
**AUSTRALIA'S
NATIONAL
ANTIMICROBIAL
RESISTANCE
STRATEGY
2020 & BEYOND**



Australian Government

Department of Health

Department of Agriculture,
Water and the Environment

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Foreword

In today's global society, microorganisms and their resistance genes can swiftly spread through the movements of people, animals, food, soil or water. Additionally, these genes can transfer between different species of microorganisms. This makes the antibiotics, antifungals and other antimicrobials on which we all depend less effective, endangering human health and affecting food production and other economic activity.

Any effective response to the continuing rise of antimicrobial resistance requires a 'One Health' approach: coordinated action across all sectors where antimicrobials are used in the country, as well as close coordination with global action.

In 2015, the Australian Government released *Australia's First National Antimicrobial Resistance Strategy 2015–2019*. It was closely aligned with the World Health Organization's Global Action Plan on Antimicrobial Resistance and provided a national framework for a coordinated cross-sectoral response to the very real dangers posed by antimicrobial resistance.

Australia made significant progress in its response under the first strategy, including the creation of a One Health antimicrobial resistance online hub, which acts as a central repository for trusted information and resources related to antibiotic use and antimicrobial resistance generally; the establishment of the Antimicrobial Use and Resistance in Australia (AURA) Surveillance System; the completion of specific proof-of-concept antimicrobial resistance surveillance projects in the animal sector; and significant investment in research and development through National Health and Medical Research Council grants, the Medical Research Future Fund and the Cooperative Research Centres Program.

To ensure antimicrobials remain effective for decades to come, Australia needs to build on those achievements. This will require taking longer term, coordinated action to ensure antimicrobials are managed as the valuable shared resource they are, and that a national effort is made to retain their usefulness to society. *Australia's National Antimicrobial Resistance Strategy – 2020 and Beyond* presents a 20 year vision and seeks to further embed the One Health approach through a coordinated and sustained cross-sectoral response to antimicrobial resistance.

The *2020 Strategy* builds on the original 2015 strategy, broadening its ambit to encompass food, the environment and other classes of antimicrobials such as antifungals and antivirals. It will be underpinned by a series of national and sector-specific action plans which will outline the short- to medium-term goals that are needed to achieve the vision.

The *2020 Strategy* represents the collective, expert views of stakeholders – from across governments and the animal and human health, environment, agricultural and food sectors – on how best to combat antimicrobial resistance. It also maintains its alignment with the World Health Assembly-endorsed Global Action Plan on Antimicrobial Resistance and a commitment to continue to support global and regional efforts to manage the threat of antimicrobial resistance.

On 13 March 2020, the *2020 Strategy* was endorsed by the Council of Australian Governments (COAG) in recognition that combatting antimicrobial resistance is a matter of national importance and requires coordinated action by all Australian governments, along with the private sector, industry, professionals, the research community and the general public. Only such comprehensive, coordinated action can ensure we achieve the goal of preserving the power and usefulness of antimicrobials to Australian society and the economy.



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AUSTRALIA'S 20 YEAR VISION FOR ANTIMICROBIAL RESISTANCE

A world without antibiotics is inconceivable to us. Today, we take them for granted, but before 1941, an infection from even a small cut to the skin could kill. The first patient treated with penicillin was a 43-year-old English policeman who scratched his face on a rose thorn. Within a month, the infection spread, his head was covered in abscesses and one eye had to be removed. But after just 24 hours of the first treatment with the experimental drug, his temperature dropped, his appetite returned, and the infection began to heal. On the fifth day, the supply of penicillin ran out; the man relapsed and died a month later.

Antibiotics are just one of a range of active agents we use today to kill or stop the growth of microbes such as bacteria, fungi, algae, viruses and parasites; they are known collectively as antimicrobials. They are some of the most widely used therapeutic drugs worldwide – in medicine, livestock, companion animals such as pets, in plant agriculture and even oil pipelines and industrial paints. The drawback of these highly effective agents is that the more they are used, the less effective they become.

“The drawback of these highly effective agents is that the more they are used, the less effective they become.”

Some microorganisms will always have a genetic mutation or two that allow them to resist antimicrobials. Over time, these resistant strains can become dominant. This is known as antimicrobial resistance, and it is becoming more common worldwide, including in Australia.

