8. References

Acs G., Palkovits M. and Blumberg P.M. (1996) Specific binding of [3H]resiniferatoxin by human and rat preoptic area, locus ceruleus, medial hypothalamus, reticular formation and ventral thalamus membrane preparations. *Life Sci*. **59**, 1899-908.

Agopyan N, Bhatti T, Yu S, Simon SA. (2003) Vanilloid receptor activation by 2- and 10 microm particles induces responses leading to apoptosis in human airway epithelial cells. *Toxicol Appl Pharmacol*. **192**, 21-35.

Agopyan N, Head J, Yu S, Simon SA. (2004) TRPV1 receptors mediate particulate matter-induced apoptosis. *Am J Physiol Lung Cell Mol Physiol*. **286**, L563-72.

Ahern GP. (2003) Activation of TRPV1 by the satiety factor oleoylethanolamide. *J Biol Chem*. **278**, 30429-34.

Ahmad F.J., Hughey J., Wittmann T., Hyman A., Greaser M. and Baas P.W. (2000) Motor proteins regulate force interactions between microtubules and microfilaments in the axon. *Nat Cell Biol*. **2**, 276-80.

Ahmari S.E., Buchanan J. and Smith S.J. (2000) Assembly of presynaptic active zones from cytoplasmic transport packets. *Nat Neurosci.* **3**, 445-51.

Akiba Y., Kato S., Katsube K., Nakamura M., Takeuchi K., Ishii H. and Hibi T. (2004) Transient receptor potential vanilloid subfamily 1 expressed in pancreatic islet beta cells modulates insulin secretion in rats. *Biochem Biophys Res Commun*. **321**, 219-25.

Al-Bassam J., Ozer R.S., Safer D., Halpain S. and Milligan R.A. (2002) MAP2 and tau bind longitudinally along the outer ridges of microtubule protofilaments. *J Cell Biol.* **157**, 1187-96.

Alessandri Haber N., Dina O.A., Yeh J.J., Parada C.A., Reichling D.B. and Levine J.D. (2004) Transient receptor potential vanilloid 4 is essential in chemotherapy-induced neuropathic pain in the rat. *J Neurosci.* **24**, 4444-52.

Amantini C., Mosca M., Lucciarini R., Perfumi M., Morrone S., Piccoli M. and Santoni G. (2004) Distinct thymocyte subsets express the vanilloid receptor VR1 that mediates capsaicin-induced apoptotic cell death. *Cell Death Differ*. **11**, 1342-56.

Andre N., Braguer D., Brasseur G., Goncalves A., Lemesle-Meunier D., Guise S., Jordan M.A. and Briand C. (2000) Paclitaxel induces release of cytochrome c from mitochondria isolated from human neuroblastoma cells. *Cancer Res*. **60**, 5349-53.

Arniges M., Fernandez-Fernandez J.M., Albrecht N., Schaefer M. and Valverde M.A.. (2006) Human TRPV4 channel splice variants revealed a key role of ankyrin domains in multimerization and trafficking. *J Biol Chem.* **281**, 1580-6.

Asai H., Ozaki N., Shinoda M., Nagamine K., Tohnai I., Ueda M. and Sugiura Y. (2005) Heat and mechanical hyperalgesia in mice model of cancer pain. *Pain*. **117**, 19-29.

Baas P.W. and Ahmad F.J. (2001) Force generation by cytoskeletal motor proteins as a regulator of axonal elongation and retraction. *Trends Cell Biol*. **11**, 244-9.

Babesa A., Amuzescua B., Krauseb U., Scholzb A., Flontaa M.L. and Reida G. (2002) Cooling inhibits capsaicin-induced currents in cultured rat dorsal root ganglion neurones. *Neuroscience Letters* **317,** 131–134.

Banvolgyi A., Palinkas L., Berki T., Clark N., Grant A.D., Helyes Z., Pozsgai G. Szolcsanyi J., Brain S.D. and Pinter E. (2005) Evidence for a novel protective role of the vanilloid TRPV1 receptor in a cutaneous contact allergic dermatitis model. *J. Neuroimmunol.* **169**, 86-96.

Basu S. and Srivastava P. (2005) Immunological role of neuronal receptor vanilloid receptor 1 expressed on dendritic cells. *Proc Natl Acad Sci U S A.* **102**, 5120-5.

Bezzerides V.J., Ramsey I.S., Kotecha S., Greka A. and Clapham D.E. (2004) Rapid vesicular translocation and insertion of TRP channels. *Nat Cell Biol.* **6**, 709-20

Bhave G. and Gereau R.W. (4^{th}). (2003) Growing pains: the cytoskeleton as a critical regulator of pain plasticity. *Neuron.* **39**, 577-9.

Bhave G., Hu H. J., Glauner K. S., Zhu W., Wang H., Brasier D. J., Oxford G. S., and GereauR. W. (2003) Protein kinase C phosphorylation sensitizes but does not activate the capsaicin receptor transient receptor potential vanilloid 1 (TRPV1). *Proc Natl Acad Sci U S A* **100**, 12480-12485.

Bhave G., Zhu W., Wang H., Brasier D. J., Oxford G. S., and Gereau R. W. (2002) cAMP-dependent protein kinase regulates desensitization of the capsaicin receptor (VR1) by direct phosphorylation. *Neuron* **35**, 721-731.

Birder L.A., Kanai A.J., de Groat W.C., Kiss S., Nealen M.L., Burke N.E., Dineley K.E., Watkins S., Reynolds I.J. and Caterina M.J. (2001) Vanilloid receptor expression suggests a sensory role for urinary bladder epithelial cells. *Proc Natl Acad Sci U S A.* **98**, 13396-401.

Birder L.A., Nakamura Y., Kiss S., Nealen M.L., Barrick S., Kanai A.J., Wang E., Ruiz G., De Groat W.C., Apodaca G., Watkins S. and Caterina M.J. (2002)Altered urinary bladder function in mice lacking the vanilloid receptor TRPV1. *Nat Neurosci*. **5**, 856-60.

Bodo E., Biro T., Telek A., Czifra G., Griger Z., Toth B.I., Mescalchin A., Ito T., Bettermann A., Kovacs L. and Paus R. (2005) A hot new twist to hair biology: involvement of vanilloid receptor-1 (VR1/TRPV1) signaling in human hair growth control. *Am J Pathol*. **166**, 985-98.

Bogen, O., Dreger, M., Gillen, C., Schroeder, W. & Hucho F. (2005) Identification of versican as an isolectin B4-binding glycoprotein from mammalian spinal cord tissue. *The FEBS J.* **272**, 090-102.

Bolcskei K., Helyes Z., Szabo A., Sandor K., Elekes K., Nemeth J., Almasi R., Pinter E., Petho G. and Szolcsanyi J. (2005) Investigation of the role of TRPV1 receptors in acute and chronic nociceptive processes using gene-deficient mice. *Pain*. **117**, 368-76.

Bollimuntha S., Cornatzer E. and Singh B.B. (2005) Plasma membrane localization and function of TRPC1 is dependent on its interaction with beta-tubulin in retinal epithelium cells. *Vis Neurosci*. **22**, 163-70.

Bonnington J.K. and McNaughton P.A. (2003) Signalling pathways involved in the sensitisation of mouse nociceptive neurones by nerve growth factor. *J Physiol*. **551**, 433-46.

Bradford M.M. (1976) A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. *Anal Biochem*. **72**, 248-54.

Bre M.H., Redeker V., Quibell M., Darmanaden-Delorme J., Bressac C., Cosson J., Huitorel P., Schmitter J.M., Rossler J., Johnson T., Adoutte A. and Levilliers N. (1996) Axonemal tubulin polyglycylation probed with two monoclonal antibodies: widespread evolutionary distribution, appearance during spermatozoan maturation and possible function in motility. *J Cell Sci.* **109**, 727-38.

Carre M., Andre N., Carles G., Borghi H., Brichese L., Briand C. and Braguer D. (2002) Tubulin is an inherent component of mitochondrial membranes that interacts with the voltage-dependent anion channel. *J Biol Chem.* **277**, 33664-9.

Campetelli A.N., Previtali G., Arce C.A., Barra H.S. and Casale C.H. (2005) Activation of the plasma membrane H-ATPase of Saccharomyces cerevisiae by glucose is mediated by dissociation of the H-ATPase-acetylated tubulin complex. *FEBS J*. **272**, 5742-52.

Caterina M. J. and Julius D. (2001) The vanilloid receptor: a molecular gateway to the pain pathway. *Annu Rev Neurosci* **24**, 487-517.

Caterina M. J., Leffler A., Malmberg A. B., Martin W. J., Trafton J., Petersen-Zeitz K. R., Koltzenburg M., Basbaum A. I., and Julius D. (2000) Impaired nociception and pain sensation in mice lacking the capsaicin receptor. *Science* **288**, 306-313.

Caterina M.J., Schumacher M.A., Tominaga M., Rosen T.A., Levine J.D. and Julius D. (1997) The capsaicin receptor: a heat-activated ion channel in the pain pathway. *Nature*. **389**, 816-24.

Cervero F. and Laird J.M. (2004) Understanding the signaling and transmission of visceral nociceptive events. *J Neurobiol.* **61**, 45-54.

