

## House Energy and Commerce Committee

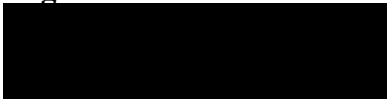
### U.S. House of Representatives

Witness Disclosure Requirement – “Truth in Testimony”  
Required by House Rules XI, Clause 2(g)(5)

1. Your Name: <b>Homer A. Boushey</b>		
2. Are you testifying on behalf of the Federal, or a State or local government entity?	Yes	No <b>X</b>
3. Are you testifying on behalf of an entity that is not a government entity?	Yes <b>X</b>	No
4. Other than yourself, please list which entity or entities you are representing:  <b>American Thoracic Society</b>		
5. Please list any Federal grants or contracts (including subgrants or subcontracts) that <u>you or the entity you represent have received</u> on or after October 1, 2011.  <b>See attached.</b>		
6. If your answer to the question in item 3 is “yes” please describe your position or representational capacity with the entity(ies) you are representing.  <b>I am a member and Past President of the American Thoracic Society. .</b>		
7. If your answer to the question in item 3 is “yes” do any of the entities disclosed in item 4 have parent organizations, subsidiaries, or partnerships that you are not representing in your testimony?	Yes	No <b>X</b>
8. If the answer to question in item 3 is “yes”, please list any Federal grants or contracts (including subgrants and subcontracts” that were received by the entities listed under the question in item 4 on or after October 1, 2011, that exceed 10 percent of the revenue of the entities in the year received, including the source and amount of each grant or contact to be listed:  <b>The American Thoracic Society has received grants and contracts from the federal government (see attached). The combined total of all federal grants and contracts do not exceed 10% of the revenue of the American Thoracic Society.</b>		

I certify that the above information is true and correct.

Signature:



Date: 3/20/17

**Homer A. Boushey MD  
Federal Grants and Awards**

Source	Project	Grant/Contract Number	Annual Amount	Years Awarded
NIH/NHLBI	UCSF AsthmaNet Clinical Center	U10 HL098107	\$ 589,615 direct/yr 1	2000-2016
NIH/NIAID	Inner City Asthma Consortium II / UCSF ICAC-II Basic Science Site	HHSN272200900052C	-\$ 236,534 direct/yr 1	2009-2014
NIH/NHLBI	Development and Validation of test for Gastro-esophageal Reflux with Aspiration	1R43HL120427	\$ 60,000 direct/yr 1	2013-2017
NIH/NIAID	Pets and the Infant Microbiome: Effect on Immune Maturation & Atopic Asthma	P01AI089473	\$ 231,991 direct/yr 1	2012-2017

**American Thoracic Society  
Federal Grants, Contracts, Subcontracts and Awards**

Source	Project	Grant/Contract Number	2014	2015	2016
CDC	STOP TB USA Partnership (2012-2017)	U52 PS003781"	96,817.00\$	96,817.00	\$95,626.92
CDC	Asthma EHR SME Workplan	000HCCHD-2014-69390	\$10,000		
CDC	Work Asthma Domain Experts (WADE)	212-2014-M-5906	10,000.00\$	\$7,500.00 \$	\$4,780.00
USAID/ TB Cares	Subcontract: TB Care Program	AI-OAA-A-10-00020	\$783,850.5 9	\$1,459,782 .00	\$
USAID/ KNVC	Subcontract: USAID	AID-OAA-A-14-00029	\$	\$	\$191,775.0 0

**University of California, San Francisco  
CURRICULUM VITAE**

**Name:** Homer A Boushey, Jr., MD

**Position:** Recalled Faculty, Step 9  
Medicine  
School of Medicine

**Address:** [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

**EDUCATION**

1956 - 1960	St. Paul's School, Concord, New Hampshire	Magna Cum Laude	
1960 - 1964	Stanford University, California	A.B.	Biology,
1964 - 1968	University of California, San Francisco	M.D.	
1968 - 1969	University of California	Intern	Medicine
1969 - 1970	UCSF	Resident	Medicine
1970 - 1971	Beth-Israel Hospice (Harvard Medical School)	Resident	Medicine
1971 - 1972	Oxford University	Fellow	Physiology
1972 - 1974	UCSF	Fellow	Pulmonary, Medicine

**LICENSES, CERTIFICATION**

1969	California License Number A 23453
June 1972	American Board of Internal Medicine (June 1972)
October 1974	Subspecialty Board of Pulmonary Medicine (Oct. 1974)

**PRINCIPAL POSITIONS HELD**

1974 - 1980	University of California San Francisco	Assistant Professor	Medicine
1980 - 1986	University of California San Francisco	Associate Professor	Medicine
1986 - 2015	University of California San Francisco	Professor	Medicine

2015 - present University of California San Francisco Professor Emeritus Medicine

### **OTHER POSITIONS HELD CONCURRENTLY**

1994 - present Airway Clinical Research Center Director 1994-2008 Associate Director 2008-present Medicine, Division of Pulmonary, Critical Care, and Sleep Medicine

1997 - 2010 Division of Allergy & Immunology Chief

### **HONORS AND AWARDS**

1964 Phi Beta Kappa

1964 1964-1968, Regents' Scholar

1967 AOA

1968 Awarded Gold-Headed Cane

1977 H.J. Kaiser Award for Excellence in Teaching

1977 H,J. Kaiser Award for Excellence in Teaching

1988 Faculty-Student Teaching Award for "An Outstanding Lecture"

1988 Faculty-Student Award for "An Outstanding Lecture"

1990 Faculty-Student Teaching Award for "An Outstanding Lecture"

1993 Clean Air Award, American Lung Association of San Francisco

1993 California Thoracic Society/American Lung Association of California Medal

1993 The Best Doctors in America Listing, selected by fellow physicians

1994 present, Honorary Membership Status, California Thoracic Society

1995 Faculty-Student Teaching Award for "An Outstanding Lecture"

1996 UCSF Alumnus of the Year Award

1997 Bay Area's Best Physicians, San Francisco Focus Magazine

1998 Bay Area's Best Physicians, San Francisco Focus Magazine

1999 Bay Area's Best Physicians, San Francisco Focus Magazine

1999 Faculty-Student Teaching Award for "An Outstanding Lecture"

2000 Bay Area's Best Physicians, San Francisco Focus Magazine

2000 Faculty-Student Teaching Award for "An Outstanding Lecture"

2000 Medical Student Teaching Award: "An Outstanding Clinical Correlation Lecturer"

2000 Medical Student Teaching Award for "An Outstanding Clinical Correlation Lecture."

- 2000 Medical Student Teaching Award for "An Outstanding Clinical Correlation Lecture."
- 2004 UCSF Academic Senate Distinguished Clinical Research Lecturer
- 2006 American Thoracic Society Public Advisory Roundtable Distinguished Achievement Award
- 2008 American Thoracic Society Outstanding Contributions Award as Chariman, Foundation of ATS Board of Trustees and as a member of the Board of Directors

**KEYWORDS/AREAS OF INTEREST**

Asthma, COPD, bronchitis, airway inflammation, clinical and translational research, pharmacologic treatment, respiratory infection, respiratory viruses, rhinovirus, bacterial infection, microarrays, novel pathogen discovery, and the microbiome

**CLINICAL ACTIVITIES SUMMARY**

Attending Physician, Pulmonary Medicine, UCSF.

