National Strategic Plan
for Combating Antimicrobial Resistance
in Sri Lanka
2017 – 2022

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Message from the President

Antimicrobial resistance (AMR) is a significant global health priority that threatens to take modern medical practice to the pre antibiotic area. Combating such a problem would pose a greater challenge to a developing country such as Sri Lanka compared to a developed country. Unrestrained use of antimicrobial medicines in human and animals has been responsible for increasing AMR globally.

The World Health Organisation (WHO) has called on nations to develop national strategies to minimise the development of AMR. As recommended by WHO the Ministry of Health has taken the leadership to develop a National Strategic plan (NSP) with multisectoral collaboration. It is commendable that specialists dealing with human health, animal health, fisheries and agriculture have worked as a team to develop this plan. The strategies developed calls on all stakeholders including the public, to support collaborative efforts to change practices that have contributed to AMR and implement new initiatives to reduce inappropriate use of antimicrobials and resistance. Strategies developed will also support global and regional efforts to address the threat of AMR.

I thank all professionals for working as a team with commitment to formulate a national action plan. I wish to emphasize, that I would provide the support needed by all relevant ministries under the leadership of the Ministry of Health, towards achieving the strategies planned to combat this serious public health hazard.

His Excellency Maithripala Sirisena
President, Democratic Socialist Republic of Sri Lanka

Message from the Hon. Minister of Health, Nutrition and Indigenous Medicine

Antimicrobial resistance (AMR) is a serious public health problem that affects all countries. The health impact of AMR would pose a major challenge to a developing country such as Sri Lanka. It is disturbing to note that there has been an escalation in the emergence of multidrug resistant organisms causing infectious diseases in the country. AMR is known to occur in hospital and community settings and would result in loss of treatment options to patients with infections thereby increase morbidity and mortality, as well as increase health expenditure. Presently a significant amount, comprising 12.7% of total estimated health budget, is spent on antimicrobial medicines. Hence, further increase of costs incurred due to AMR would be detrimental towards providing cost effective health care.

As AMR is a global problem, World Health Organization (WHO) has taken the initiative of promoting and assessing its member countries to develop strategies to overcome this serious threat posed by development of AMR. Sri Lanka as a member state of the WHO South East Asia region became a signatory to the Jaipur declaration which agreed to regulate the antimicrobial medicines to prolong and preserve efficacy of such medicines. The WHO Global Action Plan for 2015-2020 emphasizes the development and implementation of national action plans to combat AMR. I am very pleased that the Ministry of Health (MoH) has taken cognisance regarding strategies recommended by WHO, to provide leadership in developing a National Strategic Plan (NSP) for combating antimicrobial resistance with multisectoral collaboration. Thus, specialists dealing with human health, animal health, fisheries and agriculture have been involved in developing the NSP.

MoH will take necessary action to carry out ongoing activities to promote strategies recommended such as infection prevention and

control, rational use especially by enhancing national awareness of AMR to all stakeholders including healthcare professionals and public, and ensure availability of safe and effective antimicrobials of good quality. As the Minister of Health, I will provide financial and other support and will implement necessary legislation to achieve strategies planned.

I appreciate and thank all personnel involved in formulating the national action plan. I am certain that all stake holders will work diligently with commitment to combat this major health problem confronting our society.

Hon. (Dr.) Rajitha Senaratne
Minister of Health, Nutrition and Indigenous Medicine

Message from Hon. Minister of Rural Economy

It is with a deep sense of responsibility that I pen this message on the occasion of the launching of the National Strategic Plan for combating Anti-Microbial Resistance in Sri Lanka.

I have come to learn that the World Health Assembly has sanctioned a Global Action Plan to combat antimicrobial resistance (AMR). AMR is found to be seriously threatening the capacity to treat infectious diseases in both human and animals. There is no doubt that antibiotics, which have revolutionized modern medicine, is a limited resource and needs to be preserved for future generations. Now, it is a global human and animal health concern without borders, which has influenced the use of antimicrobials in both human and veterinary medicine, as well as in the agriculture sector. Consequently, a concerted effort of all sectors is necessary to battle this problem. In this context, I am pleased to note that all concerned agencies are united in this worthy cause, determined not to go back to the pre-antibiotic era.

