

## CURRICULUM VITAE

**Name:** Lee Alan Witters

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**Place of Birth:** Canton, Ohio

**Education:**

1965 A.B. Oberlin College  
1969 M.D. University of Rochester School of Medicine and Dentistry  
1992 M.A. Dartmouth College (honorary)

**Postdoctoral Training:**

Internship and Residencies:

1969-1971 Clinical Fellow in Medicine, Harvard Medical School  
1969-1970 Intern in Medicine, Beth Israel Hospital, Boston, MA  
1970-1971 Assistant Resident in Medicine, Beth Israel Hospital

Research Fellowships:

1965-1969 Research Associate, Department of Medicine, University of Rochester School of Medicine and Dentistry  
1971-1973 Clinical Associate, National Heart and Lung Institute Molecular Disease Branch (with Donald S. Fredrickson), National Institutes of Health  
1973-1975 Research Fellow in Medicine, Harvard Medical School and Massachusetts General Hospital

**Academic Appointments:**

1973-1975 Research Fellow in Medicine, Harvard Medical School  
1975-1978 Instructor in Medicine, Harvard Medical School  
1978-1981 Assistant Professor of Medicine, Harvard Medical School  
1981-1982 Honorary Research Fellow, Department of Biochemistry, University of Dundee, Scotland  
1982-1984 Associate Professor of Medicine, Harvard Medical School  
1984-1986 Associate Professor of Medicine, Dartmouth Medical School,

1984-1999 Chief, Endocrine-Metabolism Division, Department of  
Medicine, Dartmouth Medical School

1985-1986 Associate Professor of Biochemistry, Dartmouth Medical School

1986- Professor of Medicine, Dartmouth Medical School

1986- Professor of Biochemistry, Dartmouth Medical School

1987- Eugene W. Leonard 1921 Professor of Medicine & Biochemistry,  
Dartmouth Medical School

1993-1999 Director, Endocrinology Program, Norris Cotton Cancer Center,  
Dartmouth Medical School

1996-1999 Adjunct Professor of Biological Sciences, Dartmouth College

1999-2003 Director, Humanitates Vitae (Human Biology Program), Dartmouth College

1999- Professor of Biological Sciences, Dartmouth College

2014- Director, Teaching Science Fellows Program, Dartmouth College

2016- Professor of Medical Education, Geisel School of Medicine at Dartmouth

### **Hospital Appointments:**

1973-1975 Clinical and Research Fellow in Medicine, Massachusetts  
General Hospital

1975-1978 Assistant in Medicine, Massachusetts General Hospital

1979-1983 Assistant Physician, Massachusetts General Hospital

1983-1985 Associate Physician, Massachusetts General Hospital

1984-1999 Chief, Endocrine-Metabolism Division, Dartmouth Medical School

1984- Attending Physician, Dartmouth-Hitchcock Medical Center

1985- Consultant in Medicine, Medical Services, Massachusetts  
General Hospital

### **Awards and Honors:**

1965 Graduated with Honors in Chemistry, Oberlin College

1969 Graduated with Distinction in Research, University of  
Rochester School of Medicine and Dentistry

1974-1976 Fellow, The Medical Foundation of Boston, Inc.

1977-1979 Research and Development Awardee, American Diabetes Association

1978-1983 Research Career and Development Awardee, U.S. Public Health Service

1981-1982 Fellow, John Simon Guggenheim Foundation

1997-1998 Faculty Advisor of the Year (for service to the Nathan Smith  
Premedical Society), Dartmouth College

1999-2000 Basic Science Teaching Award, Dartmouth Medical School

2001 Excellence in Medical Education Award, DMS, Awarded by DMS  
Class of 2004

2002 Faculty Speaker, Dartmouth College Commencement Class Day (elected by  
Class of 2002)

2002 Featured Professor in Aegis (Class of 2002 Yearbook)

2002 Elected as Honorary member, Golden Key International Honour Society:  
keynote speaker at member induction ceremony

2003 Elected as Distinguished Member, National Society of Collegiate Scholars;  
keynote speaker at member induction ceremony

