

**NATIONAL ANTIMICROBIAL RESISTANCE
CONTAINMENT ACTION PLAN NEPAL
2016**



Department of Health Services

Ministry of Health

Ram Shah Path, Kathmandu

Foreword

Antibiotics have been a critical public health tool since the discovery of Penicillin in 1928, saving the lives of millions of people around the world. In developing country like ours, where the burden of treatable disease is very high and access to health facilities and laboratories is difficult, antibiotics have long acted as miracle drugs. Today, however, the emergence of drug resistance in bacteria is reversing the miracles of the past eighty years, with drug choices for the treatment of many bacterial infections becoming increasingly limited, expensive, and in some cases, nonexistent. Diseases previously regarded as relatively easy to manage are much harder to treat as doctors must use “last-resort” drugs that are more costly, take longer to work and are often unavailable or unaffordable in developing countries. Moreover, regular prescription of antibiotics, random treatment, over the counter sales, inadequate dosage, inclusion of antibiotics in animal feeds and agriculture has contributed equally to emergence of antibiotics resistance as silent epidemic within the country.

To address this issue, the members of National Alliance for Prevention and Control of Antibiotic resistance have prepared a National Action Plan for Combating Antibiotic-resistance which provides a road map to guide the Nation in rising against this challenge. The *National Action Plan* is also designed to guide action by public health, healthcare, and veterinary partners in a common effort to address urgent and serious drug-resistant threats that affect people in the country and to take urgent action at the national, regional, and local levels to combat resistance.

Implementation of the objectives and activities in the National Action Plan requires sustained, coordinated and complementary efforts of individuals and groups around the world, including health care providers, leaders, veterinarians, agriculture industry leaders, manufacturers, policymakers and patients. This document aims to bridge the information gap related to AMR in human and animal sectors and will further serve as an important baseline document for developing plans, policies and programmes in AMR for government and other allied agencies.

All of us who depend on antibiotics must join in a common effort to detect, stop, and prevent the emergence and spread of resistant bacteria.

Acknowledgements

Contributors in the development of the action plan:

Mr. B. K Khakurel	Director General , Department of Drug Administration, MoH
Dr. Geeta Shakya	Director, National Public Health Laboratory
Dr. G. R. Lohani	Ministry of Health, Curative Division
Dr Nihal Singh	World Health Organization, Nepal
Dr. Prakash Ghimire	World Health Organization, Nepal
Mr Narayan Dhakal	Department of Drug Administration, MoH
Ms. Jyoti Acharya	Co-chief Medical Technologist / Microbiologist- National Public Health Laboratory
Ms. Nisha Rijal	Microbiologist- National Public Health Laboratory

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ABBREVIATIONS

ACPN	Association of Clinical Pathologists of Nepal
AM	Antimicrobial
AMR	Antimicrobial Resistance
APPON	Association of pharmaceutical producers of Nepal
CHD	Child Health Division
CVL	Central Veterinary Laboratory
DDA	Department of Drug Administration
DAH	Directorate of Animal Health
DoHS	Department of Health services
DoLS	Department of Livestock Services
EDCD	Epidemiology and Disease Control Division
MOA	Ministry of Agriculture
MOH	Ministry of Health
MoLD	Ministry of Livestock Development
FHD	Family Health Division
GARP	Global Antibiotic Resistance Partnership
IOM	Institute of Medicine
IPC	Infection Prevention and Control
KMC	Kathmandu Medical College
LCD	Leprosy Control Division
LMD	Logistics Management Division
MD	Management Division
MELAN	Medical Laboratory Association Nepal
MoE	Ministry Of Education
NACARC	National Advisory Committee on Antimicrobial Resistance and Containment
NAMC	Nepal Ayurvedic Medical Council
NAMLS	Nepal Association for Medical Laboratory Sciences
NAMS	National Academy of Medical Sciences
NCASC	National Centre for AIDS and STD Control
NGO	Non-Governmental Organization
NHEICC	National Health Education Information and Communication Center
NHPC	Nepal Health Professional Council
NHTC	National Health Training Centre
NMC	Nepal Medical Council
NVC	Nepal Veterinary Council
NNC	Nepal Nursing Council
NNA	Nursing Association of Nepal
NPA	Nepal Pharmaceutical Association
NPC	Nepal Pharmacy Council
NPHL	National Public Health Laboratory
NTC	National Tuberculosis Centre
PHSRD	Primary Health Service Revitalization Division

