## 6. REFERENCES

**Alberola Ila, J., Takaki, S., Kerner, J.D., and Perlmutter, R.M. (1997).** Differential signaling by lymphocyte antigen receptors. Annu. Rev. Immunol. 15, 125-154.

**Alderson, M.R., Tough, T.W., Davis Smith, T., Braddy, S., Falk, B., Schooley, K.A., Goodwin, R.G., Smith, C.A., Ramsdell, F., and Lynch, D.H. (1995).** Fas ligand mediates activation-induced cell death in human T lymphocytes. J. Exp. Med. 181, 71-77.

**Amakawa, R., Hakem, A., Kundig, T.M., Matsuyama, T., Simard, J.J., Timms, E., Wakeham, A., Mittruecker, H.W., Griesser, H., Takimoto, H., Schmits, R., Shahinian, A., Ohashi, P., Penninger, J.M., and Mak, T.W. (1996).** Impaired negative selection of T cells in Hodgkin's disease antigen CD30-deficient mice. Cell 84, 551-562.

**Amos, L.A. (1991).** Molecules of the cytoskeleton. New York: Guilford Press.

**Aruffo, A., Stamenkovic, I., Melnick, M., Underhill, C.B., and Seed, B. (1990).** CD44 is the principal cell surface receptor for hyaluronate. Cell 61, 1303-1313.

**Babbitt, B.P., Allen, P.M., Matsueda, G., Haber, E., and Unanue, E.R. (1985).** Binding of immunogenic peptides to Ia histocompatibility molecules. Nature 317, 359-361.

**Bachmann, M., Barner, M., and Kopf, M. (1999).** CD2 sets quantitative thresholds in T cell activation. J. Exp. Med. 190, 1383-1391.

**Bagrodia, S., Derijard, B., Davis, R.J., and Cerione, R.A. (1995).** Cdc42 and PAK-mediated signaling leads to Jun kinase and p38 mitogen-activated protein kinase activation. J. Biol. Chem. 270, 27995-27998.

**Barber, E.K., Dasgupta, J.D., Schlossman, S.F., Trevillyan, J.M., and Rudd, C.E. (1989).** The CD4 and CD8 antigens are coupled to a protein-tyrosine kinase (p56lck) that phosphorylates the CD3 complex. Proc. Natl. Acad. Sci. U. S. A. 86, 3277-3281.

**Beggs, H.E., Soriano, P., and Maness, P.F. (1994).** NCAM-dependent neurite outgrowth is inhibited in neurons from Fyn-minus mice. J. Cell Biol. 127, 825-833.

**Berg, E.L., Goldstein, L.A., Jutila, M.A., Nakache, M., Picker, L.J., Streeter, P.R., Wu, N.W., Zhou, D., and Butcher, E.C. (1989).** Homing receptors and vascular addressins: cell adhesion molecules that direct lymphocyte traffic. Immunol. Rev. 108, 5-18.

**Berg, N.N. and Ostergaard, H.L. (1995).** Characterization of intercellular adhesion molecule-1 (ICAM-1)-augmented degranulation by cytotoxic T cells. ICAM-1 and anti-CD3 must be co-localized for optimal adhesion and stimulation. J. Immunol. 155, 1694-1702.

**Berg, N.N., Puente, L.G., Dawicki, W., and Ostergaard, H.L. (1998).** Sustained TCR signaling is required for mitogen-activated protein kinase activation and degranulation by cytotoxic T lymphocytes. J. Immunol. 161, 2919-2924.

**Bluestone, J. A. (1995).** New perspectives of CD28-B7-mediated T cell costimulation. Immunity 2:555-559.

**Borland, G., Ross, J.A., and Guy, K. (1998).** Forms and functions of CD44. Immunology. 93, 139-148.

**Bourguignon, L.Y., Lokeshwar, V.B., He, J., Chen, X., and Bourguignon, G.J. (1992).** A CD44-like endothelial cell transmembrane glycoprotein (GP116) interacts with extracellular matrix and ankyrin. Mol. Cell Biol. 12, 4464-4471.

**Bourguignon, L.Y., Lokeshwar, V.B., Chen, X., and Kerrick, W.G. (1993).** Hyaluronic acid-induced lymphocyte signal transduction and HA receptor (GP85/CD44)-cytoskeleton interaction. J. Immunol. 151, 6634-6644.

**Bourguignon, L.Y. and Jin, H. (1995).** Identification of the ankyrin-binding domain of the mouse T-lymphoma cell inositol 1,4,5-trisphosphate (IP3) receptor and its role in the regulation of IP3-mediated internal Ca2+ release. J. Biol. Chem. 270, 7257-7260.

**Bourguignon, L.Y., Gunja Smith, Z., Iida, N., Zhu, H.B., Young, L.J., Muller, W.J., and Cardiff, R.D. (1998).** CD44v(3,8-10) is involved in cytoskeleton-mediated tumor cell migration and matrix metalloproteinase (MMP-9) association in metastatic breast cancer cells. J. Cell Physiol. 176, 206-215.

**Brdicka, T., Cerny, J., and Horejsi, V. (1998).** T cell receptor signalling results in rapid tyrosine phophorylation of the linker protein LAT present in detergent-resistent membrane microdemains. Biochem. Biophys. Res. Commun. 248, 356-360.

**Brown, D. (1993).** The tyrosine kinase connection: how GPI-anchored proteins activate T cells. Curr. Opin. Immunol. 5, 349-354.

**Brown, D.A. and London, E. (1997).** Structure of detergent-resistant membrane domains: does phase separation occur in biological membranes? Biochem. Biophys. Res. Commun. 240, 1-7.

**Brown, J.L., Stowers, L., Baer, M., Trejo, J., Coughlin, S., and Chant, J. (1996).** Human Ste20 homologue hPAK1 links GTPases to the JNK MAP kinase pathway. Curr. Biol. 6, 598-605.

**Brown, S.S. (1993).** Phenotypes of cytoskeletal mutants. Curr. Opin. Cell Biol. 5, 129-134.

**Brown, T.A., Bouchard, T., St.John, T., Wayner, E., and Carter, W.G. (1991).** Human keratinocytes express a new CD44 core protein (CD44E) as a heparan-sulfate intrinsic membrane proteoglycan with additional exons. J. Cell Biol. 113, 207-221.

**Brunner, T., R. Mogil, D. LaFace, N. J. Yoo, A. Mahboubi, F. Echeverri, S. j. Marin, W. R. Force, D. H. Lynch, C. F. Ware, and D. R. Green. (1995).** Cell-autonomous Fas (CD95)/Fas-ligand interaction mediated activation-induced apoptosis in T cell hybridomas. Nature 373:441-444.

**Bubeck Wardenburg, J., Fu, C., Jackman, J.K., Flotow, H., Wilkinson, S.E., Williams, D.H., Johnson, R., Kong, G., Chan, A.C., and Findell, P.R. (1996).** Phosphorylation of SLP-76 by the ZAP-70 protein-tyrosine kinase is required for T-cell receptor function. J. Biol. Chem. 271, 19641-19644.

**Bubeck Wardenburg, J., Pappu, R., Bu, J.Y., Mayer, B., Chernoff, J., Straus, D., and Chan, A.C. (1998).** Regulation of PAK activation and the T cell cytoskeleton by the linker protein SLP-76. Immunity. 9, 607-616.

**Cantrell, D. (1996).** T cell antigen receptor signal transduction pathways. Annu. Rev. Immunol 14:259-274.

**Caplan, S. and Baniyash, M. (1995).** Multisubunit receptors in the immune system and their association with the cytoskeleton: in search of functional significance. Immunol. Res. 14, 98-118.

**Chambers, C.A. and Allison, J.P. (1997).** Co-stimulation in T cell responses. Curr. Opin. Immunol. 9, 396-404.

**Chan, A.C., Iwashima, M., Turck, C.W., and Weiss, A. (1992).** ZAP-70: a 70 kd protein-tyrosine kinase that associates with the TCR zeta chain. Cell 71, 649-662.

