CURRICULUM VITAE

Neil R. Aggarwal, M.D. Sept 2021

**DEMOGRAPHIC AND PERSONAL INFORMATION**

**Current Appointments**

2021-present Director of Critical Care Research and Visiting Associate Professor of Medicine, Division of Pulmonary Sciences and University of Colorado – Anschutz Medical Campus

**Personal Data**

University of Colorado – Anschutz Medical Campus
Division of Pulmonary Sciences & Critical Care Medicine
Research 2 – Mail Stop C272

12700 East 19th Avenue

Aurora, CO, 80045

neil.aggarwal@cuanschutz.edu

**Education and Training**

Undergraduate

1995-1998 B.S. Chemical Engineering, Illinois Tech, Chicago, IL (*summa cum laude*)

Doctoral/Graduate

August 1999 - June 2003 M.D., Northwestern University – Feinberg School of Medicine, Chicago, IL (*AA*)

August 2019 - current Clinical Research Training Program, Duke University, Master’s candidate

Postdoctoral

July 2003 - June 2004 Intern, Department of Medicine, Johns Hopkins Hospital, Baltimore, MD

July 2004 – June 2006 Resident, Department of Medicine, Johns Hopkins Hospital, Baltimore, MD

July 2006 - June 2010 Fellow, Division of Pulmonary and Critical Care Medicine, Johns Hopkins University School of Medicine, Baltimore, MD. Research mentor: Landon King, MD

**Professional Experience**
July 2010 - June 2012 Instructor of Medicine, Division of Pulmonary and Critical Care
 Johns Hopkins University School of Medicine, Baltimore, MD

July 2012 - August 2016 Assistant Professor, Division of Pulmonary and Critical Care
 Johns Hopkins University School of Medicine, Baltimore, MD

August 2016 – August 2021 Chief, Lung Biology and Disease Branch, Division of Lung Diseases, National Heart, Lung, and Blood Institute, NIH

**RESEARCH ACTIVITIES and EXPERTISE**

**Johns Hopkins School of Medicine (2006 – 2016)**

I have expertise in understanding the role of immune cells and immunotherapy in acute and chronic inflammatory lung diseases. Through 10 years of contiguous federal and non-federal funding support, my colleagues and I demonstrated how external and internal stimuli influence and regulate macrophages to alter acute or chronic lung inflammation, and impact mechanisms of resolution and lung repair due to inflammation-induced acute lung injury (ALI). We found that moderate levels of supplemental oxygen can augment lung damage. By blunting activation of anti-inflammatory pathways including adenosine 2a receptor, excess oxygen exposure sustained activation of pro-inflammatory macrophages to augment lung inflammation and damage, impair resolution and lung repair. We then translated these studies into humans with ARDS that were enrolled in NIH-funded ARDS Network clinical trials, and demonstrated that excess oxygen exposure was associated with worse outcome irrespective of ARDS severity. More recently, we focused on internal, macrophage-specific mechanisms that regulate processes central for ALI resolution and lung repair. We identified a novel role for IL-4 as rescue therapy in experimental ALI, and demonstrated that macrophages are key orchestrators of IL-4-enhanced ALI resolution and lung repair.

**National Institutes of Health (2016 – 2021)**

In August 2016, I joined the extramural Division of Lung Diseases (DLD) in the National Heart, Lung, and Blood Institute (NHLBI) as the Chief of Lung Biology and Disease Branch. The branch funds basic, translational, and clinical research grants and cooperative agreements in pulmonary vascular biology and pulmonary hypertension; lung development, repair, and regeneration; acute respiratory failure and acute respiratory distress syndrome (ARDS); pulmonary fibrosis and other rare parenchymal and interstitial lung diseases; lung transplantation; and host response to infection. Signature Institute-initiated cooperative programs overseen by our branch program directors include: Prevention and Early Treatment of Acute Lung Injury (PETAL) Network, Lung Molecular Atlas Program (LungMAP), Pulmonary Vascular Disease Phenomics (PVDOMICS), Lung Transplant Outcomes Group (LTOG), and Prematurity-Related Ventilatory Control: Role in Respiratory Outcomes (Pre-Vent).

**Inventions, Patents, Copyrights**

3/20/2015 Co-Inventor, Patent: PCT/US2016/012621. Converted to and filed as “Compositions and Methods to Accelerate Resolution of Acute Lung Inflammation” from IL-4 Therapy to Accelerate Resolution and Repair of Acute Lung Inflammation in July 2016

