

Oklahoma Center for Respiratory and Infectious Disease Center (OCRID) Investigator Biosketch

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Education:

Ph.D. in Molecular Virology (2004), University of Leeds, Leeds, UK

BSc (1st Class Honors) in Genetics (2000), University of Liverpool, Liverpool, UK

Postgraduate Education and Training:

Postdoctoral Research Scientist (2004-2009), Department of Microbiology and Immunology, Columbia University, New York, NY, USA

Academic Appointments:

Adjunct Associate Professor (2022-present), Department of Cell Biology, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Adjunct Associate Professor (2022-present), Department of Microbiology and Immunology, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Associate Professor of Medicine (2022-present), Department of Internal Medicine, Section of Pulmonary, Critical Care & Sleep Medicine, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Adjunct Assistant Professor (2017-2022), Department of Cell Biology, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Adjunct Assistant Professor (2017-2022), Department of Microbiology and Immunology, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Assistant Professor of Medicine (2016-2022), Department of Internal Medicine, Section of Pulmonary, Critical Care & Sleep Medicine, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Assistant Research Professor (2010-2016), Department of Genetic Medicine, Weill Cornell Medical College, New York, NY, USA

Associate Research Scientist (2009-2010), Department of Microbiology and Immunology, Columbia University, New York, NY, USA

Research Interests:

The major focus of my research program is to understand the cellular processes that regulate airway epithelial stem/progenitor cell fate decisions during repair and regeneration of the lung. Alterations in the normal ratio of differentiated epithelial cell types (defined as epithelial remodeling) are associated with multiple chronic lung

diseases including asthma, cystic fibrosis (CF), idiopathic pulmonary fibrosis (IPF) and chronic obstructive pulmonary disease (COPD). The overarching goal of my research is to identify signaling pathways that regulate differentiation of airway epithelial stem/progenitor cells into specific cell types thus providing novel targets for developing new therapies to treat chronic lung disease.

In addition to studying the processes that regulate lung regeneration and repair, my lab is engaged in team-science based collaborations with Dr. James Papin (Associate Professor, Department of Pathology, Division of Comparative Medicine, OUHSC), Dr. Dean Myers (Professor and John W. Records Chair, Department of Obstetrics and Gynecology, OUHSC) and Dr. Anthony Burgett (Associate Professor, Department of Pharmaceutical Sciences, OUHSC) focused on studying host-virus interactions during respiratory virus infection (e.g., SARS-CoV-2) of the airway epithelium using both *in vitro* and *in vivo* models.

Publications:

A complete list of published work can be viewed in MyBibliography:

<https://www.ncbi.nlm.nih.gov/myncbi/matthew.walters.1/bibliography/public/>

Select Publications (In reverse chronological order):

