulation of 3', 5'-phosphate in isolated cerebral tissue. *J. Neurochem.* **16**, 485-491.

Karnik, S. S., Sakmar, T. P., Chen, H. B. and Khorana, H. G. (1988). Cysteine residue 110 and residue 187 are essential for the formation of correct structure of rhodopsin. *Proc. Natl. Acad. Sci. U.S.A.* **85**, 8459-8463.

Kaziro, Y., Itoh, H., Kozasa, T., Nakafuku, M. and Satoh, T. (1991). Structure and function of signal-transducing GTP-binding proteins. *Annu. Rev. Biochem.* **60**, 349.

Kellem, R. E., Yeung, C. Y. and Ingolia, D. E. (1985). Adenosine deaminase deficiency and severe combined immunodeficiencies. *Trends. Genet.* **1**, 278-283.

Kikkawa, S., Takahashi, K., Takahashi, K., Shimada, N., Ui, M., Kimura, N. and Katada, T. (1990). Conversion of GDP into GTP by nucleoside diphosphate kinase on the GTP-binding proteins. *J. Biol. Chem.* **265**, 21536-21540.

Kim, D., Lewis, D.L., Graziadei, L., Neer, E.J., Bar-Sagi, D. and Clapham, D.E. (1989). G-protein β/γ -subunits activate the cardiac muscarinic K^+ -channel via phospholipase A₂. *Nature* **337**, 557-560.

Kleuss, C., Scherubl, H., Hescheler, J., Schultz, G. and Wittig, B. (1992). Different β -subunits determine G-protein interaction with transmembrane receptors. *Nature* **358**, 424-426.

Klotz, K. N., Cristalli, G., Grifantini, M., Vittori, S. and Lohse, M. J. (1985). Photoaffinity labeling of A₁ adenosine receptors. *J. Biol. Chem.* **260**, 14659-14664.

Klotz, K. N. and Lohse, M. J. (1986). The glycoprotein nature of A₁ adenosine receptors. *Biochem. Biophys. Res. Commun.* **140**, 406-413.

Klotz, K. N., Lohse, M. J. and Schwabe, U. (1988). Chemical modification of A₁ adenosine receptors in rat brain membranes. Evidence for histidine in different domains of the ligand binding site. *J. Biol. Chem.* **260**, 14659-14663.

Kolassa, N., Pfleger, K. and Tram, M. (1971). Species differences in action and elimination of

adenosine after dipyridamole and hexobendine. *Eur. J. Pharmacol.* **13**, 320-325.

Krzanowski, J.J., Urdaneta-Bohorquez, A., Polson, J.B., Sakamoto, Y. and Szentivanyi, A. (1987). Effects of adenosine and theophylline on canine tracheal smooth muscle tone. *Arch. Int. Pharmacody. Ther.* **287**, 224-236.

Kuan, C. J., Herzer, W. A. and Jackson, E. K. (1993). Cardiovascular and renal effects of blocking A₁ adenosine receptors. *J. Cardiovasc. Pharmacol.* **21**, 822-828.

Kügelgen, I.V., Spath, L. and Starke, K. (1992). Stable adenine nucleotides inhibit [³H]-noradrenaline release in rabbit brain cortex slices by direct action at presynaptic adenosine A₁-receptors. *Naunyn-Schäeideberg's Arch. Pharmacol.* **346**, 187-196.

Kurz, L. C. and Frieden, C. (1983). Adenosine deaminase: solvent isotope and pH effects on the binding of transition-state and ground state analogue inhibitors. *Biochemistry*. **22**, 382-389.

Kurz, L. C., La Zard, D. and Frieden, C. (1985). Changes accompanying formation of enzymatic transition-states. Tryptophan environment in ground-state and transition-state analog complexes of adenosine-deaminase. *Biochemistry*. **24**, 1342-1346.

Kurz, L. C., Weitkamp, E. and Frieden, C. (1987). Adenosine deaminase: viscosity studies and mechanism of binding of substrate and of ground- and transition-state analogue inhibitors. *Biochemistry*. **26**, 3027-3032.

Kwong, F. Y. P., Baldwin, S. A., Scudder, P. R., Jarvis S. M., Choy, M. Y. M. and Young, J. D. (1986). Erythrocyte nucleoside and sugar transport; endo-β-galactosidase and endoglycosidase-F digestion of partially purified human and pig transporters proteins. *Biochem. J.* **240**, 349-356.

Kwong, F. Y. P., Tse, C. M., Jarvis, S. M., Choy, M. Y. M. & Young, D. (1987). Purification and reconstitution studies of the nucleoside transporters from pig erythrocytes. *Biochim. Biophys. Acta*. **904**, 105-116.

Kwong, F.Y.P., Davies, A., Tse, C.M., Young, J.D., Henderson, P.J.E. and Baldwin, S.A. (1988). Purification of the human erythrocyte nucleoside transporter by immunoaffinity chromatography. *Biochem. J.* **255**, 243-249.

Kwong, F. Y. P., Fincham, H. E., Davies, A., Beaumont, N., Henderson, P. J. F., Young, J. D. and Baldwin, S. A. (1992). Mammalian nitrobenzylthioinosine-sensitive nucleoside transport proteins. *J. Biol. Chem.* **276**, 21954-21960.

Kwong, F. Y. P., Wu, J.S.R., Shi, M.M., Fincham, H.E., Davies, A., Henderson, P.J.E., Baldwin, S.A. and Young, J.D. (1993). Enzymic cleavage as a probe of the molecular structures of mammalian equilibrative nucleoside transporters. *J. Biol. Chem.* **268**, 22127-22134.

Landis, C.A., Masters, S.B., Spada, A., Pace, A.M., Bourne, H.R. and Vallar, L. (1989). GTPase inhibiting mutations activate the α chain of G_s and stimulate adenylyl cyclase in human pituitary

tumors. *Nature* **340**, 692-696.

Lasley, R.D., Rhee, J.W., Van Wylen, D.G.L., Mentzer, R.M., Jr. (1990). Adenosine A₁ receptor mediated protection of the globally ischemic isolated rat heart. *J. Mol. Cell. Cardiol.* **22**, 39-47.

Liang, L. and Johnstone, R.M. (1992). Evidence for an internal pool of nucleoside transporters in mammalian reticulocytes. *Biochim. Biophys. Acta* **1106**, 189-196.

Libert, F., Parmentier, M., Lefort, A., Dinsart, C., Sande, J. V., Maenhaut, C., Simons, M. J., Dumont, J. E. and Vassart, G. (1989). Selective amplification and cloning of four new members of the G-protein coupled receptors. *Science* **244**, 569-572.

Libert, F., Schiffmann, S. N., Lefort, A., Parmentier, M., Gérard, C., Dumont, J. E., Vanderhaeghen, J. J. and Vassart, G. (1991). The orphan receptor cDNA RDC7 encodes an A₁ adenosine receptor. *EMBO J.* **10**, 1677-1682.

Lienhard, G. E., Grabb, J. H. and Ransome, K. J. (1984). Endoglycosidase-F cleaves the oligosaccharides from the glucose transporter of the human erythrocytes. *Biochim. Biophys. Acta* **769**, 404-410.

Ligett, S.N., Freedman, N.J., Schwinn, D.A. and Lefkowitz, R.J. (1993). Structural basis for receptor subtype specific regulation revealed by a chimeric β_3/β_2 -adrenergic receptor. *Proc. Natl. Acad. Sci. USA* **90**, 3665-3669.

Linden, J. (1984). Purification and characterization of (-)[I-125] Hydroxyphenyl isopropyladenosine, an adenosine R-site agonist radioligand and theoretical analysis of mixed stereoisomer radioligand binding. *Mol. Pharmacol.* **26**, 414-423.

Linden, J., Earl, C. Q., Patel, A., Craig, R. H. and Daluge S. M. (1987). Agonist and antagonist radioligands and photoaffinity probes for the adenosine A₁ receptor. En "Topics and Perspectives in Adenosine Research". pp. 3-14 (Eds. E. Gerlach and B. F. Becker) Springer-Verlag, Berlin/Heidelberg.

