

# Executive Summary



**The Dog Aging Project is an innovative initiative that brings together a community of dogs, owners, veterinarians, researchers, and volunteers to carry out the most ambitious canine health study in the world. Our work is centered on two fundamental goals: understanding how genes, lifestyle, and environment influence aging and intervening to increase healthspan, the period of life spent free from disease.**

As of August 2023, the **Dog Aging Project Pack** includes over 45,000 enrolled companion dogs. Each dog owner completes extensive surveys about the health and life experiences of their dog through a secure research portal. These surveys are updated annually for the entirety of the dog's life, and these data are augmented by veterinary electronic medical records when possible. For each dog, these data are matched with comprehensive environmental data. From this research cohort, we invite dogs to join four additional cohorts.

The **Foundation Cohort** includes 8,500 dogs of all ages, sizes, and genetic backgrounds. Each participant receives a DNA Kit with which to collect a cheek swab sample for use in low-pass sequencing. Genome sequence data will be integrated with health measures and age-related physiological and behavioral traits to carry out comprehensive genome-wide association studies of common diseases, frailty, and co-morbidity associated with age.

The **Precision Cohort** consists of 1,000 dogs from whom we collect saliva, blood, urine, fecal, and hair samples annually for in-depth, multi-omic assays. Our goals are to identify metabolomic predictors of disease and longevity, to understand how the microbiome changes with age and how these changes in microbiome diversity impact healthy aging, and to develop an "epigenetic clock" for dogs that predicts biological age.

The **Centenarian Cohort** includes 300 dogs in the oldest 0.1% of their size class for whom we will conduct targeted genomic sequencing. Data from this cohort will help us identify gene variants that confer especially long and healthy lives.

The **Intervention Cohort** includes 580 dogs participating in the *Test of Rapamycin In Aging Dogs* trial, or "TRIAD," a double-blind, placebo-controlled clinical trial of the mTOR inhibitor rapamycin, which at low doses has been shown to extend lifespan in laboratory animals. This is the third and largest trial of rapamycin that our group has conducted to date.

The Dog Aging Project is an open science project. We consider the data we collect a public good, which will be made available to researchers around the world via Terra, a cloud computing platform hosted by the Broad Institute of MIT and Harvard. In addition, biological samples will be banked at the Dog Aging Project Biobank housed at the Cornell University Veterinary Biobank. The project is supported by a U19 grant from the National Institute on Aging (Principal Investigator: Daniel Promislow).

## **Scientific Leadership of the Dog Aging Project**



**Dr. Daniel Promislow, D.Phil.**

**Principal Investigator and Co-Director of the Dog Aging Project**

Dr. Promislow is a Professor in the Department of Biology and the Department of Lab Medicine & Pathology at the University of Washington. He uses genetics and systems biology approaches to understand how and why patterns of aging vary among individuals. He began studying aging in dogs in 2007, when he met Dr. Kate Creevy, now the Dog Aging Project Chief Veterinary Officer. (Email: [promislo@wu.edu](mailto:promislo@wu.edu))



**Dr. Kate Creevy, DVM, MS, DACVIM**

**Chief Veterinary Officer of the Dog Aging Project**

Dr. Creevy is a Professor of Small Animal Internal Medicine at the College of Veterinary Medicine & Biomedical Sciences at Texas A&M University. Through the Dog Aging Project, she intends to establish standards to better describe aging in companion animal practice, to improve the health of her aging canine patients, and to inspire young people to engage with science by learning from their cherished canine companions. (Email: [kcreevy@cvm.tamu.edu](mailto:kcreevy@cvm.tamu.edu))



**Dr. Matt Kaeberlein, Ph.D.**

**Founder and Consultant to the Dog Aging Project**

Dr. Kaeberlein is the Chief Science Officer at Optispan Geroscience and was formerly a Professor at the University of Washington for 20 years, where he led the Healthy Aging and Longevity Research Institute. Matt studies the biology of aging, with a particular focus on evolutionarily conserved mechanisms and translational applications.

## **Key Members of the Research Team**

**Dr. Josh Akey, Ph.D.**, is a Professor of Genome Sciences at Princeton University. He studies the evolutionary forces that shape genomic variation within and between species and the genetic architecture and evolution of complex, quantitative, and high-dimensional molecular phenotypes.

**Dr. Rozalyn Anderson, Ph.D.**, is a Professor of Medicine in the Division of Geriatrics and Gerontology at the University of Wisconsin School of Medicine and Public Health. Her research focuses on the molecular and cellular mechanisms of aging and delayed aging by caloric restriction.

**Dr. Elhanan Borenstein, Ph.D.**, is a Professor at Tel-Aviv University. Dr. Borenstein integrates microbiome data with methods inspired by systems biology, network theory, machine-learning, and statistics to study the microbiome. The long-term goal of his work is to provide a better understanding of the microbiome and its role in health and disease.

