

Alzheimer's and Related Diseases Research Award Fund

2021-2022 FINAL PROJECT REPORT SUMMARIES

The Alzheimer's and Related Diseases Research Award Fund (ARDRAF) was established by the Virginia General Assembly in 1982 and is administered by the Virginia Center on Aging at Virginia Commonwealth University. Summaries of the final project reports submitted by investigators funded during the 2021-2022 round of competition are given below. To receive the full reports, please contact the investigators or the ARDRAF administrator, Dr. Constance Coogle (ccoogle@vcu.edu).

GMU **Alicia Hong, PhD, Sojung Kim, PhD, and Emily S. Ihara, PhD**
Alzheimer's Research Inquiry and Care for Asian Americans (ARICAA):
Protocol development of a culturally tailored social media-based program

Asian Americans and Pacific Islanders (AAPI), the fastest growing racial group in the U.S., are underrepresented in AD/DR research. To address this gap, the investigators developed a culturally tailored, linguistically appropriate, social media-based program for AAPI older adults and their caregivers. It's delivered via WeChat, a social media app highly popular in Chinese Americans. A total of 24 family caregivers of older adults with dementia were recruited through the Chinese Culture and Community Service Center and the University of California - San Francisco Asian American Aging Research Participant Registry. Caregivers completed a baseline survey, then enrolled in the 7-week WECARE intervention. After the intervention, participants completed a follow-up survey and a qualitative interview. The initial data analysis showed that WECARE was both feasible and acceptable, and it significantly improved users' psychosocial wellbeing, including decreased depressive symptoms and caregivers burden. The WECARE intervention protocol represents one of the first culturally tailored digital health intervention for Chinese American family caregivers of dementia. ***(Dr. Hong may be contacted at 703-993-1929, yhong22@gmu.edu; Dr. Kim may be contacted at 703-993-6328, skim205@gmu.edu; Dr. Ihara may be contacted at 703-993-2023, eihara@gmu.edu)***

VCU Shenandoah **J. William Kerns, MD, and Jonathan Winter, MD**
Valley Family ***Clinician perspectives regarding COVID-19's impact on management to***
Practice Residency ***approaches dementia symptoms in Virginia nursing homes***

Unsafe drugs continue to be used in Virginia nursing homes to treat behavioral symptoms of dementia, particularly in Virginia's rural areas, locales with high proportions of minorities, and those with adverse socioeconomic determinants of health. The investigators report surveys of Virginia nursing home prescribers regarding COVID-19 related resident mood and behavior, and management with/without drugs. In three exploratory surveys of Virginia nursing home clinicians stated that all behavioral symptoms (agitation, anxiety, depression, etc.) were increased and more difficult to treat due to fewer staff available to utilize non-drug approaches to address symptoms, absent family and volunteers, and disorienting masks/protective gear worn by caregivers. As a result, more medications were used, especially antidepressants, but also risky antipsychotics and 'mood stabilizers.' The increase in antipsychotic use trended worse in rural areas. Over 90% of clinicians responded that facilities expected them to provide the same level of care despite less staff and family assistance, and roughly 80% stated that nursing homes did not offer support for increased clinician stress and burnout. In one survey 25% of clinicians felt legally exposed because of the pandemic actions of their nursing home. Clinicians, staff and nursing homes urgently need practical assistance delineated by published pandemic data regarding how to strengthen care. ***(Dr. Kerns can be contacted at 540-631-3700, bkerns@valleyhealthlink.com; Dr. Winter can be contacted at 540-631-3700, jwinter@valleyhealthlink.com)***