Linden, J., Munshi, R., Daluge, S. M., Arroyo, M. L. and Patel, A. (1989a). The purification in high yield of A₁ adenosine receptors. resolution from guanine nucleotide binding proteins and a 34,000 Da non-receptor polypeptide. En "Role of adenosine and adenine nucleotides in the biological system" pp 91-99. (eds. S. Imai and M. Nakazawa) Elsevier.

Linden, J. (1989b). Adenosine deaminase for removing adenosine: how much is enough?. *Trends Pharmacol. Sci.* **10**, 260-262.

Linden, J. (1991). Structure and function of adenosine A₁ receptors. *FASEB J.* **5**, 2668-2676.

Linden, J., Taylor, H. E., Robeva, A. S., Tucker, A. L., Stehle, J. H., Rivkees, S. A., Fink, J. S. and Reppert, S. M. (1993). Molecular cloning and functional expression of a sheep A₃ adenosine receptor with widespread tissue distribution. *Mol. Pharmacol.* **44**, 524-532.

Linden, J. (1994). En "Basic Neurochemistry. Molecular, Cellular, and Medical Aspects, 5th Ed." pp. 402-416. (Eds. G. J. Siegel et al). Raven Press, New York.

Linder, M.E., Middleton, P., Helper, J.R., Taussig, R., Gilman, A.G. and Mumby, S.M. (1993). Lipid modifications of G proteins: α subunits are palmitoylated. *Proc. Natl. Sci. U.S.A.* **90**, 3675-3679.

Lindner, F. and Rigler, R. (1931). Über die beeinflussung derweita der hertzeranzgefasse durch produkte des zelkern stoffwechsels. *Pflügers. Arch.* **226**, 697-708.

Lochrie, M.A. and Simon, M.I. (1988). G protein multiplicity in eukaryotic signal transduction systems. *Biochemistry* **27**, 4957-4965.

Logothetis, D.E., Kurachi, Y., Galper, J., Neer, E.J. and Clapham, D.E. (1987). The β/γ subunits of GTP-binding proteins activate the muscarinic K⁺ channel in heart. *Nature* **325**, 321-326.

Lohse, M. J., Klotz, K. N., Schwabe, U., Cristalli, G., Vittori, S. and Grifantini, M. (1988a). 2-Chloro-N⁶-cyclopentyladenosine. a highly selective agonist at A₁ adenosine receptors. *Naunyn Scmiedebergs' Arch. Pharmacol.* **337**, 687-689.

Lohse, M. J., Benovic, J.L., Caron, M.G. and Lefkowitz, R.J. (1990). Multiple pathways of rapid β_2 -adrenergic receptor desensitization. delineation with specific inhibitors. *J. Biol. Chem.* **265**, 3202-3209.

Lohse, M.J., Andexinger, S., Pitcher, J., Trukawinski, S., Codina, J., Fraure, J.P., Caron, M.G. and Lefkowitz, R.J. (1992). Receptor specific desensitization with purified proteins kinase dependence and receptor specificity of β -arrestin and arrestin in β_2 -adrenergic receptor and rhodopsin systems. *J. Biol. Chem.* **267**, 8558-8564.

Londos, C. and Wolff, J. (1977). Distinct adenosine-sensitive sites on adenylate cyclase. *Proc. Natl. Acad. Sci. U.S.A.* **74**, 5482-5486.

Londos, C., Cooper, D.M.F. and Wolff, J. (1980). Subclasses of external adenosine receptors. *Proc. Natl. Acad. Sci. USA* **74**, 5482-5486.

Londos, C., Wolff, J. and Cooper, D. M. F. (1983). En "Regulatory Function of Adenosine" pp. 17-32. (Eds. R. M. Berne, T. W. Rall and R. Rubio). Nijhoff, The Hague.

Lorenzen, A., Grün, S., Vogt, H. Schwabe, U. (1992). Identification of a novel high affinity adenosine binding protein from bovine striatum. *Naunyn-Schmiedeberg's Arch. Pharmacol.* **346**, 63-69.

Lupidi, G., Falasca, M., Marmocchi, F., Venardi, G., Cristalli, G. and Riva, F. (1992). Adenosine deaminase from bovine brain: purification and partial characterization. *Biochem. Int.* **26**, 1053-1063.

Lustig, K.D., Shiao, A.K., Brake, A.J. and Julius, D. (1993). Expression cloning of an ATP

receptor from mouse neuroblastome cells. *Proc. Natl. Acad. Sci. U.S.A.* **90**, 5113-5117.

Luthin, D. R. and Linden, J. (1994). Temperature dependent binding of [³H]CV1808, mimicry of "A4" binding in cos cells expressing only recombinant A_{2a} adenosine receptors. *Drug Develop. Res.* **31**, 292.

Maeda, K., Morita, K., Shibata, T., Naito, Y., Suzuki, H. and Mizuno, A. (1990). Increased purine nucleoside phosphorylase and adenosine deaminase activities in oral squamous cell carcinomas in vivo and in vitro. *Biomed. Res.* **11**, 117-124.

Maenhaut, C., Van Sande, J., Libert, F., Abramowicz, M., Parmentier, M., Vanderhaegen, J.-J., Dumont, J.E., Vassart, G. and Schiffman, S. (1990). RDC8 codes for an adenosine A₁ receptor with physiological constitutive activity. *Biochem. Biophys. Res. Commun.* **173**, 1169-1178.

Mahan, L. C., Koachman, A.M. and Insel, P.A. (1985). Genetic analysis of β-adrenergic receptor internalization and down-regulation. *Proc. Natl. Acad. Sci. USA* **82**, 129-133.

Mahan, L. C., McVittie, L. D., Smyk-Randall, E. M., Nakata, H., Monsma, F. J., Gerfen, C. R. and Sibley, D. R. (1991). Cloning and expression of an A₁ adenosine receptor from rat brain. *Mol. Pharmacol.* **40**, 1-7.

Maitre, M., Ciesielski, L., Lehmann, A., Kempf, E. and Mandel, P. (1974). Protective effect of adenosine and nicotinamide against audiogenic seizure. *Biochem. Pharmacol.* **23**, 2807-2816.

Malbon, C. C., George, S. T. and Moxham, C. P. (1978). Characterization of [³H]adenosine binding to fat cell membranes. *Trends Biochem. Sci.* **12**, 172-175.

Maloteaux, J.M. and Hermans, E. (1994). Agonist-induced muscarinic cholinergic receptor internalization, recycling and degradation in cultured neuronal cells. cellular mechanisms and role in desensitization. *Biochem. Pharmacol* **47**, 77-88.

Marangos, P. J. & Deckert, J. (1987). [³H]Dipyridamole binding to guinea pig brain membranes: possible heterogeneity of central adenosine uptake sites. *J. Neurochem.* **48**, 1231-1236.

Margalith, M. and Handler, I. (1991). Adenosine deaminase activity in relation to the appearance of early and late Epstein-Barr virus antigens induced in lymphoblastoid cells. *Mol. Cell. Biochem.* **108**, 99-103.

Marguet, D., Bernard, A. M., Vivier, I., Darmoul, D., Naquet, P. and Pierres, M. (1992). cDNA cloning for mouse thymocyte-activating molecule; a multifunctional ecto-dipeptidyl peptidase IV (CD26) included in a subgroup of serine proteases. *J. Biol. Chem.* **267**, 2200-2208.

Martín, M., Centelles, J. J., Huguet, J., Echevarne, F., Colomer, D., Vives-Corrons, J. L. and Franco, R. (1993). Surface expression of adenosine deaminase in mitogen-stimulated lymphocytes. *Clin. Exp. Immunol.* **93**, 286-291.

