

Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR) 2022-2026

Ministry of Health Malaysia
&
Ministry of Agriculture and Food Security





Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR) 2022-2026

Copyright © Ministry of Health Malaysia

All right reserved. This book may not be reproduced, in whole or in part, in any form or means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system now known or here after invented, without written permission from publisher.

**Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR)
2022-2026****Produced & Distributed by:**

Infection Control Unit
Medical Care Quality Section
Medical Development Division
Ministry of Health Malaysia
Level 4, Block E1, Complex E, Precinct I,
Federal Government Administration Centre,
62590, Putrajaya Malaysia
Tel: 03-8883 1180

Printed by:

ATTIN PRESS SDN BHD

ISBN : 978-967-2469-63-6

FOREWORD BY THE HONOURABLE MINISTER OF HEALTH

The COVID-19 pandemic has highlighted the importance of preventing and controlling antimicrobial resistance (AMR). The widespread use of antibiotics to treat patients with co-infections has raised concerns about the dual health threats of AMR alongside COVID-19 infection, which has the potential to accelerate the emergence of AMR.

This silent AMR pandemic has long taken its roots, causing increased morbidity, mortality, and catastrophic financial consequences that involve not just humans but also affect animals and the environment. The continued emergence of drug-resistant diseases will cause a reduction in the effectiveness of medicine and present a complex problem for the health and development of the nation. Hence, a coordinated global response is needed to prevent and control the spread of AMR and ensure effective treatments are available to combat drug-resistant infections.

After extensive deliberations in the United Nations and other high-level meetings, Malaysia developed its first

Malaysian Action Plan on AMR in 2017. This strategy is aligned with the WHO Global Action Plan on AMR framework to involve multiple collaborative efforts between public and private sectors involving human, animal, and environmental health sectors in the past five years. These measures will not end here and more so after the pandemic.

To ensure the continuity of the programme, a second phase of the action plan has been structured based on the progress of the first plan and country's current situational analysis. This new action plan will present coordinated activities with expanded efforts into areas previously not focused on, such as the environment and agriculture. This plan will also continue strengthening the current strategies through a more comprehensive One Health approach and concrete deliverables to minimise the impact of AMR.

We thank the National Antimicrobial Resistance Committee, working groups, and all stakeholders and agencies for their collaboration, contributions, and continued commitment. We look forward to working together to reduce AMR and its impact and safeguard the health and development of the nation for current and future generations.



YB Dr. Zaliha binti Mustafa

Minister of Health

FOREWORD BY THE HONOURABLE MINISTER OF AGRICULTURE AND FOOD SECURITY

Antimicrobial resistance (AMR) is a serious global public health threat in this century and like other countries, Malaysia is no exception. The Ministry of Agriculture and Food Security (KPKM) and the Ministry of Health Malaysia (MOH) have been working together for several years through the “One Health” approach to address risks at the human-animal interface. For KPKM, the AMR issue is a major threat to food safety and security in this country.

Following the first National Antimicrobial Resistance Committee (NARC) Meeting in 2017, KPKM and MOH agreed to jointly develop the Malaysian Action Plan on Antimicrobial Resistance (MyAP-AMR) 2017-2021 followed by this second phase of MyAP-AMR 2022-2026 as a continuation of the AMR programme. The implementation of activities in MyAP-AMR requires commitment and effort from all industry players including veterinarians, farmers, animal feed manufacturers, processing plant operators and all relevant stakeholders. KPKM will continue to stay committed to the national agenda in minimising the emergence of AMR.

Although antimicrobial utilisation (AMU) is important for the treatment of both human and animal diseases, maintaining the

effectiveness of antimicrobial agents is a priority to minimise the development of AMR. Antimicrobials should be used in a responsible manner. This is important to ensure the antimicrobials used do not cause harm to animals and humans. In addition, encouraging the use of animal vaccines is one alternative to reduce the need for antimicrobials.

KPKM has implemented initiatives by introducing Malaysian Good Agricultural Practices (MyGAP), Veterinary Health Mark (VHM) and Good Veterinary Hygiene Practice (GVHP) certification schemes to strengthen animal biosecurity on farms to prevent infections and to improve hygiene in slaughterhouses and processing plants. Indirectly, animal production can be increased, and the industry provides animal-based food products that are safe for human consumption. AMR, AMU, and all of the initiatives must be communicated not only to livestock industry players and stakeholders but also to politicians, leaders, civil society, consumers and the public as a whole. The purpose of creating awareness with wide coverage is to gain support, understanding and behavioural change towards supporting the initiatives against AMR.

Finally, I would like to express my gratitude and appreciation to all parties involved directly or indirectly in developing MyAP-AMR 2022-2026. I hope this will guide the implementation of actions and efforts in the fight against AMR and preserve the effectiveness of this valuable antimicrobials for present and future generations.



YB Datuk Seri Haji Mohamad bin Sabu

Minister of Agriculture and Food Security

ADVISORS

ACKNOWLEDGEMENT

Tan Sri Dato' Seri Dr. Noor Hisham Abdullah

Former Director-General of Health Malaysia
Ministry of Health Malaysia

Dr. Akma Ngah Hamid

Director-General of Veterinary Services Malaysia
Ministry of Agriculture and Food Security

Datuk Mohd Sufian Sulaiman

Former Director-General of Fisheries Malaysia
Ministry of Agriculture and Food Security

Dato' Wan Abdul Latiff Wan Jaffar

Director-General of Environment Malaysia
Ministry of Natural Resources, Environment and
Climate Change

Dato' Ir. Nor Hisham Mohd Ghazali

Former Director-General of National Water
Research Institute of Malaysia
Ministry of Natural Resources, Environment and
Climate Change

Dato' Dr. Asmayani Khalib

Deputy Director-General of Health Malaysia
(Medical)
Ministry of Health Malaysia

Dato' Dr. Mohd Azman Yacob

Director
Medical Development Division
Ministry of Health Malaysia

Dr. Nor Hayati Ibrahim

Former Deputy Director
Medical Care Quality Section
Medical Development Division
Ministry of Health Malaysia

CONTRIBUTORS

Datuk Dr. Mahiran Mustafa
Dr. Rohaya Mohd Ali
Dr. Suraya Amir Husin
Dato' Dr. Suresh Kumar Chidambaram
Dato' Dr. Chow Ting Soo
Dr. Jamaliah Senawi
Dr. Norazah Ahmad
Dr. Rohaidah Hashim
Dr. Tariq Jaafar
Dr. Benedict Sim
Mrs. Munira Muhammad
Dr. Azman Shah Abd Manaf
Mrs. Fuziah Abdul Rashid
Mrs. Rohana Hassan
Mrs. Laila Rabaah Ahmad Suhaimi
Dr. Alifah Ismail
Dr. Noor Amelia Abd Rasid
Mrs. Nor Fasihah Abdullah Sani
Dr. Noor Haza Fazlin Hashim
Mrs. Hazimah Hashim
Mrs. Siti Nurul Fathihah Baharudin
Dr. Norazlina Hj Mohd Noh
Dr. Nor Farah Bakhtiar
Mrs. Kasumawaty Sudin
Prof. Dr. Latiffah Hassan
Prof. Madya Dr. Siti Khairani Bejo
Dr. Rozaihan Mansor
Dr. Thirunavabarasu Rajoo
Mr. Ir Dzulkifli Mohamad
Dr. Nur Azzalia Kamaruzaman
Mr. Amrahi Buang
Mrs. Nurul Hidayati Surawi
Mrs. Ani Fadhlina Mustaffa
Dr. Sohayati Abd Rahman
Dr. Noraini Mohd Yusof
Dr. Norhazirah Mohd Noor
Prof. Madya Dr. Arifah Kadir
Prof. Dr. Ariza Adnan
Mrs. Lau Chee Lan
Dr. Mariani Hashim
Dr. Sara Sofia Yahya
Dr. Shahnaz Md Nor
Mrs. Suhaily Othman
Mrs. Norhanida Sharifuddin
Mrs. Che Liza Che Abdullah
Datin Shantini Thevendren
Mrs. Siti Mariaton Abd Moksin
Mrs. Chee Yoke Ling
Dr. Muhammad Nazri Aziz
Dr. Hazilawati Hussin

Mrs. Hafizah Mohd
Dr. Koay Teng Khoon
Mrs. Mariatul Umeera Muhd Dahaban
Dr. Melia Abd Salam
Mr. Muhammad Azroie
Mr. Abdul Halim Abu Naim
Dr. Syamhanin Adnan
Dr. Sahlawati Mustakim
Dr. Nor Zahrin Hasran
Datin Zahura Mohames @ Ismail
Dr. Noraini Ismail
Dr. Salmiah Mohd Shariff
Dr. Rahela Ambaras Khan
Dr. Nor'Aishah Abu Bakar
Mrs. Norsaadah Omar
Dr. Sarah Dadang Abdullah
Dr. Rohani Jahis
Mrs. Najwa Ahmad Hamdi
Mrs. Siti Hir Huraizah Md Tahir
Mrs. Sulastri Samsudin
Mrs. Tee Tee Tan
Dr. Ker Hong Bee
Mrs. R. Pusparani Ramasamy
Dr. Masliza Zaid
Dr. Tuan Suhaila Tuan Soh
Mrs. Marina Idi
Dr. Low Lee Lee
Dr. Husni Hussain

Dr. Thilaka Chinnayah@Nadarajah
Dr. Cheng Joo Thye
Mrs. Marina Abdul Rahman
Dr. Ummy Sumilah Soraya Mohamad Johar
Prof. Dr Zunita Zakaria
Dr. Azlan Enjah
Dr. Siti Hafizah Mohd Salleh
Mr. Mohd Azroie Mohamed Yusoff
Mrs. Zuhainim Abd Ghafar
Prof. Dr. Sasheela La Sri Ponnamlavanan
Prof. Madya Sharifah Faridah Syed Omar
Mr. Ts Mohammad Nazrul Fahmi Abdul Rahim
Mrs. Zanariah Zaini
Mrs. Nor Fatmahwati Yakup @ Jhon
Mrs. Mardhiyah Kamal
Dr. Farrah Alias
Dr. Siti Norzubaiddah Abd Rafar
Mrs. Raja Yana Maleesa Raja Haroon Arashid
Mr. Roslan Hassan
Mrs. Zarina Zainuddin
Mrs. Rozana Johari
Dr. Noorliza Mohamad Noordin
Mr. Pang Anak Nyukang
Mr. Wan Azrin Izani Wan Mohd Zain
Mr. Jamal Affendy Shahar
Mrs. Wan Syahidah Hussain
Dr. Khairil Erwan Khalid
Dr. Wan Norhana Md Noordin

**Special thanks to WHO Malaysia Country Office and
WHO Western Pacific Regional Office for their contribution in reviewing
this action plan**

EDITORIAL COMMITTEE

Dr. Suraya Amir Husin
Dr. Feroza Sulaiman
Dr. Noor Amelia Abd Rasid
Dr. Shahnaz Md Nor
Dr. Rohaya Mohd Ali
Dr. Rohaidah Hashim
Mrs. Nor Fasihah Abdullah Sani
Dr. Noor Haza Fazlin Hashim
Mrs. Hazimah Hashim
Dr. Nor Farah Bakhtiar
Dr. Sara Sofia Yahya
Ms. Siti Nurul Fathihah Baharudin
Dr. Norazlina Mohd Noh
Mrs. Kasumawaty Sudin

IMPLEMENTERS

viii

In response to our shared responsibility in the containment of AMR, the key implementers of MyAP-AMR are:

1. Ministry of Health Malaysia
2. Department of Veterinary Services,
Ministry of Agriculture and Food Security
3. Department of Fisheries,
Ministry of Agriculture and Food Security
4. Ministry of Natural Resources,
Environment and Climate Change
5. Ministry of Higher Education
6. Ministry of Education
7. Ministry of Defence
8. Private Healthcare Facilities
9. Community Pharmacists
10. Animal Food Industries
11. Professional Organisations pertaining to
Human and Animal Health

In addition to the above list, we would like to acknowledge the important role of universities, the private sector, international partners, non-governmental organisations, and civil society in implementing MyAP-AMR.

