

CURRICULUM VITAE

Ira Tabas, M.D., Ph.D.

Richard J. Stock Professor and Vice-Chair of Research, Department of Medicine
Professor of Pathology & Cell Biology (in Physiology and Cellular Biophysics)
Columbia University Irving Medical Center

I. Date of preparation

September, 2021

II. Personal data

Name: Ira Abram Tabas

Birth date: April 22, 1953

Birthplace: Philadelphia, Pennsylvania

Citizenship: USA

Office address: Department of Medicine, PH 8East-105F, Columbia University 630 West 168th Street,
New York, NY 10032

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III. Academic training

Undergraduate: Tufts University (Medford, MA), 1975, B.S.

Graduate: Washington University (St. Louis, MO), 1981, M.D., Ph.D. Biochemistry)

Ph.D. Thesis: "The Processing of Asparagine-Linked Oligosaccharides During Glycoprotein
Biosynthesis"; Dr. Stuart Kornfeld, Sponsor

M.D. Licensure: State of New York (#150522)

IV. Traineeship

Internship/Residency: Internal Medicine, Columbia-Presbyterian Medical Center, New York, NY
(1981-1983)

Clinical Fellowship: Endocrinology/Metabolism, Columbia-Presbyterian Medical Center, New York,
NY (1983-1985)

Research Fellowship: Laboratory of Dr. Alan Tall, Department of Medicine, Columbia University, New
York, NY, 1983-1985

V. Board certification

Internal Medicine, 1985

Endocrinology/Metabolism, 1987

VI. Professional organizations and societies

Arteriosclerosis, Thrombosis, and Vascular Biology as Council of the American Heart Association;
Membership/Credentials Committee (1990-1992, 1997-1999); Program Committee (1992-1994;
2000-2002; 2009-2011), and Executive Board (2010)

American Society of Biochemists and Molecular Biologists

American Association for the Advancement of Science

American Society for Cell Biology

Society of Leukocyte Biology

New York Lipid Club

Interurban Clinical Club

American Society for Clinical Investigation

Association of American Physicians

American Diabetes Association

VII. Academic appointments

Assistant Professor of Medicine, Columbia University College of Physicians and Surgeons, New York, NY (1985-1992)

Assistant Professor of Anatomy & Cell Biology, Columbia University College of Physicians and Surgeons, New York, NY (1988-1992)

Associate Professor of Medicine and Anatomy & Cell Biology (**Tenured**), Columbia University College of Physicians and Surgeons, New York, NY (1992-1997)

Professor of Medicine and Anatomy & Cell Biology (**Tenured**), Columbia University College of Physicians and Surgeons, New York, NY (1997-present)

Professor of Physiology and Cellular Biophysics (**Tenured**), Columbia University College of Physicians and Surgeons, New York, NY (2004-present)

Vice-Chairman of Research, Department of Medicine, Columbia University (2004-present)

VIII. Hospital appointments

Assistant Attending Physician of Medicine, Columbia-Presbyterian Medical Center, New York, NY (1985-1992)

Associate Attending Physician of Medicine, Columbia-Presbyterian Medical Center, New York, NY (1992-1997)

Attending Physician of Medicine, Columbia University Medical Center, New York, NY (1997-present)

IX. Honors

Phi Beta Kappa, Tufts University, Medford, MA (1974)

Summa cum laude, Tufts University, Medford, MA (1975)

Mosby Scholarship Book Award, Washington University School of Medicine (1981)

Alpha Omega Alpha, Washington University School of Medicine, St. Louis (1981)

Pfizer Research Award for Young Faculty (1985-1987)

Silberberg Assistant Professorship of Medicine, Columbia University (1988-1993)

American Heart Association Established Investigator Award (1988-1993)

Doctor Harold and Golden Lamport Research Award (1990)

Elected to the American Society for Clinical Investigation (1992)

Named Chair, Columbia University: Richard J. Stock Professor of Medicine (2000-present)

Elected to Association of American Physicians (1998-present)

Elected Deputy Editor, *Journal of Clinical Investigation*, (2002-2007)

American Heart Association/ATVB Council Special Recognition Award (2003)

David Rubinstein Lectureship of the Canadian Lipoprotein Conference (2005)

Alumni Achievement Award, Washington University School of Medicine (2011)

Elected to Board of Reviewing Editors for *Science* (2011 -)

Keynote Lecture, Australian Atherosclerosis Society (2011)

Terman Lectureship, Albert Einstein College of Medicine (2011)

2014 Bonazinga award: "Presented annually to a Society of Leukocyte Biology member for excellence in leukocyte biology research. It is the highest honor the society can bestow upon one of its members and has been awarded annually since 1980."

