

Departamento de Bioquímica y Biología Molecular
Facultad de Biología
Universidad de Barcelona

PAPEL DE LAS CAVEOLAS/CAVEOLINA-1 EN LA FISIOLOGÍA DEL ADIPOCITO

Elena González Muñoz
Tesis Doctoral
Barcelona, 2007

BIBLIOGRAFÍA

1. Abel,E.D., Peroni,O., Kim,J.K., Kim,Y.B., Boss,O., Hadro,E., Minnemann,T., Shulman,G.I., and Kahn,B.B. (2001). Adipose-selective targeting of the GLUT4 gene impairs insulin action in muscle and liver. *Nature*, **409**, 729-733.
2. Abramson,E.A. and Arky,R.A. (1968). Acute antilipolytic effects of ethyl alcohol and acetate in man. *J Lab Clin. Med.*, **72**, 105-117.
3. Abumrad,N., Coburn,C., and Ibrahimi,A. (1999). Membrane proteins implicated in long-chain fatty acid uptake by mammalian cells: CD36, FATP and FABPm. *Biochim. Biophys. Acta*, **1441**, 4-13.
4. Abumrad,N.A., el Maghrabi,M.R., Amri,E.Z., Lopez,E., and Grimaldi,P.A. (1993). Cloning of a rat adipocyte membrane protein implicated in binding or transport of long-chain fatty acids that is induced during preadipocyte differentiation. Homology with human CD36. *J Biol. Chem.*, **268**, 17665-17668.
5. Abumrad,N.A., Forest,C.C., Regen,D.M., and Sanders,S. (1991). Increase in membrane uptake of long-chain fatty acids early during preadipocyte differentiation. *Proc. Natl. Acad. Sci. U. S. A.*, **88**, 6008-6012.
6. Acheson,K.J., Gremaud,G., Meirim,I., Montigon,F., Krebs,Y., Fay,L.B., Gay,L.J., Schneiter,P., Schindler,C., and Tappy,L. (2004). Metabolic effects of caffeine in humans: lipid oxidation or futile cycling?. *Am. J Clin. Nutr.*, **79**, 40-46.
7. Al Hasani,H., Hinck,C.S., and Cushman,S.W. (1998). Endocytosis of the glucose transporter GLUT4 is mediated by the GTPase dynamin. *J. Biol. Chem.*, **273**, 17504-17510.
8. Alessi,D.R. and Downes,C.P. (1998). The role of PI 3-kinase in insulin action. *Biochim. Biophys. Acta*, **1436**, 151-164.
9. Aloia,R.C., Jensen,F.C., Curtain,C.C., Mobley,P.W., and Gordon,L.M. (1988). Lipid composition and fluidity of the human immunodeficiency virus. *Proc. Natl. Acad. Sci. U. S. A.*, **85**, 900-904.
10. Aloia,R.C., Tian,H., and Jensen,F.C. (1993). Lipid composition and fluidity of the human immunodeficiency virus envelope and host cell plasma membranes. *Proc. Natl. Acad. Sci. U. S. A.*, **90**, 5181-5185.
11. Alwine,J.C. (1985). Transient gene expression control: effects of transfected DNA stability and trans-activation by viral early proteins. *Mol. Cell Biol.*, **5**, 1034-1042.
12. Anderson,H.A., Chen,Y., and Norkin,L.C. (1996). Bound simian virus 40 translocates to caveolin-enriched membrane domains, and its entry is inhibited by drugs that selectively disrupt caveolae. *Mol. Biol. Cell*, **7**, 1825-1834.
13. Anderson,R.G. (1998). The caveolae membrane system. *Annu. Rev. Biochem.*, **67**, 199-225.
14. Anderson,R.G., Kamen,B.A., Rothberg,K.G., and Lacey,S.W. (1992). Potocytosis: sequestration and transport of small molecules by caveolae. *Science*, **255**, 410-411.
15. Aoki,T., Nomura,R., and Fujimoto,T. (1999). Tyrosine phosphorylation of caveolin-1 in the endothelium. *Exp. Cell Res.*, **253**, 629-636.
16. Arner,P. (2005). Human fat cell lipolysis: biochemistry, regulation and clinical role. *Best. Pract. Res. Clin. Endocrinol. Metab.*, **19**, 471-482.
17. Babitt,J., Trigatti,B., Rigotti,A., Smart,E.J., Anderson,R.G., Xu,S., and Krieger,M. (1997). Murine SR-BI, a high density lipoprotein receptor that mediates selective lipid uptake, is N-glycosylated and fatty acylated and colocalizes with plasma membrane caveolae. *J Biol. Chem.*, **272**, 13242-13249.
18. Babiychuk,E.B., Monastyrskaya,K., Burkhard,F.C., Wray,S., and Draeger,A. (2002). Modulating signaling events in smooth muscle: cleavage of annexin 2 abolishes its binding to lipid rafts. *FASEB J.*, **16**, 1177-1184.
19. Bacia,K., Schwille,P., and Kurzchalia,T. (2005). Sterol structure determines the separation of phases and the curvature of the liquid-ordered phase in model membranes. *Proc. Natl. Acad. Sci. U. S. A.*, **102**, 3272-3277.
20. Backer,J.M., Kahn,C.R., Cahill,D.A., Ullrich,A., and White,M.F. (1990). Receptor-mediated internalization of insulin requires a 12-amino acid sequence in the juxtamembrane region of the insulin receptor beta-subunit. *J Biol. Chem.*, **265**, 16450-16454.
21. Baillie,A.G., Coburn,C.T., and Abumrad,N.A. (1996). Reversible binding of long-chain fatty acids to purified FAT, the adipose CD36 homolog. *J Membr. Biol.*, **153**, 75-81.
22. Bandyopadhyay,G., Sajan,M.P., Kanoh,Y., Standaert,M.L., Quon,M.J., Lea-Currie,R., Sen,A., and Farese,R.V. (2002). PKC-zeta mediates insulin effects on glucose

- transport in cultured preadipocyte-derived human adipocytes. *J Clin. Endocrinol. Metab.*, **87**, 716-723.
23. Barros,R.P., Machado,U.F., Warner,M., and Gustafsson,J.A. (2006). Muscle GLUT4 regulation by estrogen receptors ERbeta and ERalpha. *Proc. Natl. Acad. Sci. U. S. A.*, **103**, 1605-1608.
24. Baumann,C.A., Ribon,V., Kanzaki,M., Thurmond,D.C., Mora,S., Shigematsu,S., Bickel,P.E., Pessin,J.E., and Saltiel,A.R. (2000). CAP defines a second signalling pathway required for insulin-stimulated glucose transport. *Nature*, **407**, 202-207.
25. Baumgart,T., Hess,S.T., and Webb,W.W. (2003). Imaging coexisting fluid domains in biomembrane models coupling curvature and line tension. *Nature*, **425**, 821-824.
26. Beitner-Johnson,D., Blakesley,V.A., Shen-Orr,Z., Jimenez,M., Stannard,B., Wang,L.M., Pierce,J., and LeRoith,D. (1996). The proto-oncogene product c-Crk associates with insulin receptor substrate-1 and 4PS. Modulation by insulin growth factor-I (IGF) and enhanced IGF-I signaling. *J. Biol. Chem.*, **271**, 9287-9290.
27. Belanger,M.M., Gaudreau,M., Roussel,E., and Couet,J. (2004). Role of caveolin-1 in etoposide resistance development in A549 lung cancer cells. *Cancer Biol. Ther.*, **3**, 954-959.
28. Bender,F.C., Reymond,M.A., Bron,C., and Quest,A.F. (2000). Caveolin-1 levels are down-regulated in human colon tumors, and ectopic expression of caveolin-1 in colon carcinoma cell lines reduces cell tumorigenicity. *Cancer Res.*, **60**, 5870-5878.
29. Benson,D.A., Boguski,M.S., Lipman,D.J., Ostell,J., and Ouellette,B.F. (1998). GenBank. *Nucleic Acids Res.*, **26**, 1-7.
30. Bergeron,J.J., Cruz,J., Khan,M.N., and Posner,B.I. (1985). Uptake of insulin and other ligands into receptor-rich endocytic components of target cells: the endosomal apparatus. *Annu. Rev. Physiol.*, **47**, 383-403.
31. Berk,P.D., Wada,H., Horio,Y., Potter,B.J., Sorrentino,D., Zhou,S.L., Isola,L.M., Stump,D., Kiang,C.L., and Thung,S. (1990). Plasma membrane fatty acid-binding protein and mitochondrial glutamic-oxaloacetic transaminase of rat liver are related. *Proc. Natl. Acad. Sci. U. S. A.*, **87**, 3484-3488.
32. Berk,P.D., Zhou,S.L., Kiang,C.L., Stump,D., Bradbury,M., and Isola,L.M. (1997). Uptake of long chain free fatty acids is selectively up-regulated in adipocytes of Zucker rats with genetic obesity and non-insulin-dependent diabetes mellitus. *J Biol. Chem.*, **272**, 8830-8835.
33. Bernard,P., Gabant,P., Bahassi,E.M., and Couturier,M. (1994). Positive-selection vectors using the F plasmid ccdB killer gene. *Gene*, **148**, 71-74.
34. Bevan,A.P., Krook,A., Tikerpae,J., Seabright,P.J., Siddle,K., and Smith,G.D. (1997). Chloroquine extends the lifetime of the activated insulin receptor complex in endosomes. *J Biol. Chem.*, **272**, 26833-26840.
35. Bevan,A.P., Seabright,P.J., Tikerpae,J., Posner,B.I., Smith,G.D., and Siddle,K. (2000). The role of insulin dissociation from its endosomal receptor in insulin degradation. *Mol. Cell Endocrinol.*, **164**, 145-157.
36. Bickel,P.E. (2002). Lipid rafts and insulin signaling. *Am. J Physiol Endocrinol. Metab.*, **282**, E1-E10.
37. Bickel,P.E., Scherer,P.E., Schnitzer,J.E., Oh,P., Lisanti,M.P., and Lodish,H.F. (1997). Flotillin and epidermal surface antigen define a new family of caveolae-associated integral membrane proteins. *J Biol. Chem.*, **272**, 13793-13802.
38. Blanchette-Mackie,E.J., Dwyer,N.K., Barber,T., Coxey,R.A., Takeda,T., Rondinone,C.M., Theodorakis,J.L., Greenberg,A.S., and Londos,C. (1995). Perilipin is located on the surface layer of intracellular lipid droplets in adipocytes. *J. Lipid Res.*, **36**, 1211-1226.
39. Blot,V. and McGraw,T.E. (2006). GLUT4 is internalized by a cholesterol-dependent nystatin-sensitive mechanism inhibited by insulin. *EMBO J.*, **25**, 5648-5658.
40. Boguski,M.S., Lowe,T.M., and Tolstoshev,C.M. (1993). dbEST--database for "expressed sequence tags". *Nat. Genet.*, **4**, 332-333.
41. Borglum,J.D., Vassaux,G., Richelsen,B., Gaillard,D., Darimont,C., Ailhaud,G., and Negrel,R. (1996). Changes in adenosine A1- and A2-receptor expression during adipose cell differentiation. *Mol. Cell Endocrinol.*, **117**, 17-25.
42. Bouras,T., Lisanti,M.P., and Pestell,R.G. (2004). Caveolin-1 in breast cancer. *Cancer Biol. Ther.*, **3**, 931-941.

43. Brasaemle,D.L., Barber,T., Wolins,N.E., Serrero,G., Blanchette-Mackie,E.J., and Londos,C. (1997). Adipose differentiation-related protein is an ubiquitously expressed lipid storage droplet-associated protein. *J. Lipid Res.*, **38**, 2249-2263.
44. Brasaemle,D.L., Dolios,G., Shapiro,L., and Wang,R. (2004). Proteomic analysis of proteins associated with lipid droplets of basal and lipolytically stimulated 3T3-L1 adipocytes. *J. Biol. Chem.*, **279**, 46835-46842.
45. Brasaemle,D.L., Levin,D.M., Adler-Wailes,D.C., and Londos,C. (2000a). The lipolytic stimulation of 3T3-L1 adipocytes promotes the translocation of hormone-sensitive lipase to the surfaces of lipid storage droplets. *Biochim. Biophys. Acta*, **1483**, 251-262.
46. Brasaemle,D.L., Rubin,B., Harten,I.A., Gruia-Gray,J., Kimmel,A.R., and Londos,C. (2000b). Perilipin A increases triacylglycerol storage by decreasing the rate of triacylglycerol hydrolysis. *J Biol. Chem.*, **275**, 38486-38493.
47. Breuza,L., Corby,S., Arsanto,J.P., Delgrossi,M.H., Scheiffele,P., and Le Bivic,A. (2002). The scaffolding domain of caveolin 2 is responsible for its Golgi localization in Caco-2 cells. *J Cell Sci.*, **115**, 4457-4467.
48. Brown,D.A. (2001a). Lipid droplets: proteins floating on a pool of fat. *Curr. Biol.*, **11**, R446-R449.
49. Brown,D.A. (2001b). Lipid droplets: proteins floating on a pool of fat. *Curr. Biol.*, **11**, R446-R449.
50. Brown,D.A. and London,E. (1998a). Functions of lipid rafts in biological membranes. *Annu. Rev. Cell Dev. Biol.*, **14**, 111-136.
51. Brown,D.A. and London,E. (1998b). Functions of lipid rafts in biological membranes. *Annu. Rev. Cell Dev. Biol.*, **14**, 111-136.
52. Brown,D.A. and London,E. (1998c). Structure and origin of ordered lipid domains in biological membranes. *J. Membr. Biol.*, **164**, 103-114.
53. Brown,D.A. and Rose,J.K. (1992). Sorting of GPI-anchored proteins to glycolipid-enriched membrane subdomains during transport to the apical cell surface. *Cell*, **68**, 533-544.
54. Bryant,N.J., Govers,R., and James,D.E. (2002). Regulated transport of the glucose transporter GLUT4. *Nat. Rev. Mol. Cell Biol.*, **3**, 267-277.
55. Bu,J., Bruckner,S.R., Sengoku,T., Geddes,J.W., and Estus,S. (2003). Glutamate regulates caveolin expression in rat hippocampal neurons. *J Neurosci. Res.*, **72**, 185-190.
56. Bucci,M., Gratton,J.P., Rudic,R.D., Acevedo,L., Roviezzo,F., Cirino,G., and Sessa,W.C. (2000). In vivo delivery of the caveolin-1 scaffolding domain inhibits nitric oxide synthesis and reduces inflammation. *Nat. Med.*, **6**, 1362-1367.
57. Calvo,M., Tebar,F., Lopez-Iglesias,C., and Enrich,C. (2001). Morphologic and functional characterization of caveolae in rat liver hepatocytes. *Hepatology*, **33**, 1259-1269.
58. Campbell,P.J., Carlson,M.G., Hill,J.O., and Nurjhan,N. (1992). Regulation of free fatty acid metabolism by insulin in humans: role of lipolysis and reesterification. *Am. J Physiol*, **263**, E1063-E1069.
59. Cao,Z., Umek,R.M., and McKnight,S.L. (1991). Regulated expression of three C/EBP isoforms during adipose conversion of 3T3-L1 cells. *Genes Dev.*, **5**, 1538-1552.
60. Capozza,F., Williams,T.M., Schubert,W., McClain,S., Bouzahzah,B., Sotgia,F., and Lisanti,M.P. (2003). Absence of caveolin-1 sensitizes mouse skin to carcinogen-induced epidermal hyperplasia and tumor formation. *Am. J Pathol.*, **162**, 2029-2039.
61. Carey,G.B. (1998). Mechanisms regulating adipocyte lipolysis. *Adv. Exp. Med. Biol.*, **441**, 157-170.
62. Carlotti,F., Bazuine,M., Kekarainen,T., Seppen,J., Pognonec,P., Maassen,J.A., and Hoeben,R.C. (2004). Lentiviral vectors efficiently transduce quiescent mature 3T3-L1 adipocytes. *Mol. Ther.*, **9**, 209-217.
63. Carmen,G.Y. and Victor,S.M. (2006). Signalling mechanisms regulating lipolysis. *Cell Signal.*, **18**, 401-408.
64. Carnicero,H.H. (1984). Changes in the metabolism of long chain fatty acids during adipose differentiation of 3T3 L1 cells. *J. Biol. Chem.*, **259**, 3844-3850.
65. Carozzi,A.J., Ikonen,E., Lindsay,M.R., and Parton,R.G. (2000). Role of cholesterol in developing T-tubules: analogous mechanisms for T-tubule and caveolae biogenesis. *Traffic*, **1**, 326-341.

66. Carpentier,J.L. (1992). Insulin-induced and constitutive internalization of the insulin receptor. *Horm. Res.*, **38**, 13-18.
67. Carver,L.A. and Schnitzer,J.E. (2003). Caveolae: mining little caves for new cancer targets. *Nat. Rev. Cancer*, **3**, 571-581.
68. Ceresa,B.P., Kao,A.W., Santeler,S.R., and Pessin,J.E. (1998). Inhibition of clathrin-mediated endocytosis selectively attenuates specific insulin receptor signal transduction pathways. *Mol. Cell Biol.*, **18**, 3862-3870.
69. Chang,C.C., Chen,J., Thomas,M.A., Cheng,D., Del Priore,V.A., Newton,R.S., Pape,M.E., and Chang,T.Y. (1995). Regulation and immunolocalization of acyl-coenzyme A: cholesterol acyltransferase in mammalian cells as studied with specific antibodies. *J Biol. Chem.*, **270**, 29532-29540.
70. Chang,L., Chiang,S.H., and Saltiel,A.R. (2007). TC10alpha is required for insulin-stimulated glucose uptake in adipocytes. *Endocrinology*, **148**, 27-33.
71. Chang,W.J., Rothberg,K.G., Kamen,B.A., and Anderson,R.G. (1992). Lowering the cholesterol content of MA104 cells inhibits receptor-mediated transport of folate. *J. Cell Biol.*, **118**, 63-69.
72. Chang,W.J., Ying,Y.S., Rothberg,K.G., Hooper,N.M., Turner,A.J., Gamblie,H.A., De Gunzburg,J., Mumby,S.M., Gilman,A.G., and Anderson,R.G. (1994). Purification and characterization of smooth muscle cell caveolae. *J. Cell Biol.*, **126**, 127-138.
73. Charron,M.J., Katz,E.B., and Olson,A.L. (1999). GLUT4 gene regulation and manipulation. *J Biol. Chem.*, **274**, 3253-3256.
74. Chatterjee,S. and Mayor,S. (2001). The GPI-anchor and protein sorting. *Cell Mol. Life Sci.*, **58**, 1969-1987.
75. Chen,W.J., Goldstein,J.L., and Brown,M.S. (1990). NPXY, a sequence often found in cytoplasmic tails, is required for coated pit-mediated internalization of the low density lipoprotein receptor. *J Biol. Chem.*, **265**, 3116-3123.
76. Cheng,Z.J., Singh,R.D., Sharma,D.K., Holicky,E.L., Hanada,K., Marks,D.L., and Pagano,R.E. (2006). Distinct mechanisms of clathrin-independent endocytosis have unique sphingolipid requirements. *Mol. Biol. Cell*, **17**, 3197-3210.
77. Chiang,S.H., Baumann,C.A., Kanzaki,M., Thurmond,D.C., Watson,R.T., Neudauer,C.L., Macara,I.G., Pessin,J.E., and Saltiel,A.R. (2001). Insulin-stimulated GLUT4 translocation requires the CAP-dependent activation of TC10. *Nature*, **410**, 944-948.
78. Chiang,S.H., Chang,L., and Saltiel,A.R. (2006). TC10 and insulin-stimulated glucose transport. *Methods Enzymol.*, **406**, 701-714.
79. Clifford,G.M., Londos,C., Kraemer,F.B., Vernon,R.G., and Yeaman,S.J. (2000). Translocation of hormone-sensitive lipase and perilipin upon lipolytic stimulation of rat adipocytes. *J Biol. Chem.*, **275**, 5011-5015.
80. Coburn,C.T., Knapp,F.F., Jr., Febbraio,M., Beets,A.L., Silverstein,R.L., and Abumrad,N.A. (2000). Defective uptake and utilization of long chain fatty acids in muscle and adipose tissues of CD36 knockout mice. *J Biol. Chem.*, **275**, 32523-32529.
81. Coe,N.R., Simpson,M.A., and Bernlohr,D.A. (1999a). Targeted disruption of the adipocyte lipid-binding protein (aP2 protein) gene impairs fat cell lipolysis and increases cellular fatty acid levels. *J Lipid Res.*, **40**, 967-972.
82. Coe,N.R., Smith,A.J., Frohnert,B.I., Watkins,P.A., and Bernlohr,D.A. (1999b). The fatty acid transport protein (FATP1) is a very long chain acyl-CoA synthetase. *J Biol. Chem.*, **274**, 36300-36304.
83. Cohen,A.M. and Schenker,J.G. (1972). The effect of insulin treatment on fetal mortality and congenital malformations in diabetic pregnant women. *Adv. Exp. Med. Biol.*, **27**, 377-381.
84. Cohen,A.W., Combs,T.P., Scherer,P.E., and Lisanti,M.P. (2003a). Role of caveolin and caveolae in insulin signaling and diabetes. *Am. J. Physiol Endocrinol. Metab.*, **285**, E1151-E1160.
85. Cohen,A.W., Razani,B., Schubert,W., Williams,T.M., Wang,X.B., Iyengar,P., Brasaemle,D.L., Scherer,P.E., and Lisanti,M.P. (2004a). Role of caveolin-1 in the modulation of lipolysis and lipid droplet formation. *Diabetes*, **53**, 1261-1270.