ABBREVIATIONS

Abbreviations Full Name

AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
AMU	Antimicrobial Utilisation
ANIMUSE	Animal Antimicrobial Use System
APHM	Associations of Private Hospitals of Malaysia
AST	Antibiotic Sensitivity Testing
BKAV	Veterinary Public Health Division
BSI	Blood Stream Infection
CAUTI	Catheter Associated Urinary Tract Infection
CCU	Corporate Communication Unit
CIA	Critically Important Antibiotics
CLABSI	Central Line-Associated Bloodstream Infections
CPD	Continuing Professional Development
CRE	Carbapenem Resistant <i>Enterobacteriales</i>
CS	Clinical Sepsis
DCD	Disease Control Division
DOE	Department of Environment
DOF	Department of Fisheries Malaysia
DST	Drug Susceptibility Testing
DVM	Doctor of Veterinary Medicine
DVS	Department of Veterinary Services
ESBL	Extended Spectrum Beta Lactamase
ESD	Engineering Services Division
FAO	Food and Agriculture Organization of the United Nations
FHDD	Family Health Development Division
FLFAM	Federation of Livestock Farmers Associations of Malaysia
FOMCA	Federation of Malaysian Consumer Associations
FSQD	Food Safety and Quality Division
FSQL	Food Safety and Quality Laboratory
GLASS	Global Antimicrobial Resistance and Use Surveillance System
GVHP	Good Veterinary Hygiene Practice

HA-MDRO	Healthcare Associated Multidrug Resistant Organisms
HCAI	Healthcare Associated Infection
HCW	Healthcare Worker
HED	Health Education Division
HePiLI	Health Promotion in Learning Institutions
HO	House Officer
HPIA	Hospital Performance Indicator Approach
ICLN	Infection Control Link Nurse
ICU	Intensive Care Unit
ICR	Institute for Clinical Research
IMR	Institute for Medical Research
IPC	Infection Prevention and Control
IHBR	Institute for Health Behavioural Research
KAP	Knowledge, Attitude and Practices
KPI	Key Performance Indicators
LKIM	Malaysian Fisheries Development Authority
KPKM	Ministry of Agriculture and Food Security
MAHA	Malaysia Agriculture, Horticulture and Agrotourism
MAQIS	Malaysian Quarantine & Inspection Services
MARDI	Malaysian Agricultural Research and Development Institute
MDD	Medical Development Division
MDRO	Multidrug Resistant Organism
MINDEF	Ministry of Defence
MMA	Malaysian Medical Association
MOA	Ministry of Agriculture and Agro-based Industry
MOH	Ministry of Health Malaysia
MOHE	Ministry of Higher Education
MOSTI	Ministry of Science, Technology and Innovation
MPS	Malaysian Pharmacists Society
MPUHC	Malaysian Public University Hospitals Consortium
MRSA	Methicillin-resistant <i>Staphylococcus aureus</i>
MSA	Malaysian Society of Animal Production
MyAP-AMR	Malaysian Action Plan on Antimicrobial Resistance
MyGAP	Malaysian Good Agricultural Practices
MyOHAR	Malaysia One Health Antimicrobial Resistance
MyOHUN	Malaysia One Health University Network
MyOrganics	Malaysian Organics

NAHRIM	National Water Research Institute of Malaysia
NARC	National Antimicrobial Resistance Committee
NGO	Non-Governmental Organisation
NIP	National Immunisation Programme
NPC	National Poison Centre
NPHL	National Public Health Laboratory
NVPHL	National Veterinary Public Health Laboratory
NRECC	Ministry of Natural Resources, Environment and Climate Change
NSAR	National Surveillance of Antimicrobial Resistance
NSDWQ	National Standard for Drinking Water Quality
OHP	Oral Health Programme
PHL	Public Health Laboratory
PMDT	Programmatic Management of Drug Resistant Tuberculosis
POCT	Point of Care Testing
PPS	Point Prevalence Survey
PRP	Provisionally Registered Pharmacists
PSP	Pharmaceutical Services Programme
CCS	Corporate Communication Section
SPAN	National Water Service Commissions
SSI	Surgical Site Infection
SOP	Standard Operating Procedure
TRIuMPH	TRIcycle protocol: upscaling to national Monitoring, detection of Carbapenemase Producer <i>E. Coli</i> and <i>Enterobacterales</i> (CPE) and Whole Genome Sequencing (WGS) pipelines for One Health Surveillance
TrACSS	Tracking AMR Country Self-Assessment Survey
TOT	Training of Trainers
UM	Universiti Malaya
UTI	Urinary Tract Infection
VAP	Ventilator Associated Pneumonia
VHM	Veterinary Health Mark
WAAW	World Antimicrobial Resistance Awareness Week
WASH	Water, Sanitation and Hygiene
WHO	World Health Organisation
WOAH	World Organisation for Animal Health
WGS	Whole Genome Sequencing

TABLE OF CONTENTS

Page iii	FOREWORD BY THE HONOURABLE MINISTER OF HEALTH
Page iv	FOREWORD BY THE HONOURABLE MINISTER OF AGRICULTURE AND FOOD SECURITY
Page v	ADVISORS
Page vi	CONTRIBUTORS
Page vii	EDITORIAL COMMITTEE
Page viii	IMPLEMENTERS
Page ix	ABBREVIATIONS
Page I	SECTION I: EXECUTIVE SUMMARY
Page 9	SECTION 2: KEY ACHIEVEMENTS OF MyAP-AMR 2017-2021
Page 23	SECTION 3: STRATEGIC OBJECTIVES AND ACTIONS UNDER MyAP-AMR 2022-2026
Page 63	SECTION 4: OUTCOME INDICATORS OF MyAP-AMR 2022-2026
Page 65	Appendix

SECTION I

EXECUTIVE SUMMARY

The emergence of AMR poses a major threat to global health and is accelerated by the misuse and overuse of antimicrobials. It is estimated that 700,000 people die due to AMR, and the death toll could surge to 10 million annually by 2050 as quoted in a 2017 report entitled 'Drug-Resistant Infections: A threat to Our Economic Future'. The estimated death is five times more than the recorded death toll annually during the COVID-19 pandemic, and this catastrophe will continue to advance if no urgent action is taken.

AMR recognises no borders and may be transmitted to humans through the food chain and environment. Hence, employing the One Health approach is essential to engage the government's and diverse stakeholders' active involvement and long-term commitment.

Following the WHO Global Action Plan on AMR in 2015, Malaysia developed the Malaysian Action Plan on AMR (MyAP-AMR) 2017-2021, which was the first 5-year national action plan that outlined AMR containment strategies and activities, as well as establishing the National Antimicrobial Resistance Committee (NARC), a coordinating body to govern intersectoral containment activities.

The first action plan represented collective recommendations from stakeholders, mainly from the human and animal health sectors, and the WHO. Building on the strategies and programmes already in place, the newly developed MyAP-AMR 2022-2026 will implement new initiatives, including the involvement of environment and plant health. Additionally, this updated action plan aims to establish a successful and sustainable antimicrobial stewardship (AMS) programme in both public and private healthcare facilities and the animal health sector. At the same time, preventing and controlling infections and diseases will continue to be prioritised.

The MyAP-AMR 2022 - 2026 consists of four main objectives with 21 new strategies. The objectives are:

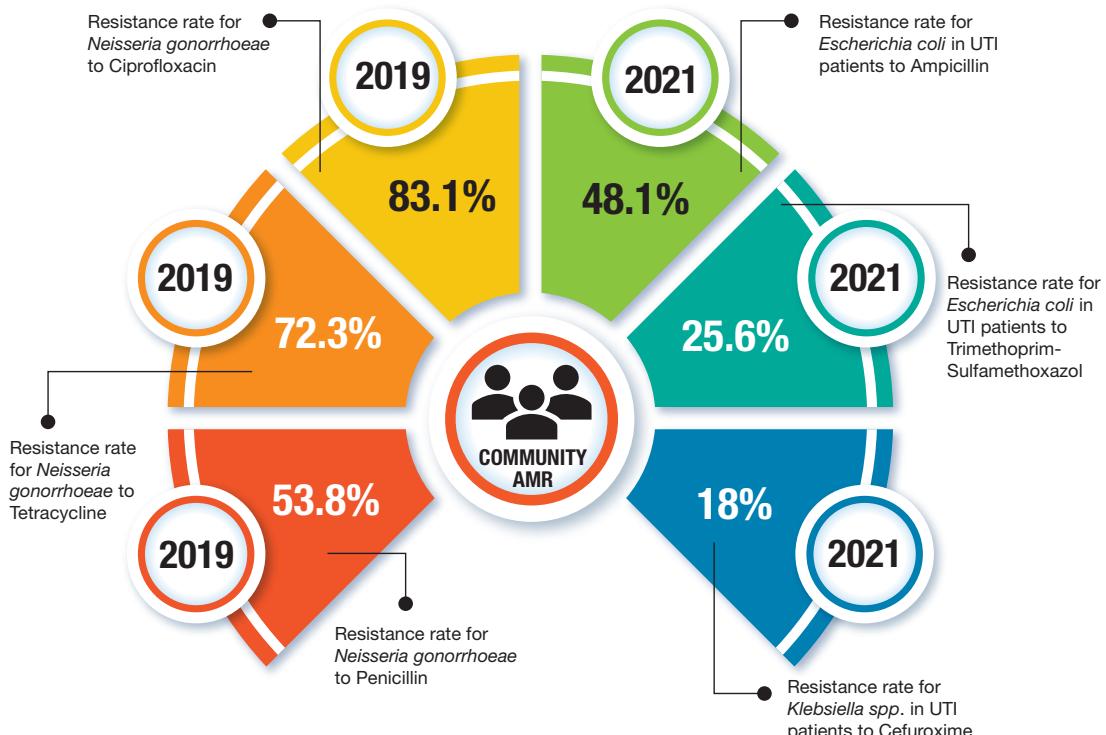
- 1. Strategic Objective 1: Strengthen awareness and understanding of AMR**
- 2. Strategic Objective 2: Strengthen National One Health Surveillance and Research Efforts**
- 3. Strategic Objective 3: Reduce the Transmission of Infection and Disease**
- 4. Strategic Objective 4: Optimise the use of antimicrobials across relevant sectors**

The plan has enhanced the One Health strategies by adopting a comprehensive approach to address AMR effectively whilst guiding all stakeholders in mitigating the burden and impact of AMR in the country. Furthermore, this new plan is designed to ensure the continuity of successful interventions taken in the first My-AP AMR. Malaysia remains fully committed to taking proactive measures in dealing with the increasing challenges and burden of AMR.

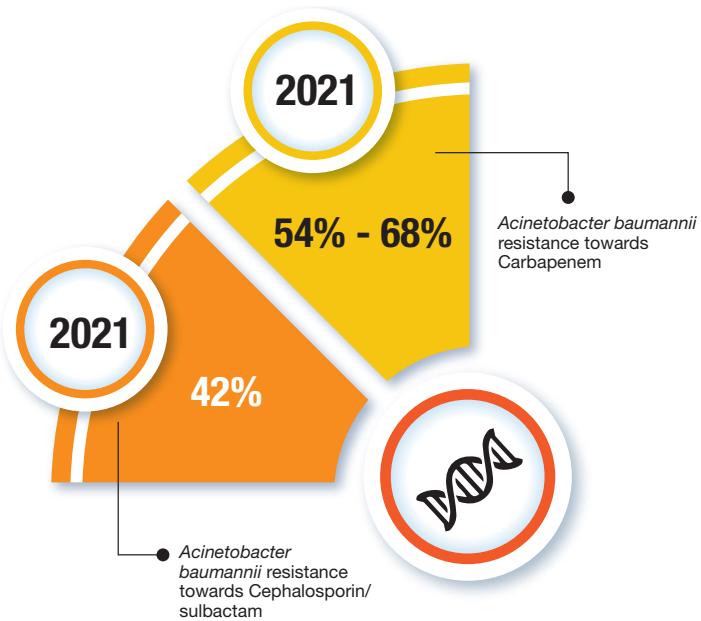
BACKGROUND

The continued emergence of AMR has posed a significant challenge to our healthcare system's ability to uphold patient safety, as it diminishes our capacity to effectively prevent and manage infectious diseases in both human and animal health domains. Failing to address AMR adequately will have far-reaching consequences, affecting global health, socio-economic progress, food safety and security, and environmental well-being.

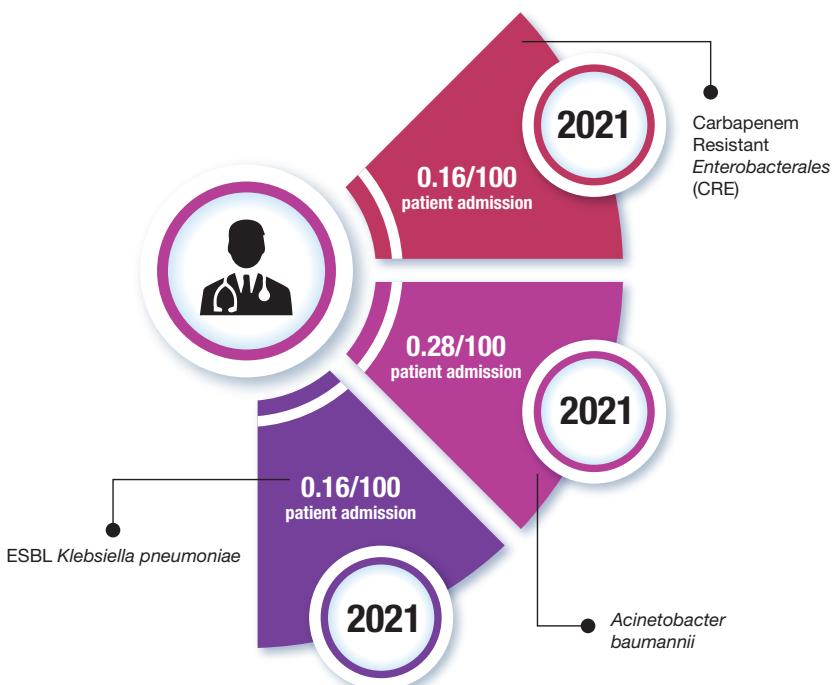
The Presence of AMR in the Community



National Antibiotic Resistance Surveillance (2021): Multidrug Resistant *Acinetobacter baumannii*



Top Three Healthcare Associated Multidrug Resistant Organisms (HA-MDROs) in selected MOH and MOHE Hospitals



Acknowledging the intricate connections between human, animal, plant, and environmental health across sectors is crucial. Building upon the foundation of MyAP-AMR 2017-2021, the current national strategy focuses on four key priority areas with strategic objectives as outlined below (**TABLE I**).

