Antibiotics have been heralded as one of the greatest breakthroughs of modern medicine, but years of inappropriate use has seen the rapid development of resistant bacteria.1 In the European Union alone, drug-resistant bacteria are estimated to cause 25,000 deaths and cost more than US$1.5 billion every year in healthcare expenses and productivity losses.2 The situation in the USA is similar with approximately 23,000 deaths reported in 2013 due to antibiotic resistant bacterial infections.3

As bacteria become resistant to more and more antibiotics, and in the absence of new antibiotics being developed, we are on the cusp of a post-antibiotic era, but what could the impact of antibiotic resistance be on medicine?

We look at four areas of modern medicine that in the absence of effective antibiotics could plunge us back into a pre-antibiotic era, where minor infections could kill.

**Surgery and transplants**

In patients, depending on the cleanliness of the wound, the introduction of antibiotics before surgery can reduce the risk of infections by over 30%.4–6

It is estimated that approximately 234.2 million major surgical procedures are undertaken every year worldwide. Whether a facelift, a hip replacement, organ transplants or a triple bypass, antibiotics are used routinely to prevent infections from occurring and to treat infections if they arise.7

Taking routine hip replacement as an example, the current post-operation infection rate is estimated to be 0.5–2.0%. In the absence of antibiotics, this is expected to rise to affect 40–50% of hip replacement operations, with approximately 30% of these infections resulting in the death of the patient.8

Without effective antibiotics, operations such as hip replacements would no longer be considered routine, leaving patients untreated and increasing the healthcare burden.8

**Cancer**

Over the past 40 years, huge progress has been made in the treatment of cancer. In the UK, the 10-year survival rates for cancer more than doubled between 1971 and 2011.9

Surgery to remove a tumour, radiotherapy and chemotherapy all increase the risk of getting an infection, making the support offered by antibiotics an essential part of treating patients with cancer.10

Without effective antibiotics, we are facing a world where treating cancer could become more dangerous than doing nothing; treating patients could potentially expose them to untreatable infections, shortening rather than extending a patient’s life.11

Despite the large numbers of cancer treatments in clinical trials, in a world without antibiotics, many of these may no longer be suitable for use and cancer could once again be seen as a death sentence.
Childbirth

Childbirth has historically been a dangerous time for both the mother and child, although antibiotics have played a large role in reducing the number of deaths.12

Between 1920 and 1970, the number of mothers dying in childbirth dropped from approximately 40/1000 to 1/1000. A major factor driving this reduction was the prevention of deaths due to bacterial infections of the female reproductive tract, otherwise known as puerperal infections.12

Even today, pre-term babies are vulnerable to life-threatening infections due to their less developed immune system and their exposure to common treatments such as ventilation. Most pre-term babies require treatment with antibiotics to survive, with the deaths of one in five pre-term babies being due to infection.13

In the face of less effective antibiotics, damaging long-term complications may become more common and survival rates of both mother and child may decrease as doctors are no longer able to control infections.13

Diabetes

Diabetes is characterised by the body’s impaired ability to regulate and use sugar, leading to high blood-sugar levels. High blood-sugar levels have been linked to a reduced immune response, making people with diabetes more susceptible to infections.14,15

Approximately 347 million people worldwide have diabetes, although this number is increasing. In 2012, diabetes was the direct cause of approximately 1.5 million deaths. By 2030, diabetes is predicted to be the seventh leading cause of death in the world, but could this be an underestimate?14

At the moment antibiotics can be used to manage minor infections, and even to support the limb amputations that are sometimes required, but in a future without antibiotics, the life expectancy of this growing section of the world’s population could drop dramatically.15

Antibiotics, along with aseptic techniques, improved nutrition and a number of other areas of medicine, forms part of the foundations of modern medicine. Unless action is taken to both preserve current antibiotics and to increase development of new antibiotics, we risk losing much of the progress that has been made.

References

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