Caroline S. Cencer, Ph.D.
Curriculum Vitae

Stanford University School of Medicine, Endocrinology
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EDUCATION

Vanderbilt University **Nashville, TN**
Ph.D., Cell and Developmental Biology *Degree Conferral: December 2023*
- Advisor: Dr. Matthew Tyska, Ph.D. (Cornelius Vanderbilt Chair)
- Dissertation: *Unraveling the Mechanisms of Apical Cadherin-Based Adhesion in Brush Border and Junction Assembly*

Oakland University **Auburn Hills, MI**
B.S., Biology *Graduation Date: August 2016*
- *Cum laude*, Graduate of The Honors College
- Degree in Three [years] program
- Research advisor: Dr. Frank Giblin, Ph.D. (Eye Research Institute Director)

RESEARCH EXPERIENCE

Oakland University, Eye Research Institute

I began my formal laboratory research experience with the Summer Undergraduate Program in Eye Research (SUPER) at Oakland University in Auburn Hills, Michigan, working full time in Dr. Frank Giblin's laboratory. My project asked how UV-light can lead to the formation of cataracts. I discovered a novel two-phase mechanism in which exposure of cultured human lens epithelial cells to UV-light caused immediate damage to the DNA, followed by DNA repair by the enzyme PARP-1. Remarkably, cells experienced a second round of DNA damage due to reactive oxygen species buildup, which was not able to be repaired as efficiently by PARP-1. This study resulted in a first-author publication.

Vanderbilt University, Department of Cell and Developmental Biology

I obtained my Ph.D. in Dr. Matthew Tyska's laboratory at Vanderbilt University in Nashville, Tennessee. My dissertation work focused on how apical microvilli on transporting epithelia, found in both the small intestine and kidney, are organized into a tightly packed array called the brush border. I discovered an adhesion-based mechanism whereby protocadherin proteins CDHR2 and CDHR5 create an intermicrovillar adhesion complex (IMAC) between microvilli of neighboring cells, spanning cell-cell junctions. This transjunctional IMAC stabilizes microvilli early in cell surface organization leading to their accumulation at cell margins, suggesting that the brush border may pack from the outside inwards. In a follow-up study, these transjunctional IMACs were found to also influence basolateral junctions, with CDHR2 knockout models leading to a loss of tight and adherens junction proteins. As a result, CDHR2 knockout cells exhibit abnormal morphologies, increased permeability, and decreased collective cell migration. Interestingly, the original literature surrounding CDHR2 and CDHR5 implicated these proteins as tumor suppressors, with their expression being significantly reduced in cancers. Taken together, my research regarding transjunctional IMACs and influence on junctional stability may offer a unifying mechanism for the role of CDHR2 and CDHR5 in cancer metastasis. My thesis work resulted in two first-author publications.

ACADEMIC RESEARCH PUBLICATIONS

Cencer CS, Robinson KL, Tyska MJ. (2024) Loss of intermicrovillar adhesion factor CDHR2 impairs basolateral junctional complexes in transporting epithelia. *Molecular Biology of the Cell.* DOI: 10.1091/mbc.E24-03-0113

Cencer CS, Silverman JB, Meenderink LM, Krystofiak ES, Millis BA, Tyska MJ. (2023) Adhesion-based capture stabilizes nascent microvilli at epithelial cell junctions. *Developmental Cell.* DOI: 10.1016/j.devcel.2023.09.001

Childress KO, **Cencer CS**, Tyska MJ, Lacy DB (2023). NECTIN-3 and shed forms of CSPG4 can serve as epithelial cell receptors for Clostridioides difficile TcdB. *mBio* American Society for Microbiology. DOI: 10.1128/mbio.01857-23

Gaeta IM, Meenderink LM, Postema MM, **Cencer CS**, Tyska MJ. 2021. Direct Visualization of epithelial microvilli biogenesis. *Current Biology*. DOI: 10.1016/j.cub.2021.04.012

Naguib S, Bernardo-Colon A, **Cencer C**, Gandra N, Rex TS. 2020. Galantamine protects against synaptic, axonal, and vision deficits in experimental neurotrauma. *Neurobiology of Disease*. DOI: 10.1016/j.nbd.2019.104695

Meenderink LM, Gaeta IM, Postema MM, **Cencer CS**, Chinowsky CR, Krystofiak ES, Millis BA, Tyska MJ. 2019. Actin Dynamics Drive Microvillar Motility and Clustering during Brush Border Assembly. *Developmental Cell*. DOI: 10.1016/j.devcel.2019.07.008