Recognising the need for a robust AMR response that encompasses health, agriculture, the food chain, and the environment, numerous partners from relevant ministries and agencies have collaborated to formulate this new action plan. This plan outlines the strategies and initiatives slated for implementation in the country over the next five years. The proposed activities span various sectors and encompass both public and private entities.

TABLE I: Key Priority Areas and Strategic Objectives

Key Priority Areas	Strategic Objectives
1. Public Awareness and Education	Strengthen Awareness and Understanding of AMR
2. Surveillance and Research	Strengthen National One Health Surveillance and Research Efforts
3. Infection Prevention and Control	Reduce the Transmission of Infection and Disease
4. Appropriate Use of Antimicrobials	Optimise the Use of Antimicrobials Across Relevant Sectors

NATIONAL AMR GOVERNANCE

AMR has emerged as a global health challenge in the twenty-first century, posing significant risks to population health. It is estimated to cause around 700,000 deaths annually worldwide and could disrupt the global economy, potentially resulting in trillions of dollars in costs if left unaddressed. Nonetheless, the international response to AMR has been robust. In 2015, the World Health Assembly approved a Global Action Plan on AMR, and in 2016, leaders at the United Nations High-Level Meeting on AMR committed to a multisectoral approach to counter the global AMR threat. The international community has also recognised AMR as a significant threat to achieving the Sustainable Development Goals (SDGs) 2030.

Furthermore, the widespread use of antibiotics to treat co-infections alongside COVID-19 has highlighted the dual health threat of AMR and the pandemic, as it could potentially accelerate the emergence of AMR. Most importantly, AMR does not solely affect human health but also extends to environmental and animal health. Thus, the multifaceted nature of AMR requires the comprehensive One Health approach, which is a collaborative effort involving multiple disciplines working together to find solutions that benefit human, animal, and environmental health.

The National Antimicrobial Resistance Committee (NARC) was established in 2017 as a steering committee to govern and coordinate the AMR strategies and activities at the national level, spearheaded by the Ministry of Health Malaysia (MOH). The stakeholders consist of relevant ministries, professional organisations, and universities. Due to the expansion of scope in the current MyAP-AMR, the environmental and plant health sectors have been added to this committee to ensure a holistic approach to One Health AMR. The AMR agenda's key stakeholders include

medical, pharmaceutical and animal-related associations, healthcare practitioners, patient groups and non-profits, researchers, and academia. The committee is co-chaired by the Director General (DG) of Health and DG of Veterinary Services (**Figure 1**).

The NARC is supported by four technical working groups responsible for providing technical input, strategising actions, and monitoring the implementation of all the plan measures and their evaluation. The National Infection and Antibiotic Control Committee also supports implementing the strategies in this plan.

The NARC will report the progress of MyAP-AMR 2022-2026 implementation, including challenges identified and actions taken to address those challenges.

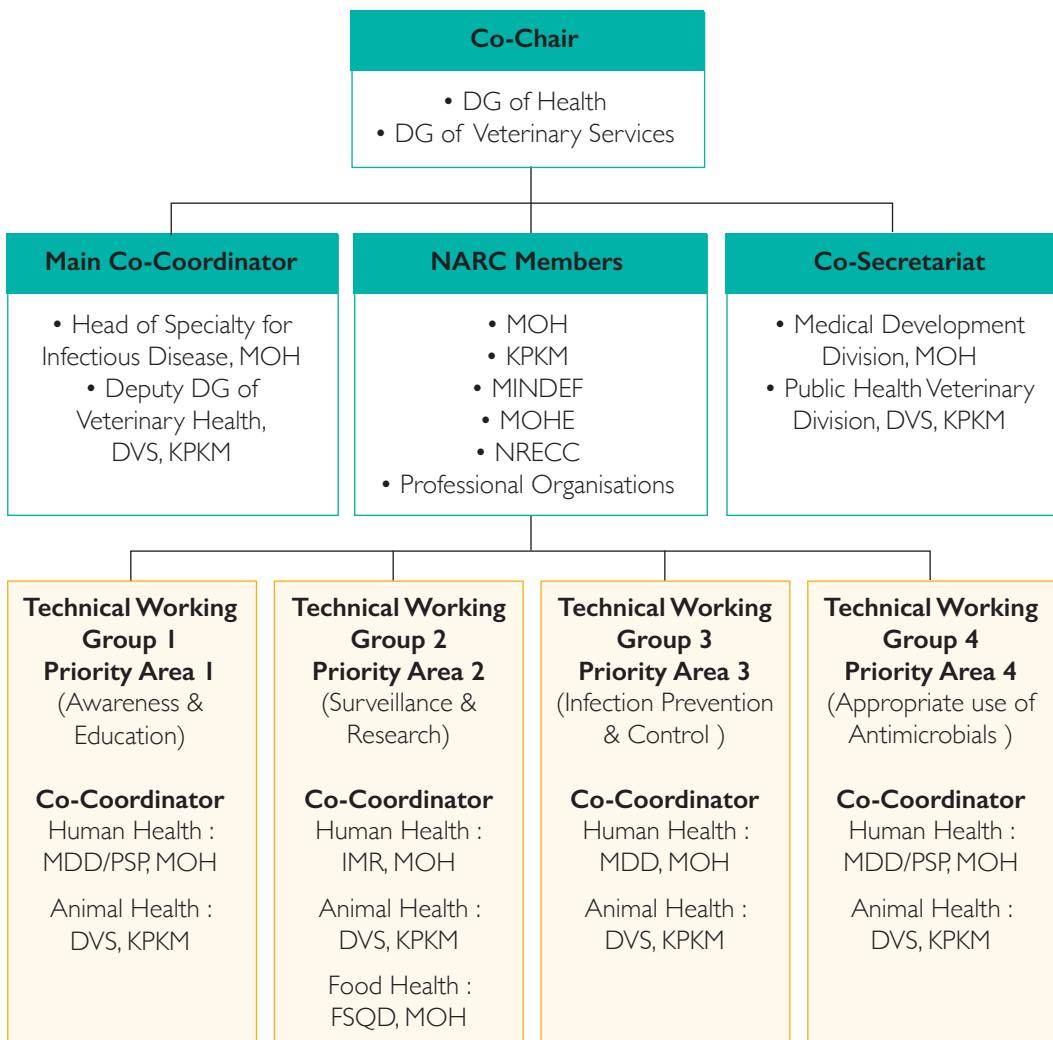


Figure 1: National Antimicrobial Resistance Committee (NARC) Framework

SECTION 2

KEY ACHIEVEMENTS OF MyAP-AMR 2017-2021

Antibiotics have played an essential role in treating infectious diseases. However, the benefits of this medication have been substantially lost following the widespread emergence and dissemination of antibiotic-resistant strains. If AMR is not successfully addressed, the continued emergence of drug-resistant diseases will put the effectiveness of medicine at risk and pose challenges to nations' health and development. According to the report by the World Bank Group, without an effective AMR containment, it is predicted that the world will lose 3.8% of its annual GDP by 2050, with a yearly shortfall of USD 3.4 trillion by 2030. In addition, the Sustainable Development Goals 2030 are less likely to be achieved.

AMR occurs naturally over time through genetic changes. It is a global, multifactorial, and complex problem intrinsically linked to human health and behaviour but also entangled with animal health, food production, agriculture, and the environment. The misuse and overuse of antimicrobials are key factors contributing to AMR, which includes inappropriate prescribing.

In 2015, the 68th World Health Assembly urged all member states to adopt the Global Action Plan on AMR and develop national action plans on AMR involving different sectors through the One Health approach. In response, the MOH initiated a steering committee, namely the NARC, encompassing human, animal, and environmental sectors to develop the Malaysian Action Plan on AMR (MyAP-AMR) 2017-2021 to coordinate national AMR strategies and activities. The national action plan adopted four key priority areas: public awareness and education, surveillance and research, infection prevention and control, and appropriate use of antimicrobials. Currently, MOH and other related ministries support NARC activities through their respective specific funding.

PUBLIC AWARENESS & EDUCATION

Professional Education

Since 2005, the MOH has rolled out campaigns to increase awareness of AMR nationally, focusing on healthcare professionals. This effort includes organising the Annual Scientific Meeting on AMR (ASMAR) and incorporating AMR components in related workshops and conferences such as the National Infection Prevention and Control Conference held biannually. In 2015, WHO launched a global campaign on AMR, "World Antibiotic Awareness Week (WAAW)", to improve awareness and understanding of antimicrobial use and encourage best practices. In support of this move, Malaysia initiated its first WAAW in 2015, targeting healthcare professionals. This campaign was also carried out at the state and institutional levels, focusing on different stakeholders each year with the theme of "Antibiotik, Perlu ke?" which brings the meaning of "Antibiotic, is it necessary?". In achieving One Health coverage, this campaign was extended to include animal health and the environment sectors.

Apart from the annual WAAW campaign, continuous education programmes were provided to all the stakeholders, including pre-service, in-service personnel and those involved in animal food industries. Examples of pre-service and in-service training are Patient Safety Awareness for Junior Health Care Professionals, which has been ongoing since 2017. A syllabus related to AMR is also being taught to undergraduates of Doctor of Veterinary Medicine (DVM) and Fish Health Management for students pursuing the Malaysian Fisheries Certificate.

Public Awareness

Good knowledge and understanding of AMR are among the pillars in tackling increasing AMR. The public and other stakeholders should be adequately engaged and educated on becoming part of the solution to curbing AMR. To complement national efforts in raising AMR awareness to the public through the annual WAAW platform, an Antibiotic Fun Run was held in January 2020 with the theme of "Antibiotic: Handle with Care, Unnecessary Use Causes Harm" and was attended by more than 1,000 participants. In addition, various AMR campaign activities were conducted in conjunction with other national events, such as the annual Malaysia Agriculture, Horticulture & Agrotourism (MAHA) show. Dissemination of knowledge on AMR to the public was also done through "Program Duta Kenali Ubat Anda" (Know Your Medicine Ambassador program). This programme empowers a community representative in their locality to deliver information regarding AMR.

Press statements, newspapers, TV and radio programs, and social media pages are other platforms to increase public understanding of AMR. Furthermore, a Malaysian One Health AMR (MyOHAR) website (myohar.moh.gov.my) was developed to facilitate access to AMR information by healthcare personnel and the public and acts as a repository for trusted information related to the AMR programme.

As antibiotic misuse is the primary driver for AMR, addressing the issue of AMR requires efforts to modify the behaviour of prescribers and the public towards the use of antibiotics. Hence, the National Health & Morbidity Survey (NHMS) was conducted in 2020 to focus on infectious diseases, including AMR. The NHMS 2020 was a nationwide community-based cross-sectional study designed using a multistage stratified random sampling method (<http://iku.gov.my/nhms2020>). Apart from this survey, a Knowledge, Attitude and Practices (KAP) study towards antibiotic use and AMR among the public was also conducted (<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0258698>). The result of these studies shows that awareness of antibiotics and AMR is, however, not satisfactory. These studies serve as a baseline to identify the knowledge gaps and help to facilitate future interventions.

SURVEILLANCE AND RESEARCH

An effective national AMR surveillance programme monitors the trends and magnitude of AMR in the country. Multiple surveillance programmes have been in place to monitor AMR in human health, including National Antibiotic Resistance Surveillance (NSAR) and National Surveillance on Healthcare-Associated Multidrug Resistant Organism (HA-MDRO), established in late 1999 and 2003, respectively. With the implementation of the MyAP-AMR 2017-2021, the integrated AMR surveillance, which covers both human and animal health, was initiated in 2018. Malaysia also participated in the Global Antimicrobial Resistance and Use Surveillance System (GLASS), a standardised approach to collecting, analysing, interpreting and sharing data.

To support implementing the integrated surveillance initiative, Malaysia, representing the Western Pacific Region, participated in and completed the "WHO Integrated Global Survey on ESBL-producing *Escherichia coli* (*E. coli*) using the One Health Approach, The Tricycle Project" in 2019. Based on the study, the findings demonstrate that ESBL *E. coli* is already widely circulated in humans, the food chain, and the environment in Malaysia. It is also evident that ESBL *E. coli* isolates from all three sectors are interrelated (**Figure 2**).

