Chapter 6

AMR education and research

6.1 This chapter examines the implementation of the JETACAR recommendations in relation to education and research.

Education

6.2 JETACAR recommendations 15 to 17 urged the development of prudent use codes of practice for antibiotics; regularly updated antibiotic use guidelines; and the development of continuing educational programs on AMR by learned (medical and veterinary) and professional societies. Recommendations 19 and 20, which related to communications, also called for the development of an ongoing education strategy to provide appropriately targeted information on AMR to relevant professional bodies, stakeholders and the general public. The Government supported these recommendations.

6.3 In relation to education, DoHA noted that the Government continues to fund education programs and awareness campaigns to ensure that health professionals, industry and the community are informed about antibiotic use. Part of this program is undertaken by the National Prescribing Service NPS. Relevant NPS activities include NPS News and Australia Prescriber journal; education on targeted therapeutic programs; and consumer awareness campaigns as well as a medicine line that consumer can call for information.[1]

6.4 DoHA also commented that the implementation of activities to address AMR in Australia is a shared responsibility between governments, industries, educators, health and veterinary professionals and the community.[2] One group providing education in relation to antibiotic use is NSP MedicineWise. NPS MedicineWise is currently running a campaign aimed at reducing the prescription of antibiotics by 25 per cent over five years. In April 2013, NPS launched a comprehensive campaign encouraging all Australians to become 'antibiotic resistance fighters'.[3]

6.5 Two key communication campaigns were identified by DoHA: Antibiotic Awareness Week; and the National Hand Hygiene Initiative. Antibiotic Awareness Week is a global initiative that aims to raise awareness of the importance of appropriate use of antibiotics in our hospitals and the community. The National Hand Hygiene Initiative is delivered on behalf of the ACSQHC by Austin Health. Its success has been recognised by the WHO which awarded the Initiative a 'Centre of Excellence Award' in 2011. DoHA noted that in 2012, 569 hospitals contributed data

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1 Department of Health and Ageing and portfolio bodies joint submission, *Submission 32*, pp 17–18.

2 Department of Health and Ageing and portfolio bodies joint submission, *Submission 32*, p. 2.

3 Dr Lynn Weekes, Chief Executive Officer, NPS MedicineWise, *Committee Hansard*, 7 March 2013, p. 20.

to the national initiative, comprising over 90 per cent of public hospitals and over 50 per cent of private hospitals.[4]

6.6 In relation to the veterinary aspects of recommendations 15 to 17, DAFF stated that it understands that these obligations have been, and continue to be, fulfilled. For example, state and territory veterinary registration boards have developed codes of practice and antibiotic use legislation is in place. In addition, the AVA has published guidelines on the use of veterinary medicines and policies on use of antimicrobial drugs.[5] DAFF also noted that part of its website is dedicated to AMR issues associated with food producing animals and food regulation and safety, and the Codex Adhoc Intergovernmental Task Force on Antimicrobial Resistance.[6]

Concerns with the implementation of recommendations relating to education

6.7 To successfully address the growth of AMR, effective education programs will be required for medical professionals, veterinarians, the public sector and the community. The implementation of the JETACAR recommendations relating to education appears to have been progressed significantly. However, important issues were raised in evidence including the effectiveness of education programs for both practitioners and the community. For example, the committee was informed that, in spite of the various education programs that had been conducted, Australia's antibiotic usage remains high.[7] Over the period 2005–06 to 2010–11, the aggregate antibiotic utilisation rates for hospitals increased from around 930 to 985 daily defined doses per 1000 occupied bed days.[8] In total, more than 22 million prescriptions for antibiotics are issued each year.[9]

6.8 Submitters pointed to a number of significant areas where improvements in education could be undertaken for both the community who seek antibiotics, and practitioners who prescribe them.

