

# DAVID ZHAO

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## EDUCATION

**University of Maryland, College Park**  
*B.Sc. in Biochemistry, Minor in Statistics*  
Cumulative GPA: 3.819 / 4.000

**Fall 2019 - Present**  
Expected Graduation Spring 2023

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## AWARDS & HONORS

### **AMGEN Scholar at the University of Tokyo**

- One of 20 applicants selected worldwide from a pool of highly competitive undergraduate researchers to contribute to a fully funded, independent research project at the University of Tokyo in the summer of 2023.
- Invited to present research findings at the AMGEN Scholars Asia Symposium in Singapore in August of 2023.

### **UMD Honors College, Integrated Life Sciences (ILS)**

- The Integrated Life Sciences Program at the University of Maryland is a competitive, science-focused program designed for talented STEM students. ILS citation requirements include a significant 240-hour research requirement and a two-year commitment to accelerated coursework.

### **President's Freshman Merit Scholarship**

- Recipients are identified through an evaluation of admission application materials to the University of Maryland including academic achievement, extracurriculars, awards, honors, and an essay. The President's Scholarship provides four-year awards ranging from \$2,000 to \$12,500 per year.

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## RESEARCH EXPERIENCE

### **Undergraduate Researcher, Sukharev Research Group, University of Maryland**

**September 2022 – Present**

- Examine the biophysics of mechanosensitive membrane protein MscS, especially in factors leading to their adaptive opening, closing, and inactivation in *E. coli* during hypoosmotic shock.
- Survey structural and thermodynamic impacts of mutant MscS proteins on the survival of bacterial colonies through site-directed mutagenesis, patch clamp, and hypoosmolality survival experiments.

### **Junior Scientist, US Medigene**

**September 2022 – Present**

- Develop gene therapy approach for the expression of aquaporin proteins (AQPs) in damaged tissue for the treatment of water-channel related disorders, including Sjögren's syndrome and nephrogenic diabetes insipidus (NDI).
- Mapped gene expression levels across thousands of genes in the KEGG database to an experimental heatmap of pathways through R programming.
- Engineer antibody-conjugated lipid nanoparticle (LNP) delivery systems for specific targeting of genetic cargo to different organs of the body.
- Probe protein and nucleic acid sequences for the design of lentiviral vectors carrying therapeutic genes of interest.

### **Research Associate, GlycoT Therapeutics**

**September 2022 – October 2022**

- Evaluated anti-inflammatory effects of hypersialylated antibodies through HPLC and LC-MS methodologies to improve IVIG replacement therapies in autoimmune disease.

### **Research Intern, Ibx Biosciences**

**December 2021 – August 2022**

- Explored efficacy of alternative eukaryotic transcription factors for induced pluripotent stem cell (iPSC) proliferation to avoid the risk of cancer associated with the Yamanaka factors.
- Analyzed competing roles of the NF- $\kappa$ B protein family and the MAP-K pathway in generating pro-inflammatory cytokines, including TNF- $\alpha$ , through RT-PCR to assess synergistic or antagonistic effects between the two.
- Wrote programs and scripts in Java to analyze polypeptide sequences for amino acid residues and DNA nucleotides involved in site-directed mutagenesis of phosphorylatable proteins and for RT-PCR/qPCR data analysis.
- Transformed astrocytes into neural progenitor cells through proprietary transcription factors for the regeneration of functioning neurons for the treatment of neurodegenerative diseases.

### **Undergraduate Researcher, Sunny Research Group, University of Maryland**

**June 2021 – May 2022**

- Investigated role of branched chain amino acids (BCAAs) in oxidative metabolism and its connection to insulin resistance for the management of metabolic diseases such as non-alcoholic fatty liver disease (NAFLD) and type 2 diabetes mellitus.
- Interpreted gas chromatography mass spectrometry (GC-MS) peaks using Agilent MassHunter Quantitative Analysis software to assess abundance of key citric acid cycle intermediates and rates of ketogenesis.

- Quantitated carnitine palmitoyltransferase I (CPT1) mitochondrial membrane protein quantities in long chain fatty acid transport via western blotting and immunofluorescence analysis.
- Presented data for further discussion of findings to fellow researchers and faculty in the Department of Animal and Avian Sciences at the University of Maryland.

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## PUBLICATIONS

- *Branched chain amino acids alter cellular redox to induce lipid oxidation and reduce de novo lipogenesis in the liver* – C. Surugihalli, V. Muralidaran, C. Ryan, K. Patel, D. Zhao, and N. Sunny. ***Submitted, in Review.***

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## PROJECTS

### **Mission 14 to the International Space Station, National Center for Space Science Education (NCESSE)**

- Formulate strategy to analyze replication rates of T4 *E.coli* bacteriophages in a microgravity environment via gene sequencing methods and real time polymerase chain reaction (qPCR).
- Arrange bacteriophage samples to be loaded aboard the ISS with guidance from NASA and the University of Maryland's Institute for Bioscience and Biotechnological Research (IBBR).

### **GC-MS Data Organization Tool – Java Program**

- Developed Java program to analyze thousands of uniformly labeled Carbon-13 mass spectrometer peaks across multiple metabolic pathways, with isotope ratio and concentration calculation functionalities.

### **RT-PCR Data Processor – Java Program**

- Developed Java Program to organize RT-PCR data produced by StepOne™ Real-Time PCR System software.
- Integrated Livak method for computational analysis of qPCR results.

### **Phosphorylation Site Indexer – Java Program**

- Java program designed to index predicted phosphorylation sites in proteins for the identification of protein mutation sites. Can isolate open reading frames from a nucleotide sequence and identify the corresponding codon sequence for its respective amino acid and vice versa.
- Includes basic front-end functionality, allowing users to input a protein of interest and the indexes of interest.

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## LEADERSHIP & INVOLVEMENT

### **Founder and President, Aquarist Association**

**December 2022 – Present**

- Promote aquarium keeping as a hobby for people of all backgrounds at the University of Maryland, College Park through interactive fishkeeping sessions and educational meetings.
- Educate curious students about keeping aquatic plants and animals through firsthand experiences with fishkeeping.
- Delegate organizational responsibilities to student officers and treasurers, including holding elections, scheduling meetings, sending announcements, and planning activities.

### **UMD Guided Study Session (GSS) Leader**

**August 2022 – December 2022**

- Designed lessons pertaining to the Biochemistry of Physiology (BCHM 463) curriculum to lead discussions on topics including protein chemistry, enzymology, and metabolism.
- Presented engaging exercises in a classroom environment to help students understand difficult topics in biochemistry through various teaching approaches, including classroom discussions mixed with supplementary instruction in a casual environment.

### **Student Volunteer, Food Recovery Network**

**September 2019 – March 2020**

- Alleviated food insecurity issues and advocated for the accessibility and affordability of nutritious food for impoverished communities.
- Coordinated removal of excess dry foods from north and south campus diners at the University of Maryland at closing hours for food banks in the DC area.
- Refined teamwork and leadership skills with other campus students by communicating end-of-shift objectives, setting reasonable goals for food transported, and holding other volunteers accountable for their contributions.