

Antimicrobial Resistance Action Planning Group

Antimicrobial Resistance: New Zealand's current situation and identified areas for action



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Objectives, vision and goals of the National Antimicrobial Resistance Action Plan

Objectives

1. Improve awareness and understanding of antimicrobial resistance (AMR), including the implications and actions required to combat antimicrobial resistance, through effective communication, education and training.
2. Strengthen the knowledge and evidence base about AMR through research and surveillance.
3. Improve infection prevention and control measures across human health and animal care settings to prevent infection and the transmission of microorganisms
4. Optimise the use of antimicrobial medicines in human, animal and plant health which includes maintaining and enhancing the regulation of animal and plant antimicrobials.
5. Establish and support clear governance, collaboration and investment arrangements so that the approach to tackling AMR is sustainable.

Vision

- A society that manages antimicrobials as a valuable shared resource and maintains their efficacy in order to be able to treat infections in humans, as well as managing diseases in animals and plants

Goals

- Ensure that antimicrobials continue to be effective and available by using them in a prudent and responsible way.
- Improve knowledge of what drives the development and spread of AMR and use that knowledge to minimise its development.

Acknowledgements

This document was prepared by Andrea McNeill and Jane Pryer, from the Ministry of Health with input from members of the Antimicrobial Resistance Action Planning Group.

The group includes members from the following organisations and professional bodies:

- Ministry of Health
- Ministry for Primary Industries
- Institute for Environmental Science and Research Limited
- Health Quality & Safety Commission
- Pharmaceutical Management Agency Ltd
- New Zealand Veterinary Association
- New Zealand Hospital Pharmacists' Association
- New Zealand Microbiology Network
- Infection Prevention & Control Nurses College
- Australasian Society for Infectious Diseases
- Best Practice Advocacy Centre New Zealand
- Agcarm – Agricultural Chemical and Animal Remedy Manufacturers Association
- Royal New Zealand College of General Practitioners.

Co-chairs' foreword

Antimicrobial resistance (AMR) is a well-documented global threat to modern medical and veterinary practice.

Recent data from the 2014 World Health Organization (WHO) Global Antimicrobial Resistance report indicate that New Zealand has comparatively low rates of antimicrobial resistance, particularly when compared with countries such as those in South East Asia. However, New Zealand has seen a rise in antibiotic resistant infections, including infections due to resistant strains of *Escherichia coli*, *Neisseria gonorrhoeae* and *Staphylococcus aureus*.

Several work streams are already under way in New Zealand to manage the threat of antimicrobial resistance. The Ministry of Health and the Ministry for Primary Industries now have the opportunity to work together to and make these work streams into a cohesive national programme that makes the best use of resources and manages AMR effectively.

Calls for national, regional and global efforts to slow the development of antimicrobial resistance have strengthened over the past year. Internationally, the United Nations General Assembly, WHO, the Codex Alimentarius Commission, the World Organisation for Animal Health and the Food and Agriculture Organization have increased their focus and leadership on antimicrobial resistance.

The Ministry for Primary Industries and the Ministry of Health share the objective of managing the threat of antimicrobial resistance so that AMR has minimal impact on animal, plant and human health.

By pooling our resources, we can deliver an effective antimicrobial resistance action plan and coordinate responses to manage this threat.

Our ministries have therefore jointly created an Antimicrobial Resistance Action Planning Group with nominated representatives from across the human health, animal health and agriculture sectors. This group will develop an effective and sustainable National AMR Action Plan by May 2017. The actions identified will then be implemented in stages.

We also encourage all stakeholders to work together to minimise antimicrobial resistance and ensure that effective antimicrobials continue to be widely available for use in humans and animals.

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List of abbreviations

ACVM Act	Agricultural Compounds and Veterinary Medicines Act 1997
AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
CLAB	Central line associated bacteraemia
DDD	Daily defined dose
DHB	District health board
ESR	Environmental Science Research
FAO	Food and Agriculture Organization of the United Nations
HAIGG	Healthcare Associated Infections Governance Group
HIV	Human immunodeficiency virus
HQSC	Health Quality & Safety Commission
IPC	Infection prevention and control
IT	Information technology
MDRO	Multidrug-resistant organisms
MPI	Ministry for Primary Industries
NZVA	New Zealand Veterinary Association
OECD	Organisation for Economic Co-operation and Development
OIE	World Organisation for Animal Health
PHARMAC	Pharmaceutical Management Agency Ltd
WHO	World Health Organization

Contents

Objectives, vision and goals of the National Antimicrobial Resistance Action Plan	iii
Objectives	iii
Vision	iii
Goals	iii
Acknowledgements	iv
Co-chairs' foreword	v
List of abbreviations	vi
Introduction	1
Background	2
What is antimicrobial resistance?	2
What is the scale of the problem?	2
Global response to AMR.....	4
New Zealand response – the New Zealand National AMR Action Plan	5
Objective 1	6
Situation analysis and assessment	6
Priority areas for action	7
Objective 2	9
Situation analysis and assessment	9
Priority areas for action	12
Objective 3	15
Situation assessment and analysis – humans	15
Situation assessment and analysis – animals.....	17
Priority areas for action	17
Objective 4	21
Situation analysis and assessment – humans	21
Situation analysis and assessment – animals and plants	23
Situation analysis and assessment – veterinary medicines	24
Priority areas for action	25
Objective 5	28
Situation analysis and assessment	28
Priority areas for action	29
References.....	31

Introduction

The Ministry of Health and the Ministry for Primary Industries together are leading the development of the New Zealand National Antimicrobial Resistance Action Plan. This first document outlines the evidence and the collective, expert views of stakeholders from across the sectors of animal and human health, food and agriculture on how best to address antimicrobial resistance (AMR) in New Zealand.

The co-chairs of the Antimicrobial Resistance Action Planning Group will choose priority areas for action based on feasibility, the evidence for the effectiveness of the action and the cost of the initiative. These identified priorities will inform the group as it develops an action plan with an appropriate monitoring and evaluation framework.

Background

What is antimicrobial resistance?

Antimicrobial resistance is a serious and growing global threat to public health and animal health. AMR is the term for resistance in different types of micro-organisms, including resistance to antibacterial, antiviral, antiparasitic and antifungal medications. Resistance does develop naturally; however, using antibiotics improperly accelerates the process and is the single most powerful contributor to the development of antimicrobial resistance (WHO 2011b). Therefore, this report primarily focuses on resistance to antibacterial medications.

What is the scale of the problem?

Global – AMR in humans

AMR affects patients and communities and threatens to severely undermine the modern health system. As existing antimicrobials become less effective in preventing and controlling infection, common infections may become untreatable, and routine surgery and chemotherapy will become less safe.

Infections caused by multidrug-resistant organisms are already responsible for an estimated 700,000 deaths each year. If the world fails to act, it has been estimated that, by 2050, more than 10 million people may die each year from these infections and AMR may cost the world over USD 100 trillion in lost output (Review on Antimicrobial Resistance 2016).

The global AMR situation is rapidly evolving and no country can afford to be complacent.

Global – AMR in animals and plants

The impact of AMR in animals (companion and production animals) can have serious negative impacts on animal health, welfare and production. There also can be impacts through transfer of resistant bacteria, or genes between animals and humans (both ways) (Lazarus et al 2015; Shen et al 2016). While the impacts of resistant bacteria transferring from plants to humans are considered low, more work is needed to better understand this subject.

It is important to ensure good stewardship and use antimicrobials prudently in animals and plants to minimise the impact of AMR.

New Zealand – AMR in humans

Recent data from the 2014 World Health Organization (WHO) global antimicrobial resistance report indicate that New Zealand has comparatively low rates of resistance to antimicrobials used for tuberculosis (TB) and human immunodeficiency virus (HIV) therapy (WHO 2014).