OIE	World Organization for Animal Health
PAHS	Patan Academy of Health Sciences
RHD	Regional Health Directorate
SOP	Standard Operating Procedure
VSDAO	Veterinary Standards and Drug Administration Office
VPHO	Veterinary Public Health Office

INTRODUCTION

Antimicrobials are the most effective treatment for infectious diseases; they are generally safe, effective and to date, relatively inexpensive. Antimicrobial resistance is a natural microbial survival mechanism; however, the overuse and misuse of antimicrobials has increased the rate of resistance development and spread. Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi. The impact on particularly vulnerable patients is most obvious, resulting in prolonged illness and increased mortality. Antimicrobial resistance is a growing global public health threat. Some estimates of the economic effects of AMR have been attempted, and the findings are disturbing. For example, the yearly cost to the US health system alone has been estimated at US \$21 to \$34 billion dollars, accompanied by more than 8 million additional days in hospital. Because AMR has effects far beyond the health sector, it was projected, nearly 10 years ago, to cause a fall in real gross domestic product (GDP) of 0.4% to 1.6%, which translates into many billions of today's dollars globally.

ANTIMICROBIAL RESISTANCE IS A GLOBAL CHALLENGE

The antimicrobial resistance phenomenon has become a global concern as geographic borders among countries and continents have become less distinct. There are high proportions of antibiotic resistance in bacteria that cause common infections (e.g. urinary tract infections, pneumonia, bloodstream infections) in all regions of the world. A high percentage of hospital-acquired infections are caused by highly resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA) or multidrug-resistant Gram-negative bacteria. Treatment failures due to resistance to treatments of last resort for gonorrhoea (third-generation cephalosporins) have been reported from ten countries. Gonorrhoea may soon become untreatable as no vaccines or new drugs are in development. Patients with infections caused by drug-resistant bacteria are generally at increased risk of worse clinical outcomes and death, and consume more health-care resources than patients infected with the same bacteria that are not resistant. More than half of all medicines worldwide are prescribed, dispensed, or sold inappropriately, according to the WHO.

In September 2011, ministers of the South East Asian countries met in Jaipur India, acknowledged antimicrobial resistance as a major global public health issue and expressed commitment for Institution of a coherent, comprehensive and integrated national approach to combat antimicrobial resistance through:

- Development of national antibiotic policy and formulating multi-sectoral national alliances against antimicrobial resistance.
- Advocate for multidisciplinary approach by all sectors of the government, with the private health sector providing desired information and following national guidelines.
- Study the emergence and spread of antimicrobial resistance and assess accurately its impact on public health.
- Regulating the use of antimicrobial agents, both in public and private sectors to prolong

and preserve their efficacy.

- Strengthen legislation to prevent the manufacture, sale and distribution of spurious and substandard/not-of standard-quality and poor quality antimicrobial agents and the sale of antibiotics.
- Promoting behavioral change in prescribers and communities through continuous training, educational campaigns with process and outcome measures for rational use of antimicrobial agents and emphasizing antimicrobial resistance in medical, dental veterinary and pharmacy curricula.
- Build increased capacity for efficient surveillance of antimicrobial resistance and its effective use in modifying antibiotic policy.
- Strengthen diagnostic facilities for microbial diseases to facilitate evidence-based antimicrobial prescription.
- Strengthen infection control practices in health care facilities to reduce the burden of microbial diseases and health-care associated infections.
- Ensure use of antimicrobial agents included in National Essential Drugs List, regulate non-therapeutic use of antimicrobial agents and irrational use in the veterinary and fishery sectors.
- Encourage basic and operational research in areas that enhance application of various measures to combat antimicrobial resistance.
- Advocate healthy lifestyle, cost-effective and essential immunization and other non-pharmaceutical measures to reduce the disease burden due to microbial diseases
- Develop national and regional mechanisms for regular data sharing, regulating cross-border transfer of infectious materials and bacterial isolates, sharing best practices of laboratory-based surveillance of antimicrobial resistance and practices promoting rational use of antibiotics.
- Set up a regional mechanism for sharing of mutually agreed antimicrobial resistance data of public health importance relevant to policy making.
- Develop a regional mechanism for a regular inter-country consultative process for reviewing issue related to antimicrobial resistance including tracking of international movement of resistant organisms both within the Region and among regions.

In May 2015, 68th World Health Assembly approved the Global Action Plan on antimicrobial resistance that underscores the need for an effective “one health” approach involving coordination among numerous international sectors and actors, including human and veterinary medicine, agriculture, finance, environment, and well informed consumers. The action plan recognizes and addresses both the variable resources nations have to combat antimicrobial resistance and the economic factors that discourage the development of replacement products by the pharmaceutical industry.