- 2004 Professor of the Year, Dartmouth College, named by Order of Omega
- 2004 Profiles in Excellence Teaching Award (by Student Assembly), Dartmouth College
- 2006 Dean of Faculty Award for Undergraduate Mentoring and Advising,  
Dartmouth College
- 2006 Linda '82 and Paul Gridley Faculty Fellow Award (for faculty-student  
involvement; inaugural recipient), Dartmouth College
- 2009 Named by Class of 2009 as one of Top 10 Professors in College; featured in  
Aegis (Class of 2009 Yearbook)
- 2010 Distinguished Educator Award, Dartmouth Medical School (voted by  
members of the class of 2012)
- 2010 Faculty Advisor of the Year (voted by Council of Student Organizations)
- 2010 Distinguished Educator Award, Dartmouth Medical School (voted by  
members of the class of 2013)
- 2011 Basic Science Teaching Award, Dartmouth Medical School (voted by  
graduating class of 2011)
- 2011 Distinguished Lecturer Award, Dartmouth Medical School (voted by  
members of the class of 2014)
- 2012 Elected to inaugural class Geisel School of Medicine Academy of Master  
Educators
- 2012 Named by Class of 2012 as one of Top 10 Professors in College; featured in  
Aegis (Class of 2012 Yearbook)
- 2014 Named by Class of 2014 as one of Top 10 Professors in College; featured in  
Aegis (Class of 2014 Yearbook)
- 2015 Named by Class of 2015 as one of Top 10 Professors in College; featured in  
Aegis (Class of 2015 Yearbook)
- 2015 Nominated for national Arnold P. Gold Humanism in Medicine award by  
vote of Geisel student body
- 2015 Faculty speaker at Geisel Year Two Transition Celebration
- 2016 Honored with creation of the Lee A. Witters Teaching Award in Human  
Biology and Social Justice at Dartmouth (Dr. Jim O'Connell first recipient  
4/28/16)
- 2016 Elizabeth Howland Hand-Otis Norton Pierce Award: An award for a member  
of the faculty who, in the opinion of the Trustees, is an outstanding teacher  
of undergraduates
- 2016 Geisel Faculty Marshal, 2016 Commencement
- 2017 Lifetime Achievement Award, Geisel Chapter of the Arthur P. Gold  
Humanism Society
- 2018 Election to the Arnold P. Gold Humanism Honor Society

**Licensure and Certification:**

- 1969- -Massachusetts License Registration No. 37796
- 1973- Diplomate, Internal Medicine, American Board of Internal Medicine
- 1975- Diplomate, Endocrinology and Metabolism, American Board of Internal Medicine
- 1984- New Hampshire License Registration No. 7006

**Memberships, Offices and Committee Assignment in Professional Societies:**

1965	Sigma Xi, Oberlin College
1969	Alpha Omega Alpha, University of Rochester
1977	Member, Professional Section, American Diabetes Association
1977	American Federation for Clinical Research
1982	Member, American Society for Clinical Investigation
1984	Member, American Association for the Advancement of Science
1984-1986	Member, Medical Science Review Committee, Juvenile Diabetes Foundation
1985-1989	Metabolism Study Section, National Institutes of Health
1988	American Society for Biochemistry and Molecular Biology
1991	The Biochemical Society (United Kingdom)
1999-2000	Chair and Vice Chair, Gordon Research Conference on 2 <sup>nd</sup> Messengers and Protein Phosphorylation

**Service to Biomedical Journals:**

Editor , Biochemical Journal 1995-2002

Reviewer for:

Journal of Biological Chemistry  
 Journal of Clinical Investigation  
 Science  
 European Journal of Biochemistry  
 New England Journal of Medicine  
 Diabetes  
 Endocrinology  
 Archives of Biochemistry and Biophysics  
 Molecular and Cellular Biology  
 FASEB Journal  
 Journal of Cell Biology  
 Nature/Nature Medicine