6.9 Submitters argued that properly targeted education campaigns can have a significant impact on prescribing rates. Friends of the Earth Australia pointed to Scandinavia where more than a decade of education campaigns have contributed to some of the lowest levels of superbugs in the world.[10] NPS MedicineWise provided further detail on what has been achieved in Scandinavia:

> They have run a campaign and evaluation between 1994 and 2004 where they implemented surveillance and education. They saw a fall in

4 Department of Health and Ageing and portfolio bodies joint submission, *Submission 32*, pp 18–20.

5 Department of Agriculture, Fisheries and Forestry, *Submission 12*, p. 9.

6 Department of Agriculture, Fisheries and Forestry, *Submission 12*, p. 10.

7 The Australia Institute, *Submission 13, Attachment 1*, p. 13; Dr Lynn Weekes, Chief Executive Officer, NPS MedicineWise, *Committee Hansard*, 7 March 2013, pp 20–22.

8 National Antimicrobial Utilisation Surveillance Program, *Annual Report 2011–2012*, p. 11.

9 Public Health Association of Australia, *Submission 14*, p. 11.

10 Dr Gregory Crocetti, Friends of the Earth Australia, *Committee Hansard*, 7 March 2013, p. 3.

> prescriptions from 536 prescriptions per thousand population per year down to 410 prescriptions per thousand per year. Those rates have been sustained. They still have the lowest recorded levels of MRSA. So they are seeing the lowering of prescribing translating into lower rates of the antibiotic resistant infections.[11]

6.10 The ASA also emphasised the importance of ensuring that education campaigns were sustained and coupled with audit and feedback on outcomes:

> Research has demonstrated that the education campaigns and guidelines are ineffective unless they are combined with sustained interventions such as audit and feedback methods and/or a system where proactive steps are taken to assist prescribing and interventions are made to address poor performance.[12]

6.11 NPS MedicineWise concurred with the need for sustained education programs and noted that each time it had undertaken an education campaign and implemented a program to fight antibiotic resistance, evaluation has shown a decline in antibiotic prescribing and a rise in community awareness. However, when the campaigns have ceased, and in the absence of ongoing effort, some of the gains have been lost.[13]

6.12 A common theme in the inquiry was the continuing overuse of antibiotics in situations where they were not really needed, or where their effectiveness was questionable, such as in the presence of viral infections. The CHF indicated that their research showed that there is continued widespread confusion about the efficacy of antibiotics in the treatment of viral and bacterial infections.[14] NPS MedicineWise also noted that consumers create significant demand for antibiotics:

> Recent NPS research found approximately 1 in 5 Australians still expect to receive antibiotics when they visit their GP with a cough or cold. This number increased to 76% – 3 in 4 people – if they had an ear, nose, throat or chest infection, with 53% stating they would ask for a prescription if one was not supplied by the GP. Consumers need to understand how antibiotics work, which conditions they don't work for, and have a broader understanding of the impact their treatment choices will have on the future of available effective treatments for life threatening infections.[15]

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11 Dr Phillipa Binns, Clinical Adviser, NPS MedicineWise, *Committee Hansard,* 7 March 2013, p. 21.

12 Australian Society for Antimicrobials, *Submission 5,* p. 8.

13 Dr Lynn Weekes, Chief Executive Officer, NPS MedicineWise, *Committee Hansard,* 7 March 2013, p. 20.

14 Consumer Health Forum of Australia, *Submission 10,* p. 2.

15 NPS MedicineWise, *Submission 30,* pp 1–2.

6.13 Friends of the Earth, CHF and NPS MedicineWise argued that educating consumers is vital if the usage rates of antibiotics are to be reduced.[16] NPS MedicineWise concluded that to ensure that unnecessary prescribing rates for antibiotics decline and consumers change their behaviour, ongoing education campaigns are required:

> Previous NPS research has shown during and immediately after an antibiotic campaign has been run prescribing rates decline, however once the campaign is out of mind antibiotic prescribing starts to increase. An investment needs to be made in longer funded campaigns to achieve adequate population exposure.[17]

6.14 In relation to practitioners, submitters commented on university curricula and the attitudes to AMR and prescribing of those who working in the community. Associate Professor Gottlieb highlighted gaps in the university curricula for the education of medical professionals:

> Where we have not kept up to date in an educational way is in university curricula where there is very little mention of antimicrobials. Our medical students, as an example, and I am sure those in other areas as well, hardly hear about the problems of antimicrobial resistance. It is up to individuals lecturers to mention it. They walk into hospitals, particularly surgical trainees and so on, not having much of an idea of the scale of the problem. If you do not get to people early then you may lose them.[18]