In this long-term Strategy, Australia commits to tackling antimicrobial resistance in humans, animals, food and the environment as a priority. This will be done under the ‘One Health’ approach, which recognises the interconnection between people, animals, plants and their shared environment. Across a number of sectors – locally, nationally and globally – efforts will be aligned and, through targeted collaboration, policy, practice and systems will be strengthened to minimise the development and spread of antimicrobial resistance. Only such a holistic approach can ensure the continued availability of effective antimicrobials for decades to come.

OUR VISION

A society in which antimicrobials are recognised and managed as a valuable shared resource; and their efficacy is maintained so that the health of humans, animals and the environment is protected now and into the future.

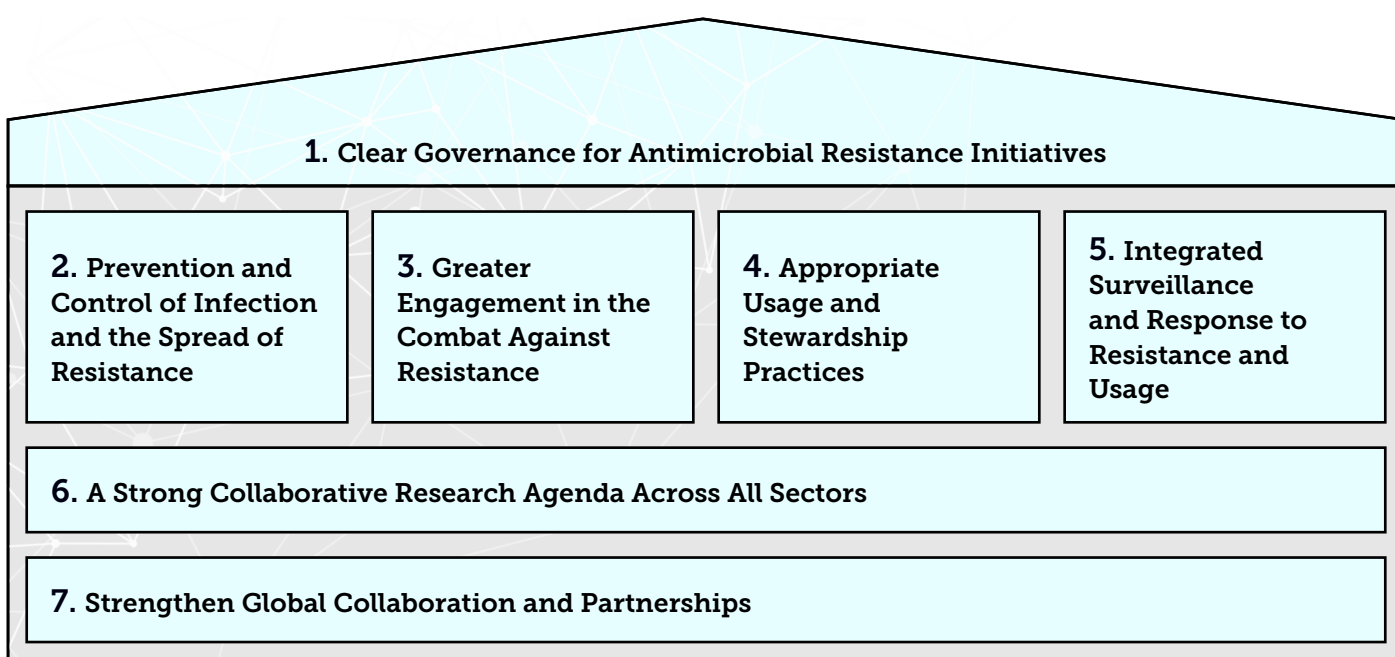
OUR GOAL

Minimise the development and spread of antimicrobial resistance and ensure the continued availability of effective antimicrobials.

OBJECTIVES AND PRIORITY AREAS FOR ACTION

The Strategy is supported by seven key objectives that will guide all sectors (see figure below). Effective action across these objectives will be driven by the overarching objective of transparent governance arrangements: clear responsibilities at the local, jurisdictional and national level to ensure leadership, engagement and accountability for actions to combat antimicrobial resistance.

Four 'pillar objectives' (numbers 2 to 5) will work concurrently to a) prevent and control infections and the spread of resistance; b) improve engagement amongst stakeholders; c) practise better antimicrobial stewardship and management; and d) undertake effective surveillance and threat responses. Supporting the four pillar objectives are two further objectives (numbers 6 and 7) for research and international collaboration and partnerships. Each objective outlines priority areas for action to focus efforts and to guide the development of action plans.