Martínez, C., Zumalacarregui, J. M., Diez, V. and Burgos, J. (1984). Bovine skeletal muscle

- adenosine deaminase; purification and some properties. *Int. J. Biochem.* **16**, 1279-1282.
- Marone, G., Petracca, R., Vigorita, S and Casolaro, V. (1990). Adenosine receptors of human leukocytes II: characterization of an inhibitory P-site. *Biochem. Pharmacol.* **127**, 197-204.
- Meckling-Gill, K. A. and Cass, C. E. (1992). Effects of transformation by v-fps on nucleoside transport in rat-2 fibroblasts. *Biochem. J.* **282**, 147-154.
- Meghji, P., Middleton, K., Hassall, C. J., Phillips, M. I. and Newby, A. C. (1988). Evidence for extracellular deamination of adenosine in the rat heart. *Int. J. Biochem.* **20**, 1335-1340.
- Meuwissen, H. J., Pollara, B. and Pickering, R. J. (1975). Combined immunodeficiency disease associated with adenosine deaminase deficiency. *J. Pediatr.* **86**, 169-181.
- Meyerhof, W., Muller-Brechlin, R. and Richter, D. (1991). Molecular cloning of a novel putative G-protein coupled receptor expressed during rat spermiogenesis. *FEBS Lett.* **284**, 155-160.
- Miras-Portugal, M. T., Torres, M., Rotllan, P. and Aunis, D. (1986). Adenosine transport in bovine chromaffin cells in culture. *J. Biol. Chem.* **216**, 1712- 1719.
- Miras-Portugal, M. T., Delicado, E. G., Casillas, T. and Sen, R. P. (1991). Control of nucleoside transport in neural cells effect of protein Kinase C activation Harkness R. A. ed. "Purine and Pyrimidine Metabolism in Man VII" Part A. Plenum Press. New York, pp.435-438.
- Mogul, D.J., Adams, M.E. and Fox, A.P. (1993). Differential activation of adenosine receptors decreases N-type but potentiates P-type Ca^{2+} current in hippocampal CA3 neurons. *Neuron* **10**, 327-334.
- Morgan, P.F. (1991). Post receptor mechanisms. In *Adenosine in the Nervous System*, ed. by Stone, T.W., pp. 119-137, Academic Press, London.
- Morimoto, C., Lord, C. I., Zhang, C., Duke-Cohan, J. S., Letvin, N. L. and Schlossman, S. F. (1994). Role of CD26/dipeptidyl peptidase IV in human immunodeficiency virus type 1 infection and apoptosis. *Immunology*. **91**, 9960-9964.
- Morisaki, T., Fujii, H. and Miwa, S. A. (1985). Adenosine deaminase (ADA) in leukemia: Clinical value of plasma ADA activity and characterization of leukemic cell ADA. *Am. J. Hematol.* **19**, 37-45.
- Morisaki, T., Horiuchi, N., Tsutsumi, H., Ogura, H., Kanno, H., Tani, K., Fujii, H. and Miwa, S. A. (1988). Genetic analysis of adenosine deaminase expression in adult T-cell leukemia. *Am. J. Hematol.* **28**, 119-121.
- Moro, O., Lameh, J. and Sadée, W. (1993). Hydrophobic amino acid in the I2-loop plays a key role in receptor G-protein coupling. *J. Biol. Chem.* **268**, 6862-6865.
- Morrison, M. E., Vijayasaradhi, S. E., Engelstein, D., Albino, A. P. and Houghton, A. N. (1993).

A marker for neoplastic progression of human melanocytes is a cell surface ectopeptidase. *J. Exp. Med.* **177**, 1135-1141.

Moos, W. H., Szotek, D. S. and Bruns, R. F. (1985). N6-cycloalkyladenosines potent A₁ selective agonists. *J. Med. Chem.* **28**, 1383-1384.

Mueckler, M., Caruso, C., Baldwin, S. A., Panico, M., Blench, I., Morris, H. R., Allard, W. J., Lienhard, G. E. and Lodish, H. F. (1985). Sequence and structure of a human glucose transporter. *Science*. **229**, 941-945.

Mumby, S.M., Heukereth, R.O., Gordon, J.I. and Gilman, A.G. (1990). G-protein α -subunit expression, myristoylation, and membrane association in COS cells. *Proc. Natl. Acad. Sci. U.S.A.* **87**, 728-732.

Munshi, R. and Linden, J. (1989). Co-purification of A₁ adenosine receptors and guanine nucleotide-binding proteins from bovine brain. *J. Biol. Chem.* **264**, 14853-14859.

Munshi, R., Pang, I.-H., Sternweis, P.C. and Linden , J. (1991). A₁ adenosine receptors of bovine brain couple to guanine nucleotide-binding proteins G_{i1}, G_{i2}, and G_o. *J. Biol. Chem.* **266**, 22285-22289.

Murray, A. W. (1971). The biological significance of purine salvage. *Annu. Rev. Biochem.* **40**, 811-820.

Murray, J. L., Loftin, K. C., Munn, C. G., Reuben, J. M., Mansell, P. W. A. and Hersh, E. M. (1985). Elevated adenosine deaminase and purine nucleoside phosphorylase activity in peripheral blood null lymphocytes from patients with acquired immune deficiency syndrome. *Blood*. **65**, 1318-1323.

Nagy, J. I., La Bella, L. A., Buss, M. and Daddona, P. E. (1984). Immunohistochemistry of adenosine deaminase: implications for adenosine neurotransmission. *Science*. **244**, 166-169.

Nagy, L. E., Diamond, I. and Gordon, A. S. (1991). cAMP-dependent protein Kinase regulates inhibition of adenosine transport by ethanol. *Mol. Pharmacol.* **40**, 812-817.

Nakamura, H., Koyama, G., Litaka, Y., Ohno, M., Yagisawa, N., Koudo, S., Maeda, K. and Umezawa, H. (1974). Structure of coformycin, an unusual nucleoside of microbial origin. *J. Amer. Chem. Soc.* **96**, 4327-4328.

Nakata, H. (1989). Purification of adenosine A₁ receptor from rat brain membranes. *J. Biol. Chem.* **264**, 10839-10843.

Nakata, H. (1990). A₁ adenosine receptors of rat testis membranes. Purification and partial characterization. *J. Biol. Chem.* **265**, 671-677.

Nantel, F., Bonin, H., Emorine, L.J., Zilberfarb, V., Strosberg, A.D., Bouvier, M. and Marullo, S. (1993). The human β_3 -adrenergic receptor is resistant to short term agonist promoted

desensitization. *Mol. Pharmacol.* **43**, 548-555.

Newman, M. E., De Lucía, R., Patel, J. and McIlwain, H. (1980). Adenosine binding to cerebral preparations in interpretation of adenosine activation of adenosine 3'-5'-cyclic monophosphate formation. *Biochem. Soc. Trans.* **8**, 141-142.

Newby, A.C. (1984). Adenosine and the concept of "retaliatory metabolites". *Trends Biochem.* **9**, 42-44.

Niedzwicki, J., Kouttab, N. M., Mayer, K. H., Carpenter, C. C. J., Parks, R. E., Abushanab, E. and Abernethy, D. R. (1991). Plasma adenosine deaminase 2: a marker for human immunodeficiency virus infection. *J. Acquir. Immune. Defic. Syndr.* **4**, 178-182.

O'Connor, S.E., Dainty, I.A. and Leff, P. (1991). Further subclassification of ATP receptors based on agonist studies. *Trends Pharmacol. Sci.* **12**, 137-141.

Ogata, S., Misumi, Y. and Ikehara, Y. (1989). Primary structure of rat liver dipeptidyl peptidase IV deduced from its cDNA; identification of the NH₂-terminal signal sequence as the membrane-anchoring domain. *J. Biol. Chem.* **264**, 3596-3601.

Olah, M. E., Jacobson, K. A. and Styles, G. L. (1990). Purification and characterization of bovine cerebral cortex A₁ adenosine receptor. *Arch. Biochem. Biophys.* **283**, 440-446.

Olah, M. E., Ren, H., Ostrowski, J., Jacobson, K. A. and Stiles, G. L. (1992). Cloning, expression, and characterization of the unique bovine A₁ adenosine receptor. Studies on the ligand binding site by site-directed mutagenesis. *J. Biol. Chem.* **267**, 10764-10770.