6.15 Similar concerns about training in the veterinary use of antibiotics were raised by Professor Barton:

> In veterinary schools although the microbiologists will educate students about responsible antimicrobial use and the risks to animal and human health from antimicrobial resistance, once the students get into the clinical years this is dismissed as irrelevant by many of the clinician veterinarians and the vets with whom they do work experience.[19]

6.16 As AMR is an international problem and thus resistance entering Australia from other countries is a significant challenge, Associate Professor Gottlieb noted that Australia could have an educational role internationally if we are able to get our own house in order:

> I see there is a huge problem in Asia—in South-East Asia, China and so on. We can lead by example. There is no reason why Australia cannot contribute to the dialogue that is out there. So I think we have an

16 Dr Gregory Crocetti, Nanotechnology Campaigner, Friends of the Earth Australia, *Committee Hansard*, 7 March 2013, p. 5; Dr Lynn Weekes, Chief Executive Officer, NPS MedicineWise, *Committee Hansard*, 7 March 2013, p. 20; Consumer Health Forum of Australia, *Submission 10*, p. 2.

17 NPS MedicineWise, *Submission 30*, p. 3.

18 Associate Professor Thomas Gottlieb, President, Australian Society for Antimicrobials, *Committee Hansard*, 7 March 2013, p. 39.

19 Professor Mary Barton, *Submission 7*, p. 5.

> educational role. But before we extend ourselves over there we have to be seen to be doing the right thing here as well.[20]

Conclusions

6.17 The education recommendations appear to be one of the areas more effectively addressed following JETACAR. However, much remains to be done, given the continuing increases in antimicrobial usage and resistance in the community with more than 22 million prescriptions for antibiotics being issued each year.

6.18 One of the reasons for the high usage of antibiotics is the poor understanding in the community of efficacy of antibiotics in the treatment of viral and bacterial infections. JETACAR also noted that farmers who have infected animals under veterinary care similarly have a poor understanding of the use of antibiotics. In order to improve the understanding of the correct use of antibiotics, education campaigns are required. The committee was provided with examples of successful education campaigns which have led to the increased awareness and reduction in antibiotic usage rates. However, to achieve a real and sustained change in behaviour, education campaigns must be well targeted and sustained.

6.19 Submitters also pointed to the lack of focus in both medical and veterinary curricula and ongoing education for those already in the workforce.

6.20 The committee notes that as part of the proposed new national strategy to address AMR, matters to be addressed include education and stewardship and community and consumer campaigns. The committee welcomes the inclusion of these matters in the national strategy. Further, the committee considers that education campaigns under the national strategy must take account of some of the issues identified in this inquiry, including:

- better linkages to monitoring and evaluation so the effectiveness of education programs can be determined;
- ensuring that efforts are sustained, rather than being of a start-stop nature;
- focussing on consistency of education and communication across hospitals, healthcare facilities, general practitioners, veterinarians, agriculture and the community;
- consistency of education within different levels in particular disciplines, across disciplines (medicine and veterinary), and across jurisdictions; and
- making contributions to education with Australia's trading partners and neighbours.

Research and development

6.21 The JETACAR report observed that Australia had a high level of expertise in the molecular biology of antibiotic resistance. However, the lack of a centrally coordinated research facility or agenda had resulted in several important areas needing

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20 Associate Professor Thomas Gottlieb, President, Australian Society for Antimicrobials, *Committee Hansard*, 7 March 2013, p. 40.

attention, including alternatives to antibiotic growth promotants for animal production, alternatives to other antibiotic uses in animals and humans (including vaccines), epidemiology of resistance (including molecular epidemiology and gene transfer mechanisms), effects of intervention programs (for example, to reduce levels of prescribing and antibiotic use), clinical efficacy and rapid diagnostic methods. JETACAR recommended that all relevant research funding agencies give priority to research into AMR.

