

Kaitlin Allen

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EDUCATION

- 2024-present** **Postdoctoral Fellow at Woods Hole Oceanographic Institute**
Advisors: Dr. Michelle Shero, Dr. Mark Hahn, Dr. Colleen Hansel
- 2018-2024** **PhD in Integrative Biology – University of California Berkeley**
Advisor: Dr. José Pablo Vázquez-Medina
NSF Graduate Research Fellow
Berkeley Fellow
- 2016-2017** **Certificate in Public Health – Colorado School of Public Health**
Concentration in Animals, People and the Environment
- 2010-2014** **BS in Biology – Massachusetts Institute of Technology**
Concentration in Science, Technology and Society

FUNDING AND AWARDS

2024-	\$120,000	Woods Hole Postdoctoral Fellowship
2024	\$500	American Physiological Society Dr. Dolittle Travel Award
2024		Outstanding Graduate Student Instructor Award
2020-2023	\$10,860	UC Berkeley Department of Integrative Biology Summer Grant
2023	\$1,000	UC Berkeley Big Give Research Award
2022	\$1,000	Sigma Xi Grants In Aid of Research
2021	\$500	American Physiological Society Research Recognition Award
2020	\$500	American Physiological Society Novo Nordisk Student Travel Award
2019	\$500	American Cetacean Society (LA chapter) Student Travel Grant
2019	\$500	Coll Perske Memorial Fund Student Travel Grant
2018-2023	\$102,000	National Science Foundation Graduate Research Fellowship Program
2018-2019	\$65,000	Berkeley Fellowship

PUBLICATIONS

Allen KN, Torres-Velarde JM, Vazquez JM, Moreno-Santillán DD, Sudmant PH & Vázquez-Medina JP. (2024). Hypoxia exposure blunts angiogenic signaling and upregulates the antioxidant system in endothelial cells derived from elephant seals. *BMC Biology*. doi: 10.1101/2023.07.01.547248.

Torres-Velarde JM, **Allen KN**, Salvador-Pascual A, Leija RG, Luong D, Moreno-Santillán DD, Ensminger DE & Vázquez-Medina JP (2024). Peroxiredoxin 6 suppresses ferroptosis in lung endothelial cells. *Free Radical Biology and Medicine*. doi: 10.1016/j.freeradbiomed.2024.04.208.

Khudyakov JI, **Allen KN**, Crocker DE, Trost NS, Roberts AH, Pirard L, Debier C, Piotrowski ER & Vázquez-Medina JP. (2022). Comprehensive molecular and morphological resolution of blubber stratification in a deep-diving, fasting-adapted seal. *Front Physiol*. doi: 10.3389/fphys.2022.1057721.

Noh HJ, Turner-Maier J, Schulberg SA, Fitzgerald ML, Johnson J, **Allen KN**, Hückstädt LA, Batten AJ, Alföldi J, Costa DP, Karlsson EK, Zapol WM, Buys ES, Lindblad-Toh K & Hindle AG. (2022). The Antarctic Weddell seal genome reveals evidence of selection on cardiovascular phenotype and lipid handling. *Commun Biol*. doi: 10.1038/s42003-022-03089-2.

Allen KN & Vázquez-Medina JP. (2021). Reactive oxygen species, redox signaling, and regulation of vascular endothelial signaling. In *Endothelial Signaling in Vascular Dysfunction and Disease*, pp. 37–45. Elsevier. doi: 10.1016/B978-0-12-816196-8.00011-4.

Ensminger DC, Crocker DE, Lam EK, **Allen KN** & Vázquez-Medina JP. (2021). Repeated stimulation of the HPA axis alters white blood cell count without increasing oxidative stress or inflammatory cytokines in fasting elephant seal pups. *J Exp Biol*. doi: 10.1242/jeb.243198.

Akther F, Razan MR, Shaligram S, Graham JL, Stanhope KL, **Allen KN**, Vázquez-Medina JP, Havel PJ & Rahimian R. Potentiation of Acetylcholine-Induced Relaxation of Aorta in Male UC Davis Type 2 Diabetes Mellitus (UCD-T2DM) Rats: Sex-Specific Responses. *Front Physiol*. doi: 10.3389/fphys.2021.616317.

Ensminger DC, Salvador-Pascual A, Arango BG, **Allen KN** & Vázquez-Medina JP. (2021). Fasting ameliorates oxidative stress: A review of physiological strategies across life history events in wild vertebrates. *Comp Biochem Physiol A Mol Integr Physiol*. doi: 10.1016/j.cbpa.2021.110929.

