Src (gene)

WARNING: Article could not be rendered - ouputting plain text.
Potential causes of the problem are: (a) a bug in the pdf-writer software (b) problematic Mediawiki markup (c) table is too wide

V-src sarcoma (Schmidt-Ruppin A-2) viral oncogene homolog (avian)Protein_Data_BankPDB rendering based on 1a07.Available structuresProtein Data BankPDB 1A07, 1A08, 1A09, 1A1A, 1A1B, 1A1C, 1A1E, 1FMK, 1HCS, 1HCT, 1KSW, 1O41, 1O42, 1O43, 1O44, 1O45, 1O46, 1O47, 1O48, 1O49, 1O4A, 1O4B, 1O4C, 1O4D, 1O4E, 1O4F, 1O4G, 1O4H, 1O4I, 1O4J, 1O4K, 1O4L, 1O4M, 1O4N, 1O4O, 1O4P, 1O4Q, 1O4R, 1SHD, 1Y57, 1YI6, 1YOJ, 1YOL, 1YOM, 2BDF, 2BDJ, 2H8H, 2SRCIdentifiersHuman Genome OrganisationSymbols SRC; ASV; SRC1; c-SRC; p60-SrcExternal IDsMendelian Inheritance in ManOMIM: 190090 Mouse Genome InformaticsMGI: 98397 HomoloGene: 21120 GeneCards: SRC GeneEnzyme Commission numberEC number 2.7.10.2Gene OntologyMolecular function• nucleotide binding• protein kinase activity• protein kinase activity• protein tyrosine kinase activity• protein tyrosine kinase activity• non-membrane spanning protein tyrosine kinase activity• SH3/SH2 adaptor activity• protein kinase C binding• receptor binding• insulin receptor binding• integrin binding• protein binding• ATP binding• protein C-terminus binding• kinase activity• heme binding• SH2 domain binding• ion channel binding• cell adhesion molecule bindingCellular component• mitochondrion• mitochondrial inner membrane• cytosol• cytosol• plasma membrane• plasma membrane• caveola• postsynaptic density• synaptosomeBiological process• response to acid• protein phosphorylation• protein phosphorylation• response to stress• signal transduction• signal complex assembly• epidermal growth factor receptor signaling pathway• intracellular protein kinase cascade• Ras protein signal transduction• axon guidance• blood coagulation• cell proliferation• fibroblast growth factor receptor signaling pathway• response to mechanical stimulus• response to virus• positive regulation of gene expression• positive regulation of intracellular protein kinase cascade• positive regulation of glucose metabolic process• positive regulation of smooth muscle cell migration• cellular membrane organization• phosphorylation• cell-cell adhesion• peptidyl-tyrosine phosphorylation• platelet activation• forebrain development• T cell costimulation• response to nutrient levels• cellular response to insulin stimulus• regulation of estrogen receptor signaling pathway• positive regulation of integrin activation• cell junction assembly• response to drug• response to hydrogen peroxide• positive regulation of apoptosis• regulation of vascular permeability• interspecies interaction between organisms• transcytosis• regulation of bone resorption• bone resorption• positive regulation of cell adhesion• positive regulation of insulin receptor signaling pathway• platelet-derived growth factor receptor signaling pathway• nerve growth factor receptor signaling pathway• oogenesis• positive regulation of cytokine secretion• leukocyte migration• positive regulation of protein transport• response to mineralocorticoid stimulus• response to electrical stimulus• uterus development• branching involved in mammary gland duct morphogenesis• positive regulation of ERK1 and ERK2 cascade• response to interleukin-1• cellular response to lipopolysaccharide• cellular response to fatty acid• cellular response to protein stimulus• cellular response to hypoxia• positive regulation of canonical Wnt receptor signaling pathwaySources: Amigo / QuickGORNA expression pattern More reference expression dataOrthologsSpeciesHumanMouseEntrez 6714 20779Ensembl ENSG00000197122 ENSMUSG00000027646UniProt P12931 Q2M4I4RefSeq (mRNA) NM_005417.3 NM_001025395RefSeq (protein) NP_005408.1 NP_001020566Location (UCSC) Chr 20:35.97 – 36.03 Mb Chr 2:157.24 – 157.3 MbPubMed searchProto-oncogene tyrosine-protein kinase Src is an enzyme that in humans is encoded by the SRC gene.Anderson SK, Gibbs CP, Tanaka A, Kung HJ, Fujita DJ (May 1985). "Human cellular src gene: nucleotide sequence and derived amino acid sequence of the region coding for the carboxy-terminal two-thirds