1. CLEAR GOVERNANCE FOR ANTIMICROBIAL RESISTANCE INITIATIVES

PRIORITY AREAS FOR ACTION

- 1.1 Create sustainable funding for combatting antimicrobial resistance based on evidence of economic and societal costs and benefits of different approaches in all sectors
- 1.2 Develop, implement and/or maintain sector-specific action plans
- 1.3 Maintain and expand linkages and opportunities between stakeholders across all sectors to provide a nationally coordinated approach to combatting antimicrobial resistance
- 1.4 Monitor and review regulatory measures (legislated and other) relevant to antimicrobial usage and resistance

Australia's national antimicrobial resistance governance arrangements reflect a shared responsibility between health, agriculture and environment portfolios.

Only through a shared responsibility in the health, agriculture and environment portfolios across all jurisdictions can a national antimicrobial resistance effort succeed. The Council of Australian Governments (COAG) has provided endorsement of *Australia's National Antimicrobial Strategy – 2020 and Beyond*, demonstrating the high priority placed on responding to the threat of antimicrobial resistance. Existing COAG governance arrangements for its health, agriculture and environment sub-committees allow the creation of a One Health approach to national antimicrobial resistance policy built on collaborative partnerships between portfolios.

The Antimicrobial Resistance Governance Group (ARGG), which includes the membership of the Australian Government Chief Medical Officer and the Australian Chief Veterinary Officer, will provide national coordination and linkage between sectors. Their shared coordination of this Strategy's implementation will best ensure efforts to respond to antimicrobial resistance are effective.

The Australian Strategic and Technical Advisory Group on AMR (ASTAG) will provide expert advice to the ARGG on current and emerging issues, research priorities and implementation approaches to support the Strategy.

Through its membership, ASTAG will continue to strengthen linkages between governments, industry, professional bodies and other key stakeholders to support a comprehensive and sustainable One Health response to antimicrobial resistance.

In addition to national governance, all parts of Australia's public and private sectors – such as business owners, hospitals and industry – will be encouraged to establish or review their own governance arrangements so that they integrate with this Strategy in their relevant areas of operations. Clear and consistent governance from the national to local level, and across both public and private sectors, will provide oversight, as well as support action and accountability, under the Strategy.

Implementation partners will be required to develop short- to medium-term action plans, setting out commitments and timeframes for their completion. Governance arrangements will also need to include provisions for the oversight of those plans, to ensure they are consistent with the principles of action planning as set out under the Taking Action and Measuring Success section of this report (p. 14), and that actions are completed on time to the best extent possible.

For its part, the Australian Government will need to assess the success of the Strategy – its Vision, Goal and Objectives – by developing a national monitoring and evaluation framework.

2. PREVENTION AND CONTROL OF INFECTIONS AND THE SPREAD OF RESISTANCE

PRIORITY AREAS FOR ACTION

- 2.1 Adopt evidence-based and nationally consistent standards for infection prevention and control and biosecurity
- 2.2 Maximise compliance with best-practice infection prevention and control and biosecurity measures through adherence to applicable legislation, targets and accreditation standards
- 2.3 Promote disease prevention practices to reduce infections and subsequent use of antimicrobials
- 2.4 Share information on emerging antimicrobial resistance trends to inform responses

Infections are the core reason for antimicrobial use; therefore, efforts to prevent, reduce and control their spread helps lower the need for antimicrobials in the first place. The less antimicrobials used, the less opportunity there is for organisms to develop resistance. Without effective infection prevention and control in human health, and biosecurity measures in animal health and food production, antimicrobial resistance would rise.

Infection can spread from person to person through direct contact or contaminated objects. It can also spread from humans to animals (and vice versa) through direct or indirect contact, or via disease carriers such as mosquitoes. It can spread through food via infected animal products and contaminated vegetables; or contaminated water used for drinking and irrigation.

The spread of infection can be accelerated by many factors: from the close proximity of many ill and infirm in human healthcare facilities such as hospitals, to the ease and volume of international trade and travel, which can easily allow an infection to become global.

It's not generally appreciated that everyone, not just those working in human health or agricultural biosecurity, has a role to play in preventing infection spread. Organisations and individuals must be encouraged to practise infection control in all settings, including workplaces, public spaces, veterinary practices and the livestock industry, as well as the health, aged care and child care sectors.

This can take the form of hand hygiene, better nursing and sanitation practices and the use of vaccines.