**PROFESSIONAL ORGANIZATIONS**

**MEMBERSHIPS**

- 1974 - present California Thoracic Society
- 1974 - present American Thoracic Society
- 1978 - present American Federation for Clinical Research
- 1978 - present American Physiological Society
- 1980 - present California Academy of Medicine
- 1980 - present Western Association of Physicians
- 1980 - present Western Society for Clinical Investigation
- 2002 - present European Respiratory Society
- 2005 - present American Academy of Asthma Allergy and Immunology
- 2005 - 2009 Board of Trustees, Foundation of the American Thoracic Society
- 1990 - present Board of Directors, Gold-Headed Cane Society, UCSF (President 2008-2015)

**SERVICE TO PROFESSIONAL ORGANIZATIONS**

- 1986 - 1989 San Francisco Lung Association Member, Board of Directors
- 1976 - 1983 California Thoracic Society Ad Hoc Committee on Pulmonary Function Standards
- 1978 - 1983 California Thoracic Society Membership Committee
- 1979 - 1982 California Thoracic Society Representative to American Thoracic Society Council

1979 - 1980	California Thoracic Society	Chairman, Annual Meeting Planning Committee
1980 - 1981	California Thoracic Society	Secretary-Treasurer
1981 - 1982	California Thoracic Society	Vice President
1982 - 1983	California Thoracic Society	President-Elect
1983 - 1984	California Thoracic Society	President
1995 - 1997	California Thoracic Society	Member, Nominating Committee
1979 - 1982	American Thoracic Society	Member, Council of Chapter Representatives
1979 - 1987	American Thoracic Society	Member, Editorial Board, American Review of Respiratory Disease
1984 - 1985	American Thoracic Society	Chair, Nominating Committee, Assembly on Occupational and Environmental Health
1985 - 1987	American Thoracic Society	Annual Meeting Abstract Reviewer
1987 - 1990	American Thoracic Society	Member, Board of Directors
1995 - 1996	American Thoracic Society	Chair, Nominating Committee
1995 - 1996	American Thoracic Society	Member, Northern California Committee for Asthma Research Initiative
1996 - 1998	American Thoracic Society	Member, ATS Awards Committee
2000 - 2001	American Thoracic Society	Secretary-Treasurer
2001 - 2002	American Thoracic Society	Vice-President
2002 - 2003	American Thoracic Society	President-Elect
2003 - 2004	American Thoracic Society	President
2002 - present	American Thoracic Society	Chair, Spirometry Task Force
2004 - present	American Thoracic Society	European Respiratory Society, Task Force on Definitions of Asthma Severity, Control, and Outcomes
2005 - 2008	American Thoracic Society	Chair, Board of Trustees
1997 - present	American Academy of Allergy, Asthma & Immunology	Fellow
1996 - 2000	The Gold-Headed Cane Society, Inc.	Vice-President
2008 - 2015	The Gold-Headed Cane Society, Inc.	President
2015 - present	The Gold-Headed Cane Society, Inc.	Board Member

## **SERVICE TO PROFESSIONAL PUBLICATIONS**

- 1997 - 2002 Associate Editor, American Journal of Medicine
- 1997 - 1999 Editor, Difficult Asthma by Martin Dunitz, U.K. 1999 -U.S.Distr.Blackwell Science, Inc.
- 1980 - present Ad hoc reviewer (1-4 articles per journal per year): American Journal of Respiratory and Critical Care Medicine; Journal of Allergy and Clinical Immunology; Chest
- 1980 - present Occasional reviewer (0-1 articles per year), JAMA, European Respiratory Journal, Journal of Clinical Asthma, Allergy, Immunology, Thorax, Lancet, American Journal of Respiratory Cell and Molecular Biology, New England Journal of Medicine

## **INVITED PRESENTATIONS - INTERNATIONAL**

- 2004 4th World Asthma Meeting (WAM). Bangkok, Thailand, February 16-19, 2004.
- 2004 Japanese Respiratory Society, Tokyo, Japan. March 31-2 April, 2004.
- 2004 7th Annual Congress of Turkish Thoracic Society, Antalya, Turkey, April 22- 27, 2004.
- 2004 European Respiratory Society (ERS), Glasgow, Scotland, Sept. 4-8, 2004.
- 2004 ALAT & Congreso Argentino de Medicina Respiratoria. Buenos Aires, Argentina, Oct. 9-11, 2004.
- 2004 NAPCON 2004 National Conference, Ahmedabad, India, Nov. 15-19, 2004.
- 2004 9th Asian Research Symposium & 10th Biennial Congress of the Trans-Pacific Allergy & Immunology Society, Mumbai, India Nov. 19-22, 2004.
- 2006 8th International Symposium on Respiratory Viruses, Hapuna, HI March 16-19, 2006.
- 2007 TransAtlantic Airway Conference (TAC), Zurich, Switzerland, Jan 16-20, 2007.
- 2008 Joint Indo-US Workshop on Environmental Risks of Respiratory Disease, Chandigarh, India, Sept. 5-7, 2008.
- 2010 2nd International Congress on Exacerbation of Airway Disease, Miami Beach, Florida, USA, April 17-19, 2010.
- 2011 World Asthmal Congress, Cancun, Mexico, December 4-7, 2011. On "Microbiome and Asthma: a new window to health and allergic diseases?" and on "Molecular Links between Pets, Infants, and Allergic Disease."
- 2015 TransAtlantic Airway Conference (TAC), Zurich, Switzerland, Jan 13-17, 2015. "'COPD exacerbations, airway microbiome, and antibiotic treatment."
- 2016 Severe Asthma Conference, Marseille, France, Feb 20-21. "Asthma and the Microbiome."

## **INVITED PRESENTATIONS - NATIONAL**

- 2004 GlaxoSmithKline Asthma Master Class, Washington, DC, July 8-10, 2004.

- 2009 National Association Medical Directors, Respiratory Care (NAMDRC), Napa, CA, April 7-9, 2009
- 2004 Bi-Annual NIAID Asthma and Allergic Diseases Research Centers Meeting (AADRC), Bethesda, MD, Sept. 21-22, 2004.
- 2004 World Organization of Primary Care Societies (WONCA) & MCR Vision Meeting, Orlando, FL, Oct. 12-13, 2004.
- 2005 American Association for Respiratory Care, San Antonio, TX, Dec. 3-5, 2005.
- 2005 American Academy of Asthma, Allergy, and Immunology, San Antonio, TX, March 17-21, 2005
- 2006 American Academy of Asthma, Allergy, and Immunology, Miami, FL, March 3-7, 2006
- 2006 Merck National Therapeutics Experts Forum, Chicago, ILL, June 15-17, 2006
- 2006 American Thoracic Society, San Diego, CA May 20-25, 2006,
- 2007 American Academy of Asthma, Allergy, and Immunology, San Diego, CA Feb. 24-27, 2007
- 2007 Genentech/Novartis, Asthma Master Class, San Francisco, CA, March 2-3, 2007
- 2007 Sandler Program for Asthma Research (SPAR) Annual Meeting, Keynote, San Francisco, CA, May 9-11, 2007
- 2008 50th Annual Thomas L. Petty Lung Conference -Summarizer for "Asthma: Insights and Expectations", Aspen, CO, June 3-7, 2008.
- 2009 Western Society of Allergy, Asthma & Immunology (WSAAI) 47th Annual Scientific Session, Maui, HI January 25-29, 2009
- 2010 2010 AAAAI Annual Meeting, New Orleans, LA, Feb 26-March 2, 2010/ Presentations: "Phenotype, Personalization & Patterns of ICS Use in Asthma" & "Microbes as Modifiers of Allergic Disease"
- 2010 NHLBI/Asthma Outcomes Workshop, Bethesda, MD, March 15-16, 2010
- 2010 Gordon Research Conferences - Biology of Acute Respiratory Infection, Ventura, CA, March 21-26, 2010.
- 2010 Sandler Program for Asthma Research (SPAR) Annual Meeting, Keynote, San Francisco, CA, May 3-5, 2010
- 2011 American Academy of Asthma, Allergy, and Immunology Annual Meeting, San Francisco, CA, "Manipulating Human Microbial Community for Prevention of Asthma and Allergy"
- 2011 American Thoracic Society International Conference, Denver, Co., May 14-18, 2011 "The Human Microbiome: A Target for Disease Modification?"
- 2012 Sam Sills Distinguished Scholars Lectureship, Los Angeles, CA, March 26-28, 2012
- 2012 New York University: Department of Medicine Grand Rounds series, New York, NY, April 30-May 1, 2012



