

January 2017

CURRICULUM VITAE

Lewis J. Rubin, MD, FACP, FCCP, FAHA, FRCP

Emeritus Professor of Medicine  
Emeritus Director, Pulmonary and Critical Care Division  
University of California, San Diego School of Medicine

Adjunct Professor of Medicine  
Columbia University College of Physicians and Surgeons, New York, NY

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Colchester, VT 05446  
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**BIRTHDATE:** August 5, 1950. New York, New York

**EDUCATION:**

1968 – 1972	B.A.	Yeshiva University New York, New York
1968 – 1972	Diploma in Hebraic Studies	Yeshiva University New York, New York
1972 – 1975	M.D.	Albert Einstein College of Medicine Bronx, New York

**Internship:**  
1975 – 1976  
Duke University Medical Center  
Durham, North Carolina

**Residency:**  
1976 – 1977  
Jr. Assistant Resident in Medicine  
Duke University Medical Center  
Durham, North Carolina

1978  
Sr. Assistant Resident in Medicine  
Assistant Chief Medical Resident  
Duke University Medical Center  
Durham, North Carolina

**Fellowship:**  
1978 – 1979  
Fellow in Allergy and Respiratory Diseases  
Duke University Medical Center  
Durham, North Carolina

**CERTIFICATIONS:**

1976	Diplomate, National Board of Medical Examiners
1978	Diplomate, American Board of Internal Medicine
1980	Subspecialty Boards in Pulmonary Disease
1989	Subspecialty Boards in Critical Care

**LICENSURE:**

1978	North Carolina (active)
1981	Texas (inactive)
1985	Maryland (active)
1999	California (active)
2015	New York (active)

**RESEARCH  
INTERESTS:**

The Pulmonary Circulation  
Pulmonary Physiology  
Cardiopulmonary Interrelationships

**FACULTY POSITIONS:**

2016 –	Adjunct Professor of Medicine Columbia University College of Physicians and Surgeons, New York
2010 – present	Emeritus Professor of Medicine University of California, San Diego School of Medicine
1999 – 2010	Professor of Medicine University of California, San Diego School of Medicine
1999 – 2002	Director, Division of Pulmonary and Critical Care Medicine University of California, San Diego School of Medicine
1985 – 1998	Head, Division of Pulmonary and Critical Care Medicine University of Maryland School of Medicine
1990 – 1998	Professor of Medicine University of Maryland School of Medicine
1990 – 1998	Professor of Physiology University of Maryland School of Medicine
1986 – 1990	Associate Professor of Physiology University of Maryland School of Medicine
1985 – 1990	Associate Professor of Medicine University of Maryland School of Medicine
1984 – 1985	Associate Professor of Internal Medicine University of Texas Health Science Center at Dallas Southwestern Medical School

1981 – 1984                    Assistant Professor of Internal Medicine  
University of Texas Health Science Center at Dallas  
Southwestern Medical School

1979 – 1980                    Associate, Department of Medicine  
Duke University Medical Center

**MAJOR ACADEMIC TASKS:**

1999 – 2002                    Director, Division of Pulmonary and Critical Care Medicine  
University of California, San Diego School of Medicine, San Diego,  
California

1985 – 1998                    Head, Pulmonary and Critical Care Division  
University of Maryland School of Medicine, Baltimore, Maryland

1981 – 1985                    Chief, Pulmonary Section, V.A. Medical Center, Dallas, Texas

**PROFESSIONAL MEMBERSHIPS:**

American College of Chest Physicians (Fellow)  
American College of Physicians (Fellow)  
American Heart Association, Cardiopulmonary Council (Fellow)  
American Society for Clinical Investigation (elected 1995)  
American Thoracic Society  
Interurban Clinical Club (elected 1996)  
California Thoracic Society  
International Society for Heart and Lung Transplantation  
North Carolina Commission on Occupational Lung Diseases  
Alpha Epsilon Delta (Premedical Honor Society)  
The LAM Foundation, Clinical Trials Advisory Board

**HONORS AND AWARDS:**

B.A., Cum Laude, 1972  
New York State Regents Scholarship, 1968–1972  
Yeshiva University Academic Scholarship, 1968–1972  
Haskel Schiff Award in Clinical Medicine, Duke University Medical  
Center, 1978  
Edward Livingston Trudeau Fellow, American Lung Association,  
1980-81  
Listed in Who's Who in Frontier Science and Technology, 1983  
Listed in Who's Who in Science and Engineering, 2011–12; 2016–17  
Listed in Who's Who in Medicine and Healthcare, 2009–2012  
Listed in Who's Who in America, 2004–2016  
Listed in Who's Who in the World, 2005, 2009–2016  
Listed in Best Doctors in America, 1994–2014  
Listed in America's Top Doctors, 2005–2011

Scientific Progress Award, Primary Pulmonary Hypertension Cure Foundation, 1997  
Dickinson W. Richards Memorial Lecturer, American Heart Association, 1997  
George Comstock, M.D. Award, American Lung Association of Maryland, 1997  
Faculty Research Lecturer of the Year, University of Maryland Founders Day Celebration, 1998  
Kenneth Moser Memorial Award, Pulmonary Hypertension Association, 1998  
Visiting Professor & Visiting Scientist, Wolfson Institute for Biomedical Research and University College London, United Kingdom, 1999  
Honorary Fellow, Royal College of Physicians, United Kingdom, 2002  
Scientific Achievement Award, Polish Society of Cardiology, 2006  
Honorary Fellow, Venezuelan Society of Cardiology, 2009  
Simon Dack Award for Outstanding Scholarship, American College of Cardiology, 2012  
Most Influential Researchers in the World, Thomas Reuters, 2014 and 2015  
Lifetime Achievement Award, Pulmonary Vascular Research Institute (PVRI), 2016  
CHEST College Medalist Award, American College of Chest Physicians, 2016

**EDITORIAL TASKS/MANUSCRIPT REVIEWER:**

**Editorships/Editorial Boards:**

- Structural Heart: The Journal of the Heart Team (**Editorial Consultant 2017-2019**)
- Journal of the American College of Cardiology (**Senior Consulting Editor 2002–2014**)
- Annals of Internal Medicine (**Editorial Board 2005–2009**)
- American Journal of Respiratory and Critical Care Medicine (**Editorial Board 2003–2006**)
- Respiratory Research (**Associate Editor**)
- Clinical Pulmonary Medicine (**Associate Editor**)
- Journal of Heart and Lung Transplantation (**Editorial Board**)

**Manuscript Reviewer:**

- Science
- New England Journal of Medicine
- Lancet
- Journal of the American Medical Association (JAMA)
- Journal of Clinical Investigation

- Circulation
- Circulation Research
- American Journal of Physiology
- Chest
- Journal of Applied Physiology
- American Journal of Cardiology
- American Journal of Respiratory Cell and Molecular Biology
- Intensive Care Medicine
- Critical Care Medicine
- Journal of Respiratory Diseases
- Pediatric Pulmonology
- Kidney International
- The Western Journal of Medicine
- American Journal of Medicine
- American Journal of Medical Sciences
- Respiratory Medicine
- Journal of Rheumatology
- Mayo Clinic Proceedings
- American Journal of Pathology
- European Respiratory Journal
- European Heart Journal
- Pediatrics
- Clinical Pharmacokinetics
- Annals of Rheumatic Diseases
- Journal of Pharmacology and Experimental Therapeutics
- Pediatric Research
- Journal of Thrombosis and Haemostasis
- FASEB Journal
- Arteriosclerosis, Thrombosis, and Vascular Biology
- Thorax
- Drugs
- Journal of Molecular Medicine
- Avian Pathology
- Cardiology
- Computational & Mathematical Methods in Medicine
- Science Translational Medicine
- Cell Metabolism

**MAJOR CONSULTANTSHIPS:**

1983	Occupational Lung Disease, United States Justice Department
1985 – 1992	American Medical Association, Division of Drugs and Technology

1991 – 1993	Rand Corporation, Santa Monica, California
1991 – 1992	World Health Organization (WHO)
1993 – 1995	International Primary Pulmonary Hypertension (IPPH) Study Diagnosis Committee
1997 – 2002	Steering Committee, Study of Pulmonary Hypertension in America (SOPHIA) (through Harvard University School of Public Health)
1997 –	Coordinating Committee, International Registry of Primary Pulmonary Hypertension
1997 – 1998	Steering Committee, Glaxo Wellcome, Epoprostenol in Scleroderma-Induced Pulmonary Hypertension Study
1998 – 2001	Chair, Steering Committee, United Therapeutics Corporation, 15-UT in Pulmonary Hypertension Study
1998 –	Advisory Committee, Schering Pharmaceuticals, Inhaled Iloprost in Pulmonary Hypertension Study
1999	Chair, Steering Committee, Actelion Pharmaceuticals, Bosentan in Pulmonary Hypertension Clinical Trials
2002 –	Advisory Committee, Pfizer Pharmaceuticals, Sildenafil in Pulmonary Hypertension Clinical Trials
2006	Chair, Steering Committee, Myogen/Gilead Pharmaceuticals, Ambrisentan in Pulmonary Hypertension Clinical Trials
2002 –	Co-Chair, Steering Committee, LungRx, Inhaled Treprostinil Pulmonary Hypertension Clinical Program
2005 –	Chair, Pfizer Data Monitoring Committee (DMC) for sildenafil pediatric pulmonary hypertension trials
2005 –	Advisory Committee, MondoBiotech, Inhaled Aviptadil in Pulmonary Hypertension Clinical Program
2006 –	External Reviewer, United Kingdom Medical Research Council
2006 – 2008	Scientific Advisory Board, Encysive Pharmaceuticals, Sitaxsentan in Pulmonary Hypertension Program
2006 –	Scientific Advisory Board, Aires Pharmaceuticals