Chae Y.C., Lee S., Lee H.Y., Heo K., Kim J.H., Kim J.H., Suh P.G. and Ryu S.H. (2005) Inhibition of muscarinic receptor-linked phospholipase D activation by association with tubulin. *J Biol Chem*. **280**, 3723-30.

Chang Q., Gyftogianni E., van de Graaf S.F., Hoefs S., Weidema F.A., Bindels R.J. and Hoenderop J.G. (2004) Molecular determinants in TRPV5 channel assembly. *J Biol Chem*. **279**, 54304-11.

Chan W.K., Yabe J.T., Pimenta A.F., Ortiz D. and Shea T.B. (2003) Growth cones contain a dynamic population of neurofilament subunits. *Cell Motil Cytoskeleton*. **54**, 195-207.

Chard P.S., Bleakman D., Savidge J.R. and Miller R.J. (1995) Capsaicin-induced neurotoxicity in cultured dorsal root ganglion neurons: involvement of calcium-activated proteases. *Neuroscience*. **65**, 1099-108.

Chaudhuri A. R., Khan I. A., Prasad V., Robinson A. K., Luduena R. F., and Barnes L. D. (1999) The tumor suppressor protein Fhit. A novel interaction with tubulin. *J Biol Chem* **274**, 24378-24382.

Chuang H. H., Prescott E. D., Kong H., Shields S., Jordt S. E., Basbaum A. I., Chao M. V., and Julius D. (2001) Bradykinin and nerve growth factor release the capsaicin receptor from PtdIns(4,5)P2-mediated inhibition. *Nature* **411**, 957-962.

Chu C.J., Huang S.M., De Petrocellis L., Bisogno T., Ewing S.A., Miller J.D., Zipkin R.E., Daddario N., Appendino G., Di Marzo V., Walker J.M. (2003) N-oleoyldopamine, a novel endogenous capsaicin-like lipid that produces hyperalgesia. *J Biol Chem*. **278**, 13633-9.

Ciruela F. and McIlhinney R. A. (2001) Metabotropic glutamate receptor type 1α and tubulin assemble into dynamic interacting complexes. *J Neurochem* **76**, 750-757.

Ciruela F., Robbins M. J., Willis A. C., and McIlhinney R. A. (1999) Interactions of the C-terminus of metabotropic glutamate receptor type 1alpha with rat brain proteins: evidence for a direct interaction with tubulin. *J Neurochem* **72**, 346-354.

Clapham D.E. (2003) TRP channels as cellular sensors. *Nature*. **426**, 517-24.

Contassot E., Wilmotte R., Tenan M., Belkouch M.C., Schnuriger V., de Tribolet N., Burkhardt K. and Dietrich P.Y. (2004) Arachidonylethanolamide induces apoptosis of human glioma cells through vanilloid receptor-1. *J Neuropathol Exp Neurol*. **63**, 956-63.

Correll C.C., Phelps P.T., Anthes J.C., Umland S. and Greenfeder S. (2004) Cloning and pharmacological characterization of mouse TRPV1. *Neurosci Lett*. **370**, 55-60.

Cortright D.N. and Szallasi A. (2004) Biochemical pharmacology of the vanilloid receptor TRPV1. An update. *Eur J Biochem*. **271**, 1814-9.

Crandall M., Kwash J., Yu W. and White G. (2002) Activation of protein kinase C sensitizes human VR1 to capsaicin and to moderate decreases in pH at physiological temperatures in Xenopus oocytes. *Pain*. **98**, 109-17.

Davidson E.P., Coppey L.J. and Yorek M.A. (2005) Activity and expression of the vanilloid receptor 1 (TRPV1) is altered by long-term diabetes in epineurial arterioles of the rat sciatic nerve. *Diabetes Metab Res Rev*. (Epub ahead of print).

Davis J. B., Gray J., Gunthorpe M. J., Hatcher J. P., Davey P. T., Overend P., Harries M. H., Latcham J., Clapham C., Atkinson K., Hughes S. A., Rance K., Grau E., Harper A. J., Pugh P. L., Rogers D. C., Bingham S., Randall A., and Sheardown S. A. (2000) Vanilloid receptor-1 is essential for inflammatory thermal hyperalgesia. *Nature* **405**, 183-187.

deBono M., Tobin D.M., Davis M.W., Avery L. and Bargmann C.I. (2002) Social feeding in Caenorhabditis elegans is induced by neurons that detect aversive stimuli. *Nature* **419**, 899–903.

Dedov V.N., Tran V.H., Duke C.C., Connor M., Christie M.J., Mandadi S. and Roufogalis B.D. (2002) Gingerols: a novel class of vanilloid receptor (VR1) agonists. *Br J Pharmacol*. **137**, 793-8.

Denda M., Fuziwara S., Inoue K., Denda S., Akamatsu H., Tomitaka A. and Matsunaga K. (2001) Immunoreactivity of VR1 on Epidermal Keratinocyte of Human Skin. *Biochem Biophys Res Commun*. **285**, 1250-2.

Denis V. and Cyert M. S. (2002) Internal Ca2þ release in yeast is triggered by hypertonic shock and mediated by a TRP channel homologue. *J. Cell Biol.* **156**, 29–34.

Dent E.W. and Gertler F.B. (2003) Cytoskeletal dynamics and transport in growth cone motility and axon guidance. *Neuron.* **40**, 209-27.

De Petrocellis L., Harrison S., Bisogno T., Tognetto M., Brandi I., Smith G.D., Creminon C., Davis J.B., Geppetti P. and Di Marzo V. (2001) The vanilloid receptor (VR1) mediated effects of anandamide are potently enhanced by the cAMP-dependent protein kinase. *J Neurochem*. **77**, 1660-3.

Dickenson A.H. and Dray A. (1991) Selective antagonism of capsaicin by capsazepine: evidence for a spinal receptor site in capsaicin-induced antinociception. *Br J Pharmacol*. **104**, 1045-9.

Dina O. A., McCarter G. C., de Coupade C., and Levine J. D. (2003) Role of the sensory neuron cytoskeleton in second messenger signaling for inflammatory pain. *Neuron* **39**, 613-624.

Doly S., Fischer J., Salio C. and Conrath M. (2004) The vanilloid receptor-1 is expressed in rat spinal dorsal horn astrocytes. *Neurosci Lett*. **357**, 123-6.

Dorovkov M.V. and Ryazanov A.G. (2004) Phosphorylation of annexin I by TRPM7 channel -kinase. *J Biol Chem*. **279**, 50643-6.

Doyle M.W., Bailey T.W., Jin Y.H. and Andresen M.C. (2002) Vanilloid receptors presynaptically modulate cranial visceral afferent synaptic transmission in nucleus tractus solitarius. *J Neurosci.* **22**, 8222-9.

Erler I., Hirnet D., Wissenbach U., Flockerzi V. and Niemeyer B.A. (2004) Ca^{2+}-selective transient receptor potential V channel architecture and function require a specific ankyrin repeat. *J Biol Chem*. **279**, 34456-63.

Fernihough J., Gentry C., Bevan S. and Winter J. (2005) Regulation of calcitonin gene-related peptide and TRPV1 in a rat model of osteoarthritis. *Neurosci Lett*. **388**, 75-80.

Ferrer-Montiel A., Garcia-Martinez C., Morenilla-Palao C., Garcia-Sanz N., Fernandez Carvajal A., Fernandez-Ballester G. and Planells-Cases R. (2004) Molecular architecture of the vanilloid receptor. Insights for drug design. *Eur J Biochem.* **271**, 1820-6.

Fong K.C., Babitch J.A. and Anthony F.A. (1988) Calcium binding to tubulin. *Biochim Biophys Acta.* **952**, 13-9.

Funakoshi K., Nakano M., Atobe Y., Goris R.C., Kadota T. and Yazama F. (2006) Differential development of TRPV1-expressing sensory nerves in peripheral organs. *Cell Tissue Res*. **323**, 27-41.

Garcia-Martinez C., Humet M., Planells-Cases R., Gomis A., Caprini M., Viana F., De La Pena E., Sanchez-Baeza F., Carbonell T., De Felipe C., Perez-Paya E., Belmonte C., Messeguer A. and Ferrer-Montiel A. (2002) Attenuation of thermal nociception and hyperalgesia by VR1 blockers. *Proc Natl Acad Sci U S A*. **99**, 2374-9.

Garcia-Sanz N., Fernandez-Carvajal A., Morenilla-Palao C., Planells-Cases R., Fajardo-Sanchez E., Fernandez-Ballester G. and Ferrer-Montiel A. (2004) Identification of a tetramerization domain in the C terminus of the vanilloid receptor. *J Neurosci.* **24**, 5307-14.