- 2013 AAAAI Annual Meeting, San Antonio, TX, February 22-26. "The Role of Airway and Gut Microbiome in the Development of Allergy."
- 2013 Roger Mitchell Lecture, Aspen Lung Conference, "The Microbiome and Asthma," Aspen, Colorado, June 5-8, 2013
- 2014 AAAAI Annual Meeting, San Diego, CA, March 1-2 Presentations: "The Microbiome is Important in Asthma"; and "Why are Microbiomes Important in Asthma?"
- 2014 Annual Meeting of the American Asthma Foundation Research Program, San Francisco, CA, May 7-9
- 2014 NIAID Meeting - Gastrointestinal Microbiota in Allergy and Advances in Probiotic Research Workshop, Bethesda, MD, August 4-5
- 2014 American College of Chest Physicians Annual Conference, Austin, TX, October 26-28
- 2015 AAAAI Annual Meeting, Houston, TX, February 20-24. Session Co-Chair: "So! How Clean Should Your Home Be?"
- 2016 AAAAI Annual Meeting, Los Angeles, CA, March 3-6 Presentations: "Airway and Gut Microbiome and Phenotypes of Mild Asthma"
- 2016 American College of Chest Physicians Annual Conference, Los Angeles, CA, October 24-26 Presentation: "The Microbiome and Asthma"
- 2016 Yale Severe Asthma 2016: A Personalized Approach to Therapy. "The Gut and Airway Microbiome in Asthma," November 10-11, 2016
- 2016 UNC Multi-Institutional Visiting Pulmonary Scholars Program, Chapel Hill, NC, November 16-17. Presentation: "The Gut and Airway Microbiome in Allergy and Asthma"
- 2017 AAAAI Annual Meeting, Atlanta, GA, March 2-6 Presentation: "What Organisms Make Up Exogenous and Endogenous Microbiomes?"

**INVITED PRESENTATIONS - REGIONAL AND OTHER INVITED PRESENTATIONS**

- 2003 May 7, 2003:UCSF Mini-Med School: "Asthma, Allergies, or Infections, Friends or Foes, San Francisco, CA
- 2004 May 22, 2004: American thoracic Society, "100 years of Advances in Lung Disease: Asthma", Orlando, Florida
- 2005 Loma Linda University Medical Grand Rounds, Loma Linda, CA.
- 2005 National Advisory Board, Genentech/Novartis, Santa Monica, CA.
- 2005 Sutter Medical Center, Santa Rosa, CA.
- 2006 Stanford University, California
- 2006 American Lung Association, Oakland, CA.
- 2006 University of Southern California Grand Rounds, Los Angeles, CA
- 2006 Santa Clara Valley Medical Center, California

- 2006 Visiting Professor, University of Wisconsin, Madison, WI
- 2006 Visiting Professor, University of Texas, Medical Board, Galveston, TX
- 2006 Visiting Professor, Ohio State University, OH
- 2006 Visiting Professor, University of Mississippi, St. Louis, MO
- 2006 June 24, 2006: Alpha-1 Foundation National Meeting, "The Second Genome Revolution", San Diego, CA
- 2007 Visiting Professor, University of California, Los Angeles, CA
- 2007 March 28, 2007: UCSF Faculty Associates: "A Coming Revolution in Medicine? New Methods for Detecting Microbes", San Francisco, CA
- 2008 Visiting Professor, Northwestern University, Feinberg School of Medicine, Chicago, IL
- 2008 UCSF-QB3 Clinical presentation (BioE 297), Mission Bay Campus, San Francisco, CA
- 2008 AAE Annual Conference, San Francisco, CA
- 2008 California Asthma Research Summit, UCSF-Mission Bay Conf.Ctr. San Francisco, CA
- 2009 UCD-CCRBM Seminar: Asthma & the Microbiome, Davis, CA
- 2009 AAIF of No. California, Annual Educational Symposium, San Francisco, CA
- 2009 Santa Rosa Memorial Hospital, CME-Grand Rounds, Santa Rosa, CA
- 2009 Commonwealth Club -"Now & Then Speaker Series", San Francisco, CA
- 2010 AAIF of No. California, 19th Annual Educational Symposium, San Francisco, CA
- 2010 5th Annual Strunk Family Lectureship, Washington University, St. Louis, MO.
- 2010 UC-Davis, Internal Medicine Grand Rounds, Sacramento, CA
- 2012 AAIF of No. California, 21st Annual Educational Symposium, San Francisco, CA
- 2012 Grand Rounds, Alta Bates Hospital, Berkeley, CA
- 2015 Visiting Professor, University of Wisconsin, Madison, WI
- 2015 Visiting Professor, Washington University, St. Louis, MO
- 2015 Invited Speaker, 20th Annual Asthma and Allergy Update 2015: It Takes a Village to Treat Asthma, University of Rochester, NY

**GOVERNMENT AND OTHER PROFESSIONAL SERVICE**

1987 - 2005	TransAtlantic Airway Conference	Member, Organizing Committee
1997 - 1999	Brown & Toland's Asthma Management Program Committee	Advisory Member
1997 - 1998	Merck Medco's Respiratory Disorders & Asthma Medical Advisory Board	Member

1997 - 2001	World Asthma Meeting	Member, Programme Committee
1998 - 2001	Novartis Global Respiratory Advisory Board	Member
2000 - 2001	Schering-Plough's Data Monitoring Advisory Committee (DMAC)	Member
2001 - 2005	GlaxoSmithKline Academic Advisory Board	Member
2005 - 2006	ALTANA Board Pharma Pulmonary Advisory Board	
2008 - 2011	Boehringer/Ingelheim	Advisory Board Member
2010 - 2013	Merck Global Advisory Board	Member
2011 - 2014	Johnson and Johnson Advisory Panel on Microbiome and Disease	Member
2016 - 2016	UCB Biopharma Advisory Committee	Member

### **SERVICE ACTIVITIES SUMMARY**

The major focus of my public service from 2000-2006 was the American Thoracic Society, as an officer of the Society from 2000-2005, and then as the Founding Chair of the ATS Foundation, organized to generate philanthropic support for research and training for diseases of the respiratory system. My work in both capacities involved attending board meetings (3-5/year) and committee meetings and speaking to professional, government, and lay groups about the impact of lung disease and the potential for research to improve methods for prevention, diagnosis, and treatment.