**Chan, A. C., and A. S. Shaw, (1996).** Regulation of antigen receptor signal transduction by protein tyrosine kinases. Curr. Opin. Immunol. 8, 394-401.

**Collins, T.L., Deckert, M., and Altman, A. (1997).** Views on Vav. Immunol. Today. 18, 221-225.

**Colombatti, A., Hughes, E.N., Taylor, B.A., and August, J.T. (1982).** Gene for a major cell surface glycoprotein of mouse macrophages and other phagocytic cells is on chromosome 2. Proc. Natl. Acad. Sci. U. S. A. 79, 1926-1929.

**Conrad, P., Rothman, B.L., Kelley, K.A., and Blue, M.L. (1992).** Mechanism of peripheral T cell activation by coengagement of CD44 and CD2. J. Immunol. 149, 1833-1839.

**Cooper, D.L., Dougherty, G., Harn, H.J., Jackson, S., Baptist, E.W., Byers, J., Datta, A., Phillips, G., and Isola, N.R. (1992).** The complex CD44 transcriptional unit; alternative splicing of three internal exons generates the epithelial form of CD44. Biochem. Biophys. Res. Commun. 182, 569-578.

**Crabtree, G.R. (1989).** Contingent genetic regulatory events in T lymphocyte activation. Science 243, 355-361.

**Crespo, P., Schuebel, K.E., Ostrom, A.A., Gutkind, J.S., and Bustelo, X.R. (1997).** Phosphotyrosine-dependent activation of Rac-1 GDP/GTP exchange by the vav proto-oncogene product. Nature 385, 169-172.

**Croft, M. and Dubey, C. (1997).** Accessory molecule and costimulation requirements for CD4 T cell response. Crit. Rev. Immunol. 17, 89-118.

**D'Ambrosio, D., Cantrell, D.A., Frati, L., Santoni, A., and Testi, R. (1994).** Involvement of p21ras activation in T cell CD69 expression. Eur. J. Immunol. 24, 616-620.

**Darnell J., H. Lodish, and D. Baltimore. (1986).** Molecular Cell Biology. pp 771-815. Scientific American Books, New York.

**Davis, M.M., Boniface, J.J., Reich, Z., Lyons, D., Hampl, J., Arden, B., and Chien, Y. (1998).** Ligand recognition by alpha beta T cell receptors. Annu. Rev. Immunol. 16, 523-544.

**Davis, S.J., and van der Merwe, P.A. (1996).** The structure and ligand interactions of CD2: implications for T cell function. Immunol. Today 17, 177-187.

**DeGrendele, H.C., Estess, P., Picker, L.J., and Siegelman, M.H. (1996).** CD44 and its ligand hyaluronate mediate rolling under physiologic flow: a novel lymphocyte-endothelial cell primary adhesion pathway. J. Exp. Med. 183, 1119-1130.

**DeGrendele, H.C., Estess, P., and Siegelman, M.H. (1997).** Requirement for CD44 in activated T cell extravasation into an inflammatory site. Science 278, 672-675.

**Denning, S.M., Le, P.T., Singer, K.H., and Haynes, B.F. (1990).** Antibodies against the CD44 p80, lymphocyte homing receptor molecule augment human peripheral blood T cell activation. J. Immunol. 144, 7-15.

**De Petris, S. (1974).** Inhibition and reversal of capping by cytochalasin B, vinblastine and colchicine. Nature 250:54-56.

**Dhein, J., H. C. Walczac, K. M. Baumler, Debatin, and P. H. Krammer. (1995).** Autocrine T cell suicide mediated by APO-1/(Fas/CD95). Nature 373:438-441.

**Dianzani, U., Bragardo, M., Tosti, A., Ruggeri, L., Volpi, I., Casucci, M., Bottarel, F., Feito, M.J., Bonissoni, S., and Velardi, A. (1999).** CD44 signaling through p56lck involves lateral association with CD4 in human CD4+ T cells. Int. Immunol. 11, 1085-1092.

**Downward, J., Riehl, R., Wu, L., and Weinberg, R.A. (1990).** Identification of a nucleotide exchange-promoting activity for p21ras. Proc. Natl. Acad. Sci. U. S. A. 87, 5998-6002.

**Draberova, L., Amoui, M., and Draber, P. (1996).** Thy-1-mediated activation of rat mast cells: the role of Thy-1 membrane microdomains. Immunology. 87, 141-148.

**D'Souza Schorey, C., Boettner, B., and Van Aelst, L. (1998).** Rac regulates integrin-mediated spreading and increased adhesion of T lymphocytes. Mol. Cell Biol. 18, 3936-3946.

**Dustin, M.L., M. W. Olszowy, A. D. Holdorf, J. Li, S. Bromley, N. Desai, P. Widder, F. Rosenberger, P. A. van der Merwe, P. M. Allen, and A. S. Shaw. (1998).** A novel adaptor protein orchestrates receptor patterning and cytoskeletal polarity in T-cell contacts. Cell 94:667-677.

**Dustin, M.L. and Springer, T.A. (1989).** T-cell receptor crosslinking transiently stimulates adhesiveness through LFA-1. Nature 341, 619-624.

**Engvall, E. and Perlman, P. (1971).** Enzyme-linked immunosorbent assay (ELISA). Quantitative assay of immunoglobulin G. Immunochemistry. 8, 871-874.

**Ferrell, J.E.J. (1996).** Tripping the switch fantastic: how a protein kinase cascade can convert graded inputs into switch-like outputs. Trends. Biol. Sci. 21, 460-466.

**Finco, T.S., Kadlecek, T., Zhang, W., Samelson, L.E., and Weiss, A. (1998).** LAT is required for TCR-mediated activation of PLCgamma1 and the Ras pathway. Immunity. 9, 617-626.

**Fischer, K.D., Y. Y. Kong, H. Nishina, K. Tedford, L. E. Marengere, I. Kozieradzki, T. Sasaki, M. Starr, G. Chan, S. Gardener, M. P. Nghiem, D. Bouchard, M. Barbacid, A. Bernstein, and J. M. Penninger. (1998).** Vav is a regulator of cytoskeletal reorganization mediated by the T- cell receptor. Curr. Biol. 8:554-562.

**Franklin, R.A., Tordai, A., Patel, H., Gardner, A.M., Johnson, G.L., and Gelfand, E.W. (1994).** Ligation of the T cell receptor complex results in activation of the Ras/Raf-1/MEK/MAPK cascade in human T lymphocytes. J. Clin. Invest. 93, 2134-2140.

**Friedrichson, T. and Kurzchalia, T.V. (1998).** Microdomains of GPI-anchored proteins in living cells revealed by crosslinking. Nature 394, 802-805.

**Frogner, F.J. and O'Neill, H.C. (1992).** Lymphocyte recirculation: the need for site-specific receptors to dictate T-lymphocyte localization into different tissue sites [editorial]. Scand. J. Immunol. 35, 627-632.

**Galandrini, R., Albi, N., Tripodi, G., Zarcone, D., Terenzi, A., Moretta, A., Grossi, C.E., and Velardi, A. (1993).** Antibodies to CD44 trigger effector functions of human T cell clones. J. Immunol. 150, 4225-4235.

**Galandrini, R., De Maria, R., Piccoli, M., Frati, L., and Santoni, A. (1994).** CD44 triggering enhances human NK cell cytotoxic functions. J. Immunol. 153, 4399-4407.

**Galluzzo, E., Albi, N., Fiorucci, S., Merigiola, C., Ruggeri, L., Tosti, A., Grossi, C.E., and Velardi, A. (1995).** Involvement of CD44 variant isoforms in hyaluronate adhesion by human activated T cells. Eur. J. Immunol. 25, 2932-2939.

**Garcia, K. C., C. A. Scott, A. Brunmark, F. R. Carbone, P. A. Peterson, I. A. Wilson, and L. Teyton. (1996).** CD8 enhances formation of stable T-cell receptor/MHC class I molecule complexes [see comments] [published erratum appears in Nature 1997 Jun 5;387(6633):634]. Nature 384:577-581.