2015 Harrington Scholar-Innovator Award, Harrington Discovery Institute, University Hospitals, Cleveland, OH

2016 University of Washington (Seattle) 2016 Annual Russell Ross Invited Lectureship

2016 American Heart Association Russell Ross Memorial Lectureship Award in Vascular Biology

2018 Outstanding Investigator Award (R35), National Heart, Lung, and Blood Institute

2018 Distinguished Lecturer for National Institute of Environment Health Sciences
 2019 Arthur C. Fox Visiting Professorship and Lecture, NYU School of Medicine
 Keynote lecture—2019 Gordon Research Conference on Phagocytosis
 Keynote lecture—2019 European Lipid Club
 2019 Dean's Distinguished Lecture, Columbia University Irving Medical Center
 2019 Hugh Sinclair Memorial Lecture, British Atherosclerosis Society
 2020 Journal of Lipid Research Award Lecture, Deuel Conference on Lipids

Conference Chairs and Boards

External Advisory Committee, Deuel Research Conferences (2004-2009)
 Scientific Board, Kern Lipid Conference (2005-2010)
 Scientific Board, Deuel Lipid Conference (2005-2010)
 Chairman, 2005 Keystone Symposium on the Cellular Biology of Atherosclerosis
 Chairman, 2010 Gordon Conference on Lipoprotein Metabolism
 Co-Chair, 2011 Kern Lipid Conference
 Chairman, 2012 Deuel Lipid Conference
 Co-Chairperson, 2018 Keystone Symposium on Inflammation Resolution

X. Grant support

1 R35HL145228-01-Outstanding Investigator Award (Tabas, PI) A Mechanistic and Translational Research Program Linking Impaired Resolution, Defective Efferocytosis, and Clonal Hematopoiesis to the Formation of Clinically Dangerous Atherosclerotic Plaques Goals: To understand links among impaired resolution, defective efferocytosis, and clonal hematopoiesis in atherosclerosis	3/07/19 - 2/28/26
P01 HL087123-11A1 (Tabas, overall PI and PI of Project 1) Mechanisms of Atherogenesis in Insulin Resistance Project 1: CaMKII/MK2 Signaling in Cardiometabolic Disease Goals: To understand the role of hepatocyte and macrophage CaMKII in insulin resistance and atherosclerosis	1/01/19 - 12/31/23
1 R01DK116620 (Tabas, MPI) TAZ and YAP in Non-Alcoholic Steatohepatitis and its Complications Goals: To understand the roles of TAZ and YAP in steatosis, NASH, and hepatocellular carcinoma	2/1/18 - 1/31/23
Fondation Leducq grant number 18CVD04 (Tabas, Project leader) Clonal Hematopoiesis and Atherosclerosis Goal: To elucidate mechanisms linking CH to atherosclerosis and to assess potential therapeutic interventions.	1/01/18 - 12/31/21
1 R01 HL127464 NIH/NHLBI (Tabas, MPI) Enhancing Inflammation Resolution in Atherosclerosis via Targeted Nanoparticle-Mediated Delivery of Biologics Goals: To elucidate the mechanisms that promote clinically significant atherosclerosis and then use this knowledge to design nanoparticle-mediated therapies.	1/1/16 - 12/31/19 (no cost extension)
1 R01 HL132412 NIH/NHLBI (Tabas, PI) MerTK Cleavage and Signaling in Atherosclerosis Goals: To study the impact of MerTK cleavage in efferocytosis, inflammation resolution, and advanced atherosclerosis	4/1/16 - 3/31/21 (relinquished for R35)

