A world without antibiotics?

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Imagine a world without antibiotics. Common infections are life threatening. Pneumonia, urinary tract infections and venereal diseases are incurable. Cancer chemotherapies do not exist. The life expectancy for Canadian men is 47 and 50 for women.

"Antibiotics are arguably the most important drugs discovered in the 20th century," says Gerry Wright, scientific director of the Michael G. DeGroote Institute for Infectious Disease Research and chair of the Department of Biochemistry. "They not only control infectious diseases such as pneumonia and tuberculosis, they enable many modern clinical procedures including cancer chemotherapy, surgery, and transplantation. Without antibiotics, we return to an era where not only do the young and the old routinely die from infections, but where even healthy individuals are at risk."

For World Health Day today (April 7), the World Health Organization (WHO) has put a special focus on antimicrobial resistance and its global spread, particularly the HIV/AIDS, tuberculosis and malaria epidemics. In addition to introducing a six-point policy package to combat the spread of antimicrobial resistance, WHO is calling on governments and stakeholders to implement the policies and practices needed to prevent and counter the emergence of highly resistant superbugs, and to also provide appropriate care to those seriously affected by these microbes.

The culprit to antibiotic resistance is evolution, says Wright. "Antibiotics are unique among drugs as their use causes their demise. If you use it, you lose it. Resistance to antibiotics is now a global problem that is

having a massive effect on the practice of medicine."

Antimicrobial resistance is not a new problem but one that is becoming more dangerous, he explains. "Antibiotics are chemicals (many produced by bacteria themselves) that block the growth of bacteria. Each bacterial cell on the planet, even those that do not cause disease, is equipped with genes that protect it from the natural chemicals circulating in the environment, often including antibiotics. These organisms have been around for more than four billion years; we've been using antibiotics for less than a century. We're simply no match for the numbers and evolutionary history of bacteria. Antibiotic resistance is natural and unavoidable."

The solution to this inevitability, he says, has been to discover new drugs and chemically modify old ones.

In McMaster's Institute for Infectious Disease Research, 38 clinicians and researchers collaborate to examine antibiotic discovery and resistance. For example, Mark Loeb looks at respiratory infections and antimicrobial use and resistance, research trials on SARS, West Nile and pneumonia; Fiona Smaill performs clinical trials of HIV management, vaccines for tuberculosis and management of infections in pregnancy; and Marek Smieja examines HIV in cardiovascular and respiratory disease, diagnostics for virology, pandemic influenza and tuberculosis pericarditis in sub-Saharan Africa.

"The IIDR has incredible potential in the area of drug discovery, antimicrobial resistance, the chemical biology of pathogens and diagnostics research," says Wright. "With a new Centre for Microbial Chemical Biology, which applies the principles of chemistry to the study of biology, and the scientific tools that allow researchers to sequence bacterial genomes, discover and synthesize new molecules, and screen these by the tens of thousands for antibiotic activity using robotic

platforms, we are providing the push for the discovery of new drugs and finding new leads for the next generation of antibiotics."

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