**Major Research Interests:**

1. Hormonal and Nutritional Regulation of Lipogenesis
2. Cellular Responses to Metabolic Stress: the AMP-activated Protein Kinase
3. Molecular Mechanism(s) of Hormone Action

**Teaching Experience:**

1971-1973	Visiting Physician, Georgetown University Hospital, Medical Services, Washington, D.C.
1973-1985	Attending Physician, Medical Services, Massachusetts General Hospital
1975-1985	Attending Physician, Endocrine Unit, Massachusetts General Hospital
1975-1985	Attending Physician, Diabetes Unit, Massachusetts General Hospital

- 1973-1985 Lecturer: Harvard Medical Endocrine Pathophysiology and Emergency Medicine Courses; MGH Internal Medicine and Endocrine Postgraduate Courses ; regular lectureships at various medical schools and other hospitals
- 1985- Attending Physician, Department of Medicine and Endocrine-Metabolism Division, Dartmouth-Hitchcock Medical Center
- 1985- Lecturer in Endocrinology, Physiology and Biochemistry, Dartmouth Medical School
- 1996- Lecturer, Department of Biological Sciences, Dartmouth College
- 1999-2003 Director and Faculty Member, Humanitates Vitae (the Human Biology Program at Dartmouth College)

**Major Clinical, Hospital, Medical School and College Service Responsibilities:**

- 1973-1985 Physician, Diabetes Outpatient Clinic, Massachusetts General Hospital plus inpatient consultation service
- 1973-1985 Attending Physician, Medical Ward Services, Massachusetts General Hospital
- 1975- Attending Physician, Endocrine Services, Massachusetts General Hospital
- 1978-1981 Member, Subcommittee for Review for Research Proposals, Massachusetts General Hospital
- 1978-1979 Member, Committee on Research, Massachusetts General Hospital
- 1980 Member, Internship Selection Committee, Medical Services, Massachusetts General Hospital
- 1985-1999 Chief, Endocrine-Metabolism Division, Department of Medicine, Dartmouth Medical School; Director, Endocrine Fellowship Program, Dartmouth Medical School; Attending Physician, DHMC
- 1986-1988 Member, Research and Development Committee, V.A. Hospital, White River Junction, VT
- 1985-1986 Chairman, Dean's Committee on Impact of Medical Center Relocation on Dartmouth Medical School
- 1986-2001 Co-Director, Endocrine Research Training Program, Dartmouth Medical School
- 1986-1987 Member, Search Committee for Pharmacology Chairman, Clinical Pharmacology
- 1987-1996 Member, Diabetes Advisory Committee, Mary Hitchcock Memorial Hospital
- 1987-1992 Chairman, Department of Medicine Faculty Promotions Committee, Dartmouth Medical School
- 1989-1990 Chairman, Rheumatology Chairman Search Committee, DMS
- 1989-1991 Chair/Co-Chairman, Department of Medicine Clinician-Scientist Search Committee, DMS
- 1990-1993 Member, DMS Research Committee
- 1991 Member, Dean's Committee on New Curricular Directions, DMS
- 1993-1997 Director, Endocrinology Program, Norris Cotton Cancer Center,