XI. Departmental and university committees

Faculty advisor for Columbia University College of Physicians and Surgeons medical students (1986-1994)
Member of the Columbia University Research Advisory Committee for first year medical student summer research projects (1990)
Member of the Department of Medicine Resident Selection Committee (1990-present)
Organizer of the Department of Medicine Young Faculty Research Conference (1990-1992)
Member of Department of Medicine Subcommittee on Research (1991) and Committee for Organizing Departmental Retreat (1995)
Member of Doctoral Program Subcommittee on Nutrition (1991-present)
Co-Director of Basic Research Track of the CPMC Internal Medicine Residency Program (1992-1997),
Scientific Advisory and Executive Committee, Medical Scientist Training (MD-PhD) Program, Columbia University (1993-present)
Member, Curriculum Committee of the College of Physicians & Surgeons (1997-2002)
Co-Associate Director, Medical Scientist Training (MD-PhD) Program, Columbia University (2001-present)
Chairman, Committee on Promotions of the Department of Medicine (1997-2004)
Member of Search Committees for Director of Pathology, St. Luke's Roosevelt Hosp. (1992), Chairperson of the Department of Pharmacology, Columbia University (1994-1995), Chairperson-Division of Cardiology, Columbia University (1999), Director of the Irving Center for Cancer Research (2004), Chairperson-Division of Oncology (2005)
Member, Dean's Scientific Advisory Committee (2007 - 2009)
Vice-Chair of Research, Department of Medicine (2007-present)
Director of the Department of Medicine Young Faculty Mentoring Program (2007 - present)

XII. Teaching experience and responsibilities

Specific courses:

Medical Student Preceptor (1989, 1991, 1994, 1996), 6 students
Abnormal Human Biology, Atherosclerosis session preceptor (1987-present), 30 students
Cellular Membranes graduate course (Department of Anatomy & Cell Biology), LDL receptor and intracellular cholesterol metabolism sessions (1987-present), 30 students
Pharmacology graduate student course, LDL receptor session (1989-1993), 20 students
Histology medical student course, microcirculation session (1989-1994), 200 students
Advanced pathophysiology course for fourth year medical, atherosclerosis sessions (1990-1996), 40 students
Pathology graduate student course (Molecular Mechanisms of Disease), organizer and lecturer of Atherosclerosis section (1991-present), 15 students
Science Basic to the Practice of Medicine (formerly Biochemistry of Disease) medical student course, Atherosclerosis session (1992-present), 120 students
Pathophysiology course for 2nd-year medical students, Atherosclerosis session (1997-present), 120 students
Molecular and Cellular Biology of Nutrients, Apoptosis section (2001-2010), 15 students
Molecular and Cellular Cardiology Lecture Series (1998-2010), 15 fellows
Molecular Pathophysiology of the Cardiovascular System (2007-present), 20 graduate students
Cardiovascular T32 Course "How to Make a Drug" (2014-present), 20 graduate students
Molecular Mechanisms Basic Tissues Healthy and Sick (2014-present), 120 medical students

General teaching activities:

Attending on Internal Medicine ward service (1985-present), 2-3 students and 3 housestaff physicians

Attending on Endocrinology ward service (1987-present), 1-2 students and 1 fellow

Ph.D. Thesis sponsor:

Lori Bottalico, Department of Anatomy/Cell Biology, Columbia University (1989-1992)

Scott Schissel, Department of Anatomy/Cell Biology, Columbia University (1993-1997)

Andrew Leventhal, Department of Anatomy/Cell Biology, Columbia University (2000-2004)—

Winner of the 2004 Samuel W. Rover and Lewis Rover Award for Scholarship and Outstanding Achievement in Anatomy and Cell Biology

Ying Wang, Department of Physiology, Columbia University (2010 -)

Master's thesis sponsor:

Sungtae Lim, Institute of Human Nutrition, Columbia University (1989)

Woan-Chyng Su, Institute of Human Nutrition, Columbia University (1990)

Ph.D. Advisory/Examination committees:

Deborah A. Lazzarino, Department of Anatomy/Cell Biology, Columbia University (Ph.D. advisory committee and examination, 1987-1990)

Shing-Jong Lin, Department of Physiology, Columbia University (Ph.D. examination, 1989)

Maria Davila-Bloom, Institute of Human Nutrition, Columbia University (Ph.D. examination, 1989)

Fan Yuan, Department of Engineering, The City University of New York (Ph.D. examination, 1990-1993)

Lester S. Johnson, Department of Pathology, Columbia University, Ph.D. thesis committee (1990-1993)

Steven Rumsey, Institute of Human Nutrition, Ph.D. thesis committee (1992-1993)

Thomas E. Phalen, Albert Einstein College of Medicine, Ph.D. thesis defense committee (1993)