Gavva N.R., Klionsky L., Qu Y., Shi L., Tamir R., Edenson S., Zhang T.J., Viswanadhan V.N., Toth A., Pearce L.V., Vanderah T.W., Porreca F., Blumberg P.M., Lile J., Sun Y., Wild K., Louis J.C. and Treanor J.J. (2004) Molecular determinants of vanilloid

sensitivity in TRPV1. *J Biol Chem.* **279**, 20283-95.
Ghilardi J.R., Rohrich H., Lindsay T.H., Sevcik M.A., Schwei M.J., Kubota K., Halvorson K.G., Poblete J., Chaplan S.R., Dubin A.E., Carruthers N.I., Swanson D., Kuskowski M., Flores C.M., Julius D. and Mantyh P.W. (2005) Selective blockade of the capsaicin receptor TRPV1 attenuates bone cancer pain. *J Neurosci.* **25**, 3126-31.
Goel M, Sinkins W, Keightley A, Kinter M, Schilling WP. (2005) Proteomic analysis of TRPC5- and TRPC6-binding partners reveals interaction with the plasmalemmal Na(+)/K(+)-ATPase. *Pflugers Arch*. **451**, 87-98.
Golech S.A., McCarron R.M., Chen Y., Bembry J., Lenz F., Mechoulam R., Shohami E. and Spatz M. (2004) Human brain endothelium: coexpression and function of vanilloid and endocannabinoid receptors. *Brain Res Mol Brain Res*. **132**, 87-92.
Gomez A.M., Kerfant B.G., Vassort G. and Pappano A.J. (2004) Autonomic regulation of calcium and potassium channels is oppositely modulated by microtubules in cardiac myocytes. *Am J Physiol Heart Circ Physiol.* **286**, H2065-71.
Gomez T. (2005) Neurobiology: channels for pathfinding. *Nature*. **434**, 835-8.
Gomez T.M. and Spitzer N.C. (1999) In vivo regulation of axon extension and pathfinding by growth-cone calcium transients. *Nature*. **397**, 350-5.
Gomez T.M. and Spitzer N.C. (2000) Regulation of growth cone behavior by calcium: new dynamics to earlier perspectives. *J Neurobiol*. **44**, 174-83.
Gomez T.M., Robles E., Poo M. and Spitzer N.C. (2001) Filopodial calcium transients promote substrate-dependent growth cone turning. *Science.* **291**, 1983-7.
Goode B.L., Chau M., Denis P.E. and Feinstein S.C. (2000) Structural and functional differences between 3-repeat and 4-repeat tau isoforms. Implications for normal tau function and the onset of neurodegenetative disease. *J Biol Chem.* **275**, 38182-9.
Gopinath P., Wan E., Holdcroft A., Facer P., Davis J.B., Smith G.D., Bountra C. and Anand P. (2005) Increased capsaicin receptor TRPV1 in skin nerve fibres and related vanilloid receptors TRPV3 and TRPV4 in keratinocytes in human breast pain. *BMC Womens Health*. **5**, 2.
Gordon-Weeks P.R. (2004) Microtubules and growth cone function. *J Neurobiol*. **58**, 70-83.
Greka A., Navarro B., Oancea E., Duggan A. and Clapham D.E. (2003) TRPC5 is a regulator of hippocampal neurite length and growth cone morphology. *Nat Neurosci.* **6**, 837-45.
Griffith L.M. and Pollard T.D. (1978) Evidence for actin filament-microtubule interaction mediated by microtubule-associated proteins. *J Cell Biol*. **78**, 958-65.
Griffith L.M. and Pollard T.D. (1982) The interaction of actin filaments with microtubules and microtubule-associated proteins. *J Biol Chem.* **257**, 9143-51.
Grishchuk E.L., Molodtsov M.I., Ataullakhanov F.I. and McIntosh J.R. (2005) Force production by disassembling microtubules. *Nature*. **438**, 384-8.
Groneberg D.A., Niimi A., Dinh Q.T., Cosio B., Hew M., Fischer A., Chung K.F. (2004) Increased expression of transient receptor potential vanilloid-1 in airway nerves of chronic cough. *Am J Respir Crit Care Med*. **170**, 1276-80.
Goswami C., Dreger M., Jahnel R., Bogen O., Gillen C. and Hucho F. (2004) Identification and characterization of a Ca^{2+} -sensitive interaction of the vanilloid receptor TRPV1 with tubulin. *J Neurochem.* **91**, 1092-103.
Gundersen G.G., Kalnoski M.H. and Bulinski J.C. (1984) Distinct populations of microtubules: tyrosinated and nontyrosinated alpha tubulin are distributed differently in vivo. *Cell*. **38**, 779-89
Hartel M., Di Mola F.F., Salvaggi F., Mascetta G., Wente M.N., Felix K., Giese N.A., Hinz U., Di Sebastiano P., Buchler M.W. and Friess H. (2005) Vanilloids in pancreas cancer: potential for chemotherapy and pain management. *Gut*. (Epub ahead of print).
Hayashi M. and Matsumura F. (1975) Calcium binding to bovine tubulin. *FEBS Lett* **58**, 222-225.
Hayes P., Meadows H.J., Gunthorpe M.J., Harries M.H., Duckworth D.M., Cairns W.,

Harrison D.C., Clarke C.E., Ellington K., Prinjha R.K., Barton A.J., Medhurst A.D., Smith G.D., Topp S., Murdock P., Sanger G.J., Terrett J., Jenkins O., Benham C.D., Randall A.D., Gloger I.S. and Davis J.B. (2000) Cloning and functional expression of a human orthologue of rat vanilloid receptor-1. *Pain*. **88**, 205-15.

Hellwig N., Plant T.D., Janson W., Schafer M., Schultz G. and Schaefer M. (2004) TRPV1 acts as proton channel to induce acidification in nociceptive neurons. *J Biol Chem*. **279**, 34553-61.

Hellwig N., Albrecht N., Harteneck C., Schultz G. and Schaefer M. (2005) Homo- and heteromeric assembly of TRPV channel subunits. *J Cell Sci*. **118**, 917-28.

Henley J. and Poo M.M. (2004) Guiding neuronal growth cones using Ca^{2+} signals. *Trends Cell Biol*. **14**, 320-30.

Himmler A., Drechsel D., Kirschner M.W. and Martin D.W. Jr. (1989) Tau consists of a set of proteins with repeated C-terminal microtubule-binding domains and ariable N-terminal domains. *Mol Cell Biol.* **9**, 1381-8.

Hingtgen C.M., Waite K.J., Vasko M.R. (1995) Prostaglandins facilitate peptide release from rat sensory neurons by activating the adenosine 3',5'-cyclic monophosphate transduction cascade. *J Neurosci*. **15**, 5411-9.

Honda A., Yamada M., Saisu H., Takahashi H., Mori K.J. and Abe T. (2002) Direct, Ca^{2+}-dependent interaction between tubulin and synaptotagmin I: a possible mechanism for attaching synaptic vesicles to microtubules. *J Biol Chem.* **277**, 20234-42.

Hudson L.J., Bevan S., Wotherspoon G., Gentry C., Fox A. and Winter J. (2001) VR1 protein expression increases in undamaged DRG neurons after partial nerve injury. *Eur J Neurosci*. **13**, 2105-14.

Hu H.J., Bhave G. and Gereau R.W (4^{th}). (2002) Prostaglandin and protein kinase A-dependent modulation of vanilloid receptor function by metabotropic glutamate receptor 5: potential mechanism for thermal hyperalgesia. *J. Neurosci*. **22**, 7444-52.

Hu H.Z., Gu Q., Wang C., Colton C.K., Tang J., Kinoshita-Kawada M., Lee L.Y., Wood J.D. and Zhu M.X. (2004) 2-aminoethoxydiphenyl borate is a common activator of TRPV1, TRPV2, and TRPV3. *J Biol Chem*. **279**, 35741-8.

Husi H., Ward M. A., Choudhary J. S., Blackstock W. P., and Grant S. G. (2000) Proteomic analysis of NMDA receptor-adhesion protein signaling complexes. *Nat Neurosci* **3**, 661-669.

Hwang S. M., Bisogno T., Trevisani M., Al Hayani A., De Petrocellis L., Fezza F., Tognetto M., Petros T. J., Krey J. F., Chu C. J., Miller J. D., Davies S. N., Geppetti P., Walker J. M., and Di Marzo V. (2002) An endogenous capsaicin-like substance with high potency at recombinant and native vanilloid VR1 receptors. *Proc Natl Acad Sci U S A* **99**, 8400-8405.

Hwang S.W., Cho H., Kwak J., Lee S.Y., Kang C.J., Jung J., Cho S., Min K.H., Suh Y.G., Kim D. and Oh U. (2000) Direct activation of capsaicin receptors by products of lipoxygenases: endogenous capsaicin-like substances. *Proc Natl Acad Sci U S A*. **97**, 6155-60.

Idriss H.T. (2000) Man to trypanosome: the tubulin tyrosination/detyrosination cycle revisited. *Cell Motil Cytoskeleton*. **45**, 173-84.

Iida T., Shimizu I., Nealen M.L., Campbell A. and Caterina M. (2005) Attenuated fever response in mice lacking TRPV1. *Neurosci Lett*. **378**, 28-33.

Inoue K., Koizumi S., Fuziwara S., Denda S., Inoue K. and Denda M. (2002) Functional vanilloid receptors in cultured normal human epidermal keratinocytes. *Biochem Biophys Res Commun*. **291**, 124-9.

Item C. and Sieghart W. (1994) Binding of gamma-aminobutyric acidA receptors to tubulin. *J Neurochem.* **63**, 1119-25.