**Gauen, L. K., Y. Zhu, F. Letourneur, Q. Hu, J. B. Bolen, L. A. Matis, R. D. Klausner, and A. S. Shaw. (1994).** Interactions of p59fyn and ZAP-70 with T-cell receptor activation motifs: defining the nature of a signalling motif. Mol. Cell Biol. 14:3729-3741.

**Geiger, B., D. Rosen, and G. Berke. (1982).** Spatial relationships of microtubule-organizing centers and the contact area of cytotoxic T lymphocytes and target cells. J Cell Biol. 95:137-143.

**Geppert, T.D. and Lipsky, P.E. (1991).** Association of various T cell-surface molecules with the cytoskeleton. Effect of cross-linking and activation. J. Immunol. 146, 3298-3305.

**Gogolak, P., Rethy, B., Horvath, A., Toth, G.K., Cervenak, L., Laszlo, G., and Rajnavolgyi, E. (1996).** Collaboration of TCR-, CD4- and CD28-mediated signalling in antigen-specific MHC class II-restricted T-cells. Immunol. Lett. 54, 135-144.

**Goodfellow, P.N., Banting, G., Wiles, M.V., Tunnacliffe, A., Parkar, M., Solomon, E., Dalchau, R., and Fabre, J.W. (1982).** The gene, MIC4, which controls expression of the antigen defined by monoclonal antibody F10.44.2, is on human chromosome 11. Eur. J. Immunol. 12, 659-663.

**Grakoui, A., S. K. Bromley, C. Sumen, M. M. Davis, A. S. Shaw, P. M. Allen, and M. L. Dustin. (1999).** The immunological synapse: A molecular machine controlling T cell activation. Science 285:221-227

**Green, J.M. and Thompson, C.B. (1994).** Modulation of T cell proliferative response by accessory cell interactions. Immunol. Res. 13, 234-243.

**Guo, Y., Wu, Y., Shinde, S., Sy, M.S., Aruffo, A., and Liu, Y. (1996).** Identification of a costimulatory molecule rapidly induced by CD40L as CD44H. J. Exp. Med. 184, 955-961.

**Guo, Y.J., Ma, J., Wong, J.H., Lin, S.C., Chang, H.C., Bigby, M., and Sy, M.S. (1993).** Monoclonal anti-CD44 antibody acts in synergy with anti-CD2 but inhibits anti-CD3 or T cell receptor-mediated signaling in murine T cell hybridomas. Cell Immunol. 152, 186-199.

**Guo, Y.J., Lin, S.C., Wang, J.H., Bigby, M., and Sy, M.S. (1994).** Palmitoylation of CD44 interferes with CD3-mediated signaling in human T lymphocytes. Int. Immunol. 6, 213-221.

**Hall, A. (1998).** G proteins and small GTPases: distant relatives keep in touch [comment]. Science 280, 2074-2075.

**Hamilton, M.S., Ball, J., Bromidge, E., and Franklin, I.M. (1991).** Surface antigen expression of human neoplastic plasma cells includes molecules associated with lymphocyte recirculation and adhesion. Br. J. Haematol. 78, 60-65.

**Hahn, W. C., Y. Rosenstein, V. Calvo, S. J. Burakoff, and B. E. Bierer. (1992).** A distinct cytoplasmic domain of CD2 regulates ligand avidity and T-cell responsiveness to antigen. Proc. Natl. Acad. Sci. U. S. A 89:7179-7183.

**Han, J., Das, B., Wei, W., Van Aelst, L., Mosteller, R.D., Khosravi Far, R., Westwick, J.K., Der, C.J., and Broek, D. (1997).** Lck regulates Vav activation of members of the Rho family of GTPases. Mol. Cell Biol. 17, 1346-1353.

**Han, J., K. Luby Phelps, B. Das, X. Shu, Y. Xia, R. D. Mosteller, U. M. Krishna, J. R. Falck, M. A. White, and D. Broek. (1998).** Role of substrates and products of PI 3-kinase in regulating activation of Rac-related guanosine triphosphatases by Vav. Science 279:558-560.

**Hanke, J.H., Gardner, J.P., Dow, R.L., Changelian, P.S., Brissette, W.H., Weringer, E.J., Pollok, B.A., and Connelly, P.A. (1996).** Discovery of a novel, potent, and Src family-selective tyrosine kinase inhibitor. Study of Lck- and FynT-dependent T cell activation. J. Biol. Chem. 271, 695-701.

**Harder, T. and Simons, K. (1997).** Caveolae, DIGs, and the dynamics of sphingolipid-cholesterol microdomains. Curr. Opin. Cell Biol. 9, 534-542.

**Harder, T. and Simons, K. (1999).** Clusters of glycolipid and glycosylphosphatidylinositol-anchored proteins in lymphoid cells: accumulation of actin regulated by local tyrosine phosphorylation. Eur. J. Immunol. 29, 556-562.

**Harding, F.A., McArthur, J.G., Gross, J.A., Raulet, D.H., and Allison, J.P. (1992).** CD28-mediated signalling co-stimulates murine T cells and prevents induction of anergy in T-cell clones. Nature 356, 607-609.

**Hartwig, J. H., G. M. Bokoch, C. L. Carpenter, P. A. Janmey, L. A. Taylor, A. Toker, and T. P. Stossel. (1995).** Thrombin receptor ligation and activated Rac uncap actin filament barbed ends through phosphoinositide synthesis in permeabilized human platelets. Cell 82:643-653.

**Haynes, B.F., Telen, M.J., Hale, L.P., and Denning, S.M. (1989).** CD44--a molecule involved in leukocyte adherence and T-cell activation [published erratum appears in Immunol Today 1990 Mar;11(3):80]. Immunol. Today. 10, 423-428.

**He, Q., Lesley, J., Hyman, R., Ishihara, K., and Kincade, P.W. (1992).** Molecular isoforms of murine CD44 and evidence that the membrane proximal domain is not critical for hyaluronate recognition. J. Cell Biol. 119, 1711-1719.

**Herrlich, P., Zoller, M., Pals, S.T., and Ponta, H. (1993).** CD44 splice variants: metastases meet lymphocytes. Immunol. Today. 14, 395-399.

**Hirao, M., Sato, N., Kondo, T., Yonemura, S., Monden, M., Sasaki, T., Takai, Y., and Tsukita, S. (1996).** Regulation mechanism of ERM (ezrin/radixin/moesin) protein/plasma membrane association: possible involvement of phosphatidylinositol turnover and Rho-dependent signaling pathway. J. Cell Biol. 135, 37-51.

**Holdorf, A.D., Green, J.M., Levin, S.D., Denny, M.F., Straus, D.B., Link, V., Changelian, P.S., Allen, P.M., and Shaw, A.S. (1999).** Proline residues in CD28 and the Src homology (SH)3 domain of Lck are required for T cell costimulation. J. Exp. Med. 190, 375-384.

**Holsinger, L. J., I. A. Graef, W. Swat, T. Chi, D. M. Bautista, L. Davidson, R. S. Lewis, F. W. Alt, and G. R. Crabtree. (1998).** Defects in actin-cap formation in Vav-deficient mice implicate an actin requirement for lymphocyte signal transduction. Curr. Biol. 8:563-572.

**Huet, S., Groux, H., Caillou, B., Valentin, H., Prieur, A.M., and Bernard, A. (1989).** CD44 contributes to T cell activation. J. Immunol. 143, 798-801.

**Ilangumaran, S., Briol, A., and Hoessli, D.C. (1998).** CD44 selectively associates with active Src family protein tyrosine kinases Lck and Fyn in glycosphingolipid-rich plasma membrane domains of human peripheral blood lymphocytes. Blood. 91, 3901-3908.

**Ishiwatari Hayasaka, H., Fujimoto, T., Osawa, T., Hirama, T., Toyama Sorimachi, N., and Miyasaka, M. (1999).** Requirements for signal delivery through CD44: analysis using CD44-Fas chimeric proteins. J. Immunol. 163, 1258-1264.

**Izquierdo Pastor, M., Reif, K., and Cantrell, D. (1995).** The regulation and function of p21ras during T-cell activation and growth. Immunol. Today. 16, 159-164.