Lam EK, **Allen KN**, Torres-Velarde JM & Vázquez-Medina JP. (2020). Functional Studies with Primary Cells Provide a System for Genome-to-Phenome Investigations in Marine Mammals. *Integr Comp Biol*. doi: 10.1093/icb/icaa065.

Allen KN & Vázquez-Medina JP. (2019). Natural Tolerance to Ischemia and Hypoxemia in Diving Mammals: A Review. *Front Physiol*. doi: 10.3389/fphys.2019.01199.

Allen KN, Vázquez-Medina JP, Lawler JM, Mellish JE, Horning M & Hindle AG. (2019). Muscular apoptosis but not oxidative stress increases with old age in a long-lived diver, the Weddell seal. *J Exp Biol*. doi: 10.1242/jeb.200246.

Hindle AG, **Allen KN**, Batten AJ, Hückstädt LA, Turner-Maier J, Schulberg SA, Johnson J, Karlsson E, Lindblad-Toh K, Costa DP, Bloch DB, Zapol WM & Buys ES. (2019). Low guanylyl cyclase activity in Weddell seals: implications for peripheral vasoconstriction and perfusion of the brain during diving. *Am J Physiol Regul Integr Comp Physiol*. doi: 10.1152/ajpregu.00283.2018.

Bagchi A, Batten AJ, Levin M, **Allen KN**, Fitzgerald ML, Hückstädt LA, Costa DP, Buys ES & Hindle AG. (2018). Intrinsic anti-inflammatory properties in the serum of two species of deep-diving seal. *J Exp Biol*. doi: 10.1242/jeb.178491.

Muenster S, Lieb WS, Fabry G, **Allen KN**, Kamat SS, Guy AH, Dordea AC, Teixeira L, Tainsh RE, Yu B, Zhu W, Ashpole NE, Malhotra R, Brouckaert P, Bloch DB, Scherrer-Crosbie M, Stamer WD, Kuehn MH, Pasquale LR & Buys ES. (2017). The Ability of Nitric Oxide to Lower Intraocular Pressure Is Dependent on Guanylyl Cyclase. *Invest Ophthalmol Vis Sci*. doi: 10.1167/jovs.17-22168.

Nagasaka Y, Wepler M, Thoonen R, Sips PY, **Allen KN**, Graw JA, Yao V, Burns SM, Muenster S, Brouckaert P, Miller K, Solt K, Buys ES, Ichinose F & Zapol WM. (2017). Sensitivity to Sevoflurane anesthesia is decreased in mice with a congenital deletion of Guanylyl Cyclase-1 alpha. *BMC Anesthesiol*. doi: 10.1186/s12871-017-0368-5.

Vandenwijngaert S, Swinnen M, Walravens AS, Beerens M, Gillijns H, Caluwé E, Tainsh RE, Nathan DI, **Allen KN**, Brouckaert P, Bartunek J, Scherrer-Crosbie M, Bloch KD, Bloch DB, Janssens SP & Buys ES. (2017). Decreased Soluble Guanylate Cyclase Contributes to Cardiac Dysfunction Induced by Chronic Doxorubicin Treatment in Mice. *Antioxid Redox Signal*. doi: 10.1089/ars.2015.6542.

Din MO, Danino T, Prindle A, Skalak M, Selimkhanov J, **Allen KN**, Julio E, Atolia E, Tsimring LS, Bhatia SN & Hasty J. (2016). Synchronized cycles of bacterial lysis for in vivo delivery. *Nature*. doi: 10.1038/nature18930.

Wu C, Arora P, Agha O, Hurst LA, **Allen KN**, Nathan DI, Hu D, Jiramongkolchai P, Smith JG, Melander O, Trenson S, Janssens SP, Domian I, Wang TJ, Bloch KD, Buys ES, Bloch DB & Newton-Cheh C. (2016). Novel MicroRNA Regulators of Atrial Natriuretic Peptide Production. *Mol Cell Biol*. doi: 10.1128/MCB.01114-15.

Dordea AC, Bray MA, **Allen KN**, Logan DJ, Fei F, Malhotra R, Gregory MS, Carpenter AE & Buys ES. (2016). An open-source computational tool to automatically quantify immunolabeled retinal ganglion cells. *Exp Eye Res*. doi: 10.1016/j.exer.2016.04.012.

