Xinyu (Cynthia) Tang

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EDUCATION

Doctor of Philosophy in **Nutritional Biology** Expected: June 2024
University of California, Davis
Advisor**:** Dr. Angela Zivkovic
Dissertation: Unraveling Glycosylation Alterations in Alzheimer's Disease through Multi-Omics Analysis

Master of Science in **Epigenetic Nutrition** June 2018
University of Illinois, Urbana-Champaign
Advisor**:** Dr. Hong Chen
Thesis: Epigenetic regulation of genes related to lipid metabolism by microRNA in mice fed high fat diet

Bachler of Engineering in **Food Science & Engineering** June 2017
Zhejiang University

RESEARCH EXPERIENCE

Graduate Student Researcher April 2020 - Present
Department of Nutrition, University of California, Davis

- Glycosylation in human brains with AD
  - Investigated glycosylation changes in **postmortem brains of Alzheimer's individuals** through a comprehensive analysis of **transcriptome and glycome data**, revealing novel insights into the **glycosylation patterns** associated with Alzheimer's Disease.
  - Identified **potential transcription factors** governing glycosyltransferases by employing innovative **TF binding motif enrichment analysis via R**.
- Glycosylation signature in human microglia activated by AβO
  - Revealed **distinct impacts of AβO and LPS** on N-glycan patterns on human iPSC microglia by **optimizing the data analysis strategy of glycomic data**.
  - Highlighted the **consistency** between **the expression of glycosyltransferases** and **alterations in glycan structures** by integrating the **glycomic and transcriptome** data.
- Potential of serum glycoprotein as biomarker for AD diagnosis

- Identified **potential serum glycan biomarkers** for **Alzheimer's Disease** through a Partial Least Square-Linear Discriminant Analysis (PLS-LDA) analysis of **glycosylation panels**, contributing to the development of potential diagnostic tools for Alzheimer's Disease using serum glycan signatures.
- Highlighted the importance of **ethnicity, sex, age, and BMI** as a variable contributing to variability in glycan profiles using various **multivariate linear regression models**, emphasizing the need for tailored and potentially **ethnicity-specific** and **sex-specific** approaches in the development of glycan-based diagnostic tools for Alzheimer's disease.

- Dietary impact on HDL protein glycosylation
  - **Examine** changes in the **glycoproteins on HDL particles** in subjects following 4-week monosaccharide supplementation intake.
  - Demonstrated that **short-term dietary supplementation** with monosaccharides **induces alterations in the glycosylation patterns** of HDL proteins.
- Lipid profile associated with HDL particle size
  - Explored the **lipid composition** of the separated plasma fractions using **semi-quantitative** LC-MS/MS-based **lipidomics,** which quantifies over 600 lipid species across various lipid classes.
  - Developed **a robust lipidome processing pipeline** to accurately quantify the lipid composition within distinct lipoprotein particle fractions.
- HDL particle count and quantification in TEM image
  - Implemented and enhanced the **YOLO (You Only Look Once) object detection system in python** as a replacement for the existing computational tool in the recognition and analysis of Transmission Electron Microscopy (TEM) images, achieving **an accuracy rate of 96% on the validation dataset**.

Graduate Researcher September 2016 – May 2018
Department of Nutrition, University of Illinois at Urbana-Champaign

- Investigated the impact of a high-fat diet on **the epigenetic regulation** of lipid metabolism and the amino acid response pathway in mouse adipose tissues using **qPCR, western blot, and ChIP** technology.
- **Reviewed and enhanced the protocol for protein immunoblotting** in the laboratory, optimizing experimental procedures and ensuring the accuracy and reliability of protein analysis.

TEACHING AND MENTOR EXPERIENCE

Teaching Assistant September 2019 - Present
Department of Nutrition, University of California, Davis

- Prepared essential experiments for the laboratory class and guided a class of 20 students with the professor in **executing various experiments**, including q-PCR and western blot.