**PUBLICATIONS**

**Peer-reviewed Publications**

1. Summers RM, **Aggarwal NR**, Sneller MC, Cowan MJ, Wood BJ, Langford CA, Shelhamer JH. CT virtual bronchoscopy of the central airways in patients with Wegener’s granulomatosis. Chest2002; 121(1): 242-50. PMID: 11796457
2. Tsushima K, King LS, **Aggarwal NR**, De Gorordo A, D’Alessio FR, Kubo K. Acute lung injury review. Intern Med. 2009; 48(9):621-30. PMID: 19420806.
3. D’Alessio F, Tsushima K, **Aggarwal NR**, West E, Willett MH, Britos MF, Pipeling MR, Brower RG, Tuder RM, McDyer JF, King LS\*. CD4+CD25+Foxp3+ Tregs Resolve Experimental Lung Injury by and are present in Humans with Acute Lung Injury. J. Clin. Invest. 2009: 119(10): 2898-913. doi: 10.1172/JCI36498. PMID: 19770521
4. **Aggarwal NR**, D’Alessio FR, Tsushima K, Sidhaye VK, Cheadle C, Grigoryev DN, BarnesKC, King LS\*. Regulatory T cell-mediated resolution of lung injury: Identification of potential target genes via expression profiling. Physiol Genomics. 2010: 41(2): 109-19. doi: 10.1152/physiolgenomics.00131.2009. PMID: 20028937
5. **Aggarwal NR**, D’Alessio FR, Tsushima K, Files DC, Damarla M, Sidhaye VK, Fraig MM, Polotsky VY, \*King LS. Moderate oxygen augments lipopolysaccharide-induced lung injury in mice. Am J Physiol Lung Cell Mol Physiol. 2010 Mar; 298(3): L371-81. doi: 10.1152/ajplung.00308.2009. PMID: 20034961
6. Drager LF, Li J, Shin M-K, Reinke C, **Aggarwal NR**, Jun JC, Bevans-Fonti S, Sztalryd C, O’Byrne SM, Kroupa O, Olivecrona G, Blaner WS and \*Polotsky VY. Intermittent Hypoxia Inhibits Clearance of Triglyceride Rich Lipoproteins and Inactivates Adipose Lipoprotein Lipase in a Mouse Model of Sleep Apnea. Eur Heart J. 2012; 33(6): 783-90. doi: 10.1093/eurheartj/ehr097. Epub 2011 Apr 9. PMID: 21478490
7. Rentsendorj O, Damarla M, **Aggarwal NR**, Choi JY, Johnston L, D’Alessio FR, Crow MT, \*Pearse DB. Knockdown of lung phosphodiesterase 2A attenuates alveolar inflammation and protein leak in a two-hit mouse model of acute lung injury. Am J Physiol Lung Cell Mol Physiol. 2011 Aug; 301 (2):L161-70. doi: 10.1152/ajplung.00073.2011. Epub 2011 May 13. PMID: 21571906
8. Gurkan OU, He C, Zielinski R, Rabb H, King LS, Dodd-o JM, D’Alessio FR, **Aggarwal N**, Pearse D, \*Becker PM. Interleukin-6 mediates pulmonary vascular permeability in a two-hit model of ventilator-associated lung injury. Exp Lung Res. 2011; 37(10):575-84. DOI: 10.3109/01902148.620680. PMID: 22044313
9. Files DC, D’Alessio FR, Johnston LF, Kesari P, **Aggarwal NR**, Garibaldi BT, Mock JR, Simmers JL, Degorordo A, Murdoch J, Willis MS, Patterson C, Tanskersley CG, Messi ML, Liu C, Delbono O, Furlow JD, Bodine SC, Cohn RD, King LS, Crow MT\*. A Critical Role for Muscle Ring Finger-1 in Acute Lung Injury-Associated Skeletal Muscle Wasting. Am J Respir Crit Care Med. 2012; 185(8): 825-34. doi: 10.1164/rccm.201106-1150OC. Epub 2012 Feb 3. PMID: 22312013
10. Sidhaye VK, Chau E, Srivastava V, Sirimalle S, Balabhadrapatruni C, **Aggarwal NR**, D’Alessio FR, Robinson DN, King LS\*. A novel role for Aquaporin-5 in enhancing microtubule organization and stability. PLoS One. 2012; 7(6): e338717. 10.1371/journal.pone.0038717. Epub 2012 Jun 8. PMID: 22715407