**Jackman, J.K., Motto, D.G., Sun, Q., Tanemoto, M., Turck, C.W., Peltz, G.A., Koretzky, G.A., and Findell, P.R. (1995).** Molecular cloning of SLP-76, a 76-kDa tyrosine phosphoprotein associated with Grb2 in T cells. J. Biol. Chem. 270, 7029-7032.

**Jain, J., Loh, C., and Rao, A. (1995).** Transcriptional regulation of the IL-2 gene. Curr. Opin. Immunol. 7, 333-342.

**Jalkanen, S., Jalkanen, M., Bargatze, R., Tammi, M., and Butcher, E.C. (1988).** Biochemical properties of glycoproteins involved in lymphocyte recognition of high endothelial venules in man. J. Immunol. 141, 1615-1623.

**Jalkanen, S. and Jalkanen, M. (1992).** Lymphocyte CD44 binds the COOH-terminal heparin-binding domain of fibronectin. J. Cell Biol. 116, 817-825.

**Janmey, P.A. (1998).** The cytoskeleton and cell signaling: component localization and mechanical coupling. Physiol. Rev. 78, 763-781.

**Janmey, P. A. and T. P. Stossel. (1989).** Gelsolin-polyphosphoinositide interaction. Full expression of gelsolin-inhibiting function by polyphosphoinositides in vesicular form and inactivation by dilution, aggregation, or masking of the inositol head group. J Biol. Chem. 264:4825-4831.

**Jenkins, M. K. (1994).** The ups and downs of T cell costimulation. Immunity. 1:443-446.

**Jenkinson, E.J., Kingston, R., Smith, C.A., Williams, G.T., and Owen, J.J. (1989).** Antigen-induced apoptosis in developing T cells: a mechanism for negative selection of the T cell receptor repertoire. Eur. J. Immunol. 19, 2175-2177.

**Jones, P.H., Bishop, L.A., and Watt, F.M. (1996).** Functional significance of CD9 association with beta 1 integrins in human epidermal keratinocytes. Cell Adhes. Commun. 4, 297-305.

**Ju, S-T., D. J. Panka, H. Cui, R. Ettinger, M. El-Khatib, D. H. Sherr, B. Z. Stanger, and A. Marshak-Rothstein. (1995).** Fas (CD95)/FasL interactions required for programmed cell death after T cell activation. Nature 373:444-448.

**Kaga, S., S. Ragg, K. A. Rogers, and A. Ochi. (1998).** Stimulation of CD28 with B7-2 promotes focal adhesion-like cell contacts where Rho family small G proteins accumulate in T cells. J Immunol 160:24-27.

**Kalomiris, E.L. and Bourguignon, L.Y. (1988).** Mouse T lymphoma cells contain a transmembrane glycoprotein (GP85) that binds ankyrin. J. Cell Biol. 106, 319-327.

**Kandzari, D.E., Chen, J., and Goldschmidt Clermont, P.J. (1996).** Regulation of the actin cytoskeleton by inositol phospholipid pathways. Subcell. Biochem. 26, 97-114.

**Kato, K., M. Koyanagi, H. Okada, T. Takanashi, Y. W. Wong, A. F. Williams, K. Okumura, and H. Yagita. (1992).** CD48 is a counter-receptor for mouse CD2 and is involved in T cell activation. J Exp. Med. 176:1241-1249.

**Katoh, S., Zheng, Z., Oritani, K., Shimozato, T., and Kincade, P.W. (1995).** Glycosylation of CD44 negatively regulates its recognition of hyaluronan. J. Exp. Med. 182, 419-429.

**Kersh, E.N., Shaw, A.S., and Allen, P.M. (1998).** Fidelity of T cell activation through multistep T cell receptor zeta phosphorylation [see comments]. Science 281, 572-575.

**Khaldoyanidi, S., Denzel, A., and Zoller, M. (1996).** Requirement for CD44 in proliferation and homing of hematopoietic precursor cells. J. Leukoc. Biol. 60, 579-592.

**Kobayashi, M., Imamura, M., Uede, T., Sakurada, K., Maeda, S., Iwasaki, H., Tsuda, Y., Musashi, M., and Miyazaki, T. (1994).** Expression of adhesion molecules on human hematopoietic progenitor cells at different maturational stages. Stem. Cells. Dayt. 12, 316-321.

**Kong Y., K. Fisher, M. F. Bachmann, S. Mariathasan, I. Kozieradzki, M. P. Nghiem, D. Bouchard, A. Bernstein, P. S. Ohashi, and J. M. Penniger. (1998).** Vav regulates peptide-specific apoptosis in thymocytes. J. Exp. Med. 188(11): 2099-2111

**Koopman, G., van Kooyk, Y., de Graaff, M., Meyer, C.J., Figdor, C.G., and Pals, S.T. (1990).** Triggering of the CD44 antigen on T lymphocytes promotes T cell adhesion through the LFA-1 pathway. J. Immunol. 145, 3589-3593.

**Kosugi, A., Saitoh, S.I., Noda, S., Yasuda, K., Hayashi, F., Ogata, M., and Hamaoka, T. (1999).** Translocation of tyrosine-phosphorylated TCRζ chain to glycolipid-enriched membrane domains upon T cell activation. Int. Immunol. 11, 1395-1401.

**Kozma, R., Ahmed, S., Best, A., and Lim, L. (1995).** The Ras-related protein Cdc42Hs and bradykinin promote formation of peripheral actin microspikes and filopodia in Swiss 3T3 fibroblasts. Mol. Cell Biol. 15, 1942-1952.

**L mmli, U. K. (1970).** Cleavage of structural proteins durung the assembly of the head of bacteriophage T4. Nature 227:680-685.

**Leeuwen, J. and Samelson, L.E. (1999).** T cell antigen-receptor signal transduction. Curr. Opin. Immunol. 11, 242-248.

**Lenardo, M.J., Boehme, S., Chen, L., Combadiere, B., Fisher, G., Freedman, M., McFarland, H., Pelfrey, C., and Zheng, L. (1995).** Autocrine feedback death and the regulation of mature T lymphocyte antigen responses. Int. Rev. Immunol. 13, 115-134.

**Lesley, J. and Hyman, R. (1992).** CD44 can be activated to function as an hyaluronic acid receptor in normal murine T cells. Eur. J. Immunol. 22, 2719-2723.

**Lesley, J., Kincade, P.W., and Hyman, R. (1993).** Antibody-induced activation of the hyaluronan receptor function of CD44 requires multivalent binding by antibody. Eur. J. Immunol. 23, 1902-1909.

**Liao, H.X., Levesque, M.C., Patton, K., Bergamo, B., Jones, D., Moody, M.A., Telen, M.J., and Haynes, B.F. (1993).** Regulation of human CD44H and CD44E isoform binding to hyaluronan by phorbol myristate acetate and anti-CD44 monoclonal and polyclonal antibodies. J. Immunol. 151, 6490-6499.

**Lin, J., Weiss, A., and Finco, T.S. (1999).** Localization of LAT in glycolipid-enriched microdomains is required for T cell activation. J. Biol. Chem. 274, 28861-28864.

**Lisanti, M.P., Scherer, P.E., Vidugiriene, J., Tang, Z., Hermanowski Vosatka, A., Tu, Y.H., Cook, R.F., and Sargiacomo, M. (1994).** Characterization of caveolin-rich membrane domains isolated from an endothelial-rich source: implications for human disease. J. Cell Biol. 126, 111-126.

**Liu, D., Zhang, D., Mori, H., and Sy, M.S. (1996).** Binding of CD44 to hyaluronic acid can be induced by multiple signals and requires the CD44 cytoplasmic domain. Cell Immunol. 174, 73-83.

**Lokeshwar, V.B. and Bourguignon, L.Y. (1991).** Post-translational protein modification and expression of ankyrin-binding site(s) in GP85 (Pgp-1/CD44) and its biosynthetic precursors during T-lymphoma membrane biosynthesis. J. Biol. Chem. 266, 17983-17989.