Biosecurity measures help minimise the risk of infection between animals and groups of animals, thereby reducing the need for antimicrobials. It is a shared responsibility, and requires both commitment and effort from all sectors, including government, industry, business and the community.

Best-practice infection prevention and control, and biosecurity programs and standards – including quality assurance, monitoring and evaluation programs – need to be evidence-based and adopted across all sectors.

To limit the emergence and spread of infections in humans and animals, efforts should be carried out in parallel with those activities that reinforce antimicrobial stewardship and the use of timely surveillance and monitoring data. Over time, the availability of surveillance data, and findings from research and the development of new technologies, will help suggest new approaches and improvements that will further enhance infection prevention and biosecurity.

International trends in infection prevention and control need to be monitored to learn about new and better ways to arrest the spread of infections and where critically important resistant infections are occurring, so that all sectors in Australia can be better informed on how best to respond.

3. GREATER ENGAGEMENT IN THE COMBAT AGAINST RESISTANCE

PRIORITY AREAS FOR ACTION

- 3.1 Develop and implement a coordinated, One Health communication strategy, as well as monitoring and evaluation, to support whole-of-society awareness and behavioural change
- 3.2 Strengthen public and political awareness to champion and improve the understanding of the importance of combatting antimicrobial resistance
- 3.3 Create new and different key antimicrobial resistance messages that resonate with society
- 3.4 Drive education and training initiatives across all relevant sectors and increase accessibility to evidence-based best-practice information

Expanding the commitment to combat antimicrobial resistance, and boosting the engagement of Australians across all sectors, and among all members of society, will be essential to the Strategy's success. Hence communication, education and training are not only crucial to creating deeper awareness and understanding of the challenge, but vital in empowering communities to take ownership of the issue and share in the response.

This can help improve understanding of both the causes and the effects of antimicrobial resistance, including its potential to jeopardise health, the environment and the availability and affordability of food. It can also assist better-informed decision-making, prescribing and use by practitioners; and encourage behaviour that minimises the rise and spread of resistant organisms.

Such efforts need to be coordinated, and must aim to both change behaviour and encourage concrete actions that reduce inappropriate antimicrobial use and the spread of resistant organisms. Understanding the variety of factors that influence prescribing and antimicrobial use remains a challenge. However, identifying champions in each sector, and enlisting the help of players outside of the human, animal and environmental health space – such as social science experts, civil society and advocacy groups – would help improve the public's understanding and commitment to fight antimicrobial resistance.

Reinforcing the Strategy's One Health approach to antimicrobial resistance will be important. Tailored education and training resources and tools to support participants in all sectors to carry out their various roles and responsibilities will be required, particularly around topics such as antimicrobial stewardship, infection prevention and control, as well as materials aimed at patients, clients and consumers.

Continuous improvement in education and training about antimicrobial resistance and the Strategy's One Health response will be essential in developing the skills of professionals and prescribers. This includes ongoing access to professional development built on evidence-based best-practice information, and incorporation of antimicrobial stewardship theory in human and animal health degrees such as medical and veterinary degrees.

To fulfil the Strategy's goals, simple and consistent messaging on the need to minimise the rise and spread of resistant organisms will be essential to sustain both public and political support. Audiences across all sectors – including consumers, school students, the public, and professionals in the human, animal and environmental health sectors – will all need to be targeted. An accompanying monitoring and evaluation process will be required to help quantify the effectiveness and penetration of the messaging in the public consciousness, so that adjustments can be made to maximise impact.

4. APPROPRIATE USAGE AND STEWARDSHIP PRACTICES

PRIORITY AREAS FOR ACTION

- 4.1 Ensure that coordinated, evidence-based antimicrobial prescribing guidelines and best-practice supports are developed and made easily available, and encourage their use by prescribers
- 4.2 Develop and implement effective mechanisms to monitor, reward and enforce compliance with standards and best-practice approaches for appropriate and judicious antimicrobial use
- 4.3 Use data on antimicrobial usage to inform antimicrobial stewardship policy and support the development of targeted, timely and effective responses

Resistance to antimicrobials occurs naturally in microorganisms. But it is dramatically amplified by antimicrobial overuse, underuse or poor management. Hence, the effective stewardship of antimicrobials – through appropriate and judicious manufacture, administering, dispensing, prescribing and disposal – is critical.

Where they already exist, compliance with best-practice antimicrobial prescribing guidelines must be promoted and maintained. In support of this, all sectors must have easy access to existing guidelines, and these need to be widely followed and regularly updated.