However, resistance in a wide range of bacteria to commonly used antimicrobial medicines is rapidly emerging as a major threat to health in New Zealand (Thomas et al 2014).

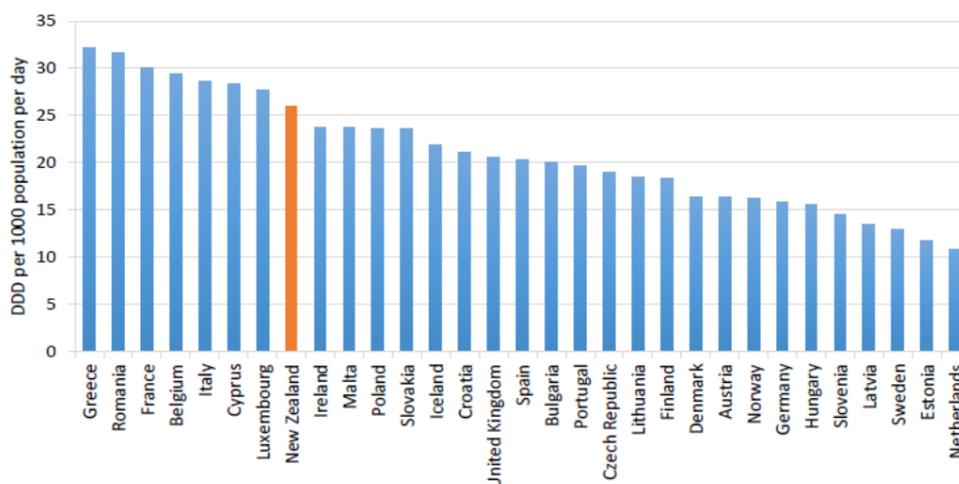
New Zealand needs to take action now because infections caused by multidrug-resistant micro-organisms are increasing across the country (Thomas et al 2014; Williamson and Heffernan 2014; Walls et al 2015). Over the past 20 years pathogen resistance patterns have changed. Some of the resistant pathogens that have emerged and are spreading in New Zealand are community-acquired methicillin resistant *Staphylococcus aureus*, extended-spectrum beta-lactamase (ESBL) producing Enterobacteriaceae, multidrug-resistant *Neisseria gonorrhoeae* and Vancomycin-resistant enterococci (Dyet et al 2014; ESR 2015b; Heffernan et al 2015; Heffernan and Bakker 2016).

Williamson and Heffernan (2014) note the following reasons why antimicrobial-resistant pathogens have emerged and are spreading in New Zealand:

- inappropriate use of antimicrobials (including overuse of broad spectrum antibiotics such as topical antibiotics)
- transmission of resistant organisms in both community and health care settings (Graves et al 2003; WHO 2011a)
- importation of resistant pathogens from areas where multidrug-resistant organisms are endemic (ESR 2015a)
- environmental and genetic factors that increase the viability of multidrug-resistant bacteria (Heinemann et al 2000; Udikovic-Kolic et al 2014).

New Zealand communities have increased their consumption of antimicrobials by as much as 49 percent between 2006 and 2014 (Williamson et al 2016). Their level of consumption is high in comparison with many other countries (see Figure 1).

Figure 1: Antibiotic consumption of 29 European countries and New Zealand, 2013, expressed as defined daily doses (DDD) per 1,000 population per day



Source: Williamson et al (2016)

New Zealand – AMR in animals and plants

The prevalence of AMR in New Zealand animals and plants is relatively low. New Zealand is one of the three countries in the Organisation for Economic Co-operation and Development (OECD) with the lowest use of antibiotics to treat animals (Hillerton et al 2016). One reason for such low use is likely to be that New Zealand has strong regulatory controls on use of antimicrobial agents, which limit prescribing and dispensing to the veterinary profession. Other probable reasons are that animal husbandry systems are relatively low in intensity, and that the Government and industry continue to invest in initiatives to limit AMR.¹

It is important that the Government, veterinarians and the primary industries continue to be proactive to minimise the development of antimicrobial resistance in animals and plants. In particular, managing antibiotics that are important to human health is a focus for the Ministry for Primary Industries (MPI) and their stakeholders.

Global response to AMR

Several countries have already developed national plans to coordinate responses to the threat of AMR, including the United Kingdom (Department for Environment, Food and Rural Affairs et al 2014), Canada (Public Health Agency of Canada et al 2015) and Australia (Department of Health and Department of Agriculture and Water Resources 2016). These plans emphasise the need for strong leadership, governance and cross-sector coordination.

In July 2014, the United Kingdom Government in collaboration with the Wellcome Trust commissioned the Review on Antimicrobial Resistance, chaired by Jim O’Neill, to analyse the global problem of AMR and to propose concrete actions to tackle it internationally. Its final report, released in May 2016, identified 10 interventions to tackle AMR by reducing demand for antimicrobials, increasing the number of effective antimicrobial drugs and building a global coalition for action on AMR (Review on Antimicrobial Resistance 2016).

In May 2015, the 68th World Health Assembly endorsed a Tripartite Global Action Plan to tackle AMR (involving WHO, the World Organisation for Animal Health (OIE), and the Food and Agriculture Organization (FAO)). The aim of the global action plan is to ensure that infectious diseases continue to be successfully treated and prevented, for as long as possible, with effective and safe medicines that are quality-assured, used in a responsible way and accessible to all who need them.

Member states, including New Zealand, have committed to developing a national action plan on AMR that is aligned with the WHO’s Global Action Plan, by May 2017.

¹ See, for example, MPI (2016) and the Veterinary Council of New Zealand’s poster on prudent use.

New Zealand response – the New Zealand National AMR Action Plan

Addressing AMR requires collaborative action nationally and internationally across government sectors and society. It is also necessary to both change behaviour and implement new initiatives to reduce inappropriate antibiotic use and minimise the development and transmission of AMR microorganisms. The action plan will build on the successful work already under way in New Zealand, by coordinating this work into a national response.

While the human health and agricultural sectors share a number of common themes in addressing AMR, each sector also faces its own AMR challenges.

Both the WHO Global Action Plan (WHO 2015) and the recommendations of the Jim O’Neill Review on Antimicrobial Resistance (2016) will inform the New Zealand National AMR Action Plan.

New Zealand has identified the following five objectives for the action plan to focus on.

1. Improve awareness and understanding of antimicrobial resistance (AMR), including the implications and actions required to combat antimicrobial resistance, through effective communication, education and training.
2. Strengthen the knowledge and evidence base about AMR through research and surveillance.
3. Improve infection prevention and control measures across human health and animal care settings to prevent infection and the transmission of micro-organisms.
4. Optimise the use of antimicrobial medicines for human, animal and plant health, which includes maintaining and enhancing the regulation of animal and plant antimicrobials.
5. Establish and support clear governance, collaboration and investment arrangements so that the approach to minimising AMR is sustainable.

The following sections set out the context and identify priority areas for action for each of these objectives in turn.

Objective 1

Improve awareness and understanding of antimicrobial resistance, including the implications and actions required to combat antimicrobial resistance, through effective communication, education and training.

Essential steps in changing behaviour are to increase awareness, education and understanding of the causes and impacts of AMR and ways of combating it across the human and animal health sectors, in the agricultural sector and among consumers. This work will complement other initiatives to address AMR such as supporting more informed clinical decision-making and judicious antibiotic prescribing.

Situation analysis and assessment

The New Zealand Health Strategy recognises the importance of a people-centred, people first approach to health care. With this approach, people can access and understand the information they need to manage their health and make choices about the care and support they receive (Minister of Health 2016). Increasing public awareness of AMR is essential to enable people to make informed decisions about antimicrobials.