Nepal’s Approach for containment of antimicrobial resistance (Rationale): Government of Nepal, as a part of continued commitment to Jaipur declaration to contain the threat of Antimicrobial resistance, has developed the current *National Antimicrobial Resistance Containment Action Plan*. This Framework will serve as a starting point for cohesive engagement and mobilization of all who are accountable for action on antimicrobial resistance

and use. Given the global nature of this issue, the Action Plan, in line with the one- health concept, highlights the need for Nepal to work with international organizations and groups to develop solutions applicable to domestic production and use and importation from global market.

This Action Plan is presented in three sections:

- The first section explains what antimicrobial resistance is, how it is spread and why it is a problem.
- Section two outlines the strategic areas of focus for the Government of Nepal and associated priority actions.
- The third section describes the roles and responsibilities of different agencies involved.

Section -I

What is an antimicrobial?

An antimicrobial is a natural, semi-synthetic or synthetic substance that is capable of killing or inhibiting the growth of microorganisms (e.g., bacteria, virus, parasites, fungi). The term antimicrobial will be used throughout this document to refer to: antibiotics, antivirals, antifungals, and antiparasitics.

What is antimicrobial resistance and how does it develop?

Antimicrobial resistance simply means that the antimicrobial drugs that used to be effective against a particular microbe no longer work because the microbe's biological makeup has changed; it has become resistant to the treatment. The problem can occur naturally, or when an infection is treated with an antimicrobial which kills only some of the microbes. Those that can resist the treatment survive and multiply. Over time, more and more of the resistant microbes remain in our environment, eventually leading to the emergence of new strains of disease-causing microbes that are partially or fully resistant to antimicrobial treatment.

How does antimicrobial resistance spread?

Antimicrobial resistant microbes move and spread in the same way that all infectious disease causing microbes do; through direct contact (person, animal, and environment), contaminated food or water, or contact with body fluids. Resistant microbes are generally found where antimicrobial use is higher and disease conditions more common.

Why is antimicrobial resistance (AMR) a problem?

Antimicrobial Resistance (AMR) is a problem because:

- **AMR kills:** Infections caused by resistant microorganisms often fail to respond to the standard treatment, resulting in prolonged illness, higher health care expenditures, and a greater risk of death.
- **AMR hampers the control of infectious diseases:** AMR reduces the effectiveness of treatment; thus patients remain infectious for a longer time, increasing the risk of spreading resistant microorganisms to others.
- **AMR increases the costs of health care:** When infections become resistant to first-line drugs, more expensive therapies are used, longer duration of illness and treatment increases health care costs as well as the economic burden on families and societies.
- **AMR jeopardizes health-care gains to society:** The achievements of modern medicine are put at risk by AMR. Without effective antimicrobials for prevention and treatment of infections, the success of organ transplantation, cancer chemotherapy and major surgery would be compromised.
- **AMR threatens health security, and damages trade and economies:** The growth of global trade and travel allows resistant microorganisms to be spread rapidly to distant countries and continents through humans and food.

Section-II

NEPAL'S COMMITMENT TO ACTION

Nepal's action on antimicrobial resistance, including those addressing antimicrobial use, are aligned in line with international organizations guidelines and commitments. Government of Nepal Ministries, departments and agencies will work together and with other jurisdictions and sectors including private sectors to focus on reducing the public health risks and impacts of antimicrobial resistance.

Laboratory based AMR Surveillance:

In Nepal, AMR surveillance started as early as 1999 with limited number of participant laboratories and organisms under surveillance. The program has grown up with the current network of 20 laboratories covering all five regions of the country and expanded to 8 pathogens of interest as of now viz. *Salmonella* species, *Shigella* species, *Vibrio cholerae*, *Streptococcus pneumoniae*, *Neisseria gonorrhoeae*, *Haemophilus influenza* type b, Extended Spectrum Beta Lactamase (ESBL) producing *E. coli* and Methicillin Resistant *Staphylococcus aureus* (MRSA). WHO has been supporting NPHL for AMR surveillance in the country since 2006. The program has provided significant contribution in the treatment policy / guideline formulation / review at the national level and uniformity in testing at the local level. Moreover, it has contributed to regional and global AMR database.