Jahnel R. (2005) Thesis title: Investigations of molecular pain perception mechanisms, especially biochemical characterization of the thermosensitive vanilloid receptors TRPV1 and TRPV2. (http://www.diss.fu-berlin.de/2005/48/indexe.html)

Jahnel R., Dreger M., Gillen C., Bender O., Kurreck J., and Hucho F. (2001) Biochemical characterization of the vanilloid receptor 1 expressed in a dorsal root ganglia derived cell line. *Eur J Biochem* **268**, 5489-5496.

Jancso G., Karcsu S., Kiraly E., Szebeni A., Toth L., Bacsy E., Joo F. and Parducz A. (1984) Neurotoxin induced nerve cell degeneration: possible involvement of calcium. *Brain Res*. **295**, 211-6.

Jia Y., McLeod R.L., Hey J.A. (2005) TRPV1 receptor: a target for the treatment of pain, cough, airway disease and urinary incontinence. *Drug News Perspect*. **18**, 165-71.

Jin K., Xie L., Kim S.H., Parmentier-Batteur S., Sun Y., Mao X.O., Childs J., Greenberg D.A. (2004) Defective adult neurogenesis in CB1 cannabinoid receptor knockout mice. *Mol Pharmacol.* **66**, 204-8.

Jin X, Morsy N, Winston J, Pasricha PJ, Garrett K, Akbarali HI. (2004) Modulation of TRPV1 by nonreceptor tyrosine kinase, c-Src kinase. *Am J Physiol Cell Physiol*. **287**, C558-63

Job D., Fischer E.H. and Margolis R.L. (1981) Rapid disassembly of cold-stable microtubules by calmodulin. *Proc Natl Acad Sci U S A.* **78**, 4679-82.

Jordt S.E. and Julius D. (2002) Molecular basis for species-specific sensitivity to "hot" chili peppers. *Cell*. **108**, 421-30.

Jordt S.E., Tominaga M. and Julius D. (2000) Acid potentiation of the capsaicin receptor determined by a key extracellular site. *Proc Natl Acad Sci U S A.* **97**, 8134-9.

Jung J., Lee S. Y., Hwang S. W., Cho H., Shin J., Kang Y. S., Kim S., and Oh U. (2002) Agonist recognition sites in the cytosolic tails of vanilloid receptor 1. *J Biol Chem.* **277**, 44448-44454.

Jung J., Shin J.S., Lee S.Y., Hwang S.W., Koo J., Cho H., and Oh U. (2004) Phosphorylation of vanilloid receptor 1 by Ca^{2+}/calmodulin-dependent kinase II regulates its vanilloid binding. *J Biol Chem* **279**, 7048-7054.

Kamei J., Zushida K., Morita K., Sasaki M. and Tanaka S. (2001) Role of vanilloid VR1 receptor in thermal allodynia and hyperalgesia in diabetic mice. *Eur J Pharmacol*. **422**, 83-6.

Karai L., Brown D.C., Mannes A.J., Connelly S.T., Brown J., Gandal M., Wellisch O.M., Neubert JK, Olah Z, Iadarola MJ. (2004) Deletion of vanilloid receptor 1-expressing primary afferent neurons for pain control. *J Clin Invest.* **113**, 1344-52.

Karr T.L., Kristofferson D. and Purich D.L. (1980) Calcium ion induces endwise depolymerization of bovine brain microtubules. *J Biol Chem*. **255**, 11853-6

Kedei N., Szabo T., Lile J.D., Treanor J.J., Olah Z., Iadarola M.J. and Blumberg P.M. (2001) Analysis of the native quaternary structure of vanilloid receptor 1. *J Biol Chem.* **276**, 28613-9.

Keeble J., Russell F., Curtis B., Starr A., Pinter E. and Brain S.D. (2005) Involvement of transient receptor potential vanilloid 1 in the vascular and hyperalgesic components of joint inflammation. *Arthritis Rheum*. **52**, 3248-56.

Keith C., DiPaola M., Maxfield FR. and Shelanski ML. (1983) Microinjection of Ca^{++}-calmodulin causes a localized depolymerization of microtubules. *J Cell Biol*. **97**, 1918-24.

Kim S.R., Lee da. Y., Chung E.S., Oh U.T., Kim S.U. and Jin B.K. (2005) Transient receptor potential vanilloid subtype 1 mediates cell death of mesencephalic dopaminergic neurons in vivo and in vitro. *J Neurosci*. **25**, 662-71.

Kollarik M. and Undem B.J. (2004) Activation of bronchopulmonary vagal afferent nerves with bradykinin, acid and vanilloid receptor agonists in wild-type and TRPV1-/- mice. *J Physiol.* **555**, 115-23.

Koplas P.A., Rosenberg R.L., and Oxford G.S. (1997) The role of calcium in the desensitization of capsaicin responses in rat dorsal root ganglion neurons. *J Neurosci* **17**, 3525-3537.

Krause J.E., Chenard B.L. and Cortright D.N. (2005) Transient receptor potential ion channels as targets for the discovery of pain therapeutics. *Curr Opin Investig Drugs*. **6**, 48-57.

Kreis T.E. (1987) Microtubules containing detyrosinated tubulin are less dynamic. *EMBO J.* **6**, 2597-606

Laemmli U. K. (1970) Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature* **227**, 680-685.

Lazzeri M., Vannucchi M.G., Spinelli M., Bizzoco E., Beneforti P., Turini D. and Faussone-Pellegrini M.S. (2005) Transient receptor potential vanilloid type 1 (TRPV1) expression changes from normal urothelium to transitional cell carcinoma of human bladder. *Eur Urol*. **48**, 691-8.

Lee S.Y. (2005) Identification of a protein that interacts with the vanilloid receptor. *Biochem Biophys Res Commun*. **331**, 1445-51.

Lee Y.C. and Wolff J. (1982) Two opposing effects of calmodulin on microtubule assembly depend on the presence of microtubule-associated proteins. *J Biol Chem*. **257**, 6306-10.

Lee Y.S., Lee J.A., Jung J., Oh U. and Kaang B.K. (2000) The cAMP-dependent kinase path way does not sensitize the cloned vanilloid receptor type 1 expressed in xenopus oocytes or Aplysia neurons. *Neurosci Lett.* **288**, 57-60.

Lewis S.A., Wang D.H. and Cowan N.J. (1988) Microtubule-associated protein MAP2 shares a microtubule binding motif with tau protein. *Science*. **242**, 936-9.

Liapi A. and Wood J.N. (2005) Extensive co-localization and heteromultimer formation of the vanilloid receptor-like protein TRPV2 and the capsaicin receptor TRPV1 in the adult rat cerebral cortex. *Eur J Neurosci.* **22**, 825-34.

Lieuvin A., Labbe J.C., Doree M. and Job D. (1994) Intrinsic microtubule stability in interphase cells. *J Cell Biol*. **124**, 985-96.

Liu B., Hui K. and Qin F. (2003) Thermodynamics of heat activation of single capsaicin ion channels VR1. *Biophys J*. **85**, 2988-3006.

Liu B., Ma W., Ryu S. and Qin F. (2004) Inhibitory modulation of distal C-terminal on protein kinase C-dependent phospho-regulation of rat TRPV1 receptors. *J Physiol*. **560**, 627-38.

Liu X., Constantinescu S.N., Sun Y., Bogan J.S., Hirsch D., Weinberg R.A. and Lodish H.F. (2000) Generation of mammalian cells stably expressing multiple genes at predetermined levels. *Anal Biochem*. **280**, 20-8.

Li X. and Eisenach J.C. (2001) alpha2A-adrenoceptor stimulation reduces capsaicin-induced glutamate release from spinal cord synaptosomes. *J. Pharmacol Exp. Ther.* **299**, 939-44.

Li Y., Jia Y.C., Cui K., Li N., Zheng Z.Y., Wang Y.Z. and Yuan X.B. (2005) Essential role of TRPC channels in the guidance of nerve growth cones by brain-derived neurotrophic factor. *Nature.* **434**, 894-8.

Lopez-Rodriguez M.L., Viso A. and Ortega-Gutierrez S. (2003) VR1 receptor modulators as potential drugs for neuropathic pain. *Mini Rev Med Chem*. **3**, 729-48.

Lopshire J.C. and Nicol G.D. (1998) The cAMP transduction cascade mediates the prostaglandin E2 enhancement of the capsaicin-elicited current in rat sensory neurons: whole-cell and single-channel studies. *J Neurosci*. **18**, 6081-92.

Maccarrone M., Barboni B., Paradisi A., Bernabo N., Gasperi V., Pistilli M.G., Fezza F., Lucidi P. and Mattioli M. (2005) Characterization of the endocannabinoid system in boar spermatozoa and implications for sperm capacitation and acrosome reaction. *J Cell Sci.* **118**, 4393-404.

Macpherson L.J., Geierstanger B.H., Viswanath V., Bandell M., Eid S.R., Hwang S., Patapoutian A. (2005) The pungency of garlic: activation of TRPA1 and TRPV1 in response to allicin. *Curr Biol*. **15**, 929-34.

MacNeish, R.S. (1964). Ancient Mesoamerican civilization. *Science* **143**, 531-537.