	Dartmouth Medical School
1997-1999	Director, Cell Signaling, Growth and Differentiation Program, Norris Cotton Cancer Center, Dartmouth Medical School
1997-	Faculty Advisor, The Nathan Smith Premedical Society, Dartmouth College
1997-	DMS Institutional Representation to the American Society for Clinical Investigation
1999-2002	Chair, Committee on Physician-Scientists, Dartmouth Medical School
2000-2015	Chair, Health Professions Advisory Committee, Dartmouth College
2001-2002	Member, Committee on Academic Advising, Dartmouth College
1999-	Member, Advisory Board, Diabetes Center, Massachusetts General Hospital
2002-2003	Member, Search Committee for DMS Dean
2002-2003	Member, College Course Steering Committee, Dartmouth College
2003-2006	Member, Committee on Instruction, Dartmouth College
2004-	Member, Dickey Center Faculty Steering Committee, Dartmouth College
2004-2006	Member, Dickey Center Global Health Initiative Steering Committee, Dartmouth College
2006	Member, Committee on Classroom Technology, Academic Computing Division, Dartmouth College
2010	Member, AB/MD Program Study Group, Dartmouth College
2010-2015	Director, Health Professions Program, Dartmouth College (note: this is the year of my formal appointment, but I have been doing this <i>pro bono</i> since 1995, along with my advisorship of the undergraduate Nathan Smith Society since then)
2014-2016	Faculty Advisor, OneDartmouth (an organization dedicated to creating student communities at Dartmouth)
2012-	Faculty Advisor. Geisel Physicians for Human Rights group
2014	Committee on Priorities, Dartmouth College (term appointment)
2014-	Director, Teaching Science Fellows Program, Dartmouth College
2015-2017	Faculty Advisor, The Sununu Project (students teaching incarcerated youth)
2016-	Faculty Advisor, Dartmouth Equestrian Team
2018-	American Association of University Professors, Communications Director
2018-	Faculty Advisor, Dartmouth Mental Health Student Union
2018-2021	Committee on Student Life (Chair, 2018-19 and 2019-2020)
2018-2020	Council on Academic Freedom & Responsibility
2021-2024	Council on Academic Freedom & Responsibility

## **Bibliography:**

### Original Manuscripts

1. Witters, L. A., Alberico, L., and Avruch, J. (1976) Insulin regulation of glycogen synthase in the isolated rat hepatocyte. *Biochem. Biophys. Res. Comm.* 69: 977-1003.

2. Witters, L. A., Herbert, P. N., Shulman, R. S., Krauss, R. A., and Levy, R. I. (1976) Therapeutic failure in familial type II hyperlipoproteinemia. *Metabolism* 25: 1017-1025.
3. Witters, L. A., Ohman, J. L., Weir, G. C., Raymond, L., and Lowell, F. C. (1977) Insulin antibodies in the pathogenesis of insulin allergy and resistance. *Amer. J. Med.* 63: 703-709.