Cencer CS, Chintala SK, Townsend TJ, Feldmann DP, Awrow MA, Putris NA, Geno ME, Donovan MG, Giblin FJ. 2018. PARP-1/PAR Activity in Cultured Human Lens Epithelial Cells Exposed to Two Levels of UVB Light*. Photochemistry and Photobiology*. 94(1): 126–138. DOI: 10.1111/php.12814

PRESENTATIONS

- November 6, 2023. Dissertation Defense. Unraveling the Mechanisms of Apical Cadherin-Based Adhesion in Brush Border and Junction Assembly. Vanderbilt University, Nashville, TN
- (2023) Vanderbilt Epithelial Biology Center Talk. Apical cadherin adhesion complexes stabilize microvilli and junctions of transporting epithelia. Vanderbilt University, Nashville, TN [Awarded Talk and Funding]
- (2023) Cell Dynamics Symposium. Adhesion-based capture stabilizes nascent microvilli at epithelial cell junctions. Vanderbilt University, Nashville, TN [Received Award]
- (2023) Vanderbilt Cell and Developmental Biology Retreat Poster. An adhesion-based mechanism stabilizes apical microvilli at the margins of transporting epithelial cells. Nashville, TN.
- (2022) American Society of Cell Biology CellBio 2022 Conference Building the Cell Subgroup Talk. An adhesion-based mechanism stabilizes apical microvilli at the margins of transporting epithelial cells. Washington, D.C.
- (2022) American Society of Cell Biology CellBio 2022 Conference Poster. An adhesion-based mechanism stabilizes apical microvilli at the margins of transporting epithelial cells. Washington, D.C.
- (2022) Harding Lecture Series Invited Talk. Building the intestinal brush border. Oakland University, Auburn Hills, MI. [Received honorarium]
- (2022) Vanderbilt Cell and Developmental Biology Retreat Breakout Session Talk. A novel adhesion-based mechanism stabilizes microvilli on the surface of transporting epithelial cells and supports cell-cell junctions. Nashville, TN.

- (2022) Vanderbilt Program in Developmental Biology Retreat Poster. A cadherin adhesion-based mechanism stabilizes marginal microvilli on the surface of transporting epithelial cells. Pickwick Landing State Park, Counce, TN.
- (2021) Vanderbilt Cell and Developmental Biology Retreat Poster. Determining the role of apical adhesion complexes in brush border formation. Nashville, TN. [Received Award]
- (2021) Vanderbilt Program in Developmental Biology Retreat Talk. An adhesion-based mechanism for stabilizing microvilli on the surface of epithelial cells. Lake Guntersville State Park, Guntersvile, AL. [Received Award]
- (2021) Vanderbilt Cell and Developmental Biology Research Exchange Graduate Student Seminar. A novel mechanism for the stabilization of microvilli on the apical cell surface. Zoom.
- (2020) Vanderbilt Epithelial Biology Center Talk. The role of intermicrovillar adhesion in brush border formation and intestinal epithelial organization. Zoom.
- (2019) American Society of Cell Biology Conference. Poster. ArtLab: Building an Art-Science Community. Washington, D.C.
- (2019) Vanderbilt Program in Developmental Biology Retreat Poster. Determining the role of apical adhesion complexes in brush border formation. Pickwick Landing State Park, Counce, TN.
- (2018) Michigan Microscopy and Microanalysis Society Invited Talk. An Apical Symphony: The formation of the intestinal brush border. Central Michigan University, Mount Pleasant, MI. [Award]

POSITIONS HELD

Stanford University School of Medicine — **Palo Alto, CA**
Grant Writer: Dr. Joy Wu MD, PhD Endocrinology Division Chief — *March 2024-Present*
Interim Lab Manager: Dr. Joy Wu MD, PhD Endocrinology Division Chief — *May 2025-Present*

PhD Candidate and Postdoctoral Fellow – Vanderbilt University — **Nashville, TN**
Cell and Developmental Biology; Dr. Matthew Tyska, PhD — *August 2017-May 2024*

B.S. Lab Technician — **Auburn Hills, MI**
Dr. Frank Giblin, PhD, Eye Research Institute Director — *August 2016-August 2017*

CAREER DEVELOPMENT

Scientific Writing for Research Grant Proposals (Coursera) — *December 2024*
Practical Strategies for Strong Writing ASPIRE Module — *March 2021*
SciComm for All Vanderbilt ASPIRE Module — *September 2020 - November 2020*

SCIENTIFIC OUTREACH

Medical Literacy Initiative — **Remote**
Volunteer Writer and Editor — *January 2024-April 2025*

SciComm Bites — **Remote**
Author and Editor — *March 2023-March 2024*

Vanderbilt School of Medicine Basic Sciences — **Nashville, TN**
Science Communication Intern — *August 2022-December 2022*

