BIOGRAPHICAL SKETCH

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NAME: Mitchell, Aaron P.

eRA COMMONS USER NAME (credential, e.g., agency login): MITCHELLA

POSITION TITLE: Professor & Head, Department of Microbiology

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Carnegie Mellon University, Pittsburgh, PA	BS	05/1977	Biology
MIT, Cambridge, MA	PhD	04/1984	Microbiology
UCSF, San Francisco, CA	postdoc	06/1987	Molecular Genetics

A. Personal statement.

I have a long standing interest in gene expression and regulation, and how we can use such information to get insight into biological questions. This interest was a constant throughout my training with Boris Magasanik and Ira Herskowitz, both of whom had thought deeply about such connections and inspired me to pursue those ideas. My group has contributed to gene discovery in *C. albicans* through construction and distribution of mutant collections, and through genetic screens for defects in biofilm formation and drug sensitivity.

I have also committed significant effort to training and mentorship of young scientists. I was PI or co-PI for three different training grants during my time at Columbia University. I served as PI for an HHMI Undergraduate Education Grant immediately upon moving to Carnegie Mellon University. I was an instructor in the Cold Spring Harbor Yeast Genetics Course, and a co-founder and co-director (through 2010) of the MBL Molecular Mycology Course. I served as an advocate for young scientists as a member of the Burroughs Wellcome Fund Advisory Board for Pathogenesis of Infectious Disease Awards. I was recognized for these efforts with the 2015 Graduate Microbiology Teaching Award from the American Society for Microbiology, and in 2021 as the shared namesake for the Jack Edwards and Aaron Mitchell Endowed Lectureship in Molecular Mycology at the Marine Biological Labs in Woods Hole, MA.

B. Positions and Honors.

Positions and Employment

1976-1977 Undergraduate Research Assistant, Carnegie Mellon University, Pittsburgh, PA; Beth Jones, advisor
1977-1984 Graduate Student, Department of Biology, MIT, Cambridge, MA; Boris Magasanik, advisor
1984-1987 Postdoctoral Fellow, Department of Biochemistry and Biophysics UCSF, San Francisco, CA; Ira Herskowitz, sponsor
1987-2008 Assistant/Associate/Full Professor, Department of Microbiology, Columbia University, New York, NY
1995 Visiting Scientist, Department of Biochemistry, Merck Research Labs, Rahway, NJ Myra Kurtz, sponsor
2005-2008 Acting Chair, Department of Microbiology, Columbia University, New York, NY
2008-2019 Professor of Biological Sciences, Carnegie Mellon University, Pittsburgh, PA
2015-2016 Acting Head, Biological Sciences, Carnegie Mellon University, Pittsburgh, PA
2016-2019 Head, Biological Sciences, Carnegie Mellon University, Pittsburgh, PA
2020- Professor & Head, Department of Microbiology, University of Georgia, Athens, GA

Other Experience and Professional Memberships

1990-1994 Yeast Genetics Summer Course Instructor, Cold Spring Harbor Lab
1995-1999 Member, NIH Microbial Physiology and Genetics-1 Study Section
1995-1998 Member, American Cancer Society Virology and Molecular Genetics Study Section
1996- Associate Editor, GENETICS
1997-2010 Course Director, Molecular Mycology Summer Course, Woods Hole MBL
2000- Ad hoc Member, NIH BM-2, MBC-1, PTHE, AOIC, & Special Emphasis Panels
2002-2015 Editor/Editor in Chief, EUKARYOTIC CELL
2002-2005 Director, Microbiology PhD Training Program, Columbia University
2004-2007 Member, Damon Runyon Fellowship Review Panel
2006-2008 Executive Committee, ASM Candida and Candidiasis Conference
2006 Chair, Cellular and Molecular Fungal Biology Gordon Conference
2007-2008 Co-director, TIRAR Training Program, Columbia University
2008- Associate Editor/Mycology Section Editor/Reviews Section Editor, PLOS PATHOGENS
2008-2012 Director, HHMI Undergraduate Research Program, Carnegie Mellon University
2009-2015 Member, NIH PTHE Study Section
2012- Editorial Board, PLOS BIOLOGY
2012-2018 Advisory Board, Burroughs Wellcome Fund Pathogenesis of Infectious Disease Awards
2014 Chair, Medical Mycology Division, American Society for Microbiology
2015 Reviewer, Mycology Centre Review Panel, Medical Research Council, UK
2016- Senior Editor, mSPHERE

