



Introduction

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On returning from holiday to St Mary's Hospital in London in 1928, Alexander Fleming discovered something unexpected on a Petri dish containing *Staphylococcus*. Contamination of the plate with a rare *Penicillium* fungus led to a zone of bacterial killing, demonstrating that the fungus was secreting a factor that killed staphylococci.

Fleming observed that an extract from this fungus could kill a wide range of bacteria, particularly Gram-positive bacteria. Subsequent work confirmed that some organisms were susceptible to the *Penicillium* extract, while many, particularly Gram-negative organisms, were not. Indeed the initial application of penicillin published in the *British Journal of Experimental Pathology* in June 1929 appeared to be as a method to differentiate between different bacteria in the laboratory [1]. However, in his Nobel Lecture on December 11, 1945, Fleming had already foreseen the “antibiotic resistance crisis” caused by overuse and underdosing [2]:

But I would like to sound one note of warning. ... It is not difficult to make microbes resistant to penicillin in the laboratory by exposing them to concentrations not sufficient to kill them, and the same thing has occasionally happened in the body. The time may come when penicillin can be bought by anyone in the shops. Then there is the danger that the ignorant man may easily underdose himself and by exposing his microbes to non-lethal quantities of the drug make them resistant.

Thus, through a remarkable accident, one of the greatest medical advances in history was made, *i.e.* the ability to cure disease through antibiotic treatment, and simultaneously the threat of antibiotic resistance was also discovered.

These competing opportunities and threats continue in parallel to this day.

The lung is the key interface between the human body and the microbial world, with an average person with a normal breathing rate inhaling nearly 1 000 000 bacteria per day. It is therefore not surprising that respiratory tract infections are the most common reason for antibiotic prescribing in both primary and secondary care, and a leading cause of mortality worldwide. Despite advances in hygiene and the availability of antimicrobials, TB and pneumonia remain devastating on a global level, while bronchiectasis, cystic fibrosis, pleural

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infection and NTM disease represent some of the most complex and challenging infectious diseases in medicine.

The correct principles of antibiotic therapy are therefore a critical skill for all practising pulmonologists, primary care physicians, infectious disease specialists and allied health professionals with responsibility for respiratory patients.

It is for this reason we are delighted to introduce this *ERS Monograph* dedicated to understanding the pharmacology, administration, clinical role and stewardship of antibiotics in respiratory disease.

This was a challenging *Monograph* to write and edit. Unlike many aspects of respiratory disease, there are rarely large RCTs to guide our therapy, and respiratory infectious diseases are often neglected in terms of research funding and underestimated in terms of public importance.

In the absence of robust evidence, many antibiotic practices have evolved differently in different countries in Europe and worldwide. A patient presenting with severe CAP in Scandinavia may receive intravenous penicillin, while a patient with the same characteristics might receive piperacillin–tazobactam plus macrolide or vancomycin in the USA. Global antibiotic practices are determined by differences in common organisms and antibiotic resistance patterns, but also more obviously, by cultural attitudes toward the risk of missing a serious infection, perceptions of the importance of antibiotic resistance, concerns over litigation and organisation of healthcare.

We are especially pleased, therefore, that this *ERS Monograph* captures important perspectives from Northern, Southern and Eastern Europe as well as the USA and Japan, among others. The topics cover the major indications for antibiotic use, from LRTIs in the community through to severe infections in critical care. Inhaled delivery is extensively discussed, as is the role of antibiotic therapy in airways diseases such as asthma, COPD and bronchiectasis. Pleural infection, TB, NTM disease and respiratory infections in children are also some of the key highlights.

The first *ERS Monograph* on Antibiotics and the Lung was published in 2004 [3]. A key addition to the current book is that we address the emerging risk of antibiotic resistance with chapters on antimicrobial stewardship and the importance of looking to the future of new drug development to tackle this threat.

After a tumultuous 2016, the authors are writing this Introduction a few days before the inauguration of a new US President in January 2017. You will forgive us then, for paraphrasing from a former US President, from a simpler time, to introduce this new *ERS Monograph*:

Ask not what your antibiotics can do for you, ask what you can do for (the responsible use of) antibiotics.

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