**Lokeshwar, V.B. and Bourguignon, L.Y. (1992).** Tyrosine phosphatase activity of lymphoma CD45 (GP180) is regulated by a direct interaction with the cytoskeleton. J Biol. Chem. 267:21551-21557.

**Lokeshwar, V.B., Fregien, N., and Bourguignon, L.Y. (1994).** Ankyrin-binding domain of CD44(GP85) is required for the expression of hyaluronic acid-mediated adhesion function. J. Cell Biol. 126, 1099-1109.

**Lokeshwar, V.B., Iida, N., and Bourguignon, L.Y. (1996).** The cell adhesion molecule, GP116, is a new CD44 variant (ex14/v10) involved in hyaluronic acid binding and endothelial cell proliferation. J. Biol. Chem. 271, 23853-23864.

**Lowin Kropf, B., V. S. Shapiro, and A. Weiss. (1998).** Cytoskeletal polarization of T cells is regulated by an immunoreceptor tyrosine-based activation motif-dependent mechanism. J Cell Biol. 140:861-871.

**Mackay, D.J., Esch, F., Furthmayr, H., and Hall, A. (1997).** Rho- and rac-dependent assembly of focal adhesion complexes and actin filaments in permeabilized fibroblasts: an essential role for ezrin/radixin/moesin proteins. J. Cell Biol. 138, 927-938.

**Mackay, D.J. and Hall, A. (1998).** Rho GTPases. J. Biol. Chem. 273, 20685-20688.

**Maecker, H.T., Todd, S.C., and Levy, S. (1997).** The tetraspanin superfamily: molecular facilitators. FASEB. J. 11, 428-442.

**Maness, P. F. and R. C. Walsh. (1982).** Dihydrocytochalasin B disorganizes actin cytoarchitecture and inhibits initiation of DNA synthesis in 3T3 cells. Cell 30:253-262.

**Manser, E., Leung, T., Salihuddin, H., Zhao, Z.S., and Lim, L. (1994).** A brain serine/threonine protein kinase activated by Cdc42 and Rac1. Nature 367, 40-46.

**Matsumoto, G., Nghiem, M.P., Nozaki, N., Schmits, R., and Penninger, J.M. (1998).** Cooperation between CD44 and LFA-1/CD11a adhesion receptors in lymphokine-activated killer cell cytotoxicity. J. Immunol. 160, 5781-5789.

**Matsuyama, T., A. Yamada, K. Deusch, J. Sleasman, J. F. Daley, Y. Torimoto, and T. Abe. (1991).** Cytochalasins enhance the proliferation of CD4 cells through the CD3-Ti antigen receptor complex or the CD2 molecule through an effect on early events of activation. J Immunol 146:3736-3741.

**McConkey, D.J., Fosdick, L., D'Adamio, L., Jondal, M., and Orrenius, S. (1994).** Co-receptor (CD4/CD8) engagement enhances CD3-induced apoptosis in thymocytes. Implications for negative selection. J. Immunol. 153, 2436-2443.

**Meng, F. and Lowell, C.A. (1998).** A beta 1 integrin signaling pathway involving Src-family kinases, Cbl and PI-3 kinase is required for macrophage spreading and migration. EMBO J. 17, 4391-4403.

**Michel, F., Grimaud, L., Tuosto, L., and Acuto, O. (1998).** Fyn and ZAP-70 are required for Vav phosphorylation in T cells stimulated by antigen-presenting cells. J. Biol. Chem. 273, 31932-31938.

**Miki, H., K. Miura, and T. Takenawa. (1996).** N-WASP, a novel actin-depolymerizing protein, regulates the cortical cytoskeletal rearrangement in a PIP2-dependent manner downstream of tyrosine kinases. EMBO J 15:5326-5335.

**Miyake, K., Medina, K.L., Hayashi, S., Ono, S., Hamaoka, T., and Kincade, P.W. (1990).** Monoclonal antibodies to Pgp-1/CD44 block lympho-hemopoiesis in long-term bone marrow cultures. J. Exp. Med. 171, 477-488.

**Montixi, C., Langlet, C., Bernard, A.M., Thimonier, J., Dubois, C., Wurbel, M.A., Chauvin, J.P., Pierres, M., and He, H.T. (1998).** Engagement of T cell receptor triggers its recruitment to low-density detergent-insoluble membrane domains. EMBO J. 17, 5334-5348.

**Moran, M. and Miceli, M. C. (1998).** Engagement of GPI-linked CD48 contributes to TCR signals and cytoskeletal reorganization: A role for lipid raftes in T cell activation. Immunity 9:787-796

**Morimoto, K., Robin, E., Le Bousse Kerdiles, M.C., Li, Y., Clay, D., Jasmin, C., and Smadja Joffe, F. (1994).** CD44 mediates hyaluronan binding by human myeloid KG1A and KG1 cells. Blood. 83, 657-662.

**Naor, D., Sionov, R.V., Zahalka, M., Rochman, M., Holzmann, B., and Ish Shalom, D. (1998).** Organ-specific requirements for cell adhesion molecules during lymphoma cell dissemination. Curr. Top. Microbiol. Immunol. 231, 143-166.

**Naujokas, M.F., Morin, M., Anderson, M.S., Peterson, M., and Miller, J. (1993).** The chondroitin sulfate form of invariant chain can enhance stimulation of T cell responses through interaction with CD44. Cell 74, 257-268.

**Neame, S.J. and Isacke, C.M. (1992).** Phosphorylation of CD44 in vivo requires both Ser323 and Ser325, but does not regulate membrane localization or cytoskeletal interaction in epithelial cells. EMBO J. 11, 4733-4738.

**Neame, S.J. and Isacke, C.M. (1993).** The cytoplasmic tail of CD44 is required for basolateral localization in epithelial MDCK cells but does not mediate association with the detergent-insoluble cytoskeleton of fibroblasts. J. Cell Biol. 121, 1299-1310.

**Nel, A.E., Gupta, S., Lee, L., Ledbetter, J.A., and Kanner, S.B. (1995).** Ligation of the T-cell antigen receptor (TCR) induces association of hSos1, ZAP-70, phospholipase C-gamma 1, and other phosphoproteins with Grb2 and the zeta-chain of the TCR. J. Biol. Chem. 270, 18428-18436.

**Nicoletti, I., Migliorati, G., Pagliacci, M.C., Grignani, F., and Riccardi, C. (1991).** A rapid and simple method for measuring thymocyte apoptosis by propidium iodide staining and flow cytometry. J. Immunol. Methods 139, 271-279.

**Nobes, C.D. and Hall, A. (1995).** Rho, Rac and Cdc42 GTPases Regulate the Assembly of Multimolecular Focal Comlexes Associated with Actin Stress Fibers, Lamellipodia, and Filopodia. Cell 81, 53-62.

**Nunes, J.A., Truneh, A., Olive, D., and Cantrell, D.A. (1996).** Signal transduction by CD28 costimulatory receptor on T cells. B7-1 and B7-2 regulation of tyrosine kinase adaptor molecules. J. Biol. Chem. 271, 1591-1598.

**O'Rourke, A.M., Apgar, J.R., Kane, K.P., Martz, E., and Mescher, M.F. (1991).** Cytoskeletal function in CD8- and T cell receptor-mediated interaction of cytotoxic T lymphocytes with class I protein. J. Exp. Med. 173, 241-249.

**Oliferenko, S., Paiha, K., Harder, T., Gerke, V., Schwarzler, C., Schwarz, H., Beug, H., Gunthert, U., and Huber, L.A. (1999).** Analysis of CD44-containing lipid rafts: Recruitment of annexin II and stabilization by the actin cytoskeleton. J. Cell Biol. 146, 843-854.

**Olson, M.F., Pasteris, N.G., Gorski, J.L., and Hall, A. (1996).** Faciogenital dysplasia protein (FGD1) and Vav, two related proteins required for normal embryonic development, are upstream regulators of Rho GTPases. Curr. Biol. 6, 1628-1633.