Dordea AC, Vandenwijngaert S, Garcia V, Tainsh RE, Nathan DI, **Allen KN**, Raher MJ, Tainsh LT, Zhang F, Lieb WS, Mikelman S, Kirby A, Stevens C, Thoonen R, Hindle AG, Sips PY, Falck JR, Daly MJ, Brouckaert P, Bloch KD, Bloch DB, Malhotra R, Schwartzman ML & Buys ES. (2016). Androgen-sensitive hypertension associated with soluble guanylate cyclase- α 1 deficiency is mediated by 20-HETE. *Am J Physiol Heart Circ Physiol*. doi: 10.1152/ajpheart.00877.2015.

Arora P, Wu C, Hamid T, Arora G, Agha O, **Allen KN**, Tainsh RET, Hu D, Ryan RA, Domian IJ, Buys ES, Bloch DB, Prabhu SD, Bloch KD, Newton-Cheh C & Wang TJ. (2016). Acute Metabolic Influences on the Natriuretic Peptide System in Humans. *J Am Coll Cardiol*. doi: 10.1016/j.jacc.2015.11.049.

Danino T, Prindle A, Kwong GA, Skalak M, Li H, **Allen KN**, Hasty J & Bhatia SN. (2015). Programmable probiotics for detection of cancer in urine. *Sci Transl Med*. doi: 10.1126/scitranslmed.aaa3519.

PRESENTATIONS

Conference presentations:

2024 American Physiological Society Summit (USA)

Fasting metabolic profiles are cell-autonomous in elephant seal primary muscle cells

2023 Symposium on the cell biology, physiology and toxicology of marine mammals (USA)

Cellular mechanisms of hypoxia tolerance in diving seals

2023 American Physiological Society Summit (USA)

Seal endothelial cells exhibit blunted angiogenic signaling during hypoxia

2022 Experimental Biology (USA)

Rapid hypoxia-induced upregulation of glutathione-related genes may protect elephant seal endothelial cells against oxidative stress

2021 Experimental Biology (USA)

Elephant seal endothelial cells are resistant to oxidative stress

2021 Society for Integrative and Comparative Biology (USA)

Seal endothelial cells mount a rapid and sustained response to hypoxia

2019 World Marine Mammal Conference (Spain)

Mechanisms of tolerance to hypoxia and oxidative stress in primary endothelial cells isolated from seals

2019 International Congress on Comparative Physiology and Biochemistry (Canada)

Mechanisms of tolerance to hypoxia and oxidative stress in primary endothelial cells isolated from seals

2018 APS Intersociety Meeting in Comparative Physiology (USA)

Studying natural tolerance to ischemia/reperfusion using endothelial cells derived from seals

Conference posters:

2024 American Physiological Society Summit (USA)

Fasting metabolic profiles are cell-autonomous in elephant seal primary muscle cells

2023 Center for Physiological Genomics of Low Oxygen Summit (USA)

Hypoxia exposure blunts angiogenic signaling and upregulates the antioxidant system in seal endothelial cells

2022 Society for Marine Mammalogy (USA)

Gene expression signatures of the long-term transcriptional response to hypoxia in endothelial cells from seals

2018 Experimental Biology (USA)

Age- and muscle-specific oxidative stress management strategies in a long-lived diver, the Weddell seal

RESEARCH EXPERIENCE

2018-2024 PhD thesis research: Understanding the molecular and cellular responses to hypoxia and fasting in northern elephant seals

Advisor: Dr. José Pablo Vázquez-Medina – UC Berkeley

Developed and characterized a biobank of primary cells from northern elephant seals, including arterial endothelial cells, skeletal muscle myoblasts, and adipose-derived stem cells. Identified real-time transcriptomic and functional cellular responses to hypoxia, including the decoupling of the canonical HIF-angiogenesis pathway in elephant seal endothelial cells. Quantified muscle cell reliance on various metabolic pathways, concluding that cell-autonomous reliance on glycolysis to produce ATP increases across the postnatal fasting period in elephant seals.