4. Witters, L. A., Avruch, J. (1978) Insulin regulation of hepatic glycogen synthase and phosphorylase. *Biochemistry* 17: 406-410.
5. Avruch, J., Witters, L. A., Alexander, M. C., and Bush, M. A. (1978) The effects of glucagon and insulin on cytoplasmic protein phosphorylation in hepatocytes. *J. Biol. Chem.* 253: 4754-4761.
6. Avruch, J., Witters, L. A., Alexander, M. C., Bush, M. A., and Crapo, L. M. (1979) Insulin and the phosphorylation of intracellular proteins. *Proc. ICN/UCLA Symp. Transmembrane Signalling* 31: 621-628.
7. Witters, L. A., Kowaloff, E. M., and Avruch, J. (1979) Glucagon regulation of protein phosphorylation: Identification of acetyl-CoA carboxylase as a substrate. *J. Biol. Chem.* 254: 245-249.
8. Witters, L. A. and Trasko, C. T. (1979) Regulation of hepatic free fatty acid metabolism by insulin and glucagon. *Amer. J. Physiol.* 237: E23-E29.
9. Witters, L. A., Moriarty, D., and Martin, D. B. (1979) Regulation of hepatic acetyl-CoA carboxylase by insulin and glucagon. *J. Biol. Chem.* 254: 6644-6649.
10. Alexander, M. C., Kowaloff, E. M., Witters, L. A., Dennihy, D. T., and Avruch, J. (1979) Purification of a hepatic 123,000 dalton hormone-stimulated 32P-peptide and its identification as ATP-citrate lyase. *J. Biol. Chem.* 254: 8052-
11. Avruch, J., Witters, L. A., Alexander, M. C., Kowaloff, E. M., and Palmer, J. L. (1979) Insulin-stimulated protein phosphorylation: A progress report. *Proc. 10th International Congr. Diabetes Federation* 500: 185-190.
12. Witters, L. A. and Vogt, B. (1981) A new method for the isolation of rat liver acetyl-CoA carboxylase. *J. Lipid Res.* 22: 364-369.
13. Segre, G. V., Perkins, A. S., Witters, L. A., and Potts, J. T. Jr. (1981) Metabolism of parathyroid hormone by isolated rat Kupffer cells and hepatocytes. *J. Clin. Invest.* 67: 449-457.
14. Witters, L. A. (1981) Insulin stimulates the phosphorylation of acetyl-CoA carboxylase. *Biochem. Biophys. Res. Comm.* 100: 872-878.
15. Witters, L. A., Friedman, S. A., and Bacon, G. W. (1981) Microsomal acetyl-CoA carboxylase: evidence for association of enzyme polymer with liver microsomes. *Proc. Natl. Acad. Sci. USA* 78: 3639-3643.
16. Witters, L. A., Friedman, S. A., Tipper, J. P., and Bacon, G. W. (1981) Regulation of acetyl-CoA carboxylase by guanine nucleotides. *J. Biol. Chem.* 256: 8573-8578.
17. Avruch, J., Alexander, M. C., Palmer, J. L., Pierce, M. W., Nemenhof, R. A., Blackshear, P. J., Tipper, J. P., and Witters, L. A. (1982) The role of insulin-stimulated protein phosphorylation in insulin action. *Fed. Proc.* 41: 2629-2633.
18. Tipper, J. P. and Witters, L. A. (1982) In vitro phosphorylation and inactivation of rat liver acetyl-CoA carboxylase purified by avidin-affinity chromatography. *Biochim. Biophys. Acta* 715: 162-169.