Olah, M. E., Gallo-Rodríguez, C., Jacobson, K. A. and Stiles G. L. (1994). ¹²⁵I-4-ainobenzyl-5'-methylcarboxamidoadenosine, a high affinity radioligand for the rat A₃ adenosine receptor. *Mol. Pharmacol.* **45**, 978-982.

Olate, J. and Allende, J.E. (1991). Structure and function of G proteins. *Pharmac. Ther.* **51**, 403-419.

Olivera, A., Lamas, S., Rodríguez-Puyol, D. and López-Novoa, J. M. (1989). Adenosine induces mesangial cell contraction by an A₁-type receptor. *Kidney Int.* **35**, 1300-1305.

Olsson, R.A. (1978). Ligand binding to the adenine analogue binding protein of the rabbit erythrocyte. *Biochemistry* **17**, 367-375.

Olsson, R.A., Saito, D. and Steinhart, C.R. (1982). Compartmentalization of the adenosine pool of dog and rat hearts. *Circ. Res.* **50**, 617-626.

Olsson, R.A. and Pearson, J.D. (1990). Cardiovascular purinoreceptors. *Physiol. Rev.* **70**, 761-845.

Okabe, K., Yatani, A., Evans, T., Ho, Y.-K., Codina, J., Birnbaumer, L. and Brown, A.M.

(1990). β/γ dimers of G proteins inhibit atrial muscarinic K⁺ channels. *J. Biol. Chem.* **265**, 12854-12858.

Orozco, M., Canela, E. I. and Franco, R. (1989). Theoretical study of the protonation and tautomerization of adenosine, formycin, and their 2-NH₂ and 2-F derivatives. Functional implications in the mechanism of reaction of adenosine deaminase. *Mol. Pharmacol.* **35**, 257-264.

Orozco, M., Canela, E. I. and Franco, R. (1990a). A quantum chemical study of the enzymatic deamination of benzoadenine derivatives. A theoretical model of the interactions occurring between nucleosides and the active site of adenosine deaminase. *Eur. J. Biochem.* **188**, 155-163.

Orozco, M., Canela, E. I. and Franco, R. (1990b). Theoretical study of the hydroxyl nucleophilic-attack on the 6-aminopyrimidine molecule. Functional implications in the reaction-mechanism of nucleoside deaminative enzymes. *J. Organic. Chem.* **55**, 2630-2637.

Orozco, M., Canela, E. I., Mallol, J., Lluis, C. and Franco, R. (1990c). Ab initio study of the protonation and the tautomerism of the 7-aminopyrazolopyrimidine molecule. *J. Organic. Chem.* **55**, 753-756.

Osipchuk, Y and Cahalan, M. (1992). Cell-to-cell spread of calcium signals mediated by ATP receptors in mast cells. *Nature* **359**, 241-244.

Padua, R. A., Geiger, J. D., Delaney, S. M. and Nagy, J. I., (1992). Rat brain adenosine deaminase after 2'- deoxycoformycin administration: Biochemical properties and evidence for reduced enzyme levels detected by 2'-[³H]Deoxycoformycin ligand binding. *J. Neurochem.* **58**, 421-429.

Paglia, D. E., Valentine, W. N., Tartaglia, A. P. and Konrad, P. N. (1970). Adenine nucleotides reductions associated with a dominantly transmitted form of nonspherocytic hemolytic anemia. *Blood* **36**, 837-839.

Pajor, A. M. and Wright, E. M. (1992). Cloning and functional expression of a mammalian Na⁺-nucleoside cotransporter. A member of the Sglt family. *J. Biol. Chem.* **267**, 3557-3560.

Palacios, J. M., Fastbom, J., Wiederhold, K. H. and Probst, A. (1987). Visualization of adenosine A₁ receptors in the human and the guinea-pig kidney. *Eur. J. Pharmacol.* **138**, 273-276.

Palmer, T. M., Gettys, T. W., Jacobson, K. A. and Stiles, G. L. (1994). Desensitization of canine A_{2a} adenosine receptor. Delineation of multiple processes. *Mol. Pharmacol.* **45**, 1082-1094.

Pantely, G. A. and Bristow, J. D. (1990). Adenosine. Renewed interest in an old drug. *Circulation* **82**, 1854-1856.

Parker, E.M., Kameyama, K., Higashijima, T. and Ross, E.M. (1991). Reconstitutively active G protein-coupled receptors purified from baculovirus-infected insect cells. *J. Biol. Chem.* **266**, 519-527.

- Parkman, R. and Gelfand, E. W. (1991). Severe combined immunodeficiency disease, adenosine deaminase deficiency and gene therapy. *Curr. Opin. Immunol.* 3, 547-551.
- Paterson, A.R.P., Jakobs, E.S., Harley, E.R., Cass, C.E. and Robins, M.J. (1983). Inhibitors of nucleoside transport as probes and drugs. In. Development of target orientated anticancer drugs. Y.C. Cheng, B. Gox and M. Minkoff, editors. pp. 41-56, Raven, New York.
- Paton, D.M. (1981). Presynaptic neuromodulation mediated by purinergic receptors. In *Purinergic Receptors*, ed, by Burnstock, G., pp. 199-219, Chapman and Hall, London.
- Paton, D.M. and Kurahashi, K. (1981). Structure-activity relations for negative chronotropic action of adenosine in isolated rat atria: evidence for an action on A₁ receptors. *IRCS Med. Sci. Libr. Compend.* 9, 447.
- Pearson, J.D., Carleton, J.S. and Gordon, J.L. (1980). Metabolism of adenine nucleotides by ectoenzymes of vascular endothelial and smooth-muscle cells in culture. *Biochem. J.* 190, 421-429.
- Perkins, J.P., Hausdorff, W.P. and Lefkowitz, R.J. (1991). The β-adrenergic receptors. (Perkins, J.P., ed.). Human Press, Clifton, N.J., pp. 125-180.
- Phillis, J. W., Edstrom, J. P., Kostopoulos, G. K. and Kirkpatrick, J. R. (1979). Effects of adenosine and adenine nucleotides in synaptic transmission in the cerebral cortex. *Can. J. Pharmacol.* 57, 1289-1312.
- Pierce, K. D., Furlong, T. J., Selbie, L. A. and Shine, J. (1992). Molecular cloning and expression of an adenosine A_{2b} receptor from human brain. *Biochem. Biophys. Res. Commun.* 187, 86-93.
- Piersen, C. E., True, C. D. and Wells, J. N. (1994a). A carboxyl-terminally truncated mutant and nonglycosilated A_{2a} adenosine receptors retain ligand binding. *Mol. Pharmacol.* 45, 861-870.
- Pickering, D.S., Thomsen, C., Suzdak, P.D., Fletcher, E.J., Robitaille, R., Salter, M.W., MacDonald, J.F., Huang, X.-P. and Hampson, D.R. (1993). A comparison of two alternatively spliced forms of a metabotropic glutamate receptor coupled to phosphoinositide turnover. *J. Neurochem.* 61, 85-92.
- Pippig, S., Andexinger, S. and Lohse, M.J. (1995). Sequestration and recycling of β₂-adrenergic receptors permit receptor resensitization. *Mol. Pharmacol.* 47, 666-676.
- Pitarys, C.J., Virmani, R., Vildbill, H.D., Jackson, E.K., Forman, M.N. (1991). Reduction of myocardial reperfusion injury by intravenous adenosine administered during the early reperfusion period. *Circulation* 83, 237-247.
- Pitcher, J.A., Inglese, J., Higgins, J.B., Arriza, J.L., Casey, P.J., Kim, C., Benovic, J.L., Kwatra, M.M., Caron, M.G. and Lefkowitz, R.J. (1992). Role of βγ-subunits of G-proteins in targeting the β-adrenergic receptor kinase to membrane bound receptors. *Science* 257, 1264-1267.

Plagemann, P. G. W. and Wohlhueter, R. M. (1980). Permeation of nucleosides, nucleic acid bases, and nucleotides in animal cells. *Curr. Top. Membr. Transp.* **14**, 225-330.