New Zealand and the United States of America are two countries that allow direct-to-consumer advertising of prescription medicine, including advertisements for antibiotics that make product claims. Evidence shows that such advertising influences prescriber behaviour and increases inappropriate prescribing (Every-Palmer et al 2014). Therefore, this direct advertising could undermine awareness-raising initiatives.

Human health awareness-raising initiatives

New Zealand has seen a range of initiatives to raise awareness of AMR and how to use antibiotics appropriately. For example, the Pharmaceutical Management Agency Ltd (PHARMAC) managed the Wise Use of Antibiotics ('Kick that bug') campaign,² the Health Quality & Safety Commission (HQSC) and individual district health boards (DHBs) were involved in world antibiotic awareness week and the Best Practice Advocacy Centre³ published articles on the subject via PHARMAC's responsible use of medicines contracts. Most recently, the Council of Medical Colleges, supported by the Ministry of Health and the HQSC, has led a 'Choosing Wisely' campaign.⁴ The main target of these initiatives was health professionals.

² An evaluation of this campaign in 2009 found infectious disease clinicians, including the Ministry of Health's Antimicrobial Resistance Advisory Group, valued the campaign as a means of promoting appropriate prescribing. During the campaign and in line with the campaign messages, prescribing of amoxicillin (a narrow spectrum antibiotic) increased compared with amoxicillin clavulanate (broad spectrum antibiotic). Consumer recall of the key campaign messages was low.

³ *Best Practice Journal* 2015, issue 68 (www.bpac.org.nz/BPJ/2015/June/contents.aspx); Rising antimicrobial resistance (www.bpac.org.nz/BPJ/2014/June/antimicrobial.aspx); What is my role in primary care? (www.bpac.org.nz/BPJ/2013/August/upfront.aspx).

⁴ <http://choosingwisely.org.nz>

Recently the Institute of Environmental Science and Research Limited (ESR) and the Ministry of Health have made a series of presentations on AMR at academic forums and have published reports to raise awareness of the scale of resistance in New Zealand.

Several recent news reports and documentaries have covered AMR in New Zealand. The Ministry of Health also regularly updates its website (health.govt.nz) to raise public awareness of AMR. To date, the level of interest in these items has not been high.

Current animal and plant health awareness-raising initiatives

Industry initiatives have included developing stewardship guidelines on using antibiotics prudently. MPI convened two expert panels, one in 1999 and the other in 2004, on antibiotic resistance in animals and plants. The first expert panel examined the existing information on antibiotic resistance and New Zealand's regulatory control of antibiotic products. The second updated the 1999 review and examined the adjustment in regulatory control. MPI published the reports of these two expert panels on its website.

In 2016 MPI published an AMR Direction Statement outlining its vision, goal and objectives to manage AMR (MPI 2016).

The New Zealand Veterinary Association (NZVA) has been developing guidelines on using antibiotics judiciously for each sector of the veterinary profession, and developing tools for prioritising the use of different antimicrobial agents in line with WHO and OIE recommendations. These guidelines and tools consider the subset of antimicrobials used in animals in New Zealand.

In addition, the NZVA has publicly launched an aspirational goal that by 2030, NZ Inc. will not need antibiotics to maintain the health and welfare of animals. The NZVA has produced an implementation framework to support the achievement of this goal (NZVA 2016).

Priority areas for action

While awareness-raising activities continue in New Zealand, further efforts are required to promote behaviour change and use available resources in the most effective way. These priority areas for action are described below.

1 Improve consumers' understanding of antimicrobial resistance and the importance of using antibiotics appropriately

There is no coordinated AMR education/communication strategy targeted at the general public. Appropriately targeted, comprehensive, sustainable and well-supported public engagement and communications plans across the human and animal health sectors are needed.

The Review on Antimicrobial Resistance (2016) recommends large-scale global public awareness campaigns with a common set of core messages that are globally consistent, with recognisable and iconic themes and symbols. The Review notes that public awareness or

behaviour change campaigns can be very cost-effective and lead to lasting changes when done well. For example, campaigns to reduce antibiotic use over the winter flu season in Belgium resulted in a 36 percent reduction in prescriptions. Over 16 years, the cumulative savings in drug costs alone amounted to around EUR 130 (NZD 202) per Euro spent on the campaign (Review on Antimicrobial Resistance 2016). Systems need to be in place to evaluate the effectiveness of initiatives aimed at the public when they are implemented in New Zealand.

Such long-term engagement and communication campaigns need to take into account the behaviours and context that are driving antibiotic use across the human, animal and agricultural sectors and empower consumers to change behaviours to reduce the levels of antibiotic consumption. Targeted campaigns might be needed given that different geographic areas and ethnic groups consume different amounts of antibiotics (Williamson et al 2016).

Human health prescribers, pharmacists and pharmacy staff have an important role in reinforcing messages and educating the public. Therefore, support, resources and education are needed on strategies for communicating key messages with the public about AMR and using antibiotics appropriately in community and hospital settings.

Animal health providers such as veterinarians, technicians and nurses are key to providing clients and organisations that cover farmers and pet owners information on AMR and the importance of using antibiotics in a prudent manner.

2 Strengthen communication and education initiatives on AMR and stewardship for all prescribers, health care professionals and health care team members

Education is important for all prescribers and dispensers of antimicrobials for human and animal health so that they prescribe and dispense appropriately and consider alternatives to antibiotics for managing bacterial diseases.

This education should cover strategies to reduce total antimicrobial prescribing. It should be part of all stages of formal training and career through compulsory continuing education and professional development programmes.

Objective 2

Strengthen the knowledge and evidence base about AMR through research and surveillance.

Any programme to manage antimicrobial resistance must have nationally coordinated surveillance of AMR, knowledge of antimicrobial usage and an improved understanding of the genetic basis for resistance. Surveillance is essential to:

- understand the magnitude, distribution and impact of multidrug-resistant micro-organisms and antimicrobial usage
- identify trends and emerging resistance
- understand the associations between antibiotic use and AMR.

Surveillance is needed at multiple levels – institutional, local/community, national and global – and across all sectors. Ideally in the long term, AMR surveillance and monitoring of antimicrobial use will also be integrated across human health, animal health, and food and plant sectors.

It is important to evaluate surveillance information and communicate widely so that people can use the information to make improvements at multiple levels. At the local level, surveillance information is important to improve patient and animal health – for example, enhancing local therapy and antibiotic guidelines. At the national level, surveillance information is valuable when making policy decisions, responding to health threats and monitoring the impact of interventions. At the global level, surveillance information can be used to identify long-term trends and emerging threats.

Situation analysis and assessment

The New Zealand Health Strategy aims to build a smart health system with improved evidence-based decisions and management. In a smart health system, health professionals would also have access to reliable and accurate information at the point of care and would use standardised technology. Having strong surveillance systems and being able to use and share surveillance information are other parts of this smart health system so that health care providers and prescribers supporting antimicrobial use have accurate information at the time they need it.

AMR surveillance in humans

The Ministry of Health funds the ESR to undertake national AMR surveillance using data from various surveillance systems and sources. The level of surveillance depends on the pathogen, the prevalence and the extent to which current and/or anticipated levels of AMR threaten human health.