6.22 The Government acknowledged that research into the areas identified by JETACAR played an important and necessary role in controlling the emergence and impact of antibiotic resistance. The Government also acknowledged that Australia had access to research being undertaken overseas which should be used to guide Australian research priorities and assist in making evidence-based policy decisions.[21]

6.23 DoHA provided information on NHMRC research funding relating to AMR and noted that it has increased dramatically over the last ten years. In 2002, NHMRC invested $1.0 million in AMR research across 13 grants. By 2012, this amount had grown nine-fold to $9.7 million across 65 grants (forecast expenditure). The NHMRC's Strategic Plan (2010–2012) identified *Planning for emerging infectious disease threats* (including AMR) as a strategic research priority. The Strategic Plan for 2012–2015 will continue funding for AMR research.

6.24 DoHA also noted that in 2012, NHMRC launched the Research Translation Faculty, a major strategic initiative for health and medical research translation in Australia and commented that 'this initiative will support more effective and accelerated translation of health and medical research into improved policy and practice in Australia…AMR is one of the health issues that will be considered for action by the Faculty during the current NHMRC triennium, 2013–2015.'[22]

6.25 One program funded by the NHMRC is the Centre for Research Excellence in Minimising Antibiotic Resistance in Acute Respiratory Infections. This program is investigating issue including side-effects of antibiotics, the extent of benefits of antibiotics for acute respiratory infections, changes in prescribing practice and whether changes to packaging can improve the use of antibiotics.[23]

6.26 Research is also undertaken by industry associations. This research has been conducted on molecular diagnostic tools, innate immune systems, predisposing factors, capabilities to investigate AMR in the red meat supply chain, chicken meat programs such as enhancing bird performance, antibiotic replacement, and AMR in

21 Department of Health and Ageing and portfolio bodies joint submission, *Submission 32, Attachment 1*, The Commonwealth Government Response to the Report of the Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR), August 2000, p. 29.

22 Department of Health and Ageing and portfolio bodies joint submission, *Submission 32*, p. 19.

23 Centre for Research Excellence in Minimising Antibiotic Resistance in Acute Respiratory Infections, *Submission 4*, p. 1.

pork.[24] The committee was also informed that some industry research investigating AMR in red meat had informed the conduct of subsequent government studies:

> This research demonstrated, for the industry, the low level of resistant bacteria in animals and in meat, well before the DAFF and DoHA reports were released. In fact, industry funding developed capability that was utilised to perform the work presented in the DoHA report and provided a valuable insight into how to conduct the study. A contract has been entered into for the conduct of a survey to produce new data on antibiotic resistant bacteria in cattle. This study will be comparable to the earlier studies and also collect data of interest to current concerns. The medical community is being consulted about the details of this survey.[25]

6.27 The CHF concluded that much has been done to advance the research envisaged in recommendation 18, and that 'research into antimicrobial resistance itself has largely been recognised as a priority'.[26]

Concerns with the implementation of recommendations relating to research

6.28 Not all submitters supported the view that the AMR research program responds comprehensively to the JETACAR recommendation. The ASM, for example, lamented the failure to develop a comprehensive research agenda, although it acknowledged that there had been initial flurry of activity in the research sphere following the release of the JETACAR report. This activity included support for research in a variety of agricultural pursuits by the Rural Industries Research and Development Corporation.[27]

6.29 However, both ASM and the ASA noted that the NHMRC's attempt to establish a targeted AMR management research agenda has been unsuccessful despite the Commonwealth in its response to JETACAR acknowledging that research plays an important and necessary role in controlling the emergence and impact of AMR. Similarly, a bid for a Cooperative Research Centre into Antimicrobial Resistance Management was not supported.[28]

6.30 While the recent NHMRC funding for a centre for clinical research excellence at Bond University to investigate AMR was viewed as a positive step, other submitters noted that generally, there is a lack of funding for AMR.[29] Professor Barton

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24 Australian Lot Feeder's Association, *Submission 11*, p. 7; Cattle Council of Australia and Sheepmeat Council of Australia, *Submission 16*, p. 6; Australian Chicken Meat Federation, *Submission 24*, p. 8; Australian Pork Limited, *Submission 27*, pp 7–8.

