

Michael Melesse
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Michael Melesse Vergara

Technical Professional in Synthetic Biology

Education

December 2015

Ph.D. in Biochemistry, Purdue University, West Lafayette, IN
Advisor: Dr. Mark C. Hall

May 2008

B.A. in Biochemistry and Molecular Biology, Reed College, Portland, OR
Advisor: Dr. Ronald W. McClard

Publications

- Melesse Vergara, M.**, Labbé, JL., Tannous J., Reflection on the challenges, accomplishments, and new frontiers of gene drives, *BioDesign Research*. 2022;2022:9853416. doi:10.34133/2022/9853416.
- Yuan G., Hassan Md. M., Yao T., Lu H., **Melesse Vergara, M.**, Labbé, JL. Muchero W, Chen J-G, Tuskan GA, Abraham PE, Yang X, Plant-based biosensors for detecting CRISPR-mediated genome engineering and transcriptional regulation tools, *ACS Synthetic Biology*. 2021. doi:10.1021/acssynbio.1c00455.
- Bai X*, **Melesse M.***, Turpin CGS*, Sloan DE*, Chen CY, Wang WC, Lee PY, Simmons JR, Nebenfuehr B, Mitchell D, Klebanow LR, Mattson N, Betzig E, Chen BC, Cheerambathur D, Bembenek JN, Aurora B functions at the apical surface after specialized cytokinesis during morphogenesis in *C. elegans*, *Development*. 2020. doi:10.1242/dev.181099. *Authors contributed equally
- Melesse M.**, Bembenek JN, Cracking the eggshell: A novel link to intracellular signaling for Developmental Biology, *Developmental Biology*. 2019. doi: 10.1016/j.ydbio.2019.05.014.
- Melesse M.**, Bembenek JN, Jouline I, Conservation of the separase regulatory domain, *Biology Direct*. 2019. doi: 10.1016/j.ydbio.2019.05.014
- Melesse M.**, Sloan D E, Benthall J T, Caylor Q, Gosine K, Bai X and Bembenek JN, Genetic Identification of Novel Separase regulators in *Caenorhabditis elegans*, *G3:Genes, Genomes, Genetics*. 2018 Jan. doi:10.1534/g3.117.300298.
- Powers B.L., **Melesse M.**, Eissler C.E., Charbonneau H., and Hall M.C., Measuring activity and specificity of protein phosphatases, *Methods in Molecular Biology*, 2016; Vol. 1342:221-35. doi:10.1007/978-1-4939-2957-3
- Qin L., Guimaraes D., **Melesse M.**, Hall M.C., Substrate recognition by the Cdh1 destruction box receptor is a general requirement for APC/C^{Cdh1}-mediated Proteolysis, *J Biol Chem*. 2016 May. doi: 10.1074/jbc.M116.731190.
- Iliuk A, Li L, **Melesse M**, Hall MC, Tao WA., Multiplexed imaging of protein phosphorylation on membranes based on Ti(IV) functionalized nanopolymers, *Chembiochem*. 2016 May; 17(10):900-3. doi: 10.1002/cbic.201600068 .

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Publications (cont.)

Li C., Melesse M., Zhang H, Hao C., Wang C., Zhang H., Hall M.C., Xu J.R., FgCDC14 regulates cytokinesis, morphogenesis, and pathogenesis in *Fusarium graminearum*, *Molecular Microbiology*, 2015 Aug. doi: 10.1111/mmi.13157.

Melesse M., Choi E., Hall H., Walsh M.J., and Hall M.C., Timely activation of budding yeast APC^{Cdh1} involves degradation of its inhibitor, Acm1, by an unconventional proteolytic mechanism, *PLoS One*, 9(7): e103517. doi: 10.1371/journal.pone.0103517

Research Experience

Oct. 2019 - Present

Technical Professional in Synthetic Biology

Biological Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
Dr. Carrie Eckert, Dr. Adam Guss

- Genetic construct development in non-model microbes
- Long read genome sequencing and methylome analysis
- CRISPR/Cas9 tool development for non-model microbes

Sep. 2019 - Sep. 2022

Postdoctoral Research Associate

Biological Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN
Dr. Jesse Labbé, Dr. Carrie Eckert