2007 – 2008	Member, Data and Safety Monitoring Board (DSMB) Gleevec pulmonary hypertension Phase 2 trial
2008 – 2009	Scientific Advisory Board, Gilead Sciences, Inc.
2009 – 2016	Scientific Advisory Board, United Therapeutics
2013 –	Special Government Employee (SGE) to the Food and Drug Administration (FDA)

**CAMPUS ACTIVITIES:**

1985 – 1989	Research and Development Committee, Baltimore V.A. Medical Center Baltimore, Maryland
1985 – 1997	Management Committee, University of Maryland School of Medicine, Department of Medicine, Baltimore, Maryland
1986 – 1989	M.D./Ph.D. Advisory Committee, University of Maryland School of Medicine, Baltimore, Maryland
1986 – 1998	Admissions Review Committee, University of Maryland School of Medicine, Baltimore, Maryland
1990 – 1991	Radiology Chairman Search Committee, University of Maryland School of Medicine, Baltimore, Maryland
1991 – 1993	Promotion and Tenure Appeals Committee, University of Maryland at Baltimore, Baltimore, Maryland
1991	Selection and Program Committee, University of Maryland, Baltimore, Maryland (NHLBI sponsored Short-term Research Training for Minority Students Program)
1998	Associate Dean Search Committee, University of Maryland School of Medicine, Baltimore, Maryland

**COMMITTEE ACTIVITIES:**

1981	House Staff Selection Committee, Department of Medicine, Duke University Medical Center
	Cardiopulmonary Resuscitation Committee, Duke University Medical Center
	Emergency Room Advisory Committee, Duke University Medical Center

1982	NHLBI ad hoc study section for Primary Pulmonary Hypertension, National Data and Coordinating Center Contracts
1982	<p>Planning Committee for NHLBI Primary Pulmonary Hypertension Multicenter Study</p> <p>Participating Investigator, NHLBI Cooperative Study of Primary Pulmonary Hypertension</p> <p>Alfred Richman Competition Review Committee, American College of Chest Physicians</p> <p>Planning Committee for NHLBI, Pulmonary Vascular Diseases and Respiratory Failure Programs</p> <p>Research and Development Committee, Dallas V.A. Medical Center</p>
1983	Site Visit Committee, Pulmonary SCOR Application Division of Lung Diseases, NHLBI, NIH for Yale University, New Haven, Connecticut
1984	<p>Executive Committee on Pulmonary Circulation, American Thoracic Society</p> <p>Medical School Admissions Committee, University of Texas Health Science Center Southwestern Medical School, Dallas, Texas</p> <p>Publications Committee, NHLBI, Registry for Primary Pulmonary Hypertension</p>
1985	Secretary, Pulmonary Circulation Section, American Thoracic Society
1986	Chairman Elect, Pulmonary Circulation Section, American Thoracic Society Site Visit Committee, Cystic Fibrosis Foundation, for Johns Hopkins University Grant Application
1986 – 1988	Member at Large, Executive Committee, Cardiopulmonary Council, American Heart Association
1987	<p>Executive Committee, Maryland Thoracic Society</p> <p>Chairman, Pulmonary Circulation Section, American Thoracic Society</p>



1988	<p>Program Committee, American College of Chest Physicians Original Investigations Committee, American College of Chest Physicians</p> <p>Program Committee, Cardiopulmonary Council, American Heart Association</p>
1989	<p>Board of Governors, American College of Chest Physicians</p> <p>President-Elect, Maryland Thoracic Society</p>
1989	<p>Research Review Committee, American Heart Association, Maryland Affiliate</p>
1991	<p>National Heart, Lung, and Blood Institute, ATS Lung Transplantation Committee</p>
1991 – 1993	<p>President, Maryland Thoracic Society</p>
1991 – 1995	<p>Board of Directors and Executive Committee, American Lung Association of Maryland Study Section, University of California Tobacco-Related Disease Program</p>
1991 – 1994	<p>Program Specialist in Respiratory and Pulmonary Disease, Department of Veterans Affairs, Washington, D.C.</p>
1992	<p>Research Progress and Initiatives Committee, National Heart, Lung and Blood Institute National Institutes of Health</p> <p>Chairman, American College of Chest Physicians Consensus Panel on Primary Pulmonary Hypertension</p>
1992 – 1997	<p>Executive Committee of the Council on Cardiopulmonary and Critical Care, American Heart Association</p>
1992 – Present	<p>Scientific Advisory Board, United Patients Association for Pulmonary Hypertension</p>
1992 – 1993	<p>Oversight Committee Pulmonary SCOR Program, National Heart, Lung, and Blood Institute, National Institutes of Health</p>
1993 – 1995	<p>President, American Lung Association of Maryland</p>
1993 – 1996	<p>Scientific Sessions Committee, American Heart Association</p>
1994	<p>National Institutes of Health, National Heart, Lung, and Blood Institute, Program Project Committee</p>

1998	Chair, Working Group on Pulmonary Vascular Diseases, American Heart Association
1998	Co-Chair, World Health Organization Conference on Primary Pulmonary Hypertension
1999	European Society of Cardiology Task Force on Pulmonary Hypertension
2000 – 2002	Scientific Advisory Committee of the University of California Tobacco-Related Disease Research Program (TRDRP)
2001 –	Chair, Research Committee, Pulmonary Hypertension Association
2002	Special Emphasis Panel, NHLBI Mentored Scientist Development Award Program
2002 – 2004	Chair, ACCP Evidence-Based Clinical Practice Guideline Consensus Panel on Pulmonary Artery Hypertension
2002 –	Member, Medical Advisory Board, Scleroderma Foundation
2003 –	Member, Organizing Committee, 3 <sup>rd</sup> WHO Conference on Pulmonary Hypertension
2005 –	Chairman, Data Monitoring Committee, Sildenafil for Pediatric Pulmonary Hypertension Program, Pfizer Inc.
2006 –	Chairman, Data Monitoring Committee, Bosentan in addition to Sildenafil in Pulmonary Hypertension Program, Actelion Pharmaceuticals.
	European Society of Cardiology Task Force Meeting on the Diagnosis & Treatment of Pulmonary Arterial Hypertension (Update)
	American College of Cardiology/American Heart Association
	Clinical Expert Consensus Document (CECD) Writing Group on Pulmonary Hypertension
2008 –	Special Emphasis Committee, NHLBI, Respiratory Integrative Biology and Translational Research (RIBT) Study Section (4-6 Feb, Washington DC)
	Co-Chairman, Steering Committee, 4th World Symposium on PAH, Dana Point, CA, 11-14 Feb 2008
	Presenter on behalf of National Pulmonary Hypertension

2008 –	Centers of UK Physicians Committee Stakeholders to National Institute of Clinical Excellence (NICE), Westminster, London, 24 June
	Joint European Society of Cardiology (ESC) and European Respiratory Society (ERS) Task Force Meeting on the Diagnosis and Treatment of Pulmonary Arterial Hypertension (Update)
	Data Safety Monitoring Board, Clinical Trials in Pulmonary Diseases with HIV Infections, NHLBI, NIH
2011 –	Organizing Committee, 4 <sup>th</sup> World Symposium on Pulmonary Hypertension
2012 –	NHLBI Review Section, Scientific Conferences
2012 – 2013	Steering Committee, 5 <sup>th</sup> World Symposium on Pulmonary Hypertension
2013 – 2014	Chair, Site Visit and Grant Review Committee for expert evaluation of the Ludwig Boltzmann Institute for Lung Vascular Research (LBI-LVR), Vienna, Austria
2016 – 2017	Chair, Site Visit and Grant Review Committee for expert evaluation of the Ludwig Boltzmann Institute for Lung Vascular Research (LBI-LVR), Vienna, Austria

**TEACHING ACTIVITIES:**

1986 – 1992	<u>Section Director:</u> Respiration Physiology Section (170 students)
1986 – 1995	Medical Physiology Course (MBPH 501, MBPH 601) (150 students)
1996 – 1998	Respiration Pathology Course (170 students)
1999	Respiration Physiology (170 students)
2004	Introduction to Clinical Medicine, Observed Structured Clinical Examination Course (10 students)

**MEDICAL VOLUNTEER ACTIVITIES:**

July – Aug 2008	Medical Volunteer, Pacific Partnership, USNS Mercy Timor Leste, Southeast Asia
May 2009 –	Medical Volunteer, UCSD Free Clinic Project Southeast San Diego, CA
August 2012 –	Medical Volunteer, Comfort the Children (CTC) International Maai Mahiu, Kenya, Africa

PATENTS:

- #7,964,573      Regulating expression of transient receptor potential channel genes. The present invention relates to compositions related to a polynucleotide encoding a transient receptor potential channel gene. Also disclosed is the use of this polynucleotide, its homologs, fragments, variants and its resultant polypeptides in the diagnosis, prevention and treatment of disease, particularly idiopathic pulmonary arterial hypertension (IPAH). This invention also teaches the use of these polynucleotides and polypeptides as assays for drug discovery and therapies. Issued USPTO 6/21/11
- #8,609,728      Treatment for pulmonary hypertension. A method of treating pulmonary hypertension based upon co-administering to a subject in need thereof a pharmaceutically effective amount of an oral therapeutic agent for treating pulmonary hypertension and a pharmaceutically effective amount of an inhaled therapeutic agent for treating pulmonary hypertension. Issued USPTO 12/17/13
- #8,969,409      Treatment for pulmonary hypertension. A method of treating pulmonary hypertension comprising co-administering to a subject in need thereof a pharmaceutically effective amount of an oral therapeutic agent for treating pulmonary hypertension and a pharmaceutically effective amount of an inhaled therapeutic agent for treating pulmonary hypertension, wherein the oral therapeutic agent is beraprost or a pharmaceutically acceptable salt thereof administered orally and the inhaled therapeutic agent is treprostinil or a pharmaceutically acceptable salt thereof administered by inhalation. Issued USPTO 03/03/15
- #9,339,507      Treprostinil administration by inhalation. Treprostinil can be administered using a metered dose inhaler. Such administration provides a greater degree of autonomy to patients. Also disclosed are kits that include a metered dose inhaler containing a pharmaceutical formulation containing treprostinil. Issued USPTO 5/17/16
- #9,358,240      Treprostinil administration by inhalation. Treprostinil can be administered using a metered dose inhaler. Such administration provides a greater degree of autonomy to patients. Also disclosed are kits that include a metered dose inhaler containing a pharmaceutical formulation containing treprostinil. Issued USPTO 6/07/16

**GRANT SUPPORT:**

- 1979 – 1980 American Lung Association of North Carolina: “Vasodilators in Pulmonary Hypertension,” \$2,500, L.J. Rubin, Principal Investigator.
- 1980 – 1982 American Lung Association: “The Effects of Vasodilators in Experimental Pulmonary Hypertension,” \$30,000, L.J. Rubin, Principal Investigator.
- 1980 – 1985 Burroughs Wellcome Company: “Prostacyclin (PGI<sub>2</sub>) as Pulmonary Vasodilator in Pulmonary Hypertension,” \$15,000, L.J. Rubin and B.M. Groves, Co-Investigators.
- 01/81 – 12/81 National Institutes of Health, Biomedical Research Fund (through the University of Texas Health Science Center): “Prostaglandins as Modulators of Pulmonary Vascular Tone,” \$4,000, L.J. Rubin, Principal Investigator.
- 1981 – 1982 Veterans Administration: “Role of Prostaglandins as Mediators of Hypoxic Vasculature,” \$25,000, L.J. Rubin, Principal Investigator.
- 12/81 – 11/84 National Heart, Lung, Blood Institute, NIH: “Prostaglandin Modulation of Pulmonary Vascular Tone,” \$82,579 (total award), L.J. Rubin, Principal Investigator.
- 1981 – 1985 Division of Research Resources, NIH: “Hemodynamic and Gas Exchange Effects of Therapy for Primary and Secondary Pulmonary Arterial Hypertension.” L.J. Rubin, Principal Investigator, through the General Clinical Research Center Program, University of Texas Health Science Center at Dallas.
- 1982 – 1985 Betty Crossman Marcus Memorial Fund for Pulmonary Research, through the University of Texas Health Science Center. \$75,000, L.J. Rubin, Principal Investigator.
- 1983 – 1984 Miles Institute for Preclinical Research: “The effects of Nafazatron on Hypoxic Pulmonary Vasoconstriction in Dogs,” \$4,000, L.J. Rubin, Principal Investigator.
- 1983 – 1984 Miles Laboratories: “The Effects of Nitrendipine in Patients with Primary and Secondary Pulmonary Hypertension,” \$27,500, Lewis J. Rubin, Principal Investigator.
- 1984 – 1987 Veterans Administration Research Service (Merit Review): “Mechanisms of Pulmonary Vascular Reactivity in Chronic Lung Disease,” \$119,800, L.J. Rubin, Principal Investigator.
- 1984 – 1986 Burroughs Wellcome Company: “The Hemodynamic and Gas Exchange Effects at Rest and During Exercise of Prostacyclin (PGI<sub>2</sub>) and BW in Patients with Chronic Cor Pulmonale,” \$45,000, L.J. Rubin, Principal Investigator.
- 1984 – 1986 American Edwards Laboratories: “Measurement of Right Ventricular Ejection Fraction (RVEF) Using Thermodilution Technique and Correlation Between RVEF and Pulmonary Hemodynamics in Patients with or Pulmonale,” \$5,000, L.J. Rubin, Principal Investigator.

- 1985 – 1989 Miles Pharmaceuticals: “Nitrendipine Vs. Placebo in Pulmonary Hypertension Secondary to Chronic Obstructive Lung Disease,” \$65,000. L.J. Rubin, Principal Investigator.
- 1986 – 1989 Institute for Preclinical Pharmacology, Miles Laboratories: “Effects of Calcium Channel Blockade on Pathogenesis of Cor Pulmonale in Papain-Induced Emphysema in Dogs,” \$10,000, LJ Rubin, MD, Principal Investigator.
- 1987 – 1990 Veterans Administration Research Service (Merit Review): “Superoxide-Mediated Pulmonary Vascular Reactivity,” \$540,500, G. Rosen & L.J. Rubin, Principal Investigators.
- 1990 – 1993 Veterans Administration Research Service (Merit Review): “Pathogenesis of Pulmonary Hypertension in Emphysema,” \$324,900, L.J. Rubin, Principal Investigator.
- 1993 – 1998 NIH: NHLBI Vascular Disease Academic Award, Direct cost: \$517,614, Indirect cost: \$41,409, LJ Rubin, MD, Principal Investigator.
- 1994 – 1997 Parker B. Francis Fellowship Program: Role of Ion Channels in Hypoxic Pulmonary Vasoconstriction,” Xiao-Jian Yuan, MD, PhD., Principal Investigator, L.J. Rubin, MD, Sponsor
- 1996 Primary Pulmonary Hypertension Cure Foundation: K<sup>+</sup> Channel Structure and Function in PPH. Direct cost: \$316,642, Indirect cost: \$100,000, L.J. Rubin, MD, Principal Investigator, X-J Yuan, MD, PhD, Principal Investigator.
- 1996 – 1997 Primary Pulmonary Hypertension Research Foundation: Ion Channels in Primary Pulmonary Hypertension. \$50,000, L.J. Rubin, Principal Investigator, JX-J Yuan, Co-Investigator.
- 1996 – 1998 Glaxo Welcome: Flolan in Pulmonary Hypertension Secondary to Scleroderma. Direct cost: \$400,000, Indirect cost: \$66,667, Lewis J. Rubin, M.D., Principal Investigator.
- 1998 – 2002 Harvard School of Public Health: Study of Pulmonary Hypertension in America. Direct cost: \$400,000, Lewis J. Rubin, MD, Principal Investigator.
- 1997 – 1998 United Therapeutics: A Dose Range-Finding Study of Intravenous 15AU81 in Patients with Primary Pulmonary Hypertension. Direct cost: \$36,800, Indirect cost: \$7360, Lewis J. Rubin, MD, Principal Investigator.
- 1999 – 2003 NIH: Cellular Mechanisms of PPH: Role of K<sup>+</sup> Channels. (RO1 HL64945-01). Direct cost: \$901,753, Indirect cost: \$453,029 Lewis J. Rubin, MD, Co-Investigator.
- 2006 NIH: Pulmonary Vascular Responses in Primary Pulmonary Hypertension. NHLBI Pharmacogenomics Research Centers. Direct cost: \$775,346, Indirect cost: \$399,303, Lewis J. Rubin, MD, Co-Investigator.

- 2006 NIH: Capacitative Ca<sup>2+</sup> Entry in Pulmonary Myocyte Growth. (1R01HL66012-01A1). Direct cost: \$1,250,000, Indirect Cost: \$650,000. Lewis J. Rubin, MD, Co-Investigator.
- 2002 – 2005 NIH: Autonomic Pharmacodynamic Pharmacogenomics—Pulmonary Vascular Responses in PPH. (5U01HL69758-02). Lewis J. Rubin, MD, Principal Investigator on Project 1.
- 2003 – 2007 NIH: Cellular Mechanisms of PPH: Role of Potassium Channels (5R01 HL 64945-08). Lewis J. Rubin, MD, Co-Investigator
- 2005 – 2007 NIH: SNPs in Idiopathic Pulmonary Arterial Hypertension (1R21 HL 80033-02). Lewis J. Rubin, MD, Co-Investigator
- 2001 – 2012 NIH: Capacitative Ca<sup>2+</sup> Entry and TRP Channels in Thromboembolic Pulmonary Hypertension. (5R01 HL066012-07). Lewis J. Rubin, MD, Co-Investigator.