**Pardi, R., L. Inverardi, C. Rugarli, and J. R. Bender. (1992).** Antigen-receptor complex stimulation triggers protein kinase C-dependent CD11a/CD18-cytoskeleton association in T lymphocytes. J Cell Biol. 116:1211-1220.

**Peach, R.J., Hollenbaugh, D., Stamenkovic, I., and Aruffo, A. (1993).** Identification of hyaluronic acid binding sites in the extracellular domain of CD44. J. Cell Biol. 122, 257-264.

**Penninger, J.M. and Crabtree, G.R. (1999).** The actin cytoskeleton and lymphocyte activation. Cell 96, 9-12.

**Perlmutter, R. M., S. D. Levin, M. W. Appleby, S. J. Anderson, and J. Alberola-Ila. (1993).** Regulation of lymphocyte function by protein phosphorylation. Annual reviews in immunology 11:451-499.

**Price, L.S., Leng, J., Schwartz, M.A., and Bokoch, G.M. (1998).** Activation of Rac and Cdc42 by integrins mediates cell spreading. Mol. Biol. Cell 9, 1863-1871.

**Punt, J.A., Havran, W., Abe, R., Sarin, A., and Singer, A. (1997).** T cell receptor (TCR)-induced death of immature CD4+CD8+ thymocytes by two distinct mechanisms differing in their requirement for CD28 costimulation: implications for negative selection in the thymus. J. Exp. Med. 186, 1911-1922.

**Qian, D. and Weiss, A. (1997).** T cell antigen receptor signal transduction. Curr. Opin. Cell Biol. 9, 205-212.

**Raab, M., da Silva, A.J., Findell, P.R., and Rudd, C.E. (1997).** Regulation of Vav-SLP-76 binding by ZAP-70 and its relevance to TCR zeta/CD3 induction of interleukin-2. Immunity. 6, 155-164.

**Rafi, A., Nagarkatti, M., and Nagarkatti, P.S. (1997).** Hyaluronate-CD44 interactions can induce murine B-cell activation. Blood. 89, 2901-2908.

**Rajnavolgyi, E., Nagy, Z., Kurucz, I., Gogolak, P., Toth, G.K., Varadi, G., Penke, B., Tigyi, Z., Hollosi, M., and Gergely, J. (1994).** T cell recognition of the posttranslationally cleaved intersubunit region of influenza virus hemagglutinin. Mol. Immunol. 31, 1403-1414.

**Ridley, A.J. and Hall, A. (1992).** Distinct patterns of actin organization regulated by the small GTP-binding proteins Rac and Rho. Cold. Spring. Harb. Symp. Quant. Biol. 57, 661-671.

**Ridley, A.J., Paterson, H.F., Johnston, C.L., Diekmann, D., and Hall, A. (1992).** The small GTP-binding protein rac regulates growth factor-induced membrane ruffling. Cell 70, 401-410.

**Rincon, M. and Flavell, R.A. (1994).** AP-1 transcriptional activity requires both T-cell receptor-mediated and co-stimulatory signals in primary T lymphocytes. EMBO J. 13, 4370-4381.

**Rozdzial, M. M., B. Malissen, and T. H. Finkel. (1995).** Tyrosine-phosphorylated T cell receptor zeta chain associates with the actin cytoskeleton upon activation of mature T lymphocytes. Immunity. 3:623-633.

**Rosel, M., Foger, N., and Zoller, M. (1998).** Involvement of CD44 exon v10 in B-cell activation. Tissue. Antigens. 52, 99-113.

**Rothenberg, E.V. and Ward, S.B. (1996).** A dynamic assembly of diverse transcription factors integrates activation and cell-type information for interleukin 2 gene regulation. Proc. Natl. Acad. Sci. U. S. A. 93, 9358-9365.

**Rothman, B.L., Blue, M.L., Kelley, K.A., Wunderlich, D., Mierz, D.V., and Aune, T.M. (1991).** Human T cell activation by OKT3 is inhibited by a monoclonal antibody to CD44. J. Immunol. 147, 2493-2499.

**Rozsnyay, Z. (1999).** Signaling complex formation of CD44 with src-related kinases. Immunol. Lett. 68, 101-108.

**Ryser, J. E., E. Rungger Brandle, C. Chaponnier, G. Gabbiani, and P. Vassalli. (1982).** The area of attachment of cytotoxic T lymphocytes to their target cells shows high motility and polarization of actin, but not myosin. J Immunol 128:1159-1162.

**Sancho, J., Peter, M.E., Franco, R., Danielian, S., Kang, J.S., Fagard, R., Woods, J., Reed, J.C., Kamoun, M., and Terhorst, C. (1993).** Coupling of GTP-binding to the T cell receptor (TCR) zeta-chain with TCR-mediated signal transduction. J. Immunol. 150, 3230-3242.

**Scheeren, R.A., Koopman, G., Van der Baan, S., Meijer, C.J., and Pals, S.T. (1991).** Adhesion receptors involved in clustering of blood dendritic cells and T lymphocytes. Eur. J. Immunol. 21, 1101-1105.

**Schroeder, R.J., Ahmed, S.N., Zhu, Y., London, E., and Brown, D.A. (1998).** Cholesterol and sphingolipid enhance the Triton X-100 insolubility of glycosylphosphatidylinositol-anchored proteins by promoting the formation of detergent-insoluble ordered membrane domains. J. Biol. Chem. 273, 1150-1157.

**Schwartz, L.M. (1992)**. Insect muscle as a model for programmed cell death. J. Neurobiol. 23, 1312-1326.

**Sconocchia, G., Titus, J.A., and Segal, D.M. (1994).** CD44 is a cytotoxic triggering molecule in human peripheral blood NK cells. J. Immunol. 153, 5473-5481.

**Screaton, G.R., Bell, M.V., Jackson, D.G., Cornelis, F.B., Gerth, U., and Bell, J.I. (1992).** Genomic structure of DNA encoding the lymphocyte homing receptor CD44 reveals at least 12 alternatively spliced exons. Proc. Natl. Acad. Sci. U. S. A. 89, 12160-12164.

**Secrist, J.P., Karnitz, L., and Abraham, R.T. (1991).** T-cell antigen receptor ligation induces tyrosine phosphorylation of phospholipase C-g1. J. Biol. Chem. 266, 12135-12139.

**Seth, A., Gote, L., Nagarkatti, M., Nagarkatti, P.S. (1991).** T cell receptor independent activation of cytolytic activity of cytotoxic T lymphocytes mediated through CD44 and gp90MEL-14. Proc. Natl. Acad. Sci. USA 88, 7877-7881.

**Shahinian, A., Pfeffer, K., Lee, K.P., Kundig, T.M., Kishihara, K., Wakeham, A., Kawai, K., Ohashi, P.S., Thompson, C.B., and Mak, T.W. (1993).** Differential T cell costimulatory requirements in CD28-deficient mice. Science 261, 609-612.

**Shaw, A.S. and Dustin, M.L.. (1997).** Making the T cell receptor go the distance: a topological view of T cell activation. Immunity. 6:361-369.

**Shaw, S. and Shimizu, Y. (1988).** Two molecular pathways of human T cell adhesion: establishment of receptor-ligand relationship. Curr. Opin. Immunol 1:92-97.

**Shimizu, Y., van Seventer, G.A., Siraganian, R., Wahl, L., and Shaw, S. (1989).** Dual role of the CD44 molecule in T cell adhesion and activation. J. Immunol. 143, 2457-2463.

**Shimizu, Y., J. L. Mobley, L. D. Finkelstein, and A. S. Chan. (1995).** A role for phosphatidylinositol 3-kinase in the regulation of beta 1 integrin activity by the CD2 antigen. J Cell Biol. 131:1867-1880.

**Shimizu, Y. and Shaw, S. (1991).** Lymphocyte interactions with extracellular matrix. FASEB. J. 5, 2292-2299.

**Shimizu, Y., van Seventer, G.A., Ennis, E., Newman, W., Horgan, K.J., and Shaw, S. (1992).** Crosslinking of the T cell-specific accessory molecules CD7 and CD28 modulates T cell adhesion. J. Exp. Med. 175, 577-582.