of pp60c-src". Mol. Cell. Biol. 5 (5): 1122–9. PMC 366830. PMID 2582238.Src (pronounced "sarc" as it is short for sarcoma) is a proto-oncogene encoding a tyrosine kinase originally discovered by J. Michael Bishop and Harold E. Varmus, for which they won the 1989 Nobel Prize in Physiology or Medicine. "The Nobel Prize in Physiology or Medicine 1989: J. Michael Bishop, Harold E. Varmus". Nobelprize.org. 1989-10-09. . "for their discovery of 'the cellular origin of retroviral oncogenes'" It belongs to a family of non-receptor tyrosine kinases called Src family kinases. The discovery of Src family proteins has been instrumental to the modern understanding of cancer as a disease where normally healthy cellular signalling has gone awry.This gene is similar to the v-src gene of Rous sarcoma virus. This proto-oncogene may play a role in the regulation of embryonic development and cell growth. The protein encoded by this gene is a tyrosine-protein kinase whose activity can be inhibited by phosphorylation by c-SRC kinase. Mutations in this gene could be involved in the malignant progression of colon cancer. Two transcript variants encoding the same protein have been found for this gene. "Entrez Gene: SRC v-src sarcoma (Schmidt-Ruppin A-2) viral oncogene homolog (avian)". .v-srcFrancis Peyton Rous first proposed that viruses can cause cancer. He proved it in 1911 and was later awarded the Nobel prize in 1966. Chickens grow a tumor called a fibrosarcoma. Rous ground up these sarcomas, centrifuged them to remove the solid material, and injected the remaining liquid into chicks. The chicks developed sarcomas. The causative agent in the liquid was a virus, now called Rous sarcoma virus (RSV). Later work by others showed that RSV was a type of retrovirus. Non-cancer-forming retroviruses contain three genes, called gag, pol, and env. Some tumor-inducing retroviruses (such as RSV), however, also contain a gene called v-src (viral-sarcoma). It was found that the v-src gene in RSV is required for the formation of cancer and that the other genes have no role in oncogenesis.Stehelin D, Fujita DJ, Padgett T, Varmus HE, Bishop JM. (1977). "Detection and enumeration of transformation-defective strains of avian sarcoma virus with molecular hybridization". Virology 76 (2): 675–84. doi:10.1016/0042-6822(77)90250-1. PMID 190771.A function for Src tyrosine kinases in normal cell growth was first demonstrated with the binding of family member p56lck to the cytoplasmic tail of the CD4 and CD8 co-receptors on T-cells.Rudd CE, Trevillyan JM, Dasgupta JD, Wong LL, Schlossman SF (July 1988). "The CD4 receptor is complexed in detergent lysates to a protein-tyrosine kinase (pp58) from human T lymphocytes". Proc. Natl. Acad. Sci. U.S.A. 85 (14): 5190–4. doi:10.1073/pnas.85.14.5190. PMC 281714. PMID 2455897. . Src tyrosine kinases also transmit Cell adhesionintegrin-dependent signals central to Cell (biology)cell movement and Cell growthproliferation. Hallmarks of v-src induced transformation are rounding of the cell and the formation of actin rich podosomes on the basal surface of the cell. These structures are correlated with increased invasiveness, a process thought to be essential for metastasis. v-src lacks the C-terminal endC-terminal inhibitory phosphorylation site (tyrosine-527), and is therefore constitutively active as opposed to normal src (c-src) which is only activated under certain circumstances where it is required (e.g. growth factor signaling). v-src is therefore an instructive example of an oncogene whereas c-src is a proto-oncogene. The first sequence of v-src was published in 1980Czernilofsky AP, Levinson AD, Varmus HE, Bishop JM, Tischer E, Goodman HM (September 1980). "Nucleotide sequence of an avian sarcoma virus oncogene (src) and proposed amino acid sequence for gene product". Nature 287 (5779): 198–203. doi:10.1038/287198a0. PMID 6253794. and the characterization of sites for tyrosine phosphorylation in the transforming protein of Rous sarcoma virus and its normal cellular homologue was published in 1981.Smart JE, Oppermann H, Czernilofsky AP, Purchio AF, Erikson RL, Bishop JM (October 1981). "Characterization of sites for tyrosine phosphorylation in the transforming protein of Rous sarcoma virus (pp60v-src) and its normal cellular homologue (pp60c-src)". Proc. Natl. Acad. Sci. U.S.A. 78 (10): 6013–7. doi:10.1073/pnas.78.10.6013. PMC 348967. PMID 6273838.c-src In 1979, J. Michael Bishop and Harold E. Varmus discovered that normal chickens contain a gene that is structurally closely related to v-src. The normal cellular gene was called c-src (cellular-src).Oppermann H, Levinson AD, Varmus HE, Levintow L, Bishop JM (1979). "Uninfected vertebrate cells contain a protein that is closely related to the product of the avian sarcoma virus transforming gene (src)". Proc Natl Acad Sci U S A. 76 (4): 1804–8. doi:10.1073/pnas.76.4.1804. PMC 383480. PMID 221907. This discovery changed the current thinking about cancer from a model wherein cancer is caused by a foreign substance (a viral gene) to one where a gene that is normally present in the cell can cause cancer. It is believed that at one point an ancestral virus mistakenly incorporated the