Indiscriminate use of antimicrobials in both human and animals has been blamed vastly on AMR. Meanwhile, Investments in antimicrobials have become a testing proposition due to the immense risk involved, stringent regulatory procedures and poor returns on investment. Hence, there is nothing much in the pipeline of new developments, leaving us with little choice. Circumstances have made our involvement more than a moral responsibility, where it has become a decisive obligation.

There is no doubt that apart from medical over-use, antibiotics used in animals mainly for therapy, prophylaxis and growth promotion, particularly in food producing animals, may have contributed vastly to the AMR, which needs meticulous addressing. Self-regulation among users and advocacy will play a significant role in securing these extraordinary substances for future, and I will assure that any laws and

regulatory procedures that need to be strengthened to support the progression of this intervention will be enacted at the earliest. It is scientifically proven that there is a positive correlation between antimicrobial use and the development of resistance, and more than two thirds of antibiotics produced is used for growth promotion in food producing animals in the world. I wish to affirm with confidence that we have already taken steps to phase out such antibiotics within the next six months as a commitment to this important endeavour, not withstanding possible setbacks to the livestock industry.

Let's all join hands as different sectors concerned, for a worthy cause, to encounter and combat AMR, enabling perpetuation of the effectiveness of antimicrobials and in turn, longer life of human beings. Our wholehearted intervention today will save millions of lives tomorrow.

I wish AMR National Strategic Plan tremendous success.

Hon. Mr. P. Harrison
Minister of Rural Economy

Message from Hon. Minister of Fisheries and Aquatic Resources Development

I wish to compliment the initiative taken by the Ministry of Health Nutrition and Indigenous Medicine to launch the National Strategic Plan on Antimicrobial Resistance for publication which I consider to be an important step towards building a healthy nation.

Being a country that exports aqua cultured fish and fishery products to the International market, especially to the EU, the Ministry of Fisheries and Aquatic Resources Development had taken the lead in monitoring of chemical residuals including antibiotic residuals in aqua cultural fishery products with the gazetting of the Aquaculture (Monitoring of Residues) Regulations 2002" under the Fisheries and Aquatic Resources Act No 2 of 1996. Since then, an "Annual Residual Monitoring Plan" for exports of aqua cultured fish and fishery products has been under implementation by the Department of Fisheries and Aquatic Resources which is the competent authority for export of fishery products from Sri Lanka.

I am glad to state that my ministry is firmly committed to implement and enforce the provisions of the above regulations and thus collaborate with the Ministry of Health. Nutrition and Indigenous Medicine and other concerned agencies in the implementation of the National Strategic Plan on Antimicrobial Resistance.

Hon. Mr. Mahinda Amaraweera
Minister of Fisheries and Aquatic Resources Development

Message from Minister of Agriculture

Antimicrobial drugs play a critical role in the treatment of diseases and their use is essential for both human and animal health. However misuse in the livestock sector as well as aqua culture and crop production has been associated with a potential risk of the emergence and builds up of antimicrobial resistant microorganisms. Though antimicrobial agents have revolutionized our lives in many respects, the rapid appearance of resistant strains through genetic changes and misuse mainly due to lack of professional insight during administration, for many decades is resulting in a multitude of global health problem. The majority of antimicrobial use in agriculture tends to be for livestock production; however antimicrobials such as antibiotics and fungicides are also used in to agricultural crops and are used in the agro-industries.

A growing world population means an increased demand for food and this in turn puts pressure on the food supply chains and systems. Global antimicrobial use in the agriculture sector is difficult to estimate due to lack of regulations and poor data collection in many countries, but estimates by the FAO lie at over 60,000 tons annually. This total volume is expected to rise over time with an increase in demand for food.