86. Cohen,A.W., Razani,B., Schubert,W., Williams,T.M., Wang,X.B., Iyengar,P., Brasaemle,D.L., Scherer,P.E., and Lisanti,M.P. (2004b). Role of caveolin-1 in the modulation of lipolysis and lipid droplet formation. *Diabetes*, **53**, 1261-1270.
87. Cohen,A.W., Razani,B., Wang,X.B., Combs,T.P., Williams,T.M., Scherer,P.E., and Lisanti,M.P. (2003b). Caveolin-1-deficient mice show insulin resistance and defective insulin receptor protein expression in adipose tissue. *Am. J. Physiol Cell Physiol*, **285**, C222-C235.
88. Cohen,P., Alessi,D.R., and Cross,D.A. (1997). PDK1, one of the missing links in insulin signal transduction?. *FEBS Lett.*, **410**, 3-10.
89. Cong,L.N., Chen,H., Li,Y., Zhou,L., McGibbon,M.A., Taylor,S.I., and Quon,M.J. (1997). Physiological role of Akt in insulin-stimulated translocation of GLUT4 in transfected rat adipose cells. *Mol. Endocrinol.*, **11**, 1881-1890.
90. Conner,S.D. and Schmid,S.L. (2003). Regulated portals of entry into the cell. *Nature*, **422**, 37-44.
91. Conrad,P.A., Smart,E.J., Ying,Y.S., Anderson,R.G., and Bloom,G.S. (1995). Caveolin cycles between plasma membrane caveolae and the Golgi complex by microtubule-dependent and microtubule-independent steps. *J Cell Biol.*, **131**, 1421-1433.
92. Cooke,D.W. and Lane,M.D. (1999a). The transcription factor nuclear factor I mediates repression of the GLUT4 promoter by insulin. *J Biol. Chem.*, **274**, 12917-12924.
93. Cooke,D.W. and Lane,M.D. (1999b). Transcription factor NF1 mediates repression of the GLUT4 promoter by cyclic-AMP. *Biochem. Biophys. Res. Commun.*, **260**, 600-604.
94. Couet,J., Belanger,M.M., Roussel,E., and Drolet,M.C. (2001). Cell biology of caveolae and caveolin. *Adv. Drug Deliv. Rev.*, **49**, 223-235.
95. Couet,J., Li,S., Okamoto,T., Ikezu,T., and Lisanti,M.P. (1997a). Identification of peptide and protein ligands for the caveolin-scaffolding domain. Implications for the interaction of caveolin with caveolae-associated proteins. *J. Biol. Chem.*, **272**, 6525-6533.
96. Couet,J., Sargiacomo,M., and Lisanti,M.P. (1997b). Interaction of a receptor tyrosine kinase, EGF-R, with caveolins. Caveolin binding negatively regulates tyrosine and serine/threonine kinase activities. *J. Biol. Chem.*, **272**, 30429-30438.
97. Covey,S.D., Brunet,R.H., Gandhi,S.G., McFarlane,N., Boreham,D.R., Gerber,G.E., and Trigatti,B.L. (2007). Cholesterol depletion inhibits fatty acid uptake without affecting CD36 or caveolin-1 distribution in adipocytes. *Biochem. Biophys. Res. Commun.*, **355**, 67-71.
98. Czarny,M., Lavie,Y., Fiucci,G., and Liscovitch,M. (1999). Localization of phospholipase D in detergent-insoluble, caveolin-rich membrane domains. Modulation by caveolin-1 expression and caveolin-182-101. *J. Biol. Chem.*, **274**, 2717-2724.
99. Damm,E.M., Pelkmans,L., Kartenbeck,J., Mezzacasa,A., Kurzchalia,T., and Helenius,A. (2005). Clathrin- and caveolin-1-independent endocytosis: entry of simian virus 40 into cells devoid of caveolae. *J Cell Biol.*, **168**, 477-488.
100. Dandekar,A.A., Wallach,B.J., Barthel,A., and Roth,R.A. (1998). Comparison of the signaling abilities of the cytoplasmic domains of the insulin receptor and the insulin receptor-related receptor in 3T3-L1 adipocytes. *Endocrinology*, **139**, 3578-3584.
101. del Pozo,M.A., Balasubramanian,N., Alderson,N.B., Kiosses,W.B., Grande-Garcia,A., Anderson,R.G., and Schwartz,M.A. (2005). Phospho-caveolin-1 mediates integrin-regulated membrane domain internalization. *Nat. Cell Biol.*, **7**, 901-908.
102. Dietzen,D.J., Hastings,W.R., and Lublin,D.M. (1995). Caveolin is palmitoylated on multiple cysteine residues. Palmitoylation is not necessary for localization of caveolin to caveolae. *J Biol. Chem.*, **270**, 6838-6842.
103. Dolinsky,V.W., Gilham,D., Hatch,G.M., Agellon,L.B., Lehner,R., and Vance,D.E. (2003). Regulation of triacylglycerol hydrolase expression by dietary fatty acids and peroxisomal proliferator-activated receptors. *Biochim. Biophys. Acta*, **1635**, 20-28.
104. Dolinsky,V.W., Sipione,S., Lehner,R., and Vance,D.E. (2001). The cloning and expression of a murine triacylglycerol hydrolase cDNA and the structure of its corresponding gene. *Biochim. Biophys. Acta*, **1532**, 162-172.
105. Doornbos,R.P., Theelen,M., van der Hoeven,P.C., van Blitterswijk,W.J., Verkleij,A.J., and van Bergen en Henegouwen PM (1999). Protein kinase C ζ is a negative regulator of protein kinase B activity. *J Biol. Chem.*, **274**, 8589-8596.

106. Drab,M., Verkade,P., Elger,M., Kasper,M., Lohn,M., Lauterbach,B., Menne,J., Lindschau,C., Mende,F., Luft,F.C., Schedl,A., Haller,H., and Kurzchalia,T.V. (2001). Loss of caveolae, vascular dysfunction, and pulmonary defects in caveolin-1 gene-disrupted mice. *Science*, **293**, 2449-2452.
107. Dubbs,D.R. and Scherer,W.F. (1969). Variants of Japanese encephalitis virus cytopathic for L mouse fibroblasts and lass human epithelial cells. *Jpn. J Med. Sci. Biol.*, **22**, 253-261.
108. Dugani,C.B. and Klip,A. (2005). Glucose transporter 4: cycling, compartments and controversies. *EMBO Rep.*, **6**, 1137-1142.
109. Ehehalt,R., Fullekrug,J., Pohl,J., Ring,A., Herrmann,T., and Stremmel,W. (2006). Translocation of long chain fatty acids across the plasma membrane--lipid rafts and fatty acid transport proteins. *Mol. Cell Biochem.*, **284**, 135-140.
110. Engelman,J.A., Chu,C., Lin,A., Jo,H., Ikezu,T., Okamoto,T., Kohtz,D.S., and Lisanti,M.P. (1998a). Caveolin-mediated regulation of signaling along the p42/44 MAP kinase cascade in vivo. A role for the caveolin-scaffolding domain. *FEBS Lett.*, **428**, 205-211.
111. Engelman,J.A., Lee,R.J., Karnezis,A., Bearss,D.J., Webster,M., Siegel,P., Muller,W.J., Windle,J.J., Pestell,R.G., and Lisanti,M.P. (1998b). Reciprocal regulation of neu tyrosine kinase activity and caveolin-1 protein expression in vitro and in vivo. Implications for human breast cancer. *J Biol. Chem.*, **273**, 20448-20455.
112. Engelman,J.A., Wykoff,C.C., Yasuhara,S., Song,K.S., Okamoto,T., and Lisanti,M.P. (1997). Recombinant expression of caveolin-1 in oncogenically transformed cells abrogates anchorage-independent growth. *J Biol. Chem.*, **272**, 16374-16381.
113. Ezaki,O., Flores-Riveros,J.R., Kaestner,K.H., Gearhart,J., and Lane,M.D. (1993). Regulated expression of an insulin-responsive glucose transporter (GLUT4) minigene in 3T3-L1 adipocytes and transgenic mice. *Proc. Natl. Acad. Sci. U. S. A.*, **90**, 3348-3352.
114. Fajas,L. (2003). Adipogenesis: a cross-talk between cell proliferation and cell differentiation. *Ann. Med.*, **35**, 79-85.
115. Fan,J.Y., Carpentier,J.L., Van Obberghen,E., Grunfeld,C., Gorden,P., and Orci,L. (1983). Morphological changes of the 3T3-L1 fibroblast plasma membrane upon differentiation to the adipocyte form. *J. Cell Sci.*, **61**, 219-230.
116. Faraj,M., Lu,H.L., and Cianflone,K. (2004). Diabetes, lipids, and adipocyte secretagogues. *Biochem. Cell Biol.*, **82**, 170-190.
117. Farese,R.V. (2002). Function and dysfunction of aPKC isoforms for glucose transport in insulin-sensitive and insulin-resistant states. *Am. J Physiol Endocrinol. Metab.*, **283**, E1-11.
118. Farmer,S.R. (2005). Regulation of PPARgamma activity during adipogenesis. *Int. J. Obes. (Lond)*, **29 Suppl 1**, S13-S16.
119. Farmer,S.R. (2006). Transcriptional control of adipocyte formation. *Cell Metab*, **4**, 263-273.
120. Febbraio,M., Abumrad,N.A., Hajjar,D.P., Sharma,K., Cheng,W., Pearce,S.F., and Silverstein,R.L. (1999). A null mutation in murine CD36 reveals an important role in fatty acid and lipoprotein metabolism. *J Biol. Chem.*, **274**, 19055-19062.
121. Fernandez,I., Ying,Y., Albanesi,J., and Anderson,R.G. (2002). Mechanism of caveolin filament assembly. *Proc. Natl. Acad. Sci. U. S. A.*, **99**, 11193-11198.
122. Fernandez,M.A., Albor,C., Ingelmo-Torres,M., Nixon,S.J., Ferguson,C., Kurzchalia,T., Tebar,F., Enrich,C., Parton,R.G., and Pol,A. (2006). Caveolin-1 is essential for liver regeneration. *Science*, **313**, 1628-1632.
123. Feron,O., Michel,J.B., Sase,K., and Michel,T. (1998). Dynamic regulation of endothelial nitric oxide synthase: complementary roles of dual acylation and caveolin interactions. *Biochemistry*, **37**, 193-200.
124. Fielding,C.J., Bist,A., and Fielding,P.E. (1997a). Caveolin mRNA levels are up-regulated by free cholesterol and down-regulated by oxysterols in fibroblast monolayers. *Proc. Natl. Acad. Sci. U. S. A.*, **94**, 3753-3758.
125. Fielding,C.J., Bist,A., and Fielding,P.E. (1999). Intracellular cholesterol transport in synchronized human skin fibroblasts. *Biochemistry*, **38**, 2506-2513.
126. Fielding,C.J. and Fielding,P.E. (1997b). Intracellular cholesterol transport. *J Lipid Res.*, **38**, 1503-1521.

127. Fielding,C.J. and Fielding,P.E. (2000). Cholesterol and caveolae: structural and functional relationships. *Biochim. Biophys. Acta*, **1529**, 210-222.
128. Fielding,C.J. and Fielding,P.E. (2001). Caveolae and intracellular trafficking of cholesterol. *Adv. Drug Deliv. Rev.*, **49**, 251-264.
129. Fielding,P.E. and Fielding,C.J. (1995). Plasma membrane caveolae mediate the efflux of cellular free cholesterol. *Biochemistry*, **34**, 14288-14292.
130. Fischer-Pozovszky,P., Wabitsch,M., and Hochberg,Z. (2007). Endocrinology of adipose tissue - an update. *Horm. Metab Res.*, **39**, 314-321.
131. Fiucci,G., Ravid,D., Reich,R., and Liscovitch,M. (2002). Caveolin-1 inhibits anchorage-independent growth, anoikis and invasiveness in MCF-7 human breast cancer cells. *Oncogene*, **21**, 2365-2375.
132. Flores-Riveros,J.R., McLenithan,J.C., Ezaki,O., and Lane,M.D. (1993). Insulin down-regulates expression of the insulin-responsive glucose transporter (GLUT4) gene: effects on transcription and mRNA turnover. *Proc. Natl. Acad. Sci. U. S. A*, **90**, 512-516.
133. Fong,A., Garcia,E., Gwynn,L., Lisanti,M.P., Fazzari,M.J., and Li,M. (2003). Expression of caveolin-1 and caveolin-2 in urothelial carcinoma of the urinary bladder correlates with tumor grade and squamous differentiation. *Am. J Clin. Pathol.*, **120**, 93-100.
134. Fortier,M., Wang,S.P., Mauriege,P., Semache,M., Mfuma,L., Li,H., Levy,E., Richard,D., and Mitchell,G.A. (2004). Hormone-sensitive lipase-independent adipocyte lipolysis during beta-adrenergic stimulation, fasting, and dietary fat loading. *Am. J Physiol Endocrinol. Metab.*, **287**, E282-E288.
135. Fra,A.M., Masserini,M., Palestini,P., Sonnino,S., and Simons,K. (1995a). A photo-reactive derivative of ganglioside GM1 specifically cross-links VIP21-caveolin on the cell surface. *FEBS Lett.*, **375**, 11-14.
136. Fra,A.M., Pasqualetto,E., Mancini,M., and Sitia,R. (2000). Genomic organization and transcriptional analysis of the human genes coding for caveolin-1 and caveolin-2. *Gene*, **243**, 75-83.
137. Fra,A.M., Williamson,E., Simons,K., and Parton,R.G. (1995b). De novo formation of caveolae in lymphocytes by expression of VIP21-caveolin. *Proc. Natl. Acad. Sci. U. S. A*, **92**, 8655-8659.
138. Frank,P.G., Cheung,M.W., Pavlides,S., Llaverias,G., Park,D.S., and Lisanti,M.P. (2006). Caveolin-1 and regulation of cellular cholesterol homeostasis. *Am. J. Physiol Heart Circ. Physiol.*, **291**, H677-H686.
139. Fridriksson,E.K., Shipkova,P.A., Sheets,E.D., Holowka,D., Baird,B., and McLafferty,F.W. (1999). Quantitative analysis of phospholipids in functionally important membrane domains from RBL-2H3 mast cells using tandem high-resolution mass spectrometry. *Biochemistry*, **38**, 8056-8063.
140. Fu,Y., Hoang,A., Escher,G., Parton,R.G., Krozowski,Z., and Sviridov,D. (2004). Expression of caveolin-1 enhances cholesterol efflux in hepatic cells. *J Biol. Chem.*, **279**, 14140-14146.
141. Fujimoto,T. (1996). GPI-anchored proteins, glycosphingolipids, and sphingomyelin are sequestered to caveolae only after crosslinking. *J Histochem. Cytochem.*, **44**, 929-941.
142. Fujimoto,T., Kogo,H., Ishiguro,K., Tauchi,K., and Nomura,R. (2001). Caveolin-2 is targeted to lipid droplets, a new "membrane domain" in the cell. *J. Cell Biol.*, **152**, 1079-1085.
143. Galbiati,F., Engelmann,J.A., Volonte,D., Zhang,X.L., Minetti,C., Li,M., Hou,H., Jr., Kneitz,B., Edelmann,W., and Lisanti,M.P. (2001). Caveolin-3 null mice show a loss of caveolae, changes in the microdomain distribution of the dystrophin-glycoprotein complex, and t-tubule abnormalities. *J Biol. Chem.*, **276**, 21425-21433.
144. Galbiati,F., Volonte,D., Brown,A.M., Weinstein,D.E., Ben Ze'ev,A., Pestell,R.G., and Lisanti,M.P. (2000). Caveolin-1 expression inhibits Wnt/beta-catenin/Lef-1 signaling by recruiting beta-catenin to caveolae membrane domains. *J Biol. Chem.*, **275**, 23368-23377.
145. Galbiati,F., Volonte,D., Engelmann,J.A., Watanabe,G., Burk,R., Pestell,R.G., and Lisanti,M.P. (1998a). Targeted downregulation of caveolin-1 is sufficient to drive cell transformation and hyperactivate the p42/44 MAP kinase cascade. *EMBO J*, **17**, 6633-6648.