The national AMR programme covers community and hospital AMR. It involves:

- identifying and characterising new and emerging mechanisms of resistance, including carbapenemase-producing organisms, vancomycin-non-susceptible *Staphylococcus aureus* and vancomycin-resistant Enterococci
- undertaking national period-prevalence surveys of antimicrobial susceptibility to specific antibiotics among key resistant pathogens, including methicillin-resistant *S. aureus* (MRSA) and extended-spectrum beta-lactamase (ESBL) producing Enterobacteriaceae
- conducting continuous surveillance of antimicrobial susceptibility among invasive isolates of *Streptococcus pneumoniae*, *Neisseria meningitidis* and *Haemophilus influenzae*
- conducting continuous surveillance of antimicrobial susceptibility among *Salmonella*
- collecting general susceptibility data each year from hospital and community diagnostic laboratories
- collecting anti-tuberculosis-drug sensitivity data each year from the mycobacteriology laboratories
- molecular hospital-acquired pathogens and antibiotic-resistant organisms to understand the molecular epidemiology of resistance in New Zealand, and to help health care facilities investigate and manage nosocomial transmission.

In addition to this national surveillance programme, individual laboratories are monitoring resistance patterns but without any overall coordination.

Surveillance of antimicrobial use in humans

In 2015 the Ministry of Health commissioned ESR to produce a baseline study on antibiotic consumption in the community, using data on all subsidised antimicrobial dispensing between 2006 and 2014. The study (Williamson et al 2016) reported:

- antibiotic dispensing increased by as much as 49 percent between 2006 and 2014
- consumption differs between ethnic groups and between geographic areas
- New Zealand has relatively high rates of antibiotic dispensing compared with similar developed countries
- dispensing varies markedly by season
- the level of dispensing of broad spectrum antimicrobials is high
- use of topical antimicrobials is high.

HQSC, in partnership with the Accident Compensation Corporation and the Ministry of Health, has produced an *Atlas of Healthcare Variation* that includes a domain on infection and antibiotic use following major surgery (HQSC 2016). This work gives an overview of infections after major surgery in public hospitals and of community use of antibiotics in the 30 days after this surgery. Results show DHBs vary in their level of antibiotic use following major surgery and high levels of antibiotic dispensing in the first two days after discharge from hospital, compared with the rate of people who are recorded as having an infection after major surgery. This work raises questions as to the appropriateness of this level of antibiotic prescribing after surgery.

Information on consumption of antimicrobials in New Zealand hospitals is limited, although four recently published studies from public hospitals provide some information (Beardsley et al 2011; Ticehurst and Thomas 2011; Hopkins 2014; Duffy et al 2015). Surveillance programmes for antimicrobial consumption in New Zealand hospitals are still in the development phase. However, some New Zealand hospitals (Auckland, Wellington, New Plymouth, Christchurch, Middlemore and North Shore) undertook antimicrobial consumption studies, which reported that the overall level of antibiotic consumption per patient per day is comparable with levels in Australian hospitals. Australian data (ACSQHC 2016) suggest 77 percent of in-hospital prescribing is appropriate but New Zealand has no equivalent published data. In a pilot of National Antimicrobial Prescribing Survey methodology in a DHB in 2015, results indicated 84.6 percent of prescribing was appropriate, although only 70.3% was optimal (E Duffy and C Chen, personal communication, March, 2016).

AMR surveillance in animals and agriculture

New Zealand does not undertake routine AMR surveillance of animals and plants. Government, industry and research bodies undertake surveillance of AMR in agriculture on an ad hoc basis without national coordination. Surveillance of infectious diseases and agents in animals and plants tends to focus on the detection of exotic and notifiable disease. A one-off survey in 2009–2010, (Heffernan et al 2011) reported rates of AMR were not significant and were low compared with rates in other countries.

Some industry sectors have funded one-off surveys of AMR in key organisms. For example the poultry industry funded surveys in 2006 and 2014 of AMR in four target organisms (*E. coli*, *Salmonella*, *Campylobacter* and Enterococci). The results of the 2006 survey have been published in peer-reviewed journals (Pleydell et al 2010).

A well-established National Microbiological Database (NMD) programme allows for the sampling of carcasses in abattoirs and poultry processing plants to detect designated zoonotic and commensal bacteria, namely *Salmonella*, *Campylobacter* and *Escherichia coli*. It covers the processing of bovine, ovine, bobby calf, caprine, cervine, ostrich, emu, poultry and porcine carcasses. Although currently the NMD programme does not test for antimicrobial susceptibility, its comprehensive sampling framework could provide the isolates and samples required for the surveillance of AMR among zoonotic and commensal bacteria from food-producing animals.

Surveillance of antimicrobial usage in animals

Since the early 2000s, MPI has been collecting annual data on the sale of antibiotics used in animals and plants. It has produced a consolidated report every two to three years and from 2016 is reporting every year.

This information contributed to a recent NZVA study comparing use of antibiotics in animals in New Zealand with other developed countries (Hillerton et al 2016).

The NZVA funded a pilot surveillance programme of antimicrobial use in six large veterinary clinics, focusing initially on farm animals. Data on antimicrobial use will be compared between species, geographical regions and farm ownership type. The results of the pilot programme will be available during 2017.

Priority areas for action

3 Establish a coordinated national surveillance programme of AMR and antimicrobial consumption in humans, animals and plants

The Review on Antimicrobial Resistance (2016) recognises the need to continue to improve global monitoring and understanding of infectious diseases and to include the surveillance of AMR pathogens in these systems. The Review notes that global action is required in two areas: first, to coordinate and develop a global surveillance network; and second, to remove barriers to sharing data in safe, secure and appropriate ways.

A national surveillance system must have:

- nationally representative and coordinated, sustainable programmes to monitor antimicrobial use in hospitals, the community including health care facilities, veterinary medicine and agricultural production
- nationally representative and coordinated, sustainable surveillance programmes to monitor for increased resistance to indicator antibiotics and key resistance genes in priority organisms that have an impact on human health in hospitals and the community, on animal health and in food production settings
- a standardised method for collecting, collating, interpreting and reporting on data on antimicrobial use and resistance at local, national and global levels
- a system for regularly reporting and widely communicating national and regional data, where relevant, to stakeholders in the community, governmental and non-governmental organisations, and international surveillance programmes.

Human surveillance

The picture of human AMR in New Zealand is incomplete because of gaps in surveillance coverage, as well as differences in methods of data collection, analysis and reporting.

It is necessary to review existing surveillance, information technology (IT) and reporting systems in order to understand the key issues involved in establishing national surveillance of AMR and antimicrobial consumption.

It is also essential to collect, analyse and communicate data in a timely way so that people can respond promptly to trends in antimicrobial resistance or antimicrobial use. A mechanism to report key exceptional resistances in real time is needed. With the existing IT infrastructure, it is not easy to share data. To support the surveillance system effectively, IT infrastructure will need to support the work of collecting, analysing and communicating surveillance data across human and animal health and across government departments. It is important to report surveillance information regularly to contribute to decision-making on clinical and public health, increase public and consumer awareness and help monitor and evaluate the effectiveness of actions.

Animal and plant surveillance

The current system of collecting data on yearly sales of antibiotics used on animal and plants will be reviewed. One reason for this review is to be consistent with OIE's recent initiative to collect data on use and sales from all member countries. MPI will also consider whether in the future it would be appropriate to collect information about the use of antibiotics.

MPI will increase its capacity to conduct surveillance of antimicrobial resistance and antimicrobial use in food-producing animals. These programmes must, at a minimum meet OIE standards and generate internationally comparable data. A national task group, led by MPI, will be established and will work with industry and human health stakeholders to design and implement a model for surveillance in animals and plants.

4 Develop lists of priority organisms, key resistance genes and antimicrobials for national surveillance and reporting

Sector-specific lists of priority organisms and key antimicrobial agents will be developed based on their impacts on human, animal and plant health. Lists for human health will include the seven priority organisms WHO has identified for its global antimicrobial resistance surveillance reports as well as key organisms already under surveillance in New Zealand. The list will be reviewed regularly and updated in response to changing incidence and importance of resistant organisms. Lists for animal health will include organisms the OIE has prioritised.