Honors

1984 Damon Runyon - Walter Winchell Cancer Fund Postdoctoral Fellow
1989 Searle Scholar
1992 Faculty Research Award, American Cancer Society
1997 Molecular Mycology Scholar Award, Burroughs Wellcome Fund
2003 Fellow, American Academy of Microbiology
2005 Keynote Speaker, CSH Microbial Pathogenesis & Host Response Meeting
2005 Fellow, American Association for the Advancement of Science
2005-2008 Harold S. Ginsberg Professorship, Columbia University
2011 Friday Night Lecturer, Marine Biological Lab, Woods Hole
2013 Division X Lecturer, American Society for Microbiology General Meeting
2015 American Society for Microbiology Graduate Microbiology Teaching Award
2016-2019 Dr. Frederick A. Schwertz Distinguished Professor of Life Sciences, Carnegie Mellon University
2019 Top 2% of Microbiologists, as per PLoS Biol 17(8): e3000384
2020 MVP Speaker, Marine Biological Labs summer program
2021 Shared namesake for “The Jack Edwards and Aaron Mitchell Endowed Lecture in Molecular Mycology,” Marine Biological Labs, Woods Hole, MA

C. Contribution to Science.

My full bibliography is available at
https://www.ncbi.nlm.nih.gov/myncbi/browse/collection/41198498/?sort=date&direction=ascending
ORCID 0000-0002-0868-4000

My work on *C. albicans* biofilm formation began with mutant screens to identify biofilm-defective mutants. This work was inspired by several stimulating reviews on bacterial biofilms by O’Toole and Kolter. Our studies were, to the best of my knowledge, the first broad identifications of biofilm mutants in *C. albicans*.

1. Richard ML, Nobile CJ, Bruno VM, Mitchell AP. 2005. Candida albicans biofilm-defective mutants. Eukaryot Cell 4:1493-502.
2. Nobile CJ, Mitchell AP. 2005. Regulation of cell-surface genes and biofilm formation by the C. albicans transcription factor Bcr1p. Curr Biol 15:1150-5.
3. Norice CT, Smith FJ, Jr., Solis N, Filler SG, Mitchell AP. 2007. Requirement for Candida albicans Sun41 in biofilm formation and virulence. Eukaryot Cell 6:2046-55.

4. Finkel JS, Xu W, Huang D, Hill EM, Desai JV, Woolford CA, Nett JE, Taff H, Norice CT, Andes DR, Lanni F, Mitchell AP. 2012. Portrait of Candida albicans Adherence Regulators. PLoS Pathog 8:e1002525.

Our biofilm mutants led us to identify key downstream target genes that mediate adherence, matrix production, and biofilm growth in vitro and in murine biofilm infection models.

1. Nobile CJ, Andes DR, Nett JE, Smith FJ, Yue F, Phan QT, Edwards JE, Filler SG, Mitchell AP. 2006. Critical role of Bcr1-dependent adhesins in C. albicans biofilm formation in vitro and in vivo. PLoS Pathog 2:e63.
2. Nobile CJ, Nett JE, Hernday AD, Homann OR, Deneault JS, Nantel A, Andes DR, Johnson AD, Mitchell AP. 2009. Biofilm matrix regulation by Candida albicans Zap1. PLoS Biol 7:e1000133.
3. Dwivedi P, Thompson A, Xie Z, Kashleva H, Ganguly S, Mitchell AP, Dongari-Bagtzoglou A. 2011. Role of Bcr1-activated genes Hwp1 and Hyr1 in Candida albicans oral mucosal biofilms and neutrophil evasion. PLoS One 6:e16218.
4. Fanning S, Xu W, Solis N, Woolford CA, Filler SG, Mitchell AP. 2012. Divergent targets of Candida albicans biofilm regulator Bcr1 in vitro and in vivo. Eukaryot Cell 11:896-904.

We characterized the regulatory circuitry that controls biofilm-related genes, and were the first group to my knowledge to document extensive regulatory network variation among *C. albicans* isolates.

1. Fanning S, Xu W, Beaurepaire C, Suhan JP, Nantel A, Mitchell AP. 2012. Functional control of the Candida albicans cell wall by catalytic protein kinase A subunit Tpk1. Mol Microbiol 86:284-302.
2. Desai JV, Bruno VM, Ganguly S, Stamper RJ, Mitchell KF, Solis N, Hill EM, Xu W, Filler SG, Andes DR, Fanning S, Lanni F, Mitchell AP. 2013. Regulatory role of glycerol in Candida albicans biofilm formation. MBio 4:e00637-12.
3. Woolford CA, Lagree K, Xu W, Aleynikov T, Adhikari H, Sanchez H, Cullen PJ, Lanni F, Andes DR, Mitchell AP. 2016. Bypass of Candida albicans Filamentation/Biofilm Regulators through Diminished Expression of Protein Kinase Cak1. PLoS Genet 12:e1006487.
4. Huang MY, Woolford CA, May G, McManus CJ, Mitchell AP. 2019. Circuit diversification in a biofilm regulatory network. PLoS Pathog 15:e1007787.