## PUBLICATIONS

### **Books**

1. *Pulmonary Heart Disease*, LJ Rubin, editor, 1984. Martinus Nijhoff, Boston, MA.
2. *Primary Pulmonary Hypertension*, LJ Rubin and SR Rich, editors, 1996. Marcel Dekker, NY, NY.
3. *Pulmonary Circulation*, AJ Peacock and LJ Rubin, editors, 2004. Edward Arnold Publishers/Oxford University Press, London, UK.
4. *The Endothelin System in Cardiopulmonary Diseases*, M Clozel and LJ Rubin, editors, 2004. Rheinhard Druck Publishers, Basel, Switzerland.
5. *Pulmonary Arterial Hypertension Related to Congenital Heart Disease*, M Beghetti, RJ Barst, R Naeije, and LJ Rubin, editors, 2006, Elsevier Publishers, Munich, Germany.
6. *Pulmonary Circulation: Diseases and Their Treatment*, 3<sup>rd</sup> edition, AJ Peacock, R Naeije, and LJ Rubin, editors. Hodder Arnold, 2011, London, UK.
7. *Pulmonary Circulation: Diseases and Their Treatment*, 4th Edition, AJ Peacock, R Naeije, LJ Rubin, editors. CRC Press, 2016, London UK.

### **Monographs**

1. Konstam MA, Dracup K, Baker DW, Bortorft MB, Brooks NH, Dacey RA, Dunbar SB, Jackson AB, Jessup M, Johnson JC, Jones RH, Luchi RJ, Massie BM, Pitt B, Rose EA, Rubin LJ, Wright RF, Hadorn DC: Heart Failure: Evaluation and Care of Patients with Left Ventricular Dysfunction. *Clinical Practice Guideline Number 11, AHCPR Publication No. 94-0612*, U.S. Department of Health and Human Services, Rockville, Maryland, June 1994.
2. Rubin LJ, editor: Proceedings of the Brenot Symposium on the Pathogenesis of Pulmonary Hypertension. *Chest* (suppl) 1998, Vol. 114 (3): 183S-247S.
3. Rubin LJ, guest editor: Pulmonary Vascular Diseases. *Progress in Cardiovascular Diseases* 2002; 45 (2).
4. Galié N, Rubin LJ, guest editors: Pulmonary Arterial Hypertension: Epidemiology, Pathobiology, Assessment, and Therapy. *J Amer Coll Cardiol* 2004 (supplement); 43 (12): 1S-90S.
5. Rubin LJ, editor: Diagnosis and Management of Pulmonary Arterial Hypertension: ACCP Evidence-Based Clinical Practice Guidelines. *Chest* 2004 (supplement); 126 (1) 1S-92S.
6. Rubin LJ, Hoepfer MM, Simonneau G, editors: Pathogenesis and Treatment of Chronic Thromboembolic Pulmonary Hypertension. *Proc Amer Thoracic Society*, 2006; 3: 563-616.



## Articles

### Peer Review Manuscripts:

1. Rubin LJ, Gutman RA: Hypotension during hemodialysis. *Kidney* 1978; 11:21-26.
2. Rubin LJ, Peter RH: Oral hydralazine therapy for primary pulmonary hypertension. *N Engl J Med* 1980; 302:69-73.
3. Rubin LJ, Peter RH: Primary pulmonary hypertension new approaches to therapy. *Am Heart J* 1980; 100:757-759.
4. Rubin LJ, Peter RH: Rest and exercise hemodynamic effects of oral hydralazine in patients with cor pulmonale. *Am J Cardiol* 1981; 47:116-122.
5. Rubin LJ, Lazar JD: Influence of prostaglandin synthesis inhibitors on the pulmonary vasodilator effects of hydralazine in dogs with hypoxic pulmonary vasoconstriction. *J Clin Invest* 1981; 67:193-200.
6. Rubin LJ, Handel F, Peter RH: The effects of oral hydralazine on right ventricular end diastolic pressure in patients with right ventricular failure. *Circulation* 1982; 65:1369-1373.
7. Rubin LJ, Groves BM, Reeves JT, Frosolono MF, Handel F, Cato AE: Prostacyclin-induced acute pulmonary vasodilation in primary pulmonary hypertension. *Circulation* 1982; 66:334-338.
8. Cohen MD, Rubin LJ, Taylor WE, Cuthbert JA: Primary pulmonary hypertension A unique case associated with extrahepatic portal hypertension. *Hepatology* 1983; 3:588-592.
9. Rubin LJ, Lazar JD: Nonadrenergic effects of isoproterenol in dogs with hypoxic pulmonary vasoconstriction: Possible role of prostaglandins. *J Clin Invest* 1983; 71:1366-1374.
10. Chappell TR, Rubin LJ, Markham RV, Firth BG: Independence of oxygen consumption and systemic oxygen transport in patients with either stable pulmonary hypertension or refractory left ventricular failure. *Am Rev Respir Dis* 1983; 128:30-33.
11. Henrich WL, Woodard TD, Meyer BD, Chappell TR, Rubin LJ: High sodium bicarbonate and acetate hemodialysis: A doubleblind crossover comparison of hemodynamic and ventilatory effects. *Kidney Inter* 1983; 24:245-250.
12. Rubin LJ, Nicod P, Hillis LD, Firth BG: Treatment of primary pulmonary hypertension with nifedipine: A hemodynamic and scintigraphic evaluation. *Ann Int Med* 1983; 99:433-438.
13. Miller MJ, Chappell TR, Cook W, Deolazabol JR, Rubin LJ: The effects of oral hydralazine on gas exchange in patients with cor pulmonale. *Am J Med* 1983; 75:937-942.
14. Hunt JM, Chappell TR, Henrich WL, Rubin LJ: Gas exchange during dialysis: Contrasting mechanisms for the alterations with acetate and bicarbonate buffers. *Am J Med* 1984; 77:255-260.

15. Hughes JD, Rubin LJ: The relationship between mixed oxygen venous tension and pulmonary vascular tone in dogs during normoxic, hyperoxic, and hypoxic ventilation. *Am J Cardiol* 1984; 54:402-409.
16. Ensley RD, Rubin LJ: Nafazatrom (Bay g 6575) blunts canine hypoxic pulmonary vasoconstriction: Evidence for a prostaglandin-mediated mechanism. *Prostaglandins, Leukotrienes and Medicine* 1985; 18:95-104.
17. Groves BM, Rubin LJ, Reeves JT, Frosolono MF: Comparable hemodynamic effects of prostacyclin and hydralazine in primary pulmonary hypertension. *Am Heart J* 1985; 110:1200-1204.
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67. Rubin LJ: Treatment of Pulmonary Arterial Hypertension: A Look to the Future. In: **Pulmonary Arterial Hypertension: Diagnosis and Evidence-Based Treatment**, RJ Barst, ed., John Wiley & Sons, Ltd., West Sussex, England, 2008; pp 237-243.
68. Yuan JX-J, Rubin LJ: Idiopathic and Familial Pulmonary Arterial Hypertension. In: **Encyclopedia of Molecular Mechanisms of Disease**, F Lang, ed. Springer Berlin Heidelberg: Germany, 2009; pp. 937-939.

69. Rubin LJ, Clinical Diagnosis of Pulmonary Vascular Disease. In: **Diagnostic Pulmonary Pathology**, 2<sup>nd</sup> ed, PT Cagle, et al, eds. Lung Biology in Health & Disease (vol 226), Claude Lenfant, exec. editor. Informa Healthcare USA, New York 2008, pp. 393-399.
70. Channick RN, Rubin LJ: Pulmonary Vasodilators in COPD. In **Asthma and COPD: Basic Mechanisms and Clinical Management**, 2<sup>nd</sup> ed, P Barnes, J Drazen, S Rennard, N Thomson, editors. Academic Press, Elsevier Ltd., London, UK, 2009, pp. 699-704.
71. Rubin LJ: Hipertension Arterial Pulmonar. In **Manual de Pruebas de Función Pulmonar: de la fisiología a la práctica**, JA Mazzei, ME Mazzei, A Barro, CG Di Bartolo, editors. Thomson Reuters, Prous Science: A Thomson Reuters Business. Barcelona, Spain, 2009, (Chapter 38), pp. 295-298.
72. Channick RN, Rubin LJ: Pulmonary Hypertension. In **Textbook of Respiratory Medicine**, 5<sup>th</sup> Ed, Vol II, RJ Mason, VC Broaddus, TR Martin, et al, editors. Saunders Elsevier, Philadelphia 2010, pp. 1224-1243.
73. Rubin LJ: Pulmonary Hypertension: Current Management and Future Directions. In **Pharmacotherapy of Pulmonary Hypertension, Handbook of Experimental Pharmacology 218**, M Humbert, OV Evgenov and J-P Stasch, editors. Springer-Verlag, Berlin Heidelberg, 2013, pp. 551-555.

## MAJOR LECTURES/PRESENTATIONS

Pulmonary Hypertension—New Concepts. Annual Meeting American Heart Association, 1980. AP Fishman, Chairman. Title: Therapy of Pulmonary Hypertension.

Pulmonary Hypertension. American College of Cardiology Annual Meeting, San Francisco, March 1981. JT Reeves, Chairman, LJ Rubin, CoChairman.

Cardiopulmonary Resuscitation—Physiologic Concepts. The National Institutes of Health, Bethesda, Maryland, March 1981. S Permutt and M Weisfeldt, CoChairman.

Vasodilation of the Pulmonary Vasculature. American College of Chest Physicians, San Francisco, October 1981. DR Dantzker, Chairman.

Pulmonary Hypertension. American Heart Association, Dallas, November 1981. AP Fishman, Chairman.

Evaluation and Treatment of Primary Pulmonary Hypertension, American College of Cardiology, Atlanta, April 1982. Ronald E Vlietstra, Chairman.

Visiting Lecturer, Department of Pharmacology, Uniformed Services School of Medicine, Bethesda, Maryland, 1981.