- Collaborated with the professor and fellow teaching assistants to manage a course with **more than 1500 students each quarter**.
- **Developed a Shiny web tool** to address the process of roster splitting for grading assignments in a large course with over 1500 students across in-person and virtual sections per quarter, **reducing about 1 hour** of time spent on roster splitting each time.
- Conducted **in-person or virtual review sessions for over 300 student**s, providing guidance for exam preparation and calculation assignments.
- Orchestrated **Jeopardy Games for more than 200 students**, facilitating an engaging and interactive review session to reinforce lecture material.

Research Mentor
Department of Nutrition, University of California, Davis

- Jea Woo Kang, PhD - Metagenomic data analysis and visualization for the USANA fiber supplementation study
- Brian Hong, PhD - Statistical analysis of the Ghana study
- Eddie Romo, PhD candidate - Statistical analysis of LCAT activity in subjects from the USANA fiber supplementation study
- Jingyuan Jack Zheng, PhD candidate - Lipoprotein Particle Detection and Quantification on TEM images using Deep Learning
- Jingyuan Jack Zheng, PhD candidate - HDL proteomic data visualization
- Yanshan Jin, PhD student – Table design for clinical data collection.

PUBLICATION

1. **Tang X**, Tena J, Di Lucente J, Maezawa I, Harvey DJ, Jin L-W, Lebrilla CB, Zivkovic AM (2023) Transcriptomic and glycomic analyses highlight pathway-specific glycosylation alterations unique to Alzheimer's disease. Sci Rep 13:7816

2. Jin L-W, Di Lucente J, Ruiz Mendiola U, **Tang X**, Zivkovic AM, Lebrilla CB, Maezawa I (2023) The role of FUT8-catalyzed core fucosylation in Alzheimer's amyloid-β oligomer-induced activation of human microglia. Glia 71:1346–1359

3. Hong B V, Agus JK, **Tang X**, Zheng JJ, Romo EZ, Lei S, Zivkovic AM (2023) Precision Nutrition and Cardiovascular Disease Risk Reduction: The Promise of High-Density Lipoproteins. Curr Atheroscler Rep 25:663–677

4. Hong B V, Rhodes CH, Agus JK, **Tang X**, Zhu C, Zheng JJ, Zivkovic AM (2023) A single 36-h water-only fast vastly remodels the plasma lipidome. Front Cardiovasc Med 10

5. Hong B V, Zheng JJ, Romo EZ, Agus JK, **Tang X**, Arnold CD, Adu-Afarwuah S, Lartey A, Okronipa H, Dewey KG, others (2023) Seasonal factors are associated with activities of

enzymes involved in high-density lipoprotein metabolism among pregnant women in Ghana. Curr Dev Nutr 102041

6. Rhodes CH, Zhu C, Agus J, **Tang X**, Li Q, Engebrecht J, Zivkovic AM (2023) Human fasting modulates macrophage function and upregulates multiple bioactive metabolites that extend lifespan in Caenorhabditis elegans: a pilot clinical study. Am J Clin Nutr 117:286–297

7. Tena J*, **Tang X***, Zhou Q, Harvey D, Barajas-Mendoza M, Jin L-W, Maezawa I, Zivkovic AM, Lebrilla CB (2022) Glycosylation alterations in serum of Alzheimer's disease patients show widespread changes in N-glycosylation of proteins related to immune function, inflammation, and lipoprotein metabolism. Alzheimer's Dement Diagnosis, Assess Dis Monit 14:e12309

8. **Tang X,** Wong M, Tena J, Zhu C, Rhodes C, Zhou Q, Vinjamuri A, Oloumi A, Boddu S, Luxardi G, others (2022) Quantitative glycoproteomics of high-density lipoproteins. RSC Adv 12:18450–18456

9. Hong B V, Zheng J, Agus JK, **Tang X**, Lebrilla CB, Jin LW, Maezawa I, Erickson K, Harvey DJ, DeCarli CS, others (2022) High-Density Lipoprotein Changes in Alzheimer's Disease Are APOE Genotype-Specific. Biomedicines 10:1495

10. Kang JW, **Tang X**, Walton CJ, Brown MJ, Brewer RA, Maddela RL, Zheng JJ, Agus JK, Zivkovic AM (2022) Multi-Omic Analyses Reveal Bifidogenic Effect and Metabolomic Shifts in Healthy Human Cohort Supplemented With a Prebiotic Dietary Fiber Blend. Front Nutr 9:908534