**Simons, K. and Ikonen, E. (1997).** Functional rafts in cell membranes. Nature 387, 569-572.

**Sloan Lancaster, J., Shaw, A.S., Rothbard, J.B., and Allen, P.M. (1994).** Partial T cell signaling: altered phospho-zeta and lack of zap70 recruitment in APL-induced T cell anergy [see comments]. Cell 79, 913-922.

**Smith, C.A., Williams, G.T., Kingston, R., Jenkinson, E.J., and Owen, J.J.T. (1989).** Antibodies to CD3/T-cell receptor complex induce death by apoptosis in immature T cells in thymic cultures. Nature 337, 181-184.

**Snapper, S. B., F. S. Rosen, E. Mizoguchi, P. Cohen, W. Khan, C. H. Liu, T. L. Hagemann, S. P. Kwan, R. Ferrini, L. Davidson, A. K. Bhan, and F. W. Alt. (1998).** Wiskott-Aldrich syndrome protein-deficient mice reveal a role for WASP in T but not B cell activation. Immunity. 9:81-91.

**Sommer, F., Huber, M., Rollinghoff, M., and Lohoff, M. (1995).** CD44 plays a co-stimulatory role in murine T cell activation: ligation of CD44 selectively co-stimulates IL-2 production, but not proliferation in TCR-stimulated murine Th1 cells. Int. Immunol. 7, 1779-1786.

**Soula, M., Rothhut, B., Camoin, L., Guillaume, J.L., Strosberg, D., Vorherr, T., Burn, P., Meggio, F., Fischer, S., and Fagard, R. (1993).** Anti-CD3 and phorbol ester induce distinct phosphorylated sites in the SH2 domain of p56lck. J. Biol. Chem. 268, 27420-27427.

**Sperling, A.I. and Bluestone, J.A. (1996).** The complexities of T-cell co-stimulation: CD28 and beyond. Immunol. Rev. 153, 155-182.

**Springer, T.A., Dustin, M.L., Kishimoto, T.K., and Marlin, S.D. (1987).** The lymphocyte function-associated LFA-1, CD2, and LFA-3 molecules: cell adhesion receptors of the immune system. Annu. Rev. Immunol. 5, 223-252.

**Springer, T.A. (1994).** Traffic signals for lymphocyte recirculation and leukocyte emigration: the multistep paradigm. Cell 76, 301-314.

**St.John, T., Meyer, J., Idzerda, R., and Gallatin, W.M. (1990).** Expression of CD44 confers a new adhesive phenotype on transfected cells. Cell 60, 45-52.

**Stamenkovic, I., Aruffo, A., Amiot, M., and Seed, B. (1991).** The hematopoietic and epithelial forms of CD44 are distinct polypeptides with different adhesion potentials for hyaluronate-bearing cells. EMBO J. 10, 343-348.

**Stevens, R.L., Avraham, S., Gartner, M.C., Bruns, G.A., Austen, K.F., and Weis, J.H. (1988). I**solation and characterization of a cDNA that encodes the peptide core of the secretory granule proteoglycan of human promyelocytic leukemia HL-60 cells. J. Biol. Chem. 263, 7287-7291.

**Stossel, T. P. (1994).** The machinery of cell crawling. Sci. Am. 271:54-5, 58.

**Straus, D.B. and Weiss, A. (1992).** Genetic evidence for the involvement of the lck tyrosine kinase in signal transduction through the T cell antigen receptor. Cell 70, 585-593.

**Su, B., Jacinto, E., Hibi, M., Kallunki, T., Karin, M., and Ben Neriah, Y. (1994).** JNK is involved in signal integration during costimulation of T lymphocytes. Cell 77, 727-736.

**Sy, M.S., Liu, D., Schiavone, R., Ma, J., Mori, H., and Guo, Y. (1996).** Interactions between CD44 and hyaluronic acid: their role in tumor growth and metastasis. Curr. Top. Microbiol. Immunol. 213, 129-153.

**Taher, T.E., Smit, L., Griffioen, A.W., Schilder Tol, E.J., Borst, J., and Pals, S.T. (1996).** Signaling through CD44 is mediated by tyrosine kinases. Association with p56lck in T lymphocytes. J. Biol. Chem. 271, 2863-2867.

**Tapon, N., Nagata, K., Lamarche, N., and Hall, A. (1998).** A new rac target POSH is an SH3-containing scaffold protein involved in the JNK and NF-kappaB signalling pathways. EMBO J. 17, 1395-1404.

**Teramoto, H., Crespo, P., Coso, O.A., Igishi, T., Xu, N., and Gutkind, J.S. (1996).** The small GTP-binding protein rho activates c-Jun N-terminal kinases/stress-activated protein kinases in human kidney 293T cells. Evidence for a Pak-independent signaling pathway. J. Biol. Chem. 271, 25731-25734.

**Thomas, M.L. (1999).** The regulation of antigen-receptor signaling by protein tyrosine phosphatases: a hole in the story. Curr. Opin. Immunol. 11, 270-276.

**Thomas, S.M., Soriano, P., and Imamoto, A. (1995).** Specific and redundant roles of Src and Fyn in organizing the cytoskeleton. Nature 376, 267-271.

**Thompson, C. B. 1995.** Distinct roles for the costimulatory ligands B7-1 and B7-2 in T helper cell differentiation? Cell 81:979-982.

**Tolg, C., Hofmann, M., Herrlich, P., and Ponta, H. (1993).** Splicing choice from ten variant exons establishes CD44 variability. Nucleic Acids Res. 21, 1225-1229.

**Toyama Sorimachi, N. and Miyasaka, M. (1994).** A sulfated proteoglycan as a novel ligand for CD44. J. Dermatol. 21, 795-801.

**Toyama Sorimachi, N., Sorimachi, H., Tobita, Y., Kitamura, F., Yagita, H., Suzuki, K., and Miyasaka, M. (1995).** A novel ligand for CD44 is serglycin, a hematopoietic cell lineage-specific proteoglycan. Possible involvement in lymphoid cell adherence and activation. J. Biol. Chem. 270, 7437-7444.

**Traunecker, A., Dolder, B., and Karjalainen, K. (1986).** A novel approach for preparing anti-T cell receptor constant region antibodies. Eur. J. Immunol. 16, 851-854.

**Tsukita, S., Oishi, K., Sato, N., Sagara, J., and Kawai, A. (1994).** ERM family members as molecular linkers between the cell surface glycoprotein CD44 and actin-based cytoskeletons. J. Cell Biol. 126, 391-401.

**Tsukita, S. and Yonemura, S. (1997).** ERM proteins: head-to-tail regulation of actin-plasma membrane interaction. Trends. Biochem. Sci. 22, 53-58.

**Tuosto, L., and Acuto, O. (1998).** CD28 affects the earliest signaling events generated by TCR engagement. Eur. J Immunol 28:2131-2142.

**Turley, E.A., Austen, L., Vandeligt, K., and Clary, C. (1991).** Hyaluronan and a cell-associated hyaluronan binding protein regulate the locomotion of ras-transformed cells. J. Cell Biol. 112, 1041-1047.

**Valitutti, S., M. Dessing, K. Aktories, H. Gallati, and A. Lanzavecchia. (1995).** Sustained signaling leading to T cell activation results from prolonged T cell receptor occupancy. Role of T cell actin cytoskeleton. J Exp. Med. 181:577-584.

**van Leeuwen, J.E. and Samelson, L.E. (1999).** T cell antigen-receptor signal transduction. Curr. Opin. Immunol. 11, 242-248.

**van Oers, N.S., Lowin Kropf, B., Finlay, D., Connolly, K., and Weiss, A. (1996).** alpha beta T cell development is abolished in mice lacking both Lck and Fyn protein tyrosine kinases. Immunity. 5, 429-436.

**Varma, R. and Mayor, S. (1998).** GPI-anchored proteins are organized in submicron domains at the cell surface. Nature 394, 798-801.

**Veillette, A., Zuniga Pflucker, J.C., Bolen, J.B., and Kruisbeek, A.M. (1989).** Engagement of CD4 and CD8 expressed on immature thymocytes induces activation of intracellular tyrosine phosphorylation pathways. J. Exp. Med. 170, 1671-1680.