Pulmonary Hypertension. Texas Thoracic Society, 1982. Title: "Newer Aspects in the Treatment of Pulmonary Hypertension."

Therapy of Pulmonary Heart Disease. American Thoracic Society, Los Angeles, May 1982. JT Reeves, Chairman.

Symposium on Arachidonic Acid Metabolites and the Pulmonary Circulation, Division of Lung Diseases, NHLBI (NIH), Bethesda, Maryland, September 30-October 1, 1982. Title: Prostacyclin and Pulmonary Hypertension.

Primary and Secondary Pulmonary Hypertension, Meet the Professor, with Dr. CA Hales, American Thoracic Society, Kansas City, May 1983.

Treatment of Primary and Secondary Pulmonary Hypertension, Sunrise Seminar, American Thoracic Society, Kansas City, May 1983.

Therapy of Pulmonary Hypertension, American Thoracic Society, Meet the Professor Seminar, Miami, Florida, May 20-23, 1984.

Therapy of Pulmonary Hypertension, American Heart Association, Anaheim, California, November 14-18, 1983.

Treatment of Pulmonary Hypertension, American Thoracic Society, Meet the Professor Seminar, Miami, Florida May 20-23, 1984.



Vasodilator Therapy for COPD and Pulmonary Hypertension, Sunrise Seminar, American Thoracic Society, Miami, Florida, May 20-23, 1984.

Calcium Channel Blockers in Primary Pulmonary Hypertension, Conference on Pulmonary Vascular reactivity, Sedalia, Colorado, October 9-12, 1984.

Therapeutic Options in Pulmonary Hypertension, American College of Chest Physicians, Dallas, Texas, October 10, 1984.

Pulmonary Hypertension, American Thoracic Society, Meet the Professor Seminar, Anaheim, California, May 12-15, 1985.

Cor Pulmonale, American Thoracic Society, Meet the Professor Seminar, Anaheim, California, May 12-15, 1985.

Treatment of Pulmonary Hypertension, American Thoracic Society, Meet the Professor Seminar, Anaheim, California, May 12-15, 1985.

Topics in Pulmonary Medicine on Controversies in Pulmonary Medicine, American Thoracic Society, Meet the Professor Seminar, Anaheim, California, May 12-15, 1985.

Visiting Professor, Stead Chest Symposium, University of Arkansas, May 1985.

Symposium on Frontiers in Pulmonary Hypertension, NHLBI (NIH), Bethesda, Maryland, September 22-24, 1985. Title: Treatment of Secondary Pulmonary Hypertension.

Medical Grand Rounds, Johns Hopkins University, November 6, 1985.

Visiting Professor, Pulmonary Division, Yale University, March 4-5, 1986.

Pulmonary Circulation in Health and Disease Symposium, Madison, Wisconsin, July 8-11, 1986.

Prostaglandins, Leukotrienes and Platelet Activating Factor in the Pathophysiology of the Pulmonary Circulation. The Pulmonary Circulation Foundation, Sedalia, Colorado, September 14-18, 1986.

Fourth Annual Meranze Memorial Lecture, Albert Einstein Medical Center, November 11, 1986.

Evaluation of Right Ventricular Function in Patients with Hypertensive Pulmonary Vascular Disease, The California Thoracic Society Advanced Course, Yosemite National Park, California, January 14-17, 1987.

Pulmonary Thromboembolism: Approach to Diagnosis, Management and Prevention, Advances in Respiratory Infections and Diseases Symposium, Baltimore, Maryland, April 16, 1987.

Vasodilator Therapy, NHLBI International Conference on Primary Pulmonary Hypertension, Philadelphia, Pennsylvania, May 5-8, 1987.

Pulmonary Hypertension," Cardiopulmonary Update 87' (Heart & Lung Institute at St. Vincent's Medical Center), Sawgrass, Florida, October 9-11, 1987.

Pulmonary Hypertension and Cor Pulmonale Due to COPD, The 53rd Annual Scientific Assembly of the American College of Chest Physicians, Atlanta, Georgia, October 26-30, 1987.

Pulmonary Vascular Disease, North Carolina Thoracic Society Distinguished Lecture Honoring Dr. Ross L. McLean, Durham, North Carolina, April 8, 1988.

An Approach to Pulmonary Hypertension, David P. Earle Lecture, Northwestern University Medical School, Chicago, Illinois, May 6, 1988.

Diagnosis and Approach to Pulmonary Hypertension, Walter Reed Army Hospital, Washington, D.C., September 23, 1988.

Vasodilator Therapy in Pulmonary Hypertension: Pro and Con. New Jersey Thoracic Society's Seventeenth Joint Conference, March 1, 1989.

Approach to the Diagnosis and Management of Pulmonary Hypertension, Philadelphia Heart Institute, University of Pennsylvania Medical Center, March 9, 1989.

Managing Adult Respiratory Failure and Cor Pulmonale, 41st Annual Scientific Assembly of the North Carolina Academy of Family Physicians, Charlotte, NC, April 8, 1989.

Clinical Topics in Pulmonary Medicine on Primary Pulmonary Hypertension: Therapy and Outcome (Presenter), American Thoracic Society's Annual Meeting, Cincinnati, Ohio, May 17, 1989.

The Assessment and Management of a Patient with Pulmonary Hypertension, Symposium on Pulmonary Hypertension at the American College of Chest Physicians 55th Annual Scientific Assembly and the XVI World Congress on Diseases of the Chest, Boston, MA, October 31, 1989.

Approach to the Diagnosis and Management of Pulmonary Hypertension, Visiting Professor, Department of Medicine Pulmonary Division, Thomas Jefferson University, February 5, 1990.

Visiting Professor, Department of Medicine/Pulmonary Division, University of Massachusetts, February 15, 1990.

Visiting Professor, Department of Medicine/Pulmonary Division, Medical College of Wisconsin, February 27, 1990.

New Approaches to the Management of Pulmonary Hypertension, Visiting Professor, Division of Pulmonary Medicine, Maine Medical Center, April 4-5, 1990.

Basic and Physiologic Issues in Primary Pulmonary Hypertension, Visiting Professor, Pulmonary Disease Section, Temple University School of Medicine, May 15, 1990.

Clinical Pulmonary Hypertension: Diagnosis and Treatment—Is Early Diagnosis Possible, Useful and Cost-Effective? Fourth Grover Conference on the Pulmonary Circulation, Sedalia, Colorado, September 12-16, 1990.

Role of Ion Channels in Modulating Pulmonary Vascular Responses to Hypoxia, Visiting Professor, Department of Internal Medicine/Division of Pulmonary and Critical Care Medicine, The University of Michigan Medical Center, Ann Arbor, Michigan, November 14-15, 1990.

New Concepts in the Management of Primary Pulmonary Hypertension, Visiting Professor, Department of Medicine, The University of Vermont, Burlington, Vermont, April 11-12, 1991.

Respiratory Disease from Contaminated L-tryptophan, L-tryptophan Litigation Group Seminar, September 25-27, 1991, Lake Tahoe, Nevada.

Plenary Session, American Heart Association's 64th Scientific Session, Anaheim, California, November 11-14, 1991.

Management of Pulmonary Hypertension, Chilean Thoracic Society Annual Meeting, Santiago, Chile, November 4-10, 1991.

Pathogenesis of Pulmonary Vascular Disease in Emphysema, Chilean Thoracic Society Annual Meeting, Santiago, Chile, November 4-10, 1991.

Pulmonary Manifestations of the Eosinophilia-Myalgia Syndrome, EMS/Toxic Oil Syndrome Project, Madrid, Spain, May 5-7, 1992.

Therapeutic Strategies in Pulmonary Hypertension, European Respiratory Society Second Annual Meeting, Cardiopulmonary Interactions, Vienna, Austria, August 29-September 3, 1992.

New Concepts in the Management of Pulmonary Hypertension, International Symposium on Hypertension and Coronary Heart Disease and Sixth National Congress on Pulmonary Heart Disease, Beijing, China, September 5-12, 1992.

The Roles of Endothelium Derived Products and Potassium Channels in Hypoxic Pulmonary Vasoconstriction, International Symposium on Hypertension and Coronary Heart Disease and Sixth National Congress on Pulmonary Heart Disease, Beijing, China, September 5-12, 1992.

Ion Flux and Vascular Reactivity, Sixth Grover Conference on the Pulmonary Circulation, Sedalia, Colorado, October 14-18, 1992.

Pulmonary Manifestations of the Eosinophilia Myalgia Syndrome (Interstitial Lung Involvement; Pulmonary Hypertension), World Health Organization, Workshop on the Clinical Aspects of the Toxic Oil Syndrome and the Eosinophilia Myalgia Syndrome, Stony Brook, New York, October 29, 1992.

Management of Primary Pulmonary Hypertension, British Thoracic Society Meeting, London, England, December 8-10, 1992.

Visiting Professor, University of Miami, March Research Seminar: Role of  $K^+$  Channel Inactivation In the Pulmonary Vascular Response To Hypoxia; Medical Grand Rounds: New Approaches to the Management of Pulmonary Hypertension.

Primary Pulmonary Hypertension, Thromboembolic and Primary Pulmonary Vascular Disease: Diagnosis and Management Course, University of California, San Diego, March 26-28, 1993.

Endothelium-Dependent Modulation of Hypoxic Pulmonary Vasoconstriction, International Congress of Physiological Sciences, Glasgow, Scotland, August 1-6, 1993.