c-src gene of its cellular host. Eventually this normal gene mutationmutated into an abnormally functioning oncogene within the Rous sarcoma virus. Once the oncogene is transfected back into a chicken, it can lead to cancer.src: The Cancertransforming (sarcoma inducing) gene of Rous sarcoma virus. The protein product is pp60vsrc, a cytoplasmic protein with tyrosine-specific protein kinase activity (Enzyme Commission numberEC 2.7.10.2), that associates with the cytoplasmic face of the plasma membrane. The protein consists of three domains, an N-terminal SH3 domain, a central SH2 domain and a tyrosine kinase domain. The SH2 and SH3 domains cooperate in the auto-inhibition of the kinase domain. c-Src is phosphorylated on an inhibitory tyrosine near the c-terminus of the protein. This produces a binding site for the SH2 domain which, when bound, facilitates binding of the SH3 domain to a low affinity polyproline site within the linker between the SH2 domain and the kinase domain. Binding of the SH3 domain results in misalignment of residues within the kinase domain's active site inactivating the enzyme. This allows for multiple mechanism for c-Src activation: dephosphorylation of the C-terminal tyrosine by a protein tyrosine phosphatase, binding of the SH2 domain by a competitive phospho-tyrosine residue, as seen in the case of c-Src binding to focal adhesion kinase, or competitive binding of a polyproline binding site to the SH3 domain, as seen in the case of the HIV NEF protein. Model organisms Src knockout mouse phenotype Characteristic Phenotype Homozygote viability Normal Fertility Normal General Observations Abnormal Body weight Normal Open_Field_(animal_test)AnxietyNormal Neurological assessment Normal Grip strength Normal Hot_plate_testHot plateNormal DysmorphologyNormal Indirect calorimetryNormal Glucose tolerance testNormal Auditory brainstem responseNormal Dual-energy_X-ray_absorptiometryDEXANormal RadiographyNormal Body temperature Normal Eye morphology Normal Clinical chemistryNormal HaematologyNormal Peripheral blood lymphocytes Normal Micronucleus testNormal Heart weight Normal Brain histopathology Normal Salmonella infection Normal "Salmonella infection data for Src". Wellcome Trust Sanger Institute. .Citrobacter infection Normal "Citrobacter infection data for Src". Wellcome Trust Sanger Institute. . All tests and analysis fromGerdin AK (2010). "The Sanger Mouse Genetics Programme: high throughput characterisation of knockout mice". Acta Opthalmologica 88: 925-7.doi:10.1111/j.1755-3768.2010.4142.x: Wiley. . Mouse Resources Portal, Wellcome Trust Sanger Institute.Model organisms have been used in the study of SRC function. A conditional knockout mouse line, called Srctm2a(EUCOMM)Wtsi "International Knockout Mouse Consortium". . "Mouse Genome Informatics". . was generated as part of the International Knockout Mouse Consortium program — a high-throughput mutagenesis project to generate and distribute animal models of disease to interested scientists.Skarnes, W. C.; Rosen, B.; West, A. P.; Koutsourakis, M.; Bushell, W.; Iyer, V.; Mujica, A. O.; Thomas, M. et al (2011). "A conditional knockout resource for the genome-wide study of mouse gene function". Nature 474 (7351): 337–342. doi:10.1038/nature10163. PMID 21677750.Dolgin E (June 2011). "Mouse library set to be knockout". Nature 474: 262-263. doi:10.1038/474262a. .Collins FS, Rossant J, Wurst W (January 2007). A mouse for all reasons. Cell 128(1): 9-13. doi:10.1016/j.cell.2006.12.018 PMID 17218247.Male and female animals underwent a standardized phenotypic screen to determine the effects of deletion.van der Weyden L, White JK, Adams DJ, Logan DW (2011). "The mouse genetics toolkit: revealing function and mechanism.". Genome Biol 12 (6): 224. doi:10.1186/gb-2011-12-6-224. PMID 21722353. . Twenty four tests were carried out on mutant mice and one significant abnormality was observed. Homozygote mutant animales were found to viable, but lacking teeth. Due to the severity of the homozygous phenotype, the remaining tests were carried out on heterozygous mutant adult mice; no additional significant abnormalities were observed in these animals.Interactions Src (gene) has been shown to Protein-protein interactioninteract with Androgen receptorAR,Migliaccio A, Castoria G, Di Domenico M, de Falco A, Bilancio A, Lombardi M, Barone MV, Ametrano D, Zannini MS, Abbondanza C, Auricchio F (October 2000). "Steroid-induced androgen receptor-oestradiol receptor beta-Src complex triggers prostate cancer cell proliferation". EMBO J. 19 (20): 5406–17. doi:10.1093/emboj/19.20.5406. PMC 314017. PMID 11032808.Unni, E.; Sun, S.; Nan, B.; McPhaul, M. J.; Cheskis, B.; Mancini, M. A.; Marcelli, M. (2004). "Changes in Androgen Receptor nongenotropic Signaling Correlate with Transition of LNCaP Cells to Androgen Independence". Cancer Research 64 (19): 7156–7168. doi:10.1158/0008-5472.CAN-04-1121. PMID 15466214.Powell, S. M.; Christiaens, V.; Voulgaraki, D.; Waxman, J.; Claessens, F.; Bevan, C. L. (2004). "Mechanisms of androgen receptor signalling via