146. Galbiati,F., Volonte,D., Gil,O., Zanazzi,G., Salzer,J.L., Sargiacomo,M., Scherer,P.E., Engelman,J.A., Schlegel,A., Parenti,M., Okamoto,T., and Lisanti,M.P. (1998b). Expression of caveolin-1 and -2 in differentiating PC12 cells and dorsal root ganglion neurons: caveolin-2 is up-regulated in response to cell injury. *Proc. Natl. Acad. Sci. U. S. A.*, **95**, 10257-10262.
147. Galbiati,F., Volonte,D., Minetti,C., Chu,J.B., and Lisanti,M.P. (1999). Phenotypic behavior of caveolin-3 mutations that cause autosomal dominant limb girdle muscular dystrophy (LGMD-1C). Retention of LGMD-1C caveolin-3 mutants within the golgi complex. *J Biol. Chem.*, **274**, 25632-25641.
148. Ganley,I.G., Carroll,K., Bittova,L., and Pfeffer,S. (2004). Rab9 GTPase regulates late endosome size and requires effector interaction for its stability. *Mol. Biol. Cell.*, **15**, 5420-5430.
149. Gao,J.G. and Simon,M. (2006). Molecular screening for GS2 lipase regulators: inhibition of keratinocyte retinylester hydrolysis by TIP47. *J Invest Dermatol.*, **126**, 2087-2095.
150. Gargalovic,P. and Dory,L. (2001). Caveolin-1 and caveolin-2 expression in mouse macrophages. High density lipoprotein 3-stimulated secretion and a lack of significant subcellular co-localization. *J Biol. Chem.*, **276**, 26164-26170.
151. Gargalovic,P. and Dory,L. (2003). Caveolins and macrophage lipid metabolism. *J Lipid Res.*, **44**, 11-21.
152. Gargiulo,C.E., Stuhlsatz-Krouper,S.M., and Schaffer,J.E. (1999). Localization of adipocyte long-chain fatty acyl-CoA synthetase at the plasma membrane. *J Lipid Res.*, **40**, 881-892.
153. Gerrits,P.M., Olson,A.L., and Pessin,J.E. (1993). Regulation of the GLUT4/muscle-fat glucose transporter mRNA in adipose tissue of insulin-deficient diabetic rats. *J Biol. Chem.*, **268**, 640-644.
154. Gimble,J.M., Robinson,C.E., Wu,X., Kelly,K.A., Rodriguez,B.R., Kliewer,S.A., Lehmann,J.M., and Morris,D.C. (1996). Peroxisome proliferator-activated receptor-gamma activation by thiazolidinediones induces adipogenesis in bone marrow stromal cells. *Mol. Pharmacol.*, **50**, 1087-1094.
155. Giudicelli,H., Combes-Pastre,N., and Boyer,J. (1974). Lipolytic activity of adipose tissue. IV. The diacylglycerol lipase activity of human adipose tissue. *Biochim. Biophys. Acta*, **369**, 25-33.
156. Giudicelli,Y., Provins,D., and Nordmann,R. (1975). Effects of sulphydryl inhibition on the regulation of basal lipolysis and glucose uptake in human adipose tissue. *Biochem. Pharmacol.*, **24**, 1029-1033.
157. Glenney,J.R., Jr. (1989). Tyrosine phosphorylation of a 22-kDa protein is correlated with transformation by Rous sarcoma virus. *J Biol. Chem.*, **264**, 20163-20166.
158. Glenney,J.R., Jr. and Soppet,D. (1992). Sequence and expression of caveolin, a protein component of caveolae plasma membrane domains phosphorylated on tyrosine in Rous sarcoma virus-transformed fibroblasts. *Proc. Natl. Acad. Sci. U. S. A.*, **89**, 10517-10521.
159. Gnudi,L., Frevert,E.U., Houseknecht,K.L., Erhardt,P., and Kahn,B.B. (1997). Adenovirus-mediated gene transfer of dominant negative ras(asn17) in 3T3L1 adipocytes does not alter insulin-stimulated P13-kinase activity or glucose transport. *Mol. Endocrinol.*, **11**, 67-76.
160. Godbey,W.T., Wu,K.K., and Mikos,A.G. (1999). Poly(ethylenimine) and its role in gene delivery. *J Control Release*, **60**, 149-160.
161. Goldberg,I.J. (1996). Lipoprotein lipase and lipolysis: central roles in lipoprotein metabolism and atherogenesis. *J. Lipid Res.*, **37**, 693-707.
162. Gonzalez,E., Nagiel,A., Lin,A.J., Golan,D.E., and Michel,T. (2004). Small interfering RNA-mediated down-regulation of caveolin-1 differentially modulates signalling pathways in endothelial cells. *J. Biol. Chem.*, **279**, 40659-40669.
163. Gonzalez-Yanes,C. and Sanchez-Margalef,V. (2006). Signalling mechanisms regulating lipolysis. *cellular signalling*, **18**, 401-408.
164. Govers,R., Coster,A.C., and James,D.E. (2004). Insulin increases cell surface GLUT4 levels by dose dependently discharging GLUT4 into a cell surface recycling pathway. *Mol. Cell Biol.*, **24**, 6456-6466.

165. Graf,G.A., Connell,P.M., van der Westhuyzen,D.R., and Smart,E.J. (1999). The class B, type I scavenger receptor promotes the selective uptake of high density lipoprotein cholesterol ethers into caveolae. *J Biol. Chem.*, **274**, 12043-12048.
166. Graham,F.L., Smiley,J., Russell,W.C., and Nairn,R. (1977). Characteristics of a human cell line transformed by DNA from human adenovirus type 5. *J Gen. Virol.*, **36**, 59-74.
167. Grako,K.A., Olefsky,J.M., and McClain,D.A. (1992). Tyrosine kinase-defective insulin receptors undergo decreased endocytosis but do not affect internalization of normal endogenous insulin receptors. *Endocrinology*, **130**, 3441-3452.
168. Granneman,J.G., Moore,H.P., Granneman,R.L., Greenberg,A.S., Obin,M.S., and Zhu,Z. (2007). Analysis of lipolytic protein trafficking and interactions in adipocytes. *J. Biol. Chem.*, **282**, 5726-5735.
169. Green,A. and Olefsky,J.M. (1982). Evidence for insulin-induced internalization and degradation of insulin receptors in rat adipocytes. *Proc. Natl. Acad. Sci. U. S. A.*, **79**, 427-431.
170. Green,H. and Meuth,M. (1974). An established pre-adipose cell line and its differentiation in culture. *Cell*, **3**, 127-133.
171. Greenberg,A.S., Egan,J.J., Wek,S.A., Garty,N.B., Blanchette-Mackie,E.J., and Londos,C. (1991). Perilipin, a major hormonally regulated adipocyte-specific phosphoprotein associated with the periphery of lipid storage droplets. *J. Biol. Chem.*, **266**, 11341-11346.
172. Greenberg,A.S., Egan,J.J., Wek,S.A., Moos,M.C., Jr., Londos,C., and Kimmel,A.R. (1993). Isolation of cDNAs for perilipins A and B: sequence and expression of lipid droplet-associated proteins of adipocytes. *Proc. Natl. Acad. Sci. U. S. A.*, **90**, 12035-12039.
173. Gregoire,F.M., Smas,C.M., and Sul,H.S. (1998). Understanding adipocyte differentiation. *Physiol Rev.*, **78**, 783-809.
174. Gustavsson,J., Parpal,S., Karlsson,M., Ramsing,C., Thorn,H., Borg,M., Lindroth,M., Peterson,K.H., Magnusson,K.E., and Stralfors,P. (1999). Localization of the insulin receptor in caveolae of adipocyte plasma membrane. *FASEB J.*, **13**, 1961-1971.
175. Gustavsson,J., Parpal,S., and Stralfors,P. (1996). Insulin-stimulated glucose uptake involves the transition of glucose transporters to a caveolae-rich fraction within the plasma membrane: implications for type II diabetes. *Mol. Med.*, **2**, 367-372.
176. Haemmerle,G., Lass,A., Zimmermann,R., Gorkiewicz,G., Meyer,C., Rozman,J., Heldmaier,G., Maier,R., Theussl,C., Eder,S., Kratky,D., Wagner,E.F., Klingenspor,M., Hoefler,G., and Zechner,R. (2006). Defective lipolysis and altered energy metabolism in mice lacking adipose triglyceride lipase. *Science*, **312**, 734-737.
177. Haemmerle,G., Zimmermann,R., Hayn,M., Theussl,C., Waeg,G., Wagner,E., Sattler,W., Magin,T.M., Wagner,E.F., and Zechner,R. (2002). Hormone-sensitive lipase deficiency in mice causes diglyceride accumulation in adipose tissue, muscle, and testis. *J Biol. Chem.*, **277**, 4806-4815.
178. Hagiwara,Y., Sasaoka,T., Araishi,K., Imamura,M., Yorifuji,H., Nonaka,I., Ozawa,E., and Kikuchi,T. (2000). Caveolin-3 deficiency causes muscle degeneration in mice. *Hum. Mol. Genet.*, **9**, 3047-3054.
179. Hailstones,D., Sleer,L.S., Parton,R.G., and Stanley,K.K. (1998). Regulation of caveolin and caveolae by cholesterol in MDCK cells. *J. Lipid Res.*, **39**, 369-379.
180. Hall,A.M., Smith,A.J., and Bernlohr,D.A. (2003). Characterization of the Acyl-CoA synthetase activity of purified murine fatty acid transport protein 1. *J Biol. Chem.*, **278**, 43008-43013.
181. Hamm,J.K., Park,B.H., and Farmer,S.R. (2001). A role for C/EBP β in regulating peroxisome proliferator-activated receptor gamma activity during adipogenesis in 3T3-L1 preadipocytes. *J Biol. Chem.*, **276**, 18464-18471.
182. Harder,T., Scheiffele,P., Verkade,P., and Simons,K. (1998). Lipid domain structure of the plasma membrane revealed by patching of membrane components. *J. Cell Biol.*, **141**, 929-942.
183. Harder,T. and Simons,K. (1997). Caveolae, DIGs, and the dynamics of sphingolipid-cholesterol microdomains. *Curr. Opin. Cell Biol.*, **9**, 534-542.
184. Harmon,C.M. and Abumrad,N.A. (1993). Binding of sulfosuccinimidyl fatty acids to adipocyte membrane proteins: isolation and amino-terminal sequence of an 88-kD protein implicated in transport of long-chain fatty acids. *J Membr. Biol.*, **133**, 43-49.

185. Hayashi,K., Matsuda,S., Machida,K., Yamamoto,T., Fukuda,Y., Nimura,Y., Hayakawa,T., and Hamaguchi,M. (2001). Invasion activating caveolin-1 mutation in human scirrhous breast cancers. *Cancer Res.*, **61**, 2361-2364.
186. Heidenreich,K.A., Berhanu,P., Brandenburg,D., and Olefsky,J.M. (1983). Degradation of insulin receptors in rat adipocytes. *Diabetes*, **32**, 1001-1009.
187. Heidenreich,K.A., Brandenburg,D., Berhanu,P., and Olefsky,J.M. (1984). Metabolism of photoaffinity-labeled insulin receptors by adipocytes. Role of internalization, degradation, and recycling. *J Biol. Chem.*, **259**, 6511-6515.
188. Henley,J.R., Krueger,E.W., Oswald,B.J., and McNiven,M.A. (1998). Dynamin-mediated internalization of caveolae. *J Cell Biol.*, **141**, 85-99.
189. Hernandez-Deviez,D.J., Martin,S., Laval,S.H., Lo,H.P., Cooper,S.T., North,K.N., Bushby,K., and Parton,R.G. (2006). Aberrant dysferlin trafficking in cells lacking caveolin or expressing dystrophy mutants of caveolin-3. *Hum. Mol. Genet.*, **15**, 129-142.
190. Hertzel,A.V., Smith,L.A., Berg,A.H., Cline,G.W., Shulman,G.I., Scherer,P.E., and Bernlohr,D.A. (2006). Lipid metabolism and adipokine levels in fatty acid-binding protein null and transgenic mice. *Am. J Physiol Endocrinol. Metab.*, **290**, E814-E823.
191. Hill,M.M., Clark,S.F., Tucker,D.F., Birnbaum,M.J., James,D.E., and Macaulay,S.L. (1999). A role for protein kinase Bbeta/Akt2 in insulin-stimulated GLUT4 translocation in adipocytes. *Mol. Cell Biol.*, **19**, 7771-7781.
192. Hodgkinson,C.P., Mander,A., and Sale,G.J. (2005a). Identification of 80K-H as a protein involved in GLUT4 vesicle trafficking. *Biochem. J.*, **388**, 785-793.
193. Hodgkinson,C.P., Mander,A., and Sale,G.J. (2005b). Protein kinase-zeta interacts with munc18c: role in GLUT4 trafficking. *Diabetologia*, **48**, 1627-1636.
194. Holm,C. (2003). Molecular mechanisms regulating hormone-sensitive lipase and lipolysis. *Biochem. Soc. Trans.*, **31**, 1120-1124.
195. Holmgren,J., Lonnroth,I., and Svennerholm,L. (1973). Tissue receptor for cholera exotoxin: postulated structure from studies with GM1 ganglioside and related glycolipids. *Infect. Immun.*, **8**, 208-214.
196. Hong,S., Huo,H., Xu,J., and Liao,K. (2004). Insulin-like growth factor-1 receptor signaling in 3T3-L1 adipocyte differentiation requires lipid rafts but not caveolae. *Cell Death Differ.*, **11**, 714-723.
197. Hooper,N.M. (1999). Detergent-insoluble glycosphingolipid/cholesterol-rich membrane domains, lipid rafts and caveolae (review). *Mol. Membr. Biol.*, **16**, 145-156.
198. Hosaka,T., Brooks,C.C., Presman,E., Kim,S.K., Zhang,Z., Breen,M., Gross,D.N., Sztul,E., and Pilch,P.F. (2005). p115 Interacts with the GLUT4 vesicle protein, IRAP, and plays a critical role in insulin-stimulated GLUT4 translocation. *Mol. Biol. Cell.*, **16**, 2882-2890.
199. Hosono,T., Mizuguchi,H., Katayama,K., Koizumi,N., Kawabata,K., Yamaguchi,T., Nakagawa,S., Watanabe,Y., Mayumi,T., and Hayakawa,T. (2005). RNA interference of PPARgamma using fiber-modified adenovirus vector efficiently suppresses preadipocyte-to-adipocyte differentiation in 3T3-L1 cells. *Gene*, **348**, 157-165.
200. Hresko,R.C., Murata,H., Marshall,B.A., and Mueckler,M. (1994). Discrete structural domains determine differential endoplasmic reticulum to Golgi transit times for glucose transporter isoforms. *J. Biol. Chem.*, **269**, 32110-32119.
201. Huo,H., Guo,X., Hong,S., Jiang,M., Liu,X., and Liao,K. (2003). Lipid rafts/caveolae are essential for insulin-like growth factor-1 receptor signaling during 3T3-L1 preadipocyte differentiation induction. *J. Biol. Chem.*, **278**, 11561-11569.
202. Ibrahimi,A. and Abumrad,N.A. (2002). Role of CD36 in membrane transport of long-chain fatty acids. *Curr. Opin. Clin. Nutr. Metab Care*, **5**, 139-145.
203. Ibrahimi,A., Sfeir,Z., Magharaie,H., Amri,E.Z., Grimaldi,P., and Abumrad,N.A. (1996). Expression of the CD36 homolog (FAT) in fibroblast cells: effects on fatty acid transport. *Proc. Natl. Acad. Sci. U. S. A.*, **93**, 2646-2651.
204. Ikezu,T., Ueda,H., Trapp,B.D., Nishiyama,K., Sha,J.F., Volonte,D., Galbiati,F., Byrd,A.L., Bassell,G., Serizawa,H., Lane,W.S., Lisanti,M.P., and Okamoto,T. (1998). Affinity-purification and characterization of caveolins from the brain: differential expression of caveolin-1, -2, and -3 in brain endothelial and astroglial cell types. *Brain Res.*, **804**, 177-192.
205. Ikonen,E., Heino,S., and Lusa,S. (2004). Caveolins and membrane cholesterol. *Biochem. Soc. Trans.*, **32**, 121-123.

206. Ikonen,E. and Parton,R.G. (2000). Caveolins and cellular cholesterol balance. *Traffic.*, **1**, 212-217.
207. Ishiki,M. and Klip,A. (2005). Minireview: recent developments in the regulation of glucose transporter-4 traffic: new signals, locations, and partners. *Endocrinology*, **146**, 5071-5078.
208. Israelachvili,J.N. (1973). Theoretical considerations on the asymmetric distribution of charged phospholipid molecules on the inner and outer layers of curved bilayer membranes. *Biochim. Biophys. Acta*, **323**, 659-663.
209. Ito,J., Nagayasu,Y., Kato,K., Sato,R., and Yokoyama,S. (2002). Apolipoprotein A-I induces translocation of cholesterol, phospholipid, and caveolin-1 to cytosol in rat astrocytes. *J Biol. Chem.*, **277**, 7929-7935.
210. Jaworski,K., Sarkadi-Nagy,E., Duncan,R.E., Ahmadian,M., and Sul,H.S. (2007). Regulation of Triglyceride Metabolism. * IV. Hormonal regulation of lipolysis in adipose tissue. *Am. J. Physiol Gastrointest. Liver Physiol*, **293**, G1-G4.
211. Jebailey,L., Rudich,A., Huang,X., Ciano-Oliveira,C., Kapus,A., and Klip,A. (2004). Skeletal muscle cells and adipocytes differ in their reliance on TC10 and Rac for insulin-induced actin remodeling. *Mol. Endocrinol.*, **18**, 359-372.
212. Jenkins,C.M., Mancuso,D.J., Yan,W., Sims,H.F., Gibson,B., and Gross,R.W. (2004). Identification, cloning, expression, and purification of three novel human calcium-independent phospholipase A2 family members possessing triacylglycerol lipase and acylglycerol transacylase activities. *J Biol. Chem.*, **279**, 48968-48975.
213. Jin,S., Zhai,B., Qiu,Z., Wu,J., Lane,M.D., and Liao,K. (2000). c-Crk, a substrate of the insulin-like growth factor-1 receptor tyrosine kinase, functions as an early signal mediator in the adipocyte differentiation process. *J. Biol. Chem.*, **275**, 34344-34352.
214. Juge-Aubry,C.E., Gorla-Bajszczak,A., Pernin,A., Lemberger,T., Wahli,W., Burger,A.G., and Meier,C.A. (1995). Peroxisome proliferator-activated receptor mediates cross-talk with thyroid hormone receptor by competition for retinoid X receptor. Possible role of a leucine zipper-like heptad repeat. *J Biol. Chem.*, **270**, 18117-18122.
215. Kampf,J.P. and Kleinfeld,A.M. (2007). Is membrane transport of FFA mediated by lipid, protein, or both? An unknown protein mediates free fatty acid transport across the adipocyte plasma membrane. *Physiology. (Bethesda.)*, **22**, 7-14.
216. Kandror,K.V. and Pilch,P.F. (1996). The insulin-like growth factor II/mannose 6-phosphate receptor utilizes the same membrane compartments as GLUT4 for insulin-dependent trafficking to and from the rat adipocyte cell surface. *J. Biol. Chem.*, **271**, 21703-21708.
217. Kandror,K.V., Stephens,J.M., and Pilch,P.F. (1995). Expression and compartmentalization of caveolin in adipose cells: coordinate regulation with and structural segregation from GLUT4. *J. Cell Biol.*, **129**, 999-1006.
218. Kang,L. and Nagy,L.E. (2006). Chronic ethanol feeding suppresses beta-adrenergic receptor-stimulated lipolysis in adipocytes isolated from epididymal fat. *Endocrinology*, **147**, 4330-4338.
219. Kanzaki,M., Mora,S., Hwang,J.B., Saltiel,A.R., and Pessin,J.E. (2004). Atypical protein kinase C (PKC ζ /lambda) is a convergent downstream target of the insulin-stimulated phosphatidylinositol 3-kinase and TC10 signaling pathways. *J. Cell Biol.*, **164**, 279-290.
220. Kanzaki,M. and Pessin,J.E. (2001a). Insulin-stimulated GLUT4 translocation in adipocytes is dependent upon cortical actin remodeling. *J. Biol. Chem.*, **276**, 42436-42444.
221. Kanzaki,M. and Pessin,J.E. (2001b). Signal integration and the specificity of insulin action. *Cell Biochem. Biophys.*, **35**, 191-209.
222. Kanzaki,M., Watson,R.T., Hou,J.C., Stamnes,M., Saltiel,A.R., and Pessin,J.E. (2002). Small GTP-binding protein TC10 differentially regulates two distinct populations of filamentous actin in 3T3L1 adipocytes. *Mol. Biol. Cell*, **13**, 2334-2346.
223. Kanzaki,M., Watson,R.T., Khan,A.H., and Pessin,J.E. (2001b). Insulin stimulates actin comet tails on intracellular GLUT4-containing compartments in differentiated 3T3L1 adipocytes. *J. Biol. Chem.*, **276**, 49331-49336.
224. Kao,A.W., Ceresa,B.P., Santeler,S.R., and Pessin,J.E. (1998). Expression of a dominant interfering dynamin mutant in 3T3L1 adipocytes inhibits GLUT4 endocytosis without affecting insulin signaling. *J. Biol. Chem.*, **273**, 25450-25457.

