

RESISTANCE TO ANTIBIOTICS: GUT MICROBIOTA & MECHANISMS

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Abstract

Antibiotics (AB) have been used to treat animals and human patients for infectious diseases since the discovery of penicillin by Alexander Fleming in 1928. However, these drugs have been used so widely and for so long that the infectious organisms the AB are designed to kill have adapted to them, making the drugs less effective. In USA alone, it is estimated that over 2 million people become infected with bacteria that are resistant to AB and the spread of these have been not only from humans and animals directly but also from the food. *Salmonella* and *Campylobacter*, two of the many bacteria commonly transmitted through food, cause an estimated 410,000 AB-resistant infections in the USA each year. Of these, at least 23,000 people of them die as a direct result of these infections.

Therefore, to prevent spread of AB-resistant pathogens requires new thinking including an understanding of 'gut microbiome' ($10^{10} - 10^{12}$ bacterial cells per gram of gut contents, with more than 1000 species) which plays an important role in human and animal health by modulating the immune system, improving nutrient utilization, and excluding pathogens. My presentation will discuss pathways of transfer of AB resistance from animals to humans and from humans to others, mechanisms of development of AB resistance including spontaneous genetic mutations within a gene sequence and the role of transmembrane transporter proteins P-glycoprotein (Pgp) which pump out a variety of endogenous substances and xenobiotics (including AB) across the cell membranes. We have shown that exposure to AB rifampicin can induce the overexpression of Pgp gene (encoded by the gene ABCB1) and that some chemicals like cyclosporine can inhibit Pgp. The search is for chemicals (including probiotics) that can inhibit Pgp in bacteria.

About the speaker



Associate Professor Ravi Gooneratne is a veterinarian (BVSc) with a doctorate (PhD) in toxicopathology from Murdoch University, Australia, Postgraduate Diploma (PGDip. Tox.) in toxicology from University of Saskatchewan, Canada, a registered toxicologist in UK (British Toxicology Society), a Fellow of the Royal College of Pathologists in UK (FRCPath), a Fellow of the American Academy of Veterinary and Comparative Toxicology (FAAVCT) in USA, and a Member of the Society of Environmental Toxicology & Chemistry. He has been teaching and / researching / conducting workshops in a variety of aspects of toxicology for the past 30 years in Australia, Canada, USA, Thailand, Malaysia, Spain, South Africa, Philippines, China, Sri Lanka, India, Kenya, Uganda and New Zealand. He has supervised over 50 PhD students and MSc students. He has over 200 publications in scientific journals and conference presentations. From 2011 to 2016 he has published / sent for publication over 40 manuscripts in international high profile journals, some with impact factor as high as 5.6. His research interests include food safety and security, heavy metal toxicology, pesticide toxicology, food toxicology, mycotoxins, nanotoxicology, AB resistance, ecotoxicogenomics, and development of biomarkers and biosensors to monitor environmental pollution. He is the examiner for one undergraduate toxicology course and two postgraduate advanced toxicology courses and also contributes to the teaching of animal health and animal courses. In 2015, he was appointed as a visiting professor to Guangdong Ocean University, Zhanjiang, China.