Plagemann, P.G.W. and Wohlhueter, R.M. (1984). Effect of sulphydryl reagents on nucleoside transport in cultured mammalian cells. *Arch. Biochem. Biophys.* **233**, 489-500.

Plagemann, P. G. W. and Wohlhueter, R. M. (1985). Nitrobenzylthioinosine-sensitive and Nitrobenzylthioinosine-resistant nucleoside transport in normal and transformed rat-cells. *Biochim. Biophys. Acta.* **816**, 387-395.

Plagemann, P.G.W. (1986). Transport and metabolism of adenosine in human erythrocytes. Effect of transport inhibitors and regulation by phosphate. *J. Cell. Physiol.* **128**, 491-500.

Plagemann, P. G. W., Wohlhueter, R. M. and Woffendin, C. (1988). Nucleoside and Nucleobase transport in animal cells. *Biochim. Biophys. Acta.* **947**, 405-443.

Plagemann, P. G. W. and Woffendin, C. (1989). Na^+ -dependent and Na^+ -independent transport of uridine and its phosphorylation in mouse spleen-cells. *Biochim. Biophys. Acta.* **981**, 315-325.

Plagemann, P. G. W. and Aran J. M. (1990). Na^+ dependent active nucleoside transport in mouse spleen lymphocytes, leukemia cells, fibroblast and macrophages, but not in equivalent human or pig cells. Dipyridamole enhances nucleoside salvage by cells with both active and facilitated transport. *Biochim. Biophys. Acta* **1025**, 32-42.

Pei, G., Kieffer, B.L., Lefkowitz, R.J. and Freedman, N.J. (1995). Agonist-dependent phosphorylation of the mouse δ -opioid receptor: involvement of G protein-coupled receptor kinases but not pratin kinase C. *Mol. Pharmacol.* **48**, 173-177.

Pleus, R.C. and Bylund, D.B. (1992). Desensitization and down-regulation of the 5-hydroxytryptamine1B receptor in the Opossum kidney cell line. *J. Pharmacol. Exp. Ther.* **261**, 271-277.

Port, J.D., Huang, L., Y. and Malbon, C.C. (1992). β -adrenergic agonist that down-regulate receptor messenger RNA up-regulate a M(R) 35.000 protein(s) that selectively binds to β -adrenergic receptor messenger RNAs. *J. Biol. Chem.* **267**, 24103-24108.

Prater, M. R., Taylor, H., Munshi, R. and Linden, J. (1992). Indirect effect of guanine nucleotides on antagonist binding to A_1 adenosine receptors: occupation of cryptic binding sites by endogenous vesicular adenosine. *Molec. Pharmacol.* **42**, 765-772.

Pull , I. and McIlwain, H. (1972). Adenine derivatives as neurohumoral agents in the brain. The quantities liberated on excitation of superfused cerebral tissues. *Biochem. J.* **130**, 975-981.

Puukka, R., Puukka, M., Linna, S. L., Joensuu, T. and Kouvalainen, K. (1981). Elevated erythrocyte adenosine activity in Down's syndrome. *Acta Paediatr. Scand.* **70**, 739-741.

Raberger, G., Schutz, W. and Kraupp, O. (1977). Coronary dilator actions of adenosine analogs:

A comparative study. *Arch. Int. Pharmacodyn. Ther.* **230**, 140-149.

Raberger, G., Schultz, W. and Kraupp, O. (1977). Coronary dilator actions of adenosine analogs: A comparative study. *Arch. Int. Pharmacodyn. Ther.* **230**, 140-149.

Raberger, G., Benke, T. and Kraupp, O. (1980). The effects of adenosine-5'-ethylcarboxamide on liver blood flow and hepatic glucose, lactate and pyruvate balances in dogs. *Naunyn-Schmiederg's Arch. Pharmacol.* **314**, 281-284.

Ramkumar, V., Barrington, W.W., Jacobson, K. A. and Stiles, G. L. (1991). Demonstration of both A₁ and A₂ adenosine receptors in DDT1MF2 smooth muscle cells. *Mol. Pharmacol.* **37**, 149-156.

Ramkumar, V., Stiles, G. L., Beaven, M. A. and Ali, H. (1993). The A₃ receptor is the unique adenosine receptor which facilitates release of allergic mediators in mast cells. *J. Biol. Chem.* **268**, 16887-16890.

Rampal, A. L., Jung, E. K. Y., Chin, J. J., Deziel, M. R., Pinkofsky, H. B. and Jung, C. Y. (1986). Further characterization and chemical purity assessment of the human erythrocyte glucose transporter preparation. *Biochim. Biophys. Acta.* **859**, 135-142.

Reddington, M., Alexander, S. P., Hoppe, E. and Kreutzberg, G. W. (1987). En " Adenosine receptors in the nervous system" pp. 95-102 (Ed. J. A. Ribeiro) Taylor and Francis, London.

Reppert, S. M., Weaver, D. R., Stehle, J. H. and Rivkees, S. A. (1991). Molecular cloning and characterization of a rat A₁ adenosine receptor that is widely expressed in brain and spinal cord. *Mol. Endocrinol.* **5**, 1037-1048.

Ribeiro, J. A. and Sebastiao, A. M. (1986). Adenosine receptors and calcium. basis for proposing a third (A₃) adenosine receptor. *Prog. Neurobiol.* **26**, 179-209.

Ribeiro, J. A. and Sebastiao, A. M. (1987). On the role, inactivation and origin of endogenous adenosine at the frog neuromuscular junction. *J. Physiol. (London)* **384**, 571-585.

Ribeiro, J. A. and Sebastiao, A. M. (1988). Subtypes of adenosine receptors. *Trends Pharmacol. Sci.* **9**, 279-280.

Ribeiro, J. A. and Sebastiao, A. M. (1994). Further evidence for adenosine A₃ receptors. *Trends Pharmacol. Sci.* **15**, 13.

Richardson, R.M. and Hosey, M.M. (1992). Agonist induced phosphorylation and desensitization of human M2 muscarinic cholinergic receptors in Sf9 insect cells. *J. Biol. Chem.* **267**, 22249-22255.

Rivkees, S. A. and Reppert, S. M. (1992). Rfl9 encodes an A_{2b} adenosine receptor. *Mol. Endocrinol.* **6**, 1598-1564.

Roden, M. and Turnheim, K. (1988). Sodium pump quantity and turnover in rabbit descending colon at different rates of sodium absorption. *Plug. Archiv. Europ. J. Physiol.* **413**, 181-189.

Roeder, L. M., Hopkins, I. B., Kaiser, J. R., Hanukoglu, L. and Tildon, J. T. (1988). Thyroid hormone action on glucose transporter activity in astrocytes. *Biochem. Biophys. Res. Commun.* **156**, 275-281.

Rosen, J.B. and Berman, R.F. (1985). Prolonged postictal depression in amygdaloid kindled rats by the adenosine analog, L-PIA. *Exp. Neurol.* **90**, 549-557.

Ross, E.M. (1989). Signal sorting and amplification through G protein-coupled receptors. *Neuron* **3**, 141-152.

Roth, N., Campbell, P.T., Caron, M.G., Lefkowitz, R.J. and Lohse, M.J. (1991). Comparative rates of desensitization of β -adrenergic receptors by the β -adrenergic receptor kinase and the cyclic-AMP dependent protein kinase. *Proc. Natl. Acad. Sci. USA* **88**, 6201-6204.

Sajjadi, F. G. and Firestein, G. S. (1993). cDNA cloning and sequence analysis of the human A₁ adenosine receptor. *Biochim. Biophys. Acta* **1179**, 105-107.

Salvatore, C. A., Jacobson, M. A., Taylor H. E., Linden, J. and Johnson, R. G. (1993). Molecular cloning and characterization of the human A₃ adenosine receptor. *Proc. Natl. Acad. Sci. U.S.A.* **90**, 10365-10369.

Sattin, A. and Rall, T. W. (1970). Effect of adenosine and adenine nucleotides on cyclic adenosine 3',5'-phosphate content of guinea-pig cerebral cortex slices. *Mol. Pharmacol.* **6**, 13.