Current Status: Comprehensive study findings on antibiotic resistance in Nepal are limited. There is limited information on total production, importation and use of different categories of antimicrobials in the country, although Department of Drug administration has some information on production licensing amounts of antimicrobials within the country. There have been a couple of focused studies noting tetracycline resistant *Vibrio cholerae*, quinolone resistant *Salmonella* and *Shigella*, methicillin-resistant *Staphylococcus aureus*, MDR *pneumococci*, *Acinetobacter*, and *Klebsiella pneumoniae*.

Last ten years laboratory based AMR surveillance data from 20 participating laboratories in the network has revealed:

- Increased resistance to Ciprofloxacin in *Salmonella* from 0% in 2003 to 85% in 2014.
- A five-fold increase in MDR in *Shigella* spp.
- Increased resistance to Ceftriaxone in pneumococci (from 0% in 2006 to 13% by 2013)
- Methicillin resistant *Staphylococcus aureus* (MRSA) infections are on the rise (80% increase in the number of reported cases in 2015 as compared to 2013).
- Increased resistance to first line (Ciprofloxacin and Erythromycin) and second line drugs in MRSA (Vancomycin and Linezolid).

A SHARED RESPONSIBILITY

Addressing the growing threat of antimicrobial resistance is a shared responsibility. The Government of Nepal's role in protecting the health of Nepalese against disease threats of national concern is essential to this multi-sector collaboration. The Government's role includes

promoting health, preventing and controlling disease, brokering knowledge and facilitating innovation, tracking and monitoring disease threats, ensuring the safety of antimicrobial products and all foods sold and prepared in Nepal, along with collaboration with international partners. In the recent days a new concept of one health Hub has been put forward, through a strategic framework for cabinet consideration, under review.

Ministry of Health is and will continue to take lead in coordinating related departments/centres under the ministry of health, other related ministries and line agencies in bringing all together for the cause of preventing and combating the spread of antimicrobial resistance. In this context, it has recently formed a high level steering committee and alliance with the participation of most of the stakeholders in the field including public, private and non-state participants. The coordination through Ministry of Health will be mainly focused towards bringing all together in harmonizing the guidelines/protocols/regulatory frameworks taking into consideration rational use of antibiotics in all settings. Ministry will continue organizing annual meetings of the steering committees and alliances separately in view of reviewing the progress and bottlenecks and coordinate in promulgation of directives/acts as necessary.

The National Public Health Laboratory under the department of health services, Ministry of Health acts as a focal point in AMR and leads the laboratory based AMR surveillance. It works with domestic and international partners in areas of surveillance, laboratory analysis, infectious disease outbreaks confirmation, awareness and public health guidance development together with Epidemiology & Disease Control Division of the DOHS. Outbreaks related to foodborne diseases will be investigated by EDCD and laboratory support for disease diagnosis will be provided by NPHL. NPHL will continue its existing laboratory based AMR surveillance as well as the supporting laboratory services, in support of efforts to combat AMR. This will include regular indicator based timely monitoring, review and required adjustments (e.g. incorporating additional data sources and new technologies)

Department of Drug Administration, under the Ministry of Health, regulates the approval of antimicrobial drugs for production and sale in Nepal that are used in humans and animals. Its capacity in regulating the strict prescription based sale of medicines, i.e. restricting over the counter availability of antibiotics, needs to be strengthened.

Department of Food Technology and Quality Control (DFTQC) under the Ministry of Agriculture is responsible for establishing policies and standards related to the safety and nutritional quality of the food supply, monitoring the quality of food items as per food law. The capacity and functioning of DFTQC will be enhanced in such a way that it will be able to regulate non-therapeutic use of antibiotics, e.g. use of antibiotics in food items, use of antibiotics as small animal growth promoters.

Department of Health (DoH): Respective divisions under the DOHS, i.e. EDCD, CHD, FHD, will develop/revise the related treatment protocols, standard guidelines for respective sectors, taking into consideration the rational use of antibiotics.

Department of Livestock Services(DoLS): DOLS under the Ministry of Agriculture Livestock Development, will be responsible for development / revision of the related treatment/case management protocols, standard guidelines related to livestock, taking into consideration rational use of antibiotics, particularly discouraging the use of low doses of antibiotics in animal feeds as growth promoters.

Nepal Health Research Council and Academia: Academic and NHRC will support Govt. of Nepal in conducting research for generating evidences for policy changes as and when required.

Fighting the spread of antimicrobial resistance depends on the involvement and collaboration of multiple jurisdictions, levels (local, national and international) and sectors (e.g. public health, private, and agricultural sectors). The Government of Nepal is committed to working with all jurisdictions in addressing the problem.