225. Karlsson,M., Contreras,J.A., Hellman,U., Tornqvist,H., and Holm,C. (1997). cDNA cloning, tissue distribution, and identification of the catalytic triad of monoglyceride lipase. Evolutionary relationship to esterases, lysophospholipases, and haloperoxidases. *J Biol. Chem.*, **272**, 27218-27223.
226. Karlsson,M., Thorn,H., Parpal,S., Stralfors,P., and Gustavsson,J. (2002). Insulin induces translocation of glucose transporter GLUT4 to plasma membrane caveolae in adipocytes. *FASEB J.*, **16**, 249-251.
227. Karylowski,O., Zeigerer,A., Cohen,A., and McGraw,T.E. (2004). GLUT4 is retained by an intracellular cycle of vesicle formation and fusion with endosomes. *Mol. Biol. Cell.*, **15**, 870-882.
228. Katayama,K., Wada,K., Miyoshi,H., Ohashi,K., Tachibana,M., Furuki,R., Mizuguchi,H., Hayakawa,T., Nakajima,A., Kadokawa,T., Tsutsumi,Y., Nakagawa,S., Kamisaki,Y., and Mayumi,T. (2004). RNA interfering approach for clarifying the PPARgamma pathway using lentiviral vector expressing short hairpin RNA. *FEBS Lett.*, **560**, 178-182.
229. Kato,K., Hida,Y., Miyamoto,M., Hashida,H., Shinohara,T., Itoh,T., Okushiba,S., Kondo,S., and Katoh,H. (2002). Overexpression of caveolin-1 in esophageal squamous cell carcinoma correlates with lymph node metastasis and pathologic stage. *Cancer*, **94**, 929-933.
230. Kenworthy,A.K., Petranova,N., and Edidin,M. (2000). High-resolution FRET microscopy of cholera toxin B-subunit and GPI-anchored proteins in cell plasma membranes. *Mol. Biol. Cell.*, **11**, 1645-1655.
231. Kershaw,E.E., Hamm,J.K., Verhagen,L.A., Peroni,O., Katic,M., and Flier,J.S. (2006). Adipose triglyceride lipase: function, regulation by insulin, and comparison with adiponutrin. *Diabetes*, **55**, 148-157.
232. Khan,A.H. and Pessin,J.E. (2002). Insulin regulation of glucose uptake: a complex interplay of intracellular signalling pathways. *Diabetologia*, **45**, 1475-1483.
233. Khelef,N., Buton,X., Beatini,N., Wang,H., Meiner,V., Chang,T.Y., Farese,R.V., Jr., Maxfield,F.R., and Tabas,I. (1998). Immunolocalization of acyl-coenzyme A:cholesterol O-acyltransferase in macrophages. *J Biol. Chem.*, **273**, 11218-11224.
234. Kim,H.A., Kim,K.H., and Lee,R.A. (2006). Expression of caveolin-1 is correlated with Akt-1 in colorectal cancer tissues. *Exp. Mol. Pathol.*, **80**, 165-170.
235. Kim,J.B., Wright,H.M., Wright,M., and Spiegelman,B.M. (1998). ADD1/SREBP1 activates PPARgamma through the production of endogenous ligand. *Proc. Natl. Acad. Sci. U. S. A.*, **95**, 4333-4337.
236. Kimura,A., Mora,S., Shigematsu,S., Pessin,J.E., and Saltiel,A.R. (2002). The insulin receptor catalyzes the tyrosine phosphorylation of caveolin-1. *J. Biol. Chem.*, **277**, 30153-30158.
237. Kirkham,M., Fujita,A., Chadda,R., Nixon,S.J., Kurzchalia,T.V., Sharma,D.K., Pagano,R.E., Hancock,J.F., Mayor,S., and Parton,R.G. (2005a). Ultrastructural identification of uncoated caveolin-independent early endocytic vehicles. *J Cell Biol.*, **168**, 465-476.
238. Kirkham,M. and Parton,R.G. (2005b). Clathrin-independent endocytosis: new insights into caveolae and non-caveolar lipid raft carriers. *Biochim. Biophys. Acta*, **1746**, 349-363.
239. Kletzien,R.F., Clarke,S.D., and Ulrich,R.G. (1992). Enhancement of adipocyte differentiation by an insulin-sensitizing agent. *Mol. Pharmacol.*, **41**, 393-398.
240. Klip,A. and Paquet,M.R. (1990). Glucose transport and glucose transporters in muscle and their metabolic regulation. *Diabetes Care*, **13**, 228-243.
241. Ko,Y.G., Liu,P., Pathak,R.K., Craig,L.C., and Anderson,R.G. (1998). Early effects of pp60(v-src) kinase activation on caveolae. *J Cell Biochem.*, **71**, 524-535.
242. Koleske,A.J., Baltimore,D., and Lisanti,M.P. (1995). Reduction of caveolin and caveolae in oncogenically transformed cells. *Proc. Natl. Acad. Sci. U. S. A.*, **92**, 1381-1385.
243. Kolleck,I., Guthmann,F., Ladhoff,A.M., Tandon,N.N., Schlame,M., and Rustow,B. (2002). Cellular cholesterol stimulates acute uptake of palmitate by redistribution of fatty acid translocase in type II pneumocytes. *Biochemistry*, **41**, 6369-6375.
244. Krupp,M. and Lane,M.D. (1981). On the mechanism of ligand-induced down-regulation of insulin receptor level in the liver cell. *J Biol. Chem.*, **256**, 1689-1694.

245. Kurzchalia,T.V. and Parton,R.G. (1999). Membrane microdomains and caveolae. *Curr. Opin. Cell Biol.*, **11**, 424-431.
246. Laemmli,U.K. (1970). Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature*, **227**, 680-685.
247. Lake,A.C., Sun,Y., Li,J.L., Kim,J.E., Johnson,J.W., Li,D., Revett,T., Shih,H.H., Liu,W., Paulsen,J.E., and Gimeno,R.E. (2005). Expression, regulation, and triglyceride hydrolase activity of Adiponutrin family members. *J Lipid Res.*, **46**, 2477-2487.
248. Lalioti,V.S., Vergarajauregui,S., Pulido,D., and Sandoval,I.V. (2002). The insulin-sensitive glucose transporter, GLUT4, interacts physically with Daxx. Two proteins with capacity to bind Ubc9 and conjugated to SUMO1. *J Biol. Chem.*, **277**, 19783-19791.
249. Landy,A. (1989). Dynamic, structural, and regulatory aspects of lambda site-specific recombination. *Annu. Rev. Biochem.*, **58**, 913-949.
250. Lane,M.D., Reed,B.C., and Clements,P.R. (1981). Insulin receptor synthesis and turnover in differentiating 3T3-L1 preadipocytes. *Prog. Clin. Biol. Res.*, **66 Pt A**, 523-542.
251. Lang,D.M., Lommel,S., Jung,M., Ankerhold,R., Petrausch,B., Laessing,U., Wiechers,M.F., Plattner,H., and Stuermer,C.A. (1998). Identification of reggie-1 and reggie-2 as plasmamembrane-associated proteins which cocluster with activated GPI-anchored cell adhesion molecules in non-caveolar micropatches in neurons. *J Neurobiol.*, **37**, 502-523.
252. Langhorst,M.F., Reuter,A., and Stuermer,C.A. (2005). Scaffolding microdomains and beyond: the function of reggie/flotillin proteins. *Cell Mol. Life Sci.*, **62**, 2228-2240.
253. Langin,D. (2006a). Adipose tissue lipolysis as a metabolic pathway to define pharmacological strategies against obesity and the metabolic syndrome. *Pharmacol. Res.*, **53**, 482-491.
254. Langin,D. (2006b). Control of fatty acid and glycerol release in adipose tissue lipolysis. *C. R. Biol.*, **329**, 598-607.
255. Langlet,C., Bernard,A.M., Drevot,P., and He,H.T. (2000). Membrane rafts and signaling by the multichain immune recognition receptors. *Curr. Opin. Immunol.*, **12**, 250-255.
256. Larance,M., Ramm,G., and James,D.E. (2007). The GLUT4 Code. *Mol. Endocrinol.*
257. Larance,M., Ramm,G., Stockli,J., van Dam,E.M., Winata,S., Wasinger,V., Simpson,F., Graham,M., Junutula,J.R., Guilhaus,M., and James,D.E. (2005). Characterization of the role of the Rab GTPase-activating protein AS160 in insulin-regulated GLUT4 trafficking. *J Biol. Chem.*, **280**, 37803-37813.
258. Large,V., Peroni,O., Letexier,D., Ray,H., and Beylot,M. (2004). Metabolism of lipids in human white adipocyte. *Diabetes Metab*, **30**, 294-309.
259. Lass,A., Zimmermann,R., Haemmerle,G., Riederer,M., Schoiswohl,G., Schweiger,M., Kienesberger,P., Strauss,J.G., Gorkiewicz,G., and Zechner,R. (2006). Adipose triglyceride lipase-mediated lipolysis of cellular fat stores is activated by CGI-58 and defective in Chanarin-Dorfman Syndrome. *Cell Metab*, **3**, 309-319.
260. Lau,P., Nixon,S.J., Parton,R.G., and Muscat,G.E. (2004). RORalpha regulates the expression of genes involved in lipid homeostasis in skeletal muscle cells: caveolin-3 and CPT-1 are direct targets of ROR. *J. Biol. Chem.*, **279**, 36828-36840.
261. Lavie,Y., Fiucci,G., and Liscovitch,M. (1998). Up-regulation of caveolae and caveolar constituents in multidrug-resistant cancer cells. *J Biol. Chem.*, **273**, 32380-32383.
262. Le Lay,S., Hajduch,E., Lindsay,M.R., Le,L., X, Thiele,C., Ferre,P., Parton,R.G., Kurzchalia,T., Simons,K., and Dugail,I. (2006). Cholesterol-induced caveolin targeting to lipid droplets in adipocytes: a role for caveolar endocytosis. *Traffic.*, **7**, 549-561.
263. Le,P.U., Guay,G., Altschuler,Y., and Nabi,I.R. (2002). Caveolin-1 is a negative regulator of caveolae-mediated endocytosis to the endoplasmic reticulum. *J Biol. Chem.*, **277**, 3371-3379.
264. Le,P.U. and Nabi,I.R. (2003). Distinct caveolae-mediated endocytic pathways target the Golgi apparatus and the endoplasmic reticulum. *J Cell Sci.*, **116**, 1059-1071.
265. Lee,S.W., Reimer,C.L., Oh,P., Campbell,D.B., and Schnitzer,J.E. (1998). Tumor cell growth inhibition by caveolin re-expression in human breast cancer cells. *Oncogene*, **16**, 1391-1397.

266. Lee,W. and Jung,C.Y. (1997). A synthetic peptide corresponding to the GLUT4 C-terminal cytoplasmic domain causes insulin-like glucose transport stimulation and GLUT4 recruitment in rat adipocytes. *J. Biol. Chem.*, **272**, 21427-21431.
267. Lehmann,J.M., Moore,L.B., Smith-Oliver,T.A., Wilkison,W.O., Willson,T.M., and Kliewer,S.A. (1995). An antidiabetic thiazolidinedione is a high affinity ligand for peroxisome proliferator-activated receptor gamma (PPAR gamma). *J. Biol. Chem.*, **270**, 12953-12956.
268. Lencer,W.I., Hirst,T.R., and Holmes,R.K. (1999). Membrane traffic and the cellular uptake of cholera toxin. *Biochim. Biophys. Acta*, **1450**, 177-190.
269. Li,Q., Tan,L., Wang,C., Li,N., Li,Y., Xu,G., and Li,J. (2006). Polyunsaturated eicosapentaenoic acid changes lipid composition in lipid rafts. *Eur. J. Nutr.*, **45**, 144-151.
270. Li,S., Couet,J., and Lisanti,M.P. (1996a). Src tyrosine kinases, Galpha subunits, and H-Ras share a common membrane-anchored scaffolding protein, caveolin. Caveolin binding negatively regulates the auto-activation of Src tyrosine kinases. *J. Biol. Chem.*, **271**, 29182-29190.
271. Li,S., Couet,J., and Lisanti,M.P. (1996b). Src tyrosine kinases, Galpha subunits, and H-Ras share a common membrane-anchored scaffolding protein, caveolin. Caveolin binding negatively regulates the auto-activation of Src tyrosine kinases. *J. Biol. Chem.*, **271**, 29182-29190.
272. Li,S., Okamoto,T., Chun,M., Sargiacomo,M., Casanova,J.E., Hansen,S.H., Nishimoto,I., and Lisanti,M.P. (1995a). Evidence for a regulated interaction between heterotrimeric G proteins and caveolin. *J. Biol. Chem.*, **270**, 15693-15701.
273. Li,S., Okamoto,T., Chun,M., Sargiacomo,M., Casanova,J.E., Hansen,S.H., Nishimoto,I., and Lisanti,M.P. (1995b). Evidence for a regulated interaction between heterotrimeric G proteins and caveolin. *J. Biol. Chem.*, **270**, 15693-15701.
274. Liao,W., Nguyen,M.T., Imamura,T., Singer,O., Verma,I.M., and Olefsky,J.M. (2006). Lentiviral short hairpin ribonucleic acid-mediated knockdown of GLUT4 in 3T3-L1 adipocytes. *Endocrinology*, **147**, 2245-2252.
275. Liao,W., Nguyen,M.T., Yoshizaki,T., Favelyukis,S., Patsouris,D., Imamura,T., Verma,I.M., and Olefsky,J.M. (2007). Suppression of PPAR γ Attenuates Insulin-Stimulated Glucose Uptake by Affecting Both GLUT1 and GLUT4 in 3T3-L1 Adipocytes. *Am. J. Physiol Endocrinol. Metab.*
276. Lipardi,C., Mora,R., Colomer,V., Paladino,S., Nitsch,L., Rodriguez-Boulan,E., and Zurzolo,C. (1998). Caveolin transfection results in caveolae formation but not apical sorting of glycosylphosphatidylinositol (GPI)-anchored proteins in epithelial cells. *J Cell Biol.*, **140**, 617-626.
277. 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.
278. Lisanti,M.P., Tang,Z.L., and Sargiacomo,M. (1993). Caveolin forms a hetero-oligomeric protein complex that interacts with an apical GPI-linked protein: implications for the biogenesis of caveolae. *J Cell Biol.*, **123**, 595-604.
279. Liu,J., Lee,P., Galbiati,F., Kitsis,R.N., and Lisanti,M.P. (2001). Caveolin-1 expression sensitizes fibroblastic and epithelial cells to apoptotic stimulation. *Am. J Physiol Cell Physiol*, **280**, C823-C835.
280. Liu,L.B., Omata,W., Kojima,I., and Shibata,H. (2007). The SUMO conjugating enzyme Ubc9 is a regulator of GLUT4 turnover and targeting to the insulin-responsive storage compartment in 3T3-L1 adipocytes. *Diabetes*, **56**, 1977-1985.
281. Liu,P., Li,W.P., Machleidt,T., and Anderson,R.G. (1999). Identification of caveolin-1 in lipoprotein particles secreted by exocrine cells. *Nat. Cell Biol.*, **1**, 369-375.
282. Liu,P., Rudick,M., and Anderson,R.G. (2002). Multiple functions of caveolin-1. *J. Biol. Chem.*, **277**, 41295-41298.
283. Liu,P., Ying,Y., Zhao,Y., Mundy,D.I., Zhu,M., and Anderson,R.G. (2004). Chinese hamster ovary K2 cell lipid droplets appear to be metabolic organelles involved in membrane traffic. *J Biol. Chem.*, **279**, 3787-3792.
284. Livingstone,C., James,D.E., Rice,J.E., Hanpeter,D., and Gould,G.W. (1996). Compartment ablation analysis of the insulin-responsive glucose transporter (GLUT4) in 3T3-L1 adipocytes. *Biochem. J.*, **315 (Pt 2)**, 487-495.