I also served on the National Asthma Expert Panel from 1992 to 2009. The panel's charge was to revise the NIH's national guidelines for the Diagnosis and Management of Asthma, making it, insofar as possible, an evidence-based document. I chaired the section on assessment and monitoring, and was a member of the section on pharmacologic treatment. The first edition of the guidelines were put forward in 1995 and have been updated periodically since then, most recently in 2009. This project required 2-3 two-day meetings, at least quarterly conference calls, and substantial off-line work as individuals or small groups for the 12-18 months before each update, roughly every four years.

I served as the Chair of the Review Committee of the Health Effects Institute from 2007 to 2015. This Congressionally mandated institute is jointly supported by the Environmental Protection Agency and the motor vehicle industry. The HEI sponsors national and international research projects on the health effects of air pollution (>250 projects since 1985). Reports of these projects are entered into the Congressional Record. The review Committee serves as an editorial board, directing revisions and, if necessary, additional research, before accepting a report as final. It additionally publishes commentaries and summaries of thematically-related projects funded by the HEI.

I am often called on by the American Thoracic Society and by UCSF's media-relations office to speak with reporters interested in a development in allergies, asthma, or lung disease (2-6 times/year). As a UCSF Faculty member and Clinical Associate of QB3, I regard it as a responsibility to advocate for the importance of supporting biomedical science in the maintenance and advancement of a sustainable modern society.

## UCSF CAMPUSWIDE

- 2001 - 2001 Member, ad hoc committee to investigate charge of sexual harrassment by a faculty member
- 2001 - 2004 Course: "Asthma Pathophysiology" Pathophysiology and Aging held in the winter quarter annually from 2001-2004 N208B
- 2003 - 2003 May 7, 2003: UCSF Mini Medical School Course: "Asthma and Allergens, Infections, & Rx. - friend or foe.", Cole Hall, San Francisco, CA.
- 2003 - 2003 August 28, 2003: University of California, San Francisco Medical Ground Rounds "Reconsidering Viral Respiratory Infections." N-225.
- 2011 - 2011 March 30, 2011: UCSF Mini Medical School Course: "Allergies, Asthma, and the Hygiene Hypothesis.
- 2010 - 2014 Member, Advisory Board, Participant Recruitment Service, CTSI, UCSF
- 2010 - 2014 Member, Advisory Board, Advisory Committee, Tobacco Education Center, UCSF
- 2006 - present Clinical Associate, California Institute for Qualitative Biomedical Research (QB3).

## SCHOOL OF MEDICINE

- 1993 - 2004 Director, Asthma Clinical Research Center: Overall responsibility for the conduct of NIH and privately funded clinical research studies of asthma and clinical trials of asthma therapies. This involved direction of a staff of up to two RN's, 1-3 research assistants, and a survey specialist responsible for subject recruitment programs. This also involved ensuring coordination of these research projects with those of other investigators studying asthma and COPD: Drs. Fahy, Lazarus, and Janson.
- 1995 - 2009 Chief, Division of Allergy and Immunology: Responsibilities included maintaining the standard of excellence in the A/I's Division's clinical, educational, research, and fiscal activities. This involved recruiting two clinician teachers, career counseling for junior faculty and A/I fellows ; and establishing and monitoring the Division's budget. 1-2 per year
- 2001 - 2001 April 26, 2001: UCSF Medical Ground Rounds "Updates in Asthma."
- 2002 - 2002 November 12, 2002: UCSF Pulmonary Ground Rounds " New Targets of Asthma Therapy."
- 2001 - 2001 Chair, Dean's Committee to recommend a faculty member for Endowed Chair in Occupational and Environmental Medicine
- 2002 - 2002 January 13, 2002: UCSF Pulmonary Lecture "Parmacology" School of Medicine
- 2005 - 2005 Ad-Hoc Faculty Review

2006 - 2006 Ad-Hoc Committee for selection of 2006 UCSF Presidential Chair.

### **DEPARTMENTAL SERVICE**

2003 - present Departmental Compensation Plan Committee  
2001 - 2001 Chair, Search Committee for Clinician-Teacher in Allergy/Immunology  
2002 - 2002 Member, review subcommittee for Department Promotions Committee  
2003 - 2003 Chair, Search Committee for Clinician-Teacher in Allergy/Immunology  
2004 - 2004 Chair, Search Committee, Assistant Professor in Division of Allergy-Immunology  
2009 - 2014 CTSI Recruitment - Advisory Committee

### **COMMUNITY AND PUBLIC SERVICE**

2001 - 2005 California Air Resources Board, Fresno Asthma Children's Study, Consultant  
2006 - present Health Effects Institute, Review Committee, Chair  
2003 - 2003 May 19-23, 2003: Advances in Internal Medicine "viral Respiratory Infections." Cathedral Hill Hotel, San Francisco,.  
2001 - present National Institutes of Health -NHLBI-:  
2001 - 2003 National Institutes of Health -NHLBI-, National Asthma Expert Panel  
2004 - present National Institutes of Health -NHLBI-, National Asthma Expert Panel 3  
2004 - 2007 National Institutes of Health -NHLBI-, Asthma Phenotypes Task Force  
2003 - 2003 June 17-19, 2003: National Institutes of Health -NHLBI- , Working Group on Polymorphisms of the Beta-adrenergic Receptor Gene, Co-Chair  
2003 - 2003 Nov., 2003: C National Institutes of Health -NHLBI- , OPD Coalition Conference, Co-chair  
2004 - 2004 Sept., 2004: National Institutes of Health -NHLBI- , COPD Coalition Conference, Co-chair  
2000 - 2009 American Thoracic Society:  
2000 - 2005 American Thoracic Society, Officer: Secretary-Treasurer, Vice President, President, Immediate Past President  
2005 - 2008 American Thoracic Society, American Thoracic Society Foundation, Founding-Chair  
2006 - 2015 Chair, Review Committee, Health Effects Institute (EPA-funded), Boston, MA  
2010 - present NIH-Chair, Observation Safety Monitoring Board (OSMB), COPD Gene Study/NHLBI

**TEACHING SUMMARY**

On completing my term as President of the American Thoracic Society, I resumed clinical teaching as an attending physician in the Chest-Allergy Practice, where I oversee Allergy and Pulmonary fellows, Internal Medicine residents, and students who rotate onto our outpatient services.

I continue to oversee the work of post-docs in conduct of research (Julia Durack, PhD and Marrah Lachowicz-Scoggins PhD). I gave lectures in the Pulmonary and Allergy section of the new Medical School curriculum, organized and spoke in clinical correlation sessions for the Medical School course on Infection, Immunity, and Inflammation, I also spoke at Allergy and Pulmonary Conferences, Medical Grand Rounds, other campus conferences, and the Allergy Journal Club, where I often directed discussion of the presentations. I also attend regularly the weekly Pulmonary Grand Rounds and Conferences.

