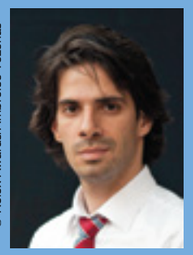
Unravelling ANTIBIOTIC RESISTANCE

Antibiotic-resistant superbugs are the world's greatest threat to humans now, and in the future, says Saudi Arabian-born Rolex Young Laureate, Hosam Zowawi, who is researching the spread of infectious diseases in the Gulf States as part of a global campaign to fight back.

ABOUT THE AUTHOR



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Hosam Zowawi is a PhD Candidate in the Infection and Immunity theme at the UQ Centre for Clinical Research. In 2014, he was awarded the 2014 Rolex Award for Enterprise. Each Rolex Award for Enterprise is given for a new or ongoing project anywhere in the world that deserves support for its capacity to improve lives, or protect the world's natural and cultural heritage. Zowawi is the second UQ recipient of the award, following in the footsteps of Professor Mark Kendall, co-inventor of the Nanopatch™, who is based at the Australian Institute for Bioengineering and Nanotechnology. Zowawi has also been announced as a Queensland Science and Innovation Champion, *TIME* Next Generation Leader and one of *The Courier-Mail's* "50 Best and Brightest" for 2014. Zowawi is interested in hospital-acquired infections, particularly those caused by antimicrobial-resistant organisms. As a clinical microbiologist, he recognised the need to develop more rapid diagnostic tools to aid initial medical management and implement infection control precautions. He completed a Masters degree in Clinical Science (Clinical Microbiology) with Honours and received the Griffith University Award for Academic Excellence 2010. In his Master's dissertation, he studied catheter-related infections (CRI) at the QIMR Berghofer Medical Research Institute, under the supervision of Dr David McMillan. Zowawi participated in the development of a novel quantitative multiplex real-time polymerase chain reaction (PCR) assay that can be used to target common bacteria causing CRIs.

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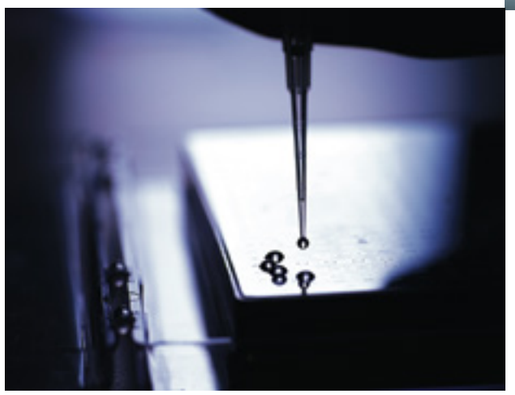
For many decades, modern medicine has enjoyed the privilege of antibiotics, which have saved millions of lives all over the world. The discovery of antibiotics was intended to end the threat of infectious diseases. While they have helped humanity to control many fatal infections of the past — such as sore throat and puerperal fever — unfortunately the privilege of antibiotics is coming to an end. This is mainly due to antimicrobial resistance.



Antimicrobial resistance is a global issue that is not only endangering humanity, but also animal health. Our sophisticated surgeries and anticancer therapies are at risk. We are confronting bacteria that can be resistant to multiple antibiotics, including last-line treatments, making them nearly impossible to treat.

An economical review of antimicrobial resistance estimated that in 2050, antimicrobial resistance would kill 10 million more people — more than how many are anticipated to die from cancer. In the United States alone, there are currently more than two million reported cases related to antimicrobial resistance, resulting in 23 thousand deaths, and $20 billion in direct costs.

As a counter plan, the World Health Organization (WHO) set a strategic plan to combat antimicrobial resistance on a global level. The pillars for this plan include initiating global surveillance on antimicrobial resistance, developing rapid diagnostic tools for early detection to allow early treatment of antibiotic-resistant bacteria, and conducting educational programs to limit the inappropriate use of antibiotics.

At the UQ Centre for Clinical Research, under the guidance of world-renowned Infectious Diseases expert, Professor David Paterson, and in partnership with other international organisations, we have initiated the first network of collaborating hospitals to monitor the emergence and spread of superbugs in the Gulf States. This research complements superbugs research by researchers at the Institute for Molecular Bioscience's Centre for Superbug Solutions.

In the Arabian Peninsula, international expatriates are contributing heavily to the economic boom, and making more money than 50 per cent of the total population. The region is also home to the two holy mosques of Mecca and Medina for Muslims around the world. These factors are contributing to heavy travel activities, and travel is known to impact the international spread of infectious diseases. Antibiotic-resistant bacteria favours free intercontinental rides. Thus, studying antibiotic resistance in the Gulf region exemplifies the global spread of the problem.

Planning the study and conducting the research were challenging. Coordinating a multinational study required many late nights and early morning phone calls, firing off unlimited emails, and flying hundreds of thousands of miles to attend meetings.

We started with a dream that only became a reality through perseverance, dedication and teamwork; access to readily available, and well-equipped, research facilities; and a healthy dose of good luck. Despite still being in the early stages of our work, our published data is considered by many local and international experts to be landmark research in the area of antibiotic resistance in the Gulf States.

Our data has raised awareness about the issue of antimicrobial resistance in the region. I recently returned from overseas after attending high-level committee planning sessions for a strategic plan to combat antimicrobial resistance in the Gulf States. It was evident our produced data has made such an impact.

Having a rapid point-of-care diagnostic test that can identify antibiotic-resistant bacteria in minutes for a very low cost is indeed still ambitious, at this stage. Yet, biotechnology innovation is at the frontier with the level of advancements achieved in this era.

We have started by exploring technologies, with an aim to advance monitoring the spread of antibiotic-resistant bacteria and hopefully produce results in a shorter turnaround time to help clinicians apply targeted therapy.

Last June, the UK Government, with Nesta Foundation, announced the next Longitude Prize will be devoted to rapid, cheap, point-of-care diagnostics for antibiotic-resistant bacteria. The White House also announced a similar award last September.

As clinical microbiologists, we recognised the need for rapid diagnosis long before these announcements, and have taken a few steps towards that direction. In fact, a few days before the announcement of the Longitude Prize, I was awarded the Rolex Award for Enterprise as a Young Laureate to support our work for rapid diagnosis research and development.

As suggested by WHO, education is a pillar in the combat strategy for antimicrobial resistance. In some parts of the world, including where I am originally from, antibiotics can be sold over the counter without prescriptions, despite the existing banning law. It is clear that public education is needed in this regard.

I have also been part of a team which has initiated an awareness campaign, with a zero-dollar budget, aimed solely at educating the public about the importance of using antibiotics wisely, and being aware of the threat superbugs pose.

The beauty of our campaign is that we use data generated from our epidemiological research in the Gulf that are published in high-tier journals, and translate this into everyday language for people. Our campaign has interested more health activists, who have volunteered to produce multimedia materials that help clarify the complicated science behind antimicrobial resistance.

We were grateful to see that the Saudi Food and Drug Authority launched a follow-up campaign last November to raise awareness about antibiotics. We feel our work is impacting, and may have triggered an organisational move towards raising antibiotic awareness.

Combating antimicrobial resistance should not be done at an individual level. It should be carried out as a global mission on multiple collaborative, innovative and social levels. We hope our slow and gentle moves are concrete in contributing to the important fight against superbugs.

More details about superbug research are available from uqccr.uq.edu.au and superbugs.imb.uq.edu.au. To contribute to the University's superbug research, visit uq.edu.au/giving or email the Pro-Vice-Chancellor (Advancement) at pvca@uq.edu.au.