285. Lizunov,V.A., Matsumoto,H., Zimmerberg,J., Cushman,S.W., and Frolov,V.A. (2005). Insulin stimulates the halting, tethering, and fusion of mobile GLUT4 vesicles in rat adipose cells. *J Cell Biol.*, **169**, 481-489.
286. Londos,C., Brasaemle,D.L., Gruia-Gray,J., Servetnick,D.A., Schultz,C.J., Levin,D.M., and Kimmel,A.R. (1995). Perilipin: unique proteins associated with intracellular neutral lipid droplets in adipocytes and steroidogenic cells. *Biochem. Soc. Trans.*, **23**, 611-615.
287. Londos,C., Brasaemle,D.L., Schultz,C.J., Segrest,J.P., and Kimmel,A.R. (1999). Perilipins, ADRP, and other proteins that associate with intracellular neutral lipid droplets in animal cells. *Semin. Cell Dev. Biol.*, **10**, 51-58.
288. Londos,C., Cooper,D.M., Schlegel,W., and Rodbell,M. (1978). Adenosine analogs inhibit adipocyte adenylate cyclase by a GTP-dependent process: basis for actions of adenosine and methylxanthines on cyclic AMP production and lipolysis. *Proc. Natl. Acad. Sci. U. S. A.*, **75**, 5362-5366.
289. Lupu,C., Hu,X., and Lupu,F. (2005). Caveolin-1 enhances tissue factor pathway inhibitor exposure and function on the cell surface. *J. Biol. Chem.*, **280**, 22308-22317.
290. Machleidt,T., Li,W.P., Liu,P., and Anderson,R.G. (2000). Multiple domains in caveolin-1 control its intracellular traffic. *J Cell Biol.*, **148**, 17-28.
291. Mackall,J.C., Student,A.K., Polakis,S.E., and Lane,M.D. (1976). Induction of lipogenesis during differentiation in a "preadipocyte" cell line. *J. Biol. Chem.*, **251**, 6462-6464.
292. Malide,D., Ramm,G., Cushman,S.W., and Slot,J.W. (2000). Immunoelectron microscopic evidence that GLUT4 translocation explains the stimulation of glucose transport in isolated rat white adipose cells. *J Cell Sci.*, **113 Pt 23**, 4203-4210.
293. Manninen,A., Verkade,P., Le Lay,S., Torkko,J., Kasper,M., Fullekrug,J., and Simons,K. (2005). Caveolin-1 is not essential for biosynthetic apical membrane transport. *Mol. Cell Biol.*, **25**, 10087-10096.
294. Marcinkiewicz,A., Gauthier,D., Garcia,A., and Brasaemle,D.L. (2006). The phosphorylation of serine 492 of perilipin directs lipid droplet fragmentation and dispersion. *J Biol. Chem.*, **281**, 11901-11909.
295. Martin,O.J., Lee,A., and McGraw,T.E. (2006). GLUT4 distribution between the plasma membrane and the intracellular compartments is maintained by an insulin-modulated bipartite dynamic mechanism. *J. Biol. Chem.*, **281**, 484-490.
296. Martin,S. and Parton,R.G. (2005). Caveolin, cholesterol, and lipid bodies. *Semin. Cell Dev. Biol.*, **16**, 163-174.
297. Martinez-Botas,J., Anderson,J.B., Tessier,D., Lapillonne,A., Chang,B.H., Quast,M.J., Gorenstein,D., Chen,K.H., and Chan,L. (2000). Absence of perilipin results in leanness and reverses obesity in Lepr(db/db) mice. *Nat. Genet.*, **26**, 474-479.
298. Mastick,C.C., Brady,M.J., and Saltiel,A.R. (1995). Insulin stimulates the tyrosine phosphorylation of caveolin. *J. Cell Biol.*, **129**, 1523-1531.
299. Matarese,V. and Bernlohr,D.A. (1988). Purification of murine adipocyte lipid-binding protein. Characterization as a fatty acid- and retinoic acid-binding protein. *J Biol. Chem.*, **263**, 14544-14551.
300. Mayor,S., Rothberg,K.G., and Maxfield,F.R. (1994). Sequestration of GPI-anchored proteins in caveolae triggered by cross-linking. *Science*, **264**, 1948-1951.
301. McCarty,M.F. and Thomas,C.A. (2003). PTH excess may promote weight gain by impeding catecholamine-induced lipolysis-implications for the impact of calcium, vitamin D, and alcohol on body weight. *Med. Hypotheses*, **61**, 535-542.
302. McClain,D.A. and Olefsky,J.M. (1988). Evidence for two independent pathways of insulin-receptor internalization in hepatocytes and hepatoma cells. *Diabetes*, **37**, 806-815.
303. Melkonian,K.A., Ostermeyer,A.G., Chen,J.Z., Roth,M.G., and Brown,D.A. (1999). Role of lipid modifications in targeting proteins to detergent-resistant membrane rafts. Many raft proteins are acylated, while few are prenylated. *J. Biol. Chem.*, **274**, 3910-3917.
304. Meshulam,T., Simard,J.R., Wharton,J., Hamilton,J.A., and Pilch,P.F. (2006). Role of caveolin-1 and cholesterol in transmembrane fatty acid movement. *Biochemistry*, **45**, 2882-2893.
305. Michel,V. and Bakovic,M. (2007). Lipid rafts in health and disease. *Biol. Cell*, **99**, 129-140.

306. Minami,A., Iseki,M., Kishi,K., Wang,M., Ogura,M., Furukawa,N., Hayashi,S., Yamada,M., Obata,T., Takeshita,Y., Nakaya,Y., Bando,Y., Izumi,K., Moodie,S.A., Kajiura,F., Matsumoto,M., Takatsu,K., Takaki,S., and Ebina,Y. (2003). Increased insulin sensitivity and hypoinsulinemia in APS knockout mice. *Diabetes*, **52**, 2657-2665.
307. Minshall,R.D., Tiruppathi,C., Vogel,S.M., Niles,W.D., Gilchrist,A., Hamm,H.E., and Malik,A.B. (2000). Endothelial cell-surface gp60 activates vesicle formation and trafficking via G(i)-coupled Src kinase signaling pathway. *J Cell Biol.*, **150**, 1057-1070.
308. Mitra,P., Zheng,X., and Czech,M.P. (2004). RNAi-based analysis of CAP, Cbl, and CrkII function in the regulation of GLUT4 by insulin. *J. Biol. Chem.*, **279**, 37431-37435.
309. Miyoshi,H., Souza,S.C., Zhang,H.H., Strissel,K.J., Christoffolete,M.A., Kovsan,J., Rudich,A., Kraemer,F.B., Bianco,A.C., Obin,M.S., and Greenberg,A.S. (2006). Perilipin promotes hormone-sensitive lipase-mediated adipocyte lipolysis via phosphorylation-dependent and -independent mechanisms. *J. Biol. Chem.*, **281**, 15837-15844.
310. Monier,S., Dietzen,D.J., Hastings,W.R., Lublin,D.M., and Kurzchalia,T.V. (1996). Oligomerization of VIP21-caveolin in vitro is stabilized by long chain fatty acylation or cholesterol. *FEBS Lett.*, **388**, 143-149.
311. Monier,S., Parton,R.G., Vogel,F., Behlke,J., Henske,A., and Kurzchalia,T.V. (1995). VIP21-caveolin, a membrane protein constituent of the caveolar coat, oligomerizes in vivo and in vitro. *Mol. Biol. Cell*, **6**, 911-927.
312. Moore,H.P., Silver,R.B., Mottillo,E.P., Bernlohr,D.A., and Granneman,J.G. (2005). Perilipin targets a novel pool of lipid droplets for lipolytic attack by hormone-sensitive lipase. *J Biol. Chem.*, **280**, 43109-43120.
313. Mora,R., Bonilha,V.L., Marmorstein,A., Scherer,P.E., Brown,D., Lisanti,M.P., and Rodriguez-Boulan,E. (1999). Caveolin-2 localizes to the golgi complex but redistributes to plasma membrane, caveolae, and rafts when co-expressed with caveolin-1. *J Biol. Chem.*, **274**, 25708-25717.
314. Mora,S. and Pessin,J.E. (2002). An adipocentric view of signaling and intracellular trafficking. *Diabetes Metab Res. Rev.*, **18**, 345-356.
315. Moreno,M.J. and Martinez,J.A. (2002). [Adipose tissue: a storage and secretory organ]. *An. Sist. Sanit. Navar.*, **25 Suppl 1**, 29-39.
316. Mouraviev,V., Li,L., Tahir,S.A., Yang,G., Timme,T.M., Goltsov,A., Ren,C., Satoh,T., Wheeler,T.M., Ittmann,M.M., Miles,B.J., Amato,R.J., Kadmon,D., and Thompson,T.C. (2002). The role of caveolin-1 in androgen insensitive prostate cancer. *J Urol.*, **168**, 1589-1596.
317. Mukherjee,S. and Maxfield,F.R. (2000). Role of membrane organization and membrane domains in endocytic lipid trafficking. *Traffic*, **1**, 203-211.
318. Muller,G., Jung,C., Wied,S., Welte,S., Jordan,H., and Frick,W. (2001). Redistribution of glycolipid raft domain components induces insulin-mimetic signaling in rat adipocytes. *Mol. Cell Biol.*, **21**, 4553-4567.
319. Mundy,D.I., Machleidt,T., Ying,Y.S., Anderson,R.G., and Bloom,G.S. (2002). Dual control of caveolar membrane traffic by microtubules and the actin cytoskeleton. *J Cell Sci.*, **115**, 4327-4339.
320. Murata,M., Peranen,J., Schreiner,R., Wieland,F., Kurzchalia,T.V., and Simons,K. (1995). VIP21/caveolin is a cholesterol-binding protein. *Proc. Natl. Acad. Sci. U. S. A.*, **92**, 10339-10343.
321. Murphy,D.J. (2001). The biogenesis and functions of lipid bodies in animals, plants and microorganisms. *Prog. Lipid Res.*, **40**, 325-438.
322. Murphy,D.J. and Vance,J. (1999). Mechanisms of lipid-body formation. *Trends Biochem. Sci.*, **24**, 109-115.
323. Nabi,I.R. and Le,P.U. (2003). Caveolae/raft-dependent endocytosis. *J Cell Biol.*, **161**, 673-677.
324. Neudauer,C.L., Joberty,G., Tatsis,N., and Macara,I.G. (1998). Distinct cellular effects and interactions of the Rho-family GTPase TC10. *Curr. Biol.*, **8**, 1151-1160.

325. Nichols,B.J., Kenworthy,A.K., Polishchuk,R.S., Lodge,R., Roberts,T.H., Hirschberg,K., Phair,R.D., and Lippincott-Schwartz,J. (2001). Rapid cycling of lipid raft markers between the cell surface and Golgi complex. *J Cell Biol.*, **153**, 529-541.
326. Nilsson,R., Ahmad,F., Sward,K., Andersson,U., Weston,M., Manganiello,V., and Degerman,E. (2006). Plasma membrane cyclic nucleotide phosphodiesterase 3B (PDE3B) is associated with caveolae in primary adipocytes. *Cell Signal.*, **18**, 1713-1721.
327. Nishimura,H., Zarnowski,M.J., and Simpson,I.A. (1993). Glucose transporter recycling in rat adipose cells. Effects of potassium depletion. *J. Biol. Chem.*, **268**, 19246-19253.
328. Nixon,S.J., Wegner,J., Ferguson,C., Mery,P.F., Hancock,J.F., Currie,P.D., Key,B., Westerfield,M., and Parton,R.G. (2005). Zebrafish as a model for caveolin-associated muscle disease; caveolin-3 is required for myofibril organization and muscle cell patterning. *Hum. Mol. Genet.*, **14**, 1727-1743.
329. Nomura,R. and Fujimoto,T. (1999). Tyrosine-phosphorylated caveolin-1: immunolocalization and molecular characterization. *Mol. Biol. Cell*, **10**, 975-986.
330. Ntambi,J.M. and Young-Cheul,K. (2000). Adipocyte differentiation and gene expression. *J Nutr.*, **130**, 3122S-3126S.
331. Nystrom,F.H., Chen,H., Cong,L.N., Li,Y., and Quon,M.J. (1999). Caveolin-1 interacts with the insulin receptor and can differentially modulate insulin signaling in transfected Cos-7 cells and rat adipose cells. *Mol. Endocrinol.*, **13**, 2013-2024.
332. Oh,P., McIntosh,D.P., and Schnitzer,J.E. (1998). Dynamin at the neck of caveolae mediates their budding to form transport vesicles by GTP-driven fission from the plasma membrane of endothelium. *J Cell Biol.*, **141**, 101-114.
333. Ohsawa,Y., Toko,H., Katsura,M., Morimoto,K., Yamada,H., Ichikawa,Y., Murakami,T., Ohkuma,S., Komuro,I., and Sunada,Y. (2004). Overexpression of P104L mutant caveolin-3 in mice develops hypertrophic cardiomyopathy with enhanced contractility in association with increased endothelial nitric oxide synthase activity. *Hum. Mol. Genet.*, **13**, 151-157.
334. Okamoto,T., Schlegel,A., Scherer,P.E., and Lisanti,M.P. (1998). Caveolins, a family of scaffolding proteins for organizing "preassembled signaling complexes" at the plasma membrane. *J. Biol. Chem.*, **273**, 5419-5422.
335. Okazaki,H., Igarashi,M., Nishi,M., Tajima,M., Sekiya,M., Okazaki,S., Yahagi,N., Ohashi,K., Tsukamoto,K., Amemiya-Kudo,M., Matsuzaka,T., Shimano,H., Yamada,N., Aoki,J., Morikawa,R., Takanezawa,Y., Arai,H., Nagai,R., Kadowaki,T., Osuga,J., and Ishibashi,S. (2006). Identification of a novel member of the carboxylesterase family that hydrolyzes triacylglycerol: a potential role in adipocyte lipolysis. *Diabetes*, **55**, 2091-2097.
336. Okazaki,H., Osuga,J., Tamura,Y., Yahagi,N., Tomita,S., Shionoiri,F., Iizuka,Y., Ohashi,K., Harada,K., Kimura,S., Gotoda,T., Shimano,H., Yamada,N., and Ishibashi,S. (2002). Lipolysis in the absence of hormone-sensitive lipase: evidence for a common mechanism regulating distinct lipases. *Diabetes*, **51**, 3368-3375.
337. Olson,A.L., Liu,M.L., Moye-Rowley,W.S., Buse,J.B., Bell,G.I., and Pessin,J.E. (1993). Hormonal/metabolic regulation of the human GLUT4/muscle-fat facilitative glucose transporter gene in transgenic mice. *J Biol. Chem.*, **268**, 9839-9846.
338. Olson,A.L. and Pessin,J.E. (1995). Transcriptional regulation of the human GLUT4 gene promoter in diabetic transgenic mice. *J Biol. Chem.*, **270**, 23491-23495.
339. Olson,E.N. and Spizz,G. (1986). Fatty acylation of cellular proteins. Temporal and subcellular differences between palmitate and myristate acylation. *J Biol. Chem.*, **261**, 2458-2466.
340. Omata,W., Shibata,H., Li,L., Takata,K., and Kojima,I. (2000). Actin filaments play a critical role in insulin-induced exocytotic recruitment but not in endocytosis of GLUT4 in isolated rat adipocytes. *Biochem. J.*, **346 Pt 2**, 321-328.
341. Orlandi,P.A. and Fishman,P.H. (1998). Filipin-dependent inhibition of cholera toxin: evidence for toxin internalization and activation through caveolae-like domains. *J. Cell Biol.*, **141**, 905-915.
342. Ortegren,U., Karlsson,M., Blazic,N., Blomqvist,M., Nystrom,F.H., Gustavsson,J., Fredman,P., and Stralfors,P. (2004). Lipids and glycosphingolipids in caveolae and

- surrounding plasma membrane of primary rat adipocytes. *Eur. J Biochem.*, **271**, 2028-2036.
343. Ostermeyer,A.G., Paci,J.M., Zeng,Y., Lublin,D.M., Munro,S., and Brown,D.A. (2001). Accumulation of caveolin in the endoplasmic reticulum redirects the protein to lipid storage droplets. *J. Cell Biol.*, **152**, 1071-1078.
344. Osuga,J., Ishibashi,S., Oka,T., Yagyu,H., Tozawa,R., Fujimoto,A., Shionoiri,F., Yahagi,N., Kraemer,F.B., Tsutsumi,O., and Yamada,N. (2000). Targeted disruption of hormone-sensitive lipase results in male sterility and adipocyte hypertrophy, but not in obesity. *Proc. Natl. Acad. Sci. U. S. A.*, **97**, 787-792.
345. Otsu,M., Hiles,I., Gout,I., Fry,M.J., Ruiz-Larrea,F., Panayotou,G., Thompson,A., Dhand,R., Hsuan,J., Totty,N., and . (1991). Characterization of two 85 kd proteins that associate with receptor tyrosine kinases, middle-T/pp60c-src complexes, and PI3-kinase. *Cell*, **65**, 91-104.
346. Paccaud,J.P., Reith,W., Johansson,B., Magnusson,K.E., Mach,B., and Carpentier,J.L. (1993). Clathrin-coated pit-mediated receptor internalization. Role of internalization signals and receptor mobility. *J Biol. Chem.*, **268**, 23191-23196.
347. Park,J.S., Kim,H.Y., Kim,H.W., Chae,G.N., Oh,H.T., Park,J.Y., Shim,H., Seo,M., Shin,E.Y., Kim,E.G., Park,S.C., and Kwak,S.J. (2005). Increased caveolin-1, a cause for the declined adipogenic potential of senescent human mesenchymal stem cells. *Mech. Ageing Dev.*, **126**, 551-559.
348. Parolini,I., Sargiacomo,M., Galbiati,F., Rizzo,G., Grignani,F., Engelmann,J.A., Okamoto,T., Ikezu,T., Scherer,P.E., Mora,R., Rodriguez-Boulan,E., Peschle,C., and Lisanti,M.P. (1999). Expression of caveolin-1 is required for the transport of caveolin-2 to the plasma membrane. Retention of caveolin-2 at the level of the golgi complex. *J. Biol. Chem.*, **274**, 25718-25725.
349. Parpal,S., Karlsson,M., Thorn,H., and Stralfors,P. (2001). Cholesterol depletion disrupts caveolae and insulin receptor signaling for metabolic control via insulin receptor substrate-1, but not for mitogen-activated protein kinase control. *J. Biol. Chem.*, **276**, 9670-9678.
350. Parton,R.G. (1996). Caveolae and caveolins. *Curr. Opin. Cell Biol.*, **8**, 542-548.
351. Parton,R.G., Hanzal-Bayer,M., and Hancock,J.F. (2006). Biogenesis of caveolae: a structural model for caveolin-induced domain formation. *J Cell Sci.*, **119**, 787-796.
352. Parton,R.G., Joggerst,B., and Simons,K. (1994). Regulated internalization of caveolae. *J Cell Biol.*, **127**, 1199-1215.
353. Parton,R.G., Molero,J.C., Floetenmeyer,M., Green,K.M., and James,D.E. (2002). Characterization of a distinct plasma membrane macrodomain in differentiated adipocytes. *J. Biol. Chem.*, **277**, 46769-46778.
354. Parton,R.G. and Richards,A.A. (2003). Lipid rafts and caveolae as portals for endocytosis: new insights and common mechanisms. *Traffic.*, **4**, 724-738.
355. Parton,R.G. and Simons,K. (1995). Digging into caveolae. *Science*, **269**, 1398-1399.
356. Parton,R.G. and Simons,K. (2007). The multiple faces of caveolae. *Nat. Rev. Mol. Cell Biol.*, **8**, 185-194.
357. Parton,R.G., Way,M., Zorzi,N., and Stang,E. (1997). Caveolin-3 associates with developing T-tubules during muscle differentiation. *J Cell Biol.*, **136**, 137-154.
358. Patlolla,J.M., Swamy,M.V., Raju,J., and Rao,C.V. (2004). Overexpression of caveolin-1 in experimental colon adenocarcinomas and human colon cancer cell lines. *Oncol. Rep.*, **11**, 957-963.
359. Pavon,E.J., Munoz,P., Navarro,M.D., Raya-Alvarez,E., Callejas-Rubio,J.L., Navarro-Pelayo,F., Ortego-Centeno,N., Sancho,J., and Zubiaur,M. (2006). Increased association of CD38 with lipid rafts in T cells from patients with systemic lupus erythematosus and in activated normal T cells. *Mol. Immunol.*, **43**, 1029-1039.
360. Pelkmans,L., Burli,T., Zerial,M., and Helenius,A. (2004). Caveolin-stabilized membrane domains as multifunctional transport and sorting devices in endocytic membrane traffic. *Cell*, **118**, 767-780.
361. Pelkmans,L. and Helenius,A. (2002a). Endocytosis via caveolae. *Traffic.*, **3**, 311-320.
362. Pelkmans,L., Kartenbeck,J., and Helenius,A. (2001). Caveolar endocytosis of simian virus 40 reveals a new two-step vesicular-transport pathway to the ER. *Nat. Cell Biol.*, **3**, 473-483.