Section -III

GOAL

To protect Nepalese from the health risks related to antimicrobial resistance

KEY AREAS OF FOCUS

The Government of Nepal, in collaboration with its partners, seeks to reduce the health risks associated with antimicrobial resistance by focusing its efforts on these five pillars: Awareness, Surveillance, Infection Prevention & Control, Stewardship, and Innovation. These pillars have been selected based on WHO resolution and Nepal's commitments in different forums.

1. Improve awareness and understanding of AMR through effective communication, education and training.
2. Strengthen the knowledge and evidence base through research and surveillance.
3. Reduce the incidence of infection through effective hygiene and infection prevention measures.
4. Optimize the use of antimicrobial medicines in human and animal health.
5. Develop the economic case for sustainable investment that takes account of the needs of all countries, as well as the need for investment in new medicines, diagnostic tools, vaccines and other interventions.

1. AWARENESS

ACTION 1: Improve awareness of the user population on the understanding of antimicrobial resistance through effective communication:

- Antimicrobial resistance (AMR) awareness week will be celebrated every November, acknowledging its global importance and also to raise awareness in Nepalese population, on the problem and ways to address it.
- Behaviour change and communication messages, targeting rational use of antibiotics will be promoted through appropriate media. NHEICC/MOH, Directorate of training and extension/ MOLD and Agriculture information centre/MOA in coordination with Ministry of Information, Press council and concerned stakeholder organizations working for AMR containment will be responsible.
- MoH/AMR steering committee will take the responsibility of developing and disseminating annual performance reports in coordination with all stakeholders.
- Consumer awareness programs on AMR and rational use of antimicrobials will be promoted mobilizing GOs and NGOs.

ACTION 2: Improve the awareness and understanding of antimicrobial resistance through education and training

- Rational use of antibiotics in academic curricula of various levels of education will be

reviewed and updated (School, College, Professional, Medical, Veterinary and Agriculture).

- Continuing Education (CE) on the rational use of antibiotics, for professionals of Human health, Animal health and Agriculture will be organized at regular intervals by the respective departments/centers.
- Prescribers, pharmaceutical manufacturers and dispensers will be trained on the rational use of antibiotics. Respective professional associations/councils will be brought into loop in organizing such orientations.
- Effective implementation of GCP, GVP, GHP, GAP, GMP and GLP will be promoted through respective ministries and line agencies.
- Infection prevention and control education programs to targeted audience in human and animal health will be promoted.

2. SURVEILLANCE

Detecting and monitoring trends and threats in order to inform strategies to reduce the risks and impacts of antimicrobial resistance are possible with sensitive surveillance system.

Through the Epidemiology & Disease Control Division of the Department of Health Services, national surveillance programs monitor different infectious diseases and respond to the outbreaks with diagnostic support from National Public Health laboratory. National Public Health laboratory through its existing 20 network laboratories monitors antimicrobial resistance among the possible isolates from patients (AMR surveillance network). However, the existing AMR surveillance system is yet to include collection of specimens from animals and the food supply, which are vital steps in the spread of resistant organisms to the communities. Surveillance information facilitates policy decisions on the management of antimicrobials at all levels of health care system.

ACTION 3: Strengthen and expand the existing surveillance systems to identify new threats or changing patterns in antimicrobial resistance and use, in human and animal settings.

- National Antimicrobial Surveillance Center will be established at NPHL/MOH, targeting towards detection and characterization of antimicrobial resistance in all aspects of one health (animal, human, antimicrobial residues in human/animal food, and environment). This includes Quality Assurance (International & national), data quality & sensitivity of surveillance system through monthly monitoring the reports from the network labs (human, animal, food & agriculture) and their performance quality.
- Number of organisms and sites for AMR surveillance will be expanded to effectively cover the entire country.
- The Central Veterinary Laboratory capacity to conduct epidemic investigations and animal disease surveillance in veterinary sectors taking into account emerging and reemerging zoonotic diseases.
- DDA capacity in monitoring production, import, prescription, dispensing etc. for improvement in prescription & consumption practices to support AMR containment program will be strengthened.
- National protocols for infectious disease control and monitor its adherence in use

through regular surveillance by DOHS/EDCD in human health, DOLS in Animal health, DFTQC in food & supplements, AM residues in Agriculture & crops.

ACTION 4: *Strengthen the knowledge and evidence base through operational research:*

- Operational research on antibiotics production, prescription, consumption, and antimicrobial resistance development in human and non-human sectors will be promoted through academic & stakeholders collaboration, to generate evidence for policy making.
- Baseline information on various areas of antibiotics (production, prescription, use, resistance) will be explored and updated regularly, which will be able to update respective policies.