Vanderbilt VI4 MEGAMicrobe Event — **Nashville, TN**
Planning Committee Event Design Co-Chair — *July-September 2022*

Vanderbilt VI4/PMI — **Nashville, TN**
Science Communication Intern — *August 2020-December 2020*

Adventure Science Center — **Nashville, TN**
TWISTER Intern — *October 2019-February 2020*

ArtLab Vanderbilt — **Nashville, TN**
Graduate Assistant — *January 2019-January 2020*

Adventure Science Center — **Nashville, TN**
Discovery Cart Volunteer — *August 2019-March 2020*

Metro Nashville Middle Schools — **Nashville, TN**
Presenter — *November 2019*

Marian High School STEM Club — **Bloomfield Hills, MI**
Presenter — *2017-2020*

MENTORING

Rohith Raman; Undergraduate Student August 2019-March 2020; Current Position: Attending medical school
Jennifer Silverman; IGP Rotation Student 2021; Current Position: PhD Candidate in Tyska Lab
Kianna Robinson; IGP Rotation Student 2022; Current Position: PhD Candidate in Tyska Lab

AWARDS

- (2023) Award for Research Excellence in Cell Dynamics
- (2023) Program in Cell and Developmental Biology Retreat: Art Award
- (2021) Program in Developmental Biology Retreat: Talk Award
- (2021) Program in Cell and Developmental Biology Retreat: Poster Award
- (2019) Cell and Developmental Biology Imaging Award: Tissues and Cells
- (2018) Michigan Microscopy and Microanalysis Society Conference: Talk Award
- (2018-2020) T32 Training Grant in Developmental Biology
- (2016) Oakland University Honors College Senior Thesis with Distinction

PROFESSIONAL LEADERSHIP AND AFFILIATIONS

- American Society of Cell Biology (ASCB) Public Information Committee, December 2022-Present
- American Society of Cell Biology (ASCB), Member 2018-Present
- Sigma Xi Scientific Research Honors Society, Member 2017-Present
- American Association for the Advancement of Science (AAAS), Member 2017-2020

NON-ACADEMIC ARTICLES

Medical Literacy Initiative

- "How Age and Environment Shape Our Health." Medical Literacy Initiative, February 6, 2025
- "Oral Bacterium has Unexpected Role in Colon Cancer." Medical Literacy Initiative, March 18, 2024

SciCommBites

- "Science you can feel - how authentic objects and hands-on museum exhibits impact learning." SciCommBites, November 22, 2023.
- "Stuck to your memory like gum on a shoe: How analogies can boost science education." SciCommBites, October 11, 2023.
- "Beyond Data Collection: The Transformative Role of Citizen Science in Public Engagement." SciCommBites, August 16, 2023.
- "Bringing art back to science: A tale of two art science programs." SciCommBites, June 30, 2023.

- Cencer, CS. “The Adventures of Science Communication: Using comics to engage young audiences.” SciCommBites, April 19, 2023.

Vanderbilt University and Vanderbilt University Medical Center

- “Through the lens: Vanderbilt’s excellence in microscopy revealed in Nikon Small World awards.” Vestigo, Issue 5 Special Sesquicentennial Edition, February 2024.
- “Mentors help high school students earn science honors.” VUMC Reporter, May 4, 2023.
- “These high school seniors found mentors in Vanderbilt research labs — and were honored in a national science talent search.” VUMC Voice, April 24, 2023.
- “Decoding cell division machinery.” VUMC Reporter, March 23, 2023.
- “Diversity in infectious mold species impacts respiratory disease severity in humans.” Vanderbilt School of Medicine Basic Sciences News, February 3, 2023.
- “New screening method could pave the way for future cancer drug discoveries.” Vanderbilt University Research News, January 17, 2023.
- “Weight cycling worsens the body’s ability to control glucose levels.” Vanderbilt School of Medicine Basic Sciences News, November 14, 2022.
- “Basic Sciences celebrates Hispanic Heritage Month.” Vanderbilt School of Medicine Basic Sciences News, November 9, 2022.
- “The best of both worlds: Blending assays to understand human genome regulation.” Vanderbilt School of Medicine Basic Sciences News, September 20, 2022.
- “Leveraging the structure of bacterial host cell receptors to detect cancer.” Vanderbilt University Research News, August 16, 2022.
- “Growing Crystals: Not your Average Science Fair Project.” *BRET Results and Discussion*, Issue 11, Spring 2021, p. 12.
- “How good is your immunity? Debating the duration of COVID-19 immunity.” *Immuknow+*, December 10, 2020.