As the minister of agriculture I wish to express my immense gratitude towards all the professionals working tirelessly towards formulating a national action plan and pledge my unwavering support as they embark on this committed journey to save our nation from this silent yet dire crisis.

Hon. Mr. Duminda Dissanayake
Minister of Agriculture

Message from the Secretary Ministry of Health, Nutrition and Indigenous Medicine

On this occasion of launching of the national strategic plan for combating Antimicrobial resistance (AMR) in Sri Lanka it is with pleasure and privilege that I send this message.

Antimicrobial resistance is not a new phenomenon; however, the current magnitude of the problem elevates the public health significance of this issue. Drug-resistant pathogens are a growing menace to all people, regardless of age, gender, or socioeconomic background. Since their discovery, antimicrobials have been used extensively in livestock and poultry for the treatment, prevention and/or control, of animal diseases, as well as for production purposes further amplifying the problem. Therefore detecting, preventing, and controlling antibiotic resistance requires a strategic, coordinated, and sustained effort. It also depends on the engagement of governments, academia, industry, healthcare providers, the general public, and the agricultural community, as well as international partners. This strategic plan was developed based on the "one health" approach involving coordination among numerous sectors including human, veterinary medicine, fisheries and agriculture.

Antimicrobial resistance is a crisis that must be managed with the utmost urgency and together we will work domestically and internationally to detect, prevent, and control illnesses and death related to antibiotic-resistant infections. I believe that this initiative will make a measurable difference in the health and well-being of our Nation.

Mr. Anura Jayawickrama
Secretary
Ministry of Health, Nutrition & Indigenous Medicine

Message from the Director General of Health Services, Ministry of Health Nutrition and Indigenous Medicine, Director General - Ministry of Agriculture, Director General - Ministry of Fisheries and Aquatic Resources and Director General of Animal Production and Health - Ministry of Rural Economy

It is with immense pleasure that we send this message on the occasion of launching of the national strategic plan for combating Anti-Microbial Resistance (AMR) in Sri Lanka 2017-2020.

Following the discovery of antibiotics there was expectation for it to herald the end of infectious diseases. However, microbial evolution and genetic manipulation have dispelled this notion due to the emergence and spread of resistance related to the irrational use of antibiotics worldwide.

Evident dearth of awareness regarding antimicrobial resistance among users, antimicrobial utilization in human, animal, food industry, aquaculture & agriculture sectors without adequate regulatory methods in some sectors, surveillance and research as well as use of counterfeit drugs have further contributed to aggravate this situation. The treatment of microbial diseases has reached a point where many infections are untreatable by the antimicrobial agents available accentuating the need for research and development of new antibiotics as alternative measures and specific treatment modalities are required instead of abusing antibiotics in health and other relevant sectors.

Under the “one health concept” integrated national approach is essential to address antimicrobial resistance effectively. As an initial step to tackle this global health problem, the national strategic plan for combating antimicrobial resistance was developed in a combined effort with the collaboration of Ministry of Health, Ministry of Agriculture, Ministry of

Fisheries and Aquatic Resources Development, and Ministry of Rural Economic Affairs. Through the commitment and collaboration of these sectors together with the World Health Organization the implementation of the National Strategic Plan will be ensured.

We appreciate the initiatives of all stakeholders involved in launching the national strategic plan and wish to extend our gratitude to the World Health Organization for their technical guidance and financial support in this endeavour of preventing and controlling antimicrobial resistance islandwide.