MacRae T.H. (1997) Tubulin post-translational modifications--enzymes and their mechanisms of action. *Eur J Biochem*. **244**, 265-78.

Maggi C.A. (1992) Therapeutic potential of capsaicin-like molecules: studies in animals and humans. *Life Sci*. **51**, 1777-81.

Marie-Claire C, Courtin C, Roques BP, Noble F. (2004) Cytoskeletal genes regulation by chronic morphine treatment in rat striatum. *Neuropsychopharmacology.* **29**, 2208-15.

Marrs G.S., Green S.H. and Dailey M.E. (2001) Rapid formation and remodeling of postsynaptic densities in developing dendrites. *Nat Neurosci.* **4**, 1006-13.

Matsumura F. and Hayashi M. (1976) Polymorphism of tubulin assembly. In vitro formation of sheet, twisted ribbon and microtubule. *Biochim Biophys Acta.* **453,** 162-75.

Matus A. (2001) Moving molecules make synapses. *Nat Neurosci*. **4**, 967-8.

McMahon S.B., Lewin G., Bloom S.R. (1991) The consequences of long-term topical capsaicin application in the rat. *Pain*. **44**, 301-10.

McNally F.J. and Vale R.D. (1993) Identification of katanin, an ATPase that severs and disassembles stable microtubules. *Cell*. **75**, 419-29

McNamara F.N., Randall A. and Gunthorpe M.J. (2005) Effects of piperine, the pungent component of black pepper, at the human vanilloid receptor (TRPV1). *Br J Pharmacol*. **144**, 781-90.

Mery L., Strauss B., Dufour J.F., Krause K.H. and Hoth M. (2002) The PDZ-interacting domain of TRPC4 controls its localization and surface expression in HEK293 cells. *J. Cell Sci.* **115**, 3497-508.

Mezey E., Toth Z.E., Cortright D.N., Arzubi M.K., Krause J.E., Elde R., Guo A., Blumberg P.M., Szallasi A. (2000) Distribution of mRNA for vanilloid receptor subtype 1 (VR1), and VR1-like immunoreactivity, in the central nervous system of the rat and human. *Proc Natl Acad Sci U S A.* **97**, 3655-60.

Minke B. (1977) Drosophila mutant with a transducer defect. *Biophys Struct.Mech*. **3**, 59-64.

Mitchell J.E., Campbell A.P., New N.E., Sadofsky L.R., Kastelik J.A., Mulrennan S.A., Compton S.J. and Morice A.H. (2005) Expression and characterization of the intracellular vanilloid receptor (TRPV1) in bronchi from patients with chronic cough. *Exp Lung Res*. **31**, 295-306.

Miyamoto R., Tokuda M., Sakuta T., Nagaoka S. and Torii M. (2005) Expression and characterization of vanilloid receptor subtype 1 in human dental pulp cell cultures. *J Endod*. **31**, 652-8.

Mohapatra D.P. and Nau C. (2003) Desensitization of capsaicin-activated currents in the Vanilloid Receptor TRPV1 is decreased by the cyclic AMP-dependent protein kinase pathway. *J Biol Chem* **278**, 50080-50090.

Montell C. (2004) Exciting trips for TRPs. *Nat Cell Biol*. **6**, 690-2.

Montell C., Birnbaumer L., Flockerzi V., Bindels R.J., Bruford E.A., Caterina M.J., Clapham D.E., Harteneck C., Heller S., Julius D., Kojima I., Mori Y., Penner R., Prawitt D., Scharenberg A.M., Schultz G., Shimizu N. and Zhu M.X. (2002) A unified nomenclature for the superfamily of TRP cation channels. *Mol Cell*. **9**, 229-31.

Montell, C., Jones, K.,Hafen, E. and Rubin, G. (1985) Rescue of the Drosophila phototransduction mutation trp by germline transformation. *Science* **230**, 1040–1043.

Morenilla-Palao C., Planells-Cases R., Garcia-Sanz N. and Ferrer-Montiel A. (2004) Regulated exocytosis contributes to protein kinase C potentiation of vanilloid receptor activity. *J Biol Chem.* **279**, 25665-72.

Moreno J., Cruz-Vera L.R., Garcia-Villegas M.R. and Cereijido M. (2002) Polarized expression of Shaker channels in epithelial cells. *J Membr Biol.* **190**, 175-87.

Mosavi L.K., Cammett T.J., Desrosiers D.C. and Peng Z.Y. (2004) The ankyrin repeat as molecular architecture for protein recognition. *Protein Sci*. **13**, 1435-48.

Movahed P., Jonsson B.A., Birnir B., Wingstrand J.A., Jorgensen T.D., Ermund A., Sterner O., Zygmunt P.M. and Hogestatt E.D. (2005) Endogenous Unsaturated C18 N-Acylethanolamines Are Vanilloid Receptor (TRPV1) Agonists. *J Biol Chem.* **280**, 38496-504.

Movsesyan V.A., Stoica B.A., Yakovlev A.G., Knoblach S.M., Lea P.M. 4th, Cernak I., Vink R. and Faden A.I. (2004) Anandamide-induced cell death in primary neuronal cultures: role of calpain and caspase pathways. *Cell Death Differ*. **11**, 1121-32.

Naeini R.S., Witty M.F., Seguela P. and Bourque C.W. (2006) An N-terminal variant of Trpv1 channel is required for osmosensory transduction. *Nat Neurosci*. **9**, 93-8.

Nakata T., Terada S. and Hirokawa N. (1998) Visualization of the dynamics of synaptic vesicle and plasma membrane proteins in living axons. *J Cell Biol.* **140**, 659-74.

Nathan J.D., Patel A.A., McVey D.C., Thomas J.E., Prpic V., Vigna S.R. and Liddle R.A. (2001) Capsaicin vanilloid receptor-1 mediates substance P release in experimental pancreatitis. *Am J Physiol Gastrointest Liver Physiol*. **281**, G1322-8.

Noble M., Lewis S.A. and Cowan N.J. (1989) The microtubule binding domain of microtubule-associated protein MAP1B contains a repeated sequence motif unrelated to that of MAP2 and tau. *J Cell Biol*. **109**, 3367-76.

Nogales E. (2001) Structural insight into microtubule function. *Annu Rev Biophys Biomol Struct.* **30**, 397-420.

Numazaki M., Tominaga T., Takeuchi K., Murayama N., Toyooka H., and Tominaga M. (2003) Structural determinant of TRPV1 desensitization interacts with calmodulin. *Proc Natl Acad Sci U S A* **100**, 8002-8006.

Numazaki M., Tominaga T., Toyooka H., and Tominaga M. (2002) Direct phosphorylation of capsaicin receptor VR1 by protein kinase Cepsilon and identification of two target serine residues. *J Biol Chem.* **277**, 13375-13378.

Ohta T., Komatsu R., Imagawa T., Otsuguro K.I. and Ito S. (2005) Molecular cloning, functional characterization of the porcine transient receptor potential V1 (pTRPV1) and pharmacological comparison with endogenous pTRPV1. *Biochem Pharmacol*. **71**, 173-87.

Okabe S., Kim H.D., Miwa A., Kuriu T. and Okado H. (1999) Continual remodeling of postsynaptic density and its regulation by synaptic activity. *Nat Neurosci*. **2**, 804-11.

Olah Z., Karai L. and Iadarola M.J. (2002) Protein kinase C(alpha) is required for vanilloid receptor 1 activation. Evidence for multiple signaling pathways. *J Biol Chem*. **277**, 35752-9.

Pacher P., Batkai S. and Kunos G. (2004) Haemodynamic profile and responsiveness to anandamide of TRPV1 receptor knock-out mice. *J Physiol*. **558**, 647-57.

Peier A.M., Reeve A.J., Andersson D.A., Moqrich A., Earley T.J., Hergarden A.C., Story G.M., Colley S., Hogenesch J.B., McIntyre P., Bevan S. and Patapoutian A. (2002) A heat-sensitive TRP channel expressed in keratinocytes. *Science.* **296**, 2046-9.

Petho G., Izydorczyk I. and Reeh P.W. (2004) Effects of TRPV1 receptor antagonists on stimulated iCGRP release from isolated skin of rats and TRPV1 mutant mice. *Pain*. **109**, 284-90.

Phelps P.T., Anthes J.C. and Correll C.C. (2005) Cloning and functional characterization of dog transient receptor potential vanilloid receptor-1 (TRPV1). *Eur J Pharmacol.* **513**, 57-66.

Platika D., Boulos M.H., Baizer L. and Fishman M.C. (1985) Neuronal traits of clonal cell lines derived by fusion of dorsal root ganglia neurons with neuroblastoma cells. *Proc Natl Acad Sci U S A.* **82**, 3499–3503.

Pogatzki-Zahn E.M., Shimizu I., Caterina M. and Raja S.N. (2005) Heat hyperalgesia after incision requires TRPV1 and is distinct from pure inflammatory pain. *Pain*. **115**, 296-

307.

Polomano R.C. and Bennett G.J. (2001) Chemotherapy-evoked painful peripheral neuropathy. *Pain Med*. **2**, 8-14.

