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Editorial

The Antibiotic Crisis and the Need for New Forms of Antibiotics

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Introduction

The growing menace of antibiotic resistance presents the single most significant threat faced by the global population. The urgency is with the development of new antibiotics. Recently, as a positive step forwards, two new antibiotics have emerged. These two medications are the first new antibiotics to emerge for a decade. Both antibiotics will available to the healthcare providers early in 2015.

Humans face the very real risk of a future without antibiotics. The risks of this scenario include a reduction in life expectancy, which could happen if people begin to die as a direct result of diseases that are currently treatable. This doomsday scenario is the core argument of a study commissioned by the British Royal Pharmaceutical Society (RPS). The report is titled "New Medicines, Better Medicines, and Better Use of Medicines". In the report, the RPS argues that new initiatives are required in order to incentivise companies to undertake research and development into new types of antibiotics. Without this, otherwise, the report warns, people will start "dying from simple surgery" [1].

The RPS sees the main problem being pharmaceutical companies not developing new antibiotics. The report goes onto state that pharmaceutical firms and orientated towards manufacturing drug products for reasons of short-term profitability and for diseases that last for the longer-term (primarily because the need to purchase the drug is for a prolonged period). With the inertia in research and development a structural consequence of capital, RPS argues the only way forwards as government investment. Thus state support is needed to aid pharmaceutical companies in developing new antibiotics.

The Royal Pharmaceutical Society was issued around the same time as a major report from the World Health Organization (WHO) about the global threat arising from antibiotic resistant bacteria [2]. The WHO report indicates that "resistance is occurring across many different infectious agents" but the primary focus of the report is on "antibiotic resistance in seven different bacteria responsible for common, serious diseases such as bloodstream infections (sepsis), diarrhoea, pneumonia, urinary tract infections and gonorrhoea".

One aspect of the WHO report is with skin infections. WHO highlights that one medical consequence of antibiotic resistance is that it leads people to being ill for longer periods and that this, in turn, increases the risk of death. For instance, those who have contracted MRSA (methicillin-resistant *Staphylococcus aureus*) are assessed to be almost two-thirds more likely to die than people who carry non-resistant form of the bacterium. MRSA is a strain of *Staphylococcus* bacteria, associated with various skin diseases and wound infections. The strain of bacterium is resistant to methicillin as well as other antibiotics, such as beta-lactams. The associated diseases become most serious when associated with bloodstream infection. Infections with MRSA are very difficult to treat.

Resistance also increases the cost of health care with lengthier stays in hospital and more intensive medical treatment is required. This serious aspect has some more positive news emerge with publications describing of two new antibiotics.

The first of the new antibiotics is Dalvance. This is a drug that can be administered intravenously. It is used to treat skin as well as soft tissue infections. Dalvance has been approved the U.S. Food and Drug Administration (FDA). The announcement in relation to initial experimental findings was made during May 2014 [3]. Dalvance is designed for the treatment of acute bacterial skin and skin structure infections caused by certain susceptible bacteria like Staphylococcus aureus (including methicillin-susceptible and methicillin-resistant strains) and *Streptococcus pyogenes.* Dalvance was given the green light as part of FDA's recently assembled Qualified Infectious Disease Product directive.

To evaluate the safety and efficacy of Dalvance, the antibiotic was assessed through clinical trials. These studies used 1,289 adults, each with acute bacterial skin and skin structure infections. The subjects for the study were assigned, through random selection; to receive either Dalvance or vancomycin (an alternative antibiotic with a long history of use). The experimental data revealed that Dalvance was as equally effective as vancomycin for the treatment of the bacterial skin diseases. In light of the emerging resistance of bacteria, including S. aureus, to mainstream antibiotics, this experimental finding represented a major step forward towards a new antibiotic [4]. As an indication of the problem of antibiotic resistance, in the U.S.A. alone in excess of 4.8 million hospital admissions, in relation to adults with various types of acute bacterial skin and skin structure infections, were recorded between 2005 and 2011 [5]. The types of skin conditions included erysipelas, cellulitis, significant cutaneous abscess, and various forms of wound infection.

The second drug is branded Oritavancin. Oritavancin is type of lipoglycopeptide with demonstrable bactericidal activity specifically against Gram-positive bacteria. As with Davlance, the antibiotic has been the subject of a clinical trial study. The clinical trial was led by G. Ralph Corey, based at Duke University. The experimental data was made available in June 2014, published in The New England Journal of Medicine [6]. The antibiotic was conceived following increased understanding about the specific mechanisms of antibiotic binding to the Gram-positive bacteria cell wall (primarily the outer cell wall peptidoglycan layer).

The evaluation of Oritavancin consisted of a double-blind trial where adults were selected at random. The participants had acute bacterial skin and skin-structure infections. The study participants were given either a single intravenous dose (1200 mg) of Oritavancin or, alternatively, the same antibiotic used to assess Dalvance: vancomycin. The antibiotics were administered twice per day two weeks. The efficacy of the candidate and control antibiotics was evaluated by examining the extent of spreading or reduction in skin lesion size; as well as absence of associated fever and in avoidance of further treatment with a so-termed "rescue antibiotic" during the 48 to 72 hour following administration of Oritavancin. The data was evaluated against different types of pathogens. This panel included methicillin-resistant Sta*phylococcus aureus.* The obtained results were similar in the two treatment groups. Therefore, Oritavancin, as with Dalvance, was determined to be of equivalence to vancomycin.

With both developments the route of administration was via a one-shot antibiotic infusion. The inference is that intravenous administration can transform the treatment of acute bacterial skin infections and alter how these infections are managed. With the array of currently available drugs several infusions are typically required. However, both Dalvance and Oritavancin appear effective as single-shot treatments. This is probably because the drugs persist for longer periods in the human body. Whilst the appearance of two new antibiotics is hopeful and they will no doubt save many lives, their emergence represents also highlights the lack of progress in relation to other fields of medicine and how far there is still to go in the battle against antibiotic resistant bacteria.

Bibliography

1. *New Medicines, Better Medicines, Better Use of Medicines.* London: Royal Pharmaceutical Society, 2014.
2. World Health Organisation. *Antimicrobial resistance: global report on surveillance 2014.* Geneva, Switzerland: WHO, 2014.
3. U.S. Food and Drug Administration. *FDA approves Dalvance to treat skin infections.* U.S. Food and Drug Administration, 2014.
4. Alam MT., *et al.* "Dissecting vancomycin-intermediate resistance in *Staphylococcus aureus* using genome-wide association". *Genome Biology and Evolution* 6.5 (2014): 1174-1185.

5. Khachatryan A., *et al.* "Rising United States Hospital Admissions for Gram+ Acute Bacterial Skin and Skin Structure Infections (ABSSSIs)". *SHM Poster #3113* (2014).
6. Corey GR., *et al.* "Single-Dose Oritavancin in the Treatment of Acute Bacterial Skin Infections". *The New England Journal of Medicine* 370.23 (2014): 2180-2190.

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