steroid receptor coactivator-1 in prostate". Endocrine-related cancer 11 (1): 117–130. doi:10.1677/erc.0.0110117. PMID 15027889.Aryl hydrocarbon receptor nuclear translocatorARNT,Beischlag, T. V.; Wang, S.; Rose, D. W.; Torchia, J.; Reisz-Porszasz, S.; Muhammad, K.; Nelson, W. E.; Probst, M. R. et al (2002). "Recruitment of the NCoA/SRC-1/p160 family of transcriptional coactivators by the aryl hydrocarbon receptor/aryl hydrocarbon receptor nuclear translocator complex". Molecular and cellular biology 22 (12): 4319–4333. doi:10.1128/MCB.22.12.4319-4333.2002. PMC 133867. PMID 12024042.Aryl hydrocarbon receptorAHR,Beta adrenergic receptor kinaseADRBK1,Wan, K. F.; Sambi, B. S.; Tate, R.; Waters, C.; Pyne, N. J. (2003). "The Inhibitory gamma Subunit of the Type 6 Retinal cGMP Phosphodiesterase Functions to Link c-Src and G-protein-coupled Receptor Kinase 2 in a Signaling Unit That Regulates p42/p44 Mitogen-activated Protein Kinase by Epidermal Growth Factor". Journal of Biological Chemistry 278 (20): 18658–18663. doi:10.1074/jbc.M212103200. PMID 12624098.Beta-3 adrenergic receptorADRB3,Cao, W.; Luttrell, L. M.; Medvedev, A. V.; Pierce, K. L.; Daniel, K. W.; Dixon, T. M.; Lefkowitz, R. J.; Collins, S. (2000). "Direct Binding of Activated c-Src to the beta 3-Adrenergic Receptor is Required for MAP Kinase Activation". Journal of Biological Chemistry 275 (49): 38131–38134. doi:10.1074/jbc.C000592200. PMID 11013230.BCAR1,Burnham, M. R.; Harte, M. T.; Bouton, A. H. (1999). "The role of SRC-CAS interactions in cellular transformation: Ectopic expression of the carboxy terminus of CAS inhibits SRC-CAS interaction but has no effect on cellular transformation". Molecular Carcinogenesis 26 (1): 20–31. doi:10.1002/(SICI)1098-2744(199909)26:1<20::AID-MC3>3.0.CO;2-M. PMID 10487518.Hsia, D. A.; Mitra, S. K.; Hauck, C. R.; Streblow, D. N.; Nelson, J. A.; Ilic, D.; Huang, S.; Li, E. et al (2003). "Differential regulation of cell motility and invasion by FAK". The Journal of Cell Biology 160 (5): 753–767. doi:10.1083/jcb.200212114. PMC 2173366. PMID 12615911.Wei, L.; Yang, Y.; Zhang, X.; Yu, Q. (2002). "Anchorage-independent phosphorylation of p130Cas protects lung adenocarcinoma cells from anoikis". Journal of Cellular Biochemistry 87 (4): 439–449. doi:10.1002/jcb.10322. PMID 12397603.Kovacic-Milivojević, B.; Roediger, F.; Almeida, E. A.; Damsky, C. H.; Gardner, D. G.; Ilić, D. (2001). "Focal adhesion kinase and p130Cas mediate both sarcomeric organization and activation of genes associated with cardiac myocyte hypertrophy". Molecular biology of the cell 12 (8): 2290–2307. PMC 58595. PMID 11514617.Donaldson, J.; Dempsey, P. J.; Reddy, S.; Bouton, A. H.; Coffey, R. J.; Hanks, S. K. (2000). "Crk-Associated Substrate p130Cas Interacts with Nephrocystin and Both Proteins Localize to Cell–Cell Contacts of Polarized Epithelial Cells". Experimental Cell Research 256 (1): 168–178. doi:10.1006/excr.2000.4822. PMID 10739664.Angers-Loustau, A.; Côté, J. F.; Charest, A.; Dowbenko, D.; Spencer, S.; Lasky, L. A.; Tremblay, M. L. (1999). "Protein tyrosine phosphatase-PEST regulates focal adhesion disassembly, migration, and cytokinesis in fibroblasts". The Journal of cell biology 144 (5): 1019–1031. doi:10.1083/jcb.144.5.1019. PMC 2148201. PMID 10085298.CD44,Bourguignon, L. Y. W.; Zhu, H.; Shao, L.; Chen, Y. W. (2000). "CD44 Interaction with c-Src Kinase Promotes Cortactin-mediated Cytoskeleton Function and Hyaluronic Acid-dependent Ovarian Tumor Cell Migration". Journal of Biological Chemistry 276 (10): 7327–7336. doi:10.1074/jbc.M006498200. PMID 11084024.DAB2,Zhou, J.; Scholes, J.; Hsieh, J. T. (2002). "Characterization of a Novel Negative Regulator (DOC-2/DAB2) of c-Src in Normal Prostatic Epithelium and Cancer". Journal of Biological Chemistry 278 (9): 6936–6941. doi:10.1074/jbc.M210628200. PMID 12473651.DDEF1,Brown, M. T.; Andrade, J.; Radhakrishna, H.; Donaldson, J. G.; Cooper, J. A.; Randazzo, P. A. (1998). "ASAP1, a phospholipid-dependent arf GTPase-activating protein that associates with and is phosphorylated by Src". Molecular and cellular biology 18 (12): 7038–7051. PMC 109286. PMID 9819391.DystroglycanDAG1,Sotgia, F.; Lee, H.; Bedford, M. T.; Petrucci, T.; Sudol, M.; Lisanti, M. P. (2001). "Tyrosine phosphorylation of beta-dystroglycan at its WW domain binding motif, PPxY, recruits SH2 domain containing proteins". Biochemistry 40 (48): 14585–14592. doi:10.1021/bi011247r. PMID 11724572.EPH receptor B2EPHB2,Zisch, A. H.; Kalo, M. S.; Chong, L. D.; Pasquale, E. B. (1998). "Complex formation between EphB2 and Src requires phosphorylation of tyrosine 611 in the EphB2 juxtamembrane region". Oncogene 16 (20): 2657–2670. doi:10.1038/sj.onc.1201823. PMID 9632142.Zisch, A. H.; Pazzagli, C.; Freeman, A. L.; Schneller, M.; Hadman, M.; Smith, J. W.; Ruoslahti, E.; Pasquale, E. B. (2000). "Replacing two conserved tyrosines of the EphB2 receptor with glutamic acid prevents binding of SH2 domains without abrogating kinase activity and biological