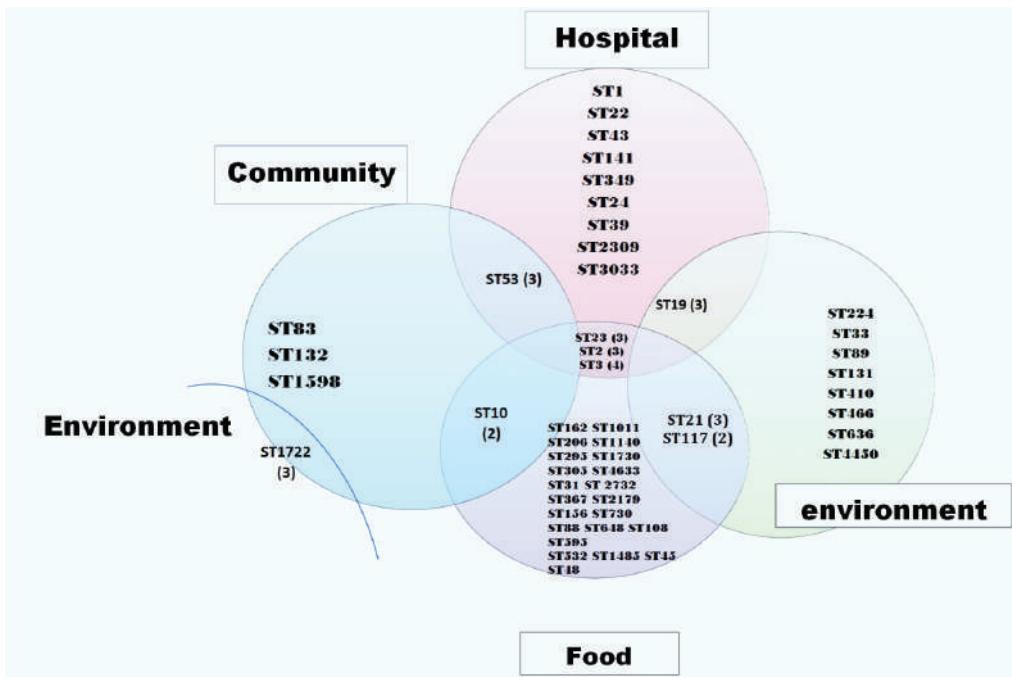


Figure 2: Venn diagram of Multi Locus Sequences Typing (MLST) for all isolates. Single Nucleotide Polymorphism (SNP) phylogenetic analysis. Based on pattern, all organisms are interrelated

AMR poses a significant threat to human health, resulting in high morbidity and mortality and dilemmas for patient management due to the scarcity of available susceptible antimicrobial options. The problem is reflected in Malaysia, as shown in the NSAR report from 43 participating hospitals (<https://myohar.moh.gov.my>).

In summary, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Enterococcus faecalis* and *Enterococcus faecium* five-year resistant patterns were stable for all antibiotics tested with minor increments and reduced resistant rates noted. Meanwhile, the *Methicillin-resistant Staphylococcus aureus* (MRSA) rate has been on a downward trend in the same period.

14

In contrast, *Acinetobacter baumannii* isolated from all clinical samples has displayed an increasing resistance rate to all the antibiotics tested over the five-year surveillance period. In 2021, resistance to some antibiotics, e.g. imipenem and meropenem, was as high as 67.7 - 68.8%, while cephalosporin/sulbactam showed an increased resistance rate at 42.4% compared to the year before (**Figure 3**). Most *Acinetobacter baumannii* infections occur among medical, ICU and surgical ward patients. A similar upward trend was noted for *Pseudomonas aeruginosa*, although the overall resistance rate for all antibiotics tested was less than 10% (refer to NSAR at <https://myohar.moh.gov.my>).

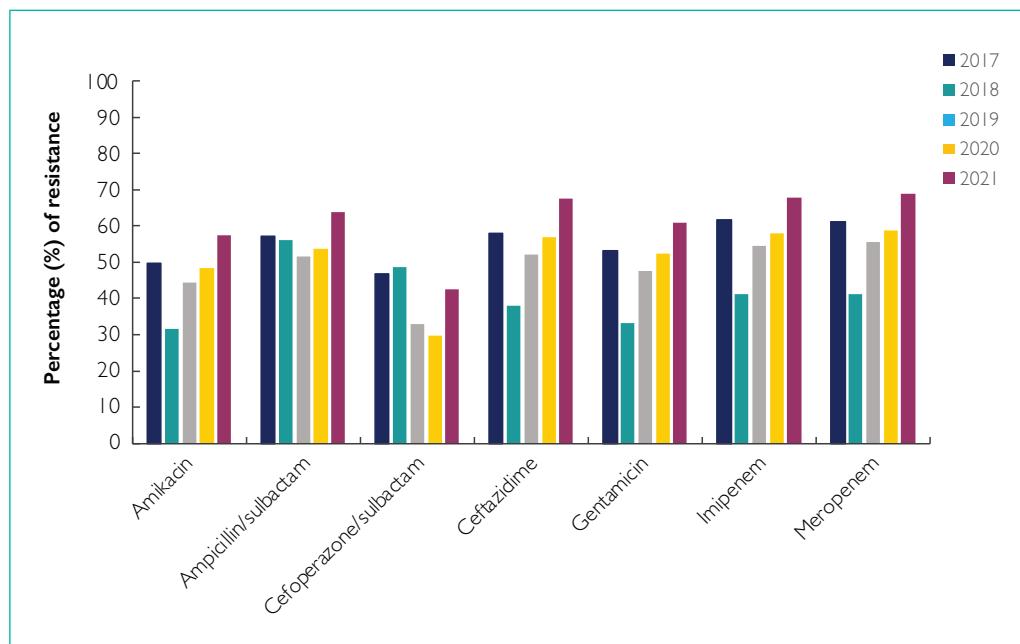


Figure 3: Antibiotic resistance trend for *Acinetobacter baumannii* isolated from all samples from 2017 until 2021

Meanwhile, *Klebsiella pneumoniae* and *E. coli* have demonstrated a stable resistance rate towards 2nd and 3rd generation cephalosporin antibiotics. However, these organisms' resistance level to carbapenem antibiotics throughout the 5-year duration has doubled.

Surveillance of HA-MDRO cases is essential to an effective IPC programme, which is part of AMR containment measures. Over the years, many improvements have been made to improve healthcare facility data collection and reporting systems. From 2017 to 2020, the surveillance showed a reducing trend of HA-MDROs such as MRSA, ESBL-*Klebsiella pneumoniae*, ESBL-*E. coli* and *Acinetobacter baumannii*. However, healthcare-associated Carbapenem-Resistant *Enterobacterales* (CRE) increased from 2017 to 2020. Subsequently, in 2021, an increase was seen in HA-MDROs *Acinetobacter baumannii*, ESBL-*Klebsiella pneumoniae* and CRE due to the possible effect of the COVID-19 pandemic (**Figure 4**).

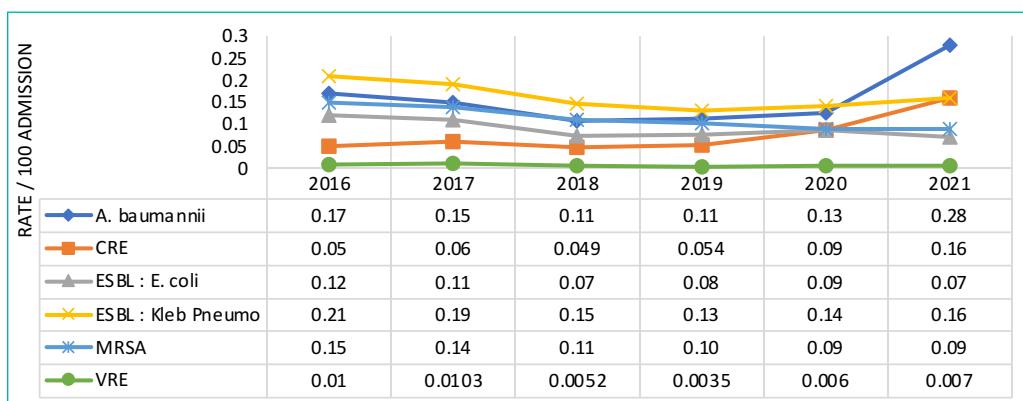


Figure 4: Trend of Healthcare-associated Multidrug resistant organism incidence 2016 until 2021

Initially, the sources of AMR data used as a basis for national guidelines focused on hospital-based data. To obtain a comprehensive population-based surveillance on AMR, a community-based surveillance focusing on urinary tract infection (UTI) and *Neisseria gonorrhoeae* at primary health care was initiated in 2017. The surveillance was carried out through a point prevalence survey for a period of 3 months in selected years. Data for 2019 reveals resistance rates for *Neisseria gonorrhoeae* to penicillin, tetracycline, and ciprofloxacin in the community were 53.8%, 72.3% and 83.1% respectively. In comparison, the sensitivity rates of *Neisseria gonorrhoeae* to ceftriaxone and azithromycin were 100%.

The community-based UTI surveillance shows a decreased prevalence for ESBL-*E. coli* and ESBL-*Klebsiella spp.* in three consecutive years from 2018 to 2020. However, in 2021, there was a significant increase in both resistant organisms. In 2021, AMR for *E.coli* in UTI patients showed ampicillin had the highest resistance rate with 45.5% followed by 19.4% for trimetoprim-sulfamethoxazole. Otherwise, the resistance rate for *Klebsiella spp.* in UTI showed an increasing trend towards several antibiotics including cefuroxime, cefepime and ceftazidime.

Overuse of antimicrobials can lead to presence of drug-resistant bacteria in animals and food products for human consumption. Transmission of resistant pathogens from animals to humans can occur through food ingestion or handling. Surveillance on the levels of AMR in common foodborne pathogens in food of animal origin is extremely important for guiding risk management and policy action. *Salmonella spp.* have long been recognised as a threat to food-producing animals and are zoonotic pathogens of public health importance. *Salmonella spp.* isolated from broiler chickens showed an increase in resistance in 2021 compared to 2018 to all antibiotics except for chloramphenicol and tetracycline. Furthermore, the findings showed an increment of resistance to chloramphenicol, ciprofloxacin, and tetracycline in layer chicken. Data also showed an increased trend of resistance to chloramphenicol, ciprofloxacin, gentamicin, and streptomycin in pigs.

The AMR surveillance for dairy cattle was initiated in 2021. *Salmonella spp.* isolated from dairy cattle showed susceptibility to all antibiotics except for ampicillin, chloramphenicol, and tetracycline. Colistin resistant *Salmonella spp.* can be seen in broiler chicken, layer chicken and pig. However, *Salmonella spp.* isolates from dairy cattle showed susceptibility to colistin.

E. coli as an indicator of AMR, was isolated from all groups of surveyed animals. *E. coli* isolates from broiler chicken and pig showed a high resistance rate to ampicillin, chloramphenicol, tetracycline, sulfamethoxazole-trimethoprim, and erythromycin. Meanwhile, *E. coli* isolates from chicken layer and dairy cattle showed a high resistance rate to ampicillin, tetracycline, and erythromycin.

On the other hand, surveillance on food of animal origin from retail markets (i.e., fish, chicken, beef, and pork) shows a reducing trend of AMR in *E. coli* in 2021 compared to 2018 in most antibiotic groups.

INFECTION PREVENTION AND CONTROL

Infection Prevention and Control Facilities

Isolation facility is integral to infection prevention in controlling airborne infectious diseases. One of the strategies in Key Priority Three aims to improve isolation facilities for patient care. This need was heightened during COVID-19 when additional isolation rooms were built and upgraded during the pandemic. To further address the issue, a Design and Requirement of Infectious Disease Facilities Workshop was held in 2020 and issues related to isolation rooms in MOH facilities were discussed. Upgrading isolation rooms in MOH facilities will be carried out through the long- and short-term plans.

Vaccination

Immunisation is one of the most successful global health interventions and cost-effective ways to save lives and prevent disease. Effective IPC measures including vaccination can limit the spread of resistant microorganisms and reduce the antimicrobial misuse and overuse in humans and animals. As such, they constitute a critical tool for mitigating AMR.

The Malaysian National Immunisation Programme (NIP) protects against thirteen major childhood diseases. Vaccination services are offered free to all Malaysians at government health facilities and for school-based vaccination, while non-citizens must pay a minimal fee. However, free vaccination for non-Malaysians is available during outreach programmes, mopping-up activities, and supplementary immunisation activities (SIA). Private healthcare facilities also offer immunisation of NIP vaccines and additional vaccines. In 2021, the immunisation coverage in Malaysia for each childhood vaccine was as follows: BCG (infants) 98.8%; DPT-HiB (third dose) 94.24%; Polio (third dose) 94.24%; MMR (age 1 to < 2 years) 99.53%; Hepatitis B (fourth dose - completed dose) 92.96%; and HPV (second dose) 91.28%.

Similarly, animal vaccination programmes in animal health were carried out to protect animal health and welfare, and to reduce the need to treat animals with antimicrobials. In Malaysia, food-producing animals were vaccinated against diseases such as Foot and Mouth Disease, Brucellosis, Newcastle Disease, Haemorrhagic Septicaemia and Lumpy Skin Disease.

