

Report of 21 November 2013 Meeting Royal Society Southern Highlands Branch

Speaker: Professor Elizabeth Harry, Professor of Biology and Deputy Director of the ithree institute, University of Technology, Sydney
Topic: Outsmarting Superbugs?

The 77 attendees waiting to greet Professor Liz Harry for her Southern Highlands lecture at 6.30pm on November 21 were quite disappointed when told of her unavoidable delay in Sydney.

Fortunately the wait was made enjoyable and enriching by the ingenuity of some in the audience. Committee member Andrea Talbot outlined the speaker program for 2014. Then Royal Society member Douglas McKinlay delivered an impromptu address on his current research into ancient Egyptian timelines. It was a fascinating presentation.

Professor Harry began her lecture with an overview of bacteria, emphasizing their prevalence and the fact that we cannot live without them. They make about half of the oxygen we breathe, and 80% of the nitrogen we use. There are more bacteria on a person's hand than there are people on the entire planet, and bacterial cells produce 100 times more protein in our bodies than human cells do. The global number of bacteria is of the order of 6×10^{30} , 90% of all bacteria occurring at the subsurface (sediment depth approx 500m). The biomass of subsurface microorganisms corresponds to one third of the total living biomass on Earth. Despite this huge prevalence of bacteria, only very few cause disease. Tuberculosis and meningitis are caused by airborne bacteria. Lyme disease, anthrax, leprosy, cholera and typhoid are all bacterial in origin. So too are infected wounds on our skin.

The emergence of antibiotic resistance was first noted in 1947, nineteen years after the discovery of penicillin, when *S. aureus* was found to be resistant to it. By 1955 it was resistant to erythromycin and tetracycline, by 1958 resistant to sulphonamide, then in 1961 resistant to methicillin. The pattern of resistance continues to this day. In USA, the number of *S. aureus* (MRSA) infections in intensive care unit patients was less than 2000 in 1993. By 2005, there were 368000, an alarming increase.

Liz Harry spent quite some time in her lecture describing how bacteria are able to generate resistance to antibiotics. She has pioneered the development of microscopy techniques for 'seeing' where proteins are in a bacterial cell. These techniques have revolutionized our view of the internal organization of bacterial cells. Her research on bacterial cell division has had a significant impact on our understanding of how bacterial cells multiply, and how they control this process to ensure equal partitioning of chromosomes vital for survival. She has worked with industry to develop novel

antibiotics that target this process in pathogens, and to examine how natural products, such as honey, function as effective therapeutics for infectious diseases.

One of her areas of research has been the experimental testing of honey as a topical antibiotic. She showed photographs of a case where honey-impregnated dressings were effective in healing infected skin ulcerations that had resisted other antibiotic treatments. Honey appears to have a general antibiotic property that allows it to be safely stored by bees and in our pantries and refrigerators for extended periods. The honey that Professor Harry and her colleagues have chosen for research is Manuka honey.

Professor Harry lamented the fact that research on antibacterial agents of all varieties has languished mainly due to commercial considerations. Drug companies clearly stand to make larger profits from drugs designed for chronic conditions, such as hypertension, than from the design of more effective antibiotics which are used for shorter periods of time in addressing acute conditions.

Her research so far has resulted in her awards of the Australian Eureka Prize for Scientific Research in 2002 and the Australian Society of Microbiology Frank Fenner Prize in 2008 in recognition of her distinguished contributions to Australian research in microbiology.

At the end of the lecture, Professor Harry very kindly offered access to her PowerPoint presentation to those further interested. It can be requested at elizabeth.harry@uts.edu.au and at wood.anne@gmail.com

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