11. Zheng JJ, Agus JK, Hong B V., **Tang X,** Rhodes CH, Houts HE, Zhu C, Kang JW, Wong M, Xie Y, Lebrilla CB, Mallick E, Witwer KW, Zivkovic AM (2021) Isolation of HDL by sequential flotation ultracentrifugation followed by size exclusion chromatography reveals size-based enrichment of HDL-associated proteins. Sci Rep 11. doi: 10.1038/s41598-021-95451-3

12. Hernández-Saavedra D, Moody L, **Tang X**, Goldberg ZJ, Wang AP, Chen H, Pan Y-X (2021) Caloric restriction following early-life high fat-diet feeding represses skeletal muscle TNF in male rats. J Nutr Biochem 91:108598

13. Zhu C, Sawrey-Kubicek L, Bardagjy AS, Houts H, **Tang X**, Sacchi R, Randolph JM, Steinberg FM, Zivkovic AM (2020) Whole egg consumption increases plasma choline and betaine without affecting TMAO levels or gut microbiome in overweight postmenopausal women. Nutr Res 78:36–41

14. Ma L, Xu GB, **Tang X**, Zhang C, Zhao W, Wang J, Chen H (2020) Anti-cancer potential of polysaccharide extracted from hawthorn (Crataegus.) on human colon cancer cell line HCT116 via cell cycle arrest and apoptosis. J Funct Foods 64:103677

PRESENTATION

Tang X, Lebrilla CB, Jin L-W, Maezawa I, Harvey DJ, Zivkovic AM "Distinct glycosylation changes in Alzheimer's Aβ oligomer- and lipopolysaccharide-activated human microglia" (poster) AD/PD 2024

Tang X, Lebrilla CB, Jin L-W, Maezawa I, Harvey DJ, Zivkovic AM "Unique N-glycosylation signatures in Aβ oligomer- and lipopolysaccharide-activated human iPSC-derived microglia" (poster) Graduate Group of Nutritional Biology Symposium 2023

Tang X, Lebrilla CB, Jin L-W, Maezawa I, Harvey DJ, Zivkovic AM "Multi-omics approach reveals disturbances in brain phosphatidylcholine metabolism in Alzheimer's Disease." (poster) Alzheimer's Association International Conference 2023

Tang X, Lebrilla CB, Jin L-W, Maezawa I, Harvey DJ, Zivkovic AM "Brain Glycosylation Alterations are Highly Pathway-Specific and Unique to Alzheimer's Disease" (oral) Graduate Group of Nutritional Biology Symposium 2022

Tang X, Lebrilla CB, Jin L-W, Maezawa I, Harvey DJ, Zivkovic AM "N-glycosylation patterns dramatically changed in brains of AD patients" (poster) Alzheimer's Disease Research Center Symposium 2022

Tang X, Lebrilla CB, Jin L-W, Maezawa I, Harvey DJ, Zivkovic AM "Cell-type deconvolution analysis of RNAseq data reveals cell-specific glycosylation changes in the brains of Alzheimer's Disease patients." (poster) Alzheimer's Association International Conference 2022

Tang X, Lebrilla CB, Jin L-W, Maezawa I, Harvey DJ, Zivkovic AM "Brain-region-specific, glycosylation-related transcriptomic alterations in Alzheimer's disease." (poster) Alzheimer's Association International Conference 2021

SKILLS

Programming: R, python, SQL

Data analysis on glycomics, glycoproteomics, transcriptomics, lipidomics, metabolimics, metagenomics

Deep Learning: YOLO, object detection

Other Technical Skills: High-Performance Computing (HPC), Linux, Git

AWARDS

2023 Mar Family Dissertation Year Fellowship, UC Davis

2023 Carpenter Travel Award, UC Davis

2023 Rucker Family Fellowship Award, UC Davis

2023 Graduate Studies: Travel Awards, UC Davis

2022 Jastro award, UC Davis

2021 Jastro award, UC Davis

2020 Jastro award, UC Davis