#Indicates co-senior author

*Indicates co-first author

1. Bodas M, Subramaniyan B, Karmouty-Quintana H, Vitiello PF, **Walters MS**. The emerging role of NOTCH3 receptor signalling in human lung diseases. *Expert Reviews in Molecular Medicine*. 2022 24, e33. PMID: 36052538. DOI: 10.1017/erm.2022.27.
2. Bodas M, Subramaniyan B, Moore AR, Metcalf J, Ocañas SR, Freeman WM, Georgescu C, Wren JD, **Walters MS**. The NOTCH3 Downstream Target HEYL Is Required for Efficient Human Airway Basal Cell Differentiation. *Cells*. 2021 10(11). DOI: 10.3390/cells10113215. PubMed PMID: 34831437. PubMed Central PMCID: PMC8620267.
3. Subramaniyan B, Larabee JL, Bodas M, Moore AR, Burgett AWG, Myers DA, Georgescu C, Wren JD, Papin JF[#], **Walters MS**[#]. Characterization of the SARS-CoV-2 Host Response in Primary Human Airway Epithelial Cells from Aged Individuals. *Viruses*. 2021 Aug 12;13(8):1603. doi: 10.3390/v13081603. PubMed PMID: 34452468. PubMed Central PMCID: PMC8402710.
4. Saxena A, **Walters MS**, Shieh JH, Shen LB, Gomi K, Downey RJ, Crystal RG, Moore MAS. Extracellular vesicles from human airway basal cells respond to cigarette smoke extract and affect vascular endothelial cells. *Sci Rep*. 2021 Mar 17;11(1):6104. doi: 10.1038/s41598-021-85534-6. PubMed PMID: 33731767. PubMed Central PMCID: PMC7969738.
5. Bodas M, Moore AR, Subramaniyan B, Georgescu C, Wren JD, Freeman WM, Brown BR, Metcalf JP, **Walters MS**. Cigarette Smoke Activates NOTCH3 to Promote Goblet Cell Differentiation in Human Airway Epithelial Cells. *Am J Respir Cell Mol Biol*. 2021 Apr;64(4):426-440. doi: 10.1165/rcmb.2020-0302OC. PubMed PMID: 33444514. PubMed Central PMCID: PMC8008804.
6. Wu W, Zhang W, Tian L, Brown BR, **Walters MS**, Metcalf JP. IRF7 Is Required for the Second Phase Interferon Induction during Influenza Virus Infection in Human Lung Epithelia. *Viruses*. 2020 Mar 29;12(4):377. doi: 10.3390/v12040377. PubMed PMID: 32235406. PubMed Central PMCID: PMC7232147.
7. Ogawa F, **Walters MS**, Shafquat A, O'Beirne SL, Kaner RJ, Mezey JG, Zhang H, Leopold PL, Crystal RG. Role of KRAS in regulating normal human airway basal cell differentiation. *Respir Res*. 2019 Aug 9;20(1):181. doi: 10.1186/s12931-019-1129-4. PubMed PMID: 31399087; PubMed Central PMCID: PMC6688249.
8. Zuo WL, Shenoy SA, Li S, O'Beirne SL, Strulovici-Barel Y, Leopold PL, Wang G, Staudt MR, **Walters MS**, Mason C, Kaner RJ, Mezey JG, Crystal RG. Ontogeny and Biology of Human Small Airway Epithelial Club