1. D’Alessio FR, Tsushima K, **Aggarwal NR**, Mock JR, Eto Y, Garibaldi BT, Files DC, Avalos CR, Rodriguez JV, Waickman AT, Reddy SP, Pearse DB, Sidhaye VK, Hassoun PM, Crow MT, King LS\*. Resolution of experimental lung injury by monocyte-derived inducible nitric oxide synthase. J Immunol. 2012 Sep 1; 189(5):2234-45. doi: 10.4049/jimmunol.1102606. Epub 2012 Jul 27. PMID: 22844117.
2. Garibaldi BT, D’Alessio FR, Mock JR, Files DC, Chau E, Eto Y, Drummond MB, **Aggarwal NR**, Sidhaye VK, King LS\*. Regulatory Tcells Reduce Acute Lung Injury Fibroproliferation by Decreasing Fibrocyte Recruitment. Am J Respir Cell Mol Biol. 2013; 48(1): 35-43. doi: 10.1165/rcmb.2012-0198OC. Epub 2012 Sep 20. PMID: 23002097
3. **Aggarwal NR**, D’Alessio FR, Eto Y, Chau E, Avalos CR, Waickman AT, Garibaldi BT, Mock JR, Files DC, Sidhaye VK, Polotsky VY, Powell J, Horton MR, King LS\*. Macrophage A2A adenosinergic receptor modulates oxygen-induced augmentation of murine lung injury. Am J Respir Cell Mol Biol. 2013; 48(5) 635-46. doi: 10.1165/rcmb.2012-0351OC. PMID: 23349051
4. Yao Q, Shin MK, Jun J, Mock J, Hernandez KL, **Aggarwal NR**, Mock JR, Gay J, Drager LF, Polotsky VY\*. Effect of chronic intermittent hypoxia on Triglyceride Uptake in different tissues, J Lipid Res. 2013; 54(3): 1058-65. doi: 10.1194/jlr.M034272. Epub 2013 Feb 5. PMID: 23386706
5. **Aggarwal NR**, Chau E, Garibaldi BT, Mock JR, Sussan T, Rao K, Rao K, Menon AG, D’Alessio FR, Damarla M, Biswal S, King LS, Sidhaye VK\*. Aquaporin 5 regulates cigarette smoke induced emphysema by modulating barrier and immune properties of the epithelium. Tissue Barriers. 2013; 1(4): e25248. doi: 10.4161/tisb.25248. Epub 2013 Jun 3. PMID: 24665410
6. **\*Aggarwal NR**, King LS, and D’Alessio FR. Diverse macrophage populations mediate acute lung inflammation and resolution. Am J Physiol Lung Cell Mol Physiol, 2014; 306(8): L709-25. doi: 10.1152/ajplung.00341.2013. Epub 2014 Feb 7. PMID: 24508730
7. **Aggarwal NR,** Tsushima K, Eto Y, Tripathi A, Mandke P, Mock JR, Garibaldi BT, Singer BD, Sidhaye VK, Horton MR, King LS, D’Alessio FR\*. Immunological Priming Requires Tregs and Interleukin-10-Producing Macrophages to Accelerate Resolution from Severe Lung Inflammation. J Immunol. 2014; 192(9): 4453-64. doi: 10.4049/jimmunol.1400146. Epub 2014 Mar 31. PMID: 24688024
8. Mock JR, Garibaldi BT, **Aggarwal NR**, Sidhaye VK, Mitzner W, Wagner EM, King, LS, D’Alessio FR\*. Foxp3+ Regulatory T Cells Promote Lung Epithelial Proliferation. Mucosal Immunol. 2014; 7(6): 1440-51. doi: 10.1038/mi.2014.33. Epub 2014 May 21. PMID: 24850425
9. **\*Aggarwal NR**, Brower RG. Targeting normoxemia in Acute Respiratory Distress Syndrome may cause worse short-term outcomes because of oxygen toxicity. Ann Am Thor Soc. 2014; 11(9): 1449-53.
10. Singer BD, Mock JR, **Aggarwal NR**, Garibaldi BT, Sidhaye VK, Florez MA, Chau E, Gibbs KW, Mandke P, Tripathi A, Yegnasubramanian S, King LS, D’Alessio FR\*. Regulatory T cell DNA Methyltransferase Inhibition Accelerates Resolution of Lung Inflammation. Am J Respir Cell Mol Biol. 2015; 52(5): 641-52. doi: 10.1165/rcmb.2014-0327OC. PMID: 25295995
11. Files DC, Liu C, Pereyra A , Wang ZM, **Aggarwal NR**, D’Alessio FR, Garibaldi BT, Mock JR, Singer BD, Feng X, Yammani RR, Zhang T, Lee AL, Philpott S, Lussier S, Purcell L, Chou J, Seeds M, King LS, Morris PE, Delbono O. Therapeutic exercise attenuates neutrophilic lung injury and skeletal muscle wasting. Sci Trans Med. 2015; 7(278):278ra32. doi: 10.1126/scitranslmed.3010283. PMID: 25761888
12. D'Alessio FR, Craig JM, Singer BD, Files DC, Mock JR, Garibaldi BT, Fallica J, Tripathi A, Mandke P, Gans JH, Limjunyawong N, Sidhaye VK, Heller NM, Mitzner W, King LS, **Aggarwal NR\***. Enhanced Resolution of Experimental ARDS through IL-4-Mediated Lung Macrophage Reprogramming. Am J Physiol Lung Cell Mol Physiol. 2016 Feb 19:ajplung.00419.2015. PMID: 26895644. APSselect publication.
13. Brune KA, Ferreira F, Mandke P, Chau E, **Aggarwal NR**, D’Alessio FR, Lambert AA, Kirk G, Blankson J, Drummond MB, Tsibris AM, Sidhaye VK\*. HIV Impairs Lung Epithelial Integrity and Enters the Epithelium to Promote Chronic Lung Inflammation. PLoS One. 2016 Mar 1;11(3): e0149679. PMID: 26930653
14. \*Singer BD, Mock JR, D’Alessio FR, **Aggarwal NR**, Mandke P, Johnston L, Damarla M. Flow-cytometric method for simultaneous analysis of mouse lung epithelial, endothelial, and hematopoietic lineage cells. Am J Physiol Lung Cell Mol Physiol. 2016 Mar 4: ajplung.00334.2015. PMID: 26944088.
15. Belli AJ, Bose S, **Aggarwal N**, DaSilva C, Thapa S, Grammer L, Paulin LM, Hansel NN. Indoor particulate matter exposure is associated with increased black carbon content in airway macrophages of former smokers with COPD. Environ Res. 2016 Oct; j.envres.2016.06.025. PMID: 27372063.
16. Bain WG, Tripathi A, Mandke P, Gans JH, D’Alessio FR, Sidhaye VK, **Aggarwal NR\***. Low-dose oxygen enhances macrophage-derived bacterial clearance following cigarette smoke exposure. J Immunol Res. 2016. 2016:1280347. PMID: 27403445.
17. **Aggarwal NR**, Brower RG, Hager DN, Thompson BT, Netzer G, Shanholtz C, Lagakos A, Checkley W; National Institutes of Health Acute Respiratory Distress Syndrome Network Investigators. Oxygen Exposure Resulting in Arterial Oxygen Tensions Above the Protocol Goal was Associated with Worse Clinical Outcomes in Acute Respiratory Distress Syndrome. Crit Care Med. 2017. PMID: 29261565.
18. Dela Cruz CS, Wunderink RG, Christiani DC, Cormier SA, Crothers K, Doerschuk CM, Evans SE, Goldstein DR, Khatri P, Kobzik L, Kolls JK, Levy BD, Metersky ML, Niederman MS, Nusrat R, Orihuela CJ, Peyrani P, Prince AS, Ramírez JA, Ridge KM, Sethi S, Suratt BT, Sznajder JI, Tsalik EL, Walkey AJ, Yende S, **Aggarwal NR**, Caler EV, Mizgerd JP. Future Research Directions in Pneumonia: NHLBI Working Group Report. Am J Respir Crit Care Med. 2018 Jul 15;198(2):256-263. doi: 10.1164/rccm.201801-0139WS. PMID: 29546996.
19. Miller Iii RR, Lopansri BK, Burke JP, Levy M, Opal S, Rothman RE, D'Alessio FR, Sidhaye VK, **Aggarwal NR**, Balk R, Greenberg JA, Yoder M, Patel G, Gilbert E, Afshar M, Parada JP, Martin GS, Esper AM, Kempker JA, Narasimhan M, Tsegaye A, Hahn S, Mayo P, van der Poll T, Schultz MJ, Scicluna BP, Klein Klouwenberg P, Rapisarda A, Seldon TA, McHugh LC, Yager TD, Cermelli S, Sampson D, Rothwell V, Newman R, Bhide S, Fox BA, Kirk JT, Navalkar K, Davis RF, Brandon RA, Brandon RB. Validation of a Host Response Assay, Septicyte™ LAB, for Discriminating Sepsis from SIRS in the ICU. Am J Respir Crit Care Med. 2018 Apr 6. doi: 10.1164/rccm.201712-2472OC. PMID: 29624409