363. Pelkmans,L., Puntener,D., and Helenius,A. (2002b). Local actin polymerization and dynamin recruitment in SV40-induced internalization of caveolae. *Science*, **296**, 535-539.
364. Pelkmans,L. and Zerial,M. (2005a). Kinase-regulated quantal assemblies and kiss-and-run recycling of caveolae. *Nature*, **436**, 128-133.
365. Pelkmans,L. and Zerial,M. (2005b). Kinase-regulated quantal assemblies and kiss-and-run recycling of caveolae. *Nature*, **436**, 128-133.
366. Pessin,J.E. and Saltiel,A.R. (2000). Signaling pathways in insulin action: molecular targets of insulin resistance. *J. Clin. Invest*, **106**, 165-169.
367. Pietiainen,V., Marjomaki,V., Upla,P., Pelkmans,L., Helenius,A., and Hyypia,T. (2004). Echovirus 1 endocytosis into caveosomes requires lipid rafts, dynamin II, and signaling events. *Mol. Biol. Cell*, **15**, 4911-4925.
368. Pike,L.J. (2006). Rafts defined: a report on the Keystone Symposium on Lipid Rafts and Cell Function. *J. Lipid Res.*, **47**, 1597-1598.
369. Ploug,T. and Ralston,E. (2002). Exploring the whereabouts of GLUT4 in skeletal muscle (review). *Mol. Membr. Biol.*, **19**, 39-49.
370. Pohl,J., Ring,A., Ehehalt,R., Herrmann,T., and Stremmel,W. (2004a). New concepts of cellular fatty acid uptake: role of fatty acid transport proteins and of caveolae. *Proc. Nutr. Soc.*, **63**, 259-262.
371. Pohl,J., Ring,A., Ehehalt,R., Schulze-Bergkamen,H., Schad,A., Verkade,P., and Stremmel,W. (2004b). Long-chain fatty acid uptake into adipocytes depends on lipid raft function. *Biochemistry*, **43**, 4179-4187.
372. Pohl,J., Ring,A., Korkmaz,U., Ehehalt,R., and Stremmel,W. (2005). FAT/CD36-mediated long-chain fatty acid uptake in adipocytes requires plasma membrane rafts. *Mol. Biol. Cell*, **16**, 24-31.
373. Pohl,J., Ring,A., and Stremmel,W. (2002). Uptake of long-chain fatty acids in HepG2 cells involves caveolae: analysis of a novel pathway. *J. Lipid Res.*, **43**, 1390-1399.
374. Pol,A., Luetterforst,R., Lindsay,M., Heino,S., Ikonen,E., and Parton,R.G. (2001). A caveolin dominant negative mutant associates with lipid bodies and induces intracellular cholesterol imbalance. *J. Cell Biol.*, **152**, 1057-1070.
375. Pol,A., Martin,S., Fernandez,M.A., Ferguson,C., Carozzi,A., Luetterforst,R., Enrich,C., and Parton,R.G. (2004). Dynamic and regulated association of caveolin with lipid bodies: modulation of lipid body motility and function by a dominant negative mutant. *Mol. Biol. Cell*, **15**, 99-110.
376. Pol,A., Martin,S., Fernandez,M.A., Ingelmo-Torres,M., Ferguson,C., Enrich,C., and Parton,R.G. (2005). Cholesterol and fatty acids regulate dynamic caveolin trafficking through the Golgi complex and between the cell surface and lipid bodies. *Mol. Biol. Cell*, **16**, 2091-2105.
377. Powell,K.A., Campbell,L.C., Tavare,J.M., Leader,D.P., Wakefield,J.A., and Gould,G.W. (1999). Trafficking of Glut4-green fluorescent protein chimaeras in 3T3-L1 adipocytes suggests distinct internalization mechanisms regulating cell surface glut4 levels. *Biochem. J.*, **344 Pt 2**, 535-543.
378. Pralle,A., Keller,P., Florin,E.L., Simons,K., and Horber,J.K. (2000). Sphingolipid-cholesterol rafts diffuse as small entities in the plasma membrane of mammalian cells. *J. Cell Biol.*, **148**, 997-1008.
379. Pratess,S., Horl,G., Hammer,A., Blaschitz,A., Graier,W.F., Sattler,W., Zechner,R., and Steyrer,E. (2000). Intracellular distribution and mobilization of unesterified cholesterol in adipocytes: triglyceride droplets are surrounded by cholesterol-rich ER-like surface layer structures. *J Cell Sci.*, **113 (Pt 17)**, 2977-2989.
380. Prusty,D., Park,B.H., Davis,K.E., and Farmer,S.R. (2002). Activation of MEK/ERK signaling promotes adipogenesis by enhancing peroxisome proliferator-activated receptor gamma (PPAR γ) and C/EBP α gene expression during the differentiation of 3T3-L1 preadipocytes. *J. Biol. Chem.*, **277**, 46226-46232.
381. Racine,C., Belanger,M., Hirabayashi,H., Boucher,M., Chakir,J., and Couet,J. (1999). Reduction of caveolin 1 gene expression in lung carcinoma cell lines. *Biochem. Biophys. Res. Commun.*, **255**, 580-586.
382. Ragolia,L. and Begum,N. (1998). Protein phosphatase-1 and insulin action. *Mol. Cell Biochem.*, **182**, 49-58.
383. Rajendran,L., Le Lay,S., and Illges,H. (2007). Raft association and lipid droplet targeting of flotillins are independent of caveolin. *Biol. Chem.*, **388**, 307-314.

384. Rajendran,L., Masilamani,M., Solomon,S., Tikkanen,R., Stuermer,C.A., Plattner,H., and Illges,H. (2003). Asymmetric localization of flotillins/reggies in preassembled platforms confers inherent polarity to hematopoietic cells. *Proc. Natl. Acad. Sci. U. S. A.*, **100**, 8241-8246.
385. Rajendran,L. and Simons,K. (2005). Lipid rafts and membrane dynamics. *J. Cell Sci.*, **118**, 1099-1102.
386. Rajjayabun,P.H., Garg,S., Durkan,G.C., Charlton,R., Robinson,M.C., and Mellon,J.K. (2001). Caveolin-1 expression is associated with high-grade bladder cancer. *Urology*, **58**, 811-814.
387. Ramirez,I., Kryski,A.J., Ben Zeev,O., Schotz,M.C., and Severson,D.L. (1985). Characterization of triacylglycerol hydrolase activities in isolated myocardial cells from rat heart. *Biochem. J.*, **232**, 229-236.
388. Ravichandran,L.V., Esposito,D.L., Chen,J., and Quon,M.J. (2001). Protein kinase C-zeta phosphorylates insulin receptor substrate-1 and impairs its ability to activate phosphatidylinositol 3-kinase in response to insulin. *J Biol. Chem.*, **276**, 3543-3549.
389. Razani,B., Altschuler,Y., Zhu,L., Pestell,R.G., Mostov,K.E., and Lisanti,M.P. (2000). Caveolin-1 expression is down-regulated in cells transformed by the human papilloma virus in a p53-dependent manner. Replacement of caveolin-1 expression suppresses HPV-mediated cell transformation. *Biochemistry*, **39**, 13916-13924.
390. Razani,B., Combs,T.P., Wang,X.B., Frank,P.G., Park,D.S., Russell,R.G., Li,M., Tang,B., Jelicks,L.A., Scherer,P.E., and Lisanti,M.P. (2002a). Caveolin-1-deficient mice are lean, resistant to diet-induced obesity, and show hypertriglyceridemia with adipocyte abnormalities. *J. Biol. Chem.*, **277**, 8635-8647.
391. Razani,B., Engelman,J.A., Wang,X.B., Schubert,W., Zhang,X.L., Marks,C.B., Macaluso,F., Russell,R.G., Li,M., Pestell,R.G., Di Vizio,D., Hou,H., Jr., Kneitz,B., Lagaud,G., Christ,G.J., Edelmann,W., and Lisanti,M.P. (2001a). Caveolin-1 null mice are viable but show evidence of hyperproliferative and vascular abnormalities. *J. Biol. Chem.*, **276**, 38121-38138.
392. Razani,B. and Lisanti,M.P. (2001b). Caveolin-deficient mice: insights into caveolar function human disease. *J. Clin. Invest.*, **108**, 1553-1561.
393. Razani,B., Rubin,C.S., and Lisanti,M.P. (1999). Regulation of cAMP-mediated signal transduction via interaction of caveolins with the catalytic subunit of protein kinase A. *J. Biol. Chem.*, **274**, 26353-26360.
394. Razani,B., Wang,X.B., Engelman,J.A., Battista,M., Lagaud,G., Zhang,X.L., Kneitz,B., Hou,H., Jr., Christ,G.J., Edelmann,W., and Lisanti,M.P. (2002b). Caveolin-2-deficient mice show evidence of severe pulmonary dysfunction without disruption of caveolae. *Mol. Cell Biol.*, **22**, 2329-2344.
395. Razani,B., Woodman,S.E., and Lisanti,M.P. (2002c). Caveolae: from cell biology to animal physiology. *Pharmacol. Rev.*, **54**, 431-467.
396. Rea,S., Martin,L.B., McIntosh,S., Macaulay,S.L., Ramsdale,T., Baldini,G., and James,D.E. (1998). Syndet, an adipocyte target SNARE involved in the insulin-induced translocation of GLUT4 to the cell surface. *J Biol. Chem.*, **273**, 18784-18792.
397. Reed,B.C., Ronnett,G.V., Clements,P.R., and Lane,M.D. (1981). Regulation of insulin receptor metabolism. Differentiation-induced alteration of receptor synthesis and degradation. *J Biol. Chem.*, **256**, 3917-3925.
398. Ren,X., Ostermeyer,A.G., Ramcharan,L.T., Zeng,Y., Lublin,D.M., and Brown,D.A. (2004). Conformational defects slow Golgi exit, block oligomerization, and reduce raft affinity of caveolin-1 mutant proteins. *Mol. Biol. Cell*, **15**, 4556-4567.
399. Resh,M.D. (1999). Fatty acylation of proteins: new insights into membrane targeting of myristoylated and palmitoylated proteins. *Biochim. Biophys. Acta*, **1451**, 1-16.
400. Reynolds,A., Leake,D., Boese,Q., Scaringe,S., Marshall,W.S., and Khvorova,A. (2004). Rational siRNA design for RNA interference. *Nat. Biotechnol.*, **22**, 326-330.
401. Richards,M.R., Harp,J.D., Ory,D.S., and Schaffer,J.E. (2006). Fatty acid transport protein 1 and long-chain acyl coenzyme A synthetase 1 interact in adipocytes. *J Lipid Res.*, **47**, 665-672.
402. Richards,M.R., Listenberger,L.L., Kelly,A.A., Lewis,S.E., Ory,D.S., and Schaffer,J.E. (2003). Oligomerization of the murine fatty acid transport protein 1. *J Biol. Chem.*, **278**, 10477-10483.

403. Ring,A., Le Lay,S., Pohl,J., Verkade,P., and Stremmel,W. (2006). Caveolin-1 is required for fatty acid translocase (FAT/CD36) localization and function at the plasma membrane of mouse embryonic fibroblasts. *Biochim. Biophys. Acta*, **1761**, 416-423.
404. Ring,A., Pohl,J., Volkl,A., and Stremmel,W. (2002). Evidence for vesicles that mediate long-chain fatty acid uptake by human microvascular endothelial cells. *J. Lipid Res.*, **43**, 2095-2104.
405. Roberts,A.B. and Wakefield,L.M. (2003). The two faces of transforming growth factor beta in carcinogenesis. *Proc. Natl. Acad. Sci. U. S. A.*, **100**, 8621-8623.
406. Robinson,L.J., Pang,S., Harris,D.S., Heuser,J., and James,D.E. (1992). Translocation of the glucose transporter (GLUT4) to the cell surface in permeabilized 3T3-L1 adipocytes: effects of ATP insulin, and GTP gamma S and localization of GLUT4 to clathrin lattices. *J. Cell Biol.*, **117**, 1181-1196.
407. Rodgers,W., Crise,B., and Rose,J.K. (1994). Signals determining protein tyrosine kinase and glycosyl-phosphatidylinositol-anchored protein targeting to a glycolipid-enriched membrane fraction. *Mol. Cell Biol.*, **14**, 5384-5391.
408. Ronnett,G.V., Knutson,V.P., and Lane,M.D. (1982). Insulin-induced down-regulation of insulin receptors in 3T3-L1 adipocytes. Altered rate of receptor inactivation. *J Biol. Chem.*, **257**, 4285-4291.
409. Ros-Baro,A., Lopez-Iglesias,C., Peiro,S., Bellido,D., Palacin,M., Zorzano,A., and Camps,M. (2001). Lipid rafts are required for GLUT4 internalization in adipose cells. *Proc. Natl. Acad. Sci. U. S. A.*, **98**, 12050-12055.
410. Rosen,E.D. and Spiegelman,B.M. (2000a). Molecular regulation of adipogenesis. *Annu. Rev. Cell Dev. Biol.*, **16**, 145-171.
411. Rosen,E.D., Walkey,C.J., Puigserver,P., and Spiegelman,B.M. (2000b). Transcriptional regulation of adipogenesis. *Genes Dev.*, **14**, 1293-1307.
412. Rosen,O.M., Smith,C.J., Hirsch,A., Lai,E., and Rubin,C.S. (1979). Recent studies of the 3T3-L1 adipocyte-like cell line. *Recent Prog. Horm. Res.*, **35**, 477-499.
413. Rothberg,K.G., Heuser,J.E., Donzell,W.C., Ying,Y.S., Glenney,J.R., and Anderson,R.G. (1992). Caveolin, a protein component of caveolae membrane coats. *Cell*, **68**, 673-682.
414. Rothberg,K.G., Ying,Y.S., Kamen,B.A., and Anderson,R.G. (1990). Cholesterol controls the clustering of the glycophospholipid-anchored membrane receptor for 5-methyltetrahydrofolate. *J Cell Biol.*, **111**, 2931-2938.
415. Roy,S., Luetterforst,R., Harding,A., Apolloni,A., Etheridge,M., Stang,E., Rolls,B., Hancock,J.F., and Parton,R.G. (1999). Dominant-negative caveolin inhibits H-Ras function by disrupting cholesterol-rich plasma membrane domains. *Nat. Cell Biol.*, **1**, 98-105.
416. Rudich,A. and Klip,A. (2003). Push/pull mechanisms of GLUT4 traffic in muscle cells. *Acta Physiol Scand.*, **178**, 297-308.
417. Sabharanjak,S., Sharma,P., Parton,R.G., and Mayor,S. (2002). GPI-anchored proteins are delivered to recycling endosomes via a distinct cdc42-regulated, clathrin-independent pinocytic pathway. *Dev. Cell*, **2**, 411-423.
418. Saha,P.K., Kojima,H., Martinez-Botas,J., Sunehag,A.L., and Chan,L. (2004). Metabolic adaptations in the absence of perilipin: increased beta-oxidation and decreased hepatic glucose production associated with peripheral insulin resistance but normal glucose tolerance in perilipin-null mice. *J Biol. Chem.*, **279**, 35150-35158.
419. Saltiel,A.R. and Pessin,J.E. (2003). Insulin signaling in microdomains of the plasma membrane. *Traffic*, **4**, 711-716.
420. Sankaram,M.B. and Thompson,T.E. (1990). Interaction of cholesterol with various glycerophospholipids and sphingomyelin. *Biochemistry*, **29**, 10670-10675.
421. Sano,H., Kane,S., Sano,E., Miinea,C.P., Asara,J.M., Lane,W.S., Garner,C.W., and Lienhard,G.E. (2003). Insulin-stimulated phosphorylation of a Rab GTPase-activating protein regulates GLUT4 translocation. *J Biol. Chem.*, **278**, 14599-14602.
422. Sargeant,R.J. and Paquet,M.R. (1993). Effect of insulin on the rates of synthesis and degradation of GLUT1 and GLUT4 glucose transporters in 3T3-L1 adipocytes. *Biochem. J.*, **290** (Pt 3), 913-919.
423. Sargiacomo,M., Scherer,P.E., Tang,Z., Kubler,E., Song,K.S., Sanders,M.C., and Lisanti,M.P. (1995). Oligomeric structure of caveolin: implications for caveolae membrane organization. *Proc. Natl. Acad. Sci. U. S. A.*, **92**, 9407-9411.