Dr. J. M. W. JayasundaraBandara
Director General of Health Services
Ministry of Health Nutrition and Indigenous Medicine

Dr. R. M. Ariyadasa
Director General of Animal Production and Health
Ministry of Rural Economy

Mr. M. C. L. Fernando
Director General
Ministry of Fisheries and Aquatic Resource

Dr. R. R. A. Wijekoon
Director General
Ministry of Agriculture

Message from the National focal point for combating antimicrobial resistance

At present antimicrobial resistance (AMR) has grown to the extent where it has become a major public health problem globally. Though it is a global problem, the major brunt of AMR is borne by developing countries like ours. Due to irrational use of antimicrobials mainly in healthcare settings as well as the community, at present there are some infections in humans caused by bacteria which are resistant to all available antibiotics making it impossible to treat those infected. Thus it is predicted that if prompt action is not taken to control the development of antimicrobial resistance, we will move back to a similar era where antibiotics were not yet discovered.

The development of the national strategic plan for combating antimicrobial resistance with the collaboration of the Ministry of Health, Ministry of Fisheries and Aquatic Resources Development, Ministry of Agriculture, Ministry of Rural Economy and with the support and concurrence of the World Health Organization is just the stepping stone in the battle against antimicrobial resistance. The Plan was developed adopting the 'one health concept' to ensure that all relevant dimensions, including terrestrial and aquatic animal health and production, crop production, food safety, standard setting and legal aspects are considered and that it is embedded within the strategic programme. It recognises that a collaborative approach between different sectors, and both political and economic entities and disciplines, is essential in order to address AMR effectively.

I wish to thank all stakeholders involved in the development of these guidelines and for the World Health Organization for the financial and technical assistance provided. We must combat the silent crisis of Antimicrobial Resistance together, today.

Dr. B.V.S.H. Benaragama
Deputy Director General (Laboratory Services)
Ministry of Health Nutrition & Indigenous Medicine

Message from WHO Country Office, Sri Lanka

It is indeed a pleasure for WHO Country Office to be a partner to the government of Sri Lanka in the development of the National Strategic Plan for combating Antimicrobial Resistance (AMR).

Since its discovery last century, antibiotics have been a valuable tool that helped humankind tackle and overcome health consequences due to communicable diseases. Its scope expanded to the medical and agricultural sectors and ultimately became a regular commodity for clinical use globally. However, this made us forget that medicines are meant to be taken properly and that misuse would lead to adverse consequences. Today antibiotic mismanagement has resulted in a serious threat for global public health: antimicrobial resistance. Unfortunately this is a natural consequence of misuse which reduces the effectiveness of antibiotics, requiring urgent action to prevent us from moving into a post-antibiotic era.

WHO supported the development of the Global Action Plan to combat AMR in 2015. In a resolution adopted at the World Health Assembly in May 2015, all member states agreed to develop a National Action Plan in line with the Global Action Plan by May 2017. Responding to this call, Sri Lanka is now launching its National Strategic Plan with the engagement of various partners who are committed to stage multisectoral activities to combat AMR. The development of the plan was possible through a broad and coordinated 'one-health' approach across human, animal, agriculture and fisheries sectors to tackle the root causes of AMR in a comprehensive way, demonstrating the commitment of every stakeholder to improve the situation.

With the launch of the National Strategic Plan, WHO reiterates its support to the government of Sri Lanka, and is very proud to witness Sri Lanka taking bold steps towards providing a healthy and prosperous life to its citizens.

Dr. Jacob Kumaresan
WHO Representative

Message from the Sri Lanka College of Microbiologists on behalf of all the stakeholders

The increasing trend of antimicrobial resistance (AMR) worldwide is threatening human health with high morbidity and mortality in infectious diseases. Sri Lanka is no exception, and the high rates of antibiotic resistance match other figures in South East Asia. Therefore, it gives us great pleasure to see the country launching a National Strategic Plan for Combating Antimicrobial Resistance, which the clinicians were longing for.

Surveillance of AMR is essential to understand its epidemiology. Recognizing this need, the Sri Lanka College of Microbiologists (SLCM) set up surveillance in year 2009 to understand the gravity of AMR in our country. Invasive blood stream infections were dealt with first and urinary tract infections were added later. The results of surveillance showed that multi-drug resistance is a significant problem in our hospital setting, posing challenges in treatment and incurring a huge cost in patient management.