Pomonis J.D., Harrison J.E., Mark L., Bristol D.R., Valenzano K.J. and Walker K. (2003) N-(4-Tertiarybutylphenyl)-4-(3-cholorphyridin-2-yl)tetrahydropyrazine -1(2H)-carbox-amide (BCTC), a novel, orally effective vanilloid receptor 1 antagonist with analgesic properties: II. in vivo characterization in rat models of inflammatory and neuropathic pain. *J Pharmacol Exp Ther*. **306**, 387-93.

Popova J.S., Garrison J.C., Rhee S.G., and Rasenick M.M. (1997) Tubulin, Gq, and phosphatidylinositol 4,5-bisphosphate interact to regulate phospholipase Cβ1 signaling. *J Biol Chem* **272**, 6760-6765.

Premkumar L.S. and Ahern G.P. (2000) Induction of vanilloid receptor channel activity by protein kinase C. *Nature*. **408**, 985-90.

Prescott E.D. and Julius D. (2003) A modular PIP2 binding site as a determinant of capsaicin receptor sensitivity. *Science* **300**, 1284-1288.

Puntambekar P, Van Buren J, Raisinghani M, Premkumar LS, Ramkumar V (2004) Direct interaction of adenosine with the TRPV1 channel protein. *J Neurosci*. **24**, 3663-71.

Qiao S., Li W., Tsubouchi R., Haneda M., Murakami K. and Yoshino M. (2005) Involvement of peroxynitrite in capsaicin-induced apoptosis of C6 glioma cells. *Neurosci Res*. **51**, 175-83.

Quasthoff S. and Hartung H.P. (2002) Chemotherapy-induced peripheral neuropathy. *J. Neurol*. **249**, 9-17.

Ramsey I.S., Delling M. and Clapham D.E. (2006) An introduction to TRP channels. *Annu. Rev. Physiol.* **68,** 18.1–18.29

Raper J.A. and Kapfhammer J. P. (1990) The enrichment of a neuronal growth cone collapsing activity from embryonic chick brain. *Neuron.* **4**, 21–29.

Rashid M.H., Inoue M., Bakoshi S.and Ueda H. (2003a) Increased expression of vanilloid receptor 1 on myelinated primary afferent neurons contributes to the antihyperalgesic effect of capsaicin cream in diabetic neuropathic pain in mice. *J Pharmacol Exp Ther*. **306**, 709-17.

Rashid M.H., Inoue M., Kondo S., Kawashima T., Bakoshi S. and Ueda H. (2003b) Novel expression of vanilloid receptor 1 on capsaicin-insensitive fibers accounts for the analgesic effect of capsaicin cream in neuropathic pain. *J Pharmacol Exp Ther*. **304**, 940-8.

Reilly C.A., Johansen M.E., Lanza D.L., Lee J., Lim J.O. and Yost G.S. (2005) Calcium-dependent and independent mechanisms of capsaicin receptor (TRPV1)-mediated cytokine production and cell death in human bronchial epithelial cells. *J Biochem Mol Toxicol*. **19**, 266-75.

Robbins W. (2000) Clinical applications of capsaicinoids. *Clin J Pain*. **16**, S86-9.

Roberts J.C., Davis J.B. and Benham C.D. (2004) [3H]Resiniferatoxin autoradiography in the CNS of wild-type and TRPV1 null mice defines TRPV1 (VR-1) protein distribution. *Brain Res.* **995**, 176-83.

Robles E., Huttenlocher A. and Gomez T.M. (2003) Filopodial calcium transients regulate growth cone motility and guidance through local activation of calpain. Neuron. **38**, 597-609.

Rodriguez O.C., Schaefer A.W., Mandato C.A., Forscher P., Bement W.M. and Waterman-Storer C.M. (2003) Conserved microtubule-actin interactions in cell movement and morphogenesis. *Nat Cell Biol*. **5**, 599-609.

Romanovsky A.A. (2004) Signaling the brain in the early sickness syndrome: are sensory nerves involved? *Front Biosci*. **9**, 494-504.

Roos J. and Kelly R.B. (2000) Preassembly and transport of nerve terminals: a new concept of axonal transport. *Nat Neurosci*. **3**, 415-7.

Rosenbaum T., Gordon-Shaag A., Munari M., and Gordon S. E. (2004) Ca^{2+}/calmodulin modulates TRPV1 activation by capsaicin. *J Gen Physiol.* **123**, 53-62.

Rosenfeld A.C., Zackroff R.V. and Weisenberg R.C. (1976) Magnesium stimulation of calcium binding to tubulin and calcium induced depolymerization of microtubules. *FEBS Lett*. **65**, 144-7.

Roychowdhury S., Panda D., Wilson L., and Rasenick M. M. (1999) G protein alpha subunits activate tubulin GTPase and modulate microtubule polymerization dynamics. *J. Biol Chem.* **274**, 13485-13490.

Roychowdhury S. and Rasenick M. M. (1997) G protein β1γ2 subunits promote microtubule assembly. *J Biol Chem* **272**, 31576-31581.

Rutter A.R., Ma Q.P., Leveridge M. and Bonnert T.P. (2005) Heteromerization and colocalization of TrpV1 and TrpV2 in mammalian cell lines and rat dorsal root ganglia. *Neuroreport*. **16**, 1735-9.

Sabo S.L. and McAllister A.K. (2003) Mobility and cycling of synaptic protein –containing vesicles in axonal growth cone filopodia. *Nat Neurosci*. **6**, 1264-9.

Saimi Y. and Kung C. (2002) Calmodulin as an ion channel subunit. *Annu Rev Physiol*. **64**, 289-311.

Sanchez M.G., Sanchez A.M., Collado B., Malagarie-Cazenave S., Olea N., Carmena M.J., Prieto J.C. and Diaz-Laviada I.I. (2005) Expression of the transient receptor potential vanilloid 1 (TRPV1) in LNCaP and PC-3 prostate cancer cells and in human prostate tissue. *Eur J Pharmacol*. **515**, 20-7.

Sancho R, de la Vega L, Appendino G, Di Marzo V, Macho A, Munoz E. (2003) The CB1/VR1 agonist arvanil induces apoptosis through an FADD/caspase-8-dependent pathway. *Br J Pharmacol*. **140**, 1035-44.

Sarma T., Voyno-Yasenetskaya T., Hope T.J., and Rasenick M.M. (2003) Heterotrimeric G-proteins associate with microtubules during differentiation in PC12 pheochromocytoma cells. *FASEB J* **17**, 848-859.

Saugstad J.A., Yang S., Pohl J., Hall R.A., and Conn P.J. (2002) Interaction between metabotropic glutamate receptor 7 and alpha tubulin. *J Neurochem* **80**, 980-988.

Savidge J., Davis C., Shah K., Colley S., Phillips E., Ranasinghe S., Winter J., Kotsonis P., Rang H., McIntyre P. (2002) Cloning and functional characterization of the guinea pig vanilloid receptor 1. *Neuropharmacology*. **43**, 450-6.

Sawynok J. (2005) Topical analgesics in neuropathic pain. *Curr Pharm Des*. **11**, 2995-3004.

Schmid G., Carita F., Bonanno G. and Raiteri M. (1998) NK-3 receptors mediate enhancement of substance P release from capsaicin-sensitive spinal cord afferent terminals. *Br J Pharmacol*. **125**, 621-6.

Schumacher M.A., Moff I., Sudanagunta S.P. and Levine J.D. (2000) Molecular cloning of an N-terminal splice variant of the capsaicin receptor. Loss of N-terminal domain suggests functional divergence among capsaicin receptor subtypes. *J Biol Chem*. **275**, 2756-62.

Serrano L., Valencia A., Caballero R., and Avila J. (1986) Localization of the high affinity calcium-binding site on tubulin molecule. *J Biol Chem* **261**, 7076-7081.

Shaw G., Morse S., Ararat M., Graham F.L. (2002) Preferential transformation of human neuronal cells by human adenoviruses and the origin of HEK 293 cells. *FASEB J*. **16**, 869-71.

Shelanski M.L., Gaskin F., and Cantor C.R. (1973) Microtubule assembly in the absence of added nucleotides. *Proc Natl Acad Sci U S A.* **70**, 765-768.

Shevchenko A., Wilm M., Vorm O., and Mann M. (1996) Mass spectrometric sequencing of proteins silver-stained polyacrylamide gels. *Anal Chem* **68**, 850-858.

Shim S., Goh E.L., Ge S., Sailor K., Yuan J.P., Roderick H.L., Bootman M.D., Worley P.F., Song H. and Ming G.L. (2005) XTRPC1-dependent chemotropic guidance of neuronal growth cones. *Nat Neurosci*. **8**, 730-5.

Shin C.Y., Shin J., Kim B.M., Wang M.H., Jang J.H., Surh Y.J. and Oh U. (2003) Essential role of mitochondrial permeability transition in vanilloid receptor 1-dependent cell death of sensory neurons. *Mol Cell Neurosci*. **24**, 57-68.

Shin J., Cho H., Hwang S.W., Jung J., Shin C.Y., Lee S.Y., Kim S.H., Lee M.G., Choi Y.H., Kim J., Haber N.A., Reichling D.B., Khasar S., Levine J.D. and Oh U. (2002) Bradykinin-12-lipoxygenase-VR1 signaling pathway for inflammatory hyperalgesia. *Proc Natl Acad Sci U S A*. **99**, 10150-5.