Primary Pulmonary Hypertension and Long-term Continuous Infusion of Prostacyclin, First International Symposium of the University of Paris-Sud School of Medicine, Paris, France, October 22, 1993.

Pathology and Pathophysiology of Primary Pulmonary Hypertension. First International Meeting on Prostacyclin, Bologna, Italy, November 20, 1993.

Visiting Professor, Pulmonary Division, Medical University of South Carolina, Charleston, South Carolina, December 13-14, 1993; Medical Grand Rounds.

Vasodilator Therapy for Pulmonary Hypertension, Ontario Thoracic Society Meeting, Ontario Canada, February 4, 1994.

Pathogenesis of Pulmonary Hypertension, International Conference on Scleroderma, Sydney, Australia, February 13-16, 1994.

The Management of Pulmonary Hypertension: A Decade of Evolution. Penny Wilkes Lecture, New York Medical College, March 11, 1994.

Pulmonary Hypertension in the L-tryptophan Eosinophilia Myalgia Syndrome. First International Symposium on Pulmonary Hypertension, Madrid, Spain, November 3, 1994.

Treatment of Pulmonary Vascular Disease: From Bench to Bedside and Back. Robert Wood Johnson Medical School, May 12, 1995.

Clinical Management of Severe Pulmonary Hypertension and Transplantation Surgery Workshop. First Transatlantic Meeting on Primary Pulmonary Hypertension. Barcelona, Spain, September 15, 1995.

Chronic Pulmonary Embolism: Morbidity and Mortality. Venous Thromboembolism Symposium. Baltimore, Maryland, October 7, 1995.

Pulmonary Vessels in Health and Disease. C.J. Stringer Memorial Lecture, Michigan Thoracic Society Annual Meeting, Novi, Michigan, April 26, 1996.

Transplantation for Pulmonary Vascular Disease. European Respiratory Society Annual Meeting, Transplant Workshop Stockholm, Sweden, September 6-7, 1996.

Management of Primary Pulmonary Hypertension. Laennec Society of Philadelphia and University of Pennsylvania Hospitals. September 17-18, 1996.

K<sup>+</sup> Channel Dysfunction in the Pathogenesis of Primary Pulmonary Hypertension. Department of Pharmacology, University of London, London, England, April 14, 1997.

Primary Pulmonary Hypertension. Medical Grand Rounds, University of Texas, San Antonio, April 16, 1997.

Brenot Symposium on the Pathogenesis of Primary Pulmonary Hypertension, Corsica, France, July 29-31, 1997.

New Insights into Pathophysiology of Pulmonary Hypertension. XIXth Congress of the European Society of Cardiology. Stockholm, Sweden, August 24-28, 1997.

Quality of Life Assessment in Pulmonary Hypertension. Annual Meeting of the European Respiratory Society Workshop on the New Developments in the Treatment of Pulmonary Hypertension. Berlin, Germany, September 20, 1997.

Hemodynamic Assessment and Emerging Therapies for Portopulmonary Hypertension. Mayo Clinic, Rochester, Minnesota, October 14, 1997.

The Pathogenesis and Treatment of Primary Pulmonary Hypertension: Lessons from the Past and Present. Dickinson W. Richards Memorial Lecture, American Heart Association Annual Scientific Meeting. Orlando, Florida, November 11-14, 1997.

Ion Channel Regulation of Pulmonary Vascular Tone, Distinguished Visiting Scientist Lecture Series, Albany Medical College, Albany, New York, March 20, 1998.

Prostacyclin in Primary and Secondary Pulmonary Hypertension and The Practical Aspects of Initiation and Long-term Management of Prostacyclin Therapy. Copenhagen, Denmark, May 25-26, 1998.

Primary Pulmonary Hypertension: Approaches to Treatment, 3rd International Congress on Pediatric Pulmonology Meeting, Monte Carlo, Monaco, June 18, 1998.

Pulmonary Hypertension, Symposium on Advances in the Pathophysiology and Treatment of Cardiopulmonary Disorders, San Luis Potosi, Mexico, August 21-22, 1998.

Medical Treatment of Primary Pulmonary Hypertension, Co-chairing session, World Health Organization Symposium on Primary Pulmonary Hypertension, Evian, France, September 7-10, 1998.

Current Concepts in Pathogenesis of Primary Pulmonary Hypertension, Mount Sinai Medical Center, Department of Medicine Grand Rounds, New York, October 12, 1998.

Translational Research in the Era of Managed Care: Challenges & Opportunities, University of Maryland Research Lecture of the Year (Founder's Day Lecture), October 14, 1998.

New Concepts in Pathogenesis and Therapy of Pulmonary Vascular Diseases. XXIXth Annual Meeting of the Brazilian Thoracic Society. Rio de Janeiro, Brazil, October 28-31, 1998.

Emerging Therapies for Pulmonary Hypertension. British Thoracic Society Annual Meeting, London, England, December 2, 1998.

Medical Treatment of Intrinsic Pulmonary Vascular Disease. 59th Congress of the Italian Society of Cardiology, Symposium on Vascular and Pulmonary Diseases of Cardiological Interest. Rome, Italy, December 12-16, 1998.

Current Therapy of Pulmonary Hypertension, Postgraduate Course, American Thoracic Society, San Diego, California, April 1999.

PPH Treatment—The Cutting Edge. Meet the Professor, American Thoracic Society, San Diego, California, April 1999.

Novel Mechanisms of Pulmonary Hypertension, Mini-Symposium, Chair, American Thoracic Society, San Diego, California, April 1999.

Prostacyclin Therapy for Chronic Pulmonary Hypertension, Clinic Topics in Pulmonary Medicine, American Thoracic Society, San Diego, California, April 1999.

Current Concepts in the Pathogenesis and Treatment of Pulmonary Hypertension. George Washington University Medical Center, Grand Rounds, Washington, D.C., Understein Memorial Endowed Lecture, May 1999.

The Diagnosis and Management of Pulmonary Hypertension. The South African Society of Cardiac Practitioners, Annual General Meeting and Scientific Sessions, Master Classes in Cardiology, George, South Africa, September 1999.

Medical and Surgical Approaches to Pulmonary Hypertension. European Respiratory Society 1999 Annual Congress, Madrid Spain, October 1999.

Chronic Thromboembolic Pulmonary Hypertension and Lung Transplantation. 19<sup>th</sup> Annual Chest Convention of the Philippine College of Chest Physicians. Quezon City, Philippines, March 2000.

Samuel J. Sills, M.D. Visiting Professor, Trudeau Society of Greater Los Angeles. American Lung Association. Guest Speaker, March 27-29, 2000.

Visiting Professor, Division of Pulmonary, Allergy and Critical Care Medicine, University of Pittsburgh Medical Center. April 13-14, 2000, Pittsburgh, Pennsylvania.

Approach to the Diagnosis and Management of Pulmonary Hypertension. 36<sup>th</sup> Annual Cardiovascular Symposium, St Francis Hospital and Medical Center, May 2000. Hartford, Connecticut.

State-of-the-Art: Pulmonary Hypertension. Flemish Universities, Post Graduate Course on Pulmonary Hypertension. June 13-16, 2000, Ghent, Belgium.

Pulmonary Hypertension: From Bench to Bedside. Faculty Ambassador Series Event - July 20, 2000, Center for Molecular Genetics, University of California, San Diego School of Medicine.

Pathogenesis and Treatment of Pulmonary Hypertension. 6<sup>th</sup> International Workshop for Scleroderma Research, Keble College Oxford, University, July 31-August 2, 2000, Oxford, United Kingdom.

Molecular Basis of Pathogenesis and Treatment of Primary Pulmonary Hypertension. Papworth Hospital, Cambridge University Centre for Cardiovascular and Respiratory Research. November 16-19, 2000, Cambridge, United Kingdom.

Visiting Professor of Medicine, Harvard Medical School, Boston, Massachusetts, March 3-6, 2001.

First Evans Family Medical Grand Rounds, Stanford University School of Medicine, Stanford, California, September 14, 2001.

Chronic Thromboembolic Pulmonary Hypertension. Plenary Session on Pulmonary Thromboembolism, American Heart Association, Anaheim, CA, April 11, 2001.

Medical Grand Rounds and Visiting Professor of Medicine, Northwestern University School of Medicine, Chicago, IL, December 13-14, 2001.

Medical Grand Rounds and Visiting Professor of Medicine, MCP Hahnemann University, Philadelphia, PA, February 20, 2002.

Nancy Middleton Smith Lecturer and Visiting Professor of Medicine, University of Louisville School of Medicine, March 6-7, 2002.

State-of-the-Art Lecture: What's New in Pathogenesis and Treatment of Pulmonary Artery Hypertension. American College of Cardiology Annual Scientific Meeting, Atlanta, GA, March 17, 2002.

Recent Advances in the Treatment of Pulmonary Hypertension. 14<sup>th</sup> World Congress of Cardiology, Sydney, Australia, May 5-9, 2002.

Medical Grand Rounds and Visiting Professor, Department of Medicine and Division of Pulmonary and Critical Care Medicine, University of Miami School of Medicine, Miami, FL, September 18, 2002.

Medical Grand Rounds and Visiting Professor, Department of Medicine, College of Physicians and Surgeons of Columbia University, Oct 2, 2002.

Noyer Family Visiting Professor and Memorial Lecturer, Department of Medicine Grand Rounds, Albert Einstein College of Medicine, New York, December 6, 2002.