Sripriya Chari, Integrated Program in Cellular, Molecular, and Biophysical Studies, Qualifying Examination (1993)

Zhenglun Zhu, Department of Anatomy/Cell Biology, Columbia University (Ph.D. advisory committee and examination, 1991-1993)

Lori Masucci, Institute of Human Nutrition, Ph.D. thesis committee (1993-1996)

Cory Huang, Department of Pathology, Ph.D. thesis committee (1995)

Mingyue Zhou, Institute of Human Nutrition, Ph.D. thesis committee (1995-)

Hong-yuan Yang, Institute of Human Nutrition, Ph.D. thesis committee (1995-)

Donata Paresce, Department of Pathology, Ph.D. thesis committee (1997)

Furcy Paultre, Institute of Human Nutrition, Ph.D. thesis committee (1997-)

Chris William, Integrated Program. Ph.D. qualifying exam (1997)

Nrgo Storey, Department of Biochemistry, Dalhousie University, Ph.D. examination, 1997

Peter Sartipy, Wallenberg Laboratory, University of Gothenburg, Sweden, opponent, 2000

Ying Lui, Institute of Human Nutrition, Ph.D. thesis committee (1999-)

Edward Cha, Department of Microbiology, Ph.D. thesis committee (2000-2005)

Yu Sun, Institute of Human Nutrition, Ph.D. thesis committee (1997-2002)

Dorien Schrijvers, University of Antwerp, Belgium, jury member, 2007

Suzhao Li, Institute of Human Nutrition, Ph.D. thesis committee (2006-2011)

Caryn Sheckman, Institute of Human Nutrition, Ph.D. thesis committee (2007-2012)

David Crider, Department of Pathology & Cell Biology, Ph.D. these committee (2007-2009)

Mi Wang, Department of Pharmacology, Ph.D. these committee (2010-2014)

Elizabeth J. Millings, Department of Medicine, Ph.D. thesis committee (2014-2017)

Chanhyu Zhu, Department of Medicine, Ph.D. thesis committee (2015-2019)
Tiara P. Ahmad, Department of Pathology, Ph.D. thesis committee (2016-2019)
David Thomas, Department of Medicine, Ph.D. thesis committee (2016-2019)
Anna Potenski, Department of Pathology & Cell Biology Ph.D. thesis committee (2019-present)

XIII. Other professional activities

Reviewer of over 3000 manuscripts for *Science*, *Nature*, *Nature Medicine*, *Nature Cell Biology*, *Nature Immunology*, *Cell Metabolism*, *Immunity*, *Blood*, *Journal of Clinical Investigation*, *Journal of Biological Chemistry*, *Arteriosclerosis, Thrombosis, and Vascular Biology*, *Journal of Lipid Research* (1985-present)
Editorial Board of *Journal of Biological Chemistry* (1995-2000)
Ad hoc grant reviewer for National Science Foundation (1989-present)
Sub-group reviewer for American Heart Association Established Investigator and Clinical Scientist Award grants (1991 & 1992)
Member of American Heart Association grant-in-aid study section (1992-1993)
Member Scientific Board of the Stanley J. Sarnoff Endowment for Cardiovascular Science, Inc. (1992-1996)
Vice-chairman of American Heart Association grant-in-aid study section (1994)
Consultant for Merck, Schering-Plough, Warner-Lambert, Berlex, Eli Lilly, Pfizer, Talaria Biotech, ReddyUS, Amersham/GE, and Bristol-Myers-Squibb, Novartis, Sankyo, Lipimetix
Institutional representative for the American Society of Clinical Investigation (1998-2000)
Co-Editor of October 2000 and 2001 issues of *Current Opinion in Lipidology*
Organizer and Chairman, Keystone Conference on the Cellular Biology of Atherosclerosis (2005)
External Advisory Committee, Deuel Research Conferences (2004-2012)
Scientific Board, Kern Lipid Conference (2005-2010)
General Council and Review Panel for Future Leaders Grant Program, The Leadership Council for Improving Cardiovascular Care (2005-)
Editorial Board of *BBA - Molecular and Cell Biology of Lipids* (2008-)
Chairman, 2010 Gordon Conference on Lipoprotein Metabolism
Board of Reviewing Editors for *Science* (2011 -)
Charter member NIH Study Section: Atherosclerosis and Inflammation of the Cardiovascular System (2011-2017)