Singh B.B., Lockwich T.P., Bandyopadhyay B.C., Liu X, Bollimuntha S., Brazer S.C., Combs C., Das S., Leenders A.G., Sheng Z.H., Knepper M.A., Ambudkar S.V., Ambudkar IS. (2004) VAMP2-dependent exocytosis regulates plasma membrane insertion of TRPC3 channels and contributes to agonist-stimulated Ca^{2+} influx. *Mol Cell*. **15,** 635-46.

Smith P.K., Krohn R.I., Hermanson G.T., Mallia A.K., Gartner F.H., Provenzano M.D., Fujimoto E.K., Goeke N.M., Olson B.J and Klenk D.C. (1985) Measurement of protein using bicinchoninic acid. *Anal Biochem*. **150**, 76-85.

Solomon F. (1977) Binding sites for calcium on tubulin. *Biochemistry* **16**, 358-363.

Soto C., Rodriguez P.H., and Monasterio O. (1996) Ca^{2+} and gadolinium ions stimulate the GTPase activity of purified chicken brain tubulin through a conformational change. *Biochemistry* **35**, 6337-6344.

Southall M.D., Li T., Gharibova L.S., Pei Y., Nicol G.D. and Travers J.B. (2003) Activation of epidermal vanilloid receptor-1 induces release of proinflammatory mediators in human keratinocytes. *J Pharmacol Exp Ther*. **304**, 217-22.

Spitzer N.C., Lautermilch N.J., Smith R.D. and Gomez T.M. (2000) Coding of neuronal differentiation by calcium transients. *Bioessays*. **22**, 811-7.

Stander S., Moormann C., Schumacher M., Buddenkotte J., Artuc M., Shpacovitch V., Brzoska T., Lippert U., Henz B.M., Luger T.A., Metze D. and Steinhoff M. (2004) Expression of vanilloid receptor subtype 1 in cutaneous sensory nerve fibers, mast cells, and epithelial cells of appendage structures. *Exp Dermatol*. **13**, 129-39.

Stein R.J., Santos S., Nagatomi J., Hayashi Y., Minnery B.S., Xavier M., Patel A.S., Nelson J.B., Futrell W.J., Yoshimura N., Chancellor M.B. and De Miguel F. (2004) Cool (TRPM8) and hot (TRPV1) receptors in the bladder and male genital tract. *J Urol*. **172**, 1175-8.

Stowers L., Holy T.E., Meister M., Dulac C. and Koentges G. (2002) Loss of sex discrimination and male–male aggression in mice deficient for TRP2. *Science* **295**, 1493–1500 (2002).

Stracke R., Bohm K.J., Wollweber L., Tuszynski J.A. and Unger E. (2002) Analysis of the migration behaviour of single microtubules in electric fields. *Biochem Biophys Res Commun*. **293**, 602-9.

Strecker T., Messlinger K., Weyand M. and Reeh P.W. (2005) Role of different proton-sensitive channels in releasing calcitonin gene-related peptide from isolated hearts of mutant mice. *Cardiovasc Res*. **65**, 405-10.

Suter D.M., Schaefer A.W. and Forscher P. (2004) Microtubule dynamics are necessary for SRC family kinase-dependent growth cone steering. *Curr Biol*. **14**, 1194-9.

Symanowicz P.T., Gianutsos G. and Morris J.B. Lack of role for the vanilloid receptor in response to several inspired irritant air pollutants in the C57Bl/6J mouse. *Neurosci Lett*. **362**, 150-3.

Szabo A., Helyes Z., Sandor K., Bite A., Pinter E., Nemeth J., Banvolgyi A., Bolcskei K., Elekes K. and Szolcsanyi J. (2005) Role of transient receptor potential vanilloid 1

receptors in adjuvant-induced chronic arthritis: in vivo study using gene-deficient mice. *J Pharmacol Exp Ther.* **314**, 111-9.

Szabo T., Biro T., Gonzalez A.F., Palkovits M. and Blumberg P.M. (2002) Pharmacological characterization of vanilloid receptor located in the brain. *Brain Res Mol Brain Res*. **98**, 51-7.

Szallasi A. (2001) Vanilloid receptor ligands: hopes and realities for the future. *Drugs Aging*. **18**, 561-73.

Szallasi A. (2002) Vanilloid (capsaicin) receptors in health and disease. *Am J Clin Pathol*. **118**, 110-21.

Szallasi A. (2005) Piperine: researchers discover new flavor in an ancient spice. *Trends Pharmacol Sci*. **26**, 437-9.

Szallasi A. and Blumberg P.M. (1990a) Specific binding of resiniferatoxin, an ultrapotent capsaicin analog, by dorsal root ganglion membranes. *Brain Res*. **524**, 106-11.

Szallasi A. and Blumberg P.M. (1990b) Resiniferatoxin and its analogs provide novel insights into the pharmacology of the vanilloid (capsaicin) receptor. *Life Sci*. **47**, 1399-408.

Szallasi A. and Di Marzo V. (2000) New perspectives on enigmatic vanilloid receptors. *Trends Neurosci*. **23**, 491-7.

Szelenyi Z., Hummel Z., Szolcsanyi J. and Davis J.B. (2004) Daily body temperature rhythm and heat tolerance in TRPV1 knockout and capsaicin pretreated mice. *Eur J. Neurosci.* **19**, 1421-4.

Szolcsanyi J., Szallasi A., Szallasi Z., Joo F. and Blumberg P.M. (1990) Resiniferatoxin: an ultrapotent selective modulator of capsaicin-sensitive primary afferent neurons. *J Pharmacol Exp Ther*. **255**, 923-8.

Tanner K.D., Levine J.D. and Topp K.S. (1998) Microtubule disorientation and axonal swelling in unmyelinated sensory axons during vincristine-induced painful neuropathy in rat. *J Comp Neurol*. **395**, 481-92.

Tian W., Fu Y., Wang D.H. and Cohen D.M. (2006) Regulation of TRPV1 by a novel renally expressed rat TRPV1 splice variant. *Am J Physiol Renal Physiol*. **290**, F117-26.

Tobias M. Böckers, Marie Germaine Mameza, Michael R. Kreutz, Jürgen Bockmann, Christoph Weise, Fritz Buck, Dietmar Richter, Eckart D. Gundelfinger, and Hans-Jürgen Kreienkamp Synaptic Scaffolding Proteins in Rat Brain. (2001) *J. Biol. Chem*. **276**, 40104-40112.

Taylor K.R., Holzer A.K., Bazan J.F., Walsh C.A. and Gleeson J.G. (2000) Patient mutations in doublecortin define a repeated tubulin-binding domain. *J Biol Chem.* **75**, 34442-50.

Tominaga M., Caterina M.J., Malmberg A.B., Rosen T.A., Gilbert H., Skinner K. Raumann B. E., Basbaum A. I., and Julius D. (1998) The cloned capsaicin receptor integrates multiple pain-producing stimuli. *Neuron* **21**, 531-543.

Tominaga M. and Julius D. (2000) Capsaicin receptor in the pain pathway. *Jpn J Pharmacol.* **83**, 20-4.

Tominaga M., Wada M. and Masu M. (2001) Potentiation of capsaicin receptor activity by metabotropic ATP receptors as a possible mechanism for ATP-evoked pain and hyperalgesia. *Proc Natl Acad Sci U S A.* **98**, 6951-6.

Topp K.S., Tanner K.D. and Levine J.D. (2000) Damage to the cytoskeleton of large diameter sensory neurons and myelinated axons in vincristine-induced painful peripheral neuropathy in the rat. *J Comp Neurol*. **424**, 563-76.

Toth A., Boczan J., Kedei N., Lizanecz E., Bagi Z., Papp Z., Edes I., Csiba L. and Blumberg P.M. (2005) Expression and distribution of vanilloid receptor 1 (TRPV1) in the adult rat brain. *Brain Res Mol Brain Res*. **135,** 162-8.

Towbin H., Ozbey O. and Zingel O. (2001) An immunoblotting method for high-resolution isoelectric focusing of protein isoforms on immobilized pH gradients. *Electrophoresis.* **22**, 1887-93.

Tran P.T., Joshi P. and Salmon E.D. (1997) How tubulin subunits are lost from the shortening ends of microtubules. *J Struct Biol*. **118**, 107-18.

Trevisani M., Smart D., Gunthorpe M.J., Tognetto M., Barbieri M., Campi B., Amadesi S., Gray J., Jerman J.C., Brough S.J., Owen D., Smith G.D., Randall A.D., Harrison S., Bianchi A., Davis J.B. and Geppetti P. (2002) Ethanol elicits and potentiates nociceptor responses via the vanilloid receptor-1. *Nat Neurosci*. **5**, 546-51.

Uchida A. and Brown A. (2004) Arrival, reversal, and departure of neurofilaments at the tips of growing axons. *Mol Biol Cell*. **15**, 4215-25.

Vaishnava P. and Wang D.H. (2003) Capsaicin sensitive-sensory nerves and blood pressure regulation. *Curr Med Chem Cardiovasc Hematol Agents*. **1**, 177-88.