**FORMAL TEACHING**

	Academic Yr	Course No. & Title	Teaching Contribution	School	Class Size
	2000 - present	I customarily speak in 2-5 Postgraduate courses per year, sponsored by national Societies (AAAAI, ATS) or their local chapters, by Lung Association Affiliates, by Societies of Internal Medicine or Family Practice, and local hospitals (Grand Round series) usually on pathophysiology, diagnosis and treatment of asthma, COPD, acute bronchitis, or other diseases of the lungs and airways.	Speaker/Lecturer		
	2008 - 2015	School of Medicine: Organ block course	Lecture on Treatment of Asthma		140-150 (whole class)
	2008 - 2015	School of Medicine: Introduction to Immunology	Clinical Correlation Session		140-150 (whole class)

	Academic Yr	Course No. & Title	Teaching Contribution	School	Class Size
	2000 - 2009	School of Nursing	Lecture on Asthma Pathophysiology and treatment		140-150 (whole class)

### INFORMAL TEACHING

1974 - 2016 Informal teaching of students, residents, and fellows who have rotated on the in-patient or out-patient pulmonary service during my periods of attending is a deeply ingrained habit. For the past 7 years, I have limited my clinical teaching to the out patient Chest/Allergy Clinic and the Airway Clinical Research Center. I also teach informally post-doctoral trainees participating in research in which I am involved as a co-investigator or principal investigator.

### MENTORING SUMMARY

I actively mentored all of the below-listed trainees who have worked with me on research projects, providing guidance and advice on activities that would foster their development into independent, self-directed academic teachers, investigators, and clinicians. I have additionally served on the mentoring committees for 2-3 fellows who work in the research programs of other Pulmonary/Critical Care faculty (2-3/year).

### POSTDOCTORAL FELLOWS AND RESIDENTS MENTORED

Dates	Name	Fellow	Mentor Role	Faculty Role	Current Position
2013 - present	Durack, Juliana	Post-Doc	Research/Scholarly Mentor, Project Mentor	Features of the bronchial bacterial microbiome	Post-Doc, UCSF
2010 - present	Lachowicz-Scroggins, M	Post-Doc		HRV infection of cultured airway epithelium	Specialist, UCSF
2006 - 2011	Huang, Y	Fel		Bronchial Bacterial Microbiome in Asthma & COPD	Will join UCSF Pulm Div faculty as K-awardee and Assistant professor, July 2012
2006 - 2009	Kistler, A	Post-Doc (co-mentored with Don Ganem, MD)		Rhinovirus infection	Scientist, Craig-Venter Institute

Dates	Name	Fellow	Mentor Role	Faculty Role	Current Position
2006 - 2008	Klein, J	Fel		Clinical Training Allergy & Immunology	Kaiser Permanente Hayward
2006 - 2009	Cheng, L	Fel		Clinical Training Allergy & Immunology	Asst. Professor UCSF-Peds A/I
2005 - 2007	Yoo, J	Fel		Research/Clinical Training Allergy & Immunology	Santa Clara Medical Ctr.
2004 - 2006	Tcheurekdjian, H.	Fel		Research/Clinical Training Allergy & Immunology.	Asst. Prof. Cleveland Clinic Case Western
2004 - 2006	Park, I.	Research Fel		Diesel particle-rhinoviruses interactions in airway epithelial cells.	Private Practice Korea
2002 - 2005	De Souza, N.	Research Fel		Rhinoviruses infection of nasal + bronchial epithelial cells in vitro.	Private Practice Canada
2003 - 2005	Kistler, A.	Post Doctoral Fel		Rhinoviruses detection and serotyping by microarray.	Research Postdoctoral UCSF-DeRisi Lab
2002 - 2004	Lo, R.	Fel		Effect of rhinoviruses infection on nasal epithelial on transport in vitro.	Kaiser Permanente South San Francisco
2001 - 2003	Xu, A.	Fel		Clinical training Allergy & immunology	Private Practice San Francisco, CA
2001 - 2002	Pek, W.Y.	Post Doctoral Fel		Nasal potential difference during rhinoviruses	Clin. Teacher National U. Hop., Singapore



Dates	Name	Fellow	Mentor Role	Faculty Role	Current Position
1999 - 2001	Tevrizian, A.	Fel		Oral immunotherapy in allergic rhinitis	Clinical Instructor, UCSF 2003-5, now in private practice, Livermore CA
1999 - 2001	Burchard, E	Fel		Identification of novel IL-13 polymorphisms and analysis of relationship to asthma severity.	Assoc Prof, UCSF
1997 - 1999	Abisheganaden J.	Fel		Macrolide treatment of RV-16 induced VRI's.	Clin. Teacher National U. Hosp., Singapore
1997 - 1998	Pedro Avila	Fel		The effects of allergen challenge and RV16 colds on airways.	Assoc. Prof., Northwestern University
1996 - 1998	Ordonez, C*	Fel		Effect of clarithromycin on cystic fibrosis	Children's Hospital in Boston Harvard. Clinical Instructor
1996 - 1997	Little, F.	Fel		RV16 infection in healthy and asthmatic subjects	Assoc. Prof. of Medicine, Boston Univ.
1986 - 1997	Margolskee D	Fel		Mechanisms of bronchomotor tolerance to repeated challenge.	Exec. Dir. Merck, Res. Rayhway, NJ
1995 - 1996	Liu, H.	PosD		Cell-to-cell interaction of the neutrophil and eosinophil.	Physician, Xian Med. U. PR China
1995 - 1996	Fleming, H. E	Fel		The effects of experimental rhinovirus infection on airways.	Consultant, McKenzie Associates
1994 - 1995	Kwang Woo Kim	Fel			

Dates	Name	Fellow	Mentor Role	Faculty Role	Current Position
1992 - 1994	David Claman	Fel		Induced sputum to assess airway inflammation	Associate Clinical Professor, UCSF
1990 - 1993	Fahy J.	Fel		Methods to assess airway inflammation	Professor, UCSF NHLBI
1987 - 1988	Rubinstein, Israel	Fel		Role of peptide in exercise-induced bronchospasm	University of Chicago
1986 - 1988	Reiss, T.F.	Fel		Local mediator release after antigen challenge in asthmatic subjects.	Medical Director, Merck, Inc.
1985 - 1987	Bethel, RA	Fel		Non-specific stimuli of airway hyperresponsiveness.	National Jewish Medical Center
1986 - 1987	Meslier, N.	Fel		Responses to antigenic and distilled water challenge in allergic rhinitis.	University of Angers, France
1985 - 1986	Myers, Deborah	Fel		Pharmacologic inhibition of bronchomotor in responses in asthma.	Asst. Professor, Wayne State U. Detroit, MI
1985 - 1986	Janson, SJ	Post Doc		Role of suggestion in regulation of airway caliber in asthma	Professor of Nursing UCSF
1984 - 1985	Seltzer, Janet	Fel		Airway inflammation induced by ozone exposure in human subjects	Private Practice, Olympia, WA
1982 - 1984	Tam, Elizabeth	Fel		Relationship between nasal and bronchial responsiveness. Characterization of human mast cell ad tryptase and chymase.	Professor of Medicine, Univ. of Hawaii
1978 - 1981	Sheppard, Dean	Fel		Effect of pollutants in the airways	Professor, UCSF

Dates	Name	Fellow	Mentor Role	Faculty Role	Current Position
1979 - 1980	Fukui, Christine	Fel			Physician, Kaiser Hospital, Honolulu, HI
1978 - 1979	DeMeo, Michael	Fel		Parasympathetic Reflex pathways in regulation in asthma	Private Practice, North Carolina
1977 - 1979	Holtzman, Mike	Fel		Effect of pollutants in the airways hyperactivity and inflammation	Professor Washington University School of medicine
1977 - 1979	Sheller, JR	Fel		Neural mechanisms of bronchial responsiveness.	Professor of Medicine Vanderbilt University
1977 - 1978	Golden, J.A.	Fel		Effects of Anti-Cholinergic treatment or response to allergen challenge.	Professor of Clinical Med, UCSF