These lists will identify key antimicrobials to monitor for their use in human health (hospitals and community), animal health (companion and production animals) and horticulture. It is also necessary to establish infrastructure for data collection and reporting.

This work will require input from clinical microbiologists, laboratory scientists, ESR, veterinarians, veterinary microbiologists, the agricultural sector and antimicrobial pharmacists.

5 Implement national minimum standard for laboratory testing and reporting of antimicrobial susceptibility

New Zealand must have nationally agreed minimum standards for laboratory testing and reporting of antimicrobial susceptibility so that it can compare data nationally and internationally. In developing minimum standards, it is necessary to take account of changes in laboratory testing methods – for example, the development of culture independent diagnostic tests. Developing these agreed standards will require input from clinical microbiologists, laboratory scientists, ESR, veterinary microbiologists and antimicrobial pharmacists. Options for rapid on-site diagnostic tools to allow point-of-care testing in human and animal settings also need to be explored.

6 Support national research priorities for AMR and antimicrobial consumption in human and animal health and food production

New Zealand supports national health research and innovation while collaborating with international partners to contribute to global research efforts on antimicrobial resistance, antimicrobial use, novel therapies and alternatives.

AMR research should be a priority area for New Zealand research over the coming years. In line with the Review on Antimicrobial Resistance (2016), research is needed to:

- identify trends in AMR, causes of inappropriate use, and causes of resistance, including the role of co-selection (the selection of multiple antibiotic resistance genes when one of these genes is selected)
- improve antimicrobial prescribing through better point-of-care diagnostics
- model or forecast the future human disease burden and costs of AMR to inform strategic priority setting and other decisions
- look at what kind of strategies work best to change behaviour in New Zealand.

Objective 3

Improve infection prevention and control measures across human health and animal care settings to prevent infection and the transmission of micro-organisms.

An effective response to AMR must involve preventing infection by controlling transmission of microorganisms and improving disease detection. Reducing infections not only lessens the need for antibiotics but also reduces the opportunity for microorganisms to develop resistance and share resistance genes.

All sectors and settings need evidence-based infection prevention and control (IPC) strategies and vaccination programmes, recognising that patients in some settings are at greater risk of infection. Those at higher risk include patients in acute care hospitals who are at greater risk of infection, and residents of age-related residential care facilities (WHO 2015) who are at greater risk of cross-transmission leading to colonisation and subsequent infection with multidrug-resistant organisms. Similarly, in veterinary practice, work to prevent and control infection and detect disease is essential for maintaining biosecurity, the health of farmed livestock and companion animals, and the health of people by preventing zoonotic transmission.

Infection rates in New Zealand could be reduced by addressing broader health and social issues such as poverty, overcrowding, cold and damp living conditions and the presence of chronic health conditions that reduce immunity.

In the agriculture sector, various industries have strategies to reduce infection and antibiotic use. These include vaccination and other preventative measures, such as using teat sealants in dairy cows to manage mastitis.

Situation assessment and analysis – humans

Human health care settings

Governance. The Ministry of Health set up the Healthcare Associated Infections Governance Group (HAIGG) in 2012. HAIGG provides national leadership across the health sector, including strategic direction for using antimicrobials prudently through antimicrobial stewardship programmes.

The Health and Disability Services Infection Prevention and Control Standard (NZS 8134.3:2008) is the framework that promotes and supports systems and processes to keep consumers, staff and visitors safe through principles of infection prevention and control. This is the standard against which health care facilities are measured. It applies to all health and disability services, and services that are subject to the Health and Disability Services (Safety) Act 2001 must follow it. In 2012 the possibility of updating this standard was considered but the conclusion was that no changes were necessary. The Australian national IPC standard provides a quality assurance framework for developing, implementing and regularly reviewing the effectiveness of an antibiotic stewardship system (ACSQHC 2012).

Workforce. The IPC workforce in the publicly funded secondary sector is small and highly specialised.⁵ This workforce will be smaller again in the private sector and primary and community care. To date, New Zealand's IPC workforce has been primarily nurse based; however it is recognised that a multidisciplinary approach is needed to effectively prevent the occurrence and spread of health care associated infections and AMR in health care facilities, including residential care facilities.

Current IPC initiatives. The New Zealand Health Quality and Safety Commission (the Commission) runs an IPC programme that aims to improve patient outcomes through the prevention and control of healthcare associated infections in the health and disability sector by:

- improving access to and use of quality data about infections at local, regional and national levels
- building the quality improvement capability of local IPC team members
- increasing consumer engagement in the prevention of health care associated infections.

Specific projects under this programme have included the national hand hygiene initiative, Hand Hygiene New Zealand,⁶ the national Surgical Site Infection Improvement Programme⁷ and the Central Line Associated Bacteraemia (Target CLAB Zero) Collaborative.⁸

Immunisation programme. PHARMAC leads the management and purchasing of publicly subsidised vaccines. It is also responsible for considering any changes to the National Immunisation Schedule, including changing the eligibility criteria, funding new vaccines and managing the supply of vaccines. The Ministry of Health is responsible for implementing the National Immunisation Programme, which aims to prevent disease through immunisation and achieve coverage that prevents outbreaks and epidemics.

Improved immunisation coverage reduces the rates of vaccine-preventable disease and consequently reduces the need for antimicrobials to treat infections.

The programme focuses on four areas:

1. immunisation services for those aged under five years
2. the annual influenza programme
3. school-based and young adult immunisation services
4. maintaining the overall National Immunisation Programme and managing outbreak responses.

⁵ District health boards in total have approximately 55 full-time equivalent IPC nursing practitioners and a small number of medical staff with designated responsibilities for IPC activities (HQSC, Survey of DHB IPC FTE, 2015).

⁶ <http://handhygiene.org.nz>

⁷ www.hqsc.govt.nz/our-programmes/infection-prevention-and-control/projects/surgical-site-infection-improvement

⁸ www.hqsc.govt.nz/our-programmes/infection-prevention-and-control/projects/prevention-of-central-line-associated-bacteraemia

Situation assessment and analysis – animals

MPI established an Antimicrobial Resistance Management Steering Group in 2007, with members from industry sectors, associations and government agencies. Its purpose is to share information and provide feedback to MPI on activities to manage antimicrobial resistance in animals and plants.

Although there is no equivalent governing body for IPC and antimicrobial stewardship in animals, the Animal Welfare Act 1999 covers the health and wellbeing of animals. It requires owners or people in charge of animals to meet an animal's physical, health and behavioural needs – including the needs to protect it from and rapidly diagnose disease. The Biosecurity Act 1993 is concerned with preventing the incursion of exotic infectious diseases.

In addition to providing infection control guidelines for the profession (NZVA 2015), the NZVA (2016) has produced a 'Framework to deliver the national strategic aim on use of antimicrobials in managing animal health and welfare', which advocates a programme of reducing, refining and replacing the use of antimicrobials in animals. These NZVA guidelines on the judicious use of antimicrobials aim to improve stewardship and, in this way, to reduce the use of antimicrobials that are critically important for human health. To replace them, it will be necessary to improve infection prevention and control, including biosecurity and hygiene barriers, as well as to use immunisation and other interventions.

Although New Zealand has no government-led immunisation programme for animals, organisations have taken some national initiatives. For example, the NZVA and the Society of Dairy Cattle Veterinarians developed Leptosure[®], an NZVA-led national risk management programme to reduce the risk of human leptospirosis infection on dairy farms. Also of note is that there is extensive vaccination of animals for many diseases.

Priority areas for action

7 Develop and update national guidelines and standards for IPC so that policies and procedures are consistent throughout the country, and enhance accreditation and quality assurance programmes to increase the number of people in the human and animal health and agriculture sectors who follow best-practice IPC measures

In the absence of national guidance, individual health care organisations have developed their own policies and procedures in relation to IPC. This has the potential to create national inconsistencies and it increases the burden on individual IPC teams. IPC guidelines or standards need to be developed for all health care facilities.