In human health, strong antimicrobial stewardship standards have been developed, and the National Safety and Quality Health Service Standards require every Australian hospital and day procedure centre to implement them. Health care practitioners and administrators need to ensure there is a concerted effort to adhere to these standards.

A need also exists to apply similar approaches in non-hospital human health settings, such as primary care and the aged care sector. Where barriers exist to the application of best-practice prescribing and stewardship practices, they need to be identified and eliminated. Innovative approaches to engage and encourage compliance are required.

Work with key stakeholders, such as the General Practitioner Antimicrobial Resistance Expert Group – which develops initiatives to enhance antimicrobial stewardship in community health settings – must continue.

It is encouraging that, in the United Kingdom's 2015 O'Neill Review into Antibiotic Resistance, Australia was ranked the fifth-lowest for antibiotic use in agriculture among the 29 countries examined.¹ However, not all segments of the Australian animal health sector have antimicrobial stewardship programs or industry standards. It is therefore important that stewardship standards be developed for the appropriate use of antimicrobials in domestic animal species – terrestrial and aquatic.

Standards for, and accreditation of, veterinary practices and hospitals should also be developed to support the implementation, maintenance and improvement of antimicrobial stewardship programs and best-practice antimicrobial use.

Antimicrobial stewardship cannot be a “one size fits all” solution. Responses need to reflect the specific needs and challenges of each sector, the regulatory environment in which it operates, and the actions already taken to address antimicrobial resistance.

¹ O'Neill, J. (2015, December). Antimicrobials in Agriculture and the Environment: Reducing Unnecessary Use and Waste. *The Review on Antimicrobial Resistance*. HM Government. Retrieved from <https://amr-review.org>

5. INTEGRATED SURVEILLANCE AND RESPONSE TO RESISTANCE AND USAGE

PRIORITY AREAS FOR ACTION

- 5.1 Create a sustainably funded national One Health surveillance system that integrates human, animal, food and environmental usage and resistance data
- 5.2 Develop and regularly review lists of priority organisms and associated antimicrobials
- 5.3 Implement national alignment of laboratory testing practices and reporting for antimicrobial resistance
- 5.4 Use evidence-based surveillance and monitoring data to inform actions and responses to contain antimicrobial resistance

To understand the magnitude, distribution and impact of resistant organisms – as well as identify emerging resistant organisms and trends, and establish links between usage and resistance across all sectors – it is vital that a nationally coordinated surveillance system covering all sectors be established. This knowledge will, in turn, be used to support policy development, prioritise actions and resources, and advocate Australia's position in trade-related forums.

The beginnings of a One Health surveillance approach – including governance arrangements to foster cross-sector collaboration and information sharing – have been gradually developed in Australia, but only in the human health sector. The Antimicrobial Use and Resistance in Australia (AURA) Surveillance System collects and reports data from partner programs across acute and community healthcare settings, and provides integrated reporting on priority organisms and antimicrobial use, and appropriateness of use, at a national level.

Comparable progress in surveillance across the animal health or environment sectors has not been made. Hence, there is an opportunity to use the existing AURA Surveillance System as the model for a nationally-coordinated surveillance system, to which other sectors can add data as it becomes available.

In the animal sector, surveillance of antimicrobial resistance has begun, conducted by the livestock industry and research groups. In the environment and food sectors, further assessment is required to determine what antimicrobial resistance and usage data will be needed to inform policy.

Expert advice from the environmental health sector will be needed to plan a risk-based approach to the staged collection and analysis of data that can contribute to a One Health surveillance system in the future.

To meet our international obligations and address potential trade issues, Australian surveillance must have the capacity to contribute to the existing global surveillance databases, including the World Health Organization's Global Antimicrobial Resistance Surveillance System (GLASS), the World Organisation for Animal Health's (OIE) global database on the use of antimicrobial agents in animals, and other future platforms that may be developed.

Data collection mechanisms will need to be transparent, and information sharing needs to be managed in a way that recognises commercial sensitivities. Also vital for the new national surveillance system will be improving the availability of real-time surveillance data, addressing data gaps and differences in data sets, making laboratory testing practices for antimicrobial susceptibility testing more consistent across the country, and having the ability to provide feedback to participants such as prescribers and industry.

Innovative approaches, such as microbial genomics (which uses genome sequencing to understand microbial populations, relatedness, mechanisms of resistances and transmission) have the potential to improve our capacity to detect and respond to outbreaks and emerging threats from the most dangerous multi-drug resistant organisms.