Savarese, T. M. and Fraser, C. M. (1992). In vitro mutagenesis and the search for structure-function relationships among G protein-coupled receptors. *Biochem. J.* **283**, 1-19.

Sayós, J., Solsona, J., Mallol, J., Lluís, C. and Franco, R. (1994). Phosphorylation of adenosine in renal brush-border membrane vesicles by an exchange reaction catalyzed by adenosine kinase. *Biochem. J.* **297**, 491-496.

Schaeffer, H. J. and Schwender, C. F. (1974). Bridging hydrophobic and hydrophilic regions on adenosine deaminase with some 9-(2-hydroxy-3-alkyl) adenines. *J. Med. Chem.* **17**, 6-8.

Scholz, K.P. and Miller, R.J. (1991). Analysis of adenosine actions on Ca²⁺ currents and synaptic transmission in cultured rat hippocampal pyramidal neurones. *J. Physiol.* **435**, 373-393.

Schrader,, W. P., Miczeck, A. D., West, C. A. and Samsonoff, W. A. (1988). Evidence for receptor mediated uptake of adenosine deaminase in rabbit kidney. *J. Histochem. Cytochem.* **36**, 1481-1487.

Schrader, W. P. and West, C. A. (1985). Adenosine deaminase complexing proteins are localized in exocrine glands of the rabbit. *J. Histochem. Cytochem.* **33**, 508-512.

Schrader, W. P., West, C. A., Rudofsky, U. H. and Samsonoff, W. A. (1994). Subcellular distribution of adenosine deaminase and adenosine deaminase complexing protein in rabbit kidney: implications for adenosine metabolism. *J. Histochem. Cytochem.* **42**, 775-782.

Schwabe, U., Kiffe, H., Puchstein, C. and Trost, T. (1979). Specific binding of [³H]adenosine to rat brain membranes. *Naunyn-Schmiedeberg's Arch. Pharmacol.* **310**, 59-67.

Schwabe, U., Fein, T and Lorenzen, A. (1993). Pharmacological properties of adenosine receptors and adenosine binding proteins. *Drug Develop. Res.* **28**, 220-225.

Sen, R. P., Delicado, E. G. and Miras-Portugal, M. T. (1990). Effect of forskolin and cyclic AMP analog on adenosine transport in cultured chromaffin cells. *Neurochem. Int.* **17**, 523-528.

Showalter, H. D. H., Putt, S. R., Borondy, P. E. and Shillis, J. L. (1983). Adenosine-deaminase inhibitors. Synthesis and biological evaluation of (+/-)-3,6,7,8-tetrahydro-3-((2-hydroxyethyl)methyl)imidazo (4,5-D) (1,3)diazepin-(ol) and some selected C-5 homologs of pentostatin. *J. Med. Chem.* **26**, 1478-1482.

Shinozuka, K., Bjur, R.A. and Westfall, D.P. (1988). Characterization of prejunctional purinoreceptors on adrenergic nerves of the rat caudal artery. *Naunyn-Scheideberg's Arch. Pharmacol.* **338**, 221-227.

Sibley, D.R., Strasser, R.H., Benovic, J.L., Daniel, K. and Lefkowitz, R.J. (1986). Phosphorylation dephosphorylation of the β-adrenergic receptor regulates its functional coupling to adenylate cyclase and subcellular distribution. *Proc. Natl. Acad. Sci. USA* **83**, 9408-9412.

Siegel, N. J., Glazier, W. B., Chaudry, I. H., Gaudio, K. M. and Lytton, B. (1980). Enhanced recovery from acute renal failure by the postischaemic infusion of adenine nucleotides and magnesium chloride in rats. *Kidney Int.* **17**, 338-349.

Simon, M.I., Strathmann, M.P. and Gautam, N. (1991). Diversity of G proteins in signal transduction. *Science* **252**, 802-808.

Simons, K. & Wandinger-Ness, A. (1990). Polarized sorting in epithelia. *Cell.* **62**, 207-210.

Smit, M.J., Bloemers, S.M., Leurs, R., Tertoolen, L.G.J., Bast, A., de Laat, S.w. and Timmerman, H. (1992). Short term desensitization of the histamine H1 receptor in human HeLa cells. involvement of protein kinase C dependent and independent pathways. *Br. J. Pharmacol.* **107**, 448-455.

Snyder, S.H., Katims, J.J., Annau, Z., Bruns, R.F. and Daly, J.W. (1981). Adenosine receptors and behavioral actions of methylxanthines. *Proc. Natl. Acad. Sci. U.S.A.* **78**, 3260-3264.

Souness, J.E. and Hagoya de Sánchez, V.C. (1981). The stimulation of [1-¹⁴C]glucose oxidation in isolated fat cells by N⁶-methyladenosine: An effect independent of cyclic AMP. *FEBS Lett.* **125**, 249-252.

Spector, R. and Huntoon, S. (1984). Specificity and sodium dependence of the active nucleoside transport system in choroid plexus. *J. Neurochem.* **42**, 1048-1052.

Spencer, N., Hopkinson, D.A. and Harris, H. (1968). Adenosine deaminase polymorphism in man. *Ann. Hum. Genet.* **32**, 9-14.

Spiegel, A.M., Backlund Jr, P.S., Butrynski, J.E., Jones, T.L.Z. and Simonds, W.F. (1991). The G protein connection: molecular basis of membrane association. *Trends Biochem. Sci.* **16**, 338-341.

Spiegel, A., Shenker, A. and Weinstein, L.S. (1992). Receptor-effector coupling by G-proteins: Implications for normal and abnormal signal transduction. *Endocr. Rev.* **13**, 536-565.

Spielman, W. S. and Arend, L. J. (1991). Adenosine receptors and signaling in the kidney. *Hypertension* **17**, 117-130.

Staehelin, M. and Simons, P. (1982). Rapid and reversible disappearance of β -adrenergic cell surface receptors. *EMBO J.* **1**, 187-190.

Steck, T. L. (1974). Organisation of proteins in human red blood-cells. *J. Cell Biol.* **62**, 1-19.

Stehle, J. H., Rivkees, S. A., Lee J. J., Weaver, D. R., Deeds, J. O. and Reppert, S. M. (1992). Molecular cloning and expression of the cDNA for a novel A₂-adenosine receptor subtype. *Mol. Endocrinol.* **6**, 384-393.

Sternweis, P.C. and Gilman, A.G. (1982). Aluminum: A requirement for activation of the regulatory component of adenylate cyclase by fluoride. *Proc. Natl. Acad. Sci. U.S.A.* **79**, 4888-4891.

Syeinberg, T.H. and Silverstein, S.C. (1987). Extracellular ATP⁴⁻ promotes cation fluxes in the J774 mouse macrophage cell line. *J. Biol. Chem.* **262**, 3118-3122.

Sternweis, P. C. (1994). The active role of $\beta\gamma$ in signal transduction. *Current Opinion in Cell Biol.* **6**, 198-203.

Stiles, G. L., Daly, D. T. and Olsson, R. A. (1985). The A₁ adenosine receptor. Identification of the binding subunit by photoaffinity cross-linking. *J. Biol. Chem.* **260**, 10806-10811.

Stiles, G. L., Daly, D. T. and Olsson, R. A. (1986). Characterization of the A₁ adenosine receptor-adenylate cyclase system of cerebral cortex using an agonist photoaffinity ligand. *J. Neurochem.* **47**, 1020-1025.

Stiles, G. L. (1986). Photoaffinity cross-linked A₁ adenosine receptor binding subunits. *J. Biol. Chem.* **261**, 10839-10843.

Stiles, G. L. and Jacobson, K. A. (1986). A new high affinity iodinated adenosine receptor antagonist as a radioligand photoaffinity cross-linking probe. *Mol. Pharmacol.* **32**, 184-188.