25 Joint submission by the Cattle Council of Australia and Sheepmeat Council of Australia, *Submission 16*, p. 6.

26 Consumers Health Forum of Australia, *Submission 10*, p. 2.

27 Australian Society for Microbiology, *Submission 6*, p. 2.

28 Australian Society for Microbiology, *Submission 6*, p. 2; Australian Society for Antimicrobials, *Submission 5*, p. 4; Professor Julian Rood, Past President, Australian Society for Microbiology, *Committee Hansard*, 7 March 2013, p. 45.

29 Dr Lynn Weekes, Chief Executive Officer, NPS MedicineWise, *Committee Hansard*, 7 March 2013, p. 21; Professor Matthew Cooper, *Committee Hansard*, 7 March 2013, pp 27–30.

commented that there is little funding for AMR research from the NHMRC and argued that this was an outcome of the NHMRC's focus on esoteric science rather than on practical measures to address AMR. Professor Barton also noted a limited level of interest from industry on AMR research:

> I was the beneficiary of funding from RIRDC Chicken Meat, the then Pig Research and Development Corporation and then Australian Pork Limited to carry out some baseline studies and the Meat and Livestock Australia have funded some work in the beef feed lot industries. Other industry funding bodies appear to have no interest – some respond that antimicrobial resistance is a public health issue and so research should be funded by the NHMRC.[30]

6.31 Professor Cooper also commented on the NHMRC research priorities and argued that the low level of AMR research funding does not reflect that rates of deaths caused by AMR:

> In the last round for the NHMRC less than 2 per cent of the budget was allocated to infectious disease research. Of that, going through the grants awarded, only $2.6 million was awarded to antibiotic research and new antibiotics. That is a very, very small number. We estimate that the cost to the Australian economy is definitely in the hundreds of millions and may be even higher. The amount of research funding available for antibiotics is less than 1 per cent of the cost to the economy. That doesn't make sense. So we need to review our research priorities in this area.[31]

6.32 Similarly, the AVA commented that the funding for antimicrobial research is 'well below what the subject demands' and may indicate that this 'area has not attracted the priority it deserves by governments and other funding agencies'.[32]

6.33 The ASM suggested that the apparent disinterest in adopting a comprehensive research agenda may have been the result of the Government's response to recommendation 18 which 'could be read to imply that Australia could just adopt the outcomes of research that was conducted overseas'. The ASM stated that such a view 'totally ignored the unique conditions present in Australia in both human health and agriculture'.[33]

6.34 Submitters called for a greater emphasis on AMR research and suggested a number of ways to achieve this.[34] The ASM recommended that an inter-sectorial group be re-established to re-formulate a strategic research plan for AMR management in Australia.[35] The AVA submitted that it would be very useful to have a

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30 Professor Mary Barton, *Submission 7*, p. 5.

31 Professor Matthew Cooper, *Committee Hansard*, 7 March 2013, pp 29–30.

32 Australian Veterinary Association, *Submission 35*, p. 16.

33 Australian Society for Microbiology, *Submission 6*, p. 2.

34 See for example, Australasian Society for Infectious Diseases, *Submission 18*, p. 3.

35 Australian Society for Microbiology, *Submission 6*, p. 2.

central register of research on AMR across human and animal species that included some assessment of the effectiveness of the research being carried out.[36]

6.35 The ASA suggested that a new approach is needed with a focus on epidemiology in both human and animal settings and on effective interventions for the public sectors, focusing on education and behavioural change. The ASA went on to comment:

> Despite funding by the NHMRC and other bodies for basic science research on microbiology, many essential aspects, such as research into educational interventions required to combat antibiotic resistance do not find a ready place in existing project grant structures.[37]

6.36 The PHAA also advocated for research directions that include epidemiological studies and translation of basic research findings into practical applications for prevention diagnosis and treatment of resistant infections.[38] Professor Rood noted that difficulties of accessing funding for epidemiology research.[39]

6.37 In addition, the Antimicrobial Resistance Summit in 2011 addressed research and called for 'a major research effort targeting all aspects of this threat to human and animal health in terms of causes, consequences, new antimicrobial agents, and prevention strategies'.[40] Another suggestion put to the committee was that a single independent body responsible for managing AMR be established and that its role include funding and influencing the AMR research agenda.[41]

