WESTERN SYDNEY
UNIVERSITY

Integrative and Complementary Medicine

SUITABLE FOR MASTER OF RESEARCH

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Supporting People with Dementia in the Community: A Multicultural Perspective

Dr Diana Karamacoska: d.karamacoska@westernsydney.edu.au

Supported by: Associate Professor Genevieve Steiner

Research area: Social science

How can we better support people with dementia and their caregivers in the community? Our multidisciplinary team is seeking a keen Masters of Research Candidate to help us answer this question.

Inclusive, enabling, and supportive cities are fundamental to the wellbeing and quality of life for people with dementia and their caregivers. How these ideals can be implemented in multicultural settings is, however, unclear. Together with Canterbury-Bankstown Council and the South Western Sydney Local Health District, we will undertake research to explore initiatives that empower people with dementia, particularly those from culturally and linguistically diverse backgrounds, to feel valued and enabled.

This project is set in Canterbury-Bankstown, where an estimated 8,007 people live with dementia. This figure will double by 2050 unless there is a medical breakthrough. Input on the creation of dementia-friendly initiatives will be sought from English, Arabic and Vietnamese speaking people, who represent 57% of the region's population.

Students with a background or experience in the fields of social science, psychology, or health are encouraged to apply.

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Exploring the Neurophysiological Mechanisms of Exercise in Ageing and Cognitive Decline

Dr Diana Karamacoska: d.karamacoska@westernsydney.edu.au

Supported by: Dr Angelo Sabag, Dr Ashleigh Smith, Associate Professor Genevieve Steiner and Professor Dennis Chang

Research area: Medicine

How can exercise protect the brain from the deleterious effects of cognitive decline? Our multidisciplinary team of neuroscientists and exercise physiologists is seeking a keen Masters of Research Candidate to help us answer this question.

Dementia affects around 50 million people globally and this figure is expected to triple by 2050 unless there is a medical breakthrough. If the onset of dementia can be delayed by two years, there would be 20% fewer people living with this condition. Exercise interventions have shown promise in reducing dementia risk by slowing cognitive decline processes.

Although regular exercise is consistently linked to better cognition, the mechanisms underpinning this association remain unknown. This innovative project will explore the effects of exercise on brain function and cognition to determine how exercise can be implemented to prevent or slow the rate of cognitive decline. This will be done using mixed methods research where an evidence-based exercise intervention will be developed in consultation with older adults who are at risk of developing dementia. This project will generate new insights on how we can best adapt physical activity and empower older adults to reduce their risk of dementia and delay deterioration.

Students with a background or experience in the fields of medicine, exercise science, psychology, or neuroscience, are encouraged to apply.

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SUITABLE FOR MASTER OF RESEARCH OR PHD

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Explore Novel Anti-neuroinflammatory Phytochemical(s) in Attenuation of Alzheimer's Disease

Dr Xian Zhou: p.zhou@westernsydney.edu.au

Supported by: Professor Chun Guang Li and Professor Dennis Chang

Research area: Medicine, Neuroinflammation, Alzheimer's disease, Co-culture

Alzheimer's disease (AD) is a neurodegenerative disorder that accounts for age-related dementia in more than 80% cases worldwide. It is a progressive disease leading to disturbances of memory and cognitive function. Recent research has demonstrated that neuroinflammation mediated by glia cells (i.e. microglia, astrocyte) in the neurovascular unit (NVU) is believed to play a primary role in neurotoxicity and neurodevelopmental disorders such as Alzheimer's disease. The activation of microglia cells occurs in the earliest stage of Alzheimer's disease, and thus, has been considered as an important therapeutic target.

Our research team in NICM has recently established a tri-culture model to mimic the microenvironment in the brain. The model contains microglia cells, neuron cells, and endothelial cells which provides a robust in vitro model for studying neuroinflammation mechanisms and screening of potential therapeutics to treat various neurodegenerative diseases.

The candidate will screen a number of natural products on the single microglia cell line to identify the most potent compound(s) in inhibiting inflammation and cytokines. Then further test the compound(s) in the tri-culture system to investigate whether the selected compound(s) can pass the endothelial barrier (mimic the blood brain barrier) and exert the protective effects in neuron survival via the potent anti-neuroinflammatory ability. The associated mechanisms regarding the regulation of neuroinflammatory and neuron survival biomarkers will be examined by western blot and PCR analysis. The efficacy and safety of the compound(s) will then be further varied using a relevant animal model. The outcome of the project will provide anti-inflammatory and neuroprotective phytochemical(s) toward the amelioration and prevention of devastating neurodegenerative diseases such as Alzheimer's disease.