- CRISPR/Cas9 genome engineering, Bio-security
Develop genomically encoded system for the prevention of undesirable CRISPR/Cas9 genomic editing
- Development of a Cas1/2 based molecular recorder to capture transcriptional states of host organisms
- SARS-Cov2 protein E production for use in biophysical studies using constructed cell membrane mimics

Feb. 2016 - Sep. 2019

Postdoctoral Research Associate

Biochemistry & Cellular and Molecular Biology Department, University of Tennessee, Knoxville, TN

Dr. Joshua Bembenek

- Cell cycle regulation, genetics.
Regulation of membrane trafficking during cell division in *C. elegans*

Fall 2009 - Winter 2015

Graduate Research Assistant

Department of Biochemistry, Purdue University, West Lafayette, IN

Dr. Mark C. Hall

- Cell cycle regulation, protein degradation.
Identification of the degradation mechanism of the *Saccharomyces cerevisiae* protein Acm1.
- Cell cycle regulation, protein phosphorylation.
Determination of the substrate selectivity of a cell cycle regulated phosphatase, Cdc14.

Fall 2008 - Summer 2009

Research Assistant

Oregon Health and Sciences University, Portland, OR

Dr. Joseph Weiss

- Identification of ligands of Anaplastic lymphoma kinase in *Mus musculus*.
Biochemical characterization of protein substrates.

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Research Experience (cont.)

Fall 2007 - Summer 2008

Undergraduate Research Assistant

Chemistry Department, Reed College, Portland, OR

Dr. Ronald W. McClard

- Year long, undergraduate thesis project entitled "Site-directed mutation of the *Saccharomyces cerevisiae* OPRase flexible loop: potential application to structural studies".

Summer 2007

Undergraduate Summer Research Assistant

Chemistry Department, Reed College, Portland, OR

Dr. Patrick G. McDougal

- Summer research project towards the organic synthesis of a pH switch for selective delivery of radioactive iodine into cancerous cells. .

Honors and Awards

- AUG. 2015 **Bird Stair Fellowship award**, Department of Biochemistry, Purdue University
- APR. 2015 **Outstanding Teaching Assistant award**, Department of Biochemistry, Purdue University
- FEB. 2015 **Bird Stair Fellowship award**, Department of Biochemistry, Purdue University
- APR. 2014 **Henry Weiner Travel Award**, Department of Biochemistry, Purdue University
- SEPT. 2009 **Ross Fellowship**, Purdue Graduate School, Purdue University
- SEPT. 2003 **National Honors Society**, International Community School of Addis Ababa

Technical Skills

Molecular biology

Genetic modification of yeast (gene deletion, genomic tagging); Genomic tagging in *C. elegans* (CRISPR construct design, injection and transformant screening), Cloning: primer design, restriction digest analysis, ligations, transformation, RNA extraction, reverse transcription, PCR, DNA purification, DNA quantification and extraction, TOPO® , Gateway® and Gibson® cloning.

Biochemistry

Protein purification, (co-)immunopurification, pulse-chase analysis, high-throughput chemical screening, enzymatic assays (experimental and data analysis).

Analytical

Flow cytometry, MS (MALDI-TOF), chromatography (thin layer, ion exchange, SEC, HPLC, RPC), quantitative western blot, titrations, photospectrophotometry, Oxford Nanopore Sequencing and analysis.

Genetics

Complementation analysis, suppressor screens, HTS analysis

Cellular biology

Liquid and solid culture of yeast and bacteria, cell cycle synchronization; microscopy: fluorescence and light microscopy, image analysis and quantification.

Professional Activities

Professional Society Memberships

- Genetics Society of America (GSA), March 2016 - Current
- National Postdoctoral Association (NPA), March 2016 - Current
- American Society of Cellular Biology (ASCB), Sept. 2018 - Current

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Professional Activities (cont.)

