

LAURE: Research Process and Scholarly Growth Essay

As an aspiring physician-scientist, I've always been interested in mechanisms of aging, from completing a research extension course at the University of California, San Diego, in high school studying a prostate cancer-related gene to joining the Walker Aging and Vascular Physiology Lab at the University of Oregon my freshman year. This research led me to explore clinical applications of aging, becoming a home health aide for older adults in Eugene and interning with the PeaceHealth Oregon Heart and Vascular Institute's Cardiac Rehabilitation program. Exposed to my own grandfather's vascular health decline and my grandmother's dementia diagnosis, I wanted my thesis to reflect my experiences connecting aging to vascular and cognitive function.

Under the mentorship of postdoctoral fellow Dr. Abby Cullen, I began working on my Clark Honors College and Human Physiology Honors Thesis project in Fall 2023. I chose to build upon Dr. Cullen's research in the lab connecting dietary zinc imbalance to Alzheimer's disease in a mouse model. After an extensive independent literature review, I landed on a specific research question to determine if oxidative stress pathways, through zinc dysregulation, affect the progression and severity of Alzheimer's disease. My research question evolved significantly during the literature review process. Early searches on zinc and neurodegeneration revealed that zinc dysregulation has been implicated in amyloid plaque formation and synaptic toxicity. However, several studies suggested that oxidative

stress may act as an intermediary mechanism linking zinc imbalance to neuronal damage. This observation shifted my focus from zinc alone toward the broader biochemical pathways involved in oxidative stress. Through iterative reading and discussions with Dr. Cullen, I refined my question to investigate whether zinc dysregulation might exacerbate oxidative stress pathways and thereby influence the severity and progression of Alzheimer's pathology.

When conducting my literature review, I relied heavily on the UO Libraries system to access leading publications in the field, including the library catalog, Interlibrary Loan, Web-of-Science, PubMed, and Google Scholar. In database searches, I refined results using Boolean operators and controlled vocabulary. For example, in PubMed I combined keywords such as “zinc,” “oxidative stress,” and “vascular dysfunction” using Boolean operators (AND/OR) to narrow results to articles addressing overlapping mechanisms. I also used PubMed's Medical Subject Headings (MeSH) to identify standardized terminology and uncover additional studies that might not appear in keyword-only searches. Web-of-Science was particularly useful to determine the impact and credibility of my chosen articles. I reviewed author affiliations, citation and reference counts, and journal impact factors. I compiled my literature review sources using Zotero, where I kept notes about how each article might be useful to my writing process.

I began my search with review articles to develop a general overview of the current knowledge surrounding my research topic. I then used citation tracking, such as “pearling” and “footnote chasing” techniques to find primary research articles to use as sources for my actual thesis. To determine whether my sources might be useful for my research, I read

each article starting with the results and discussion, and then working through the introduction and methods as needed. I assessed credibility by checking the author and institution of publication, looking through figures to find misrepresentation of data or small sample sizes, and determining limitations of each primary research study. For example, in my citation, *Arimon et al., 2015*, used to connect oxidative stress to Alzheimer's disease, the first author, Muriel Arimon, is a researcher and professor of biochemistry and molecular biology, with 14 publications at leading global institutions, including Harvard University. The senior author, Oksana Berezovska, focuses on mechanisms of Alzheimer's disease with over 60 publications, and has worked internationally, including at Harvard University and the European Molecular Biology Laboratory. The article itself has been cited 125 times and published in *Neurobiology of Disease* with an impact factor of 5.6. The mouse sample size was sufficient, and presentation of results was clear. While the findings were compelling, I also noted limitations including the reliance on a single mouse strain and the challenge of translating oxidative stress markers directly to human disease processes. Based on these factors, I can deem this citation credible and useful for my thesis.

As a Human Physiology major, the science librarian, Annie Zeidman-Karpinski, visited several of my classes throughout my time at UO. During these sessions, I learned how to use PubMed, Web-of-Science, Zotero, and Interlibrary Loans. These workshops helped me transition from general internet searching to systematic academic research. Learning how to use database filters, citation networks, and reference management

software significantly improved both the efficiency and rigor of my literature review process.

I faced many obstacles in completing my project, which I eventually accepted as inescapable parts of the research process. Although I had an organized schedule for completion, some data collection was delayed due to limited resources and funding, failed experiments, or equipment malfunctions. I learned that patience and flexibility are incredibly valuable in a research setting. For instance, when protein quantification by Western blot was postponed due to shipping delays, I pivoted and used that time for cognitive data analysis instead. When faced with setbacks, I quickly and effectively communicated with Dr. Cullen to reorganize ourselves toward a new plan under which we could still complete the project. These setbacks helped me appreciate that scientific research rarely proceeds linearly. Instead, progress often depends on adapting to unexpected obstacles while maintaining rigorous documentation and communication within a research team.

Throughout my thesis research and writing process, I developed not only as a researcher but also as an academic and professional. One of the most significant lessons I learned was the value of interdisciplinary thinking. My work on zinc dysregulation and Alzheimer's disease required integrating knowledge from vascular physiology, neuroscience, and molecular biology, while my clinical experiences working with older adults and global health background provided a human context for the biological mechanisms I was studying. Further, along with strengthening my writing skills, I practiced science communication. Presenting my preliminary results at the Undergraduate Research

Symposium in 2024 and 2025 in both oral formats challenged me to translate detailed experimental work into explanations that could be understood by diverse audiences. I was awarded the TOP award in Human Physiology for my poster in 2024 reinforcing the importance of clear scientific storytelling in addition to rigorous research.

Completing and defending my thesis at the Clark Honors College on February 27, 2026, marked a culminating moment in this process of scholarly growth. The project required persistence, critical evaluation of literature, and collaboration with mentors and peers. Being nominated by my committee for a Clark Honors College thesis award affirmed the value of this work, but more importantly, the experience strengthened my confidence in my ability to pursue independent research questions. As I prepare to enter medical school after graduating in June 2026, I hope to continue investigating mechanisms of vascular aging both in laboratory and clinical settings. Ultimately, I aspire to pursue a career that bridges scientific research and patient care, using insights from physiology and aging research to inform advances in cardiovascular medicine.