Cardiology Grand Rounds, Tulane University School of Medicine, New Orleans, LA, January 8, 2003.

Visiting Lecture Series, Chicago Thoracic Society, Chicago, IL, March 11, 2003.

Cardiology Grand Rounds, New York University School of Medicine, New York, NY, December 18, 2003.

Visiting Professor, Division of Pulmonary and Critical Care Medicine, Johns Hopkins University, March 7, 2004.

American Thoracic Society State of the Art Course: Pulmonary Hypertension. Crystal City, VA, March 8, 2004.

Thoracic Society of Australia and New Zealand: Current Concepts in the Pathogenesis and Treatment of Pulmonary Artery Hypertension, Sydney, Australia, March 17, 2004.

Taiwan Society of Cardiology: Pulmonary Arterial Hypertension-update from the Third World Symposium. Taipei, Taiwan, July 24-25, 2004.

Medical Grand Rounds, Harbor-UCLA Medical Center, Torrance, CA, August 10, 2004.

Queen's University of Belfast, Northern Ireland, Sept 3, 2004: Approaches to the diagnosis and treatment of Pulmonary Artery Hypertension.

Medical Grand Rounds, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School, New Brunswick, NJ, October 20, 2004.

American Heart Association Annual Scientific Sessions, November 9, 2004, New Orleans, LA: Featured Research Invited Lecture: New Developments in the Pathogenesis and Treatment of Pulmonary Hypertension.

32<sup>nd</sup> Brazil Thoracic Disease Congress, Salvador, Brazil, November 15, 2004: Advances in the Pathogenesis and Treatment of Pulmonary Artery Hypertension.

Panhellenic Cardiological Congress, Athens, Greece, November 20, 2004: Pulmonary Arterial Hypertension: From the bench to the bedside.

Cardiology Grand Rounds, University of Chicago, Chicago, IL, January 7, 2005.

Cardiology Grand Rounds, Krannert Institute of Cardiology of Indiana University, Indianapolis, IN, January 11, 2005.

Visiting Professor, Duke University Medical Center, Medical Grand Rounds, "Advances in pathogenesis and therapy of pulmonary artery hypertension," Durham, NC, February 25, 2005.

Medical Grand Rounds, Karolinska Institute Hospital, Stockholm, Sweden, Sept 2, 2005.

International Heart Forum, Beijing, China: Advances in the Pathogenesis and Treatment of Pulmonary Artery Hypertension, and Chronic Thromboembolic Pulmonary Hypertension, Sept 17, 2005.

Robert L. Maycock Distinguished Lecture, Pennsylvania Thoracic Society, Philadelphia, PA, Sept 24, 2005.

National Heart, Lung, and Blood Institute, NIH, Bethesda, MD Oct. 6-7, 2005: Workshop on the Right Ventricle: "Importance of Right Ventricular Function in Pulmonary Hypertension.

British Thoracic Society, London, United Kingdom, December 5, 2005: Advances in the Pathogenesis and Treatment of Pulmonary Hypertension.



Joint ATS/ERS Conference on the Pathobiology of Pulmonary Vascular Diseases, Paris, France, December 7-8, 2005.

Visiting Professor, Department of Medicine, Drexel University School of Medicine, Philadelphia, PA, December 13-14, 2005; Medical Grand Rounds, December 14, 2005.

Turkish Thoracic Society, Antalya, Turkey, April 20, 2006: Recent Developments in the Pathogenesis and Treatment of Pulmonary Artery Hypertension.

Israel Society of Rheumatology, Jerusalem, Israel, April 30, 2006: Pathogenesis and Treatment of PAH in Connective Tissue Diseases.

European Society of Cardiology and Polish Society of Cardiology Joint Symposium on the Pulmonary Circulation, Warsaw, Poland May 31-June 3, 2006.

Past, Present and Future of Treatment for Pulmonary Vascular Disease. Royal College of Physicians, International Symposium on Vascular Complications of Connective Tissue Disease, London, July 7, 2006

29th Congress of the Japanese Society on Thrombosis and Hemostasis, November 16-18, Utsunomyia, Japan: Chronic Thromboembolic Pulmonary Hypertension.

Visiting Professor, Second Department of Medicine, Nara Medical University, Nara, Japan, November 18, 2006: Chronic Thromboembolic Pulmonary Hypertension.

Congress of the Asian-Pacific Respiratory Society, Kyoto, Japan, November 20-22, 2006: Pulmonary Arterial Hypertension: Pathogenesis, Pathophysiology and Management.

Visiting Professor and Muren Annual Lecturer, Medical College of Virginia, "Advances in the Pathogenesis and Treatment of Pulmonary Artery Hypertension." Richmond, VA, November 30, 2006

History of PAH, Clinical Classification and Risk and Prognostic Factors, Evolution of Pulmonary Hypertension: Emerging Diseases and Novel Therapeutics Meeting, National Institutes of Health, Bethesda, MD, December 7-8, 2006

Co-chair, Second John Vane Memorial Symposium on Prostacyclin Science and Pulmonary Vascular Disease, Royal Society, London, UK, 30-31 March 2007

Pathogenesis and Treatment of PAH: Past, Present and Future, Penn State Grand Rounds with the Department of Pediatrics, PA, 8 May 2007

Thromboembolic Pulmonary Hypertension: From Diagnosis to Treatment Response Working Group on Pulmonary Circulation of the Spanish Society of Cardiology, Valencia, Spain, 25 May 2007

Co-chair, Endpoints in Pulmonary Hypertension Meeting II, Ayrshire, Scotland, 1-3 June 2007

Magistral Lecture of the International Master Degree in PAH, "PAH: Vision for the future," University of Bologna, Bologna, Italy, 29 June 2007

Do we need combination therapy? European Society of Cardiology, Vienna, Austria, 2 September 2007

PAH: Diagnosis and Treatment of PAH (Recent Progress); PAH related to lung disease and; PAH: Past, Present and Future; 3<sup>rd</sup> Scientific Symposium in Seoul and Busan, Korea, 12-13 September 2007

Invited to Co-Chair Session: Pathogenesis & Pathobiology of Pulmonary Vascular Disease and lecture on Endothelin Receptor Antagonists in adult and paediatric practice and Combination therapy: When and how? Pulmonary Hypertension in the Young, Royal College of Physicians, London, UK, 20 Sep 2007

Introduction: Clinical Trials in Pulmonary Arterial Hypertension: Past, Present and Future, co-sponsored by Columbia University/Stanford University, Phoenix, AZ, 5 Oct 2007

Future Directions in PAH;" "Treatment of PAH and; PAH in Chronic Pulmonary Thromboembolism: Pathogenesis, Diagnosis and Treatment, XII Columbian Neumology Congress/ III Colombian Thoracic Society Congress, Medellin, Colombia, 11-14 Oct 2007

The Evolving Prostacyclin Paradigm in PAH: Exploring Options for Optimal Outcomes, CHEST, Chicago, IL, 22 Oct 2007

From Shunt to PAH: Classification, Pathophysiology and Treatment, Nagoya Symposium, Nagoya, Japan, 11 Nov 2007

PAH, Actual Treatment and Future, National Congress of Cardiology, Veracruz, Mexico, 24 Nov 07

Clinical Evidence, Current Controversies in ETRAs Selectivity Workshop, Royal College of Surgeons of Edinburgh (RCSE), Edinburgh, Scotland, 1 Dec 2007

Endothelin-1 Receptor Antagonists in the Treatment of PAH, New Generation for ETRAs in PAH, Milan, Italy, 12 Jan 2008

Therapy for PAH: A Look into the Future, University of Southern California (USC) Seminar, Department of Pulmonary and Critical Care Medicine, Los Angeles, CA, 18 Jan 2008

Inhaled Prostacyclins and PAH, Third John Vane Memorial Symposium on Prostacyclin Science and Pulmonary Vascular Disease, The Royal Society, London, UK, 7-8 Mar 2008

Pulmonary Hypertension: Therapy Today and Tomorrow, A Personal Perspective. PHup2date Symposium, Munich, Germany, 14-15 March 2008.