Standards

The Health and Disability Services (Infection Prevention and Control) Standard (NZS 8134.3:2008) needs to be updated so that it:

- includes relevant legislation and guidelines introduced or published since 2008
- identifies any gaps in the evidence base
- ensures a nationally consistent approach towards reducing AMR and the harm and cost of health care associated infections.

One area of action to consider is enhancing the IPC and antimicrobial stewardship components of standards and programmes for use in general practice, such as the Cornerstone Programme⁹ and the Te Wana Quality Standards and Accreditation programme,¹⁰ and for use in animals and agriculture. It is also important to consider how to measure standards and accreditation.

Consistent standards for environmental contamination. Evidence shows that environmental contamination with resistant microorganisms helps the transmission of microorganisms in health care facilities. Therefore environmental cleaning is a vital aspect of IPC. There is currently no national direction on cleaning standards; however, most DHBs and some aged residential care facilities, use the *Cleaning Standards for Victorian Health Facilities* from Victoria, Australia (Department of Health and Human Services 2011). HAIGG has endorsed these cleaning standards.

Guidelines. To consistently manage new and emerging multidrug-resistant organisms (MDRO) across the health sector, it is necessary to develop and/or update consensus guidelines and systems for alerts. IT systems must also support any such systems by providing real-time data, surveillance and alerts to monitor and manage MDROs in patients.

The Ministry of Health has previously published guidelines targeting IPC areas of concern, such as:

- [Guidelines for Tuberculosis Control in New Zealand](#) (Ministry of Health 2010)
- [Guidelines for the Control of Multidrug-resistant Organisms in New Zealand](#) (Ministry of Health 2009)
- [Guidelines for the Control of Methicillin-resistant Staphylococcus aureus in New Zealand](#) (Ministry of Health 2002).

However, the Ministry of Health has not updated these guidelines. Over time since the guidelines were published, new resistant organisms have emerged, patterns of resistance have changed and AMR has become an increasing global threat. As a result, DHBs manage MDROs in different ways, including in terms of their patient isolation practices and their use of the National Medical Warning System.¹¹

⁹ http://www.rnzcgp.org.nz/RNZCGP/Im_a_practice/CORNERSTONE_Aiming_for_Excellence.aspx

¹⁰ <http://tewana.org.nz>

¹¹ DHBs have a national alert system (National Medical Warning System), which is linked to the patient's National Health Index (NHI) number. Patients known to be colonised or infected with an MDRO will have a 'medical warning' or 'alert' placed on this electronic system as a way of notifying relevant health care providers about the need for IPC interventions.

8 Promote a cohesive and sustainable one-team approach to IPC functions in all health care facilities

IPC needs to be integrated at all levels in the health system to ensure patients are safe and have good-quality care. Achieving this one-team approach will require governance, clinical leadership and engagement of all health care professionals. While health care worker teams may do strategic IPC planning, the operational IPC workforce in the DHB secondary sector is generally nurse based. However, the IPC programmes run by the HQSC have clearly demonstrated the importance of multidisciplinary clinical leadership in improving IPC. Resourcing and clinical leadership need to be accessible in private, primary and community health care settings as well.

The Review on Antimicrobial Resistance (2016) recognises that IPC needs to be embedded as a priority for health systems at all levels, requiring a return to the thinking and actions in the pre-antibiotic era, when cures were limited and so preventing infection was prioritised. The Review also notes that in the past when governments, regulators and health system leaders have prioritised reducing health care associated infections, this approach has delivered results.

9 Encourage continued immunisation to prevent infections

Increased use of immunisations offers the potential to reduce antimicrobial resistance in humans and animals by preventing infection, reducing carriage of serotypes commonly associated with resistance, helping to eradicate some diseases and eliminating the need for some antibiotics. For example, a 2011 United States study found that using a pneumococcal vaccine led to a 64 percent reduction in antibiotic resistant pneumococcal infections among children and a 45 percent decrease among adults over 65 years of age (Review on Antimicrobial Resistance 2016).

The Review on Antimicrobial Resistance also recognises the importance of using existing vaccines more widely in human and animal health and the need to sustain a viable market for vaccines.

10 Promote prevention and control of zoonotic infections

IPC is important for preventing the spread of zoonotic pathogens, including pathogens resistant to antimicrobials. To do so, veterinary, human and environmental health experts must work together (that is, take a 'One Health' approach)¹² to determine the most effective strategies for early detection and preventing the spread of zoonotic pathogens, as well as food and waterborne pathogens to reduce risk of disease transmission.

¹² World Health Organization. About the One Health Initiative. www.onehealthinitiative.com/about.php

11. Encourage alternative approaches to reduce infection and antimicrobial use in animals

Improved prevention and control of infections in animals will reduce the demand for metaphylactic, prophylactic and therapeutic use of antimicrobials. Alternative approaches such as immunisation, cost-effective animal deintensification (PwC 2015) and improved animal husbandry help to prevent infection and pathogen transmission. There is a need to apply existing methods and develop new approaches – including by reconsidering established animal husbandry methods that currently make it necessary to use antimicrobials to maintain health and welfare.

Objective 4

Optimise the use of antimicrobial medicines for human, animal and plant health, which includes maintaining and enhancing the regulation of animal and plant antimicrobials.

Antimicrobial use, both appropriate and inappropriate, contributes to the development of resistant organisms by increasing selection pressure in favour of resistant strains. Having good stewardship over the use of antimicrobials can slow the development and spread of resistance (Filice et al 2013; Centers for Disease Control and Prevention 2015).

Antimicrobial stewardship (AMS) refers to coordinated actions designed to promote the appropriate use of antimicrobials which will help to conserve their effectiveness. Hospital-based AMS programmes help to prevent and optimise treatment of infections while minimising adverse events associated with antimicrobial use such as toxicity, resistance, *Clostridium difficile* infection and cost. International guidelines provide recommendations for core components of effective hospital AMS programmes (Duguid et al 2011; Barlam et al 2016). There is less experience with community AMS programmes (for example, in general practice or aged residential care), although coordinated efforts can be expected to produce a similar pattern of benefits.

AMS programmes covering antibiotic use in animals and food production may also have significant public health value in preventing the emergence of resistant strains and their spread to humans.

Situation analysis and assessment – humans

New Zealand's community use of antibiotics in human health is high compared with other OECD countries (see Figure 1 under 'Background'). Furthermore, the true level of total antibiotic use in humans in New Zealand will be higher, as the figures do not capture hospital use. In-hospital use of antimicrobials in Europe accounts for around 10 percent of total human consumption (Vander Stichele et al 2006).

To date, AMS programmes in New Zealand have focused on hospital antimicrobial use, and most AMS programmes are still in their infancy, with inconsistencies among hospitals. Where they are operating, current AMS programmes need to be evaluated and the information shared so that DHBs can take a standardised approach to address common challenges.

Antibiotic prescribing practices in hospitals

Four recently published articles have reported on antibiotic consumption in several New Zealand public hospitals (Beardsley et al 2011; Ticehurst and Thomas 2011; Hopkins 2014; Duffy et al 2015). These studies show that the overall level of antibiotic use in New Zealand hospitals in recent years is comparable with the levels in Australian and Scandinavian hospitals. They found many New Zealand hospitals use a relatively high level of some broad spectrum

antimicrobials, but are relatively prudent in using some last-line antibiotics such as fluoroquinolones, vancomycin and carbapenems, indicating a mixed picture of AMS.

The Ministry of Health HAIGG, recently conducted a survey of AMS activities in public hospitals in New Zealand. The results of this survey will further inform the priority areas of action for AMS.