6.38 A further area of research raised by submitters was the development of new antibiotics. As noted in chapter 1, there had been a significant decline in research and development by large pharmaceutical companies. Submitters argued that there are opportunities for small pharmaceutical companies, working in conjunction with researchers, to look at developing new antimicrobials to a point where they can be drawn to the attention of large companies. Professor Rood saw this as a model for the future with advantages in terms of fewer constraints, smaller pilots and many more targets being identified and worked on.[42]

6.39 The ASM supported this approach. However, only limited resources are currently being allocated through standard competitive granting schemes even though members of ASM are key players in driving innovative drug development on both the

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36 Australia Veterinary Association, *Submission 35*, p. 4.

37 Australian Society for Antimicrobials, *Submission 5*, pp 7, 8.

38 Public Health Association of Australia, *Submission 14*, p. 10.

39 Professor Julian Rood, Past President, Australian Society for Microbiology, *Committee Hansard*, 7 March 2013, p. 46.

40 Australasian Society for Infectious Diseases, *Submission 18*, p. 5.

41 Public Health Association of Australia, *Submission 14*, p. 5; Professor Julian Rood, Past President, Australian Society for Microbiology, *Committee Hansard*, 7 March 2013, pp 45–46.

42 Professor Julian Rood, Past President, Australian Society for Microbiology, *Committee Hansard*, 7 March 2013, p. 47.

national and international stage. The ASM recommended the formation of an Innovation in Antimicrobials Research Steering Committee to formulate strategic funding initiatives to drive research leading to antimicrobials development and implementation.[43]

6.40 In addition, Professor Cooper suggested that, to support the antibiotic pipeline, regulatory reform was required as well as funding to support expensive stages of research and development. Professor Cooper also stated that there was a requirement for training academic researchers in the science of drug discovery. Exchanges with industry could be supported by government funding with academics allowed, even encouraged, to spend time with partner pharmaceutical companies and 'learn by doing'.[44]

Conclusions

6.41 While the DoHA and DAFF argued that significant funding has been provided for AMR research, evidence was received that there is poor funding of research for AMR issues. The committee considers that the lack of emphasis on research in relation to AMR does not reflect the extent of the present problem or the potential problems facing the health sector and the Australian community.

6.42 Much of the research agenda proposed by JETACAR remains to be undertaken, in areas such as epidemiology of resistance (including molecular epidemiology and gene transfer mechanisms), effects of intervention programs (e.g. to reduce levels of prescribing and antibiotic use), clinical efficacy and rapid diagnostic methods. In particular the epidemiological research needed to understand AMR trends has not been delivered. The resulting lack of epidemiological information has made it much more difficult to implement and evaluate policies to effectively address AMR.

6.43 The committee acknowledges that some research has been sponsored by food animal industries, but further research needs to be undertaken into alternatives to antibiotic growth promotants for animal production and alternatives to other antibiotic uses in animals and humans (including vaccines).

6.44 Another significant research issue brought to the committee's attention during the inquiry is the dwindling supply of new antimicrobials. A large portion of the research on new antibiotics has been undertaken by pharmaceutical companies in the past. However, that is no longer the case, partly as a result funding of changes that have dramatically reduced the profitability for new antimicrobials as opposed to treatments for other conditions. Evidence indicated that there are ways Australian research can make significant contributions to the development of new antibiotics, including partnerships between researches and companies focussing on a larger number of smaller trials.

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43 Australian Society for Microbiology, *Submission 6*, p. 3.

44 Professor Matthew Cooper, *Submission 23*, pp 7–8.

6.45 The committee notes that research into AMR and its prevention were to be included the work of AMR Standing Committee on a national strategy and that the Australian Antimicrobial Resistance Prevention and Containment Steering Group is to provide advice on future research priorities for Australia in relation to AMR. The committee welcomes this recognition of the importance of research in addressing AMR issues.

Recommendation 10

6.46 The committee recommends that the Commonwealth consider measures to support research into strategies to deal with antimicrobial resistance, including research into new antibiotics and consideration of antimicrobial resistance being designated a National Research Priority Area.

Senator Scott Ryan
Chair