XIV. Publications (* indicates that Dr. Tabas is a senior/communicating author)

Citation Report: h-index = 103; total citations = 46,291

Original, peer-reviewed articles:

1. Tabas, I., Schlesinger, S. and Kornfeld, S. (1978) Processing of high mannose oligosaccharides to form complex type of oligosaccharides on the newly synthesized polypeptides of the vesicular stomatitis virus G protein and the IgG heavy chain. *J. Biol. Chem.* **253**:716-722.
2. Li, E., Tabas, I. and Kornfeld, S. (1978) The synthesis of complex type of oligosaccharides. I. Structure of the lipid-linking oligosaccharide precursor of the complex type oligosaccharides of the vesicular stomatitis virus G. protein. *J. Biol. Chem.* **253**:7762-7770.
3. Kornfeld, S., Li, E. and Tabas, I. (1978) The synthesis of complex type oligosaccharides. II. Characterization of the processing intermediates in the synthesis of the complex oligosaccharide units of the vesicular stomatitis virus G protein. *J. Biol. Chem.* **253**:7771-7778.

4. Tabas, I., and Kornfeld, S. (1978) The synthesis of complex type oligosaccharides. III. Identification of an α -D-mannosidase activity involved in a late stage of processing of complex type oligosaccharides. *J. Biol. Chem.* **253**:7779-7786.
5. Tabas, I. and Kornfeld, S. (1979) Purification and characterization of a rat liver Golgi α -mannosidase capable of processing asparagine-linked oligosaccharides. *J. Biol. Chem.* **254**:11655-11663.
6. Tabas, I., and Kornfeld, S. (1980) Biosynthetic intermediates of β -D-glucuronidase contain high mannose oligosaccharides with blocked phosphate residues. *J. Biol. Chem.* **255**:6633-6639.
- *7. Tabas, I., and Tall, A.R. (1984) Mechanism of the association of HDL with endothelial cells, smooth muscle cells, and fibroblasts. *J. Biol. Chem.* **259**:13897-13905.
- *8. Tabas, I., Weiland, D.A. and Tall, A. (1985) Unmodified LDL causes cholesteryl ester accumulation in J774 macrophages. *Proc. Natl. Acad. Sci. USA* **82**:416-420.
- *9. Tabas, I., Weiland, D.A. and Tall, A. (1985) Inhibition of acyl coenzyme A:cholesterol acyl transferase in J774 macrophages enhances down-regulation of the low density lipoprotein (LDL) receptor and 3-hydroxy-3-methylglutaryl-coenzyme A reductase and prevents LDL-induced cholesterol accumulation. *J. Biol. Chem.* **261**:3147-3155.
10. Tall, A.R., Tabas, I. and Williams, K. (1986) Lipoprotein-liposome interactions. *Methods Enzymol.* **128**:647-657.
11. Williams, K.J., Tall, A.R., Tabas, I. and Blum, C. (1986) Recognition of vesicular lipoproteins by the apolipoprotein B, E receptor of cultured fibroblasts. *J. Lipid. Res.* **27**:892-900.
12. Tall, A., Granot, E., Brocia, R., Tabas, I., Hesler, C., Williams, K. and Denke, M. (1986) Accelerated transfer of cholesteryl esters in dyslipidemic plasma: Role of cholesteryl ester transfer protein. *J. Clin. Invest.* **79**:1217-1225.
- *13. Tabas, I., Boykow, G.C., Tall A.R. (1986) Foam cell-forming J774 macrophages have markedly elevated LDL-induced acyl coenzyme A:cholesterol acyl transferase activity compared to mouse peritoneal macrophages despite similar LDL receptor activity. *J. Clin. Invest.* **79**:418-426.
14. Granot, E., Tabas, I. and Tall, A.R. (1987) Human plasma cholesteryl ester transfer protein enhances the uptake of HDL cholesteryl esters by cultured hepatoma (HepG2) cells. *J. Biol. Chem.* **262**:3482-3487.
- *15. Tabas, I. and Boykow, G.C. (1987) Protein synthesis inhibition in mouse peritoneal macrophages results in increased acyl coenzyme A:cholesterol acyl transferase activity and cholesteryl ester accumulation in the presence of native low density lipoprotein. *J. Biol. Chem.* **262**:12175-12181.
- *16. Tabas, I., Rosoff, W.J., and Boykow, G.C. (1988) Acyl coenzyme A:cholesterol acyl transferase in macrophages utilizes a cellular pool of cholesterol oxidase-accessible cholesterol as substrate. *J. Biol. Chem.* **263**:1266-1272.
- *17. Khoo, J.C., Miller, E., McLoughlin, P., Tabas, I., and Rosoff, W.J. (1989) Cholesterol esterification as a limiting factor in accumulation of cell cholesterol: a comparison of two J774 macrophage cell lines. *Biochem. Biophys. Acta* **1012**:215-217.

