

Human and microbial interactions that influence health outcomes

Charlene Kahler and David Smith

Welcome to this edition of *Microbiology Australia* on human and microbial interactions that influence health outcomes.

As we understand the microbial world in all its diversity, we are now aware more than ever, that there is an amazing spectrum of interactions between the microbial community and the human body, which influences chronic health conditions. In the preceding decade, many large-scale studies have established that there is homeostasis between the host and microbiome which results in a tendency to resist change in order to maintain a stable, relatively constant internal environment. This relationship is maintained by a complex web of interrelationships in the microbiome itself, which secrete metabolic products that are detected by the host as a means of sampling the environment. When the microbiome is perturbed, a dysbiotic relationship between the two systems results in deleterious effects on human health such as the development of allergies, chronic inflammatory syndromes and even behavioural changes.

In this issue, we have short articles describing what we currently understand about the microbiome of the human gut and the cervicovaginal compartments. Dr Erin Shanahan explains how the gut microbial ecosystem is primarily altered by nutrient availability and that diet therefore represents an important asset in therapeutically altering the gut microbiome. Dr Willa Huston describes the role of the cervicovaginal microbiome, which is extremely important for maintenance of an acidic environment, preventing pathogenic colonisation, and modulates inflammation by cross-kingdom signalling. Thus, the composition of cervicovaginal microbiome plays an important role in health outcomes for women particularly in relation to vaginal infection, pregnancy, and fertility. Dr Jeff Keelan extends this theme by examining the potential of microbial profiling as a means of identifying women at risk of early pre-term birth which will assist in early interventions to improve neonatal survival.

A further two articles explore the concepts of using our knowledge of the human microbiome to inform novel intervention strategies for disease by using closely related species as a means of preventing unhealthy microbiome communities from developing. Dr Lea-Ann Kirkham describes the multiple mechanisms that are now being deployed to intervene in otitis media, which is caused by a polymicrobial biofilm in the inner ear. In my article on the *Neisseria* genus, I provide an update on recent expansion of this genus and

provide a commentary on the importance of the commensal species in this group as a potential source of probiotics to inhibit meningococcal carriage and gonorrhoea.

As our understanding of the human microbiome and its role in developing tolerogenic immune responses has matured, it has also become clear that historical infections affect the intensity of disease outcomes from certain infections. Dr Allison Imrie describes this feature in relation to outcomes for dengue infections. Cross reactive T-cell responses may drive either resolution of the infection or drive a life-threatening haemorrhagic response. Similar themes may emerge as we understand SARS-CoV-2 responses and why some people have mild symptoms while in others it is life threatening. Professor Ian Macreadie explores the role of dietary cholesterol and the use of statins to moderate the outcomes from a variety of respiratory viral infections including influenza and SARS-CoV-2.

Last, we have two articles providing an update on two difficult to treat multi-drug resistant pathogens, *Helicobacter pylori* by Professor Barry Marshall and *Burkholderia pseudomallei* by Dr Tim Inglis.

Biographies

The biography for **Associate Professor Charlene Kahler** is on page 83.



Clinical Professor David Smith, BMedSc, MBBS, FRCPA, FACTM, FASM, FFSM(RCPA), is a graduate in Medicine from the University of Western Australia and trained in Medical Microbiology in Perth. He is a Medical Virologist at PathWest Laboratory Medicine WA at the QE2 Medical Centre in Perth, Australia, where he is a Director of the Arbovirus Research Laboratory. He is also a Clinical Professor in the Faculty of Health and Medical Sciences at the University of Western Australia. Professor Smith serves on a number of state, national and international committees and advisory groups, and is currently Chair of the National Arbovirus and Malaria Advisory Committee. He has a particular interest in public health issues, including mosquito-borne viruses, influenza and other respiratory viruses, and emerging infections.