424. Sargiacomo,M., Sudol,M., Tang,Z., and Lisanti,M.P. (1993). Signal transducing molecules and glycosyl-phosphatidylinositol-linked proteins form a caveolin-rich insoluble complex in MDCK cells. *J. Cell Biol.*, **122**, 789-807.
425. Schaffer,J.E. (2002). Fatty acid transport: the roads taken. *Am. J. Physiol Endocrinol. Metab.*, **282**, E239-E246.
426. Schaffer,J.E. and Lodish,H.F. (1994). Expression cloning and characterization of a novel adipocyte long chain fatty acid transport protein. *Cell*, **79**, 427-436.
427. Scheiffele,P., Roth,M.G., and Simons,K. (1997). Interaction of influenza virus haemagglutinin with sphingolipid-cholesterol membrane domains via its transmembrane domain. *EMBO J.*, **16**, 5501-5508.
428. Scheiffele,P., Verkade,P., Fra,A.M., Virta,H., Simons,K., and Ikonen,E. (1998). Caveolin-1 and -2 in the exocytic pathway of MDCK cells. *J Cell Biol.*, **140**, 795-806.
429. Scherer,P.E., Lewis,R.Y., Volonte,D., Engelmann,J.A., Galbiati,F., Couet,J., Kohtz,D.S., van Donselaar,E., Peters,P., and Lisanti,M.P. (1997). Cell-type and tissue-specific expression of caveolin-2. Caveolins 1 and 2 co-localize and form a stable hetero-oligomeric complex in vivo. *J. Biol. Chem.*, **272**, 29337-29346.
430. Scherer,P.E., Lisanti,M.P., Baldini,G., Sargiacomo,M., Mastick,C.C., and Lodish,H.F. (1994). Induction of caveolin during adipogenesis and association of GLUT4 with caveolin-rich vesicles. *J. Cell Biol.*, **127**, 1233-1243.
431. Scherer,P.E., Okamoto,T., Chun,M., Nishimoto,I., Lodish,H.F., and Lisanti,M.P. (1996). Identification, sequence, and expression of caveolin-2 defines a caveolin gene family. *Proc. Natl. Acad. Sci. U. S. A.*, **93**, 131-135.
432. Scherer,P.E., Tang,Z., Chun,M., Sargiacomo,M., Lodish,H.F., and Lisanti,M.P. (1995). Caveolin isoforms differ in their N-terminal protein sequence and subcellular distribution. Identification and epitope mapping of an isoform-specific monoclonal antibody probe. *J Biol. Chem.*, **270**, 16395-16401.
433. Schlegel,A., Arvan,P., and Lisanti,M.P. (2001). Caveolin-1 binding to endoplasmic reticulum membranes and entry into the regulated secretory pathway are regulated by serine phosphorylation. Protein sorting at the level of the endoplasmic reticulum. *J. Biol. Chem.*, **276**, 4398-4408.
434. Schlegel,A. and Lisanti,M.P. (2000). A molecular dissection of caveolin-1 membrane attachment and oligomerization. Two separate regions of the caveolin-1 C-terminal domain mediate membrane binding and oligomer/oligomer interactions in vivo. *J. Biol. Chem.*, **275**, 21605-21617.
435. Schlegel,A., Schwab,R.B., Scherer,P.E., and Lisanti,M.P. (1999). A role for the caveolin scaffolding domain in mediating the membrane attachment of caveolin-1. The caveolin scaffolding domain is both necessary and sufficient for membrane binding in vitro. *J. Biol. Chem.*, **274**, 22660-22667.
436. Schmidt,W., Poll-Jordan,G., and Loffler,G. (1990). Adipose conversion of 3T3-L1 cells in a serum-free culture system depends on epidermal growth factor, insulin-like growth factor I, corticosterone, and cyclic AMP. *J. Biol. Chem.*, **265**, 15489-15495.
437. Schnitzer,J.E., McIntosh,D.P., Dvorak,A.M., Liu,J., and Oh,P. (1995). Separation of caveolae from associated microdomains of GPI-anchored proteins. *Science*, **269**, 1435-1439.
438. Schnitzer,J.E., Oh,P., Pinney,E., and Allard,J. (1994). Filipin-sensitive caveolae-mediated transport in endothelium: reduced transcytosis, scavenger endocytosis, and capillary permeability of select macromolecules. *J. Cell Biol.*, **127**, 1217-1232.
439. Schoenborn,V., Heid,I.M., Vollmert,C., Lingenshel,A., Adams,T.D., Hopkins,P.N., Illig,T., Zimmermann,R., Zechner,R., Hunt,S.C., and Kronenberg,F. (2006). The ATGL gene is associated with free fatty acids, triglycerides, and type 2 diabetes. *Diabetes*, **55**, 1270-1275.
440. Schoonjans,K., Staels,B., and Auwerx,J. (1996). The peroxisome proliferator activated receptors (PPARS) and their effects on lipid metabolism and adipocyte differentiation. *Biochim. Biophys. Acta*, **1302**, 93-109.
441. Schroeder,R., London,E., and Brown,D. (1994). Interactions between saturated acyl chains confer detergent resistance on lipids and glycosylphosphatidylinositol (GPI)-anchored proteins: GPI-anchored proteins in liposomes and cells show similar behavior. *Proc. Natl. Acad. Sci. U. S. A.*, **91**, 12130-12134.
442. Schulman,G.I. and . (2000). Cellular mechanism of insulin resistance. *J. Clin. Investigation*, **106**, 171-176.

443. Schwab,W., Galbiati,F., Volonte,D., Hempel,U., Wenzel,K.W., Funk,R.H., Lisanti,M.P., and Kasper,M. (1999). Characterisation of caveolins from cartilage: expression of caveolin-1, -2 and -3 in chondrocytes and in alginate cell culture of the rat tibia. *Histochem. Cell Biol.*, **112**, 41-49.
444. Schweiger,M., Schreiber,R., Haemmerle,G., Lass,A., Fledelius,C., Jacobsen,P., Tornqvist,H., Zechner,R., and Zimmermann,R. (2006). Adipose triglyceride lipase and hormone-sensitive lipase are the major enzymes in adipose tissue triacylglycerol catabolism. *J. Biol. Chem.*, **281**, 40236-40241.
445. Servetnick,D.A., Brasaemle,D.L., Gruia-Gray,J., Kimmel,A.R., Wolff,J., and Londos,C. (1995). Perilipins are associated with cholestryl ester droplets in steroidogenic adrenal cortical and Leydig cells. *J. Biol. Chem.*, **270**, 16970-16973.
446. Sethi,J.K. and Hotamisligil,G.S. (1999). The role of TNF alpha in adipocyte metabolism. *Semin. Cell Dev. Biol.*, **10**, 19-29.
447. Sharma,D.K., Brown,J.C., Cheng,Z., Holicky,E.L., Marks,D.L., and Pagano,R.E. (2005). The glycosphingolipid, lactosylceramide, regulates beta1-integrin clustering and endocytosis. *Cancer Res.*, **65**, 8233-8241.
448. Sharma,D.K., Brown,J.C., Choudhury,A., Peterson,T.E., Holicky,E., Marks,D.L., Simari,R., Parton,R.G., and Pagano,R.E. (2004a). Selective stimulation of caveolar endocytosis by glycosphingolipids and cholesterol. *Mol. Biol. Cell*, **15**, 3114-3122.
449. Sharma,P., Varma,R., Sarasij,R.C., Ira, Gousset,K., Krishnamoorthy,G., Rao,M., and Mayor,S. (2004b). Nanoscale organization of multiple GPI-anchored proteins in living cell membranes. *Cell*, **116**, 577-589.
450. Shaughnessy,S., Smith,E.R., Kodukula,S., Storch,J., and Fried,S.K. (2000). Adipocyte metabolism in adipocyte fatty acid binding protein knockout mice (aP2^{-/-}) after short-term high-fat feeding: functional compensation by the keratinocyte [correction of keritinocyte] fatty acid binding protein. *Diabetes*, **49**, 904-911.
451. Shewan,A.M., van Dam,E.M., Martin,S., Luen,T.B., Hong,W., Bryant,N.J., and James,D.E. (2003). GLUT4 recycles via a trans-Golgi network (TGN) subdomain enriched in Syntaxins 6 and 16 but not TGN38: involvement of an acidic targeting motif. *Mol. Biol. Cell*, **14**, 973-986.
452. Shi,H., Dirienzo,D., and Zemel,M.B. (2001). Effects of dietary calcium on adipocyte lipid metabolism and body weight regulation in energy-restricted aP2-agouti transgenic mice. *FASEB J.*, **15**, 291-293.
453. Shi,J. and Kandror,K.V. (2005). Sortilin is essential and sufficient for the formation of Glut4 storage vesicles in 3T3-L1 adipocytes. *Dev. Cell*, **9**, 99-108.
454. Shigematsu,S., Watson,R.T., Khan,A.H., and Pessin,J.E. (2003). The adipocyte plasma membrane caveolin functional/structural organization is necessary for the efficient endocytosis of GLUT4. *J. Biol. Chem.*, **278**, 10683-10690.
455. Siegel,P.M., Shu,W., Cardiff,R.D., Muller,W.J., and Massague,J. (2003). Transforming growth factor beta signaling impairs Neu-induced mammary tumorigenesis while promoting pulmonary metastasis. *Proc. Natl. Acad. Sci. U. S. A.*, **100**, 8430-8435.
456. Siler,S.Q., Neese,R.A., and Hellerstein,M.K. (1999). De novo lipogenesis, lipid kinetics, and whole-body lipid balances in humans after acute alcohol consumption. *Am. J Clin. Nutr.*, **70**, 928-936.
457. Simionescu,M., Gafencu,A., and Antohe,F. (2002). Transcytosis of plasma macromolecules in endothelial cells: a cell biological survey. *Microsc. Res. Tech.*, **57**, 269-288.
458. Simons,K. and Gruenberg,J. (2000). Jamming the endosomal system: lipid rafts and lysosomal storage diseases. *Trends Cell Biol.*, **10**, 459-462.
459. Simons,K. and Ikonen,E. (1997a). Functional rafts in cell membranes. *Nature*, **387**, 569-572.
460. Simons,K. and Ikonen,E. (1997b). Functional rafts in cell membranes. *Nature*, **387**, 569-572.
461. Simons,K. and Ikonen,E. (2000a). How cells handle cholesterol. *Science*, **290**, 1721-1726.
462. Simons,K. and Toomre,D. (2000b). Lipid rafts and signal transduction. *Nat. Rev. Mol. Cell Biol.*, **1**, 31-39.

463. Simons,K. and Vaz,W.L. (2004). Model systems, lipid rafts, and cell membranes. *Annu. Rev. Biophys. Biomol. Struct.*, **33**, 269-295.
464. Singh,R.D., Puri,V., Valiyaveettil,J.T., Marks,D.L., Bittman,R., and Pagano,R.E. (2003). Selective caveolin-1-dependent endocytosis of glycosphingolipids. *Mol. Biol. Cell*, **14**, 3254-3265.
465. Skolnik,E.Y., Batzer,A., Li,N., Lee,C.H., Lowenstein,E., Mohammadi,M., Margolis,B., and Schlessinger,J. (1993). The function of GRB2 in linking the insulin receptor to Ras signaling pathways. *Science*, **260**, 1953-1955.
466. Slot,J.W., Geuze,H.J., Gigengack,S., Lienhard,G.E., and James,D.E. (1991). Immuno-localization of the insulin regulatable glucose transporter in brown adipose tissue of the rat. *J Cell Biol.*, **113**, 123-135.
467. Smart,E.J., Graf,G.A., McNiven,M.A., Sessa,W.C., Engelmann,J.A., Scherer,P.E., Okamoto,T., and Lisanti,M.P. (1999). Caveolins, liquid-ordered domains, and signal transduction. *Mol. Cell Biol.*, **19**, 7289-7304.
468. Smart,E.J., Ying,Y., Donzell,W.C., and Anderson,R.G. (1996). A role for caveolin in transport of cholesterol from endoplasmic reticulum to plasma membrane. *J Biol. Chem.*, **271**, 29427-29435.
469. Smart,E.J., Ying,Y.S., Conrad,P.A., and Anderson,R.G. (1994). Caveolin moves from caveolae to the Golgi apparatus in response to cholesterol oxidation. *J Cell Biol.*, **127**, 1185-1197.
470. Smart,E.J., Ying,Y.S., Mineo,C., and Anderson,R.G. (1995). A detergent-free method for purifying caveolae membrane from tissue culture cells. *Proc. Natl. Acad. Sci. U. S. A*, **92**, 10104-10108.
471. Smirnova,E., Goldberg,E.B., Makarova,K.S., Lin,L., Brown,W.J., and Jackson,C.L. (2006). ATGL has a key role in lipid droplet/adiposome degradation in mammalian cells. *EMBO Rep.*, **7**, 106-113.
472. Smith,P.J., Wise,L.S., Berkowitz,R., Wan,C., and Rubin,C.S. (1988). Insulin-like growth factor-I is an essential regulator of the differentiation of 3T3-L1 adipocytes. *J. Biol. Chem.*, **263**, 9402-9408.
473. Smith,R.M., Charron,M.J., Shah,N., Lodish,H.F., and Jarett,L. (1991). Immunoelectron microscopic demonstration of insulin-stimulated translocation of glucose transporters to the plasma membrane of isolated rat adipocytes and masking of the carboxyl-terminal epitope of intracellular GLUT4. *Proc. Natl. Acad. Sci. U. S. A*, **88**, 6893-6897.
474. Smith,R.M., Harada,S., Smith,J.A., Zhang,S., and Jarett,L. (1998). Insulin-induced protein tyrosine phosphorylation cascade and signalling molecules are localized in a caveolin-enriched cell membrane domain. *Cell Signal.*, **10**, 355-362.
475. Song,K.S., Li,S., Okamoto,T., Quilliam,L.A., Sargiacomo,M., and Lisanti,M.P. (1996). Co-purification and direct interaction of Ras with caveolin, an integral membrane protein of caveolae microdomains. Detergent-free purification of caveolae microdomains. *J. Biol. Chem.*, **271**, 9690-9697.
476. Song,K.S., Tang,Z., Li,S., and Lisanti,M.P. (1997). Mutational analysis of the properties of caveolin-1. A novel role for the C-terminal domain in mediating homo-typic caveolin-caveolin interactions. *J. Biol. Chem.*, **272**, 4398-4403.
477. Soni,K.G., Lehner,R., Metalnikov,P., O'Donnell,P., Semache,M., Gao,W., Ashman,K., Pshezhetsky,A.V., and Mitchell,G.A. (2004). Carboxylesterase 3 (EC 3.1.1.1) is a major adipocyte lipase. *J Biol. Chem.*, **279**, 40683-40689.
478. Sotgia,F., Rui,H., Bonuccelli,G., Mercier,I., Pestell,R.G., and Lisanti,M.P. (2006). Caveolin-1, mammary stem cells, and estrogen-dependent breast cancers. *Cancer Res.*, **66**, 10647-10651.
479. Sottile,J. and Chandler,J. (2005). Fibronectin matrix turnover occurs through a caveolin-1-dependent process. *Mol. Biol. Cell*, **16**, 757-768.
480. Souto,R.P., Vallega,G., Wharton,J., Vinent,J., Tranum-Jensen,J., and Pilch,P.F. (2003). Immunopurification and characterization of rat adipocyte caveolae suggest their dissociation from insulin signaling. *J. Biol. Chem.*, **278**, 18321-18329.
481. Souza,S.C., Muliro,K.V., Liscum,L., Lien,P., Yamamoto,M.T., Schaffer,J.E., Dallal,G.E., Wang,X., Kraemer,F.B., Obin,M., and Greenberg,A.S. (2002). Modulation of hormone-sensitive lipase and protein kinase A-mediated lipolysis by perilipin A in an adenoviral reconstituted system. *J. Biol. Chem.*, **277**, 8267-8272.

482. Stahl,A. (2004). A current review of fatty acid transport proteins (SLC27). *Pflugers Arch.*, **447**, 722-727.
483. Stahl,A., Evans,J.G., Pattel,S., Hirsch,D., and Lodish,H.F. (2002). Insulin causes fatty acid transport protein translocation and enhanced fatty acid uptake in adipocytes. *Dev. Cell*, **2**, 477-488.
484. Stahl,A., Gimeno,R.E., Tartaglia,L.A., and Lodish,H.F. (2001). Fatty acid transport proteins: a current view of a growing family. *Trends Endocrinol. Metab.*, **12**, 266-273.
485. Stahl,A., Hirsch,D.J., Gimeno,R.E., Punreddy,S., Ge,P., Watson,N., Patel,S., Kotler,M., Raimondi,A., Tartaglia,L.A., and Lodish,H.F. (1999). Identification of the major intestinal fatty acid transport protein. *Mol. Cell*, **4**, 299-308.
486. Stahlhut,M. and van Deurs,B. (2000). Identification of filamin as a novel ligand for caveolin-1: evidence for the organization of caveolin-1-associated membrane domains by the actin cytoskeleton. *Mol. Biol. Cell*, **11**, 325-337.
487. Stan,R.V., Roberts,W.G., Predescu,D., Ihida,K., Saucan,L., Ghitescu,L., and Palade,G.E. (1997). Immunoisolation and partial characterization of endothelial plasmalemmal vesicles (caveolae). *Mol. Biol. Cell*, **8**, 595-605.
488. Standaert,M.L., Bandyopadhyay,G., Perez,L., Price,D., Galloway,L., Poklepovic,A., Sajan,M.P., Cenni,V., Sirri,A., Moscat,J., Toker,A., and Farese,R.V. (1999). Insulin activates protein kinases C-zeta and C-lambda by an autophosphorylation-dependent mechanism and stimulates their translocation to GLUT4 vesicles and other membrane fractions in rat adipocytes. *J. Biol. Chem.*, **274**, 25308-25316.
489. Stang,E., Kartenbeck,J., and Parton,R.G. (1997). Major histocompatibility complex class I molecules mediate association of SV40 with caveolae. *Mol. Biol. Cell*, **8**, 47-57.
490. Stralfors,P. (1990). Autolysis of isolated adipocytes by endogenously produced fatty acids. *FEBS Lett.*, **263**, 153-154.
491. Stremmel,W. and Theilmann,L. (1986). Selective inhibition of long-chain fatty acid uptake in short-term cultured rat hepatocytes by an antibody to the rat liver plasma membrane fatty acid-binding protein. *Biochim. Biophys. Acta*, **877**, 191-197.
492. Student,A.K., Hsu,R.Y., and Lane,M.D. (1980). Induction of fatty acid synthetase synthesis in differentiating 3T3-L1 preadipocytes. *J. Biol. Chem.*, **255**, 4745-4750.
493. Stuermer,C.A., Lang,D.M., Kirsch,F., Wiechers,M., Deininger,S.O., and Plattner,H. (2001). Glycosylphosphatidyl inositol-anchored proteins and fyn kinase assemble in noncaveolar plasma membrane microdomains defined by reggie-1 and -2. *Mol. Biol. Cell*, **12**, 3031-3045.
494. Stump,D.D., Fan,X., and Berk,P.D. (2001). Oleic acid uptake and binding by rat adipocytes define dual pathways for cellular fatty acid uptake. *J. Lipid Res.*, **42**, 509-520.
495. Subramanian,V., Rothenberg,A., Gomez,C., Cohen,A.W., Garcia,A., Bhattacharyya,S., Shapiro,L., Dolios,G., Wang,R., Lisanti,M.P., and Brasaemle,D.L. (2004). Perilipin A mediates the reversible binding of CGI-58 to lipid droplets in 3T3-L1 adipocytes. *J. Biol. Chem.*, **279**, 42062-42071.
496. Sunaga,N., Miyajima,K., Suzuki,M., Sato,M., White,M.A., Ramirez,R.D., Shay,J.W., Gazdar,A.F., and Minna,J.D. (2004). Different roles for caveolin-1 in the development of non-small cell lung cancer versus small cell lung cancer. *Cancer Res.*, **64**, 4277-4285.
497. Sztalryd,C., Xu,G., Dorward,H., Tansey,J.T., Contreras,J.A., Kimmel,A.R., and Londos,C. (2003). Perilipin A is essential for the translocation of hormone-sensitive lipase during lipolytic activation. *J. Cell Biol.*, **161**, 1093-1103.
498. Tagawa,A., Mezzacasa,A., Hayer,A., Longatti,A., Pelkmans,L., and Helenius,A. (2005). Assembly and trafficking of caveolar domains in the cell: caveolae as stable, cargo-triggered, vesicular transporters. *J. Cell Biol.*, **170**, 769-779.
499. Tahir,S.A., Yang,G., Ebara,S., Timme,T.L., Satoh,T., Li,L., Goltsov,A., Ittmann,M., Morrisett,J.D., and Thompson,T.C. (2001). Secreted caveolin-1 stimulates cell survival/clonal growth and contributes to metastasis in androgen-insensitive prostate cancer. *Cancer Res.*, **61**, 3882-3885.
500. Takeda,M., Leser,G.P., Russell,C.J., and Lamb,R.A. (2003). Influenza virus hemagglutinin concentrates in lipid raft microdomains for efficient viral fusion. *Proc. Natl. Acad. Sci. U. S. A.*, **100**, 14610-14617.

