Editorial: Antimicrobial resistance in Australia

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This supplement of *Communicable Diseases Intelligence* contains articles describing various aspects of the problem of antimicrobial resistance (AMR) in Australia. Three years ago, the Joint Expert Committee on Antibiotic Resistance (JETACAR) released a landmark report entitled *The use of antibiotics in food-producing animals: antibiotic-resistant bacteria in animals and humans*. This report reviewed the scientific evidence on the link between the use of antibiotics in food-producing animals, the emergence and selection of antibiotic resistant bacteria and their spread to humans. In addition, evidence based recommendations were made for the future management of antibiotic use in Australia. In all, 22 recommendations covering areas such as regulatory controls, monitoring and surveillance, infection prevention, education, research, communication and coordination were made. This supplement is an attempt to inform Australian prescribers, regulators and stakeholders on the current state of knowledge about various aspects of antimicrobial use, resistance and surveillance in humans and animals.

Articles were invited from recognised experts in January 2002. Thirty-two abstracts were received of which 28 were peer-reviewed and accepted for this supplement. Papers have been grouped under the following themes.

Introduction

Alexandra Geue, former Director of the Infection Management Section, Department of Health and Ageing, describes the progress towards a national antibiotic resistance management program since the JETACAR report. Tim Dyke from the National Registration Authority for Agricultural and Veterinary Chemicals, describes the regulation of veterinary antibiotics in Australia.

Education and prescribing

Management of antibiotic resistance starts with rational and appropriate use of antibiotics. The *Antibiotic Guidelines* has been an essential resource for Australian physicians to prescribe according to best practice. Harvey and colleagues describe 25 years of development of the *Guidelines* and innovations designed to improve access to the *Guidelines*, for example by integration into clinician's electronic desktops.

Promotion of best practice prescribing guidelines in a tertiary hospital setting is described in the paper by Tiley and colleagues. Guidelines for appropriate antibiotic use in the management of pneumonia, surgical prophylaxis and wound infection were developed with restrictions on the use of certain antibiotics. Implementation of these guidelines in a variety of novel ways with regular reviews seems to have already had an impact on the prevalence of vancomycin resistant enterococci and *Clostridium difficile* infection in this hospital.

Innovative methods to measure antibiotic usage in South Australian hospitals are described by Dollman and Cooper. Eight metropolitan public and private hospitals now electronically provide data on antibiotic prescribing for four major classes of antibiotics to the Communicable Disease Control Branch of the Department of Human Services, South Australia. These data will be used to monitor trends in antibiotic usage and to compare with trends in AMR. This experience will be useful in developing similar surveillance systems in other Australian jurisdictions.

Thomas and Riley provide evidence that restriction in the use of third generation cephalosporins can reduce the prevalence of *Clostridium difficile* associated diarrhoea, an indicator of inappropriate antibiotic use and antibiotic resistant bacteria. Rational use of antibiotics can control and even reverse levels of antibiotic resistance in hospital settings.

Changing antibiotic prescribing practices in general practitioners (GPs) in Canberra was assessed by means of a randomised control trial conducted by Wilson and colleagues. Involving GPs in the development of evidence-based clinical guidelines for the treatment of acute respiratory infections led to a significant decrease in the rate of prescribing. The National Prescribing Service offers GPs education and audit of antibiotic prescribing. Patterson and colleagues describe the results of two audits of GP prescribing practices for otitis media (in 1999) and sinusitis (in 2000). Rates of inappropriate antibiotic prescribing for upper respiratory tract infections by Australian GPs, however, remains high at around 50 per cent.

Consumer education programs through National Medicines Weeks (1996–1998) are described by Donovan. Consumer education has also been incorporated into the recent National Prescribing Service campaign *Common colds need common sense*, which aims to discourage inappropriate antibiotic prescribing and consumption in people with common colds. Consumer education is an important contribution to the appropriate consumption of antibiotics in Australia.

Surveillance

Several groups and networks have been, and continue to be active in the surveillance of AMR in Australia. The Australian Group for Antimicrobial Resistance have provided data on the prevalence of AMR in important pathogens in Australia for the past 15 years. The paper by Nimmo and colleagues provides important high quality data on the prevalence of resistance to major antibiotics in important pathogens in Australia.

The Australian Hospital Morbidity Database managed by the Australian Institute of Health and Welfare is a source of important data on antimicrobial resistance in Australian hospitals. An analysis of these data by International Classification of Disease codes specific for AMR infections between 1994–1995 and 1998–1999 is given in the paper by Hargreaves and Kok.

Australian laboratories are part of regional surveillance networks monitoring AMR in the Asia Pacific region and South Africa through the SENTRY antimicrobial surveillance program. The paper by Bell and Turnidge shows relatively moderate prevalence of antimicrobial resistance in Australia compared with other regional countries. The SENTRY program has published a number of significant reports over the years and this paper provides regional data of importance to the management of antibiotic resistance in Australia.

Rapid and timely data on antimicrobial resistance has been difficult to achieve in Australia. Turnidge and members of the Surveillance Network (TSN), describe a recent development in the automatic collection and analysis of data from Australian laboratories. TSN has accumulated more than 14 million results since 1996 and provides subscribers with an interactive access to a database which is growing at 300,000 records per month. Unfortunately access to these data are limited, although the collection is now undoubtedly the most comprehensive in Australia.