DHBs are working together on hospital antimicrobial guidelines regionally (Northern, Midland, Central and Southern), as a preliminary step towards developing national guidelines. Treatment pathways for community and hospital clinicians (for example, Community Health pathways) are also increasingly available across the country to help these clinicians prescribe antimicrobials appropriately.

At the regional level, many hospital and community microbiology laboratories report each year on the patterns of antimicrobial resistance found in the bacteria they have isolated. While they informally share some of this information across New Zealand, they are not doing so in a coordinated manner.

Antibiotic prescribing practices in the community

The level of antibiotics dispensed per person in the community is high in New Zealand compared with many European countries (Williamson et al 2016). This level has increased dramatically in New Zealand in recent years – by up to 49 percent between 2006 and 2014 (Norris et al 2011; Thomas et al 2014; Williamson et al 2016). Antibiotic dispensing per person varied moderately among DHBs and increased during winter months. The proportion of total antimicrobial dispensing for broad spectrum agents (especially amoxicillin/clavulanate) has also increased over the period studied.

At the national level the following initiatives are in place to encourage prudent use of antimicrobials.

- PHARMAC targets funding to get the best health outcomes from antimicrobial use in the community and in hospitals. This includes limiting the use of some antimicrobials based on the type of prescriber and/or implementing Special Authority criteria.
- PHARMAC also has a legislative function to promote the responsible use of medicines. Part of this work involves public health programmes to address less appropriate use, including overuse, underuse, wrong choice of antibiotic and wrong dose of antibiotic, as well as patient adherence.
- The Best Practice Advocacy Centre promotes using antimicrobial medicines in the best way possible in primary care, funded primarily by Vote Health, through:
 - providing a guideline for use in New Zealand that is based on the United Kingdom’s National Institute for Health and Care Excellence guidelines for self-limiting respiratory tract infections
 - educating health professionals about using antibiotics in the best way possible through a series of publications in the Best Practice Journal and through PHARMAC responsible use contracts

- developing and publishing an antibiotic guide – *Antibiotics: Choices for Common Infections*
- auditing the prescription of amoxicillin + clavulanic acid, through PHARMAC responsible use contracts.
- AMS pharmacists are now in 9 of 20 DHBs, with dedicated specialist Senior Medical Officer support for AMS initiatives. The existing AMS pharmacists have a communication network within the New Zealand Hospital Pharmacists Association so that it is easier to share information and take a cohesive approach to AMS strategies in DHB hospitals.
 - The New Zealand Microbiology Network is a forum for communicating and discussing issues related to microbiology laboratories, including systems or initiatives to monitor and control antimicrobial resistance in New Zealand.
 - A tuberculosis reference testing service is being established to support the management of patients with multidrug-resistant TB and to provide diagnostic services for patients infected with clinically significant non-tuberculosis mycobacteria.
 - The National Virtual Multidrug-Resistant Tuberculosis Clinical Network is responsible for providing clinical advice and overseeing the treatment of patients with multidrug-resistant TB.

Situation analysis and assessment – animals and plants

It is important to have an appropriate level of regulatory oversight of antibiotics for animals and plants, in order to manage and minimise antimicrobial resistance. Antibiotics for animals and plants are regulated under the Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM Act), which MPI administers.

Key aspects of the ACVM Act's regulatory regime for animals and plants include assessing antimicrobial use in the areas of chemistry and manufacture, efficacy, residues, target animal/plant safety and labels. With the information from these risk assessments, MPI can quantify the risks the New Zealand primary sector faces. When deciding on risk management options, MPI can choose an appropriate level of control to reduce the risks to an acceptable level.

The ACVM Act has a number of tools to provide the appropriate level of control. These include the ability to:

- set controls on who can authorise, sell and use antimicrobials
- approve the content on labels
- establish rules on promoting and advertising antimicrobials
- recognise particular groups of people, such as veterinarians, who may prescribe and dispense antimicrobials
- restrict use of antimicrobials
- collect information, such as sales data, on antimicrobials
- prohibit and/or suspend registrations of products

- reassess products
- undertake prosecutions for a wide range of offences specified in the ACVM Act.

MPI's regulatory oversight of antimicrobials used for animals and plants draws on the most up-to-date policies, information requirements and standards established by international bodies such as the International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products, OECD, Codex Alimentarius Commission and OIE. It also bases its approach on industry practices and government policies, which align with those used by major overseas regulators in the United States of America, European Union, Australia and Canada.

Situation analysis and assessment – veterinary medicines

Veterinary medicines are regulated under the ACVM Act. As part of the registration process, MPI applies controls to manage the risks of those medicines. In the case of antibiotics, where appropriate, MPI requires the label to contain information on how to use them prudently when veterinarians authorise and/or use them.

New Zealand is one of the three countries in the OECD with the lowest use of antibiotics to treat animals, at least in terms of crude antimicrobial tonnage compared with livestock biomass (Hillerton et al 2016). Little information is available on how New Zealand compares with other countries in terms of use of different classes of antimicrobial (including critically important antimicrobials such as fluoroquinolones) and the types of livestock, the trends over time, and parallel incidence of or trends in AMR in animals.

Antibiotic prescribing practices: animal health

Only veterinarians, as a condition of their registration under the ACVM Act, can authorise antibiotics for animal health purposes where those antibiotics are important to human health. The Veterinary Council of New Zealand's Code of Professional Conduct has a section on how veterinarians are to use antimicrobials prudently.

The New Zealand Veterinary Association is funding work with a large veterinary franchise group to gather information from databases that will give an overview of how and when antimicrobials are being used in the farm animal sector. A study of AMS in companion animal practice in New Zealand (Pleydell et al 2012) revealed continuing professional development and specialism are important drivers for good practice in prescribing antimicrobials. Such a study could be repeated for other animal health sectors.

In addition, the NZVA has been developing judicious use guidelines for each sector of the veterinary profession. It has also been developing tools for prioritising the use of different antimicrobial agents in line with WHO and OIE recommendations.

Priority areas for action

The Review on Antimicrobial Resistance (2016) concludes that fundamental change is required in the way that antibiotics are consumed and prescribed in order to preserve the usefulness of existing antimicrobials and reduce the pressure on the search for new antimicrobial medicines. The priority areas below support this conclusion.

12 Develop a national programme or standard for antimicrobial stewardship in all sectors of human health, including resources and/or targets for use in all sectors

To make AMS more consistent, an adequately resourced national programme or standard must be developed, considering the structure, governance, resource needs and auditing requirements of an AMS programme. Those developing a national AMS programme must draw on information from the AMS programmes that currently exist. The programme needs to encourage health professionals to improve their antimicrobial prescribing within hospital and community health care settings, and have support from information technology.

Resources and guidelines

An AMS lead clinician (commonly a pharmacist, infectious diseases specialist or clinical microbiologist) should work within each DHB, and within each private health care institution. Such clinical leads also need to be accessible to provide leadership and advice on antimicrobial prescribing in community health care settings. They should receive guidance and support on implementing the national programme and should have to report on AMS activities within their DHB or institution to a national focal point.

All health care facilities must have consistent guidelines and pathways for patient care available at point of care. They should update these guidelines regularly to reflect changing patterns of antimicrobial resistance. Guidelines need to be informed by pathogen and resistance data from community and hospital microbiology laboratories.

The evidence base identifying which antimicrobials are driving resistance needs to be reviewed regularly to inform priorities for research. It is important to regularly review and audit policies that restrict the ability to prescribe selected antimicrobials and, if the review concludes that those policies advance the national goals for AMS, to maintain and/or expand them.

Improved prescribing to reduce consumption

It is only possible to reduce overall antimicrobial consumption and improve antimicrobial prescribing (for example, prescribing narrower spectrum agents, and for an appropriate duration) if the prescribing habits of the large number of individual prescribers change. This change will only occur when both these prescribers, and their patients, are convinced of the need for a change.