Valtschanoff J.G., Rustioni A., Guo A. and Hwang S.J. (2001) Vanilloid receptor VR1 is both presynaptic and postsynaptic in the superficial laminae of the rat dorsal horn. *J Comp Neurol*. **436**, 225-35.

van de Graaf S.F., Boullart I., Hoenderop J.G. and Bindels R.J. (2004) Regulation of the epithelial Ca^{2+} channels TRPV5 and TRPV6 by 1alpha,25-dihydroxy Vitamin D3 and dietary Ca^{2+}. *J Steroid Biochem Mol Biol*. **89-90**, 303-8.

van de Graaf S.F., Hoenderop J.G., Gkika D., Lamers D., Prenen J., Rescher U., Gerke V., Staub O., Nilius B., Bindels R.J. (2003) Functional expression of the epithelial Ca^{2+} channels (TRPV5 and TRPV6) requires association of the S100A10-annexin 2 complex. *EMBO J*. **22**, 1478-87.

van der Stelt M. and Di Marzo V. (2004) Endovanilloids. Putative endogenous ligands of transient receptor potential vanilloid 1 channels. Eur J Biochem. 271, 1827-34.

van Rossum D., Kuhse J., and Betz H. (1999) Dynamic interaction between soluble tubulin and C-terminal domains of N-methyl-D-aspartate receptor subunits. *J Neurochem* **72**, 962-973.

Vellani V., Mapplebeck S., Moriondo A., Davis J.B. and McNaughton P.A. (2001) Protein kinase C activation potentiates gating of the vanilloid receptor VR1 by capsaicin, protons, heat and anandamide. *J Physiol*. **534**, 813-25.

Verdier-Pinard P., Wang F., Martello L., Burd B., Orr G.A., Horwitz S.B. (2003) Analysis of tubulin isotypes and mutations from taxol-resistant cells by combined isoelectrofocusing and mass spectrometry. *Biochemistry*. **42**, 5349-57.

Vlachova V., Teisinger J., Susankova K., Lyfenko A., Ettrich R., and Vyklicky L. (2003) Functional role of C-terminal cytoplasmic tail of rat vanilloid receptor 1. *J Neurosci* **23**, 1340-1350.

Vladimirova N.M., Sautkina E.N., Ovchinnikova T.V. and Potapenko N.A. (2002) Interaction between tubulin and Na^+,K^+-ATPase in brain stem neurons. *Biochemistry (Mosc)*. **67**, 503-9.

Vogel G. (2000) Hot pepper receptor could help manage pain. *Science*. **288**, 241-2.

Vriens J., Janssens A., Prenen J., Nilius B., Wondergem R. (2004) TRPV channels and modulation by hepatocyte growth factor/scatter factor in human hepatoblastoma (HepG2) cells. *Cell Calcium*. **36**, 19-28.

Wahl P., Foged C., Tullin S. and Thomsen C. (2001) Iodo-resiniferatoxin, a new potent vanilloid receptor antagonist. *Mol Pharmacol.* **59**, 9-15.

Walker KM, Urban L, Medhurst SJ, Patel S, Panesar M, Fox AJ, McIntyre P. (2003) The VR1 antagonist capsazepine reverses mechanical hyperalgesia in models of inflammatory and neuropathic pain. *J Pharmacol Exp Ther*. **304**, 56-62.

Walter S, Sandig K, Hinkel GK, Mitulla B, Ounap K, Sims G, Sitska M, Utermann B, Viertel P, Kalscheuer V, Bartsch O. (2004) Subtelomere FISH in 50 children with mental retardation and minor anomalies, identified by a checklist, detects 10 rearrangements including a de novo balanced translocation of chromosomes 17p13.3 and 20q13.33. *Am J Med Genet A*. **128**, 364-73.

Wang C., Hu H.Z., Colton C.K., Wood J.D. and Zhu M.X. (2004) An alternative splicing

product of the murine trpv1 gene dominant negatively modulates the activity of TRPV1 channels. *J Biol Chem*. **279**, 37423-30.

Wang D.H. (2005) The vanilloid receptor and hypertension. *Acta Pharmacol Sin*. **26**, 286-94.

Wang G.X. and Poo M.M. (2005) Requirement of TRPC channels in netrin-1-induced chemotropic turning of nerve growth cones. *Nature.* **434**, 898-904.

Wang Y., Kedei N., Wang M., Wang Q.J., Huppler A.R., Toth A., Tran R. and Blumberg P.M. (2004) Interaction between protein kinase Cmu and the vanilloid receptor type 1. *J Biol Chem*. **279**, 53674-82.

Wehland J. and Weber K. (1987) Turnover of the carboxy-terminal tyrosine of alpha-tubulin and means of reaching elevated levels of detyrosination in living cells. *J Cell Sci*. **88**, 185-203

Weiner J.L., Buhler A.V., Whatley V.J., Harris R.A. and Dunwiddie T.V. (1998) Colchicine is a competitive antagonist at human recombinant gamma-aminobutyric acidA receptors. *J Pharmacol Exp Ther*. **284**, 95-102.

Wen Z., Guirland C., Ming G.L. and Zheng J.Q. (2004) A CaMKII/calcineurin switch controls the direction of Ca^{2+}-dependent growth cone guidance. *Neuron*. **43**, 835-46.

Westermann S. and Weber K. (2003) Post-translational modifications regulate microtubule function. *Nat Rev Mol Cell Biol.* **4**, 938-47.

Winter J. (1987) Characterization of capsaicin-sensitive neurones in adult rat dorsal root ganglion cultures. *Neurosci Lett*. **80**, 134-40.

Winter J., Forbes C.A., Sternberg J. and Lindsay R.M. (1988) Nerve growth factor (NGF) regulates adult rat cultured dorsal root ganglion neuron responses to the excitotoxin capsaicin. *Neuron*. **1**, 973-81.

Wirkner K., Hognestad H., Jahnel R., Hucho F. and Illes P. (2005) Characterization of rat transient receptor potential vanilloid 1 receptors lacking the N-glycosylation site N604. *Neuroreport*. **16**, 997-1001.

Woodbury C.J., Zwick M., Wang S., Lawson J.J., Caterina M.J., Koltzenburg M., Albers K.M., Koerber H.R., Davis B.M. (2004) Nociceptors lacking TRPV1 and TRPV2 have normal heat responses. *J. Neurosci*. **24**, 6410-5.

Wood J.N. (2000) Pathobiology of Visceral Pain: Molecular Mechanisms and Therapeutic Implications. Genetic approaches to pain therapy. *Am J Physiol Gastrointest Liver Physiol.* **278**, G507-12.

Wood J.N., Winter J., James I.F., Rang H.P., Yeats J. and Bevan S. (1988) Capsaicin-induced ion fluxes in dorsal root ganglion cells in culture. *J Neurosci*. **8**, 3208-20.

Xin H., Tanaka H., Yamaguchi M., Takemori S., Nakamura A. and Kohama K. (2005) Vanilloid receptor expressed in the sarcoplasmic reticulum of rat skeletal muscle. *Biochem Biophys Res Commun*. **332**, 756-62.

Xue Q., Yu Y., Trilk S.L., Jong B.E., Schumacher M.A. (2001) The genomic organization of the gene encoding the vanilloid receptor: evidence for multiple splice variants. *Genomics*. **76**, 14-20.

Xu H., Blair N.T., Clapham D.E. (2005) Camphor activates and strongly desensitizes the transient receptor potential vanilloid subtype 1 channel in a vanilloid-independent mechanism. *J Neurosci*. **25**, 8924-37.

Yamamoto H., Fukunaga K., Tanaka E. and Miyamoto E. (1983) Ca^{2+}- and calmodulin-dependent phosphorylation of microtubule-associated protein 2 and tau factor, and inhibition of microtubule assembly. *J Neurochem*. **41**, 1119-25.

Yoshimura M. and Yonehara N. (2001) Influence of capsaicin cream in rats with peripheral neuropathy. *Pharmacol Res*. **44**, 105-11.

Zhang X., Huang J. and McNaughton P.A. (2005) NGF rapidly increases membrane expression of TRPV1 heat-gated ion channels. *EMBO J*. **24**, 4211-23.

Zhang Y., Hoon M.A., Chandrashekar J., Mueller K.L., Cook B., Wu D., Zuker C.S., Ryba N.J. (2003) Coding of sweet, bitter, and umami tastes: different receptor cells sharing

similar signaling pathways. *Cell* **112**, 293–301.

Zheng J., Dai C., Steyger P.S., Kim Y., Vass Z., Ren T. and Nuttall A.L. (2003) Vanilloid receptors in hearing: altered cochlear sensitivity by vanilloids and expression of TRPV1 in the organ of corti. *J Neurophysiol*. **90**, 444-55.

Zhou X.L., Batiza A.F., Loukin S.H., Palmer C.P., Kung C. and Saimi Y. (2003) The transient receptor potential channel on the yeast vacuole is mechanosensitive. *Proc. Natl Acad. Sci. USA* **100**, 7105–7110.

Zygmunt P.M., Petersson J., Andersson D.A., Chuang H., Sorgard M., Di Marzo V., Julius D. and Hogestatt E.D. (1999) Vanilloid receptors on sensory nerves mediate the vasodilator action of anandamide. *Nature*. **400**, 452-7.