20. Craig JM, **Aggarwal NR\***. Measuring Innate Immune Function in Mouse Mononuclear Phagocytes. Methods Mol Biol. 2018;1809:129-137. doi: 10.1007/978-1-4939-8570-8\_11. PMID: 29987788.
21. Michael S. Mulligan, David Weill, R. Duane Davis; Jason D. Christie, Farhood Farjah, Jonathan P. Singer, Matthew Hartwig, Pablo G. Sanchez, Daniel Kreisel, Lorraine B. Ware, Christian Bermudez, Ramsey R. Hachem, Michael J. Weyant, Cynthia Gries, Jeremiah W. Awori Hayanga, Bartley P. Griffith, Laurie D. Snyder, Jonah Odim, J. Matthew Craig, **Neil R. Aggarwal**, Lora A. Reineck. J Thor Card Surg. NHLBI-AATS Workshop Report: Identifying Collaborative Clinical Research Priorities in Lung Transplantation. J Thorac Cardiovasc Surg. 2018 Dec;156(6):2355-2365. doi: 10.1016/j.jtcvs.2018.08.010. PMID: 30244865
22. Vuga LJ\*, **Aggarwal NR\***, Reineck LA, Kalantari R, Banerjee K, Kiley J. Rare Lung Disease Research: National Heart, Lung, and Blood Institute’s Commitment to Partnership and Progress. Chest. 2019 May; doi: 10.1016/j.chest.2019.05.004. PMID: 31121150
23. Weinmann GG, Croxton TL,**Aggarwal NR**, Twery MJ, Kiley JP; NHLBI Division of Lung Diseases staff. A Perspective: Division of Lung Diseases at Fifty. Am J Respir Crit Care Med. 2019 Dec 15;200(12):1466-1471. doi: 10.1164/rccm.201910-1999PP. PMID: 31657967
24. Semler MW, Bernard GR, Aaron SD, Angus DC, Biros MH, Brower RG, Calfee CS, Colantuoni EA, Ferguson ND, Gong MN, Hopkins RO, Hough CL, Iwashyna TJ, Levy BD, Martin TR, Matthay MA, Mizgerd JP, Moss M, Needham DM, Self WH, Seymour CW, Stapleton RD, Thompson BT, Wunderink RG,**Aggarwal NR**, Reineck LA. Identifying Clinical Research Priorities in Adult Pulmonary and Critical Care: NHLBI Working Group Report. Am J Respir Crit Care Med. 2020 Mar 9. doi: 10.1164/rccm.201908-1595WS. PMID: 32150460
25. Casey JD, Johnson NJ, Semler MW, Collins SP,**Aggarwal NR**, Brower RG, Chang SY, Eppensteiner J, Filbin M, Gibbs KW, Ginde AA, Gong MN, Harrell F, Hayden DL, Hough CL, Khan A, Leither LM, Moss M, Oldmixon CF, Park PK, Reineck LA, Ringwood NJ, Robinson BR, Schoenfeld DA, Shapiro NI, Steingrub JS, Torr DK, Weissman A, Lindsell CJ, Rice TW, Thompson BT, Brown SM, Self WH; ORCHID Protocol Committee and the National Heart, Lung and Blood Institute Prevention and Early Treatment of Acute Lung Injury (PETAL) Network Investigators. Rationale and Design of ORCHID: A Randomized Placebo-Controlled Trial of Hydroxychloroquine for Adults Hospitalized with COVID-19. Ann Am Thorac Soc. 2020 Jun 3. doi: 10.1513/AnnalsATS.202005-478SD. PMID: 32492354
26. Self WH, Semler MW, Leither LM, Casey JD, Angus DC,…**Aggarwal N**,et al; Effect of Hydroxychloroquine on Clinical Status at 14 Days in Hospitalized Patients with COVID-19: A Randomized Clinical Trial. JAMA. 2020 Dec 1. doi: 10.1001/jama.2020.22240. PMID: 33165621
27. ACTIV-3/TICO LY-CoV555 Study Group (inc. **Aggarwal NR**), Lundgren JD, Grund B, Barkauskas CE, Holland TL, Gottlieb RL et al; A Neutralizing Monoclonal Antibody for Hospitalized Patients with COVID-19. N Engl J Med 2021. Mar 11; 384(10):905-914. doi: 10.1056/NEJMoa2033130. PMID: 33356051.
28. Oldham WM, Hemnes AR, Aldred MA, Barnard J, Brittain EL, Chan SY, Cheng F, Cho MH, Desai AA, Garcia JGN, Geraci MW, Ghiassian SD, Hall KT, Horn EM, Jain M, Kelly RS, Leopold JA, Lindstrom S, Modena BD, Nichols WC, Rhodes CJ, Sun W, Sweatt AJ, Vanderpool RR, Wilkins MR, Wilmot B, Zamanian RT, Fessel JP, **Aggarwal NR**, Loscalzo J, Xiao L. NHLBI-CMREF Workshop Report on Pulmonary Vascular Disease Classification: JACC State-of-the-Art Review. J Am Coll Cardiol. 2021 Apr 27;77(16):2040-2052. doi: 10.1016/j.jacc.2021.02.056. PMID: 33888254 Review.
29. Roya Kalantari, Xenia Tigno, Sandra Colombini-Hatch, James Kiley, **Neil Aggarwal\***; Impact of the National Heart, Lung, and Blood Institute’s Loan Repayment Program Funding on Retention of the National Institutes of Health Biomedical Workforce. ATS Sch; 2021 May 13; <https://doi.org/10.34197/ats-scholar.2020-0158OC>.
30. Leopold JA, Kawut SM, Aldred MA, Archer SL, Benza RL, Bristow MR, Brittain EL, Chesler N, DeMan FS, Erzurum SC, Gladwin MT, Hassoun PM, Hemnes AR, Lahm T, Lima JAC, Loscalzo J, Maron BA, Rosa LM, Newman JH, Redline S, Rich S, Rischard F, Sugeng L, Tang WHW, Tedford RJ, Tsai EJ, Ventetuolo CE, Zhou Y, **Aggarwal NR**, Xiao L; Diagnosis and Treatment of Right Heart Failure in Pulmonary Vascular Diseases: A National Heart, Lung, and Blood Institute Workshop. Circ Heart Fail. 2021 Jun;14(6): e007975. doi:10.1161/CIRCHEARTFAILURE.120.007975. Epub 2021 Jun 15. PMID: 34422205.
31. LaVange L, Adam SJ, Currier JS, Higgs ES, Reineck LA, Hughes EA, Read SW; ACTIV Therapeutics-Clinical Working Group (inc. **Aggarwal NR**). [Accelerating COVID-19 Therapeutic Interventions and Vaccines (ACTIV): Designing Master Protocols for Evaluation of Candidate COVID-19 Therapeutics.](https://pubmed.ncbi.nlm.nih.gov/34181444/) Ann Intern Med. 2021 Sep;174(9):1293-1300. doi: 10.7326/M21-1269. Epub 2021 Jun 29. PMID: 34181444 **Free PMC article.**
32. Mathews KS, Seitz KP, Vranas KC, Duggal A, Valley TS, Zhao B, Gundel S, Harhay MO, Chang SY, Hough CL; National Heart, Lung, and Blood Institute Prevention and Early Treatment of Acute Lung Injury (PETAL) Clinical Trials Network (inc. **Aggarwal NR**). Variation in Initial U.S. Hospital Responses to the Coronarvirus Disease 2019 Pandemic. Crit Care Med. 2021 Jul 1;49(7):1038-1048. doi: 10.1097/CCM.0000000000005013. PMID: 33826584.
33. Beitler JR, Thompson BT, Baron RM, Bastarache JA, Denlinger LC, Esserman L, Gong MN, LaVange LM, Lewis RJ, Marshall JC, Martin TR, McAuley DF, Meyer NJ, Moss M, Reineck LA, Rubin E, Schmidt EP, Standiford TJ, Ware LB, Wong HR, **Aggarwal NR\***, Calfee CS. Advancing precision medicine for acute respiratory distress syndrome. Lancet Respir Med. 2021 Jul 23: S2213-2600(21)00157-0. doi: 10.1016/S2213-2600(21)00157-0. PMID: 34310901. Free PMC article. Review.
34. Buchman TG, Draghia-Akli R, Adam SJ, **Aggarwal NR,** Fessel JP, Higgs ES, Menetski JP, Read SW, Hughes EA; ACTIV Therapeutics Clinical Working Group. Accelerating Coronavirus Disease 2019 Therapeutic Interventions and Vaccines (ACTIV) – Selecting Compounds for Clinical Evaluation in COVID-19 Clinical Trials. Crit Care Med. 2021 Sep 8. doi: 10.1097/CCM.0000000000005295. PMID: 34495876