- *18. Tabas, I., Feinmark, S., and Beatini, N. (1989) The reactivity of desmosterol and other shellfish and xanthomatosis-associated sterols in the macrophage sterol esterification reaction. *J. Clin. Invest.* **84**:1713-1721.
- *19. Tabas, I., Chen, L-L., Clader, J., McPhail, A.T., Burnett, D.A., Bartner, P., Das, P.R. Pramanik, B.N., Puar, M.S., Feinmark, S.J., Zipkin, R.E., Boykow, G., Vita, G., and Tall, A.R. (1990) Rabbit and human liver contain a novel pentacyclic triterpene ester with acyl-CoA:cholesterol acyl transferase-inhibitory activity. *J. Biol. Chem.* **265**:8042-8051.
- *20. Tabas, I., Lim, S., Xu, X., and Maxfield, F.R. (1990) Endocytosed β -VLDL and LDL are delivered to different intracellular vesicles in mouse peritoneal macrophages. *J. Cell Biol.* **111**:929-940
21. Hussain, M.M., Maxfield, F.R., Mas-Oliva, J., Tabas, I., Ji, Z-S, Innerarity, T.L., and Mahley, R.W. (1990) Clearance of chylomicron remnants by the low density lipoprotein receptor-related protein/ α_2 -macroglobulin receptor. *J. Biol. Chem.* **266**:13936-13940.
- *22. Xu, X., and Tabas, I. (1991) Lipoproteins activate acyl-CoA:cholesterol acyl transferase only after cholesterol pools are expanded to a critical threshold level. *J. Biol. Chem.* **266**:17040-17048.
- *23. Tabas, I., Beatini, N., Clader, J.W., Dugar, S., and Su, W-C. (1991) Identification of a novel triterpene fatty acyl esterifying activity in rabbit and human intestine. *J. Lipid Res.* **32**:1689-1698.
- *24. Bottalico, L.A., Wagner, R.E., Agellon, L.B., Assoian, R.K., and Tabas, I. (1991) Transforming growth factor- β 1 inhibits scavenger receptor activity in THP-1 human macrophages. *J. Biol. Chem.* **266**:22866-22871.
- *25. Tabas, I., Myers, J., Innerarity, T.L., Xu, X., Arnold, K., Boyles, J., and Maxfield, F.R. (1991) The influence of particle size and apoprotein E-receptor interactions on the endocytic targeting of β -VLDL in mouse peritoneal macrophages. *J. Cell Biol.* **115**:1547-1560.
- *26. Xu, X., and Tabas I. (1991) Sphingomyelinase enhances low density lipoprotein uptake and ability to induce cholesteryl ester accumulation in macrophages. *J. Biol. Chem.* **266**:24849-24858.
- *27. Bottalico, L.A., Kendrick, N.C., Keller, A., Li, Y., & Tabas, I. (1993) Cholesteryl ester loading of mouse peritoneal macrophages is associated with changes in the expression or modification of specific cellular proteins including an increase in an isoform of α -enolase. *Arterio. Thromb.* **13**:264-275.
- *28. Bottalico, L.A., Keesler, G.A., Fless, G.M., and Tabas, I. (1993) Cholesterol loading of macrophages leads to marked up-regulation of native lipoprotein(a) and apoprotein(a) internalization and degradation. *J. Biol. Chem.* **268**:8569-8573.
- *29. Tabas, I., Li, Y., Brocia, R., Swenson, T.L., and Williams, K.J. (1993) Lipoprotein lipase and sphingomyelinase enhance the association of atherogenic lipoproteins with smooth muscle cells and extracellular matrix: a possible mechanism for low density lipoprotein and lipoprotein(a) retention and macrophage foam cell formation. *J. Biol. Chem.* **268**:20419-20432.
- *30. Myers, J.N., Tabas, I. and Maxfield, F.R. (1993) Characterization of widely-distributed endocytic compartments resulting from the endocytosis of β -VLDL in mouse peritoneal macrophages. *J. Cell Biol.* **123**:1389-1402.