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Multi-compound Therapy Development Against Acute Inflammation in Infectious Diseases

Dr Xian Zhou: p.zhou@westernsydney.edu.au

Supported by: Professor Chun Guang Li and Professor Dennis Chang

Research area: Medicine, Infectious disease, COVID-19, Influenza, Pneumonia, Synergistic interaction in combination therapy

The recent COVID-19 outbreak highlights the significant challenge and drastic consequences face the mankind in dealing with emerging infectious diseases. One confirmed discovery is that the severity of the disease and fatal consequences of such infectious diseases are correlated strongly with the body's overwhelming immunity responses against the invasion leading to irreversible key organ damages (i.e. acute respiratory distress syndrome). Yet to date, successful management of acute hyperinflammation during acute infections remains extraordinarily difficult and largely unsuccessful. As most current drugs act on a single therapeutic target with less regulation on the whole immune cascade, a synergistic approach or combination therapy is suggested to have the capacity to reduce the cytokine storm via a holistic approach and multiple mechanistic pathways.

The central idea of synergy in multitarget compounds used in viral or bacterial-induced acute inflammation is the systematic modulation of multiple targets via the advanced suppression of the excessive cytokine release and the actual reduction (or disappearance) of inflammatory symptoms.

We will investigate the synergy in paired-combinations among several natural compound candidates against acute inflammation using cell models. A newly developed mathematic algorithm will be applied to predict synergy in high-order combinations. The efficacy and safety of the developed optimal combination therapy will be further investigated in an influenza-infected animal model. The outcome will provide a new venue for developing natural compounds-based cost-effective therapy and a potentially

effective treatment for a range of cytokine related diseases and conditions, such as allergy, asthma, inflammatory bowel disease, transplant rejection, T-cell-based cancer immunotherapy, cancer, diabetes, and cardiovascular diseases.

The candidate will have opportunities to work with our domestic/international industry and research partners. The expertise within our research team has a strong and combined expertise in the areas of pharmacology, natural products, synergy in combination therapy, cell, and molecular signaling, and anti-inflammatory and antiviral research.

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Can Natural Bioactives Enhance the Efficacy of Standard Chemotherapy?

Dr Deep Bhuyan: d.bhuyan@westernsydney.edu.au

Supported by: Professor Chun Guang Li

Research area: Biomedical science

Cancer is responsible for more deaths than HIV AIDS, tuberculosis, malaria and diabetes combined. According to the World Health Organisation, cancer is expected to rank as the leading cause of death in the 21st century with an estimated 16.4 million deaths by 2040. Lack of specific treatment options, development of drug resistance and severe side-effects of standard anticancer drugs are some of the biggest challenges of cancer therapy.

Natural bioactive compounds are an integral part of cancer therapy, with around 74.9% of new anticancer drugs marketed between 1981-2010 directly derived from natural sources. Our research group at NICM Health Research Institute (NICM HRI) is investigating the synergy between anticancer drugs and natural bioactive compounds to increase the efficacy and reduce the side-effects and toxicity of standard anticancer drugs. As novel drug development entails large resources and time, this approach of combining pre-existing anticancer drugs with natural bioactive compounds is quite promising and economical. Using cellular and computational models with molecular biology tools we also investigate the molecular mechanisms of action of these combinations against cancer. Additionally, we are interested to see the effect of these combinations on the growth of pathogenic and beneficial gut bacterial species that have been previously linked with cancer development, treatment and clinical outcome.

A number of potential research opportunities are available based on the candidate's research interest. The candidate will work in the state-of-the-art research labs at NICM HRI with friendly students and researchers from different scientific and cultural backgrounds. The candidate will work towards understanding both the direct (anticancer) and indirect (interaction with gut microbiota) role of natural bioactive compounds in anticancer therapy. The potential impacts of this research include providing a strong foundation for future clinical studies to define natural product-based

combination therapies and understand their influence on the “good” and the “bad” gut bacteria.

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SUITABLE FOR PHD

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N/A - Visit our find a supervisor page for further advice.

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