**Case Reports**

1. **Aggarwal NR**, Hemnes AR. All in the family. Am J Med. 2006; 119(1); 30-3. PMID: 1631179
2. Chatterjee S, Baer AN, Kontzialis M, **Aggarwal NR**, Gelber AC. Searching for the Source: Bacteremia with Marked Cerebrospinal Fluid Pleocytosis. Am J Med 2015; 129(1): 44-7.

**Book Chapters, Monographs**

1. **Aggarwal N, MD,** Dunbar K, MD, Polito A, MD (2006). Interstitial Lung Disease. In Nilsson, K, Piccini, J, eds: *The Osler Medical Handbook*, 2nd ed, Philadelphia, Elsevier
2. Dietrich A, **Aggarwal N**. (2015). Acute Respiratory Distress Syndrome. In: T. James, ed., The Osler Medicine Survival Guide App, 1st ed. Baltimore: Unbound Medicine.
3. Craig JM, **Aggarwal N**, Kiley JK (2019). Future Directions for IPF Research. In: KC Meyer, SD Nathan, ed:, Idiopathic Pulmonary Fibrosis: A Comprehensive Clinical Guide, 2nd ed. Humana Press.

**FUNDING**

**Inactive Awards**

2016-2018 Conservative oxygen use as a strategy in at-risk ARDS patients

 NHLBI / NIH

 Grant #: 1R34HL133636-01

 $729,000

 Contact PI, 1.8 CM

 Update: Administratively withdrawn, not resubmitted following NIH transition

2016-2021 Role of IL-4 to reprogram macrophages and accelerate resolution and repair of acute lung injury

 NHLBI / NIH

 Grant #: 1R01HL130263-01A1

 $2,025,000

 PD/PI, 3.0 CM

 Update: Fundable score (21%, on pay plan), withdrawn following NIH transition

**Previous Funding**

2016-2019 Defining IL-4-activated monocytes as a viable cellular immunotherapy in acute lung injury

PRMRP – FOA: W81XWH-15-PRMPR-IIRA, Department of Defense Health Program

Grant #: 120017619

$1,500,000

Contact PI, 3.0 CM

Update: Transfer PI role to Dr. Franco D’Alessio following NIH transition

2014-2016 The use of supplemental oxygen in patients at risk for ARDS

Pakula Discovery Fund

$200,000

Principal Investigator: Brower

Co-PI, 1.8 CM

Update: Support withdrawn following NIH transition

2011-2016 Oxygen augments macrophage activation and lung injury by A2aR pathway inhibition

 American Heart Association-Fellow-to-Faculty Transition Award

Grant #: 11FTF7280014

 $520,000

 PI, 4.8 CM

2011-2016 Oxygen (35%) impairs macrophage function after cigarette smoke exposure.

 Flight Attendant Medical Research Institute-Young Clinical Scientist Award

 Grant #: 110587

 $324,000

 PI, 3.0 CM

2009-2010 Supplemental Oxygen Augments Mild Lung Injury via Macrophage-Epithelial Cell Interactions

 Clinician Scientist Award

 Department of Medicine, Johns Hopkins School of Medicine

 $160,000

 PI, 9.6 CM

2008-2009 Modest supplemental oxygen worsens lung injury in a murine model of sepsis

 NHLBI / NIH

Grant #: F32 1HL090200-01A1

 $88,476

 PI, 12 CM

2006-2008 Title: Multidisciplinary Training Program in Lung Diseases

NHLBI / NIH

Grant #: T32 2HL007534 – PI: Robert Wise, MD

Postdoctoral fellow on training grant, 9.6 CM

**CLINICAL ACTIVITIES**

**Licensures and Certifications**

2006- Medical Licensure, State of Maryland, D0064512

2012- Diplomate, American Board of Internal Medicine, Critical Care Medicine (11/12)

2010- Diplomate, American Board of Internal Medicine, Pulmonary Medicine (11/20)

2006-2016 Diplomate, American Board of Internal Medicine (11/06)

2003- Basic Life Support

2006- Advanced Cardiac Life Support

**Clinical Service Responsibilities**

2010-2012Attending, Johns Hopkins/Johns Hopkins Bayview Medical Intensive Care Unit 8-12 wks/year

2010-2016 Attending, Pulmonary Fellows’ weekly clinic

2012-2016 Attending, Johns Hopkins Medical Intensive Care Unit, 6-8 weeks/year

2017-2021 Staff Physician, Pulmonary Consult Service, NIH Clinical Center

2020-2021 Intensivist moonlighter, Mercy Medical Center

2021- Attending, U. of Colorado – Anschutz Medical Campus Medical Intensive Care Unit 7-8 wks/yr

**Clinical Program Building / Leadership**

2014 Attendee, Department of Medicine Strategic Planning Retreat

2014-2016 Clinical Care Committee, Osler Residency Program, Johns Hopkins Hospital

2015-2016 Department of Medicine Grand Rounds, Planning Committee

2015-2016 Director, Pathways Program, Osler Residency Program, Johns Hopkins Hospital

