

RAINE Genetic Epidemiology Research Group

Research overview

Genetic Epidemiology is the study of the genetic and environmental components of complex human disease. The Raine Genetic Epidemiology group is primarily investigating the relationship between genes, the antenatal and postnatal environments, and how they contribute to the development of adult diseases including metabolic syndrome (coronary heart disease, stroke, insulin resistance, type-two diabetes and high cholesterol), obesity, neurologic disorders and mental illness.

Although adverse antenatal and postnatal environments increase the risk of particular adult diseases, not all individuals exposed to these environments develop these conditions, suggesting that an individual's genotype may contribute to the eventual outcome. The Genetic Epidemiology research group aims to define genes and interactions between genes and environment that underlie developmental origins of health and disease (DOHaD). The results from this group's work will have significant impact upon our understanding of the biology underlying DOHaD. Early identification of genetic signatures that enhance the risk of adult disease may provide opportunities to develop lifestyle or medical intervention strategies aimed at preventing these adverse outcomes.

Research highlights

Comprehensive research funds from the National Health and Medical Research Council facilitated collection and purification of DNA from participants in the Raine Study as well as their mothers and fathers. These groups are known as 'triads' and are important in genetic research. Once the DNA was isolated, high quality genotyping was performed. This produced vast amounts of genetic data on each participant. When the newly acquired genetic data is coupled with the physical observations collected over the past 23 years in the Raine Study, the research possibilities are amazing.

Research Achievements

During 2014 and 2015, this research team has published 22 research papers, including five in the prestigious journal *Nature* or *Nature Communication*. Acquisition of detailed genetic data in this valuable longitudinal pregnancy cohort has facilitated participation in 12 genetics consortia including EGG, EAGLE, ReproGen, CORNET, Twins Eye Study, International Eye Genetics Consortium, PREBIC, CHARGE and the Australian Asthma Genetics Consortium. Involvement in these consortia and the genetic data generated will continue to produce high profile publications over the next 5-8 years. Participation in these consortia raises international awareness of the high quality of longitudinal genetic research conducted in Australia.



Through consortium work, data have been published relating to:

- BMI/growth trajectories
- Fetal growth
- Genetic variation between men and women
- Immune function and asthma
- Infectious disease
- Language and Intelligence
- Non-communicable diseases
- Respiratory function
- Mental Health
- Menarche
- Vision

The vast amounts of data generated by this grant have featured in the research of ten post-graduate students, facilitating the training of the next generation working in genetic epidemiology and the genetic basis of DOHaD.

The complex data generated by this grant have required the development of new statistical modelling. The new models enable the undertaking of longitudinal GWAS and utilisation of more than 23 years of biometric, biochemical and socio-demographic data. This grant has allowed the identification of multiple genes and pathways associated with a broad range of outcomes, as well as identifying novel pathways and potential targets for interventions that would not have been identified through hypothesis driven research.

THE TEAM

Research Group Leader

Associate Prof Craig Pennell PhD (Dist) CMFM

Research Group Members

Prof Lawrie Beilin AO MD

Prof Eric Moses PhD

Prof John Newnham AM FRANZCOG

Prof Stephen Lye PhD

Prof Laurent Briollais PhD

Mr Wei Ang MSc

Ms Carol Wang BSc (Hons)

Students 2013 - 2014

Dr Priya Parmar PhD

Dr Scott White

Mr Richard Maganga

Dr Nicole Warrington PhD

Research Consortium Membership

Early Genetics Lifecourse Epidemiology (EAGLE) Consortium

Early Growth Genetics (EGG) Consortium

Avon Longitudinal Study of Parents and Children (ALSPAC) Consortium

Generation R Study, The Netherlands

North Finnish Birth Cohort (NFBC)

Copenhagen Studies in Asthma in Childhood (COPSAC)

Cohorts for Heart and Aging Research in Genomic Epidemiology (CHARGE) Consortium

Age, Gene, Environment Susceptibility (AGES) Study

Atherosclerosis Risk in Communities (ARIC) Study

Cardiovascular Health Study (CHS)

Framingham Heart Study (FHS)