

# Death from an untreatable infection may signal the start of the post-antibiotic era

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The ASID perspective on the most important infectious diseases problem of 2017 and beyond

On 12 January 2017, the United States Centers for Disease Control and Prevention reported that a woman in Nevada had died from an untreatable Gram-negative infection resistant to all available classes of antibiotics.<sup>1</sup> The woman had sustained a fractured femur, complicated by osteomyelitis, while travelling in India, necessitating hospitalisation and intravenous antibiotic treatment. After returning to the US in mid-2016, she was admitted to hospital with systemic inflammatory response syndrome, probably secondary to a hip seroma that developed after the earlier surgery, and a pan-resistant *Klebsiella pneumoniae* was isolated from a tissue specimen; the woman died of untreatable septic shock.

Although infections by antimicrobial-resistant organisms are now common, we and other infectious diseases physicians, microbiologists, and public health experts in Australia and around the world are deeply alarmed by this report, as it may herald a post-antibiotic era in which high level antimicrobial resistance (AMR) is widespread, meaning that common pathogens will be untreatable. Should this be the case, it would profoundly affect all areas of health care, and society. Simple childhood infections would once again be life-threatening events, major surgery would be associated with high mortality, chemotherapy for cancer and organ transplantation would no longer be possible.

There is increasing international recognition that AMR is one of the major public health problems of our time. An independent review of AMR prepared for the United Kingdom government recommended a global public awareness campaign, reducing unnecessary antibiotic use in agriculture, and providing incentives for both AMR diagnostics and new drug development.<sup>2</sup> The authors of the report emphasised that these goals could not be achieved without the concerted participation of the United Nations and G20 group. In September 2016, the G20 declared AMR a serious threat to public health, economic growth, and global economic stability, and called for prudent antibiotic use and action to tackle AMR.<sup>3</sup> The UN General Assembly held a special summit later the same month at which several countries affirmed national action plans for dealing with AMR.<sup>4</sup>

The Australian government has been proactive in its response to AMR, promptly forming the Australian Antimicrobial Resistance Prevention and Containment Steering Group, led by the secretaries of the federal Departments of Health and Agriculture. Australia's first National Antimicrobial Resistance strategy was released in June 2015, supporting a "One Health" approach to mitigating AMR (that is, recognising that human, animal and environmental health are



interrelated),<sup>5</sup> and was soon followed by an implementation plan.<sup>6</sup> Our challenge is to translate this plan "into swift, effective, life-saving actions across the human, animal and environmental health sectors", as the Director-General of the World Health Organization, Margaret Chan, has urged.<sup>4</sup>

The per capita consumption of antibiotics by people in Australia is among the highest in the world.<sup>7</sup> Australian prescribers and consumers need to reduce antibiotic use in both humans and animals. The National Health and Medical Research Council National Centre for Antimicrobial Stewardship is leading national initiatives to adapt human antimicrobial stewardship to busy clinical practices in both the hospital and community settings, with the aim of improving prescribing behaviour.<sup>8</sup> The Royal Australasian College of Physicians and the Australasian Society for Infectious Diseases (ASID) have recently developed a list of the top five low value interventions in infectious diseases,<sup>9</sup> as discussed by Spelman and colleagues in this issue.<sup>10</sup> Four of the five recommendations are related to reducing antibiotic use in settings where they are of limited value: asymptomatic bacteriuria, leg ulcers without clinical infection, upper respiratory tract infections, and treating faecal pathogens in the absence of diarrhoea.<sup>9</sup> The Australian Veterinary Association has released guidelines for the prescribing of veterinary antibiotics, but antimicrobial stewardship in animals and agriculture is yet to be established.<sup>11</sup>

To have an impact on AMR, we will need to address all its drivers in Australia, including unrestrained use of antibiotics and poor infection control in both humans and animals, the decline of antibiotic research and development, and the introduction of AMR by ingesting imported food products (eg, seafood and meat) that contain AMR organisms, particularly if antibiotics were employed during their production, and through international travel. Coordination of these actions will be critical, but also complex in Australia, as health departments, antimicrobial prescribing, and

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communicable diseases surveillance are regulated by state-based authorities, while the federal government regulates quarantine, biosecurity, and the licensing and subsidising of medicines. The Australian Medical Association has recently called for immediate establishment of an Australian National Centre for Disease Control, “with a national focus on current and emerging communicable disease threats, engaging in global health surveillance, health security, epidemiology and research”.<sup>12</sup> Such a body could operate in a similar manner to the European Centre for Disease Prevention and Control (ECDC), complementing and coordinating existing state- and territory-based activities.

The recent death from an untreatable infection in Nevada provides a preview of a future without effective antibiotics. A list of tangible actions against each of the drivers of AMR, coordinated across human and animal health and agriculture, must be an urgent priority. ASID, the Australian Society for Antimicrobials, and animal health societies will host government representatives and stakeholders in June 2017 at the second Australian AMR Summit in Melbourne, with the aim of drafting this action list.

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