- *31. Okwu, A.K., Xu, X., Shiratori, Y., and Tabas, I. (1994) Cellular sphingomyelin content influences the threshold for acyl-CoA:cholesterol acyltransferase stimulation by lipoproteins in macrophages. *J. Lipid Res.* **35**:644-655.
- *32. Shiratori, Y., Okwu, A.K., and Tabas, I. (1994) Free cholesterol loading of macrophages stimulates phosphatidylcholine biosynthesis and up-regulation of CTP:phosphocholine cytidyltransferase. *J. Biol. Chem.* **269**:11337-11348.
- *33. Keesler, G.A., Li., Skiba, P.J. Fless, G.M., and Tabas, I. (1994) The macrophage foam cell lipoprotein(a)/apoprotein(a) receptor: cell-surface localization, dependence of induction on new protein synthesis, and ligand specificity. *Arterio. Thromb.* **14**:1337-1345.
- *34. Skiba, P.J., Keesler, G.A., and Tabas, I. (1994) Interferon-gamma down-regulates the foam cell lipoprotein(a)/apoprotein(a) receptor activity. *J. Biol. Chem.* **269**:23059-23067.
- *35. Tabas, I., Zha, X., Myers, J.N., and Maxfield, F.R. (1994) The actin cytoskeleton is important for the stimulation of acyl-coenzyme A:cholesterol O-acyltransferase activity by β -VLDL and acetyl-LDL in macrophages. *J. Biol. Chem.* **269**:22547-22556.
36. Granot, E., Schwiegelshohn, B., Tabas, I., Gorecki, M., Vogel, T., Carpenter, Y.A., and Deckelbaum, R.J. (1994) Effects of particle size on cell uptake of model triglyceride-rich particles with and without apoprotein E. *Biochemistry* **33**:15190-15197.
- *37. Schissel, S.L., Beatini, N., Zha, X., Maxfield, F.R., and Tabas, I. (1995) Effect and cellular site of action of cysteine protease inhibitors on the cholesterol esterification pathway in macrophages and Chinese hamster ovary cells. *Biochemistry* **34**:10463-10473.
- *38. Shiratori, Y., Houweling, M., Zha, X., and Tabas, I. (1995) Stimulation of CTP:phosphocholine cytidyltransferase by free cholesterol loading of macrophages involves signaling through protein dephosphorylation. *J. Biol. Chem.* **270**:29894-29903.
39. Wang, N., Tabas, I., Winchester, R., Ravalli, S., Rabbani, L.E., and Tall, A. (1996) Interleukin-8 is induced by cholesterol loading of macrophages and expressed in macrophage foam cells in human atheroma. *J. Biol. Chem.* **271**:8837-8842.
- *40. Skiba, P.J., Zha, X., Maxfield, F.R., Schissel, S.L., and Tabas, I. (1996) The distal pathway of lipoprotein-induced cholesterol esterification, but not sphingomyelinase-induced cholesterol esterification, is energy-dependent. *J. Biol. Chem.* **271**:13392-13400.
- *41. Schissel, S.L., Schuchman, E.H., Williams, K.J., and Tabas, I. (1996) Zn²⁺-stimulated sphingomyelinase is secreted by macrophages and other cell types and is a product of the acid sphingomyelinase gene. *J. Biol. Chem.* **271**:18431-18436.
- *42. Schissel, S.L., Tweedie-Hardman, J., Rapp, J.H., Graham, G., Williams, K.J., and Tabas, I. (1996) Rabbit aorta and human atherosclerotic lesions hydrolyze the sphingomyelin of retained low-density lipoprotein. Proposed role for arterial-wall sphingomyelinase in subendothelial retention and aggregation of atherogenic lipoproteins. *J. Clin. Invest.* **98**:1455-1464.
- *43. Tabas, I., Marathe, S., Keesler, G.A., Beatini, N., and Shiratori, Y. (1996) Evidence that the initial up-regulation of phosphatidylcholine biosynthesis in free cholesterol-loaded macrophages is an adaptive response that prevents cholesterol-induced cellular necrosis. Proposed role of an eventual

failure of this response in foam cell necrosis in advanced atherosclerosis. *J. Biol. Chem.* **271**:22773-22781.

