Age-associated patterns in cognitive and physical function in vervet monkeys (Chlorocebus aethiops sabaueus)


1 Department of Gerontology and Geriatric Medicine, Wake Forest School of Medicine
2 Department of Pathology/Comparative Medicine, Wake Forest School of Medicine
3 Wake Forest Alzheimer’s Disease Research Center
4 Department of Pathology, University of Washington
5 Department of Pathology, Stanford University
6 Department of Internal Medicine, Section on Gerontology and Geriatric Medicine, Wake Forest School of Medicine
7 Department of Radiology, Columbia University
8 Department of Radiology, University of Texas-Southwestern, Dallas
9 Department of Radiology, Wake Forest School of Medicine

Submitting Author: Brett M. Frye, PhD (T32 Postdoctoral Research Fellow)

ABSTRACT
Age-related neurodegeneration associated with Alzheimer’s (AD) disease begins in middle age, well before the onset of symptoms. Therefore, translational models to identify modifiable risk factors in middle-age are needed to understand etiology and identify therapeutic targets. Vervet monkeys (Chlorocebus aethiops sabaueus), like humans, naturally develop several risk factors for AD with age, including obesity, prediabetes, and hypertension. Furthermore, older vervets exhibit accumulation of amyloid and tauopathies, decreased brain volumes, and physical declines in gait speed, suggesting that these NHPs may be useful models of early AD-like neuropathology. Currently, we are investigating the extent to which cognitive and physical decline co-occur in 20 elder (mean age=23 years, ~equivalent to a human age of 80 years) and 10 middle-aged (mean age=11 years) females through assessments of physical performance, executive function, social cognition, and short-term memory. These measures are part of a larger study to integrate physical, social, and cognitive function with measures of body composition, metabolic profiles, CSF, blood, neuroimages, and neuropathology. While tests of social cognition and short-term memory are ongoing, assessments of executive function indicate that performance declines with age (N=26; p<0.05; R-squared=0.23). Furthermore, animals that exhibit slower gait speed also perform poorly on the executive function task (N=26, p<0.05; R-squared=0.25). These preliminary results suggest that accelerated aging co-occurs in multiple systems in vervets. This study will enable examination of temporal relationships between physical and cognitive declines. Ultimately, this comprehensive, integrative whole-body approach will help clarify the mechanisms underlying divergent aging trajectories and inspire interventions that promote multi-system healthy aging.

SOURCES OF FUNDING
National Institutes of Health (NIH) R01HL087103 (CAS), NIH RF1AG058829 (CAS & SC), P30 AG049638 (SC), Intramural Grant from the Department of Pathology, Wake Forest School of Medicine (CAS), Wake Forest Claude Pepper Older Americans Independence Center grant P30 AG21332 (SK), Vervet Research Colony (P40-OD010965) (MJ), and the Wake Forest Clinical and Translational Science Institute (NCATS UL1TR001420).