Incentivizing Antibiotic Research

By Lila Abassi — May 29, 2016

We heard last week what we've been dreading, but anticipating – the emergence of polymyxin resistance for the first time in the United States. Polymyxins are a class of antibiotics that include the drugs colistin and polymyxin B. Although these drugs have significant drawbacks, including toxicity, they have been the last line of defense against bacteria that have become resistant to all other antibiotics.

This issue generated considerable media attention last year when a resistance gene that renders the polymyxins ineffective was discovered in bacteria in humans and animals in China. The study, which had appeared in *Lancet*, revealed that polymyxins, designated by the World Health Organization as critically important for human use, were the last class of antibiotics effective against infections from drug-resistant *E. Coli, Klebsiella* and *Pseudomonas*. This changed last year when a new polymyxin resistance gene called mcr-1, which is capable of being transmitted within and between species via plasmid-mediated transfer, was identified. This discovery is especially worrisome because these microbes have the capacity to evolve from multi-drug resistant to pan-drug resistant – and these resistant strains have epidemic potential.

Drugmakers and government research labs are working closely together to mitigate what could be a public health disaster. Pharmaceutical companies ditched antibiotic research and development in the 1990s following a foolish policy change at the FDA, which made clinical trials impossibly difficult, time consuming, and expensive(1).
As stated in the *Pharmaceutical Journal* [5], "Mahesh Patel, director of drug discovery research at Wockhardt, says the biggest barrier for companies is the regulatory burden. ‘The costs of trials are so high and society is not willing to pay the high price for antibiotics; so that is the paradox. Society wants a cheaper antibiotic, but the costs of development will be high. So we need to manage these two conflicting needs.’"

The British government has come up with a “lump-sum reward” where the government will pay $1.5 billion to the company that develops a successful antibiotic.

It will be difficult to develop new antibiotics simply by structurally modifying pre-existing drugs. While this may quell the surging tide of antibiotic resistance temporarily, even more resistant and pathogenic strains will almost certainly evolve.

The focus needs to be geared toward developing alternative approaches to bacterial infections such as vaccines. I recently discussed the Antarctic sea sponge, which has properties that help battle MRSA [6](2), and also bacteriophage (or just ‘phage’) therapy [7]. The phage therapy [8] route seems to be the most promising for battling difficult infections.

Again, we are on the brink of something very scary. Antibiotic resistance to me, is the equivalent of an apocalypse. We really don’t have the luxury of time, and we should have dealt with this problem yesterday.

**Notes:**

(1) American Council advisor and antibiotics expert Dr. David Shlaes has been writing about the upcoming crisis in his blog, Antibiotics-the Perfect Storm. Dr. Shlaes also wrote a book with the same title.

(2) Methicillin-resistant Staphylococcus aureus