responses". Oncogene 19 (2): 177–187. doi:10.1038/sj.onc.1203304. PMID 10644995.Epidermal growth factor receptorEGFR,Olayioye, M. A.; Beuvink, I.; Horsch, K.; Daly, J. M.; Hynes, N. E. (1999). "ErbB receptor-induced activation of stat transcription factors is mediated by Src tyrosine kinases". The Journal of biological chemistry 274 (24): 17209–17218. doi:10.1074/jbc.274.24.17209. PMID 10358079.Keely, S. J.; Calandrella, S. O.; Barrett, K. E. (2000). "Carbachol-stimulated transactivation of epidermal growth factor receptor and mitogen-activated protein kinase in T(84) cells is mediated by intracellular ca(2+), PYK-2, and p60(src)". The Journal of biological chemistry 275 (17): 12619–12625. doi:10.1074/jbc.275.17.12619. PMID 10777553.Sato, K.; Kimoto, M.; Kakumoto, M.; Horiuchi, D.; Iwasaki, T.; Tokmakov, A. A.; Fukami, Y. (2000). "Adaptor protein Shc undergoes translocation and mediates up-regulation of the tyrosine kinase c-Src in EGF-stimulated A431 cells". Genes to cells : devoted to molecular & cellular mechanisms 5 (9): 749–764. doi:10.1046/j.1365-2443.2000.00358.x. PMID 10971656.EPS8,Maa, M. C.; Lai, J. R.; Lin, R. W.; Leu, T. H. (1999). "Enhancement of tyrosyl phosphorylation and protein expression of eps8 by v-Src". Biochimica et biophysica acta 1450 (3): 341–351. doi:10.1016/S0167-4889(99)00069-5. PMID 10395945.Estrogen receptor alphaESR1,Teo, A. K. C.; Oh, H. K.; Ali, R. B.; Li, B. F. L. (2001). "The Modified Human DNA Repair Enzyme O6-Methylguanine-DNA Methyltransferase is a Negative Regulator of Estrogen Receptor-Mediated Transcription upon Alkylation DNA Damage". Molecular and Cellular Biology 21 (20): 7105–7114. doi:10.1128/MCB.21.20.7105-7114.2001. PMC 99886. PMID 11564893.Kim, H. J.; Yi, J. Y.; Sung, H. S.; Moore, D. D.; Jhun, B. H.; Lee, Y. C.; Lee, J. W. (1999). "Activating signal cointegrator 1, a novel transcription coactivator of nuclear receptors, and its cytosolic localization under conditions of serum deprivation". Molecular and cellular biology 19 (9): 6323–6332. PMC 84603. PMID 10454579.Slentz-Kesler, K.; Moore, J. T.; Lombard, M.; Zhang, J.; Hollingsworth, R.; Weiner, M. P. (2000). "Identification of the Human Mnk2 Gene (MKNK2) through Protein Interaction with Estrogen Receptor β". Genomics 69 (1): 63–71. doi:10.1006/geno.2000.6299. PMID 11013076.Estrogen receptor betaESR2,GNB2L1,Chang, B. Y.; Conroy, K. B.; Machleder, E. M.; Cartwright, C. A. (1998). "RACK1, a receptor for activated C kinase and a homolog of the beta subunit of G proteins, inhibits activity of src tyrosine kinases and growth of NIH 3T3 cells". Molecular and cellular biology 18 (6): 3245–3256. PMC 108906. PMID 9584165.GRB2,Saci, A.; Liu, W. Q.; Vidal, M.; Garbay, C.; Rendu, F.; Bachelot-Loza, C. (2002). "Differential effect of the inhibition of Grb2-SH3 interactions in platelet activation induced by thrombin and by Fc receptor engagement". The Biochemical journal 363 (Pt 3): 717–725. doi:10.1042/0264-6021:3630717. PMC 1222524. PMID 11964172.GRIN2A,Ma, J.; Zhang, G. Y. (2003). "Lithium reduced N-methyl-D-aspartate receptor subunit 2A tyrosine phosphorylation and its interactions with Src and Fyn mediated by PSD-95 in rat hippocampus following cerebral ischemia". Neuroscience letters 348 (3): 185–189. doi:10.1016/S0304-3940(03)00784-5. PMID 12932824.Takagi, N.; Cheung, H. H.; Bissoon, N.; Teves, L.; Wallace, M. C.; Gurd, J. W. (1999). "The Effect of Transient Global Ischemia on the Interaction of Src and Fyn with the N-Methyl-D-Aspartate Receptor and Postsynaptic Densities: Possible Involvement of Src Homology 2 Domains". Journal of Cerebral Blood Flow & Metabolism 19 (8): 880–888. doi:10.1097/00004647-199908000-00007. PMID 10458595.HNF1A,Soutoglou, E.; Papafotiou, G.; Katrakili, N.; Talianidis, I. (2000). "Transcriptional activation by hepatocyte nuclear factor-1 requires synergism between multiple coactivator proteins". The Journal of biological chemistry 275 (17): 12515–12520. doi:10.1074/jbc.275.17.12515. PMID 10777539.KHDRBS1,Stelzl, U.; Worm, U.; Lalowski, M.; Haenig, C.; Brembeck, F. H.; Goehler, H.; Stroedicke, M.; Zenkner, M. et al (2005). "A Human Protein-Protein Interaction Network: A Resource for Annotating the Proteome". Cell 122 (6): 957–968. doi:10.1016/j.cell.2005.08.029. PMID 16169070.Oneyama, C.; Nakano, H.; Sharma, S. V. (2002). "UCS15A, a novel small molecule, SH3 domain-mediated protein–protein interaction blocking drug". Oncogene 21 (13): 2037–2050. doi:10.1038/sj.onc.1205271. PMID 11960376.Koch, C. A.; Moran, M. F.; Anderson, D.; Liu, X. Q.; Mbamalu, G.; Pawson, T. (1992). "Multiple SH2-mediated interactions in v-src-transformed cells". Molecular and cellular biology 12 (3): 1366–1374. PMC 369570. PMID 1545818.Shen, Z.; Batzer, A.; Koehler, J. A.; Polakis, P.; Schlessinger, J.; Lydon, N. B.; Moran, M. F. (1999). "Evidence for SH3 domain directed binding and phosphorylation of Sam68 by Src". Oncogene 18 (33): 4647–4653. doi:10.1038/sj.onc.1203079.