- Strader, C.D., Sigal, I.S., Blake, A.D., Cheung, A.H., Register, R.B., Rands, E., Zemcik, B.A., Candelore, M.R. and Dixon, R.A.F. (1987). The carboxyl terminus of the hamster β -adrenergic receptor expressed in mouse L cells is not required for receptor sequestration. *Cell* **49**, 855-863.
- Su, C., Beavan, A. and Burnstock, G. (1971). [3 H]adenosine triphosphate release during stimulation of enteric nerves. *Science*. **173**, 336-338.
- Su, C. (1983). Purinergic neurotransmission and neuromodulation. *Pharmacol. Rev.* **23**, 397-411.
- Suzuki, T., Nguyen, C.T., Nantel, F., Bonin, H., Valiquette, M., Frielle, T. and Bouvier, M. (1992). Distinct regulation of β_1 -adrenergic and β_2 -adrenergic receptors in chinese hamster fibroblasts. *Mol. Pharmacol.* **41**, 542-548.
- Tagawa, H. and Vander, A. J. (1970). Effects of adenosine compounds on renal function and renin secretion in dogs. *Circ. Res.* **26**, 327-338.
- Tanaka, T., Camerini, D., Seed, B., Torimoto, Y., Dang, N. H., Kameoka, J., Dahlberg, H. N., Schlossman, S. F. and Morimoto, C. (1992). Cloning and functional expression of the cell activation antigen CD26. *J. Immunol.* **149**, 481-486.
- Tang, W.-J. and Gilman, A.G. (1991). Type-specific regulation of adenylyl cyclase by G protein β/γ subunits. *Science* **254**, 1500-1503.
- Taylor, A. (1984). Serum adenosine deaminase activity is increased in sarcoidosis. *Clin. Chem.* **30**, 499-500.
- Taussig, R., Quarmby, L.M. and Gilman, A.G. (1993a). Regulation of purified type I and type II adenylylcyclases by G protein β/γ subunits. *J. Biol. Chem.* **268**, 9-12.
- Taussig, R., Iniguez-Lluhi, J.A. and Gilman, A.G. (1993b). Inhibition of adenylyl cyclase by $G_{i\alpha}$. *Science* **261**, 218-221.
- Taylor, M. D., Moos, W. H., Hamilton, W., Szotek, D. S., Patt, W. C., Badger, E. W., Bristol, J. A., Bruns, R. F., Heffner, T. G. and Mertz, T. E. (1986). Ribose-modified adenosine analogs as adenosine receptor agonists. *J. Med. Chem.* **29**, 346-3.
- Thomas, R.F., Holt, B.D., Schwinn, D.A. and Liggett, S.B. (1992). Long term agonist exposure induces up-regulation of β_3 -adrenergic receptor expression via multiple cAMP response elements. *Proc. Natl. Acad. Sci. USA* **89**, 4490-4494.
- Tischfield, J.A., Creagan R.P., Nichols, E.A. and Ruddle, F.H. (1974). Assignment of a gene for adenosine deaminase to human chromosome 20. *Hum. Hered.* **24**, 1-11.
- Torres, M., Bader, M. F., Aunis, D. and Miras-Portugal, M. T. (1987). Nerve growth factor effect on adenosine transport in cultured chromaffin cells. *J. Neurochem.* **48**, 233-235.

Torres, M., Delicado, E. G. & Miras-Portugal, M. T. (1988). Adenosine transporters in chromaffin cells. Subcellular distribution and characterization. *Biochim. Biophys. Acta.* **969**, 111-120.

Torres, M., Delicado, E. G., Fideu, M. D. & Miras-Portugal, M. T. (1992). Down regulation and recycling of the NBFI sensitive nucleoside transporter in cultured chromaffin cells. *Biochim. Biophys. Acta.* **1105**, 291-230.

Tritsch, G. L., Paolini, N. S. and Bielat, K. (1985). Adenosine deaminase activity associated with phagocytic vacuoles. Cytochemical demonstration by electron microscopy. *Histochemistry.* **82**, 281-285.

Trivedi, B. K., Bridges, A. J., Patt, W. C., Priebe, S. R. and Bruns, R. F. (1989). N6-bicycloalkyladenosines with unusually high potency and selectivity for the adenosine A₁ receptor. *J. Med. Chem.* **32**, 8-11.

Trost, T. and Stock, K. (1977). Effects of adenosine derivates on cAMP accumulation and lipolysis in rat adipocytes and on adenylyl cyclase in adipocyte plasma membranes. *Naunyn-Schmiedeberg's Arch. Pharmacol.* **299**, 33-40.

Trussell, L.O. and Jacson, M.B. (1985). Adenosine-activated potassium conductance in cultured striatal neurons. *Proc. Natl. Acad. Sci. U.S.A.* **82**, 4857-4861.

Tse, C.M., Wu J.S.R. and Young J.D. (1985). Evidence for the asymmetrical binding of para-chloromercuriphenyl sulfonate to the human erythrocyte nucleoside transporter. *Biochim. Biophys. Acta.* **818**, 316-324.

Tucker, A. L., Linden, J., Robeva, A. S., D'Angelo, D. D. and Lynch, K. R. (1992). Cloning and expression of a bovine adenosine A₁ receptor cDNA. *FEBS Letters* **297**, 107-111.

Ueeda, M., Thompson, R. D., Arroyo, H. and Olsson, R. A. (1991a). 2-alkoxyadenosines. Potent and selective agonists at the coronary artery A₂ adenosine receptors. *J. Med. Chem.* **34**, 1334-1339.

Ungemach, F.R. and Hegner, D. (1978). Uptake of thymidine into isolated rat hepatocytes. Evidence for two transport systems. *j. Physiol. Chem.* **359**, 845-856.

Ueeda, M., Thompson, R. D., Padgett, W. L., Secunda, S., Daly, J. W. and Olsson, R. A. (1991b). Cardiovascular actions of adenosine, but not adenosine receptors, differ in rat and guinea pig. *Life Sci.* **49**, 1351-1358.

Valentine, W. N., Paglia, D. E., Tartaglia, A. P. and Gilsanz, F. (1977). Hereditary hemolytic anemia with increased red cell adenosine deaminase (45- to 70-fold) and decreased adenosine triphosphate. *Science.* **195**, 783-785.

Valerio, D., Dekker, B. M. M., Duyvesteyn, M. G. C., Van der Voorn, L., Berkvens, T. M., Van Ormondt, H. and Van der Eb, A. J. (1986). One adenosine deaminase allele in a patient with

severe combined immunodeficiency contains a point mutation abolishing enzyme activity. *EMBO J.* **5**, 113-119.

Valiquette, M., Bonin, H., Hnatowich, M., Caron, M.G., Lefkowitz, R.J. and Bouvier, M. (1990). Involvement of tyrosine residues located in the carboxyl tail of the human β_2 -adrenergic receptor in agonist induced down regulation of the receptor. *Proc. Natl. Acad. Sci. USA* **87**, 5089-5093.

Van Calker, D., Muller, M. and Hamprecht, B. (1978). Adenosine inhibits the accumulation of cyclic AMP in cultured brain cells. *Nature* **276**, 839-841.

Van Calker, D. Müller, M. and Hamprecht, B. (1979). Adenosine regulates via two different types of receptors the accumulation of cyclic AMP in cultured brain cells. *J. Neurochem.* **33**, 999-1005.

Van der Weyden, M. B. and Kelley, W. N. (1976). Human adenosine deaminase; distribution and properties. *J. Biol. Chem.* **251**, 5448-5456.

Van Galen, P. J. M., Van Vlijmen, H. W. T., Ijzerman, A. P. and Soudijn, W. (1990). A model for the antagonist binding site on the adenosine A₁ receptor, based on steric, electrostatic and hidrophobic properties. *J. Med. Chem.* **33**, 1708-1713.

Van Galen, P. J. M., Stiles, G. L., Michaels, G. and Jacobson, K. A. (1992). Adenosine A₁ and A₂ receptors. Structure-function relationships. *Med. Res. Rev.* **12**, 423-471.