**Clinical Extramural Funding**

None

**EDUCATIONAL ACTIVITIES**

**Teaching**

**Classroom Instruction**

2009 Lecturer, *An entity more common than we think, S. Viridans bacteremia and ARDS,* Johns Hopkins University, Pulmonary Grand Rounds, Baltimore, MD

2009 Lecturer, *Diagnostic dilemma: right paratracheal mass,* Johns Hopkins University, Pulmonary Grand Rounds, Baltimore, MD

2010 Lecturer, *Non-invasive blood pressure (NIBP) measurements,* Johns Hopkins University, Pulmonary Grand Rounds, Baltimore, MD

2012 Lecturer, *What is the role of bronchoscopy in this critically ill patient,* Johns Hopkins University, Pulmonary Grand Rounds, Baltimore, MD

2014 Lecturer, *A problem we didn’t expect, and definitely couldn’t solve*, Johns Hopkins Pulmonary Grand Rounds, Baltimore, MD

2015 Lecturer, *Update in ARDS*, Johns Hopkins Osler Residency Program noon conference, Baltimore, MD

2015 Lecturer, *Update in Sepsis,* Johns Hopkins Osler Residency Program noon conference, Baltimore, MD

2017 Faculty Instructor, ATS Resident Boot Camp, Bronchoscopy 101, American Thoracic Society Meeting, Washington, D.C., May 2017

**Clinical Instruction**

2010-2016 Attending, Medical student clerkship, Johns Hopkins Hospital

2010-2016 Attending, Johns Hopkins Pulmonary weekly fellows’ clinic,

2010-2016 Attending, Johns Hopkins Medical Intensive Care Unit (6-8 weeks each year), consisting of bedside teaching and daily morning lectures

2011-2016 Thayer Firm Faculty member, Osler Residency, Johns Hopkins Hospital

2017-2021 Attending, Pulmonary Consult Service (4 weeks per year), National Institutes of Health

**CME Instruction**

2014 Speaker, *Oxygen toxicity in acute respiratory failure: Should we care?* Johns Hopkins CME Pulmonary and Critical Care Medicine Review Course, Greenbrier Resort, White Sulphur Spring, WV

2015 Speaker, *Are we hurting patients with oxygen?* Johns Hopkins CME Pulmonary, Critical Care Medicine, and Sleep Review Course, Wild Dunes Resort, Charleston, SC

2015 Panelist, Updates in Critical Care, Johns Hopkins CME Pulmonary, Critical Care Medicine, and Sleep Review Course, Wild Dunes Resort, Charleston, SC

**Mentoring**

**Pre-doctoral**

2011-2012 Ricardo Cruz-Acuna

 Minority Summer Research Program

Awards: Top poster at Annual Biomedical Research Conference for Minority Students (ABRCMS)

 Current position: Undergraduate student, University of Puerto Rico

2012-2013 Sanjana Apte, MD

Summer Research Program

Current position: Anesthesiology Resident, Emory University School of Medicine, Atlanta, GA

**Post-doctoral**

2011-2012 Deepanker Sharma, MD

 Elective Research Program, Mt Sinai/Johns Hopkins IM Residency

Current position: Director, Interventional Pulmonary and Medical Director, Lung Institute at Columbus Regional Hospital, Columbus, IN

2012 Christine Vigiland, MD

 Osler Residency research program, Johns Hopkins University

 Current position: Instructor, Division of Pulmonary Diseases and Critical Care Medicine, University of North Carolina, Chapel Hill, NC

2011-2014 Jason Mock, MD PhD

Post-doctoral Fellow, Division of Pulmonary and Critical Care Medicine,

Current position: Instructor of Medicine, Division of Pulmonary Diseases and Critical Care Medicine, University of North Carolina, Chapel Hill, NC.

2012-2015 Benjamin Singer, MD

 Post-doctoral Fellow, Division of Pulmonary and Critical Care Medicine,

Current position: Assistant Professor, Division of Pulmonary and Critical Care Medicine, Northwestern University, Chicago, IL

2013-2015 William Bain, MD

 Osler Residency research program, Johns Hopkins Hospital

 Current position: Assistant Professor, Division of Pulmonary, Allergy and Critical Medicine, University of Pittsburgh, Pittsburgh, PA

2014-2015 Michael Keller, MD

 Osler Residency research program, Johns Hopkins Hospital

 Current position: Clinical and Research Fellow, Critical Care Medicine Department,

National Institutes of Health, Bethesda, MD

2015-2017 Susan Lin, MD

 Osler Residency research program, Johns Hopkins Hospital

Current position: Pulmonary/Critical Care Fellow, University of Pennsylvania, Philadelphia, PA

**Training Program Development / Participation**

2011-2016 R25 Short Term Training for Minority Students; Mentor

2017-2021 Lead Program Director for novel NIH Stimulating Access to Research in Residency (StARR) R38 program to increase recruitment of clinician scientists in biomedical research (<https://grants.nih.gov/grants/guide/rfa-files/rfa-hl-18-023.html>)

2020 Led inaugural R38 StARR Investigator / Resident Scholar / NIH program director meeting

**Educational Program Building / Leadership**

2012-2016 Associate Program Director, Internal Medicine Osler Residency Program

2013-2014 Participant, Johns Hopkins School of Medicine Junior Faculty Leadership Program

2014-2015 Program Chair, Department of Medicine education initiative to “Create leaders across the spectrum of careers in healthcare”

2015-2016 Director, “Pathways program”, Osler Internal Medicine Residency Program, Johns Hopkins

**Educational Extramural Funding**

None

**Research Program Building / Leadership**

2007-2010 Organizer (2008-2009) and member, Johns Hopkins Acute Lung Injury research conference

2014-2016 Member, Johns Hopkins Immunology Interest Group

2018-2020 Alliance for Academic Internal Medicine (AAIM) Physician-Scientist Post-Graduate Training Subcommittee Member

2018-2020 Expert Faculty and Invited Speaker, Annual Respiratory Disease Young Investigators’ Forum

2018-2021 Lead Program Director for novel NIH K38 Stimulating Access to Research In Residency Transition Scholar (StARRTS) K38 Program to support retention of clinical scientists in biomedical research (<https://grants.nih.gov/grants/guide/rfa-files/RFA-HL-20-006.html>)

2020-2021 Member, Accelerating COVID-19 Therapeutics Interventions and Vaccines (ACTIV) clinical-therapeutics, immunomodulatory, and neutralizing antibody working groups to evaluate and prioritize promising COVID-19 therapeutics using a public-private collaborative structure.