Service

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| Chair | <ul style="list-style-type: none">• Graduate student invited lecture committee, Biochemistry department, Purdue University (Fall 2013) |
| Session chair | <ul style="list-style-type: none">• ORNL Postdoc Association research symposium, Oak Ridge National Lab (May 2023) |
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| Poster judge | <ul style="list-style-type: none">• Cell Dynamics Symposium, Vanderbilt University, Nashville, TN (May 24-25, 2018)• Biochemistry & Cellular and Molecular Biology Department Research Retreat, University of Tennessee Knoxville (March 2, 2018) |
| Poster judge | <ul style="list-style-type: none">• TAGC (The Allied Genetics Conference), Orlando, FL (July 13-17, 2016)• REU (Research Experience for Undergraduates) / SURF (Summer Undergraduate Research Fellowships) Program, Purdue University (July 25, 2013)• SURF Program, Purdue University (Aug. 3, 2011) |
| Member | <ul style="list-style-type: none">• Lab safety committee Bindley Biosciences Center (BBC), West Lafayette, IN (July 2014 - Dec. 2015). |
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| Member | <ul style="list-style-type: none">• Graduate student advisory board, College of Agriculture, Purdue University (Spring 2012 - Fall 2013)• Grades appeal committee, College of Agriculture, Purdue University (Fall 2012, Fall 2013)• Graduate student invited lecture committee, Biochemistry department, Purdue University (Spring 2012)• Awards committee, College of Agriculture, Purdue University (Fall 2012)• Graduate student invited lecture committee, Biochemistry department, Purdue (Fall 2010) |
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Seminars and Poster Presentations

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| 5/27/21 | RNA-Based countermeasure against the CRISPR/Cas9 gene-editing tool
<i>Synthetic Biology Group research seminar</i> , Oak Ridge National Lab, Seminar |
| 5/18/21 | Secure Ecosystem Engineering and Design (SEED): Securing the genome against CRISPR-Cas9 gene editing; Lock and Key tool
<i>DOE Basic Energy Research</i> , Oak Ridge National Lab, Seminar |
| 4/22/21 | Genetics in the lab
<i>STEM into Summer</i> , Clayton Bradly Academy, Presentation |
| 6/22-23/20 | RNA-Based countermeasure against the CRISPR/Cas9 gene-editing tool
<i>ORPA research symposium</i> , Oak Ridge National Lab, Poster |
| 5/28/20 | RNA-Based countermeasure against the CRISPR/Cas9 gene-editing tool
<i>Microbial group research seminar</i> , Oak Ridge National Lab, Seminar |
| 5/1/20 | Securing genomes against the CRISPR-Cas gene editing tool
<i>DOE Basic Energy Research</i> , Oak Ridge National Lab, Seminar |
| 3/5/20 | Securing genomes against the CRISPR-Cas gene editing tool
<i>DOE Basic Energy Research</i> , Oak Ridge National Lab, Seminar |
| 11/7/19 | Securing genomes against the CRISPR-Cas gene editing tool
<i>DOE Basic Energy Research</i> , Oak Ridge National Lab, Seminar |

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Seminars and Poster Presentations (cont.)