### FACULTY MENTORING

Dates	Name	Position while Mentored	Mentor Type	Mentoring Role	Current Position
2009 - present	Susan V. Lynch, PhD	Post-Doc, Assistant Professor, Associate Professor , and now Professor of Medicine, Division of Gastroenterology.	Research/Scholarly Mentor, Project Mentor, Career Mentor	Collaborative investigator, provided advice and mentoring on securing faculty appointment and advancement at UCSF.	Professor of Medicine, G-I Division, UCSF

Dates	Name	Position while Mentored	Mentor Type	Mentoring Role	Current Position
2009 - present	Yvonne Huang, MD	Clinical and Research Fellow, Division of Pulmonary/Critical Care Medicine	Research/Scholarly Mentor, Project Mentor, Career Mentor	CO-supervised (with Susan Lynch, PhD) research work on microbiome of Asthma and COPD.	Assistant Professor of Medicine, Division of Pulm/CC Medicine, University of Michigan, Ann Arbor

### RESEARCH AND CREATIVE ACTIVITIES SUMMARY

Throughout my career, I have focused on the responses of the lungs to inhaled materials. I studied neural mechanisms of response in laboratory animals as a research fellow, and thereafter studied responses in healthy adults and in patients with asthma, cystic fibrosis, COPD, or other lung disease. Finding that brief exposure to ozone causes bronchial inflammation in healthy people led me to study the role of bronchial inflammation in asthma, and this in turn led to a lifetime interest in the causes, pathophysiology, and treatment of asthma. Dr. Sheppard and I demonstrated the extraordinarily greater sensitivity of patients with asthma to inhalation of sulfur dioxide, a finding considered important in Congressional re-authorization of the Clean Air Act.

Drs. Fahy and I demonstrated the validity of sputum induction for assessment of airway mucosal inflammation, and applied this and other methods to study new therapies for asthma (e.g., monoclonal anti-IgE antibody, inhaled corticosteroids, long-acting beta-agonists, and antagonists of leukotrienes, neuropeptides, and selectins). This work led to our selection as a site in the NHLBI's Asthma Clinical Research Network (ACRN). This network continued for 15 years, and I subsequently served as the co-PI for the UCSF site in the NHLBI's "AsthmaNet" from 2009 to 2015, when I resigned as PI, with Stephen Lazarus assuming that role in partnership with Michael Cabana, MD, Dept. of Pediatrics, the other co-PI of this grant.

My interest in bronchial inflammation also led me to study the mechanisms by which viral respiratory infections, especially by human rhinovirus (HRV), causes exacerbations of asthma, CF, and COPD. Collaborative studies with Drs. Avila and Dolganov at UCSF and Drs. Widdicombe and Wu at UC Davis suggested that the severity of lower respiratory responses to RV infection is a function of the state of differentiation of the bronchial epithelium (in turn a function of mucosal injury and repair) and of properties intrinsic to the infecting RV strain. An outgrowth of this work was collaboration with Drs. Derisi and Ganem in their development of a microarray-based approach to detecting viruses, and then, with Amy Kistler (postdoctoral fellow), in expanding the array to include sequences for all known serotypes of rhinovirus. Applying this method to samples from asthmatic patients with upper respiratory infections with, or without associated asthma exacerbations, we showed a high diversity of RV serotypes circulating concurrently, higher than expected rates of infection with "rare" viral pathogens (HKU and NL063 coronaviruses), and the existence a previously unknown phylogenetic branch of the RV genus, HRV-C. I additionally collaborated with Dr. Kistler in her work on genomic variations among RV serotypes, identifying the regions under greatest selective pressure. Drs. Collard, Ganem, DeRisi, Kistler and I have collaborated in pilot studies of the possible involvement of novel viral pathogens in exacerbations of idiopathic pulmonary fibrosis.

A parallel line of investigation focused on the determinants of epithelial cell susceptibility to HRV infection. Drs. Lopez-Sousa, Widdicombe, and I showed first that epithelial cells cultured under conditions leading to poor differentiation supported higher replication of HRV16 and produced greater quantities of IL-8, RANTES, and Eotaxin than well-differentiated cells from the same source. We subsequently showed that the addition of IL-13 to cell culture medium induces mucoid metaplasia of bronchial epithelial cells, with a similar increase in susceptibility to HRV infection (manuscript under review). We then examined the effects of corticosteroid treatment on IL-13 enhancement of susceptibility to HRV infection in this in vitro model system.

My involvement in studies applying new methods for detecting viruses led to a collaborative partnership with Dr. Susan Lynch (UCSF) in applying a new, culture-independent method, the "16S rRNA PhyloChip" to determine whether distinct bacterial communities are present in the bronchi of people with asthma. With Yvonne Huang, M.D. and Juliana Durack, Ph.D., Dr. Lynch and I thereafter completed a large study of the bronchial microbiome in allergic asthmatics, allergic patients without asthma, and healthy control subjects. These studies have shown bronchial microbial community composition to be richer and more diverse in asthmatic than in healthy subjects, and, within asthmatics, to be richer and more diverse in those with greater bronchial hyper-reactivity. They additionally identify the bacteria present in different abundance in the bronchial airways of patients with asthma vs. health. With Dr. Cabana, we also examined the effects of feeding *Lactobacillus casei* for the first 6 months of life on microbial community composition and risk of developing childhood asthma in infants born to asthmatic parents.

Dr. Lynch's and my partnership in applying the PhyloChip to describe microbial communities in clinical (protected bronchial brushings, induced sputum) and environmental (house dust) samples led to new partnerships. One is as co-directors of a "Basic Science Site" for the NIAID's Inner City Asthma Consortium and another is as co-PI's of a component project for a PPG directed by Dr. Christine Johnson at Henry Ford Hospital, Detroit. The projects of this PPG are aimed at defining the mechanisms responsible for the effects on risk of developing allergy and asthma of growing up in inner-city urban households (ICAC) or in households where dogs or cats are kept as pets (PPG). In both projects, our goal is to characterize the relationships to each other of the bacterial community composition of house dust and of the gastrointestinal tract of infants raised in the households sampled, and of either or both communities to markers of development of immune function, and to rates of allergic asthma in childhood. We are now additionally collaborating with Nick Lukacs, PhD, University of Michigan, in murine studies of the relationship between differences in gut microbial community composition and susceptibility to viral respiratory infection.

While partnering in these applications of new technologies to elucidation of the role of microbial pathogens and commensals in shaping the development, course, and responsiveness to different therapies of diseases of the lungs and airways, I continued to be involved in directing large clinical trials of asthma treatments. These included the "Best Adjustment Strategy for Asthma Long Term," which showed the simple strategy of taking a puff of inhaled beclomethasone for each puff of albuterol taken on an "as needed" basis was as effective as strategies based either on standard NIH guidelines or on the fractional concentration of exhaled nitric Oxide, a putative biomarker of airway inflammation. This paper, on which I am the senior author, was published in the *Journal of the American Medical Association*.

Looking back on my career from my current perspective, I think it may be distinguished in its later years by its novelty in taking advantage of new technologies to re-examine basic ideas

about pathophysiologic mechanisms, course, and approaches to treatment of common chronic inflammatory diseases of the airways, especially asthma and COPD. Learning these new methods and technologies has been challenging, but immensely stimulating.