Prevention of Healthcare Associated Infections

Prevention of healthcare associated infection (HCAI) will help to stop the spread of AMR within healthcare facilities. Focus has been given to strengthening the IPC measures in preventing HCAI, including developing national policies and standards of practice. National IPC policies and procedures were updated in 2019. In addition, infection control policies for primary healthcare were also updated in the same year.

Educational programmes on hygiene and IPC measures in healthcare settings, animal husbandry and food processing are integral to AMR containment. Various training sessions have been conducted to improve the stakeholders' competency in IPC and biosecurity. As of 2021, 1650 health personnel have obtained Post Basic IPC certification. These trained IPC personnel include those serving public and private healthcare facilities. An IPC educational toolkit was developed in 2019 to supplement their training, focusing on basic and applied IPC components. Furthermore, IPC and biosecurity training among agriculture personnel, including veterinarians, are regularly provided.

In healthcare settings, especially critical care, compliance with hand hygiene is crucial to prevent transmission of infection from healthcare personnel to patients or vice versa. The national surveillance on hand hygiene compliance showed improvements over the years, with rates from 79.6% in 2016 to 87.2% in 2020. However, the trend of HCAI from 2018 until 2021 has plateaued within the range of 4-5 per 100 admissions.

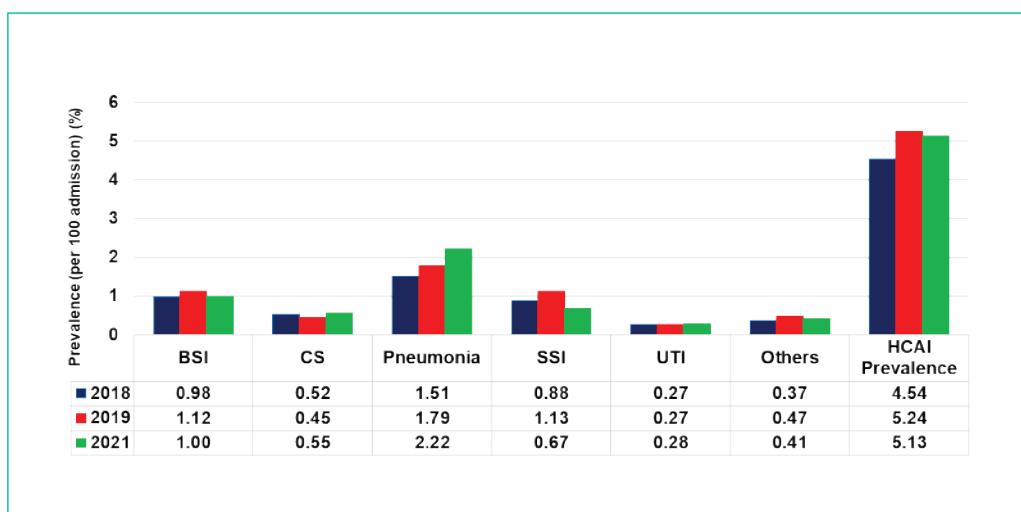


Figure 5: Prevalence of Healthcare-associated infections by type of infection, 2018 until 2021

Strengthen Biosecurity in Animal Health

The capability to control an outbreak is influenced by biosecurity measures to reduce the risk and spread of animal diseases. The Ministry of Agriculture and Food Security has undertaken initiatives to strengthen animal biosecurity measures in the animal health sector. Among the initiatives in increasing biosecurity measures is the promotion of Malaysian Good Animal Husbandry Practices (MyGAP) and Malaysian Organic (MyOrganic) certification in livestock and aquaculture farms based on the Malaysian Standard (MS) of Good Aquaculture Practice (GaQP) and Good Animal Husbandry Practice (GAHP) and Guideline for Organic Chicken Production. Furthermore, to ensure the quality and safety of food of animal origin, slaughterhouses and processing plants are encouraged to participate in the Veterinary Health Mark (VHM) and Good Veterinary Hygiene Practice (GVHP) certifications. From 2017 to 2021, a total of 464 livestock farms and 307 aquaculture farms were certified with MyGAP, 11 farms were certified with MyOrganic, and 235 and 51 slaughterhouses and processing plants were certified with VHM and GVHP, respectively. Besides certification, the farm licensing programme was carried out to ensure the efficient management of livestock farms in terms of good husbandry, animal health, biosecurity and prudent use of antimicrobials. As for 2021, a total of 2028 chicken farms and 454 pig farms were successfully licensed. Furthermore, 2,067 aquaculture farms and premises fulfilling minimum fisheries biosecurity requirements were registered.

OPTIMIZE USE OF ANTIMICROBIAL IN HUMAN & ANIMAL HEALTH

Development and Revision of Policies and Guidelines

Overuse and misuse of antimicrobials are the main drivers of AMR, thus, improving antimicrobial use is critical to the safety of patients and future medicines. To address these issues, several guidance and guidelines have been revised to ensure purchasing and prescribing of antimicrobial medicines are based on current recommendations.

The fifth edition of National Essential Medicine List and third edition of National Antimicrobial Guideline were reviewed and published in 2019. Correspondingly, the veterinary health sector has developed its first edition of National Veterinary Antimicrobial Guideline in 2019. In addition, the first edition of Arahan Prosedur Tetap Veterinar Malaysia (APTVM) for Veterinary Prescription was developed in 2019 and revised in 2021.

Furthermore, a systematic assessment was done to review the existing legislative framework for managing AMR in aquaculture in 2019. Based on the assessment findings, the Legislative Framework in Managing AMR in Fisheries was subsequently developed to control the use of antimicrobials in aquaculture industries and its indirect introduction to wild or natural aquatic resources.

A consensus was also made to ban selected antimicrobials for animal use in phases to preserve the effectiveness of critically important antimicrobials for human health. This step involved the banning of colistin for use in food-producing animals in 2019, followed by another six antimicrobials in 2021.

20

Antimicrobial Stewardship

Malaysia consistently emphasises the implementation of the Antimicrobial Stewardship Programme (AMS) throughout all healthcare facilities to ensure that the antimicrobials prescribed are used prudently to prevent the emergence of AMR and to preserve antimicrobials, particularly from the RESERVE group under the WHO AWaRe classification of antibiotics. In 2018, the first edition of the Protocol on Antimicrobial Stewardship (AMS) Programme in Healthcare Facilities was published to guide and strengthen the implementation of a structured and successful AMS programme, with a second edition published in 2022. All healthcare facilities must also ensure the establishment of an AMS team, the development and documentation of a local antimicrobial policy, and the provision of continuous educational programmes by continuous medical education (CME) and antibiotic awareness campaigns. The implementation of the AMS programme is also participated by the private hospitals through collaboration with the Ministry of Health and facilitated by the MyAP-AMR.

Surveillance of Antimicrobial use

Monitoring of selected antimicrobials at the entry points was initiated in 2017, and the data shows no significant differences in import quantity for five years. Moreover, there has been no record of colistin importation for veterinary use since 2019, which correlates with the banning of the same drug for use in food-producing animals in the same year.

In 2019, MOH conducted audits on targeted community pharmacy premises looking into record versus physical antibiotic stock, and findings show 99.3% of these premises complied with the current acts and regulations pertaining to the sale or supply of Group B poisons (antimicrobials) under the Poisons Act 1952. Yearly inspection is

conducted on licensed premises to ensure compliance under the Poisons Act 1952. To evaluate the effectiveness of the AMS programme, an audit on compliance of antimicrobial prescriptions with national or local antimicrobial guidelines was conducted in 2018 and 2021 through point prevalence survey. The data reveals almost 80% of prescriptions complied with national or local guidelines. However, the data also shows a high percentage of empiric use for carbapenem and cephalosporin in 2021, which may induce the emergence of multidrug resistance.

In the animal health sector, the strengthening of policy, which includes a report of AMU as a condition for farm licensing requirements, was initiated in 2019. In addition, the veterinary health sector has started reporting its antimicrobial usage using sales data through the WOAH antimicrobial usage reporting format.

Data collection and analysis for the National Surveillance on Antimicrobial Utilisation (NSAU) are conducted annually, which involves selected public and private hospitals and MOH health clinics. Currently, 18 antibiotics from six antibiotic groups and one antifungal are monitored for hospitals, while two antibiotics are monitored for the primary care setting. From the data analysis, there was a continuously increasing trend in total antibiotic utilisation in the ICUs from 2017 to 2021, with the highest increment (33%) observed in 2021. In contrast, the total antibiotic utilisation in All Wards (mainly non-ICUs) was consistent for the same period. Nonetheless, the total use of polypeptides, carbapenems, piperacillin/tazobactam and fluconazole increased in All Wards and ICUs in 2021 compared to 2020. In MOH health clinics, the utilisation of erythromycin ethyl succinate shows a decreasing trend from 2017 to 2021, while for cefuroxime, it was consistent between 2019 and 2021.

Antimicrobial Stewardship Training

Effective training in Antimicrobial Stewardship (AMS) is essential to promote responsible use of antimicrobial drugs in both human and veterinary healthcare. AMS training is an ongoing initiative to educate healthcare and veterinary professionals to help them make informed decisions when prescribing antimicrobials. The goal is to minimise the development of AMR and protect patients from harm.

In 2018, MOH organised a national seminar on antimicrobial stewardship featuring renowned experts from local and international backgrounds. Additionally, in October 2019, Malaysia hosted the ASEAN Antimicrobial Stewardship Seminar and Workshop as part of the ASEAN Health Cluster 2 Strategic Plan. This event brought together representatives from ASEAN member states in both human and animal health sectors to exchange insights, share best practices, and address challenges related to

implementing AMS. Furthermore, the veterinary and aquaculture sectors regularly conduct similar training programmes to keep their personnel updated on the responsible use of antimicrobials. These efforts collectively contribute to safeguarding public health and curbing the emergence of AMR.

Challenges in the Implementation of MyAP-AMR 2017-2021 during the COVID-19 Pandemic

Undoubtedly, the COVID-19 pandemic, which lasted throughout the latter part of the MyAP-AMR 2017-2021 period, had a significant impact on the situation of AMR. During the pandemic, various challenges emerged in carrying out the national action plan. Resources, such as laboratory facilities, healthcare personnel, and essential supplies, were redirected to pandemic-related activities, which hindered the efforts of the AMS programme. Some of the challenges identified are as follows:

- Weakened infection prevention and control due to healthcare workers' fatigue and heavy workload, in addition to a shortage of personal protective equipment during the early phase of the pandemic, may have facilitated the transmission of MDROs
- The surge in hospital admissions increased the risk of healthcare associated infections and the transmission of MDROs, which in turn may have led to increased antimicrobial use
- Disruption of routine immunisation activities due to COVID-19-related measures led to reductions in overall vaccination coverage globally, potentially leading to an overuse of antimicrobials
- The increased risk of secondary bacterial infection among patients with COVID-19 led to the increased use of antibiotics. Moreover, those with COVID-19 complications may require mechanical ventilation or other invasive devices, which increases the risk of acquiring hospital associated MDROs
- Increased fear of attending healthcare facilities and postponement of elective hospital procedures have resulted in fewer medical consultations and antibiotic prescriptions

SECTION 3

STRATEGIC OBJECTIVES AND ACTIONS UNDER MyAP-AMR 2022-2026

KEY PRIORITY AREA I: Public Awareness and Education

STRATEGIC OBJECTIVE I: Strengthen awareness and understanding of AMR

Strategy 1.1: Increase One Health awareness and education of AMR through public engagement

Strategy 1.2: Strengthen AMR educational programme in schools and higher learning institutions

Strategy 1.3: Strengthen engagement with media, NGO and government linked subsidiaries to increase AMR promotional activities

Strategy 1.4: Assess the knowledge on AMR and appropriate antimicrobial use amongst the public, health and veterinary personnel, livestock and aquaculture industries

Strengthen awareness and understanding of antimicrobial resistance

AMR is a major global challenge that is increasing the burden on human and veterinary health systems, impacting food sustainability, environmental well-being, and socio-economic development. Based on KAP studies conducted in the years 2019 and 2020, awareness amongst the public on AMR is still not satisfactory, therefore, strengthening of awareness programmes on AMR must be done through effective communication, education, and training.

The AMR awareness programme should include various stakeholders, from the political to the public. Emphasis should also be given to students in school and higher learning institutions to expose them early regarding the importance of preserving antibiotics' efficacy.

Effective dissemination of information can be achieved by using multiple approaches such as mainstream media and social media, identifying champions among professional societies, and AMR ambassadors using social media influencers to aid in promotional activities.

Access to official information on AMR should be made available to health professionals and the public. Thus, an official platform which consists of information on human and animal health, as well as food safety and environment, should be provided.

An evaluation should be conducted to assess the effectiveness of the campaigns and training activities on AMR to assist in identifying gaps for further interventions. Knowledge of AMR should be evaluated at various population levels to identify and address the specific interventions comprehensively.

To strengthen the workforce in combating AMR, experienced and knowledgeable professionals must train the personnel involved in AMR-related activities. An inventory of experts is essential to foster consultation, collaboration, and exchange of experiences to achieve good transfer of information.