- 9/23-24/18 Genetic identification of separase regulators in *C. elegans* *The Triangle Cytoskeleton Meeting*, Chapel Hill / Saxapahaw, NC, Poster
- 5/24-25/18 Genetic identification of separase regulators in *C. elegans* *Cell Dynamics Symposium, Department of Cell and Developmental Biology*, Vanderbilt University, Poster
- 3/2/18 Genetic identification of separase regulators in *C. elegans* *Biochemistry & Cellular and Molecular Biology Department Research Retreat*, University of Tennessee Knoxville, Poster
- 6/21-25/17 Investigating a non-canonical role of *C. elegans* separase *21st international C. elegans conference*, University of California Los Angeles, Poster
- 5/19/17 Genetic suppressors of mutant separase may elucidate membrane trafficking role of *C. elegans* separase *Southeastern Regional Society for Developmental Biology*, Kennesaw State University, Poster
- 3/27/17 Investigating a non-canonical role of *C. elegans* separase *Biochemistry & Cellular and Molecular Biology Department colloquium*, University of Tennessee Knoxville, Seminar
- 8/21/15 Cdc14 phosphatase substrate selectivity is conserved *Biochemistry Department Annual Retreat*, Purdue University, Poster
- 11/12/14 Identification of Cdc14 phosphatase inhibitors and applications to cancer, *Purdue Cancer Center Research Retreat*, Poster
- 10/17/14 Understanding and exploiting Cdc14 substrate selectivity *Biochemistry Departmental Graduate student and Postdoc seminar series*, Purdue University, Seminar
- 7/13-18/14 Towards the design of Cdc14 phosphatase inhibitors *FASEB Yeast Chromosome Structure, Replication and Segregation*, Poster
- 11/15/13 Characterization of the mechanism and biological function of Acm1 degradation *Biochemistry Departmental Graduate student and Postdoc seminar series*, Purdue University, Seminar
- 9/28-29/13 Determining the function of Acm1 degradation, *Midwestern Yeast Meeting*, Northwestern University, Poster
- 4/19/13 A cell cycle regulated proteolytic mechanism independent of ubiquitin conjugation to the substrate *Ubiquitination Processes and Their Role in Cancer, Mini-Symposium and Poster Session*, Purdue University, Poster
- 9/7/12 Ubiquitin conjugation independent mechanism for Acm1 degradation *Biochemistry Departmental Graduate student and Postdoc seminar series*, Purdue University, Seminar
- 8/17/12 Determining the mechanism for Acm1 (APC^{Cdh1} modulator 1) degradation *Biochemistry Department Annual Retreat*, Turkey Run state park, Poster
- 3/9/12 Characterization of Acm1 degradation *Biochemistry Departmental Graduate student and Postdoc seminar series*, Purdue University, Seminar
- 12/11/11 Polyubiquitination independent degradation of Acm1 *Cell cycle regulation group meeting*, Purdue University, Seminar

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Seminars and Poster Presentations (cont.)

- 9/24/11 Identification of proteins required for degradation of the APC inhibitor Acm1
Biochemistry Department Annual Retreat, Turkey Run state park, Poster
- 11/12/10 Characterization of the proteasome mediated degradation of Acm1
Biochemistry Departmental Graduate student and Postdoc seminar series, Purdue University, Seminar
- 10/2/10 Identification of proteins required for degradation of the APC inhibitor Acm1
Biochemistry Department Annual Retreat, Turkey Run state park, Poster

Teaching

Term	Class	Faculty
University of Tennessee Knoxville, Department of BCMB		
SUM. 18	Mobile Summer Institute on Undergraduate STEM Education (MoSI)	Teaching workshop
SPRING 18	BCMB311 Advanced Cell Biology Guest lecturer	Dr. Joshua N. Bembenek
Purdue University, Department of Biochemistry		
FALL 15	BCHM221 Small Molecule Biochem.	Dr. Steven S. Broyles
SUM. 15	BCHM309 Biochemistry Lab	Dr. Orla Hart
SPRING 15	BCHM100 Intro. to Biochemistry	Dr. Vikki Weake
FALL 14	BCHM100 Intro. to Biochemistry	Dr. Clint C. Chapple
SPRING 14	BCHM100 Intro. to Biochemistry	Dr. Vikki Weake
FALL 13	BCHM309 Biochemistry Lab (2)	Independent
SPRING 13	BCHM695 Macromolecules	Dr. Ann L. Kirchmaier
SPRING 12	BCHM307 Biochemistry	Dr. James C. Clemens
SPRING 11	BCHM309 Biochemistry Lab (2)	Dr. James T. Henderson

Mentoring

- Spring 2019 to Fall 2020, Margaret Spangler, ORAU Post-baccalaureate research assistant
- Summer 2016, Joseph Benthall, BCMB undergraduate
- Summer 2014, Denise Ward, NSF Research Experience for Undergraduate (REU) program
- Spring 2014, Ryan Chaparian, Biochemistry undergraduate student
- Summer 2013, Perla Cruz, Summer Undergraduate Research Foundation (SURF) program
- Summer 2012 to Spring 2013, Mercedes Leland, Biochemistry undergraduate student
- Spring 2012 to Fall 2013, Michael Walsh, Biochemistry undergraduate student
- Summer 2011, George Habib, Summer Undergraduate Research Foundation (SURF) program
- Spring and Fall 2011, Matt Berret, Biochemistry undergraduate student