### RESEARCH AWARDS - CURRENT

1. U10 HL098107	Former PI, Co-investigator since 2015		Lazarus (PI)
NIH/NHLBI		2009-09-30	2016-06-30
UCSF AsthmaNet Clinical Center		\$ 589,615 direct/yr 1	
Currently in no-cost extension			
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2. HHSN272200900052C	Former Co- PI, now Co-investigator		Lynch (PI)
NIH/NIAID		2009-09-30	2014-09-29
Inner City Asthma Consortium II / UCSF ICAC-II Basic Science Site		\$ 236,534 direct/yr 1	
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3. 1R43HL120427	Co-PI	10 % effort	
NIH/NHLBI		08/05/2013	04/30/2017
Development and Validation of test for Gastro-esophageal Reflux with Aspiration		\$ 60,000 direct/yr 1	
<p>The goals of this SBIR-funded study are to develop and validate a test for the occurrence of nocturnal or “ silent” gastroesophageal reflux and aspiration. This small proof of concept study will examine 5 healthy control subjects and 12 adults with idiopathic pulmonary fibrosis, lung transplantation, or other signs or symptoms of GER with aspiration and also with abnormal findings from esophageal manometry and pH monitoring consistent with the condition.</p>			

### RESEARCH AWARDS - PAST

1. RO1 HLO80074-01	Co-I; PI: Cabana, M		
NIH		2010-07-01	2010-03-31
Trial of Infant Probiotic Exposure on Developing Asthma		\$ 195,000 direct/yr 1	
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2. RO1 HL080414-05	Co-I; PI: Fahy, J		
NIH		2005-07-01	2010-05-31
Role of Histo-Blood Group Antigens in the Pathophysiology of Asthma		\$ 348,458 direct/yr 1	

3.	Doris Duke Foundation NIH Genomics-based Approaches to New Pathogen Discovery in Chronic Human Diseases	Co-I; P.I.: Ganem, DE	2003-10-01	2009-06-30 \$ 276,480 total
4.	No Number NIH Macrolides in Asthma Add-On Study	P.I.	2006-11-01 \$ 216,937 direct/yr 1	2008-10-31
5.	5 U10 HL074431-04 NIH COPD Clinical Research Network at UCSF	Co-I; P.I.: Lazarus, SC	2003-07-01	2008-09-30 \$ 735,800 total
6.	No number Sandler Asthma Basic Research Program The Role of Infection in Asthma Pathogenesis	Co-I; P.I.: Kronish, J	2006-01-01	2007-07-31 \$ 100,000 total
7.	P50HL56835 NIH/NHLBI Interaction of Lymphocytes, Cytokines, and Airway Cells Project 4: T cells, epithelial cells, and remodeling in human asthma	Co-I; PI: Sheppard, D	2001-09-01	2006-08-31
8.	AI05049601 NIH	PI	2001-09-01	2006-05-01
9.	No Number Glaxo Smith Kline (Industry)	PI	2004-09-01	2006-03-31

## Effects of fluticasone-salmeterol on the response of airway epithelial cells to rhinovirus infection

10. PO1 HLO70831-06A1 NIH/NHLBI Rhinovirus Infection and Childhood Asthma	Co-I; PI: Lemanske, R	2008-07-01 \$ 47,388 direct/yr 1	2013-04-30
11. 5 U10 HL074204-05 NIH/NHLBI Asthma Clinical Research Network Center at UCSF	PI	2003-09-15 \$ 168,897 direct/yr 1	2011-07-31
12. 5 U10 HLO74431-05 NIH COPD Clinical Research Network at UCSF	Co-I; P.I.: Lazarus, SC	2003-08-15 \$ 735,800 direct/yr 1	2011-07-31
13. R21 AT004732 NIH/NCCAM Probiotic Outcomes of Enteric Microflora (POEM) Study	Co-I; P.I.: Cabana, M	2009-10-01	2011-09-30
14. A1072115 NIH Siglec-F and Resolution of Allergic Inflammation	Co-I; PI: Broide, D	2010-04-01 \$ 16,800 direct/yr 1	2012-03-31
15. Prot 114878/Ref014716 GlaxoSmithKline Effects of Fluticasone-Salmeterol on Airway Epithelium to Rhinovirus Infection	PI	2010-08-01 \$ 96,925 direct/yr 1	2011-07-31



16. HL098107	PI		
NIH/ NHLBI		09/30/2011	02/28/2014
Proof of Concept Study, Microbiome in Asthma			\$ 862,000 total
17. N/A	PI		
Genentech		07/01/2011	06/30/2012
Airway Microbiome in Severe Asthma			\$ 90,000 total

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1. Willerson D, Becker CE, **Boushey HA**, Kimball RS. Hodgkin's disease exclusively with bone marrow involvement. *JAMA* 1970;214:2197-2198.
2. **Boushey HA**, Richardson PS, Widdicombe JG. Reflex effects of laryngeal irritation on the pattern of breathing and total lung resistance. *J Physiol (Lond)* 1972;224:501-513.
3. **Boushey HA**, Richardson PS. The reflex effects of intralaryngeal carbon dioxide on the pattern of breathing. *J Physiol (Lond)* 1973;228:181-191.
4. **Boushey HA**, Richardson PS, Widdicombe JG, Wise JCM. The response of laryngeal afferent fibers to mechanical and chemical stimuli. *J Physiol (Lond)* 1974;240:153-175.
5. **Boushey HA**. Pulmonary vascular disease. *West J Med* 1975;123:31-40.
6. Dain DS, **Boushey HA**, Gold WM. Inhibition of respiratory reflexes by local anesthetic aerosols in dogs and rabbits. *J Appl Physiol* 1975;38:1045-1050.
7. **Boushey HA**. The Pickwickian syndrome. *West J Med* 1977;127:24-31.
8. Geppert EF, **Boushey HA**. An investigation of the mechanism of ethanol-induced bronchoconstriction. *Am Rev Respir Dis* 1978;118:135-139.
9. Golden JA, Nadel JA, **Boushey HA**. Bronchial hyperirritability in healthy subjects after exposure to ozone. *Am Rev Respir Dis* 1978;118:287-294.
10. Holtzman MJ, Cunningham JH, Sheller JR, Irsigler GB, Nadel JA, **Boushey HA**. Effect of ozone on bronchial reactivity in atopic and non-atopic subjects. *Am Rev Respir Dis* 1979;120:1059-1067.
11. Holtzman MJ, Sheller JR, DiMeo M, Nadel JA, **Boushey HA**. Effect of ganglionic blockade on bronchial reactivity in atopic subjects. *Am Rev Respir Dis* 1980;122:17-25.
12. Sheppard D, Wong WS, Uehara CF, Nadel JA, **Boushey HA**. Lower threshold and greater bronchomotor responsiveness of asthmatic subjects to sulfur dioxide. *Am Rev Respir Dis* 1980;122:873-878.
13. DiMeo MJ, Glenn MG, Holtzman MJ, Sheller JR, Nadel JA, **Boushey HA**. Threshold concentration of ozone causing an increase in bronchial reactivity in humans and adaptation with repeated exposures. *Am Rev Respir Dis*, 1981;124:245-248.