PMID 10467411.Finan, P. M.; Hall, A.; Kellie, S. (1996). "Sam68 from an immortalised B-cell line associates with a subset of SH3 domains". FEBS letters 389 (2): 141–144. doi:10.1016/0014-5793(96)00552-2. PMID 8766817.MT-ND2,Gingrich, J. R.; Pelkey, K. A.; Fam, S. R.; Huang, Y.; Petralia, R. S.; Wenthold, R. J.; Salter, M. W. (2004). "Unique domain anchoring of Src to synaptic NMDA receptors via the mitochondrial protein NADH dehydrogenase subunit 2". Proceedings of the National Academy of Sciences 101 (16): 6237–6242. doi:10.1073/pnas.0401413101. PMC 395953. PMID 15069201.MUC1,Li, Y.; Kuwahara, H.; Ren, J.; Wen, G.; Kufe, D. (2001). "The c-Src Tyrosine Kinase Regulates Signaling of the Human DF3/MUC1 Carcinoma-associated Antigen with GSK3beta and beta -Catenin". Journal of Biological Chemistry 276 (9): 6061–6064. doi:10.1074/jbc.C000754200. PMID 11152665.Li, Y.; Ren, J.; Yu, W.; Li, Q.; Kuwahara, H.; Yin, L.; Carraway Kl, 3.; Kufe, D. (2001). "The Epidermal Growth Factor Receptor Regulates Interaction of the Human DF3/MUC1 Carcinoma Antigen with c-Src and beta -Catenin". Journal of Biological Chemistry 276 (38): 35239–35242. doi:10.1074/jbc.C100359200. PMID 11483589.NCOA6,Goo, Y. H.; Sohn, Y. C.; Kim, D. H.; Kim, S. W.; Kang, M. J.; Jung, D. J.; Kwak, E.; Barlev, N. A. et al (2003). "Activating signal cointegrator 2 belongs to a novel steady-state complex that contains a subset of trithorax group proteins". Molecular and cellular biology 23 (1): 140–149. doi:10.1128/MCB.23.1.140-149.2003. PMC 140670. PMID 12482968.Lee, S. K.; Anzick, S. L.; Choi, J. E.; Bubendorf, L.; Guan, X. Y.; Jung, Y. K.; Kallioniemi, O. P.; Kononen, J. et al (1999). "A nuclear factor, ASC-2, as a cancer-amplified transcriptional coactivator essential for ligand-dependent transactivation by nuclear receptors in vivo". The Journal of biological chemistry 274 (48): 34283–34293. doi:10.1074/jbc.274.48.34283. PMID 10567404.Lee, S. K.; Na, S. Y.; Jung, S. Y.; Choi, J. E.; Jhun, B. H.; Cheong, J.; Meltzer, P. S.; Lee, Y. C. et al (2000). "Activating protein-1, nuclear factor-kappaB, and serum response factor as novel target molecules of the cancer-amplified transcription coactivator ASC-2". Molecular endocrinology (Baltimore, Md.) 14 (6): 915–925. doi:10.1210/me.14.6.915. PMID 10847592.Lee, S. K.; Jung, S. Y.; Kim, Y. S.; Na, S. Y.; Lee, Y. C.; Lee, J. W. (2001). "Two distinct nuclear receptor-interaction domains and CREB-binding protein-dependent transactivation function of activating signal cointegrator-2". Molecular endocrinology (Baltimore, Md.) 15 (2): 241–254. doi:10.1210/me.15.2.241. PMID 11158331.PDE6G,PLD2,Ahn, B. H.; Kim, S. Y.; Kim, E. H.; Choi, K. S.; Kwon, T. K.; Lee, Y. H.; Chang, J. S.; Kim, M. S. et al (2003). "Transmodulation between phospholipase D and c-Src enhances cell proliferation". Molecular and cellular biology 23 (9): 3103–3115. doi:10.1128/MCB.23.9.3103-3115.2003. PMC 153190. PMID 12697812.Protein kinase MζPRKCZ,Seibenhener, M.; Roehm, J.; White, W. O.; Neidigh, K. B.; Vandenplas, M. L.; Wooten, M. W. (1999). "Identification of Src as a Novel Atypical Protein Kinase C-Interacting Protein". Molecular Cell Biology Research Communications 2 (1): 28–31. doi:10.1006/mcbr.1999.0140. PMID 10527887.PTK2,Hecker, T. P.; Grammer, J. R.; Gillespie, G. Y.; Stewart Jr, J.; Gladson, C. L. (2002). "Focal adhesion kinase enhances signaling through the Shc/extracellular signal-regulated kinase pathway in anaplastic astrocytoma tumor biopsy samples". Cancer research 62 (9): 2699–2707. PMID 11980671.Relou, I. A. M.; Bax, L. A. B.; Van Rijn, H. J. M.; Akkerman, J. W. N. (2003). "Site-specific phosphorylation of platelet focal adhesion kinase by low-density lipoprotein". Biochemical Journal 369 (2): 407–416. doi:10.1042/BJ20020410. PMC 1223094. PMID 12387730.Messina, S.; Onofri, F.; Bongiorno-Borbone, L.; Giovedì, S.; Valtorta, F.; Girault, J. A.; Benfenati, F. (2003). "Specific interactions of neuronal focal adhesion kinase isoforms with Src kinases and amphiphysin". Journal of neurochemistry 84 (2): 253–265. doi:10.1046/j.1471-4159.2003.01519.x. PMID 12558988.Lebrun, P.; Mothe-Satney, I.; Delahaye, L.; Van Obberghen, E.; Baron, V. (1998). "Insulin receptor substrate-1 as a signaling molecule for focal adhesion kinase pp125(FAK) and pp60(src)". The Journal of biological chemistry 273 (48): 32244–32253. doi:10.1074/jbc.273.48.32244. PMID 9822703.PTK2B,Kumar, S.; Avraham, S.; Bharti, A.; Goyal, J.; Pandey, P.; Kharbanda, S. (1999). "Negative regulation of PYK2/related adhesion focal tyrosine kinase signal transduction by hematopoietic tyrosine phosphatase SHPTP1". The Journal of biological chemistry 274 (43): 30657–30663. doi:10.1074/jbc.274.43.30657. PMID 10521452.Dikic, I.; Tokiwa, G.; Lev, S.; Courtneidge, S. A.; Schlessinger, J. (1996). "A role for Pyk2 and Src in linking G-protein-coupled receptors with MAP kinase activation". Nature 383 (6600): 547–550. doi:10.1038/383547a0. PMID 8849729.C-RafRAF1,Cleghon, V.; Morrison, D. K. (1994). "Raf-1