3. INFECTION PREVENTION AND CONTROL

Infection prevention and control measures in health facilities as well as outside (in community) reduce the risk of transmission of infections and minimizes the need for AMs. This reduces the selective pressure and the subsequent emergence of resistant strains. Furthermore, infection prevention and control measures diminish the spread of the resistant microbes once resistance has emerged.

ACTION 5: *Reduce the incidence of infection through effective sanitation and hygiene:*

- Basic Sanitation, hygiene and IPC practice in health care practice in all settings will be audited and appropriate actions for improvement will be made mandatory.
- As part of advocacy for sanitation and hygiene activities such as hand washing events will be promoted.
- Sanitation, biosafety and biosecurity measures in all sectors will be made mandatory.

ACTION 6: *Reduce the incidence of infection through infection prevention measures*

- Every level of hospitals will have Infection Prevention and Control (IPC) committees, which will be responsible for adhering to standard IPC protocols and practice.
- Occupational safety of staff in different sectors (OSHA) will be promoted through appropriate preventive measures including vaccinations through respective departments.
- Infection prevention guidelines and protocols (e.g., setting minimum standards) will be updated, implemented, monitored, and evaluated from time to time.
- Bio-safety and waste disposal guidelines and its adherence will be audited and regularly updated for hazard mitigation.
- Preventive immunization programs in human and animal health will be in place and monitored.
- Occupational hazard minimization will be promoted through respective councils.
- Minimum accreditation standards for infrastructure of health facilities to promote infection prevention and control will be updated and regulated.

4. STEWARDSHIP:

ACTION 7: Optimize the use of antibiotics in human health, animal health and food processing:

- MoH/DDA/DOLS will regulate antibiotics prescription, use and sales at different levels of health system, including private sectors. The regulations will be updated regularly based on surveillance information.
- The guidelines will include primary, secondary and tertiary line of treatments, along with last resort antibiotics strictly for use under Infectious Disease Physician/expert prescription, based on the evidences for need. Practice of antibiotics use will be solely based on culture and susceptibility testing results from accredited microbiology laboratory.
- DDA will develop evidence-based legislative framework/act for empowering National regulatory authorities to assure quality, production, sale and distribution of antibiotics.
- Veterinary drug use will be efficiently regulated as per existing and updated country regulations.
- Country regulatory mechanisms and HR capacity will be strengthened, through appropriate trainings in regulating antibiotics production/packaging, buying, selling, supplying, and receiving in donation in human health.

ACTION 8: Minimize the non- therapeutic use of antimicrobials in animals and food items

- Ministry of Agriculture, livestock and other line ministries will be brought into main stream for AMR action. The legislation/act/policy to regulate non-therapeutic use of antibiotics in animals, food, animal feed and agriculture sector will be promulgated.
- National standards for food items/animal breeding elements will be updated by the DOLS, DFTQC and DOA to restrict the use of antibiotics as growth promoters.

5. ECONOMY & INNOVATION:

ACTION 9: Develop the economic case for sustainable investment that takes into account the needs of the country, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

- Rapid and reliable diagnostic testing for infectious diseases will be improved through creation/addition of posts of infectious disease physicians, microbiologists, pharmacists, veterinarians and trained technologists at all levels. The posts will be filled by priority in a phase wise manner, through MoH/PSC process.
- Procurement and supply of equipment, media, reagents and chemicals will be regulated for nationally important infectious disease pathogens.
- Point of care RDTs at peripheral level health institutions with back up of the confirmatory testing at central level will be promoted through regular Govt. of Nepal program planning cycles, on a priority basis.
- Operational research on economic impact of diagnostics and antibiotics use in case management will be done on regular intervals for inclusion of new tests and medicines in the system, or dropping off any medicines from the prescription list.

- Further research for new vaccine/diagnostics/antimicrobials development in all related sectors (human, animal, and environment) will be encouraged.
- Collaborative participation in multi-country/multi-centric activities will be promoted.

EXPECTED OUTCOMES

Stakeholders from various sectors will be engaged in the effective implementation of the action plan with efforts to preserve the effectiveness of antimicrobial medicines through conservation and stewardship programmes.

