

## **We propose that the NHMRC makes the study of drug-resistant and pathogenic microorganisms a high priority research area and directs strategic funding to address the problem**

### **Background**

- *There is rapidly growing concern about the increasing number of drug-resistant microorganisms that are becoming untreatable by all classes of known antibiotics. The World Health Organisation (WHO), Gates Foundation and The Wellcome Trust all recognise antibacterial resistance as a major threat to human health and the global spread of antibacterial resistance was the focus of the 'WHO World Health Day 2011' to highlight the problem and the urgent need for consolidated efforts to avoid regressing to the 'pre-antibiotic era'.*
- *The problem of drug-resistant bacteria is just as much a problem for Australia as it is for the rest of the world. For example, bacteria carrying the New Delhi metallo-beta-lactamase-1 (NDM-1) gene are resistant to a broad range of beta-lactam antibiotics and have already been identified in Australia. These bacteria are often referred to as 'super bugs' and may now only be treated by classes of antibiotic (known as polymyxins, discovered in 1947) that were previously abandoned for clinical use because of their toxicity.*
- *The list of 'superbugs' has been generally typified by the so called 'ESKAPE' pathogens (**E**nterococcus faecium; **S**taphylococcus aureus; **K**lebsiella pneumonia; **A**cinetobacter baumannii; **P**seudomonas aeruginosa and **E**nterobacter species) which effectively 'escape' the effects of antimicrobial-drugs. These microorganisms represent a threat both to hospitals and the community at large, (both indigenous and non-indigenous).*
- *All of the cutting-edge clinical procedures that involve surgical intervention rely on the use of antimicrobial agents. Without effective antimicrobial treatment regimes, our success in the treatment of a whole spectrum of disease (including: cardiovascular; neurobiological; cancer and the use of implanted devices such as hip replacements etc.) will return to survival levels of the 1930s.*
- *The problem of antimicrobial drug resistance is even more acute because of the decreased presence in the sector of the large pharmaceutical companies. Market-driven research priorities drive the pharmaceutical companies drug portfolios – as a consequence the market size calculations of the 1990s up to 2005 suggested that antimicrobial drugs would not be as profitable as 'life style drugs' (for example for the treatment of conditions like obesity and diabetes). Consequently we are now in a situation where there are very few new classes of antibiotic in clinical development. Whilst this is changing, it will take 15-20 years and the combination of innovative science and clinical development to achieve the necessary goals for new antibiotics.*
- *The health of the population is too serious a matter to be left in the hands of drug companies and their shareholders – these are decisions that must be made by Governments and we propose that drug-resistant bacteria and pathogenicity should be a top governmental priority. The renewed interest by drug companies will however, provide a future avenue for the translation of innovation into commercialisation opportunities.*

### **The call for a new Strategic Initiative**

- *We propose a new strategic initiative to combat drug-resistant bacteria specifically and microbial pathogenicity in general. This NHMRC-led initiative needs to be multidisciplinary and integrate with the ongoing international efforts. The initiative needs to address the whole spectrum of infectious disease - from the design and build of new hospitals that minimise the risk of infection, to current practice in infection-control and new research.*
  - *Both national and international awareness of the problem needs to be generated. Once the community at large is aware of the scale of the problem it will become more straightforward to change the way we deal with drug-resistant infectious diseases.*
- *New NHMRC centres for drug resistance and pathogenicity - building on successful science.*
  - *We propose an integrated research-based solution for the problem of drug-resistant and pathogenic bacteria targeting: new methods of surveillance and screening; new research into the genetics of drug resistance; new approaches to antimicrobial drug discovery; new methods of identify vaccine candidates and new approaches to understand pathogenicity. Such approaches should incorporate our new insights into microbial genetics and growth (such as biofilms) and an understanding of the impact of climate change and zoonosis.*
- *The role of multidisciplinary translational research and the ithree institute: changing the way we think about drug resistance and pathogenicity*
  - *It is clear that simply funding the 'old style' models of research will simply not address the problem. We propose a new integrated multidisciplinary research model that will challenge current paradigms and generate new solutions to the problem of drug resistance. Scientists at the ithree institute are highly regarded in the infectious diseases area both in Australia and internationally and are ideally placed to take part in this initiative.*

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infection • immunity • innovation