**Verfaillie, C.M., Benis, A., Iida, J., McGlave, P.B., and McCarthy, J.B. (1994).** Adhesion of committed human hematopoietic progenitors to synthetic peptides from the C-terminal heparin-binding domain of fibronectin: cooperation between the integrin alpha 4 beta 1 and the CD44 adhesion receptor. Blood. 84, 1802-1811.

**Vermot Desroches, C., Wijdenes, J., Valmu, L., Roy, C., Pigott, R., Nortamo, P., and Gahmberg, C.G. (1995).** A CD44 monoclonal antibody differentially regulates CD11a/CD18 binding to intercellular adhesion molecules CD54, CD102 and CD50. Eur. J. Immunol. 25, 2460-2464.

**Viola, A., Schroeder, S., Sakakibara, Y. and A. Lanzavecchia. 1999.** T lymphocyte costimulation mediated by reorganization of membrane microdomains. Science 283, 680-682

**Wang, W., Gulden, P.H., Pierce, R.A., Shabanowitz, J.A., Man, S.T., Hunt, D.F., and Engelhard, V.H. (1997).** A naturally processed peptide presented by HLA-A*0201 is expressed at low abundance and recognized by an alloreactive CD8+ cytotoxic T cell with apparent high affinity. J. Immunol. 158, 5797-5804.

**Wange, R.L. and Samelson, L.E.. (1996).** Complex complexes: Signaling at the TCR. Immunity 5:197-205.

**Waterman-Storer, C.M., Worthylake, R.A., Liu, B.P., Burridge, K., and Salmon, E.D. (1999).** Microtubule growth activates Rac1 to promote lamellipodial protrusion in fibroblasts. Nature 1, 45-50.

**Watts, J.D., Welham, M.J., Kalt, L., Schrader, J.W., and Aebersold, R. (1993).** IL-2 stimulation of T lymphocytes induces sequential activation of mitogen-activated protein kinases and phosphorylation of p56lck at serine-59. J. Immunol. 151, 6862-6871.

**Weber, G.F., Ashkar, S., Glimcher, M.J., and Cantor, H. (1996).** Receptor-ligand interaction between CD44 and osteopontin (Eta-1). Science 271, 509-512.

**Weiss, A. (1993).** T cell antigen receptor signal transduction: A tale of tails and cytoplasmic protein-tyrosine kinases. Cell 73:209-212.

**Weiss, A., Koretzky, G., Schatzman, R.C., and Kadlecek, T. (1991).** Functional activation of the T-cell antigen receptor induces tyrosine phosphorylation of phospholipase C-gamma 1. Proc. Natl. Acad. Sci. U. S. A. 88, 5484-5488.

**Weiss, A. and Littman, D.R. (1994).** Signal transduction by lymphocyte antigen receptors. Cell 76:263-274.

**Wiest, D.L., Ashe, J.M., Abe, R., Bolen, J.B., and Singer, A. (1996).** TCR activation of ZAP70 is impaired in CD4+CD8+ thymocytes as a consequence of intrathymic interactions that diminish available p56lck. Immunity. 4, 495-504.

**Winkler, D.G., Park, I., Kim, T., Payne, N.S., Walsh, C.T., Strominger, J.L., and Shin, J. (1993).** Phosphorylation of Ser-42 and Ser-59 in the N-terminal region of the tyrosine kinase p56lck. Proc. Natl. Acad. Sci. U. S. A. 90, 5176-5180.

**Winoto, A. (1997).** Cell death in the regulation of immune responses. Curr. Opin. Immunol. 9, 365-370.

**Woscholski, R., T. Kodaki, M. McKinnon, M. D. Waterfield, and P. J. Parker. (1994).** A comparison of demethoxyviridin and wortmannin as inhibitors of phosphatidylinositol 3-kinase. FEBS Lett. 342:109-114.

**W lfling, C. and M. M. Davis. 1998**. A receptor/cytoskeletal movement triggered by costimulation during T cell activation. Science 282:2266-2269.

**Wu, L., Kincade, P.W., and Shortman, K. (1993).** The CD44 expressed on the earliest intrathymic precursor population functions as a thymus homing molecule but does not bind to hyaluronate. Immunol. Lett. 38, 69-75.

**Wyllie, A.H. (1980).** Glucocorticoid-induced thymocyte apoptosis is associated with endogenous endonuclease activation. Nature 284, 555-556.

**Xavier, R., Brennan, T., Li, Q., McCormack, C., and Seed, B. (1998).** Membrane compartmentation is required for efficient T cell activation. Immunity. 8, 723-732.

**Xu, H. and Littman, D.R. (1993).** A kinase-independent function of Lck in potentiating antigen-specific T cell activation. Cell 74, 633-643.

**Yablonski, D., Kuhne, M.R., Kadlecek, T., and Weiss, A. (1998).** Uncoupling of nonreceptor tyrosine kinases from PLC-gamma1 in an SLP-76-deficient T cell. Science 281, 413-416.

**Yang, Y., Mercep, M., Ware, C.F. and Ashwell, J.D. (1995).** Fas and activation-induced Fas ligand mediate apoptosis of T cell hybridomas: inhibition of Fas ligand expression by retinoic acid and glucocorticoids. J Exp Med. 181:1673-1682.

**Yashiro, Y., Tai, X.G., Toyo oka, K., Park, C.S., Abe, R., Hamaoka, T., Kobayashi, M., Neben, S., and Fujiwara, H. (1998).** A fundamental difference in the capacity to induce proliferation of naive T cells between CD28 and other co-stimulatory molecules. Eur. J. Immunol. 28, 926-935.

**Yu, Q. and Toole, B.P. (1996).** A new alternatively spliced exon between v9 and v10 provides a molecular basis for synthesis of soluble CD44. J. Biol. Chem. 271, 20603-20607.

**Zacharchuk, C.M., Mercep, M., Chakraborti, P.K., Simons, S.S.,Jr., and Ashwell, J.D. (1990).** Programmed T lymphocyte death. Cell activation- and steroid-induced pathways are mutually antagonistic. J. Immunol. 145, 4037-4045.

**Zawadzki, V., Perschl, A., Rosel, M., Hekele, A., and Zoller, M. (1998).** Blockade of metastasis formation by CD44-receptor globulin. Int. J. Cancer 75, 919-924.

**Zhang, W., Sloan Lancaster, J., Kitchen, J., Trible, R.P., and Samelson, L.E. (1998a).** LAT: the ZAP-70 tyrosine kinase substrate that links T cell receptor to cellular activation. Cell 92, 83-92.

**Zhang, W., Trible, R.P., and Samelson, L.E. (1998b).** LAT palmitoylation: its essential role in membrane microdomain targeting and tyrosine phosphorylation during T cell activation. Immunity. 9, 239-246.

**Zheng, Z., Katoh, S., He, Q., Oritani, K., Miyake, K., Lesley, J., Hyman, R., Hamik, A., Parkhouse, R.M., Farr, A.G., and et al, (1995).** Monoclonal antibodies to CD44 and their influence on hyaluronan recognition. J. Cell Biol. 130, 485-495.

**Zhou, D.F., Ding, J.F., Picker, L.J., Bargatze, R.F., Butcher, E.C., and Goeddel, D.V. (1989).** Molecular cloning and expression of Pgp-1. The mouse homolog of the human H-CAM (Hermes) lymphocyte homing receptor. J. Immunol. 143, 3390-3395.

**Zoller, M. (1995).** CD44: physiological expression of distinct isoforms as evidence for organ-specific metastasis formation. J. Mol. Med. 73, 425-438.

**Zoller, M. (1996).** Joint features of metastasis formation and lymphocyte maturation and activation. Curr. Top. Microbiol. Immunol. 213, 215-247.

**Zuckerman, L.A., Pullen, L., and Miller, J. (1998).** Functional consequences of costimulation by ICAM-1 on IL-2 gene expression and T cell activation. J. Immunol. 160, 3259-3268.