19. Ingebritsen, T. S., Blair, J., Guy, P., Witters, L. A., and Hardie, D. G. (1983) The protein phosphatases involved in cellular regulation. 3. Fatty acid synthesis, cholesterol synthesis and glycolysis/gluconeogenesis. *Eur. J. Biochem.* 132: 275-281.
20. Holland, R., Witters, L. A., and Hardie, D. G. (1983) The effect of glucagon on acetyl-CoA carboxylase phosphorylation in hepatocytes. In: *Int. Symp. on Isolation, Characterization and Use of Hepatocytes*, R. A. Harris and N. W. Cornell (eds.), Elsevier Biomedical, New York, pp. 585-590.
21. Witters, L. A., Tipper, J. P., and Bacon, G. W. (1983) Stimulation of site-specific phosphorylation of acetyl coenzyme A carboxylase by insulin and epinephrine. *J. Biol. Chem.* 258: 5643-5648.
22. Tipper, J. P., Bacon, G. W., and Witters, L. A. (1983) Acetyl-CoA carboxylase protein kinase: isolation of two cAMP-independent kinases identical to casein kinase I and casein kinase II. *Arch. Biochem. Biophys.* 227: 386-396.
23. Holland, R., Witters, L. A., and Hardie, D. G. (1984) Glucagon inhibits fatty acid synthesis in isolated hepatocytes via phosphorylation of acetyl-CoA carboxylase by cyclic AMP- dependent protein kinase. *Eur. J. Biochem.* 140: 325-333.
24. Witters, L. A., Vater, C. E., and Lienhard, G. (1985) Phosphorylation of the glucose transporter in vitro and in vivo by protein kinase C. *Nature* 315: 777-778.
25. Witters, L. A. and Bacon, G. W. (1985) Protein phosphatases active on acetyl-CoA carboxylase phosphorylated by casein kinase I and II and the cAMP-dependent protein kinase. *Biochem. Biophys. Res. Comm.* 130: 1132-1138.
26. Blackshear, P. J., Witters, L. A., Girard, P. R., Kuo, J. F., and Quamo, S. N. (1985) Growth factor-stimulated protein phosphorylation in 3T3-L1 cells. *J. Biol. Chem.* 260: 13304-13315.
27. Glynn, B. P., Colliton, J. W., McDermott, J. M., and Witters, L. A. (1985) Assay of protein kinase C with an N-bromosuccinimide-cleavage fragment of histone H-1. *Biochem. J.* 231: 489-492.
28. Witters, L. A., Colliton, J. W., McDermott, J. M., Zhang, F., and Glynn, B. P. (1986) Regulation of adipocyte metabolism by insulin and phorbol esters: potential role of protein kinase C. In: *Mechanisms of Insulin Action*, P. Belfrage (ed.), Elsevier Press, pp. 229-237.
29. Blackshear, P. J., Wen, L., Glynn, B. P., and Witters, L. A. (1986) Protein kinase C-stimulated phosphorylation in vitro of a Mr 80,000 protein phosphorylated in response to phorbol esters and growth factors in intact fibroblasts. *J. Biol. Chem.* 261:1459-1469.
30. Blackshear, P. J., Wen, L., Nemenoff, R., Gunsalus, J. R., and Witters, L. A. (1986) Growth factor activation of protein kinase C-dependent and independent pathways of protein phosphorylation in fibroblasts. Relevance to activation of protein kinase C in neuronal tissues. In: *Prog. Brain Res.*, G. H. Gispén and A. H. Routtenberg (eds.), Elsevier Sci. Pub., Amsterdam, Chapter 16, pp. 183-195.
31. Glynn, B. P., Colliton, J. W., McDermott, J. M., and Witters, L. A. (1986) Phorbol esters, but not insulin, promote depletion of cytosolic protein kinase C in rat adipocytes. *Biochem. Biophys. Res. Comm.* 135: 1119-1125.
32. Witters, L. A. (1986) Protein kinases and phosphatases active on acetyl-CoA carboxylase. *Adv. Prot. Phosphatases* 3:201-224.
33. Witters, L. A. and McDermott, J. M. (1986) Regulation of acetyl-CoA carboxylase by ADP-ribosylation. *Biochemistry* 25:7216-7220.