Strategy 1.1: Increase One Health awareness and education of AMR through public engagement

1.1.1 Expand the coverage of AMR and antimicrobial awareness campaigns to various stakeholders



MOH, KPKM (DVS, DOF), DOE, MPS, MMA, APHM, Universities, NPC, Animal Industry/ Association (MSA, FLFAM), MyOHUN



The coverage of the AMR awareness campaign expanded to include a broader range of stakeholders and participants

- 1.1.2 Identify sectorial champions for AMR public awareness among professional societies and NGOs



Professional Societies (Members of NARC) and NGOs

Champions for AMR public awareness are identified

- 1.1.3 Develop and disseminate educational materials for AMR awareness campaigns



MOH, Universities, NPC, KPKM (DVS, DOF), DOE, LKIM, MAQIS, MyOHUN

Educational materials on AMR awareness are disseminated and utilised

- 1.1.4 Identify AMR ambassadors (e.g., social media influencers) for promotional activities



MOH, KPKM (DVS, DOF)

AMR promotional activities are delivered by the appointed AMR ambassadors

- 1.1.5 Develop a new module of AMR educational toolkits, including online materials for targeted groups



MOH (HED, PSP, MDD), KPKM (DVS, DOF)

New module of AMR educational toolkits developed

- I.I.6 Identify and develop directory of expertise (database) for AMR expert panel or trainer



MOH (PSP, MDD), Universities, KPKM (DVS, DOF)



Expert panel or trainer identified and appointed to conduct educational sessions

- I.I.7 Enhance the training of trainers (TOT) programme on AMR and AMS through seminars or workshops



MOH (PSP, MDD), KPKM (DVS, DOF), MyOHUN



Increased capacity of the TOT programme on AMR and AMS

- I.I.8 Update the latest information on AMR into the Malaysia One Health Antimicrobial Resistance (MyOHAR) website to ensure timely dissemination of information (<https://myohar.moh.gov.my>)



MOH (MDD, IMR, PSP, NPHL), KPKM (DVS, DOF), NAHRIM



Information on the MyOHAR platform is continuously updated

Strategy 1.2: Strengthen AMR educational programme in schools and higher learning institutions

- 1.2.1 Expand AMR awareness as an activity in learning institutions through the Health Promotion in Learning Institutions (HePiLI) programme



MOH (HED, PSP), MOHE



Increased AMR awareness coverage in learning institutions

- 1.2.2 Develop and incorporate AMR and related topics of animal health, including food safety and public health, in schools and higher learning institutions' curriculum



MOH, KPKM, MOHE



AMR and related topics of animal health developed and incorporated into schools and higher learning institutions' curriculum

Strategy 1.3: Strengthen engagement with media, NGO and government linked subsidiaries to increase AMR promotional activities

- 1.3.1 Continue engagement with media to improve their knowledge on AMR and its implications



MOH (CCU, HED), DVS (SKK), KPKM (CCU)



Media retreat conducted, and AMR awareness articles published

- 1.3.2 Engagement with NGOs, professional associations, and agencies that operate one-stop centers accessible to the public



MOH (CCU), KPKM (CCU), MOSTI



Enhanced collaboration with NGOs, professional associations, and agencies, resulting in expanded distribution of educational materials for AMR awareness

Strategy 1.4: Assess the knowledge on AMR and appropriate antimicrobial use amongst the public, health and veterinary personnel, livestock and aquaculture industries

- 1.4.1 Conduct Knowledge, Attitude and Practices (KAP) survey on AMR and appropriate antimicrobial use amongst the public, health and veterinary personnel, and the livestock and aquaculture industries



MOH (IHBR), UM, NPC, KPKM (DVS, DOF)



KAP studies involving various stakeholders conducted and published

- 1.4.2 Conduct evaluation on AMR media campaigns (knowledge, understanding, intention and action components)



MOH (HED, IHBR), KPKM (DVS, DOF)



Gaps in media campaign approaches identified and strategies adjusted accordingly

KEY PRIORITY AREA 2: Surveillance and Research

STRATEGIC OBJECTIVE 2: Strengthen National One Health Surveillance and Research Efforts

Strategy 2.1: Strengthen the One Health surveillance programme that consists of a core set of organisms and antimicrobial medicines

Strategy 2.2: Strengthen One Health surveillance for AMR that promotes participation in regional and global networks and information sharing

Strategy 2.3: Strengthen laboratory capacity in the identification of pathogens and their antimicrobial susceptibility in animals and environmental health

Strategy 2.4: Develop collaborative research across all sectors to combat AMR

Strengthen National One Health Surveillance and Research Efforts

A coordinated national surveillance programme is an essential component of the action plan. A good surveillance programme requires a holistic and multisectoral One Health approach, as resistant bacteria arising in humans, animals or the environment may spread from one to another leading to a bigger threat. An example of One Health integrated surveillance is the monitoring of common indicators in all three sectors (human, animal and environmental health) such as Extended Spectrum Beta Lactamase *E. coli* (ESBL-Ec) and *Carbapenamase-producing E. coli* and *Enterobacteriales*

(CPE). To assess the relationship of these organisms in the three sectors, further studies such as whole genome sequencing testing is required.

The data from the surveillance programme shows the trend and progress over the years and acts as a tool in reflecting the effectiveness of intervention measures taken. Countries should participate in sharing and reporting the data to aid multilateral organisations such as the WHO, FAO and WOAH in combating AMR at the regional and global levels. This information sharing will enable the mapping of global patterns of resistance, the identification of new antibiotic-resistant pathogens, and the development of policies that could slow the emergence of AMR.

Laboratory capacity in identifying pathogens and their antimicrobial susceptibility in all related sectors should be strengthened to produce a reliable data collection to measure the true extent of AMR. Good data will assist in informed, evidence-based decision-making, better financial planning and allocation of resources in the national and local settings.

To enable laboratories to achieve and maintain high levels of accuracy and proficiency, Quality Assurance (QA) and accreditation programmes should be in place. In addition, variation in the laboratory methods should be minimised by having a standardised laboratory protocol and trained personnel.

Research is among the essential components to control the increasing trend of AMR. It aims to generate critical evidence to improve prevention, control, and response strategies to combat AMR in all three related sectors. Evidence generated from the research may aid in identifying the appropriate intervention for AMR prevention, diagnosis, treatment and care and the best strategies to deliver these improvement measures.

Strategy 2.I: Strengthen the One Health surveillance programme that consists of a core set of organisms and antimicrobial medicines

2.I.1 Strengthen the National Surveillance of Antimicrobial Resistance (NSAR) in human health by increasing the participation of private hospitals and laboratories



MOH (MDD, IMR), MOHE



Increased number of medical institutions participating in NSAR

2.1.2 Continue community surveillance of AMR targeting at resistant *E. coli* in UTI



MOH (NPHL, PHL KOTA BHARU)



AMR trend in the community continuously monitored

2.1.3 Incorporate community AMR surveillance report in NSAR



MOH (IMR)



Comprehensive NSAR report published

2.1.4 Improve the Healthcare Associated Multidrug Resistance Organism (HA-MDRO) surveillance with a focus on bloodstream infection



MOH (MDD)



Revised HA-MDRO surveillance manual published

2.1.5 Strengthen the AMR surveillance programme in livestock and food of animal origin and diagnostic cases for sick animals



KPKM (DVS)



Increased surveillance programme coverage in farms, processing plants, abattoirs, and farm environments

- 2.1.6 Strengthen the AMR surveillance in food obtained from retail markets (poultry, pork, beef, mutton, shellfish, fish, vegetable, and fruit)



MOH (FSQD, FSQL, State Health Department, PHL)



Comprehensive AMR surveillance in food established

- 2.1.7 Implement the Code of Practice to Minimise and Contain Foodborne Antimicrobial Resistance (COP) and Guidelines on Integrated Monitoring and Surveillance of Foodborne Antimicrobial Resistance (GLISS) adopted by CODEX



MOH (FSQD,) KPKM (DVS, DOF, DOA)



Plan of action harmonised and aligned with GLISS and COP for implementation in Malaysia

- 2.1.8 Establish one-stop data collection on the importation, selling and usage of pesticide in plant health



KPKM (DOA)



One stop data collection centre established

- 2.1.9 Improve competency in WHONET by conducting training for participating laboratories in collaboration with the private healthcare sector



MOH (MDD, IMR), KPKM (DVS, DOF)



Increased competency of laboratory personnel in utilising WHONET

- 2.1.10 Conduct a pilot project on case-based surveillance for inpatients with sepsis caused by antibiotic-resistant organisms



MOH (Hospital Sungai Buloh)

Surveillance report on AMR in sepsis cases produced

- 2.1.11 Strengthen and expand the surveillance of *Neisseria gonorrhoeae* through period prevalence survey for 3 months yearly



MOH (NPHL, PHL JOHOR BAHRU, PHL IPOH, PHL KOTA KINABALU, PHL KOTA BHARU)

Increased number of participating health facilities

- 2.1.12 Strengthen programmatic management of drug resistant tuberculosis (PMDT) and leprosy



MOH (DCD, NPHL)

Increased number of culture and drug susceptibility testing (DST) for all bacteriologically confirmed TB and leprosy cases

- 2.1.13 Expand national antimicrobial surveillance to include the data of antimicrobial resistant fungi



MOH (IMR, MDD)

The rate of resistance in antimicrobial-resistant fungi monitored

- 2.1.14 Expand surveillance of antimicrobial utilisation in public and private healthcare facilities



MOH, MOHE, MINDEF, Private healthcare facilities



Increased participation of healthcare facilities in AMU surveillance

- 2.1.15 Strengthen surveillance of antimicrobial utilisation in public and private healthcare facilities to include monitoring of AWaRe classification of antibiotics



MOH, MOHE, MINDEF, Private healthcare facilities



Trend of antimicrobials utilisation based on the AWaRe classification monitored

- 2.1.16 Revise antibiotic panel for AMR surveillance in animal health (including phased out antibiotics)



KPKM (DVS, DOF)



Antibiotic panel for AMR surveillance revised

- 2.1.17 Develop AMR surveillance for selected river catchment, industrial effluent, and sewage



NRECC (NAHRIM, DOE, SPAN)



Environmental AMR surveillance developed

2.1.18 Establish antibiotic residues detection surveillance from aquaculture pond



KPKM (DOF)



Protocol on antibiotic residues detection surveillance developed and implemented

Strategy 2.2: Strengthen One Health surveillance for AMR that promotes participation in regional and global networks and information sharing

2.2.1 Strengthen national, regional, and global surveillance systems through improved data management and reporting of data.

- i. WHO Global Antimicrobial Resistance Use Surveillance System (GLASS)
- ii. WOAH Animal Antimicrobial Use System (ANIMUSE)
- iii. Quadripartite Tracking AMR Country Self-Assessment Survey (TrACSS)
- iv. WHO Western Pacific Regional Antimicrobial Consumption Surveillance System (WPRACSS)



MOH (MDD, IMR, PSP, DCD, BPKj), KPKM (DVS, DOF, DOA), NRECC (NAHRIM, DOE)



Progress of AMR situation and related data reported and shared regionally and globally

2.2.2 Produce an annual One Health AMR Surveillance report involving human and animal health, food safety and environment.



MOH (MDD, IMR, NPHL, FSQD), KPKM (DVS, DOF), NRECC (NAHRIM, DOE)



Joint report on One Health AMR Surveillance published

- 2.2.3 Conduct One Health integrated AMR Surveillance project (TRIuMPH)- Improving the TRIcycle protocol: upscaling to national Monitoring and detection of Extended Spectrum Beta Lactamase *E. coli* (ESBL-Ec) and Carbapenamase Producer *E. coli* and *Enterobacteriales* (CPE) and WGS pipelines for One Health Surveillance (TRIuMPH)



MOH (MDD, IMR, DCD, FHDD, NPHL), KPKM (DVS), NRECC (NAHRIM)



TRIuMPH One Health integrated AMR Surveillance report published

Strategy 2.3: Strengthen laboratory capacity in the identification of pathogens and their antimicrobial susceptibility in animals and environmental health

- 2.3.1 Conduct training on antimicrobial susceptibility test (AST) methods for laboratory personnel.



MOH (FSQD) KPKM (DVS, DOF), NRECC (NAHRIM)



Laboratory personnel competent in conducting AST methods

- 2.3.2 Enrol in Quality Assurance (QA) programmes for laboratories involved in testing for AMR in human, animal and food.