**SYSTEM INNOVATION AND QUALITY IMPROVEMENT ACTIVITIES**

None

**ORGANIZATIONAL ACTIVITIES**

**Institutional Administrative Appointments**

1997-1998 Chair, Student Finance Board, Illinois Institute of Technology

1999-2003 Committee Member, medical student recruitment, Northwestern University – Feinberg SOM

2010-2016 Member, Osler Intern Selection Committee, Department of Medicine, Johns Hopkins

2011-2016 Member, Pulmonary/Critical Care Fellowship Selection Committee, Johns Hopkins

2014 Educational Committee, DOM Assessment and Strategic Planning Retreat

2012-2016 Associate Program Director, Osler Internal Medicine Residency Program, Johns Hopkins

2015-2016 Director, Pathways Program, Osler Internal Medicine Residency Program, Johns Hopkins

2016 Faculty Senate Nominee, Department of Medicine, Johns Hopkins

2018-2021 Subject Matter Expert and Committee Member, trans-NIH Regenerative Medicine Innovation Project and Regenerative Medicine Innovation Catalyst (RMIC)

2019-2021 NHLBI representative, NIH Early Stage Investigator Extension Committee

2020-2021 DLD Liaison, NHLBI Research Referral Guidelines Committee

2020-2021 Scientific Program Lead and Steering Committee Member, NHLBI Collaborating Network of Networks for Evaluating COVID-19 and Therapeutic Strategies (CONNECTS)

**Editorial Activities**

**Journal Peer Reviewer**

2011-present *American Journal of Physiology: Lung Cellular and Molecular Biology*

2012-present *BMC Immunology*

2013-present *Critical Care Medicine*

2015-present *Thorax*

2016-present *American Journal of Respiratory and Critical Care Medicine*

2016-present *Lancet Respiratory Medicine*

**Editorial Board**

**Advisory Committees, Review Groups/Study Sections**

2014-2016 Study section review – Flight Attendant Medical Research Institute Foundation

2014 Study section review – American Heart Association

**Professional Societies**

2003-present American Medical Association, member

2006-present American Thoracic Society, member

2006-present Society of Critical Care Medicine, member

2009-present American College of Chest Physicians, member

**Session Chair**

**National**

2015 Co-chair, Scientific symposium, American Thoracic Society Intl. Conference, Denver, CO.

2015 Co-chair, Resolution of Lung inflammation and Repair, mini-symposium, American Thoracic Society International Conference, Denver, CO.

**RECOGNITION**

**Awards and Honors**

1997-1998 *Tau Beta Pi*, Illinois Institute of Technology

2002-present *Alpha Omega Alpha* Honor Medical Society

2007 Peer Review Award, 5th Symposium on Functional Genomics of Critical Illness and Injury, NIH

2007-2008 NRSA F32 Recipient, NIH

2010-2011 Clinician Scientist Award, Johns Hopkins University School of Medicine

2013 *Am. Journal of Respiratory Cell and Molecular Biology* outstanding paper by a junior investigator

2014 Invited member, Junior Faculty Leadership Program, Johns Hopkins University

2015 American Thoracic Society International Conference Symposium Co-Chair

2016 Certificate for APS*select*, one of best published articles in physiological research

2017 NHLBI Group Award for the Regenerative Medicine Innovation Project

2017 NHLBI Director’s Award (Diversity) for the development of research recruitment programs

2017 NHLBI Director’s Award (Partnership/Collaboration) for HIV-related co-morbidities research

2018 Invited participation, NIH Senior Leadership Program

2018 NIH Director’s Award for the Regenerative Medicine Innovation Project

2018 NHLBI Group Award for the Regenerative Medicine Innovation Project Team

2019 NHLBI Group Award for Clinical Trial Stewardship Team

2019 NIH OD Honor Award for participation in the ESI Extension Committee & Electronic Support

2020 NHLBI Director’s Award for COVID, ACTIV Agent Prioritization Group

2020 NHLBI Group Award, EVALI NOSI Review Committee

2020 NHLBI COVID-Response Group Award, CONNECTS & Rapid Response Teams

**Invited Talks, Panels**

**Regional**

2012 Speaker, *Recent trials in ARDS,* Johns Hopkins University, Pulmonary Grand Rounds, Baltimore, MD

2012 Speaker, *Acute Lung Injury (ALI) and Acute Respiratory Distress Syndrome,* Harbor Hospital, Department of Medicine Grand Rounds, Baltimore, MD

2013 Speaker, *Acute Respiratory Distress Syndrome: 45 years later…still a lot to learn*, Harbor Hospital, Department of Medicine Grand Rounds, Baltimore, MD

2013 Speaker, *Macrophage reprogramming helps us understand acute lung injury and resolution,* Johns Hopkins University, Lung Research Conference, Baltimore, MD

2014 Speaker, *Do we need to reevaluate the goal oxygen saturation in at-risk ARDS patients?* Johns Hopkins Hospital, Department of Medicine Grand Rounds, Baltimore, MD

2014 Panelist, *How to make the transition to a biomedical research career?*, Research Leadership Course, Johns Hopkins University, Baltimore, MD

2015 Speaker, *Early Acute Lung Injury – Approaching an Old Problem a New Way*, Johns Hopkins Bayview Hospital, Department of Medicine Grand Rounds, Baltimore, MD

**National**

2013 *Acute lung injury and resolution: understanding exacerbating and mitigating factors*, Indiana University School of Medicine, Pulmonary Research Conference, Indianapolis, IN

2014 *Do clinical and experimental data support a need to reevaluate the goal oxygen saturation in EALI and ARDS?* University of Maryland Medical Center, Pulmonary Grand Rounds, Baltimore, MD

2015 *Diverse macrophage populations mediate acute inflammation and resolution*, Sunrise Seminar, American Thoracic Society International Conference, Denver, CO

2015 *IL-4 accelerates resolution of experimental acute lung injury*, Scientific Symposium, American Thoracic Society International Conference, Denver, CO

2015 *IL-4 modulates resolution and repair of experimental acute lung injury via macrophages,* Mini-symposium, American Thoracic Society International Conference, Denver, CO

2015 *Macrophage reprogramming accelerates experimental ARDS resolution and lung repair,* Wake Forest University School of Medicine, Pulmonary Grand Rounds, Winston-Salem, NC

2016 *Macrophage polarization modulates the acute and resolution phases of experimental acute lung injury*, National Institutes of Health, NHLBI Scientific Seminar, Bethesda, MD

2016 *Macrophage reprogramming accelerate ALI resolution and lung repair*, Experimental Biology 2016, APS Respiration Section, San Diego, MD

2017 *NHLBI Strategic Vision for Pulmonary Research*, Keynote Lecture, UAB Pulmonary Annual Research Summit 2017, Birmingham, AL

2017 *How can the Division of Lung Diseases at NHLBI help you?*, Keynote Address, South Asian Sub-Continent Organization (SASCO) annual meeting, American Thoracic Society International Conference 2017, Washington, D.C.

