

Report of 19 March 2015 Meeting

Royal Society

Southern Highlands Branch

Speaker: Professor Andrew Holmes, School of Molecular Bioscience and Microbiome Project Node Leader in the Charles Perkins Centre, University of Sydney

Topic: **Your Poo and You: gut microbes, diet and modern lifestyle changes.**

Professor Holmes' current research is focussed on understanding the dynamics of gut microbial community composition, the mechanisms of host-microbe interaction in the gut and the development of tools to enable management of the gut microbial ecosystem. He delivered a challenging lecture on his work and that of his team to an appreciative audience of 110 people at the Chevalier College Performing Arts Centre, Burradoo.

Our gut houses the microbiological equivalent of a large biodynamic organic vegetable patch that has a profound effect on our health. Holmes called on the old adage "You are what you eat", suggesting it could just as well be "You are what you grow in your gut". Our gut microbiome consists of the 1000 or so species of microbe that are normally present for most of our life.

Just as with our genome, each of us has a unique microbiome which encodes basic properties that influence our health and well-being. A key difference however is that whereas we acquire our genome more or less instantaneously at conception and hold it for life, we acquire our microbiome over a far more protracted period, and it is more malleable, for good or for bad. Holmes spoke of studies comparing the microbiome of healthy and sick people which revealed a wide range of metabolic, immunological and even neuropsychiatric conditions where a dysfunctional microbiome is part of the underlying problem. It appears that disruption of the gut microbiota can be significant in influencing obesity, diabetes, chronic inflammatory diseases such as arthritis, inflammatory bowel disease, ulcerative colitis and Crohn's disease, and some cancers.

Microbes are not simply 'on us' or 'in us', they are a part of us. A well performing microbiome promotes health, and a badly performing one promotes disease. Our gut is the primary interface between our body and our environment, our intestines having many more bacterial cells than there are human cells in our entire body. Our microbiota lie at this interface between our body and the world around us. It is not surprising then that microbe studies demonstrate their profound effect on human health. Far from being 'freeloaders', microbes perform essential functions such as digesting food, manufacturing vitamins and priming the immune system.

Much of Holmes' research into the complicated dynamics of the gut has been performed using animal studies. He described the dramatic changes that were found in the microbe community structure among rodents on different diets. Among other findings, it was found that a rise or fall in the amount of calories that the mice consumed shifted the ratio of the two main phyla of bacteria that lived in their guts – the bacteroides and the firmicutes, which are also found in humans. In the mice study, upsetting the internal ecosystem affected the performance of their immune system and their overall metabolic health.

The dynamic nature of the body's internal ecosystem suggests potential treatments for people with microbe-related diseases could be as simple as re-engineering their microbiota, possibly through medication or a change in diet. In the meantime, there is much research to be done in this complicated field. Professor Holmes received warm applause at the conclusion of his excellent lecture, and very kindly agreed to return for a further address as his research unfolds.

Anne Wood