*44. Keesler, G.A., Gabel, B., Koschinsky, M., and Tabas, I. (1996) The binding activity of the macrophage lipoprotein(a)/apoprotein(a) receptor is up-regulated by cholesterol via a post-translational mechanism and recognizes distinct kringle domains on apoprotein(a). *J. Biol. Chem.* **271**:32096-32104.

*45. Tang, W., Keesler, G.A., and Tabas, I. (1997) The structure of the gene for murine CTP:phosphocholine cytidyltransferase (*Ctpct*). Relationship of exon structure to functional domains and identification of transcriptional start sites and potential upstream regulatory elements. *J. Biol. Chem.* **272**:13146-13151.

46. Zha, X., Tabas, I., Leopold, P.L., Jones, N.L., and Maxfield, F.R. (1997) Evidence for prolonged cell-surface contact of acetyl-LDL before entry into macrophages. *Arterio. Thromb. Vasc. Biol.* **17**:1421-1431.

*47. Schissel, S.L., Jiang, X.C., Tweedie-Hardman, J., Jeong, T.S., Camejo, E.H., Najib, J., Rapp, J.H., Williams, K.J., and Tabas, I. (1998) Secretory sphingomyelinase, a product of the acid sphingomyelinase gene, can hydrolyze atherogenic lipoproteins at neutral pH. Implications for atherosclerotic lesion development. *J. Biol. Chem.* **273**:2738-2746.

48. Zha, X., Pierini, L.M., Leopold, P.L., Skiba, P.J., Tabas, I., and Maxfield, F.R. (1998) Sphingomyelinase treatment induces ATP-independent endocytosis. *J. Cell Biol.* **140**:39-47.

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XV. Patents and Patent Applications

Patents:

1. U.S. Patent: "Triterpene Derivatives Cholesterol Acyltransferase Inhibitors and Methods of Using Same." Ira Tabas, Inventor; January 22, 1991; Patent Number 4,987,151.
2. U.S. Patent: " Method for treating a subject suffering from a condition associated with an extracellular zinc sphingomyelinase." Ira Tabas, Scott L. Schissel, and Kevin Jon Williams, Inventors. November 23, 1999; Patent number 5,989,803.
3. U.S. Patent: " Human gene encoding human chondroitin 6-sulfotransferase." Kevin J. Williams and Ira Tabas, Inventors. June 4, 2002; Patent Number 6,399,358.
4. U.S. Patent: " Method for treating a subject suffering from conditions associated with an extracellular zinc sphingomyelinase." Ira Tabas, Scott Schissel, and Kevin J. Williams, Inventors. September 2, 2003; Patent Number 6,613,322.
5. U.S. Patent: "Method of treating a metabolic disorder induced by obesity in a subject in need thereof by administering MK2/3 inhibitors." Ira Tabas and Lale Ozcan, Inventors. Septemeber 26, 2017;. Patent number 9,771,430.
6. U.S. Patent: "Targeted Polymeric Inflammation-Resolving Nanoparticles." Omid C. Farokhzad, Xueqing Zhang, Xiaoyang Xu, Nazila Kamaly, Mingming Ma, Pedro M. Valencia, Robert S. Langer, Ira Tabas, and Gabrielle Beth Fredman, Inventors. June 11, 2019; Patent number 10,314,917.

Patent Applications:

1. International Application No. PCT/US2012/053552: "CaMKII, IP3R, Calcineurin, P38 and MK2/3 Inhibitors to Treat Metabolic Disturbances of Obesity."
2. U.S. Provisional Patent Application Serial No. 62/120,549 "Dipeptidyl Peptidase-IV (DPP4) Inhibitors, Methods and Compositions for Suppressing Adipose Tissue Inflammation."
3. U.S. Patent Application PCT/US2017028109, 16/094,111 (US), 17786458.4 (Europe) "Therapeutic Targets Involved in the Progression of Nonalcoholic Steatohepatitis (NASH)."
4. U.S. Patent Application PCT/US2018/0066886 "Therapeutic Targets for NASH-Induced Hepatocellular Carcinoma"
5. U.S. Patent Application No. 63/091,618 filed October 14, 2020. "Use of Plasma Indian Hedgehog (Ihh) as a Biomarker for Fibrotic NASH and for Hepatocyte TAZ and Ihh Target Engagement by NASH Therapies"