2017 *NHLBI Strategic Vision for Lung Research*, Keynote address, Northwestern/U of Chicago/U of Illinois-Chicago Lung Symposium, Chicago, IL, August 2017

2018 *Research and Training Priorities in the Division of Lung Diseases at NHLBI*, Johns Hopkins Lung Research Conference, Baltimore, MD, January 2018

2018 *The NIH and New Opportunities for Training*, Alliance for Academic Internal Medicine Research Pathways Directors Workshop, San Antonio, TX, March 2018

2018 *The NHLBI Strategy to Support Trainees and Early Stage Investigators*, Pittsburgh International Lung Conference, Pittsburgh, PA, Oct 2018

2018 *The NHLBI Strategy to Support Trainees and Early Stage Investigators*, Respiratory Disease Young Investigator’s Forum, Washington, DC, Oct 2018

2019 *NIH/NHLBI Support of Early Career Physician-Scientists*, Duke Physician-Scientist Symposium, Durham, NC, Jan 2019

2019 *NHLBI Support of Basic and Translational ARDS Research Programs*, Critical Care Clinical Trialists Workshop, French Embassy, Washington, DC, Feb 2019

2019 *StARR (R38) and StARRTS (K38) Update*, American Thoracic Society International Conference, T32 Directors’ Meeting, Dallas, TX, May 2019

2019 *The NHLBI Division of Lung Diseases: Role in Development of Early Career Scientists*, Respiratory Disease Young Investigator’s Forum, Chicago, IL, Oct 2019

2019 *NHLBI Strategic Vision for Pulmonary Fibrosis*, Keynote Speaker at University of Virginia Pulmonary Fibrosis Patient Education Day, Charlottesville, VA, Oct 2019

2020 *The NHLBI Role in Development of (Early) Career Scientists*, Ohio State University Internal Medicine Department & Center for FAME, Columbus, OH, March 2020

2020 *The NHLBI Division of Lung Diseases: Facilitating Discovery for Early Career Scientists,* 16th Annual Respiratory Disease Young Investigators’ Forum, Oct 2020

**International**

2015 *Chronic cough: More than just a Pulmonologist’s problem*, HCL-Avitas / John Hopkins University School of Medicine, Delhi, India

2015 *IL-4 activated macrophages to accelerate resolution and repair following ALI*,

3rd International ARDS Conference, Belfast, N. Ireland

**OTHER PROFESSIONAL ACCOMPLISHMENTS**

**Posters**

2007  **Aggarwal NR**, D’Alessio FR, Tsushima K, Cheadle C, Barnes KC, King LS, Gene Expression in Lung Injury is Markedly Altered in Rag-1 Null Mice. Poster presentation, American Thoracic Society Annual Conference, San Francisco, CA

2007  **Aggarwal NR**, D’Alessio FR, Tsushima K, Grigoryev DG, Cheadle C, Barnes KC, King LS, Gene Expression in Lung Injury is Markedly Altered in Rag-1 Null Mice. Poster presentation, Fifth Symposium on the Functional Genomics of Critical Illness and Injury, Bethesda, MD

2008 **Aggarwal NR**, Moderate Supplemental Oxygen Exacerbates Lipopolysaccharide-Induced Lung Injury in a Sepsis Model. Poster presentation, Department of Medicine Research Retreat, Johns Hopkins University, Baltimore, MD

2008 **Aggarwal NR**, D’Alessio FR, Tsushima K, Grigoryev DG, Cheadle C, Barnes KC, King LS, Reconstitution of Rag-1 null mice with T Regulatory Cells Blunts the Genotypic Differences between Rag-1 KO and WT mice after Intratracheal LPS. Poster discussion session, American Thoracic Society Annual Conference, Toronto, ON

2008  **Aggarwal NR**, Tsushima K, Savransky V, D’Alessio FR, Sidhaye VK, Polotsky VY, King LS, Modest supplemental oxygen worsens lung injury in a murine model of sepsis. Poster discussion session, American Thoracic Society Annual Conference, Toronto, ON

2009 **Aggarwal NR**, D’Alessio FR, Tsushima K, Files DC, Sidhaye VK, Polotsky VY, King LS, Moderate-range oxygen can augment and sustain lung injury when initiated after intratracheal LPS. Poster presentation, American Thoracic Society Annual Conference, San Diego, CA

2010 **Aggarwal NR**, D’Alessio FR, Tsushima K, Files DC, Sidhaye VK, Polotsky VY, King LS Moderate oxygen after LPS augments neutrophil-mediated murine lung injury due to enhancement of alveolar macrophage and epithelial cell interactions. Poster presentation, American Thoracic Society Annual Conference, New Orleans, LA

2012 **Aggarwal NR**, D’Alessio FR, Eto Y, Waickman AT, Garibaldi BT, Mock JM, Files DC, Sidhaye VK, Polotsky VY, Horton M, King LS. Oxygen Blunts Adenosine receptor 2a (A2aR) to Augment Lung Injury. Poster presentation, American Thoracic Society Annual Conference, San Francisco, CA

2013 **Neil R. Aggarwal**, Eric Chau, Brian T. Garibaldi, Jason R. Mock, Thomas Sussan, Keshav Rao, Kaavya Rao, Anil G. Menon, Franco R. D’Alessio, Mahendra Damarla, Shyam Biswal, Landon S. King, Venkataramana K. Sidhaye. Aquaporin 5 modulates physical and immune epithelial barriers to mitigate murine emphysema. Poster presentation, Flight Attendant Medical Research Institute Conference, Miami, FL

2014 **Aggarwal NR**, Tripathi A, Mandke P, Singer BT, Sidhaye VK, King LS, D’Alessio FR. IL-4-IL-4R pathway modulates macrophage-derived resolution of experimental ALI. Poster presentation, Aspen Lung Conference, Aspen, CO