MOH (FSQD) KPKM (DVS, DOF), NRECC (NAHRIM)



Increased number of laboratories with QA program

2.3.3 Establish AMR test methods for environmental analysis (pathogens and antimicrobial residues)



KPKM (DVS), NRECC (NAHRIM)



AMR test method for environmental analysis established

2.3.4 Obtain certification of ISO/IEC 17025:2017 laboratory accreditation for AMR testing



KPKM (DVS), NRECC (NAHRIM)



Increased number of accredited AMR testing methods

Strategy 2.4 Develop collaborative research across all sectors to combat AMR

2.4.1 Conduct research activities related to AMR



MOH (MDD, IMR, ICR, FSQD, DCD, NPHL), KPKM (DVS, DOF), NRECC (NAHRIM), MOHE



Increased number of published AMR related research

- 2.4.2 Continue the antibiotic and healthcare associated infection (HCAI) Point Prevalence Survey (PPS) programme and produce timely integrated technical report



MOH (MDD, PSP)



Technical report on antibiotic and HCAI PPS produced timely

- 2.4.3 Continue the National Surveillance of Antimicrobial Resistance (NSAR) and community acquired AMR (UTI and *Neisseria gonorrhoeae*) surveillance and produce timely technical report



MOH (IMR, DCD, NPHL)



Technical report of NSAR and community acquired AMR (UTI and *Neisseria gonorrhoeae*) produced timely

KEY PRIORITY AREA 3: Infection Prevention and Control

STRATEGIC OBJECTIVE 3: Reduce the Transmission of Infection and Disease

Strategy 3.1: Implementation of antimicrobial resistance prevention measures

Strategy 3.2: Strengthen the implementation of the Water, Sanitation and Hygiene (WASH) programme in healthcare facilities

Strategy 3.3: Strengthen the educational programme on infection prevention and control (IPC) and WASH in healthcare settings and community facilities

Strategy 3.4: Enhance good food hygiene practices among food handlers and consumers

Strategy 3.5: Implementation of antimicrobial resistance transmission control measures

Strategy 3.6: Support the National and State policies to help prevent healthcare associated infection (HCAI) and stop the spread of antimicrobial resistance within the healthcare facilities

Strategy 3.7: Strengthen biosecurity measures in the animal health sector

Reduce the Transmission of Infection and Disease

An effective IPC programme is essential to build a resilient healthcare system and one of the most cost saving interventions to limit the spread of AMR in

healthcare. In addition, effective IPC at the national, sub-national and facility levels help to detect emerging and re-emerging threats, prevent transmission of pathogens, facilitate a rapid response to outbreaks in healthcare settings, and avoid amplifying outbreaks.

Like human health, dissemination of infectious agents including AMR pathogens have a devastating effect on the animal health as well as the animal food industry. Additionally, the close contact between humans and their pets may cause transmission of infectious agents between humans and animals, in both directions. Veterinary personnel also face a risk of zoonotic disease from contact with ill animals. All these issues clearly indicate why IPC is a vital aspect of veterinary practice.

Immunisation is one of the most successful global health interventions and cost-effective ways to save lives and prevent disease. Effective IPC measures including vaccination can limit the spread of resistant microorganisms and reduce the antimicrobial misuse and overuse in humans and animals. As such, they constitute a critical tool for mitigating AMR.

Improving Water, Sanitation and Hygiene (WASH) including wastewater management helps in preventing infections and combating AMR. It is undeniable, WASH and wastewater management components are often not addressed in AMR multi-stakeholder platforms and national action plans.

Patient care activities must be conducted within a clean and hygienic environment that supports the implementation of measures for preventing and controlling HCAI and AMR. This approach includes ensuring comprehensive Water, Sanitation, and Hygiene (WASH) infrastructure and services and the availability of suitable IPC materials and equipment.

In healthcare facilities, resistant bacteria and fungi can spread to and from environmental reservoirs such as sinks, surfaces, equipment, and plumbing systems. Several national and facility-specific WASH initiatives have been developed and implemented in Malaysia, including the National Standard for Drinking Water Quality (NSDWQ) in 2004, the Frequency of Water Sampling guidelines in 2019, and the Plan of Action for Drinking Water Quality Control in 2019.

AMR carries implications for both food safety and food security, as food plays a pivotal role in the emergence and dissemination of AMR. The presence of AMR microorganisms within agricultural production systems and the food supply chain represents a potential avenue of exposure for humans and animals. Upholding good hygiene practices in agriculture is foundational for ensuring food safety and is instrumental in addressing the challenge of AMR.

Biosecurity measures aim to prevent the introduction or spread of disease on farms. There are two types of biosecurity: external and internal biosecurity. External biosecurity refers to management steps taken to prevent the introduction of pathogens to an animal herd, flock, or farm. It encompasses testing incoming animals, and quarantine or isolation for newly purchased or returning animals. Meanwhile, internal biosecurity aims to prevent the spread of pathogens within and between herd or flock or farm when they are present. Internal biosecurity practices include maintaining proper room, pen, coop, and barn sanitation, supplying dedicated boots and coveralls, and establishing distinct traffic patterns for both animals and people, among others.

Effective animal husbandry and welfare practices enhance the animals' resilience against diseases. Conversely, inadequate husbandry practices result in elevated stress levels and disease susceptibility among animals, detrimentally impacting productivity.

Strategy 3.1 Implementation of antimicrobial resistance prevention measures

3.1.1 Increase the promotion of vaccination programmes during National World Immunisation Week to mitigate the incidence of vaccine-preventable diseases



MOH, MOHE, MINDEF, APHM & MMA



National World Immunisation Week conducted once a year at the national level

3.1.2 Enhance the adult vaccination programme by incorporating pneumococcal and influenza vaccines into the existing programme



MOH, MOHE, MINDEF



- i. Pneumococcal vaccine offered to high-risk patients and haj pilgrims
- ii. 60% of HCW received influenza vaccine

3.1.3 Strengthen the children vaccination programme (National Immunisation Programme)



MOH, MOHE, MINDEF



All targets in NIP programme achieved

3.1.4 Ensure safety and effectiveness of animal vaccines



KPKM (DVS)



Safety and effectiveness of animal vaccines assured

3.1.5 Promote animal health and welfare through the vaccination programme



KPKM (DVS)



Animal diseases (livestock and pets) controlled by vaccination

3.1.6 Harmonise audit principles for IPC and biosecurity, ensuring alignment with international standards (WOAH, FAO and ASEAN)



KPKM (DOF)



Audit principles for IPC and biosecurity are aligned with the international standards

- 3.1.7 Revise checklist and guidance document on IPC based on updated SOP and international standard (farm and premise registration and audit checklist and guidelines)



KPKM (DOF)



Checklist and guidance documents on IPC updated when required

- 3.1.8 Conduct periodic audit of premises emphasising on good husbandry, health programme and biosecurity practices



KPKM (DOF)



Periodic audit of premises conducted

Strategy 3.2: Strengthen the implementation of the Water, Sanitation and Hygiene (WASH) programme in healthcare facilities

- 3.2.1 Conduct situational analysis and assessment for WASH in healthcare facilities



MOH (ESD)



Current situation and gaps in the WASH programme in healthcare facilities identified

- 3.2.2 Establish a National Strategic Action Plan for WASH in healthcare facilities to set national targets and define a roadmap for implementation



MOH (ESD)



MOH healthcare facilities achieved WASH services level as targeted in the plan

3.2.3 Establish national guidance documents and accountability mechanism related to WASH in healthcare facilities, including conducting operational research and sharing learning:

- a) Guidance document on Water Safety in Healthcare Facilities
- b) Guidance document on Effluent Quality from Healthcare Facilities
- c) Guidance document on Water Quality in Healthcare Facilities



MOH (ESD)



MOH healthcare facilities achieved WASH services level as targeted in the plan

3.2.4 Conduct awareness and training programme on WASH in healthcare facilities at national, regional, state and facility levels, including community engagement



MOH (ESD, MDD)



Awareness and training programme at national, regional, state and facility levels conducted at least once a year

3.2.5 Implement WASH FIT methodology in healthcare facilities and develop health workforce



MOH (ESD, MDD)



Assessment on healthcare facilities conducted, gaps identified, and actions taken for improvement

Strategy 3.3 Strengthen the educational programme on infection prevention and control (IPC) and WASH in healthcare settings and community facilities

3.3.1 Conduct TOT on IPC using specific educational toolkits for healthcare personnel



MOH, MOHE, MOD, APHM & MMA



TOT conducted at least once a year at various levels

3.3.2 Incorporate IPC and AMR as core competencies in the standards for undergraduate medical education



MOH, MMC, Undergraduate Education Subcommittee, Medical Education Committee



IPC and AMR topics included in the curriculum for undergraduate medical education

3.3.3 Establish IPC online training module (E-Learning) for HCW including Infection Control Link Nurse (ICLN) and hospital support services personnel



MOH, MOHE



Increased competency in IPC among HCWs

- 3.3.4 Revise the current IPC module in Malaysia's Patient Safety Awareness course for House Officers to include the Catheter Associated Urinary Tract Infection (CAUTI) and Central Line Associated Bloodstream Infections (CLABSI) prevention bundles



MOH, MOHE



House officers trained in the device associated infection prevention bundles

- 3.3.5 Harmonise the conduct of HCAI surveillance between the Intensive Care Unit and the Infection Control Unit



MOH



HCAI surveillance manual at healthcare facilities standardised

Strategy 3.4: Enhance good food hygiene practices among food handlers and consumers

- 3.4.1 Promote safe food handling behaviours to all food handlers and consumers
- Develop educational tools (poster/video/pamphlet) on safe food handling behaviours
 - Conduct promotional programme on food safety culture to ensure safe food handling behaviours



MOH (FSQD)



Increased awareness and knowledge among food handlers and consumers on safe food handling

Strategy 3.5: Implementation of antimicrobial resistance transmission control measures

- 3.5.1 Review national policies and procedures on IPC and IPC-related guidelines regularly



MOH (MDD)



National policies and procedures on IPC and IPC-related guidelines reviewed in a timely manner

- 3.5.2 Establish hospital wide Surgical Site Infection (SSI) Surveillance Programme



MOH (MDD)



Hospital wide SSI surveillance established

- 3.5.3 Develop audit tool for HCAI prevention bundles (CAUTI, VAP and CLABSI)



MOH, MOHE



Audit tool for CAUTI, VAP and CLABSI prevention bundles developed

- 3.5.4 Strengthen Hand Hygiene programme in critical care



MOH (MDD), MOHE



Hand hygiene compliance target rate in critical care units increased to ≥ 85%

- 3.5.5 Increase the number of IPC-credentialled HCWs through their participation in a structured programme recognised by the MOH



MOH (MDD), MOHE, MINDEF



The number of Infection Control Personnel (ICP) holding IPC programme credentials meets the recommended ratio of 1 ICP per 110 beds.

- 3.5.6 Improve the isolation facilities in acute healthcare setting



MOH (ESD)



Increased number of isolation facilities according to the current MOH standard

Strategy 3.6: Support the National and State policies to help prevent healthcare associated infection (HCAI) and stop the spread of AMR within the healthcare facilities

- 3.6.1 Develop a national reporting system for MDRO outbreaks



MOH (MDD), MOHE



MDRO outbreaks are reported in a timely manner to enable effective intervention to prevent further spread

Strategy 3.7 Strengthen biosecurity measures in animal health sector

- 3.7.1 Establish disease free farm programme for Brucellosis, Tuberculosis, Newcastle Disease and Foot and Mouth Disease



KPKM (DVS)



Increased number of established disease-free farms

- 3.7.2 Promote biosecurity and good manufacturing practices through certification of Malaysian Good Agriculture Practices (MyGAP), Malaysian Organic (MyOrganic), Veterinary Health Mark (VHM) and Good Veterinary Hygienic Practices (GVHP)



KPKM (DVS)



Increased number of certified premises and farms compliant to the establish standards

- 3.7.3 Develop and revise infection prevention and control of animal diseases related documents (APTVM/PVM)



MOH, MOHE



IPC of animal diseases related documents developed and revised when required

- 3.7.4 Conduct simulation exercises on outbreak of animal diseases



KPKM (DVS), related agencies



Personnel involved in outbreak of animal diseases management are well trained

3.7.5 Conduct continuous training program on IPC of animal diseases



KPKM (DVS, DOF), related agencies



Increased competency among animal health personnel

3.7.6 Strengthen the implementation of farm licensing activities to ensure good biosecurity measures in the farms



KPKM (DVS, DOF)



Farm licensing implemented at all states

3.7.7 Strengthen periodic audit of premises emphasising on good husbandry, health program and biosecurity practices



KPKM (DOF)



Increased number of registered premises

KEY PRIORITY AREA 4: Appropriate Use of Antimicrobials

STRATEGIC OBJECTIVE 4: Optimise the Use of Antimicrobials Across Relevant Sectors

Strategy 4.1: Ensure activities of distribution, prescription and dispensing of antimicrobials are in accordance with national legislation

Strategy 4.2: Review the National Essential Medicines List and National Antimicrobial Guideline regularly to ensure purchasing and prescribing of antimicrobial medicines are based on current recommendations

Strategy 4.3: Develop and revise policies on the use of antimicrobial agents and strengthen enforcement activities

Strategy 4.4: Introduction of incentives to optimise appropriate use of antimicrobial agents

Strategy 4.5: Strengthening of the Antimicrobial Stewardship Programme in healthcare facilities

Strategy 4.6: Strengthen laboratory capacity to support implementation of the AMS programme

Optimise the Use of Antimicrobials Across Relevant Sectors

Antimicrobials are one of our most essential classes of medicines, which if used appropriately save lives and conserve food production. The extensive use,

misuse, and overuse of antimicrobials in human and animal health sectors is one of the most significant factors leading to AMR's emergence and increased development.