6. A STRONG COLLABORATIVE RESEARCH AGENDA ACROSS ALL SECTORS

PRIORITY AREAS FOR ACTION

- 6.1 Set a flexible national antimicrobial resistance research and development agenda that strives for innovation
- 6.2 Coordinate and share research and development activities
- 6.3 Seek and maintain dedicated funding for the national research and development agenda, including private and public investment partnerships
- 6.4 Support the translation of research findings into new approaches, applications and policies to combat antimicrobial resistance

Discovering new classes of antimicrobials is essential for human health, but it is only part of an effective research response to antimicrobial resistance. Research is also needed to identify the best approaches and techniques likely to achieve this Strategy's goals – most effectively, rapidly and for the least cost – across all sectors. We need to understand resistance patterns in antifungals; enhance therapeutic alternatives to antimicrobials (e.g. vaccines); explore rapid diagnostic technologies; and improve infection control, biosecurity, antimicrobial stewardship, food production practices, animal welfare strategies, and environmental initiatives.

Only further research can help us understand how to reduce inappropriate antimicrobial use and investigate alternatives to antimicrobials, while also informing the development of new or novel antimicrobials, improved preventative measures and rapid diagnostic technologies. This includes improving our understanding of infectious organisms, how resistance arises and spreads between organisms, people, animals, food and the environment, and what the impacts of antimicrobial resistance are, including on different communities of microorganisms or microbiomes.

In addition, economic research will provide information and data on the current and future potential costs of resistance as well as opportunity costs – all of which will inform policy development, budgeting and prioritising the national response to antimicrobial resistance.

Progress has been made in information sharing and collaboration between Australia's research institutes.

However, limited coordination and prioritisation of the overall research effort has led to gaps in our understanding. The establishment of a national research agenda for antimicrobial resistance would allow coordinated collaboration to fill knowledge gaps, and would improve the coordination of Australia's investment in research and development.

A national research agenda would identify the priorities for each sector, such as the need for baseline data on the extent of antimicrobial resistance in the environment; and priorities to be pursued at the intersection of sectors, such as transmission risks between humans, animals and the environment.

It would guide the allocation of resources, and focus attention on areas where new discoveries, technological innovation or new best-practice initiatives are most needed. It would also highlight areas for international research collaboration as well as encourage efficiencies in Australian research and development by minimising duplication. The creation of a mechanism for national coordination, with sector representation consistent with a One Health approach, will further assist in coordinating Australia's research and development efforts.

Innovative ways will be needed to fund, or stimulate, the discovery and development of new approaches to the prevention, detection and containment of antimicrobial resistance, in both the public and private sectors. This includes alternative funding models such as Product Development Partnerships (PDPs) and Public-Private Partnerships (PPPs). However, for the nation to benefit from investments in research and development, findings will need to be transferrable to the grass-roots level across all sectors.

7. STRENGTHEN GLOBAL COLLABORATION AND PARTNERSHIPS

PRIORITY AREAS FOR ACTION

- 7.1 Influence the global antimicrobial resistance agenda by active engagement and collaboration with other countries, multilateral organisations and forums
- 7.2 Promote the importance of antimicrobial resistance in the South East Asia and Pacific regions, and engage in related initiatives to build regulatory and other capacity
- 7.3 Participate in international surveillance and monitoring initiatives

Resistant organisms are now spreading across the world faster and further than ever before. In large part, this is due to the growth of international trade and travel. As a wealthy developed nation with an advanced health system, Australia has a responsibility – as well as a vested interest – in addressing antimicrobial resistance in our region.

Growth in tourism, business travel and medical tourism – in which people travel to another country to obtain medical treatment – has also contributed to the international spread of infections, often acquired in health care settings, that are frequently resistant to multiple antimicrobials. This further highlights the global nature of the problem.

Australia, through the public and private sector, and through the research community and industry, has been collaborating with the international community in a range of areas, such as capacity building in the South East Asia Pacific region; prevention and control measures; public education; research and development; and surveillance methods.

It is essential that Australia continues to actively engage and collaborate with other countries, particularly in the South East Asia and Pacific regions, as well as with multilateral organisations and forums such as the United Nations, the G20, the Tripartite agencies (the World Health Organization, the Food and Agriculture Organization of the United Nations, and the World Organisation for Animal Health) and the UN Environment Programme to support collaboration, address potential trade issues, and share information across global research networks. Some countries

are leading the way on the testing and monitoring of resistance, or reducing antimicrobial use in humans, animals and agriculture, so there is considerable scope to learn from successes overseas.