This national strategic plan (NSP) is the fruit of the combined efforts of multi-sectoral collaboration under the “one health” concept for combating AMR.

In the year 2016, the MoH, in discussion with WHO, requested the SLCM to formulate a draft national action plan to combat AMR for discussion with a wider group of stakeholders. Agreeing to this request, the SLCM appointed a committee to attend to it. The SLCM committee achieved this target by producing a draft national action plan and a draft NSP in line with the global action plan. The veterinary sector provided the SLCM the components that should be included in the animal sector in this draft document. This draft document was subjected to wide discussion with a multi-sectoral group to produce the final document, with each group completing the areas relevant to each sector.

The members of NAC-AMR who contributed their rich inputs in the many discussions which took place to finalize the NSP are remembered here with gratitude. The participants from all the Professional Colleges in the human and animal health sector, representatives from other stakeholder Institutions and Ministries are highly appreciated here for their enthusiastic participation in the discussions. It would have been impossible to have a comprehensive and coherent NSP without their immense contribution in the relevant areas.

I would be failing in my duty if I do not appreciate the work carried out by the five member committee of SLCM, the AMR core group, comprising of five senior microbiologists, Dr. K. Karunaratne, Dr. N.S. Chandrasiri, Dr. G. Patabendige, Dr. J. P. Elwitigala and Dr. K. Jayatilleke who were the actual hub of this activity. Their commendable dedication and untiring efforts in attending to the ground work required to prepare the draft NAP and the draft NSP and having it reviewed in a multi-sectoral platform is really appreciated. At the same time the continuous support extended to them by Dr. P. Fernando and Dr. N. Priyankarage in the veterinary sector, from the preparation of the draft up to the finalization of the document, owes a special word of appreciation. All of them deserve a special thank you for the time and energy spent on compilation and editing of the NSP as an honorary service.

The support given by the WHO Country Office was very encouraging and their continuous support is really appreciated. I would like to take this opportunity to thank the MoH for facilitating the preparation of the NSP and appreciate the trust the MoH and the WHO had in the College for technical guidance of the NSP.

The next challenge we face is the effective implementation of the NSP. An all-out effort is needed. As a College, we extend our fullest support to meet this challenge in our capacity as clinical microbiologists in the hospital and community and in collaboration with all the other Colleges who have already extended their support to this task with a very positive attitude.

President SLCM

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Abbreviations

AMR	Antimicrobial Resistance
ARSP	Antibiotic Resistance Surveillance Project
CPD	Continuing Professional Development
DAPH	Department of Animal Production and Health
DDGLS	Deputy Director General of Laboratory Services
DGHS	Director General of Health Services
DOA	Department of Agriculture
FAO	Food and Agriculture Organization
GMP	Good Manufacturing Practices
GRP	Good Review Practices
IPC	Infection Prevention and Control
KAP	Knowledge, Attitude and Practice
MDR	Multidrug Resistant
MoFAR	Ministry of Fisheries and Aquatic Resource Development
MoH	Ministry of Health
NAC-AMR	National Advisory Committee on Antimicrobial Resistance
NAPIST	National Action Plan Implementation strengthening team
NARA	National Aquatic Resources Research and Development Agency
NLBSA	National Laboratory Based Surveillance on Antibiotic Resistance
NRLN	National Reference Laboratory Net
NSP	National Strategic Plan
OIE	World Animal Health Organization
SLARS	Sri Lanka Antimicrobial Resistance Surveillance
SLCM	Sri Lanka College of Microbiologists
TOR	Terms Of Reference
VDCA	Veterinary Drug Control Authority
WHO	World Health Organization

Executive Summary

Antimicrobials are precious agents for combating infectious diseases and had saved millions of lives throughout the world. However, the current trend of increasing antimicrobial resistance (AMR) has become a global health problem with increased morbidity and mortality in infectious diseases. Sri Lanka is not an exemption and face many health related issues with multidrug resistant (MDR) organisms.