501. Tang,Z., Scherer,P.E., Okamoto,T., Song,K., Chu,C., Kohtz,D.S., Nishimoto,I., Lodish,H.F., and Lisanti,M.P. (1996). Molecular cloning of caveolin-3, a novel member of the caveolin gene family expressed predominantly in muscle. *J Biol. Chem.*, **271**, 2255-2261.
502. Tansey,J.T., Sztalryd,C., Gruia-Gray,J., Roush,D.L., Zee,J.V., Gavrilova,O., Reitman,M.L., Deng,C.X., Li,C., Kimmel,A.R., and Londos,C. (2001). Perilipin ablation results in a lean mouse with aberrant adipocyte lipolysis, enhanced leptin production, and resistance to diet-induced obesity. *Proc. Natl. Acad. Sci. U. S. A.*, **98**, 6494-6499.
503. Tansey,J.T., Sztalryd,C., Hlavin,E.M., Kimmel,A.R., and Londos,C. (2004). The central role of perilipin a in lipid metabolism and adipocyte lipolysi. *IUBMB. Life*, **56**, 379-385.
504. Tanti,J.F., Gremeaux,T., Grillo,S., Calleja,V., Klipper,A., Williams,L.T., Van Obberghen,E., and Marchand-Brustel,Y. (1996). Overexpression of a constitutively active form of phosphatidylinositol 3-kinase is sufficient to promote Glut 4 translocation in adipocytes. *J Biol. Chem.*, **271**, 25227-25232.
505. Tauchi-Sato,K., Ozeki,S., Houjou,T., Taguchi,R., and Fujimoto,T. (2002). The surface of lipid droplets is a phospholipid monolayer with a unique Fatty Acid composition. *J Biol. Chem.*, **277**, 44507-44512.
506. Tellam,J.T., Macaulay,S.L., McIntosh,S., Hewish,D.R., Ward,C.W., and James,D.E. (1997). Characterization of Munc-18c and syntaxin-4 in 3T3-L1 adipocytes. Putative role in insulin-dependent movement of GLUT-4. *J Biol. Chem.*, **272**, 6179-6186.
507. Thiele,C., Hannah,M.J., Fahrenholz,F., and Huttner,W.B. (2000). Cholesterol binds to synaptophysin and is required for biogenesis of synaptic vesicles. *Nat. Cell Biol.*, **2**, 42-49.
508. Thomsen,P., Roepstorff,K., Stahlhut,M., and van Deurs,B. (2002). Caveolae are highly immobile plasma membrane microdomains, which are not involved in constitutive endocytic trafficking. *Mol. Biol. Cell*, **13**, 238-250.
509. Timme,T.L., Goltsov,A., Tahir,S., Li,L., Wang,J., Ren,C., Johnston,R.N., and Thompson,T.C. (2000). Caveolin-1 is regulated by c-myc and suppresses c-myc-induced apoptosis. *Oncogene*, **19**, 3256-3265.
510. Toomre,D., Steyer,J.A., Keller,P., Almers,W., and Simons,K. (2000). Fusion of constitutive membrane traffic with the cell surface observed by evanescent wave microscopy. *J. Cell Biol.*, **149**, 33-40.
511. Torgersen,M.L., Skretting,G., van Deurs,B., and Sandvig,K. (2001). Internalization of cholera toxin by different endocytic mechanisms. *J Cell Sci.*, **114**, 3737-3747.
512. Tornqvist,H. and Belfrage,P. (1976). Purification and some properties of a monoacylglycerol-hydrolyzing enzyme of rat adipose tissue. *J Biol. Chem.*, **251**, 813-819.
513. Trayhurn,P. (2007). Adipocyte biology. *Obes. Rev.*, **8 Suppl 1**, 41-44.
514. Trigatti,B.L., Anderson,R.G., and Gerber,G.E. (1999). Identification of caveolin-1 as a fatty acid binding protein. *Biochem. Biophys. Res. Commun.*, **255**, 34-39.
515. Trigatti,B.L., Mangroo,D., and Gerber,G.E. (1991). Photoaffinity labeling and fatty acid permeation in 3T3-L1 adipocytes. *J. Biol. Chem.*, **266**, 22621-22625.
516. Trushina,E., Du,C.J., Parisi,J., and McMurray,C.T. (2006). Neurological abnormalities in caveolin-1 knock out mice. *Behav. Brain Res.*, **172**, 24-32.
517. Tzameli,I., Fang,H., Ollero,M., Shi,H., Hamm,J.K., Kievit,P., Hollenberg,A.N., and Flier,J.S. (2004). Regulated production of a peroxisome proliferator-activated receptor-gamma ligand during an early phase of adipocyte differentiation in 3T3-L1 adipocytes. *J. Biol. Chem.*, **279**, 36093-36102.
518. Uittenbogaard,A. and Smart,E.J. (2000). Palmitoylation of caveolin-1 is required for cholesterol binding, chaperone complex formation, and rapid transport of cholesterol to caveolae. *J Biol. Chem.*, **275**, 25595-25599.
519. Uittenbogaard,A., Ying,Y., and Smart,E.J. (1998). Characterization of a cytosolic heat-shock protein-caveolin chaperone complex. Involvement in cholesterol trafficking. *J Biol. Chem.*, **273**, 6525-6532.
520. Vainio,S., Heino,S., Mansson,J.E., Fredman,P., Kuismann,E., Vaarala,O., and Ikonen,E. (2002). Dynamic association of human insulin receptor with lipid rafts in cells lacking caveolae. *EMBO Rep.*, **3**, 95-100.

521. van Deurs,B., Roepstorff,K., Hommelgaard,A.M., and Sandvig,K. (2003). Caveolae: anchored, multifunctional platforms in the lipid ocean. *Trends Cell Biol.*, **13**, 92-100.
522. van Meer,G. (1989). Lipid traffic in animal cells. *Annu. Rev. Cell Biol.*, **5**, 247-275.
523. Villena,J.A., Roy,S., Sarkadi-Nagy,E., Kim,K.H., and Sui,H.S. (2004). Desnutrin, an adipocyte gene encoding a novel patatin domain-containing protein, is induced by fasting and glucocorticoids: ectopic expression of desnutrin increases triglyceride hydrolysis. *J Biol. Chem.*, **279**, 47066-47075.
524. Vistisen,B., Roepstorff,K., Roepstorff,C., Bonen,A., van Deurs,B., and Kiens,B. (2004). Sarcolemmal FAT/CD36 in human skeletal muscle colocalizes with caveolin-3 and is more abundant in type 1 than in type 2 fibers. *J. Lipid Res.*, **45**, 603-609.
525. Vogel,U., Sandvig,K., and van Deurs,B. (1998). Expression of caveolin-1 and polarized formation of invaginated caveolae in Caco-2 and MDCK II cells. *J Cell Sci.*, **111 (Pt 6)**, 825-832.
526. Volchuk,A., Narine,S., Foster,L.J., Grabs,D., De Camilli,P., and Klip,A. (1998). Perturbation of dynamin II with an amphiphysin SH3 domain increases GLUT4 glucose transporters at the plasma membrane in 3T3-L1 adipocytes. Dynamin II participates in GLUT4 endocytosis. *J. Biol. Chem.*, **273**, 8169-8176.
527. Volonte,D., Galbiati,F., Li,S., Nishiyama,K., Okamoto,T., and Lisanti,M.P. (1999). Flotillins/cavatellins are differentially expressed in cells and tissues and form a hetero-oligomeric complex with caveolins in vivo. Characterization and epitope-mapping of a novel flotillin-1 monoclonal antibody probe. *J Biol. Chem.*, **274**, 12702-12709.
528. Wang,S.P., Laurin,N., Himms-Hagen,J., Rudnicki,M.A., Levy,E., Robert,M.F., Pan,L., Oligny,L., and Mitchell,G.A. (2001). The adipose tissue phenotype of hormone-sensitive lipase deficiency in mice. *Obes. Res.*, **9**, 119-128.
529. Wang,W., Hansen,P.A., Marshall,B.A., Holloszy,J.O., and Mueckler,M. (1996). Insulin unmasks a COOH-terminal Glut4 epitope and increases glucose transport across T-tubules in skeletal muscle. *J. Cell Biol.*, **135**, 415-430.
530. Waters,S.B., D'Auria,M., Martin,S.S., Nguyen,C., Kozma,L.M., and Luskey,K.L. (1997). The amino terminus of insulin-responsive aminopeptidase causes Glut4 translocation in 3T3-L1 adipocytes. *J. Biol. Chem.*, **272**, 23323-23327.
531. Watson,R.T., Kanzaki,M., and Pessin,J.E. (2004). Regulated membrane trafficking of the insulin-responsive glucose transporter 4 in adipocytes. *Endocr. Rev.*, **25**, 177-204.
532. Watson,R.T., Shigematsu,S., Chiang,S.H., Mora,S., Kanzaki,M., Macara,I.G., Saltiel,A.R., and Pessin,J.E. (2001). Lipid raft microdomain compartmentalization of TC10 is required for insulin signaling and GLUT4 translocation. *J. Cell Biol.*, **154**, 829-840.
533. Wei,E., Lehner,R., and Vance,D.E. (2005). C/EBPalpha activates the transcription of triacylglycerol hydrolase in 3T3-L1 adipocytes. *Biochem. J.*, **388**, 959-966.
534. Welsh,G.I., Hers,I., Berwick,D.C., Dell,G., Wherlock,M., Birkin,R., Leney,S., and Tavare,J.M. (2005). Role of protein kinase B in insulin-regulated glucose uptake. *Biochem. Soc. Trans.*, **33**, 346-349.
535. White,M.F. and Kahn,C.R. (1994). The insulin signaling system. *J. Biol. Chem.*, **269**, 1-4.
536. Widberg,C.H., Bryant,N.J., Girotti,M., Rea,S., and James,D.E. (2003). Tomosyn interacts with the t-SNAREs syntaxin4 and SNAP23 and plays a role in insulin-stimulated GLUT4 translocation. *J Biol. Chem.*, **278**, 35093-35101.
537. Wiechen,K., Diatchenko,L., Agoulnik,A., Scharff,K.M., Schober,H., Arlt,K., Zhumabayeva,B., Siebert,P.D., Dietel,M., Schafer,R., and Sers,C. (2001). Caveolin-1 is down-regulated in human ovarian carcinoma and acts as a candidate tumor suppressor gene. *Am. J Pathol.*, **159**, 1635-1643.
538. Wightman,L., Kircheis,R., Rossler,V., Carotta,S., Ruzicka,R., Kursa,M., and Wagner,E. (2001). Different behavior of branched and linear polyethylenimine for gene delivery in vitro and in vivo. *J Gene Med.*, **3**, 362-372.
539. Williams,T.M., Lee,H., Cheung,M.W., Cohen,A.W., Razani,B., Iyengar,P., Scherer,P.E., Pestell,R.G., and Lisanti,M.P. (2004). Combined loss of INK4a and caveolin-1 synergistically enhances cell proliferation and oncogene-induced tumorigenesis: role of INK4a/CAV-1 in mammary epithelial cell hyperplasia. *J Biol. Chem.*, **279**, 24745-24756.
540. Williams,T.M. and Lisanti,M.P. (2005). Caveolin-1 in oncogenic transformation, cancer, and metastasis. *Am. J Physiol Cell Physiol*, **288**, C494-C506.

541. Willson,T.M., Cobb,J.E., Cowan,D.J., Wiethe,R.W., Correa,I.D., Prakash,S.R., Beck,K.D., Moore,L.B., Kliewer,S.A., and Lehmann,J.M. (1996). The structure-activity relationship between peroxisome proliferator-activated receptor gamma agonism and the antihyperglycemic activity of thiazolidinediones. *J. Med. Chem.*, **39**, 665-668.
542. Wolins,N.E., Skinner,J.R., Schoenfish,M.J., Tzekov,A., Bensch,K.G., and Bickel,P.E. (2003). Adipocyte protein S3-12 coats nascent lipid droplets. *J Biol. Chem.*, **278**, 37713-37721.
543. Wu,Z., Bucher,N.L., and Farmer,S.R. (1996). Induction of peroxisome proliferator-activated receptor gamma during the conversion of 3T3 fibroblasts into adipocytes is mediated by C/EBPbeta, C/EBPdelta, and glucocorticoids. *Mol. Cell Biol.*, **16**, 4128-4136.
544. Wu,Z., Xie,Y., Bucher,N.L., and Farmer,S.R. (1995). Conditional ectopic expression of C/EBP beta in NIH-3T3 cells induces PPAR gamma and stimulates adipogenesis. *Genes Dev.*, **9**, 2350-2363.
545. Xue,B., Greenberg,A.G., Kraemer,F.B., and Zemel,M.B. (2001). Mechanism of intracellular calcium ($[Ca^{2+}]_i$) inhibition of lipolysis in human adipocytes. *FASEB J.*, **15**, 2527-2529.
546. Yamada E (1955). The fine structure of the gall bladder epithelium of the mouse. *J Biophys. Biochem. Cytol.*, **1**, 458.
547. Yamaguchi,T., Omatsu,N., Matsushita,S., and Osumi,T. (2004). CGI-58 interacts with perilipin and is localized to lipid droplets. Possible involvement of CGI-58 mislocalization in Chanarin-Dorfman syndrome. *J Biol. Chem.*, **279**, 30490-30497.
548. Yamaguchi,T., Omatsu,N., Omukae,A., and Osumi,T. (2006). Analysis of interaction partners for perilipin and ADRP on lipid droplets. *Mol. Cell Biochem.*, **284**, 167-173.
549. Yamamoto,M., Toya,Y., Schwencke,C., Lisanti,M.P., Myers,M.G., Jr., and Ishikawa,Y. (1998). Caveolin is an activator of insulin receptor signaling. *J. Biol. Chem.*, **273**, 26962-26968.
550. Yan,Z.C., Liu,D.Y., Zhang,L.L., Shen,C.Y., Ma,Q.L., Cao,T.B., Wang,L.J., Nie,H., Zidek,W., Tepel,M., and Zhu,Z.M. (2007). Exercise reduces adipose tissue via cannabinoid receptor type 1 which is regulated by peroxisome proliferator-activated receptor-delta. *Biochem. Biophys. Res. Commun.*, **354**, 427-433.
551. Yang,C.P., Galbiati,F., Volonte,D., Horwitz,S.B., and Lisanti,M.P. (1998). Upregulation of caveolin-1 and caveolae organelles in Taxol-resistant A549 cells. *FEBS Lett.*, **439**, 368-372.
552. Yang,G., Truong,L.D., Wheeler,T.M., and Thompson,T.C. (1999). Caveolin-1 expression in clinically confined human prostate cancer: a novel prognostic marker. *Cancer Res.*, **59**, 5719-5723.
553. Yang,H., He,S., Quan,Z., Peng,W., Yan,B., Liu,J., Wen,F., Cao,R., Xu,Y., Wen,G., and Hu,W. (2007). Small interfering RNA-mediated caveolin-1 knockout on plasminogen activator inhibitor-1 expression in insulin-stimulated human vascular endothelial cells. *Acta Biochim. Biophys. Sin. (Shanghai)*, **39**, 224-233.
554. Yao,Q., Chen,J., Cao,H., Orth,J.D., McCaffery,J.M., Stan,R.V., and McNiven,M.A. (2005). Caveolin-1 interacts directly with dynamin-2. *J Mol. Biol.*, **348**, 491-501.
555. Yu,Z.W., Buren,J., Enerback,S., Nilsson,E., Samuelsson,L., and Eriksson,J.W. (2001). Insulin can enhance GLUT4 gene expression in 3T3-F442A cells and this effect is mimicked by vanadate but counteracted by cAMP and high glucose--potential implications for insulin resistance. *Biochim. Biophys. Acta*, **1535**, 174-185.
556. Zechner,R., Strauss,J.G., Haemmerle,G., Lass,A., and Zimmermann,R. (2005). Lipolysis: pathway under construction. *Curr. Opin. Lipidol.*, **16**, 333-340.
557. Zeigerer,A., Lampson,M.A., Karylowksi,O., Sabatini,D.D., Adesnik,M., Ren,M., and McGraw,T.E. (2002). GLUT4 retention in adipocytes requires two intracellular insulin-regulated transport steps. *Mol. Biol. Cell*, **13**, 2421-2435.
558. Zhang,J., Hupfeld,C.J., Taylor,S.S., Olefsky,J.M., and Tsien,R.Y. (2005). Insulin disrupts beta-adrenergic signalling to protein kinase A in adipocytes. *Nature*, **437**, 569-573.
559. Zhang,J., Pekosz,A., and Lamb,R.A. (2000). Influenza virus assembly and lipid raft microdomains: a role for the cytoplasmic tails of the spike glycoproteins. *J Virol.*, **74**, 4634-4644.
560. Zhao,Y.Y., Liu,Y., Stan,R.V., Fan,L., Gu,Y., Dalton,N., Chu,P.H., Peterson,K., Ross,J., Jr., and Chien,K.R. (2002). Defects in caveolin-1 cause dilated

- cardiomyopathy and pulmonary hypertension in knockout mice. *Proc. Natl. Acad. Sci. U. S. A.*, **99**, 11375-11380.
561. Zhou,Q.L., Park,J.G., Jiang,Z.Y., Holik,J.J., Mitra,P., Semiz,S., Guilherme,A., Powelka,A.M., Tang,X., Virbasius,J., and Czech,M.P. (2004). Analysis of insulin signalling by RNAi-based gene silencing. *Biochem. Soc. Trans.*, **32**, 817-821.
562. Zhou,S.L., Stump,D., Sorrentino,D., Potter,B.J., and Berk,P.D. (1992). Adipocyte differentiation of 3T3-L1 cells involves augmented expression of a 43-kDa plasma membrane fatty acid-binding protein. *J Biol. Chem.*, **267**, 14456-14461.
563. Zimmermann,R., Haemmerle,G., Wagner,E.M., Strauss,J.G., Kratky,D., and Zechner,R. (2003). Decreased fatty acid esterification compensates for the reduced lipolytic activity in hormone-sensitive lipase-deficient white adipose tissue. *J. Lipid Res.*, **44**, 2089-2099.
564. Zimmermann,R., Strauss,J.G., Haemmerle,G., Schoiswohl,G., Birner-Gruenberger,R., Riederer,M., Lass,A., Neuberger,G., Eisenhaber,F., Hermetter,A., and Zechner,R. (2004). Fat mobilization in adipose tissue is promoted by adipose triglyceride lipase. *Science*, **306**, 1383-1386.
565. Zou,Z., Tong,F., Faergeman,N.J., Borsting,C., Black,P.N., and DiRusso,C.C. (2003). Vectorial acylation in *Saccharomyces cerevisiae*. Fat1p and fatty acyl-CoA synthetase are interacting components of a fatty acid import complex. *J Biol. Chem.*, **278**, 16414-16422.
566. Zuo,Y., Qiang,L., and Farmer,S.R. (2006). Activation of CCAAT/enhancer-binding protein (C/EBP) alpha expression by C/EBP beta during adipogenesis requires a peroxisome proliferator-activated receptor-gamma-associated repression of HDAC1 at the C/ebp alpha gene promoter. *J. Biol. Chem.*, **281**, 7960-7967.