AMR- "the slow pandemic" (could there be a solution 'down under'?)

Foreword

While there is no consensus on how the SARS-CoV-2 virus originated, the prevailing view is that, following a mutation, it was able to jump from bats via an intermediate and unknown animal to humans. What is certain is that all of the variants of concern which have arisen in the two years since the wild strain was identified are the result of genetic mutations which conferred a selective advantage on the variant.

It is also chance mutations conveying a selective advantage that have led pathogenic bacteria to become resistant to antibiotics. Whilst the genetic changes that occurred in the SARS-CoV-2 virus led to a disease which rapidly resulted in enormous global health consequences, that has not yet happened with the genetic changes that have occurred in the bacteria which have developed antimicrobial resistance. However, experts tell us that on our current trajectory this is only a matter of time. Therefore, whilst the Covid pandemic can be viewed as a fast pandemic, the phenomenon of antimicrobial resistance may be viewed as a slow pandemic. However, it is this slow pace that offers us the opportunity to intervene now and prevent its worst effects.

Dentists prescribe only 9% of all antibiotics used in primary care but we cannot sit on our hands and expect that the rest of the healthcare system will take care of this problem for us. Surely, we must play our part and I would urge you to refresh your knowledge of the issues by reading the information below and acting upon it while we still have time to prevent a man-made pandemic.

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Update on AMR

Antimicrobials – including antibiotics, antivirals, antifungals and antiparasitics – are medicines used to prevent and treat infections in humans, animals and plants.

Antimicrobial Resistance (AMR) occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death. These multi- and pan-resistant bacteria are known as "superbugs". The emergence of these superbugs threatens our ability to treat common infections and experts are worried

that complete antibiotic resistance has the potential to become the next pandemic and plunge medicine back into the dark ages.

AMR can also occur naturally over time, usually through genetic changes. Antimicrobial resistant organisms are found in people, animals, food, plants and the environment (in water, soil and air). They can spread from person to person or between people and animals, including from food of animal origin. The main drivers of antimicrobial resistance include:

- the misuse and overuse of antimicrobials
- lack of access to clean water, sanitation and hygiene (WASH) for both humans and animals
- poor infection and disease prevention and control in health-care facilities and farms
- poor access to quality, affordable medicines, vaccines and diagnostics
- lack of awareness and knowledge
- poor enforcement of legislation

The cost of AMR to national economies and their health systems is significant as it affects productivity of patients and their families through prolonged hospital stays and the need for more expensive and intensive care. Procedures such as caesarean sections, hip replacements, cancer chemotherapy, and organ transplantation become more risky.

Antibiotics have become the cornerstone of modern medicine but are becoming increasingly ineffective as drug-resistance spreads globally. New antimicrobials are urgently needed to treat infections identified in the WHO priority pathogen list. However, if people do not change the way antibiotics are used now, these new antibiotics will suffer the same fate as the current ones and become ineffective. The clinical pipeline of new antimicrobials is running dry. Currently, WHO have identified 43 antibiotics in clinical development, of which only ten might address the WHO list of priority pathogens.

New Antibiotics are featured in an article in The Guardian explaining some innovative research*

The body's immune system is ordinarily quite good at fighting bacteria but superbugs are good at hiding from our immune response. When they rapidly multiply we become sick. We then take antibiotics to try to kill off those bacteria, but if they're already resistant, or they develop resistance during that treatment, the antibiotics can't kill them off.

Australian scientists in Monash University have discovered a way of making drugs more effective against antibiotic-resistant bacteria, or superbugs. This new method focuses the body's immune response on the pathogenic bacteria by attracting cells of the innate immune system.

The researchers linked compounds known as formylated peptides to vancomycin, an antibiotic commonly used to treat the hospital superbug MRSA. This new compound was then tested on MRSA that had been isolated from a hospital patient.

Vancomycin attached to the cell wall of the bacteria, while the formylated peptides acted as a trail of breadcrumbs that attracted white blood cells to help combat the MRSA.

When tested on mice, the vancomycin-peptide combination was:

- *twice as effective as vancomycin alone*
- *even at one-fifth of the usual dose of vancomycin*
- *exhibiting reduced drug toxicity*

The new compound could be produced at significantly less expense than traditional antibiotics and this has implications for beleaguered healthcare budgets.

The research is still some way off preclinical and clinical trials but the early success of the compound has encouraged the team to trial similar approaches with other types of antibiotic drugs.
The study was published in the journal Nature Communications.

Original article: Antibiotic-chemoattractants enhance neutrophil clearance of Staphylococcus aureus: https://www.nature.com/articles/s41467-021-26244-5

*Guardian article: https://www.theguardian.com/society/2021/oct/26/australian-discovery-brings-hope-in-fight-against-superbugs

Some other useful references:
https://thebiomedicalscientist.net/science/silent-pandemic-antimicrobial-resistance

https://www.rsm.ac.uk/events/rsm-studios/2021-22/ceq03/

https://bsac.org.uk/antibiotic-resistance-the-other-pandemic-lurking-behind-covid-19/

https://blogs.worldbank.org/health/investing-prevent-antimicrobial-resistance-averting-slow-moving-pandemic