interacts with Fyn and Src in a non-phosphotyrosine-dependent manner". The Journal of biological chemistry 269 (26): 17749–17755. PMID 7517401.RAS p21 protein activator 1RASA1,Brott, B. K.; Decker, S.; O'Brien, M. C.; Jove, R. (1991). "Molecular features of the viral and cellular Src kinases involved in interactions with the GTPase-activating protein". Molecular and cellular biology 11 (10): 5059–5067. PMC 361505. PMID 1717825.Giglione, C.; Gonfloni, S.; Parmeggiani, A. (2001). "Differential actions of p60c-Src and Lck kinases on the Ras regulators p120-GAP and GDP/GTP exchange factor CDC25Mm". European journal of biochemistry / FEBS 268 (11): 3275–3283. doi:10.1046/j.1432-1327.2001.02230.x. PMID 11389730.Retinoic acid receptor alphaRARA,He, B.; Wilson, E. M. (2003). "Electrostatic modulation in steroid receptor recruitment of LXXLL and FXXLF motifs". Molecular and cellular biology 23 (6): 2135–2150. doi:10.1128/MCB.23.6.2135-2150.2003. PMC 149467. PMID 12612084.RICS (gene)RICS,Moon, S. Y.; Zang, H.; Zheng, Y. (2002). "Characterization of a Brain-specific Rho GTPase-activating Protein, p200RhoGAP". Journal of Biological Chemistry 278 (6): 4151–4159. doi:10.1074/jbc.M207789200. PMID 12454018.Serum response factorSRF,Kim, H. J.; Kim, J. H.; Lee, J. W. (1998). "Steroid receptor coactivator-1 interacts with serum response factor and coactivates serum response element-mediated transactivations". The Journal of biological chemistry 273 (44): 28564–28567. doi:10.1074/jbc.273.44.28564. PMID 9786846.SHB (gene)SHB,Karlsson, T.; Songyang, Z.; Landgren, E.; Lavergne, C.; Di Fiore, P. P.; Anafi, M.; Pawson, T.; Cantley, L. C. et al (1995). "Molecular interactions of the Src homology 2 domain protein Shb with phosphotyrosine residues, tyrosine kinase receptors and Src homology 3 domain proteins". Oncogene 10 (8): 1475–1483. PMID 7537362.STAT1,Cirri, P.; Chiarugi, P.; Marra, F.; Raugei, G.; Camici, G.; Manao, G.; Ramponi, G. (1997). "C-Src Activates both STAT1 and STAT3 in PDGF-Stimulated NIH3T3 Cells". Biochemical and Biophysical Research Communications 239 (2): 493–497. doi:10.1006/bbrc.1997.7493. PMID 9344858.STAT3,Cao, X.; Tay, A.; Guy, G. R.; Tan, Y. H. (1996). "Activation and association of Stat3 with Src in v-Src-transformed cell lines". Molecular and cellular biology 16 (4): 1595–1603. PMC 231145. PMID 8657134. and Wiskott–Aldrich syndrome proteinWAS.Banin, S.; Truong, O.; Katz, D. R.; Waterfield, M. D.; Brickell, P. M.; Gout, I. (1996). "Wiskott-Aldrich syndrome protein (WASp) is a binding partner for c-Src family protein-tyrosine kinases". Current biology : CB 6 (8): 981–988. doi:10.1016/S0960-9822(02)00642-5. PMID 8805332.Finan, P. M.; Soames, C. J.; Wilson, L.; Nelson, D. L.; Stewart, D. M.; Truong, O.; Hsuan, J. J.; Kellie, S. (1996). "Identification of regions of the Wiskott-Aldrich syndrome protein responsible for association with selected Src homology 3 domains". The Journal of biological chemistry 271 (42): 26291–26295. doi:10.1074/jbc.271.42.26291. PMID 8824280.Overview of signal transduction pathways involved in apoptosis.ReferencesFurther readingFrame MC, Fincham VJ, Carragher NO, Wyke JA (2002). "v-Src's hold over actin and cell adhesions". Nat. Rev. Mol. Cell Biol. 3 (4): 233–45. doi:10.1038/nrm779. PMID 11994743.Benaim G, Villalobo A (2002). "Phosphorylation of calmodulin. Functional implications". Eur. J. Biochem. 269 (15): 3619–31. doi:10.1046/j.1432-1033.2002.03038.x. PMID 12153558.Simeonova PP, Luster MI (2003). "Arsenic carcinogenicity: relevance of c-Src activation". Mol. Cell. Biochem. 234-235 (1–2): 277–82. doi:10.1023/A:1015971118012. PMID 12162444.Leu TH, Maa MC (2004). "Functional implication of the interaction between EGF receptor and c-Src". Front. Biosci. 8: s28–38. doi:10.2741/980. PMID 12456372.Greenway AL, Holloway G, McPhee DA, et al. (2004). "HIV-1 Nef control of cell signalling molecules: multiple strategies to promote virus replication". J. Biosci. 28 (3): 323–35. doi:10.1007/BF02970151. PMID 12734410.Dehm SM, Bonham K (2004). "SRC gene expression in human cancer: the role of transcriptional activation". Biochem. Cell Biol. 82 (2): 263–74. doi:10.1139/o03-077. PMID 15060621.Tolstrup M, Ostergaard L, Laursen AL, et al. (2004). "HIV/SIV escape from immune surveillance: focus on Nef". Curr. HIV Res. 2 (2): 141–51. doi:10.2174/1570162043484924. PMID 15078178.Joseph AM, Kumar M, Mitra D (2005). "Nef: "necessary and enforcing factor" in HIV infection". Curr. HIV Res. 3 (1): 87–94. doi:10.2174/1570162052773013. PMID 15638726.Roskoski R (2005). "Src kinase regulation by phosphorylation and dephosphorylation". Biochem. Biophys. Res. Commun. 331 (1): 1–14. doi:10.1016/j.bbrc.2005.03.012. PMID 15845350.Alper O, Bowden ET (2005). "Novel insights into c-Src". Curr. Pharm. Des. 11 (9): 1119–30. doi:10.2174/1381612053507576. PMID 15853660.External linksMedical Subject HeadingsMeSH src+GeneMedical Subject HeadingsMeSH