VCU

Gretchen N. Neigh, PhD

***Dietary Choices as Drivers of Mitochondrial Dysfunction in the Brain:
Implications for Dementia***

Adolescents are the highest consumers of fructose, resulting in a growing epidemic of metabolic syndrome that begins in adolescence and is maintained into adulthood. The mechanisms by which peripheral metabolic disturbances impact neural function are not fully defined despite the robust connection between somatic and neural health. This study tested the hypothesis that consumption of a diet high in fructose catalyzes mitochondrial dysfunction in synapses within the prefrontal cortex. In addition, diet-induced changes in mitochondrial function were hypothesized to be associated with cognitive dysfunction. Male and female rats were provided either standard chow, 18% fructose diet, or 55% fructose diet from adolescence through adulthood. Body mass and glucose data demonstrate that the 18% fructose diet was most detrimental and led to elevations in both body mass and blood glucose despite lower caloric consumption than chow fed rats. Female rats fed the 18% fructose diet were unable to demonstrate recognition of a novel location 1 hour following learning; whereas, the standard chow and 55% fructose females did not demonstrate this deficit until 24 hours following learning. Assessment of mitochondrial function from synapses in the prefrontal cortex illustrated that females fed the 18% fructose diet had reduced mitochondrial function within synapses in the prefrontal cortex; whereas, males fed the 18% fructose diet had increased mitochondrial function within synapses in the prefrontal cortex. Collectively the results of this study suggest that the dose response for fructose may be an inverted u-shaped curve and that females and males are differentially impacted to the neural repercussions of long-term exposure to a fructose-laden diet. ***(Dr. Neigh can be contacted at 804-628-5152, Gretchen.mccandless@vcuhealth.org)***

JMU

Terrie Rife, PhD

Understanding the Role of Tau Isoform Variants in the Nucleus

The appearance of neurofibrillary tangles of the protein tau in Alzheimer's Disease highly correlates with cognitive decline. One of tau's more recently discovered roles in the cell is to protect DNA from double strand breaks. Changes in the ability of the cell to control double strand breaks have also been associated with memory loss. Unfortunately, understanding this role is complicated by the fact that multiple different forms of the tau protein exist within the cell. Because of the variations in these forms in areas of the protein that bind DNA, it was predicted that large isoforms of tau were likely to have more ability to bind DNA than smaller isoforms of tau. The experimental results of this study suggest that the largest form of tau found in the peripheral nervous system is better at protecting against double strand breaks than the other smaller forms of tau found in the central nervous system (CNS). Moreover, a CNS form called 1N4R was shown in other experiments to bind better to DNA than two smaller forms of tau 1N3R and 0N3R. Both the 1N4R and 1N3R forms bind better to DNA containing TG repeats than to DNA pieces of the same length without TG repeats. However, the 0N3R form is better able to bind smaller pieces of DNA than the larger tau isoforms. Taken together these studies provide evidence that the isoforms *do* behave differently and are likely to all protect slightly different pieces of DNA from double strand breaks. A continued better understanding of the different isoform's function will help to determine what is happening in neurodegenerative diseases. ***(Dr. Rife can be contacted at 540-568-3343, rifetk@jmu.edu)***

ODU Tancy Vandecar-Burdin, PhD, Brian K. Payne, PhD, and Muge Akpinar-Elci, MD, PhD
An Examination of Isolation and Risk of Alzheimer's Caregivers during COVID-19:

Computer Use as a Security Risk or Effective Coping Tool?

This study investigated how the COVID-19 pandemic affected family/informal caregivers of those with Alzheimer's and other dementias related to social isolation and cybersecurity risks. Through focus groups, interviews, and surveys with residents of Virginia, the study was guided by the following aims: to investigate the experiences of caregivers during the pandemic, assess the type and extent of social isolation and stress experienced by caregivers, explore the use of virtual/computer-based caregiving resources and supports, evaluate the cyber hygiene of caregivers to determine risk for cybercrime, and document instances of cybercrime victimization amongst caregivers. A total of 1,118 individuals responded to the survey and 211 were unpaid caregivers. Feedback from family/informal caregivers via focus groups/interviews revealed the general isolation, frustration and vulnerability of dementia caregivers during the pandemic. Caregivers were significantly more likely to experience various types of cybercrime than non-caregivers. Caregivers were also more likely to experience monetary losses and losses of a higher amount than non-caregivers. Caregivers who expressed certain feelings of isolation were more than twice as likely to experience any type of cybercrime/fraud and those who did not were less likely to experience certain scams. Feelings of isolation were significant predictors of cyber victimization for all respondents. While there are various screening tools to assess risks for health outcomes, there is not currently a screening tool for risks of cybercrime. The study results were used to create a cyber victimization screening instrument. Future research is needed to assess the reliability and validity of the screening instrument. ***(Dr. Vandecar-Burdin can be contacted at 757-683-3802; tvandeca@odu.edu; Dr. Payne can be contacted at 757-683-4757; bpayne@odu.edu; Dr. Akpinar-Elci can be contacted at 757-683-5900; makpinar@odu.edu)***