34. Witters, L. A., Mendel, D. W., and Colliton, J. W. (1987) Modulation of acetyl-CoA carboxylase by inhibitors of IMP dehydrogenase. *Arch. Biochem. Biophys.* 252:130-135.
35. Allard, W. J., Gibbs, E. M., Witters, L. A., and Lienhard, G. E. (1987) The glucosetransporter in human fibroblasts is phosphorylated in response to phorbol ester but not in response to growth factors. *Biochim. Biophys. Acta* 929:288-295.
36. Witters, L. A. and Watts, T. D. (1988) An autocrine factor from Reuber hepatoma cells that stimulates DNA synthesis and acetyl-CoA carboxylase: Characterization of biologic activity and evidence for a glycan structure. *J. Biol. Chem.* 263: 8027-8036.
37. Evans, J. L. and Witters, L. A. (1988) Quantitation by immunoblotting of the in vivo induction and subcellular distribution of hepatic acetyl-CoA carboxylase. *Arch. Biochem. Biophys.* 264: 103-113.
38. Witters, L. A., Watts, T. D., Daniels, D. L., and Evans, J. L. (1988) Insulin stimulates the dephosphorylation and activation of acetyl-CoA carboxylase, *Proc. Natl. Acad. Sci. USA* 85: 5473-5477.
39. Witters, L. A., Watts, T. D., Gould, G. W., Lienhard, G. E., and Gibbs, E. M. (1988) Regulation of protein phosphorylation by insulin and an insulinomimetic oligosaccharide in 3T3-L1 adipocytes and Fao hepatoma cells. *Biochem. Biophys. Res. Comm.* 153, 992-998.
40. Vivier, P. M., Dietrich, A. J., and Witters, L. A. (1988) Management of elevated cholesterol levels by New Hampshire primary care physicians: Report of a survey. *Family Practice* 27, 167-172.
41. Evans, J. L., Quistorff, B., and Witters, L. A. (1989) Zonation of hepatic lipogenic enzymes identified by dual digitonin pulse perfusion. *Biochem. J.* 259:821-829.
42. Bianchi, A., Evans, J. L., Watts, T. D. and Witters, L. A. (1990) Identification of an isozymic form of acetyl-CoA carboxylase. *J. Biol. Chem.*, 265, 1502- 1508.
43. Iverson, A.J., Nordlund, A-C., and Witters, L.A. (1990), Immunologic Analysis of acetyl-CoA carboxylase mass, tissue distribution and subunit composition, *Biochem. J.*, 269, 365-371.
44. Evans, J.L., Quistorff, B. and Witters, L.A. (1990), Hepatic zonation of acetyl-CoA carboxylase activity, *Biochem. J.*, 270, 665-672.
45. Witters, L.A. and Watts, T.D. (1990), Yeast acetyl-CoA carboxylase: in vitro phosphorylation by mammalian and yeast protein kinases, *Biochem. Biophys. Res. Comm*, 169, 369-376.
46. Bianchi, A., Quistorff, B. and Witters, L.A. (1990), Hepatic Zonation of Insulin-Stimulated Tyrosine Phosphorylation, *FEBS Lett.*, 269, 435-439.
47. Witters, L.A. (1990), Protein phosphorylation and dephosphorylation, *Current Opinion in Cell Biology*, 2 (No. 2), 212-220.
48. Quistorff, B. Rømert, P. Evans, J.L. and Witters, L.A. (1991) In: *Regulation of Hepatic Function: Metabolic and Structural Interactions*, Alfred Benzon Symp. No. 30, (eds: N Grønnet and B. Quistorff), Munksgaard, Copenhagen, 50-67.
49. Witters, L.A. , Nordlund, A.-C. And Marshall, L. (1991) Reversible Inhibition of Cellular Acetyl CoA Carboxylase by ATP Depletion: Evidence for the Involvement of the 5'-AMP-Stimulated Protein Kinase, *Biochem. Biophys. Res. Comm.*, 181, 1486-1492.
50. Bianchi, A., Evans, J.L., Nordlund, A.-C., Watts, T. D., and Witters, L. A. (1991) Acetyl-CoA carboxylase in Reuber hepatoma cells: covariation of enzyme activity, insulin regulation and neutral lipid content, *J. Cell. Biochem.*, 48, 86- 97.
51. Lynch, C. J., McCall, K. M., Billingsley, M. L., Hreniuk, S. P., Martin, L. F., Witters, L. A., and Vannucci, S. J. (1992) Pyruvate carboxylase in obesity. *Am. J. Physiol.* 262: E608-E618.