Continued involvement in South East Asian and Pacific initiatives aimed at antimicrobial resistance is also important. This includes supporting systems and policy initiatives that deliver improved One Health action in our region, such as enhancing human and animal health systems, providing technical assistance on better regulation practices, aiding large-scale disease prevention and treatment, and encouraging regional solutions to trans-boundary disease threats. Boosting regulatory capacity in the region is essential to ensure access to quality antimicrobials and to assist with appropriate usage, and Australia should explore further opportunities to tackle antimicrobial resistance and advance the region's health security by engaging with neighbouring countries and global partners.

Without international collaboration, the efforts of individual countries will be less effective and create duplication. This is particularly the case in global research and development, where countries and organisations, through coordination and collaboration, can deliver better results for less cost while maximising efficiency and effort.

TAKING ACTION AND MEASURING SUCCESS

To accomplish the vision and objectives of this Strategy over the next 20 years, a clear and interconnected blueprint for action needs to be established, implemented, monitored and evaluated.

Tackling the urgent challenge of antimicrobial resistance in humans, animals, food and the environment will require commitment and action from all sectors and stakeholders. As such, all sectors need to develop short- to medium-term action plans. Only a planned approach towards delivering on the objectives and priority areas for action can achieve success. While each sector and its stakeholders will be in different stages of their journey in responding to antimicrobial resistance, action plans should follow a set of general principles:

- **Impactful:** Interventions with the greatest potential to combat antimicrobial resistance, to reduce inappropriate usage, and which offer the best value for money should be prioritised. A risk-based approach could be considered when determining priorities.
- **Evidence-Based:** Action plans will be based on established research, data and modelling to ensure the highest effectiveness for the lowest cost.
- **Planned Approach:** Comprehensive planning will outline the steps required to reach longer term goals and objectives, and allow organisations to monitor progress and achievements.
- **Adaptable:** As new research, data and techniques become available, or national (or global) priorities change, action plans should be flexible enough that they can be adapted to incorporate emerging information and new approaches.
- **Integrated:** Sectors should work collaboratively wherever possible, sharing information and resources, to reduce the risk of duplication of effort.
- **Measurable:** Action plans should set clear targets and timeframes, to enable progress to be tracked and appropriate action taken to address delays or other impediments.

In addition to these principles, the Tripartite agencies (the World Health Organization, the Food and Agriculture Organization and the World Organisation for Animal Health) have developed a manual and other shared resources for developing action plans which can then be monitored and evaluated.² These are useful resources for sectors and industry in developing their own action plans.

² World Health Organization. Antimicrobial resistance: National action plans [Internet]. 2019 [cited 2019 Sep]. Available from: <https://www.who.int/antimicrobial-resistance/national-action-plans/en/>

WORKING TOGETHER AS ONE HEALTH

Antimicrobial resistance is one of the most complex public health threats the world has ever faced: its potential implications range from economic, human and animal health, food safety and agriculture to environment and trade. The success of this Strategy will depend on all parties working together.

Under this Strategy, the Australian Government will continue to lead Australia's response to antimicrobial resistance. However, everyone has a role to play in a coordinated manner across the public and private sectors, industry, professionals, the research community and society.

The Public Sector

Antimicrobial resistance is an urgent national priority that requires the cooperation of all jurisdictions. Consequently, a coordinated effort across all levels of government – at the Commonwealth, state, territory and local government level – as well as partnerships across the human health, agriculture, animal health and environment portfolios, will be essential.

The Private Sector and Industry

The private sector and industry can assist by promoting best-practice stewardship, infection prevention and biosecurity measures; and by demanding compliance with best-practice guidelines and standards from suppliers such as health service providers, producers, veterinarians, and other businesses whilst working closely with regulators. Industry can also invest in research and development to ensure an effective supply of antimicrobial treatments, better diagnostic tools and new antimicrobial approaches.

Professionals

Professionals can engage in and promote best-practice use and stewardship across the human, animal, food and environmental health sectors. They can also promote best-practice infection prevention and control and antimicrobial use by health workers, veterinarians, food producers and throughout the food chain. Peak professional and industry bodies in the sectors affected should consider incorporating antimicrobial resistance into their accreditation, professional development and training programs.