Target By 2020 A.D:

- Provision of culture and diagnosis of selected bacterial pathogens and AMR surveillance will be made available up to the district level. Monthly reporting of AMR data from district to NPHL/MOH will be made mandatory, based on which a monthly update on AMR will be made available on NPHL website for the reference of the treating physicians and related authorities. Hospitals with capacity of more than 100 beds and Medical college Hospitals will be brought under the AMR Surveillance Network.
- Protocols for management of infectious diseases and its proper implementation will be ensured at every level of the health system.
- Update of data from AMR network sites in WHONET will be made mandatory.
- The National Antibiotic Guideline will be updated by MOH/DDA/NPHL annually on the basis of AMR surveillance data.
- National treatment protocol will be strictly adhered at all levels of the health system.
- Over the counter sale of antibiotics will be interrupted, through effective regulatory mechanism in place led by DDA supplemented with effective BCC activities on consumer awareness led by NHEICC and partners
- Non-therapeutic use of medically important antibiotics for growth promotion in animals will be eliminated.

Target By 2025 A.D:

- AMR surveillance will be expanded and made mandatory for both public and private sector health care providers.
- Veterinary, livestock and agriculture sectors will be incorporated under national AMR network for monthly reporting of the AMR status in each sector, contributing to one national AMR framework.
- DDA will have a strong regulatory mechanism in place for complete interruption of the non-prescription sale of antibiotics.
- No antibiotics will be distributed/sold without prescription so that over the counter sale of antibiotics is restricted.

PROGRESS INDICATORS

It is important to ensure that antibiotics are only used where they are needed therefore extra guidance needs to be put in place to ensure this happens. This can be initiated by checking the basic metrics in certain time duration:

- Comparing antibiotic resistance trend of a certain antibiotic against a certain microorganism over the years and assessing whether the resistance has decreased or not.
- Over the counter sales of antibiotics is zero or near zero.
- Tracking whether the number of hospitals with Infection Prevention and control committees (including all core members i.e., pharmacists, microbiologist, physicians, hospital authorities) has increased over the years or not.

As data improves, further measures will be implemented to assess the overall status of IPC, antimicrobial prescribing and antimicrobial stewardship activity. Appropriately targeted local information will be provided against which future progress can be more firmly evaluated and monitored. The possibility of developing a new integrated indicator is also being explored which can be used to communicate local and national standards for HCAI and antimicrobial resistance and improve patient outcomes.

WAY FORWARD

Nepal's antimicrobial resistance surveillance systems are not adequate to capture possible emergence of antimicrobial resistance at the very beginning and to the molecular level of the resistance mechanism.

Moving forward, the Government of Nepal is committed to ensuring surveillance systems that are better coordinated with a clear plan for improving antimicrobial resistance surveillance in partnership with other key stakeholders. This means linkages will be made to create a complete national picture of antimicrobial resistance in human and animal settings and within the food system in Nepal. Building on the surveillance successes across the country, systems will be expanded to support the identification of emerging threats, disease trends, and provide the information required to deal with known problems.

CONCLUSION

Significant activities of antimicrobial resistance containment have been initiated in the country. However, to further minimize the risk of AMR, there is a need of multi-sectoral governmental partnership with involvement of non-government public sectors. The contribution from all sectors will provide synergistic value in health promotion and safety of all

ANNEX- I

ADMINISTRATIVE ARRANGEMENTS FOR OPERATIONALIZATION OF THE FRAMEWORK

The list of members of National Multi-sectoral Steering committee:

1. Chairperson Secretary, MoH
2. Member Secretary Chief of Curative Division
3. Joint secretary Representative from Ministry of Agriculture and
Ministry of Livestock Development
4. Members DG of Department of Drug Administration
DG of Department of Livestock Services
DG of Department of Ayurveda
Director, National Public Health Laboratory (NPHL)
5. Representatives Association of Private Health Institutions of Nepal (ANPHIN)
Nepal Pharmacy Council
Teaching Hospital Association
Association of Non-governmental Hospitals in Nepal (ANGHOS)
Alliance for Prudent Use of Antibiotics (APUA)
Consumer forum
6. Invitees WHO Representative
FAO Representative

ANNEX-II

Members of National AMR Alliance

S. no.	Designation	Affiliation
1.	Chairperson	Secretary MoH
2.	Member Secretary	Chief of Curative Service Division
3.	Members	DG from Department of Drug Administration DG from Department of Health services (DoHS) DG from Department of Livestock Services (DoLS) DG from Department of Food Technology and Quality Control DG from Department of Agriculture(DOA) DG from Department of Wild Life and National Parks DG from Department of Ayurveda Director, National Public Health Laboratory (NPHL) Director, National Centre For AIDS and STD Control (NCASC) Director, National Health Education information and communication center (NHEICC) Director, Epidemiology and Disease control Division (EDCD) Program Director, Directorate of Animal Health(DAH)