To ensure activities of distribution, prescription and dispensing of the antimicrobials are in accordance with national legislation, the enforcement of Feed Act 2009 on the importation, manufacture and sale of animal feed or feed additives and the establishment of AMU surveillance programme in aquatic areas are essential.

Antibiotics play a critical role in treating life-threatening conditions like pneumonia and sepsis, which represents the body's severe response to an infection. Despite efforts to prevent infections, certain medical procedures such as organ transplants, major surgeries, cancer chemotherapy, and diabetes management may still necessitate treatment with effective antimicrobials. Therefore, it is crucial to use antibiotics and other antimicrobial agents only when necessary, ensuring the correct choice, timing, quantity, and duration to optimise their effectiveness.

Treatment recommendations and guidelines must be developed and kept up to date in order to guide and improve the way healthcare and veterinary professionals prescribe antibiotics. Promotion of prudent use of antimicrobials is immensely important in prolonging their efficacy and reducing the acceleration of AMR.

To reduce the growth of resistance, antimicrobials must also be used responsibly in animal husbandry. The use of antimicrobials in animals for infection prevention and growth promotion significantly contribute to the development of AMR. Over the years, evidence has accumulated to suggest that use of antimicrobials in animals has contributed to the development of AMR in humans. However, little has been focused on quantifying the burden and impact.

Steps towards reducing and restricting the use of antimicrobials in animals through phasing out the use of antibiotics as growth promoter and prophylaxis are important to preserve the drugs' efficacy in both humans and animals.

Engagement with various stakeholders should be carried out during the development or revision of policies to strengthen the commitment in ensuring good implementation of the measures.

Implementing a successful and sustainable antimicrobial stewardship programme both in the public and private healthcare sectors is crucial to ensure judicious use of antimicrobials in all healthcare settings. Hence, there is a need for the AMS programme to be included as a criterion in the hospital accreditation standards.

Antimicrobial stewardship is based on fundamental principles to guide the implementation of efforts in promoting judicious antimicrobial use and, therefore, advance patient safety and improve outcomes. It requires an integrated and multidisciplinary approach that involves a physician, microbiologist, pharmacist, and infection control practitioner. Judicious use of antimicrobials includes an appropriate selection of antimicrobials for proper patients with proper duration and route to minimise the risk of developing AMR.

Strategy 4.1 Ensure activities of distribution, prescription and dispensing of antimicrobials are in accordance with national legislation

- 4.1.1 Monitor the online sale of antimicrobials to prevent public access through online platforms



MOH (Pharmacy Enforcement Division)



Enforcement actions are taken in response to detected offences related to the sale of antimicrobials on e-commerce platforms, for example, issuing warning letters, pursuing prosecutions, removing advertisements, etc

- 4.1.2 Prohibit banned antimicrobial importation through listing under Customs Order (Prohibition of Import)



MOH (Pharmacy Enforcement Division)



Listing of Antimicrobials under Customs Order updated on request

- 4.1.3 Register polymyxins as banned ingredients in veterinary medicines to safeguard the last line of defense for severe infection in human



MOH (NPRA, Pharmacy Enforcement Division)



Total ban of Polymixins usage in the veterinary sector

- 4.1.4 Strengthen Antimicrobial Utilisation (AMU) surveillance in animal health sector by revising the National Pharmaco-surveillance guideline



KPKM (DVS, DOF)



National Pharmaco-surveillance guideline revised

- 4.1.5 Strengthen the enforcement of Feed Act 2009 on the importation, manufacture and sale of animal feeds or feed additives



KPKM (DVS)



Increased number of registered manufacturer and sellers, and licensed importers

- 4.1.6 Establish AMU surveillance programme in aquaculture industries



KPKM (DOF, LKIM, MARDI)



AMU surveillance established in Aquatic animal premises

Strategy 4.2: Review the National Essential Medicines List and National Antimicrobial Guideline regularly to ensure purchasing and prescribing of antimicrobial medicines are based on current recommendations

4.2.1 Review the National Essential Medicines List and National Antimicrobial Guideline for medical use



MOH (PSP)



Prudent use of antimicrobial amongst healthcare professionals

Strategy 4.3: Develop and revise policies on the use of antimicrobial agents and strengthen enforcement activities

4.3.1 Strengthen the monitoring program in all animal feed manufacturers (i.e., feed millers and home mixers)



KPKM (DVS, DOF)



Increased number of feed millers and home mixers monitored

4.3.2 Phase out the use of antibiotics as growth promoter and prophylaxis in animal feed

- Exclude antibiotics from list of drugs in License B of Poison Act 1952 (Refer Appendix 2)
- Engage with related stakeholders to inform the new requirement and procedure



MOH, KPKM (DVS, DOF)



Policy for phasing out the use of Critically Important Antibiotics (CIA) as growth promoter and prophylaxis established by 2023

- 4.3.3 Incorporate AMU requirements into the existing licensing procedures (e.g., Rearing Licence under States Enactment) and implement the revised procedures in all state DVS



KPKM (DVS)



AMU requirements are incorporated into the existing licensing procedures and implemented by state DVS

- 4.3.4 Develop feed sampling procedure under the Feed Act 2009 [Section 32(2)] to support the enforcement activity towards antimicrobial abuse



KPKM (DVS)



Feed sampling procedure developed

- 4.3.5 Develop regulation on matters relating to AMU in animal feed (prescription of antimicrobial) [Section 19(1) & 53(2)(f) Feed Act 2009]



KPKM (DVS)



Regulation related to prescription of antimicrobial in animal feed developed

- 4.3.6 Identify designated laboratories and qualified person to be an analyst to carry out data analysis as per requirement under the Feed Act 2009 [Section 33 & 34, Feed Act 2009]



KPKM (DVS)



Designated laboratories and data analysts identified

Strategy 4.4: Introduction of incentives to optimise appropriate use of antimicrobial agents

- 4.4.1 Facilitate market access and promotion of MyGAP certified products to optimise appropriate use of antimicrobial agents



KPKM (DOF, LKIM)



Increased number of MyGAP certified premises

Strategy 4.5: Strengthening of the Antimicrobial Stewardship Programme in healthcare facilities

- 4.5.1 Strengthen AMS in healthcare facilities by incorporating the AMS programme as one of the criteria in hospital accreditation



MOH (PSP, MDD), MPUHC



Increased number of public and private healthcare facilities with a dedicated AMS programme

- 4.5.2 Revise and update the Antimicrobial Stewardship Protocol based on current development and references



MOH (PSP, MDD)



AMS programme implemented effectively in healthcare facilities

- 4.5.3 Review clinical pathways for common infections in primary care as a guide for good management practice of common infections in the primary care setting



MOH (PSP, MDD, FHDD)



Improved management of common infections in the primary care setting

- 4.5.4 Monitor AMS implementation in public and private healthcare facilities through audit on structural, process and outcome measures



MOH (PSP, MDD), MPUHC, MINDEF (Health Services Division), APHM



Implementation progress of the AMS programme in public and private healthcare facilities evaluated

- 4.5.5 Conduct audit on the appropriateness of antimicrobial prescribing through Point Prevalence Survey (PPS) on antibiotic utilisation and adherence to national/local antimicrobial guideline and expand the PPS scope in primary care to include UTI



MOH (PSP, MDD, FHDD, PHDD, OHP)



Percentage of antimicrobial prescriptions with indications that adhere to national or local antimicrobial guidelines

- 4.5.6 Incorporate antimicrobial prescriptions' adherence to national/local antimicrobial guideline into the Hospital Performance Indicator Approach (HPIA)



MOH (PSP, MDD)



AMS programme identified as one of the key performance indicators (KPI) for hospital directors through HPIA

- 4.5.7 Increase competency in AMS among the healthcare professionals, i.e. house officers, provisionally registered pharmacists, general practitioners, community pharmacists and clinical pharmacists through recognised training, certification, or credentialing programme



MOH (PSP, MDD), MMA, MPS



Improved level of competency among the various healthcare professionals in AMS programme

- 4.5.8 Expand the AMS programme to the paediatric population in public and private healthcare facilities



MOH (PSP, MDD)



Implementation of antibiotic consumption surveillance in the paediatric discipline initiated

Strategy 4.6: Strengthen laboratory capacity to support implementation of the AMS programme

- 4.6.1 Increase placement capacity of Clinical Microbiologists in public and private microbiology laboratories



MOH (MDD), MPUHC, APHM, MINDEF (Health Services Division)



Sufficient number of Clinical Microbiologists placed in laboratories to support the AMS programme

- 4.6.2 Equip laboratories with the latest technologies and rapid diagnostic tests, including but not limited to automated pathogen identification, infection biomarkers analysis, antimicrobial susceptibility testing for fungi, colistin susceptibility testing, expansion of Point-of-Care Testing (POCT) for Multi-Drug Resistant Tuberculosis (MDR TB), and implementation of Whole Genome Sequencing (WGS) and metagenomics for pathogen detection in both diagnostic and outbreak management scenarios



MOH (IMR, NPHL)



Enhanced laboratory capacity for diagnostic tests, rapid pathogen detection and genetic analysis

- 4.6.3 Increase the number of accredited microbiology laboratories to meet international and national regulations and requirements



MOH (MDD), MPUHC, APHM, MINDEF (Health Services Division)



Laboratories enabled to operate competently and generate credible and valid results continuously

- 4.6.4 Expand the coverage of Laboratory Information System (LIS) to include all tertiary hospitals



MOH (MDD)



Facilitating the generation of laboratory results that are efficient, reliable, and accurate

SECTION 4

OUTCOME INDICATORS OF MyAP-AMR 2022-2026

Outcome Indicators

Monitoring outcome indicators is crucial for enhancing decision-making, particularly in the context of policy development. It also serves as a valuable tool for gauging the impact of strategic interventions outlined in this action plan. Among the indicators monitored in this action plan are as follows:

1. **Increased** level of awareness, knowledge and understanding of AMR among the public
2. **5% reduction** in antimicrobial use in the animal sector by 2026 compared to the rate in 2022
3. **30%** of critically important antimicrobials for human and veterinary medicine (shared important antimicrobial agents) not used as a growth promoter in food-producing animals by 2026
4. **At least 60%** of overall antibiotic consumption in humans comprised from ACCESS group of antibiotics by 2026
5. **30% reduction** in healthcare associated bloodstream infection due to selected MDROs (CRE, *Acinetobacter baumannii* and MRSA) by 2026 compared to the rate in 2021

List of stakeholders in NARC

Ministry of Health Malaysia

Medical Programme

- Medical Development Division
- Nursing Division

Public Health Programme

- Disease Control Division
- Family Health Development Division

Research and Technical Support Programme

- Institute for Medical Research
- Engineering Services Division
- Institute for Clinical Research

Pharmaceutical Services Programme

Food Safety and Quality Division

Oral Health Programme

Ministry of Agriculture and Food Security

- Department of Veterinary Services
- Department of Fisheries
- Department of Agriculture

Ministry of Natural Resources, Environment and Climate Change

- Department of Environment
- National Water Research Institute of Malaysia

Ministry of Higher Education

- Universiti Malaya
- National University of Malaysia
- Universiti Putra Malaysia
- Universiti Sains Malaysia

Ministry of Defence

Professional Organisation & Non-Governmental Organisation

- Malaysia Medical Association
- Association of Private Hospitals Malaysia
- Malaysian Pharmacists Society
- Malaysian Society of Infectious Disease and Chemotherapy
- Malaysian Community Pharmacy Guild
- Islamic Medical Association Malaysia
- Malaysian Dental Association
- Malaysian Society of Infection Control and Infectious Diseases
- Veterinary Association of Malaysia
- Malaysia Society of Animal Production
- Malaysian Association Food Animal Veterinarian
- Federation Livestock Farmers Association Malaysia
- Malaysia Shrimp Industry Association
- Malaysian Animal Health & Nutrition Industry Association
- Malaysia Fisheries Society
- Malaysian Ruminant Transformation Generation Club
- Malaysian One Health University Network
- Third World Network

Antibiotics to be excluded from list of drugs in License B of Poison Act 1952

2023

Chlortetracycline
Oxytetracycline
Amoxicillin
Ampicillin
Neomycin
Cefalexin
Benzylpenicillin
Florfenicol
Norfloxacin
Tilmicosin
Tylvalosin
Spectinomycin
Sulfamonomethoxine
Sulfadiazine
Lincomycin

2024

Enramycin
Bacitracin methylene disalicylate (BMD)
Apramycin

2025

Tiamulin
Zinc bacitracin
Trimethoprim
Virginiamycin

Secretariat

Infection Control Unit
Medical Care Quality Section
Medical Development Division
Ministry of Health Malaysia
Level 4, Block E1, Complex E,
Precinct 1, 62590 Putrajaya

03-8883 1180
myohar.moh.gov.my



Ministry of Health Malaysia

myohar.moh.gov.my