- 2022-2023** **Physiological and genetic correlates of reproductive success in Weddell seals**, Field Assistant
Advisor: Dr. Michelle Shero – Woods Hole Oceanographic Institute
 Conducted 12 weeks of fieldwork investigating the physiological and genomic drivers of differential reproductive output in female Weddell seals in McMurdo Sound, Antarctica (2022-23). Participated in animal surveys (aerial and ground-based) for mark-recapture efforts, including the use of ground- and flight-based VHF telemetry to find and identify tagged animals. Collected blood samples, tissue biopsies and microbiological swabs during animal procedures. In addition to prescribed project responsibilities, I also led a successful independent effort to isolate and develop skeletal muscle myoblast and adipose-derived stem cell cultures from seal tissue biopsies, which was not an original aim in Dr. Shero's funded project.
- 2017-2017** **Plague ecology in the endangered northern Idaho ground squirrel**, Field Assistant
Advisor: Amanda Goldberg – University of Idaho and Idaho Cooperative Fish and Wildlife Research Unit
 Conducted 20 weeks of fieldwork investigating plague ecology in a listed threatened species, the northern Idaho ground squirrel. Worked independently and within a team to trap, handle and process squirrels and other small mammals for study. Utilized VHF telemetry to identify squirrel hibernacula for snow cover analysis. Maintained field camp including instruments, gear, living quarters and vehicles.
- 2014-2016** **Nitric oxide signaling and vasoregulation in the Weddell seal**, Research Technician
Advisors: Drs. Allyson Hindle, Emmanuel Buys and Warren Zapol – Massachusetts General Hospital
 Investigated the molecular mechanisms controlling vascular tone in the Weddell seal, deploying to Antarctica for two consecutive austral summer field seasons (2015, 2016) to collect blood, biopsy and necropsy samples. Established primary cell cultures from tissue biopsies from live animals, including the first endothelial cell and fibroblast cultures from Weddell seals. Coordinated laboratory and field logistics with project PIs to facilitate sample collection, shipment and management.
- 2014-2016** **Nitric oxide signaling in translational models of hypertension**, Research Technician
Advisor: Dr. Emmanuel Buys – Massachusetts General Hospital
 Evaluated the physiological and molecular effects of the NO-cGMP signaling pathway on intraocular pressure in sheep using a custom-made device for corneal delivery of NO. Assayed regulation of atrial natriuretic peptide expression in a transgenic mouse model as a function of post-transcriptional modification by miRNAs. Maintained mouse colonies, including breeding systems and genotyping for multiple transgenic strains.
- 2013-2014** ***In vivo* use of attenuated *S. typhimurium* for targeted chemotherapy**, Undergrad Research Assistant
Advisors: Drs. Tal Danino and Sangeeta Bhatia – Massachusetts Institute of Technology
 Characterized and compared the selective colonization dynamics and *in vivo* stability of *S. typhimurium* strains engineered for chemotherapeutic potential. Animal handling included intravenous injections and oral gavage, as well as basic anesthesia and surgery assistance. Analyses included whole animal imaging, qPCR, tissue collection and screening of tumor and organ homogenates for bacterial growth. Work culminated in an undergraduate thesis and authorship on two peer-reviewed publications.

GUEST LECTURES

- 2024** **UC Berkeley: Integrative Human Biology – Why don't seals need SCUBA?**
- 2019, 21, 23** **UC Berkeley: Marine Mammals – Diving Physiology: marine mammal adaptations to life below the surface**
- 2023** **Duke University: Bass Connections – Cellular mechanisms of natural hypoxia tolerance**
- 2022** **University of the Pacific: Department of Biology seminar - Cellular mechanisms of vascular hypoxia tolerance: insight from diving mammals**

TEACHING & MENTORING

- 2018-present** **Graduate Student Mentor**
Undergraduate Research Apprenticeship Program (URAP) – UC Berkeley, 5 students
- 2019-2023** **Graduate Student Instructor**

Introduction to Human Physiology (4 semesters) – UC Berkeley Dept of Molecular & Cell Biology, 325 students
Survey of Human Physiology (1 semester) – UC Berkeley Dept of Integrative Biology, 60 students

2014 Undergraduate Teaching Assistant

Introduction to Experimental Biology and Communication (1 semester) – MIT Dept of Biology

2012-2014 Biology Tutor

MIT Dept of Biology

PROFESSIONAL MEMBERSHIPS

American Physiological Society (APS) – Comparative and Evolutionary Physiology section, Graduate student member

Society for Marine Mammalogy – Graduate student member

Association for Women in Science – Graduate student member

OUTREACH & SCIENCE COMMUNICATION

2019-2022 Letters to a Pre-Scientist – pen pal program

2018-2022 Skype A Scientist – school-based outreach program, 6 presentations

2021 Popping the Science Bubble – public lecture

2021 Be A Scientist – grade school-based outreach program

2020 Great Minds In STEM – fellowship reviewer

2020 Merritt College – career panel presentation

2019 Malcom X Elementary School – career panel presentation

2019 Expanding Your Horizons workshop – outreach program, “Science, SCUBA and seals... oh my!”