src-Family+KinasesProteopedia SRC - interactive 3D model of the structure of SRC Vega geneview Src Info with links in the Cell Migration Gateway

Article Sources and Contributors

Src (gene) *Source*: http://en.wikipedia.org/w/index.php?oldid=476478881 *Contributors*: AZDub, Adapter, AndrewGNF, Arcadian, Bliu79, Boghog, Brim, CarTick, Catchacoma, Chris the speller, Ciar, CopperKettle, Czernilofsky, D4v1d4b3ah4m, Dcirovic, Delldot, Forluvoft, JWSchmidt, Jatlas, JianLu2, K.murphy, Martious, Mat8989, Matthewmazurek, Memenen, Nbauman, Nzohoury, Rettetast, Rich Farmbrough, Rjwilmsi, Robert blake7, Rockpocket, SCEhardt, SMcCandlish, Savh, Schmiteye, Seans Potato Business, StephP, Yeast2Hybrid, 35 anonymous edits

Image Sources, Licenses and Contributors

file:PBB_Protein_SRC_image.jpg *Source*: http://en.wikipedia.org/w/index.php?title=File:PBB_Protein_SRC_image.jpg *License*: Public Domain *Contributors*: en:ProteinBoxBot

file:PBB_GE_SRC_213324_at.png *Source*: http://en.wikipedia.org/w/index.php?title=File:PBB_GE_SRC_213324_at.png *License*: GNU Free Documentation License *Contributors*: -

file:PBB_GE_SRC_221284_s_at.png *Source*: http://en.wikipedia.org/w/index.php?title=File:PBB_GE_SRC_221284_s_at.png *License*: GNU Free Documentation License *Contributors*: -

Image:Signal transduction v1.png *Source*: http://en.wikipedia.org/w/index.php?title=File:Signal_transduction_v1.png *License*: GNU Free Documentation License *Contributors*: Original uploader was Roadnottaken at en.wikipedia

License