



## Antimicrobial resistance – taking stock

### What is antimicrobial resistance?

Antimicrobial drugs are designed to kill microorganisms (viruses, bacteria, fungi and parasites) that cause life-threatening infections. Microorganisms that were previously eradicated by antimicrobial drugs but now manage to survive in their presence are said to have developed “antimicrobial resistance” (“antibacterial resistance” is sometimes used synonymously, although strictly it only pertains to resistant bacteria). Antimicrobial resistance, which is a worldwide problem, leads to extra mortality and morbidity, with profound economic and social consequences. Tuberculosis, malaria and HIV are three illnesses that have demonstrated ongoing antimicrobial resistance over multiple decades. More recently, antimicrobial resistance has emerged in bacteria that are responsible for common hospital- and community-based infections, such as pneumonia, intra-abdominal infections and gonorrhoea. Modern medicine relies heavily on effective antimicrobials; intra-abdominal surgery, joint replacements, modern obstetrics, organ transplantation, cancer care and the treatment of common infections are all impossible in the absence of effective antimicrobials. The ongoing emergence of resistant antimicrobial organisms thus threatens every aspect of modern medical care. Recognizing this, the World Health Organization (WHO) announced in 2016 that antimicrobial resistance, “Threatens the achievements of modern medicine. A post-antibiotic era – in which minor injuries can kill – is a very real possibility for the 21st century.” Recent years have seen calls to action at all levels of government, in addition to calls for international collaboration.

### What is the size of the problem?

The Centers for Disease Control (CDC) report that two million individuals in the U.S. become infected every year with bacteria that are resistant to antibiotics, and

### What underwriters should know

- Antimicrobial resistance is responsible for extra mortality and morbidity.
- Antimicrobial resistance is now evident in common bacterial infections such as pneumonia and intra-abdominal infections.
- Individuals who have required multiple courses of different antimicrobials are likely to be infected by organisms with antimicrobial resistance.

23,000 die as a result. In 2007 the European Centre for Disease Prevention and Control reported 25,000 deaths per year due to antimicrobial resistance. A recent UK report estimated that, in the absence of any progress in combating antimicrobial resistance, there would be a staggering 10,000,000 deaths globally in 2050, compared to 700,000 today. To provide some perspective for this number, antimicrobial resistance would cause more deaths than cancer. The economic cost would be US\$100 trillion. The implications for the insurance industry are potentially very damaging.

### How did we get into this mess?

It is normal for bacteria to become progressively resistant to antibiotics. In 1945, Fleming and Florey, the discoverers of penicillin, presciently warned about this outcome. Emergent resistance is part of normal Darwinian selection where the fittest bacteria (those that survive antibiotic effect) selectively propagate. However, in recent years a variety of other factors have accelerated the development of resistance. Amongst these are the overuse and misuse of antibiotics in both community and hospital settings, the inappropriate use of antibiotics in livestock (75 percent of all antibiotic

use is in animal feed), and inadequate hygiene and sanitation. All of these promote the emergence of resistant microorganisms. To further aggravate this situation, pharmaceutical companies have not invested in new drug development as the market conditions are deemed to be unattractive. As a result there are few new antimicrobials on the horizon. Furthermore, vaccine development for common bacterial infections, which would mitigate the need for ongoing drug development, is at a virtual standstill.

### What is the solution?

There is no single, simple fix; this makes the solution even more challenging. A comprehensive solution will require international collaboration and substantial investment of capital and manpower. More specifically, a combination of the following is required:

- a public awareness campaign on the dangers of inappropriate antibiotic use,
- judicious prescribing of antibiotics based on accurate diagnostic tests (these are not yet widely available),
- reduction of use of antibiotics in agriculture,
- improvement in sanitation to prevent spread of resistance,
- incentive measures to develop new antibiotics,
- development of new vaccines,
- global surveillance of antimicrobial utilization and drug resistance.

### Will it be successful?

While the challenge is daunting and the implications of failure stark, there is some reason for optimism. Major organizations (CDC, WHO and the World Economic Forum) have produced highly visible reports. Governments of the U.S. and the United Kingdom have invested capital and resources in multi-pronged approaches to the problem. The European Union has imposed restraints on antibiotic use in animal feed, a practice likely to be followed elsewhere. Public-private partnerships for antibiotic discovery are emerging.

## Key summary points

- Antimicrobial resistance is a global problem that threatens the foundations of modern healthcare.
- If unchecked it could cause as many deaths as cancer in 2050.
- The eradication of antimicrobial resistance requires a radical reconsideration of how antimicrobial agents are used, the rapid development of new antimicrobials and a major push to develop vaccines against more common organisms.

Infection surveillance methods continue to evolve and have begun to yield results. New molecular diagnostic kits will permit more judicious prescription of antimicrobials. Time will tell if these initiatives yield results. Over the next five to 10 years, the insurance industry must carefully monitor the biological and epidemiological data about antimicrobial resistance as worsening mortality and morbidity would have a broad impact on life, disability and health insurance.

### Bibliography

1. Marston, H. "Antimicrobial Resistance." *JAMA* 2016;316(11): 1193-1204
2. Nathan, C. "Antibiotic Resistance – Problems, Progress, and Prospects." *NEJM* 2014;371 (19): 1761-3
3. O'Neill, J. "Tackling Drug-Resistant Infections Globally; Final Report and Recommendations." *Wellcome Trust*, May 2016



**Dr. Tim Meagher**  
Vice President and  
Medical Director,  
Munich Re Canada  
Tel: 514 392-5069  
Fax: 514 392-5031  
tmeagher@munichre.ca