Advances in the Pathogenesis and Treatment of Secondary Pulmonary Hypertension. LXVII National Neumology Congress, Ixtapa Zihuatanejo, Mexico, 25-26 March 2008

Update from 4<sup>th</sup> World Symposium on PAH. 7<sup>th</sup> International PH Forum, Vienna, Austria, 5-6 April 2008

Epidemiology, Pathogenesis and Classification of PH. Advances and Controversies in Clinical Pulmonary Hypertension, Oklahoma City, OK, 19 April 2008

Endothelin-1 receptor antagonists in the treatment of PAH. The Future is Now: Pulmonary Vascular Disease Update, Amsterdam, Netherlands, 24 April 2008

Updates from 4th World Symposium on Pulmonary Hypertension, and Inhalation: New Alternatives and Outlooks for the Future. Nordic Region Pulmonary Arterial Hypertension Experts Meeting, Stockholm, Sweden, 30 May 2008

Possible role of pharmacological treatment in CTEPH patients: BENEFIT Study. 1st Latin American Symposium on Pulmonary Arterial Hypertension, Cartagena, Colombia, 22-23 Aug 2008

What Scientific Progress Have We Made in PAH? Failures and Successes. European Society of Cardiology (ESC) Congress, Munich, Germany, 1 Sep 2008

Non-invasive Assessment of PAH, PAH Associated with Scleroderma, and CTEPH and Lung Transplantation. The First International Conference for Pulmonary Hypertension, Tel Aviv, Israel, 24-25 Sep 2008

On the 20<sup>th</sup> anniversary of Masashi Yanagisawa's discovery of endothelin in *NATURE*, ETAs and their impact on PAH; and What Scientific Progress Have We Made in PAH? Failures and Successes. European Respiratory Society (ERS) Congress, Berlin, Germany, 4-7 Oct 2008

As invited Honorary Professor of the Department of Pulmonary Circulation, Shanghai Pulmonary Hospital, Tongji University, Significance and Prospective of Vardenafil therapy in PAH, Shanghai, PR China, 16 Oct 2008

Clinical Trials in Pulmonary Hypertension, International Meeting of the American College of Chest Physicians (ACCP), Philadelphia, PA, 27 Oct 2008

Highlights from Pulmonary Hypertension, Dana Point 2008," International Meeting on Pulmonary Hypertension, Instituto Nacional de Ciencias Medicas y Nutricion, Tlalpan, Mexico DF, 31 Oct 2008

PAH: Current Management and Future Directions, Rheumatism Society of the District of Columbia Advances in Rheumatology: Bone Health Conference, Washington, DC, 12 Nov 2008

Actual Classification of PAH, and Future Therapies, Venezuela Cardiology Society: Latino American Simposium of PAH, Margarita Island, Venezuela, 27-28 Feb 2009

The Treatment of PAH, Topics and Advances in Pulmonary and Critical Care Conference, San Diego, CA, 13 Mar 2009

Update on the Outcome for the 4th World Symposium on PAH, Fourth John Vane Memorial Symposium, Royal Society, London, UK, 27-28 Mar 2009

Advances in Pulmonary Hypertension, 3rd International Meeting on Rare Lung Diseases: Pulmonary Vascular, University of Modena, Italy, 17 Apr 2009

Session Chair, Selective kinase or multikinase inhibitors in pulmonary hypertension, International Annual Meeting of the American Thoracic Society (ATS), San Diego, CA, 17 May 2009

Current Controversies in Pulmonary Arterial Hypertension: Pro-Con Debates: Oral and inhaled PAH therapies are highly effective for most patients, preventing the need for parenteral therapy, International Annual Meeting of the American Thoracic Society (ATS), San Diego, CA, 19 May 2009

Dana Point: Classification and Treatment, and Co-Chair, Practical Management Challenge in the Management of Advanced PAH, Actelion's 6th Scientific Symposium, Tokyo, Japan, 20-21 June 2009

Co-Chair Pulmonary Hypertension 2; "Emerging Therapies," "Lessons from Basic Science," "What Molecular Science Can Teach the Clinician about Pulmonary Hypertension." 5th World Congress of Paediatric Cardiology and Cardiac Surgery, Cairns, Australia, June 23-25, 2009

Symposium and Plenary Lectures, Treatment of PAH in Groups 2 and 3, and PAH: Current and Future treatments. XLII Congreso Venezolano de Cardiología, Maracaibo, Venezuela, July 22-25, 2009

Keynote: Pulmonary Hypertension 2010: What's New. Forum on Pulmonary Hypertension, Naples, Italy, 12-13, March 2010

New Advances in Prostacyclin Therapy. 5th John Vane Memorial Symposium on Prostacyclin Science and Pulmonary Vascular Disease, The Royal Society, London, United Kingdom, 19-20 March 2010

Medical Therapy for PH, and Medical Therapy for CTEPH. Asia-Pacific Congress on the Pulmonary Circulation, Tongji University, Shanghai, China, 25-28 March 2010

Pathogenesis of PAH and Implications for Future Therapies, 3<sup>rd</sup> Annual Pulmonary Hypertension Conference, Cedars-Sinai, Los Angeles, CA, 10 April 2010

Plenary Lecture, Evolution and current state of ER antagonism in PH, ET-12, British Pharmacological Society, Cambridge University, United Kingdom, 12 September 2011

The Prostacyclins: Basic Science and Clinical Aspects, 7<sup>th</sup> John Vane Memorial Symposium on Prostacyclin Science and Pulmonary Vascular Disease, The Royal Society, London, United Kingdom, 23-24 March 2012

Advances in the treatment of PAH; what does the future hold? American Thoracic Society (ATS) International Conference, Atlanta, GA, 18-23 May 2012

The Future of Therapies and Clinical Trial Endpoints in PAH, and Where are we and where are we going in the diagnostics and treatment of PH? Venezuela Cardiology Society Congress, Maracaibo, Venezuela, 18-21 July 2012

Pulmonary Hypertension: New classification and diagnostic workup and Pulmonary Hypertension: An update on therapy, Pan American Heart Failure (PAHF) Congress, Panama City, Panama, 18-21 Oct 2012

New therapies for PAH, Annual Duke/University of North Carolina Symposium on Pulmonary Hypertension, Raleigh, NC, 26 Oct 2012

The Guidelines: Future Directions, in a Cardiovascular Seminar entitled Translational Approaches in PH Treatment: From Epidemiology to Drug Therapies, American Heart Association (AHA) Sessions, Los Angeles, CA, 6 Nov 2012

Evolution of End-Points of Clinical Trials in Pulmonary Arterial Hypertension, The Eighth John Vane Memorial Symposium on Prostacyclin Science & Pulmonary Vascular Disease, Royal Society, London, UK, 22 March 2013

Riociguat For The Treatment Of Pulmonary Arterial Hypertension (PAH): A Phase III Long-Term Extension Study (PATENT-2), Mini Symposium: Clinical Trials in Pulmonary Hypertension, American Thoracic Society International Conference (ATS), Philadelphia, PA, 20 May 2013

Diagnosis and Prognosis; Definitions and Classifications and Particularities of Different PAH Subgroups session presentations, Actelion 10<sup>th</sup> Anniversary Scientific Symposium, Tokyo, Japan, 6-7 Jul 2013

Management of Pulmonary Hypertension, Yamaguchi University, Tokyo, Japan 8 Jul 2013

The evolution of in clinical trial endpoints for PAH: Key results of SERAPHIN, European Scientific Congress (ESC), Amsterdam, Netherlands, 30 Aug 2013

Morning Educational Symposium: What's New in Pulmonary Hypertension, CHEST 2013, Chicago, IL, 29 Oct 2013

Late-breaking abstract: Riociguat for the treatment of PAH: 1-year results from the PATENT-2 long-term extension study, CHEST 2013. Chicago, IL, 29 Oct 2013

New Therapies for Pulmonary Hypertension, American Heart Association 2013 Scientific Sessions, Dallas, TX, 16 Nov 2013

Impact of Latest WHO Guidelines in PAH, The 9th John Vane Memorial Symposium on Prostacyclin Science & Pulmonary Vascular Disease, Royal Society. London, UK, 28 March 2014

Where We've Been: PAH As a Universally Fatal Disease. NewYork-Presbyterian/Columbia University Medical Center CME At The Leading Edge: New Frontiers in Pulmonary Hypertension and ECMO, New York, NY, 8 Jan 2015

Interview With a Pioneer - Lewis J. Rubin, State of the Art Assessment and Therapy for PAH. American College of Cardiology 64<sup>th</sup> Annual Scientific Sessions, San Diego, 14-15 March 2015

DEBATE: Should Right Ventricular-Pulmonary Vascular Dysfunction From Left Heart Disease be Treated With PAH-Specific Therapies? I Don't Know What's Right! Approach to Right Ventricular Dysfunction. American College of Cardiology 64<sup>th</sup> Annual Scientific Sessions, San Diego, 14-15 March 2015

55<sup>th</sup> Annual Meeting of the Japan Respiratory Society, Presidential Symposium: "Pulmonary Hypertension—Comprehensive Update." Tokyo, Japan, 19 Apr 2015

Third Focus on Pulmonary Hypertension: "Rising the Bar: Future Goals and Endpoints in the Treatment of PAH. Capri, Italy, 3 May 2015

Ayerza Course on Pulmonary Hypertension: "Approach to Diagnosis" "Current Treatment Algorithms" "Chronic Thromboembolic Pulmonary Hypertension" "Contributions of New Clinical Trials: PATENT 2 and CHEST 2" "Present and Future of Pulmonary Hypertension." Buenos Aires, Argentina, 13-14 Jun 2015

11<sup>th</sup> John Vane Memorial Symposium, "Effectiveness of Oral Prostacyclin Therapies for PAH." Royal Society London, United Kingdom, 12 Mar 2016

FEATURED TALK "20th Anniversary of Prostacyclin Therapies in Pulmonary Arterial Hypertension: From 1996 to Oral Therapies." American College of Cardiology (ACC) 65th Annual Scientific Session, Chicago, IL, 3 Apr 2016

Robert F. Johnson, MD Memorial Lecture, "Treatment of Pulmonary Artery Hypertension: Past, Present and Future." Drexel University College of Medicine, Philadelphia, PA, 18 Oct 16

Robert F. Johnson, MD Memorial Visiting Professor, Medical Grand Rounds, "Pulmonary Hypertension: A Disorder with Many Causes." Drexel University College of Medicine, Philadelphia, PA 19 Oct 16

A Celebration of Cardiopulmonary Physiology from the Nobel Prize to the Modern Era. Present "Cor Pulmonale Revisited: From Harvey and Ferrer to the Present." New York University Langone Medical Center, New York, NY, 17 Jan 2017