- Director, Logistics Management Division (LMD)
 Director, Child Health Division (CHD)
 Director, Family Health Division (FHD)
 Director, Management Division (MD)
 Director, Leprosy Control Division (LCD)
 Director, Primary Health Service Revitalization Division (PHSRD)
 Chief, Central Veterinary Laboratory (CVL)
 Chief, Veterinary Standards and Drug Administration Office(VSDAO)
 Director, National Tuberculosis Centre (NTC)
 Director, National Health Training Centre (NHTC)
 Chief Drug Manager, MoH
 Director, National Drug Laboratory
 Chief, Veterinary Public Health Office(VPHO)
4. Representatives
 Joint Secretary from Curriculum Development
 Nepal Medical Council (NMC)
 Nepal Veterinary Council(NVC)
 Nepal Nursing Council(NNC)
 Nepal Pharmacy Council(NPC)
 Nepal Health Professional Council (NHPC)
 Nepal Ayurvedic Medical Council (NAMC)
 Nepal Association for Medical Laboratory Sciences (NAMLS)
 Medical Laboratory Association Nepal (MELAN)
 Association of Clinical Pathologists of Nepal (ACPN)
 Nursing Association of Nepal (NNA)
 Nepal Pharmaceutical Association (NPA)
 Nepal Veterinary Association(NVA)
 Nepal Animal Science Association(NASA)
 Nepal Para-veterinary and Livestock Association(NEVLA)
5. Representatives
 Tribhuvan University (TU), Central Department of Microbiology
 Agriculture and Forest University(AFU)
 Kathmandu University (KU), Microbiology Deptment
 Pokhara University (PU), Microbiology Department
 Purvanchal University, Microbiology Department
 Kathmandu Medical College (KMC)
 Nepal Medical College (NMC)
 Patan Academy of Health Sciences (PAHS)
 KIST Medical College
 Institute of Medicine (IOM)
 National Academy of Medical Sciences (NAMS)
 Director, Bir Hospital
 Joint Secretary, Animal Health division, Ministry of Agriculture
 DG of Department of Livestock Services
 DG of Department of Food Technology and Quality Control
 Drug Suppliers Association(Human and Veterinary sectors)
 Association of pharmaceutical producers of Nepal (APPON)
 Director, Global Antibiotic Resistance Partnership (GARP)

ANNEX-III

Role of different stakeholders for development of National Action Plan

Ministry of Health

- Approval of policy and guidelines against AMR.
- Inter-ministerial co-ordination on organization of the activities for AMR surveillance, rational use and containment through departments/centres, steering committee and alliance.

Department of Health Services

- Respective divisions/centres under DoHS will develop/revise and implement the policies, guidelines and action plan.
- Promote Antibiotic stewardship by auditing prescribing practices.

National Public Health Laboratory

- Strengthen and expand the national laboratory-based surveillance of antimicrobial resistance by gradual inclusion of more participating laboratories.
- Develop guidelines on antibiotic panels to be tested for organisms of AMR interest to bring uniformity in antimicrobial susceptibility testing.
- Capacity strengthening of participating laboratories by providing technical support for investigation, refresher trainings and logistic support in case of need.
- Organize and Facilitate quality assurance for AMR surveillance.
- Monthly, quarterly and annual dissemination of AMR surveillance findings through media(like website, newsletter or bulletins)and respective professional councils.
- Identify nodal laboratories in case of outbreaks for investigation.

Epidemiology and Disease Control division

- Development/Revision of treatment protocol for all infectious diseases.
- Development and implementation of infection prevention protocols.
- Orientation of health workers on the above protocols and facilitate NPHL in AMR surveillance and response.

Department of Food technology and Quality control

- Development of standards, guidelines, protocols for surveillance of micro-organisms in food items.
- Effectively implement the above policies/guideline/regulatory frameworks

Department of Drug Administration

- Develop National policy guidelines on antibiotics prescription, use and sales at different levels of health system, including private sectors.
- Develop legislative framework/act for empowering National regulatory authorities to

assure quality, production, sale and distribution of antibiotics.

- Effectively implement the above policies/guideline/regulatory frameworks.

Department of Livestock services

- Develop standard guidelines, protocols for surveillance of non-therapeutic use of antibiotics.
- Update veterinary drug use regulations and guidelines.
- Effectively implement the above policies/guideline/regulatory frameworks