Vezzoni, P., Giardini, R., Lucchini, R., Lombardi, L., Vezzoni, M. A., Besana, C. and Clerici, L. (1985). Adenosine deaminase and terminal deoxynucleotidyl transferase in human lymphomas: an aid to the diagnosis and subclassification of lymphoblastic lymphomas. *Am. J. Hematol.* **19**, 219-227.

Vijayalakshmi, D. and Belt, J. A. (1988). Sodium- dependent nucleoside transporter in mouse intestinal epithelial cells. *J. Biol. Chem.* **263**, 9419-9423.

Vizi, E.S. and Knoll, J. (1976). The inhibitory effect of adenosine and related nucleotides on the release of acetylcholine. *Neuroscience* **1**, 391-398.

Von Zastrow, M. and Kobilka, B.K. (1992). Ligand regulated internalization and recycling of human β_2 -adrenergic receptors between the plasma membrane and endosomes containing transferring receptors. *J. Biol. Chem.* **267**, 3530-3538.

Waldo, G.L., Northup, J.K., Perkins, J.P. and Harden, T.K. (1983). Characterization of an altered membrane form of the β -adrenergic receptor produced during agonist induced desensitization. *J. Biol. Chem.* **258**, 13900-13908.

Wang, S.Z., Hu, J., Long, R.M., Pou, W., Forray, C. and El-Fakahany, E.E. (1990). Agonist induced down-regulation of M1 muscarinic receptors and reduction of their messenger RNA level in a transfected cell line. *FEBS Lett.* **276**, 185-188.

Webb, T.E., Simon, J., Krishek, B.J., Bateson, A.N., Smart, T.G., King, B.F., Burnstock, G. and

Barnard, E.A. (1993). Cloning and functional expression of a brain G-protein coupled ATP receptor. *FEBS Lett.* **324**, 219-225.

Weber, R. G., Jones, C. R., Palacios, J. M. & Lohse, M. J. (1988). Autoradiographic visualization of A₁-adenosine receptors in brain and peripheral tissues of rat and guinea pig using ¹²⁵I-HPIA. *Neurosci. Let.* **87**, 215-220.

Westphal, R.S., Backstrom, J.R. and Sanders-Bush, E. (1995). Increased basal phosphorylation of the constitutively active serotonin 2C receptor accompanies agonist-mediated desensitization. *Mol. Pharmacol.* **48**, 200-205.

Wiklund, N.P. and Gustafsson, L.E.(1988). Indications for P₂-purinoreceptor subtypes in guinea-pig smooth muscle. *Eur. J. Pharmacol.* **148**, 361-370.

Wheeler, T.J. and Hinkle, P.C. (1985). The glucose transporter of mammalian cells. *Ann. Rev. Physiol.* **47**, 503-517.

Wiginton, D. A., Kaplan, D. J., States, J. C., Adeson, A. L., Perme, C. M., Bilky, I. J., Vaughn, A. J., Lattier, D. L. and Hutton, J. J. (1986). Complete sequence and structure of the gene for human adenosine deaminase. *Biochemistry*. **25**, 8234-8244.

Williams, M., Risley, E.A. and Huff, J.R. (1981).Interaction of putative anxiolytic agents with central adenosine receptors. *Can. J. Physiol. Pharmacol.* **59**, 897-900.

Williams, M. (1989a). Adenosine antagonists. *Med. Res. Rev.* **9**, 219-243.

Williams, M. (1989b). Adenosine. the prototypic neuromodulator. *Neurochem. Intern.* **14**, 249-264.

Williams, M. (1990). Adenosine and adenosine receptors. The Human Press, New Jersey, U.S.A.

Williams, T. C., Doherty, A. J., Griffith, D. A. and Jarvis, S. M. (1989). Characterization of sodium- dependent and sodium-independent nucleoside transport systems in rabbit brush-border and basolateral plasma-membrane vesicles from the renal outer cortex. *Biochem. J.* **264**, 223-231.

Williams, T. C. and Jarvis, S. M. (1991). Multiple sodium dependent nucleoside transport systems in bovine renal brush-border membrane vesicles. *Biochem. J.* **274**, 27-33.

Wilson, D. K., Rudolph, F. B. and Quiocho, F. A. (1991). Atomic structure of adenosine deaminase complexed with a transition-state analog; understanding catalysis and immunodeficiency mutations. *Science*. **252**, 1278-1284.

Witters, L. A., Vater, C. A. and Lienhard, G. E. (1985). Phosphorylation of the glucose transporter in vitro and in vivo by protein Kinase C. *Nature*. **315**, 777-778.

Wolberg, G., Zimmerman, T.P., Duncan, G.S., Singer, K.H. and Elion, G.B. (1978). Inhibition of lymphocyte-mediated cytosis by adenosine analogs. Biochemical studies concerning the

mechanism of action. *Biochem. Pharmacol.* **27**, 1487-1495.

Wolfenden, R. and Frick, L. (1986). Mechanisms of enzyme action and inhibition-transition-state analogs for acid-base catalysis. *J. Prot. Chem.* **5**, 147-155.

Woo, P. W. K., Dion, H. W., Lang, S. H., Dahl, L. F. and Durham, L. J. (1974). A novel adenosine and ara-A deaminase inhibitor, (R)-3-(2-deoxy-D-erythropentafurosanyl)-3,6,7,8-tetrahydroimidazol (4,5-d) (1,3) diazepin-8-ol. *J. Heterocycl. Chem.* **11**, 641-643.

Wu, P. H. & Phillis, J. W. (1982). Nucleoside transport in rat cerebral cortical synaptosomal membrane: a high affinity probe study. *Int. J. Biochem.* **14**, 1101-1105.

Wu, D., Katz, A. and Simon, M.I. (1993). Activation of phospholipase C β 2 by thr α and β/γ subunits of trimeric GTP-binding protein. *Proc. Natl. Acad. Sci. U.S.A.* **90**, 5297-5301.

Yaron, A. and Naider, F. (1993). Proline-dependent structural and biological properties of peptides and proteins. *Crit. Rev. Biochem. Mol. Biol.* **28**, 31-81.

Yeung, S. M. H., Grend, R. D. (1984). [3 H]5'-N-ethylcarboxamidoadenosine to both Ra and Ri adenosine receptors in rat striatum. *Naunyn-Schmiedeberg's Arch. Pharmacol.* **325**, 218-225.

Yamane, H.K. and Fung, B.K.-K. (1993). Covalent modification of G-proteins. *Annu. Rev. Pharmacol. Toxicol.* **32**, 201-241.

Yeung, C. Y., Ingolia, D. E., Roth, D. R., Shoemaker, C., Al-Ubaidi, M. R., Yen, J. Y., Ching, C., Bobonis, C., Kaufman, R. J. and Kellems, R. E. (1985). Identification of functional murine adenosine deaminase cDNA clones by complementation in Escherichia coli. *J. Biol. Chem.* **260**, 10299-10307.

Yeung, S. M. H., Pérez-Rey, E. and Cooper, D. M. F. (1987). Hydrodynamic properties of adenosine Ri receptor solubilized from rat cerebral cortical membranes. *Biochem. J.* **248**, 635-642.

Yeung, S. M. H. and Johnson, R.A. (1990). Irreversible inactivation of adenylyl cyclase by the "P"-site agonist, 2',5'-dideoxy-3'-*p*-fluorosulfonylbenzoyl adenosine. *J. Biol. Chem.* **265**, 16745-16750.

Young, J. D. and Jarvis, S. M. (1983). Nucleoside transport in animal cells. *Biosci. Rep.* **3**, 309-322.

Zhou, Q. Y., Li, C., Olah, M. E., Johnson, R. A., Stiles G. L. and Civelli O. (1992). Molecular cloning and characterization of an adenosine receptor. The A₃ adenosine receptor. *Proc. Natl. Acad. U.S.A.* **89**, 7432-7436.

Zimmer, H., Trendelenburg, C., Kammermeier, H. and Gerlach, E. (1973). De novo synthesis of myocardial adenine nucleotides in the ret. Acceleration during recovery from oxygen deficiency. *Circ. Res.* **32**, 635-642.

BIBLIOGRAFÍA 178