14. Sheppard D, Nadel JA, **Boushey HA**. Inhibition of sulfur dioxide-induced bronchoconstriction by disodium cromoglycate in asthmatic subjects. *Am Rev Respir Dis* 1981;124:257-259.
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17. Kirkpatrick MB, Sheppard D, Nadel JA, **Boushey HA**. Effect of the oronasal breathing route on sulfur dioxide-induced bronchoconstriction in exercising asthmatic subjects. *Am Rev Respir Dis* 1982;125:627-361.
18. Sheppard D, Epstein J, Holtzman MJ, Nadel JA, **Boushey HA**. Dose-dependent inhibition of cold air-induced bronchoconstriction by atropine. *J Appl Physiol* 1982;53:169-174.
19. Bethel RA, Epstein J, Sheppard D, Nadel JA, **Boushey HA**. Sulfur dioxide-induced bronchoconstriction in freely breathing, exercising, asthmatic subjects. *Am Rev Respir Dis* 1983;128:987-990.
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24. Bethel RA, Sheppard D, Epstein J, Tam E, Nadel JA, **Boushey HA**. Interaction of sulfur dioxide and dry cold air in causing bronchoconstriction in asthmatic subjects. *J Appl Physiol* 1984;57:419-423.
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7. Lynch SV, **Boushey HA**. The microbiome and development of allergic disease. *Curr Opin Allergy Clin Immunol.* 2016;16(2):165-71.

## SIGNIFICANT PUBLICATIONS

1. Huang YJ, Nelson CE, Brodie EL, Desantis TZ, Baek MS, Liu J, Woyke T, Allgaier M, Bristow J, Wiener-Kronish JP, Sutherland ER, King TS, Icitovic N, Martin RJ, Calhoun WJ, Castro M, Denlinger LC, Dimango E, Kraft M, Peters SP, Wasserman SI, Wechsler ME, Boushey HA, Lynch SV; National Heart, Lung, and Blood Institute's Asthma Clinical Research Network. Airway microbiota and bronchial hyperresponsiveness in patients with suboptimally controlled asthma. *J. Allergy Clin Immunol.* 2011 Feb; 127:372-381. Senior author: I conceived of this project and in partnership with Susan Lynch, PhD (Assist Prof, G-I Division) and Yvonne Huang, MD (Research Fellow, Pulm Div), developed the protocol and applied for and secured funding for the project as an "Add-on" study to an NHLBI-funded "Asthma Clinical Research Network" trial. This study was highly innovative in that it was one of the first two publications describing the existence of an airway microbiome, revealed by the application of a recently developed, 16S-rRNA-based, culture-independent method, in the airways, revealing a difference in the airway microbiome of healthy and asthmatic adults.
2. Boushey HA, Sorkness CA, King TS, Sullivan SD, Fahy JV, Lazarus SC, Daily versus as-needed corticosteroids for mild persistent asthma. *New Eng J Med.* 2005;352(15):1519-28. Lead investigator: I proposed this project to the Steering committee of the Asthma Clinical Research Network, and in partnership with Elliot Israel, MD (Harvard Medical School and Brigham and Women's Hospital, Boston) developed the protocol and oversaw the execution, interpretation, and publication of the study. This study's findings suggest that "as needed" use of an inhaled corticosteroid may be as effective as twice daily use for control of mild persistent asthma. This finding has since been confirmed by studies by other investigators and suggests an alternate, less expensive and intrusive approach to management of a very common condition (24 million asthmatics in the U.S., 300 million world-wide). This project and its publication led directly to a subsequent ACRN research study of a very similar approach to treatment in patients with moderately severe asthma, on which I served as Senior investigator and author. A manuscript describing this second study has been submitted to the New England Journal of Medicine.

3.

Kistler A, Avila PC, Rouskin S, Wang D, Ward T, Yagi S, Schnurr D, Ganem D, DeRisi J, and Boushey HA. Pan-viral Screening of Respiratory Tract Infections in Adults with and without Asthma Reveals Unexpected Coronavirus and Human Rhinovirus Diversity. *Journal of Infectious Diseases*; Sept 2007;196(6):817-825 Senior investigator: In partnership with Pedro Avila, MD (now at Northwestern University), designed the protocol for characterizing asthmatic patients suffering a respiratory tract infection, organized sample collection, established collaboration with Drs. Ganem, DeRisi, and Kistler for molecular detection and characterization of viruses detected. This paper was among the first to demonstrate the existence of a previously unknown phylogenetic branch of human rhinoviruses, "HRV-C," so far not grown in culture, but which subsequent studies by other investigators have shown to be an important cause of febrile illnesses with wheezing and bronchiolitis in infants and children.

4.

Lachowicz ME, Boushey HA, Widdicombe JH. Interleukin-13 induced mucous metaplasia increases susceptibility of human airway epithelium to rhinovirus infection. *Amer J. Resp Cell & Molec Biol*, 2010 Co-Lead investigator: I conceived this project, and was the investigator listed as P.I. on the research grant secured from GlaxoSmithKline for its conduct. This study established that IL-13 induces mucus metaplasia in airway epithelial cells cultured at an air-liquid interface, a morphologic change associated with striking increase in susceptibility to rhinovirus infection, as reflected by increases in viral proliferation and in epithelial cell production of inflammatory cytokines. These findings suggest a mechanism accounting for the heightened susceptibility of patients with asthma to severe exacerbations when they contract rhinovirus infections. This publication has led to a subsequent, currently on-going research on the actions of corticosteroids in inhibiting IL-13-induced mucus metaplasia and heightened susceptibility to HRV infection.

5.

Fujimura KE, Johnson CC, Ownby DR, Cox MJ, Brodie EL, Havstad SL, Zoratti EM, Woodcroft KJ, Bobbitt KR, Wegienka G, Boushey HA, Lynch SV. Man's best friend? The effect of pet ownership on house dust microbial communities *J Allergy Clin Immunol*. 2010 Aug;126:410-2. Dr. Lynch was the lead investigator on this study. My contribution was to recognize the opportunity of applying Dr. Lynch's culture-independent, 16S-rRNA-based methods for characterizing microbial community composition in house dust samples as a way of examining the hypothesis that differences in microbial exposures in early infancy may underlie the protective effect of early exposure to pet dogs and cats against the development of allergies and asthma in childhood. This study established the basis for Sue Lynch and my successful application (as co-PI's) for funding to serve as a "Basic Science Site" for the NIAID's Inner-City Asthma Consortium over a 5 year period, with subsequent renewal possible.

## **PATENTS ISSUED OR PENDING**

1. European Patent No: 98 911 435.0: Brigham and Women's Hospital "Selective Asthma Patients Predisposed to Adverse  $\beta$ -Agonist Reactions."

## CONFERENCE ABSTRACTS

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## **OTHER CREATIVE ACTIVITIES**

1. I have listed only the two most recent faculty members I have mentored, Susan Lynch, PhD, and Yvonne Huang, MD. Over the course of my career, however, I have had the great privilege of mentoring the early course of fellows and junior faculty who went on from working with me to highly distinguished careers in academic medicine. The three most prominent might be Dean Sheppard (Chief, Division of Pulm/CC Medicine, UCSF), Michael Holtzman (Chief, Division of Pulm/CC Medicine, Wash U, St Louis), and John Fahy, MD, MbCH, UCSF). Others are J. R. Sheller, MD, Professor of Pulm/CC Medicine at Vanderbilt University, Elizabeth Tam, MD, Division Chief at the University of Hawaii, Esteban Burchard, MD, Associate Professor and Dave Claman, MD, Associate Professor of Pulm/CC Medicine at UCSF, and Pedro Avila, MD, Associate Professor of Allergy/Immunology at Northwestern University. For these and the other individuals I have worked with, mentoring did not feel like a duty or task, but like an act of engaged friendship.