**Dr. Marta Castelhana, DVM, MVSc**, is the Director of the Cornell Veterinary Biobank and an expert in sustainable, high-quality biobanking and medical genetics. Marta manages the collections and allocation of samples for ongoing and future research projects.

**Dr. Kyle Crowder, Ph.D.**, is the Blumstein-Jordan Professor of Sociology at the University of Washington. Dr. Crowder's research focuses on the processes of residential differentiation and the effects of physical and social context on individual health and development.

**Dr. Matthew Dunbar, Ph.D.**, is an Affiliate Assistant Professor in Geography and the Assistant Director of the Center for Studies in Demography and Ecology (CSDE) at the University of Washington. A member of CSDE's Methods and Data Core, he leads the development of a research infrastructure for spatial analysis.

**Dr. Virginia Fajt, DVM, PhD, DACVP**, is a Clinical Professor in the Department of Veterinary Physiology and Pharmacology at Texas A&M University College of Veterinary Medicine and Biomedical Sciences. She is a veterinary pharmacologist interested in promoting evidence-based veterinary medicine and critical appraisal of evidence.

**Dr. Annette Fitzpatrick, Ph.D.**, is an epidemiologist and Research Professor in the Departments of Family Medicine, Epidemiology, and Global Health at the University of Washington. She studies healthy aging in large, multi-site cohorts of older adults, with expertise in longitudinal studies, biomarkers, genomics and epigenomics.

**Dr. Elinor Karlsson, Ph.D.**, is an Assistant Professor of Bioinformatics and Integrative Biology at the University of Massachusetts Medical School, and Director of Vertebrate Genomics at the Broad Institute of MIT and Harvard. Dr. Karlsson leads the Darwin's Dogs project and is also co-PI of the 200 Mammals Genome Project.

**Dr. Kathleen Kerr, Ph.D.**, is a Professor of Biostatistics at University of Washington. She directs the Bioinformatics and Biostatistics Unit of the UW Interdisciplinary Center for

Exposures, Diseases, Genetics and Environment. Her methodological research concerns the evaluation of biomarkers and risk prediction models.

**Dr. Jing Ma, Ph.D.**, is an Assistant Professor in the Public Health Sciences Division at the Fred Hutchinson Cancer Research Center. Her research focuses on statistical methods for estimation and inference in high-dimensional networks.

**Dr. Evan MacLean, Ph.D.**, is an Assistant Professor at the University of Arizona and Director of the Arizona Canine Cognition Center. He conducts research on animal cognition and cognitive evolution with a primary focus on work with canids.

**Dr. Robyn McClelland, Ph.D.**, is a Research Professor in the Department of Biostatistics at the University of Washington and Director of the Collaborative Health Studies Coordinating Center. She is Principal Investigator of the data coordinating center for the Multi-Ethnic Study of Atherosclerosis and the Kidney Precision Medicine Project.

**Dr. May Reed, MD, FACP** is an Associate Professor of Medicine in the Division of Geriatrics and Gerontology at the University of Washington School of Medicine. Her clinical research interests are in assessments of geriatrics syndromes and frailty.

**Dr. Audrey Ruple, DVM, MS, Ph.D., DACVPM, MRCVS**, is an Associate Professor, Department of Population Health at Virginia Tech, Virginia-Maryland College of Veterinary Medicine. Dr. Ruple's research investigates risk factors for the development of cancer, focusing in particular on the genetic predispositions and environmental exposures shared between humans and client-owned dogs.

**Dr. Steve Schwartz, Ph.D.**, is a Professor in the Epidemiology Program of the Public Health Sciences Division at the Fred Hutchinson Cancer Research Center and Professor in the Department of Epidemiology at the University of Washington. He has over thirty years of experience conducting NIH-funded research in human populations on the causes and consequences of ill health.

**Dr. Noah Snyder-Mackler, Ph.D.**, is an Assistant Professor in the School of Life Sciences and the Center for Evolution and Medicine at Arizona State University and co-director of the Simien Mountains Gelada Research Project. He is an expert in the molecular sequelae of aging and how the environment can modify the aging process.

**Dr. Katherine Tolbert, DVM, PhD, DACVIM**, is a Clinical Associate Professor of Medicine, Small Animal Clinical Science at the Texas A&M University College of Veterinary Medicine. Her research program is focused on small animal gastroenterology, characterizing pathogenic mechanisms and exploring novel therapies for GI infections in dogs and cats.

**Dr. Benjamin Wilfond, M.D.**, is a Professor in the Department of Pediatrics and Director of the Treuman Katz Center for Pediatric Bioethics in the University of Washington School of Medicine. Dr. Wilfond is a bioethics consultant for the Dog Aging Project.