- Cells. *Am J Respir Crit Care Med.* 2018 Dec 1;198(11):1375-1388. doi: 10.1164/rccm.201710-2107OC. PubMed PMID: 29874100; PubMed Central PMCID: PMC6290945.
9. Zhang H, Yang J, **Walters MS**, Staudt MR, Strulovici-Barel Y, Salit J, Mezey JG, Leopold PL, Crystal RG. Mandatory role of HMGA1 in human airway epithelial normal differentiation and post-injury regeneration. *Oncotarget.* 2018 Feb 16;9(18):14324-14337. doi: 10.18632/oncotarget.24511. eCollection 2018 Mar 6. PubMed PMID: 29581847; PubMed Central PMCID: PMC5865673.
 10. Wang G, Zhou H, Strulovici-Barel Y, Al-Hijji M, Ou X, Salit J, **Walters MS**, Staudt MR, Kaner RJ, and Crystal RG. Role of OSGIN1 in mediating smoking-induced autophagy in the human airway epithelium. *Autophagy.* 2017 Jul 3;13(7):1205-1220. doi: 10.1080/15548627.2017.1301327. PubMed PMID: 28548877; PubMed Central PMCID: PMC5529077.
 11. **Walters MS***, Salit J*, Ju JH, Staudt MR, Kaner RJ, Rogalski AM, Sodeinde TB, Rahim R, Strulovici-Barel Y, Mezey JG, Almulla AM, Sattar H, Mahmoud M, Crystal RG. Waterpipe smoking induces epigenetic changes in the small airway epithelium. *PLoS One.* 2017 Mar 8;12(3):e0171112. doi: 10.1371/journal.pone.0171112. PubMed PMID: 28273093; PubMed Central PMCID: PMC5342191.
 12. Gomi K, Tang Y, Arbelaez V, Crystal RG, **Walters MS**. Endothelial Cell Mediated Promotion of Ciliated Cell Differentiation of Human Airway Basal Cells via Insulin and Insulin-Like Growth Factor 1 Receptor Mediated Signaling. *Stem Cell Rev.* 2017 Apr;13(2):309-317. doi: 10.1007/s12015-016-9707-z. PubMed PMID: 28050756; PubMed Central PMCID: PMC5584604.
 13. Strulovici-Barel Y, Shaykhiev R, Salit J, Deeb RS, Krause A, Kaner RJ, Vincent TL, Agosto-Perez F, Wang G, Hollmann C, Shanmugam V, Almulla AM, Sattar H, Mahmoud M, Mezey JG, Gross SS, Staudt MR, **Walters MS**, Crystal RG. Pulmonary Abnormalities in Young, Light-Use Waterpipe (Hookah) Smokers. *Am J Respir Crit Care Med.* 2016 Sep 1;194(5):587-95. doi: 10.1164/rccm.201512-2470OC. PubMed PMID: 27007171; PubMed Central PMCID: PMC5027211.
 14. Gomi K, Staudt MR, Salit J, Kaner RJ, Heldrich J, Rogalski AM, Arbelaez V, Crystal RG, **Walters MS**. JAG1-Mediated Notch Signaling Regulates Secretory Cell Differentiation of the Human Airway Epithelium. *Stem Cell Rev.* 2016 Aug;12(4):454-63. doi: 10.1007/s12015-016-9656-6. PubMed PMID: 27216293; PubMed Central PMCID: PMC4926772.
 15. Zhou H, Brekman A, Zuo WL, Ou X, Shaykhiev R, Agosto-Perez FJ, Wang R, **Walters MS**, Salit J, Strulovici-Barel Y, Staudt MR, Kaner RJ, Mezey JG, Crystal RG, Wang G. POU2AF1 Functions in the Human Airway Epithelium To Regulate Expression of Host Defense Genes. *J Immunol.* 2016 Apr 1;196(7):3159-67. doi: 10.4049/jimmunol.1502400. PubMed PMID: 26927796; PubMed Central PMCID: PMC4799774.
 16. Deeb RS*, **Walters MS***, Strulovici-Barel Y, Chen Q, Gross SS, Crystal RG. Smoking-Associated Disordering of the Airway Basal Stem/Progenitor Cell Metabotype. *Am J Respir Cell Mol Biol.* 2016 Feb;54(2):231-40. doi: 10.1165/rcmb.2015-0055OC. PubMed PMID: 26161876; PubMed Central PMCID: PMC4821042.
 17. Ding BS, Gomi K, Rafii S, Crystal RG, **Walters MS**. Endothelial MMP14 is required for endothelial-dependent growth support of human airway basal cells. *J Cell Sci.* 2015 Aug 15;128(16):2983-8. doi: 10.1242/jcs.168179. PubMed PMID: 26116571; PubMed Central PMCID: PMC4541042.
 18. Gomi K, Arbelaez V, Crystal RG, **Walters MS**. Activation of NOTCH1 or NOTCH3 signaling skews human airway basal cell differentiation toward a secretory pathway. *PLoS One.* 2015 Feb 20;10(2):e0116507. doi: 10.1371/journal.pone.0116507. PubMed PMID: 25700162; PubMed Central PMCID: PMC4336283.
 19. Tilley AE, **Walters MS**, Shaykhiev R, Crystal RG. Cilia dysfunction in lung disease. *Annu Rev Physiol.* 2015;77:379-406. doi: 10.1146/annurev-physiol-021014-071931. Review. PubMed PMID: 25386990; PubMed Central PMCID: PMC4465242.
 20. Durgan J, Tao G, **Walters MS**, Florey O, Schmidt A, Arbelaez V, Rosen N, Crystal RG, Hall A. SOS1 and Ras regulate epithelial tight junction formation in the human airway through EMP1. *EMBO Rep.* 2015

Jan;16(1):87-96. doi: 10.15252/embr.201439218. PubMed PMID: 25394671; PubMed Central PMCID: PMC4304732.