John Tapsall describes the role of surveillance in the management of AMR illustrating this with data on quinolone resistant gonococci and penicillin resistant meningococci in New South Wales between 1995 and 2001. Development of resistance to quinolones in the gonococci has impacted on the treatment of these infections, while penicillin remains a useful first-line treatment for meningococcal infections since resistance to this antibiotic has not developed to the same extent.

A similar picture of increasing resistance to ciprofloxacin in gonococcal isolates in Victoria since the late 1990s, with a particularly large increase in resistance in gonococcal infections acquired outside Australia, is shown in the paper by Veitch. Similarly, higher rates of resistance in *Campylobacter* infections acquired overseas were observed by Sharma *et al* in their study of isolates from residents of the Hunter region of New South Wales. This paper also provides evidence of the utility of 'resisto-typing' for describing the epidemiology of this common cause of bacterial gastroenteritis.

Surveillance of major nosocomial infections are described in a trio of papers. Cooper describes another innovative surveillance system from South Australia where state-wide monitoring of methicillin resistant *Staphylococcus aureus* has been in place since December 2000. Pearman describes an outbreak of vancomycin resistant *Enterococcus faecium* in a Western Australian hospital in 2001 and novel contact tracing and screening methods. An analysis of five years of data on quinolone resistance in *E. coli* in Australia from the TSN database is presented by Turnidge *et al*. Levels of resistance to these antibiotics in this organism remain at low levels in Australia.

Rapid methods of identifying resistant organisms are urgently needed. Jones and colleagues describe polymerase chain reaction methods that screen for antibiotic resistance genes in integrons. Polymerase chain reaction methods may allow the rapid identification of resistance and aid in timely surveillance.

Antibiotic resistance in animals

The JETACAR report confirmed that there was evidence of the spread of antibiotic resistant bacteria from animals to humans and recommended that the use of antibiotics in animals as growth promotants be limited. Further, JETACAR recommended the surveillance of antibiotic resistance bacteria in food-producing animals and veterinary areas. Four papers in this supplement address the surveillance of antibiotic resistant bacteria in animals.

Webber and Valois survey the recommendations of the JETACAR report as regards surveillance in animals, review surveillance programs in other countries and discuss strategies to implement surveillance in Australia. Jordan discusses sampling methodologies for the surveillance of antibiotic resistant *Escherichia* in food animals and describes a novel sampling method that has been successfully trialed in dairy cattle in New South Wales.

Barton and colleagues review Australian data on resistance in bacteria from food producing and veterinary animals. Although data are sparse the resistance patterns detected are similar to those overseas and reflect antibiotics used for growth promotion and treatment in animals. Veterinary data from a regional laboratory on cattle and pigs in Queensland (1999 to 2001) are presented in the paper by Stephens. This laboratory services an area that has 45 per cent of the State's cattle and more than half of Queensland's pigs. Patterns of resistance detected in this setting need, however, to be interpreted with caution because of the small and selective sample of animals tested.

Infection control

Two papers discuss methods and policies to reduce health care acquired infections. Nosocomial infections in hospitals are frequently resistant to multiple antibiotics and are increasingly untreatable with available medications. Prevention of such infections is a high priority in the management of antibiotic resistance in Australia.

Richards and colleagues describe the work of the Australian Council on Healthcare Standards (ACHS) which has been developing infection control indicators in collaboration with medical associations and the Australian Infection Control Association. These have been published in the 2002 edition of the ACHS clinical indicators users' manual. Standardised indicators aid surveillance and allow comparisons of rates of antibiotic resistance over time and between institutions.

The Australian Council for Safety and Quality in Health Care provides a summary of the outcomes from the April 2002 *National workshop to reduce health care associated infection*. Five priority areas identified by the workshop have been passed on to the Council and Australian Health Ministers to guide policy in reducing health care associated infections.

Vaccines and alternative approaches to treatment.

The supplement concludes with two papers which discuss the potential impacts of vaccines and alternative therapies on the prevalence of AMR. Dagan discusses the potential for new seven-valent conjugate pneumococcal vaccines to reduce the levels of penicillin resistant *Streptococcus pneumoniae*. As this vaccine was recently introduced into Australia in a program aimed at children with very high rates of disease and a substantial proportion of isolates from these cases are resistant to treatment with penicillin, the potential for this vaccine to control antibiotic resistance is of great interest.

Finally, Carson and Riley review non-antibiotic approaches to the treatment of infectious diseases. Probiotics, bacteriophages and phytomedicines are all approaches with potential for the control of antibiotic resistance and there will be much activity in developing these therapies in the future.

The editors thank all contributors to this supplement on antibiotic resistance in Australia. We would like to thank Alexandra Geue, Robyn Leader and Lindsay Blackburn of the Infection Management and TSE Section, Department of Health and Ageing, for initiating and coordinating the contributions for this supplement. The editors believe this collection of articles will be an important reference collection as national surveillance for antibiotic resistance commences and the management of antibiotic resistance in Australia moves forward.