We collaborated with the Andes group (U Wisconsin) in studies of the mechanism of biofilm extracellular matrix biogenesis and the roles of extracellular vesicles in the process.

1. Zarnowski R, Westler WM, Lacmbouh GA, Marita JM, Bothe JR, Bernhardt J, Lounes-Hadj Sahraoui A, Fontaine J, Sanchez H, Hatfield RD, Ntambi JM, Nett JE, Mitchell AP, Andes DR. 2014. Novel entries in a fungal biofilm matrix encyclopedia. MBio 5:e01333-14.
2. Mitchell KF, Zarnowski R, Sanchez H, Edward JA, Reinicke EL, Nett JE, Mitchell AP, Andes DR. 2015. Community participation in biofilm matrix assembly and function. Proc Natl Acad Sci U S A 112:4092-7.
3. Zarnowski R, Sanchez H, Covelli AS, Dominguez E, Jaromin A, Bernhardt J, Mitchell KF, Heiss C, Azadi P, Mitchell A, Andes DR. 2018. Candida albicans biofilm-induced vesicles confer drug resistance through matrix biogenesis. PLoS Biol 16:e2006872.
4. Zarnowski R, Noll A, Chevrette MG, Sanchez H, Jones R, Anhalt H, Fossen J, Jaromin A, Currie C, Nett JE, Mitchell A, Andes DR. 2021. Coordination of fungal biofilm development by extracellular vesicle cargo. Nat Commun 12:6235.

We have worked to develop methods to streamline and simplify *C. albicans* genetic manipulation. We also made large mutant collections freely available to the community, in 2008, via http://www.fgsc.net/candida/FGSCcandidaresources.htm

1. Wilson RB, Davis D, Mitchell AP. 1999. Rapid hypothesis testing with Candida albicans through gene disruption with short homology regions. J Bacteriol 181:1868-74.
2. Davis DA, Bruno VM, Loza L, Filler SG, Mitchell AP. 2002. Candida albicans Mds3p, a conserved regulator of pH responses and virulence identified through insertional mutagenesis. Genetics 162:1573-81.
3. Min K, Ichikawa Y, Woolford CA, Mitchell AP. 2016. Candida albicans Gene Deletion with a Transient CRISPR-Cas9 System. mSphere 1:00130-16.

4. Huang MY, Woolford CA, Mitchell AP. 2018. Rapid Gene Concatenation for Genetic Rescue of Multigene Mutants in Candida albicans. mSphere 3:e00169-18.

D. Research Support

5R01 DE026600 (coPIs: Filler, Mitchell) 04/01/2017 - 03/31/2022
NIH/NIDCR
C. albicans invasion and proliferation during oral infection
Proposed studies dissect two pathways that mediate epithelial cell interaction with Candida albicans during oropharyngeal candidiasis.

1R01AI33409 (PI: Krysan) 12/01/2017 - 11/30/2022
NIH/NIAID
Complex haploinsufficiency-based genetic analysis of *Candida albicans* pathogenesis
The goals of this project are to characterize the transcriptional networks required for oropharyngeal candidiasis and hyphae formation in vivo.

1R21AI144878 (PI: Mitchell) 04/01/2019 - 03/31/2022 (NCE)
NIH/NIAID
Carbon Regulation of Virulence in Oropharyngeal Candidiasis
The goal of this project is to identify carbon metabolic regulatory genes and their roles in oral candidiasis.

1R01AI146103 (PI: Mitchell) 07/01/2019 - 06/30/2024
NIH/NIAID
Functional Analysis of Natural Variation in the Pathogen Candida albicans
The goal of this project is to define pathogenicity regulatory networks in multiple *C. albicans* isolates.

1R21AI157341 (PI: Krysan) 09/01/2020 – 08/31/2022
NIH/NIAID
Systematic in vitro and in vivo genetic analysis of C. albicans protein kinases
The goal of this project is to create and analyze bar-coded deletion mutations in *C. albicans* protein kinase genes.

5R01AI073289 (PI: Andes) 06/15/2018 – 5/31/2023
NIH/NIAID
Biofilm Induced Extracellular Vesicle Pathogenesis
The goals of this project are to define C. albicans biofilm extracellular vesicle cargo that mediates matrix drug resistance and cell dispersion, and to elucidate the genetic pathways that orchestrate extracellular vesicle formation during biofilm pathogenesis.