The Research Community

Research and development will play a crucial role in helping to create a comprehensive, multi-sectoral approach to antimicrobial resistance through its role in expanding the knowledge base on resistant microorganisms and on how to contain and alleviate their impact. Researchers, academics and funding agencies can also improve our understanding of how antimicrobial resistance arises, and develop new, safe and effective treatments.

Society

Reducing the need for, and use of, antimicrobials will require Australians from all walks of life – including patients, animal owners, consumers and civil society organisations – to gain a greater understanding and appreciation of the dangers posed by antimicrobial resistance. This includes understanding the risks and benefits of antimicrobials, using them only as directed, as well as taking responsibility for good personal and food hygiene and infection control at home or when travelling abroad for business, tourism, or for medical procedures.

Glossary

Antimicrobial: An active agent, such as a medicine, that – on application to living tissue or through systemic use – kills, prevents or inhibits the growth of microorganisms. Antimicrobials include antibiotics, antiseptics, antifungals, antivirals, antimalarials and anthelmintics.

Antimicrobial resistance (AMR): The ability of microorganisms – including bacteria, viruses, fungi and parasites – to develop a capability to grow or survive in the presence of antimicrobials, and to pass this trait on via their genes to other microorganisms.

Antimicrobial stewardship (AMS): The safe and appropriate use of antimicrobials to reduce harm while also curtailing the incidence of antimicrobial resistance.

Antimicrobial Resistance Governance Group: A group of experts and officials who provide national coordination and linkage between sectors; it includes membership of the Australian Government Chief Medical Officer and the Australian Chief Veterinary Officer.

Australian Government Chief Medical Officer: The Australian Government's chief advisor on medical matters for both the Health Minister and the Department of Health.

Australian Chief Veterinary Officer: The chief advisor to the Australian Government on matters relating to animal health.

Australian Strategic and Technical Advisory Group on AMR (ASTAG): ASTAG develops and provides expert advice on AMR-related issues; it includes representatives from human health, animal health, food, agriculture and the environment.

AURA Surveillance System: The Antimicrobial Use and Resistance in Australia Surveillance System coordinates data from many sources to provide a comprehensive and integrated picture of patterns and trends of antimicrobial resistance and antimicrobial use in human health across Australia.

Biosecurity: Efforts to prevent, respond to and recover from pests and diseases that threaten the economy and environment.

Food and Agriculture Organization of the United Nations (FAO): A specialised agency of the United Nations that leads international efforts to defeat hunger, and share knowledge to improve agriculture, forestry and fisheries practices as well as ensuring good nutrition and food security for all.

General Practitioner Antimicrobial Resistance Expert Group (GP AMR Expert Group): A sub-group of ASTAG, whose primary objective is to support work to improve antibiotic stewardship in general practice.

Global Antimicrobial Resistance Surveillance

System (GLASS): Launched in 2015 by the World Health Organization, GLASS supports global surveillance and research to strengthen the evidence base on antimicrobial resistance and help inform national and international decision-making.

G20: The Group of 20 consists of the world's largest economies. They are Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, South Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom and the United States of America, plus the European Union.

National Safety and Quality Health Service Standards: A nationally consistent standard of the level of care Australians can expect from health service organisations.

One Health: The principle of applying a collaborative and coordinated effort across multiple sectors – working locally, nationally and globally – to attain optimal health for people, animals and the environment.

Pathogenomics: A branch of research that uses data from gene sequencing to understand microbe diversity and interaction as well as host-microbe interactions in disease states.

Product Development Partnerships (PDPs): PDPs bring together funding agencies, private industry and scientists to develop new drugs, diagnostics and other disease prevention and control technologies, often for use in poor nations where market incentives alone will not drive product development.

Public-Private Partnerships (PPPs): A cooperative arrangement between two or more public and private sector players, typically of a long-term nature.

Sector: In this report, 'sector' refers to the human health, animal health, agriculture, food and the environment sectors, to which a One Health approach will be applied.

Tripartite agencies: A formal international partnership to combat health threats associated with interactions between humans, animals and the environment, consisting of the Food and Agriculture Organization, the World Health Organization and the World Organisation for Animal Health.

World Health Organization (WHO): A specialised agency of the United Nations concerned with international public health.

World Organisation for Animal Health (OIE): The international standard setting body working to improve animal health and welfare.

UN Environment Programme (UNEP): A United Nations agency which coordinates global environmental initiatives on the atmosphere, marine and terrestrial ecosystems, environmental governance and sustainable development.



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