52. Louis, N. and Witters, L.A. (1992), Glucose regulation of acetyl-CoA carboxylase in hepatoma and islet cells, *J. Biol. Chem.*, 267, 2287-2293.
53. Witters, L.A. and Kemp, B.E. (1992) Insulin activation of acetyl-CoA carboxylase accompanied by inhibition of the 5'-AMP-activated protein kinase, *J. Biol. Chem.*, 267, 2864-2867.
54. Quistorff, B, Katz, N. and Witters, L.A. (1992) Hepatocyte Heterogeneity in the Metabolism of Fatty Acids: Discrepancies in the Hepatic Zonation of Acetyl-CoA Carboxylase, *Enzyme*, 46, 59-71.
55. Spencer, E.B., Bianchi, A., Widmer, J. and Witters, L.A. (1993) Brain acetyl-CoA carboxylase: Identification of the brain isozyme and studies of its regulation during development and altered nutrition, *Biochem. Biophys. Res. Comm.*, 192, 820-825.
56. Witters, L.A., Christiansen, A. Fassihi, K., King, A. N., Widmer, J. and Quistorff B. (1993) Application of Dual-Digitonin Pulse Perfusion to the Study of Hepatic mRNA Zonation, *Biochem. J.*, 294, 809-812.
57. Saddik, M., Gamble, J., Witters, L.A. and Lopaschuk, G.D. (1993) Acetyl-CoA Carboxylase Regulation of Fatty Acid Oxidation in the Heart, *J. Biol. Chem.*, 268, 25836-25845.
58. Kinlaw, W. B., Tron, P., and Witters, L. A. (1993) Thyroid hormone and dietary carbohydrate induce different hepatic zonation of both "spot 14" and acetyl-coenzyme-A carboxylase: a novel mechanism of coregulation. *Endocrinology*, 133:645-50.
59. Witters, L. A., Gao, G. Kemp, B.E. and Quistorff, B. (1994) Hepatic 5'-AMP- Activated Protein Kinase: Zonal Distribution and Relationship to Acetyl-CoA Carboxylase Activity in Varying Nutritional States, *Arch. Biochem. Biophys.*, 308, 413-419.
60. Witters, L.A., Widmer, J., King, A.N., Fassihi, K. and Kuhajda, F. (1994) Identification of Human Acetyl-CoA Carboxylase Isozymes in Tissue and in Breast Cancer Cells, *Int. Biochem.*, 26: 589-594.
61. Mitchellhill, K.I., Stapleton, D.A., Gao, G., House, C., Michell, B., Witters, L.A. and Kemp, B.E. (1994) Mammalian AMP-activated Protein Kinase Shares Structural and Functional Homology with the Catalytic Domain of Yeast snf1 Protein Kinase, *J. Biol. Chem.*, 269, 2361-2364.
62. McMillin, J.B., Wang, D., Witters, L.A. and Buja, L.M. (1994) Kinetic Properties of Carnitine Palmitoyltransferase I in Cultured Neonatal Rat Cardiac Myocytes, *Arch Biochem. Biophys.*, 312, 375-384.
63. Lopaschuk, G.D., Witters, L.A., Itoi, T., Barr, R. and Barr, A. (1994) Acetyl CoA Carboxylase Involvement in the Rapid Maturation of Fatty Acid Oxidation in the Newborn Rabbit Heart, *J. Biol. Chem.*, 269, 25871-25878.
64. Stapleton, D. A., Gao, G., Michell, B., Widmer, J., Mitchellhill, K, Teh, House, C.M. , Witters, L.A. and Kemp, B.E. (1994) Mammalian 5'-AMP-activated protein kinase non-catalytic subunits are homologs of proteins that interact with the yeast SNF1 protein kinase, *J. Biol. Chem.*, 269, 29343-29346.
65. Gao, G., Widmer, J., Stapleton, D. A., Teh, T., Cox, T., Kemp, B.E. and Witters, L.A. (1995) The Catalytic Subunit of the 5'-AMP-activated Protein Kinase: cDNA Cloning and mRNA Distribution, *Biochim. Biophys. Acta.*, 1266, 73- 82.
66. Stapleton, D., Mitchellhill, K., Gao, G., Widmer, J., Michell, B., Teh, T., House, C.M., Fernandez, S.C., Cox, T. , Witters, L.A. and Kemp, B.E. (1996), A Mammalian AMP-Activated Protein Kinase Subfamily, *J. Biol. Chem.*, 271, 611-614.

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68. Gao, G., Stapleton, D., Auster, A.S., Fernandez, S.C., Widmer, J., Kemp, B.E. and Witters, L.A. (1996), Non-catalytic Beta and Gamma Subunit Isoforms of the 5'-AMP-activated Protein Kinase, *J. Biol. Chem.*, 271, 8675-8681.
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