21. Brekman A, **Walters MS**, Tilley AE, Crystal RG. FOXJ1 prevents cilia growth inhibition by cigarette smoke in human airway epithelium in vitro. *Am J Respir Cell Mol Biol*. 2014 Nov;51(5):688-700. doi: 10.1165/rcmb.2013-0363OC. PubMed PMID: 24828273; PubMed Central PMCID: PMC4224080.
22. Staudt MR, Buro-Auriemma LJ, **Walters MS**, Salit J, Vincent T, Shaykhiev R, Mezey JG, Tilley AE, Kaner RJ, Ho MW, Crystal RG. Airway Basal stem/progenitor cells have diminished capacity to regenerate airway epithelium in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2014 Oct 15;190(8):955-8. doi: 10.1164/rccm.201406-1167LE. PubMed PMID: 25317467; PubMed Central PMCID: PMC4299582.
23. **Walters MS***, De BP*, Salit J, Buro-Auriemma LJ, Wilson T, Rogalski AM, Lief L, Hackett NR, Staudt MR, Tilley AE, Harvey BG, Kaner RJ, Mezey JG, Ashbridge B, Moore MA, Crystal RG. Smoking accelerates aging of the small airway epithelium. *Respir Res*. 2014 Sep 24;15:94. doi: 10.1186/s12931-014-0094-1. PubMed PMID: 25248511; PubMed Central PMCID: PMC4189169.
24. Ryan DM, Vincent TL, Salit J, **Walters MS**, Agosto-Perez F, Shaykhiev R, Strulovici-Barel Y, Downey RJ, Buro-Auriemma LJ, Staudt MR, Hackett NR, Mezey JG, Crystal RG. Smoking dysregulates the human airway basal cell transcriptome at COPD risk locus 19q13.2. *PLoS One*. 2014 Feb 3;9(2):e88051. doi: 10.1371/journal.pone.0088051. PubMed PMID: 24498427; PubMed Central PMCID: PMC3912203.
25. **Walters MS**, Gomi K, Ashbridge B, Moore MA, Arbelaez V, Heldrich J, Ding BS, Rafii S, Staudt MR, Crystal RG. Generation of a human airway epithelium derived basal cell line with multipotent differentiation capacity. *Respir Res*. 2013 Dec 3;14:135. doi: 10.1186/1465-9921-14-135. PubMed PMID: 24298994; PubMed Central PMCID: PMC3907041.
26. Buro-Auriemma LJ, Salit J, Hackett NR, **Walters MS**, Strulovici-Barel Y, Staudt MR, Fuller J, Mahmoud M, Stevenson CS, Hilton H, Ho MW, Crystal RG. Cigarette smoking induces small airway epithelial epigenetic changes with corresponding modulation of gene expression. *Hum Mol Genet*. 2013 Dec 1;22(23):4726-38. doi: 10.1093/hmg/ddt326. PubMed PMID: 23842454; PubMed Central PMCID: PMC3888123.
27. Didon L, Zwick RK, Chao IW, **Walters MS**, Wang R, Hackett NR, Crystal RG. RFX3 modulation of FOXJ1 regulation of cilia genes in the human airway epithelium. *Respir Res*. 2013 Jul 3;14:70. doi: 10.1186/1465-9921-14-70. PubMed PMID: 23822649; PubMed Central PMCID: PMC3710277.
28. Curradi G*, **Walters MS***, Ding BS*, Rafii S, Hackett NR, Crystal RG. Airway basal cell vascular endothelial growth factor-mediated cross-talk regulates endothelial cell-dependent growth support of human airway basal cells. *Cell Mol Life Sci*. 2012 Jul;69(13):2217-31. doi: 10.1007/s00018-012-0922-8. PubMed PMID: 22382924; PubMed Central PMCID: PMC3633460.
29. Hackett NR*, Shaykhiev R*, **Walters MS***, Wang R, Zwick RK, Ferris B, Witover B, Salit J, Crystal RG. The human airway epithelial basal cell transcriptome. *PLoS One*. 2011 May 4;6(5):e18378. doi: 10.1371/journal.pone.0018378. PubMed PMID: 21572528; PubMed Central PMCID: PMC3087716.