Surveillance of antimicrobial use (quality and quantity) is necessary to monitor the impact of AMS interventions and international benchmarking.

Surveillance data should be used to inform learning and decision-making around antimicrobial prescribing. Prescribers, primary health organisations and DHBs should receive information from surveillance data that documents the level of antimicrobial use for the patients registered with each general practitioner, primary health organisation and hospital. These reports should provide information on use that allows meaningful comparisons between general practitioners, primary health organisations, hospitals and DHBs within New Zealand, and with similar entities in other countries. The level of prescribing should be measured against both nationally agreed guidelines and targets for total use and quality of use. It must also consider the role that different antibiotics play in driving resistance or other consequences such as the rate of *Clostridium difficile* infection.

Another important initiative is to develop appropriate short- and medium-term goals for reducing the overall level of antimicrobial dispensing per person.

13 Develop a national programme or standard for antimicrobial stewardship in animal health

MPI will develop guidance documents on principles for using antimicrobials prudently in its areas of regulatory oversight.

The NZVA surveillance programme on antimicrobial usage can be extended to include companion animals. This will provide baseline data on AMS in animals, inform the development of an ongoing national programme, and help determine what drives good and poor AMS. The NZVA can update its judicious use guidelines based on information from the surveillance programme, and may use those guidelines to target key messages aimed at improving prescribing behaviour.

It is also important to improve disease detection and diagnosis in order to best use antimicrobials in animal health.

14 Establish a programme of regular monitoring of the controls on antimicrobial veterinary medicines

Regular monitoring of controls placed on antimicrobial-based veterinary medicines provides an important feedback loop to determine whether the controls are effective.

MPI recognises the current programme is ad hoc and that more regular monitoring is necessary as part of the regulatory oversight of such products.

15 Review the controls (conditions of registration) and labelling of antimicrobial-based trade name products to ensure they are fit for purpose

The controls and labels of antimicrobial trade name products have a significant impact on how people prescribe and use them. It is important that labels have critical information for veterinarians on how to use the product prudently, while the controls placed on those products will require and encourage people to use them appropriately.

It is important that controls and labels of such products are consistent with New Zealand's international obligations. They should also take into consideration information MPI receives from its surveillance and monitoring activities.

Objective 5

Establish and support clear governance, collaboration and investment arrangements so that the approach to tackling antimicrobial resistance is sustainable.

The New Zealand Government is committed to tackling AMR and working with all stakeholders to deliver on this AMR strategy. The ongoing success of this work will require strong governance, coordination, leadership and accountability.

Combatting AMR requires national and international collaboration to promote awareness, behaviour change, surveillance and knowledge sharing. Collaboration will also be essential to develop new antibiotics and diagnostic approaches and stewardship initiatives, as well as to improve infection prevention and control practices.

Situation analysis and assessment

Governance

The Ministry of Health established the Healthcare Associated Infections Governance Group in 2012 to provide oversight and direction on the effectiveness of activities that address health care associated infections.

Until 2010 the Ministry of Health also had an AMR Advisory Group, which provided advice and oversight on all aspects of AMR relating to human health. Since this group was disestablished, the Ministry has done little policy development and review in this area. As a result, in recent years, there has been a lack of national coordination and governance of AMR activities although national surveillance of resistant organisms has continued. National coordination and governance are needed to ensure the best use of available resources and to measure and evaluate the success of interventions.

MPI has had an AMR Steering Group for many years. It is recasting this group and its Terms of Reference as part of MPI's AMR work programme, to give it the membership and mandate needed to align work programmes and to avoid duplication across industry and MPI.

Investment

New Zealand currently invests in minimising AMR through surveillance and through preventing and controlling infections. Once the prioritised national areas of action have been identified and an action plan drafted, resources will be required to implement that plan.

While it is clear that investment in the development of new antimicrobials, diagnostic tools and immunisations is important on the global scale, New Zealand is a relatively small player in terms of having innovative companies that develop either drugs or new diagnostic tools. In this context, New Zealand's main role is likely to be to support basic research and international collaboration.

Collaboration

The New Zealand Health Strategy proposes a ‘one team’ approach, recognising the expertise of scientists and researchers in identifying opportunities for improvement, measuring the impacts of interventions and introducing new ideas into the system (Minister of Health 2016). Under a ‘one team’ approach, research, best practice and innovations in New Zealand and internationally would be shared freely and used to back improvements nationally.

New Zealand is currently a member of the WHO Executive Board as a Western Pacific Region Representative. The Executive Board is a governance structure made up of 34 Member States of the WHO. It advises and facilitates the work of the World Health Assembly, which is the decision-making body for WHO.

New Zealand has actively supported the WHO’s work on AMR through the Executive Board and World Health Assembly over the last few years. It supported adopting the Global Action Plan on AMR at the 68th World Health Assembly in 2015. More recently, it backed work on options for a Global Development and Stewardship Framework, which specifically aims to:

- preserve antimicrobial medicines through a stewardship framework covering control, distribution and appropriate use
- develop new health technologies for preventing and controlling antimicrobial resistance
- promote affordable access to existing and new antimicrobial medicines and diagnostic tools.

Priority areas for action

16 Establish a sustainable national governance structure to coordinate all efforts to minimise AMR

A clearly defined governance structure is essential for achieving the objectives of the AMR national action plan and for coordinating the AMR-related activities across government, regulators, standard setters and the human and animal health sectors.

The governance group should be small enough to be functional while including representation from the relevant sectors. To be effective, this group needs to have strong support from politicians and the relevant sectors. It also needs the authority to act and make decisions, and to be accountable for the successful delivery of the action plan. The governance structure will need to direct and have oversight of the operational work streams.

Clear lines of accountability will be needed to deliver the national antimicrobial resistance action plan. The governance group should be accountable to the Minister of Health and the Minister for Primary Industries.

It is essential to continue to measure performance against the National AMR Action Plan to support learning and decision-making. It is important to report progress against this plan to continue to raise awareness of the challenges with and progress on AMR.

As MPI has done with its AMR governance structures, the health sector could look to realign the governance structures already in place for health care associated infections, taking into account the need for strong governance in the area of antimicrobial resistance. A dedicated AMR governance group that coordinates the health sector response also needs to coordinate with MPI and other relevant government agencies.

17 Ensure that investment in initiatives to control AMR is sustainable. This includes ongoing investment in surveillance, communication, stewardship and infection prevention and control

To implement the actions necessary to minimise the threat of AMR, it will be important to consider any additional investment that might be needed. This work needs to take place once the prioritised areas of action have been identified and an action plan drafted.

The business case for investment is compelling. The Review on Antimicrobial Resistance (2016) demonstrates the economic reasons for having intersectoral cooperation across government departments to tackle drug-resistant infections. It also states that the costs associated with combatting AMR are dwarfed by the human and financial cost of inaction. Governments and societies, it notes, inevitably bear the long-term costs of rising AMR – costs that may be reduced by intervening now.

18 Establish the necessary national and international linkages and collaborations to implement the action plan effectively

To achieve the objectives in the strategy, New Zealand must join forces with international partners (Laxminarayan et al 2016) to contain the risks of spreading AMR from international trade and via the environment. It must also include some role for international governance structure, rules, treaties and targets (Nature 2014; Woolhouse and Farrar 2014; Årdal et al 2015; Woolhouse et al 2015).

New Zealand is exploring options for engaging further in the work of international bodies such as WHO, OIE and FAO to support the global approach to combatting AMR. It is also looking at how it can collaborate with different countries, particularly Pacific Island countries and territories, in sharing technical expertise, capacity and resource development for addressing AMR.

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