Currently there is a global effort in combating antimicrobial resistance. WHO extends its fullest support and plays a major role in motivating the countries to combat antimicrobial resistance with national action plans in place. Sri Lanka has initiated combating AMR with multisectoral collaboration, under one health concept. The development of the National Strategic Plan (NSP) 2017-2022 provides the roadmap to combat AMR.

The NSP is developed under five key strategies which are aligned with the strategic objectives of the Global Action Plan. These strategies cover all aspects in combating AMR involving human, animal, agriculture, fisheries and environment sectors. The five strategies are further expressed with specific objectives and with short and long term (2 year and 5 year) milestones for implementation.

1. Improve awareness and understanding of antimicrobial resistance through effective communication
2. Strengthen the knowledge and evidence base through surveillance and research
3. Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

4. Optimise the use of antimicrobial medicines in human and animal health
5. Prepare the economic case for sustainable investment and increase investment in new medicines, diagnostic tools, vaccines and other interventions

Strategy 1 - Improve awareness and understanding of antimicrobial resistance through effective communication

There are two specific objectives identified.

1.1 Increasing national awareness of AMR - under this the health care workers in private and public sectors, other related sectors and the community will be addressed widely. Establishing a public communication strategy targeting the community regarding appropriate use of antimicrobials through reading materials, web based portals and mass media is addressed here.

1.2 Improve knowledge of AMR and related topics - This is targeted by incorporating AMR as a core component in education, training, certification and professional development.

Strategy 2 - Strengthen the knowledge and evidence base through surveillance and research

Four specific objectives are defined under this strategy. Specific objective 1 and 2, is aimed at strengthening surveillance of the AMR and antimicrobial utilization respectively. Objective 3 addresses the laboratory capacity building in order to produce high quality microbiological data for patient management and surveillance. Objective

4 revolves around the operational research priorities for responsible use of antimicrobials.

2.1 Strengthen/establish the national surveillance system for antimicrobial resistance in human and animal

Strengthening surveillance in human sector will be done based on the two existing antibiotic resistance surveillance projects conducted by the Sri Lanka College of Microbiologists. Establishing a surveillance system for animal sector was identified as a priority.

2.2 Establish/strengthen national surveillance system for antimicrobial utilization in human, animal, aquatic products, food industry and agriculture

The antibiotic utilization surveillance initiated by the medical supplies division together with the clinical pharmacologists will be further strengthened to include the private sector. This surveillance will be initiated in the animal, agriculture and fisheries sectors.

2.3 Build laboratory capacity to produce high quality microbiological data for patient management and support surveillance activities in both human and animal sectors

Good quality laboratories are the essence in ensuring accurate, reliable and rapid test results on which the rational prescribing decisions and appropriate measures for the prevention and control of infections are taken. Building laboratory capacity is a must in generating good quality data for surveillance.

Identifying and establishing an accredited network of national reference laboratories for microbiology would be a priority.

2.4 Identify operational research priorities for responsible use of antimicrobial agents and better practices in human and animal health

Identifying the operational research on AMR by experts representing multisectoral groups is a milestone. Once the priorities are clearly laid down the researchers will be able to work on the relevant areas with transparency without overlaps.

Strategy 3 - Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

Five specific objectives elaborate the strategy.

3.1 Development of organizational/functional structure for practicing recommended infection prevention and control activities
3.2 Capacity building for implementing infection prevention and control (IPC) activities in healthcare setting
3.3 Surveillance and assessment of compliance with IPC
3.4 Public awareness on IPC
3.5 Strengthen a national infection prevention and control programme in animals

Establishment of national IPC unit with an administrative arm and a technical arm with adequate budget is a priority targeted at 2 years. This will lead to have a well structured national programme countrywide. Formulation of the national hospital IPC guidelines, updating the hospital infection prevention and control manual, streamlining the infection control units in the hospitals with trained IPC staff, surveillance and

public awareness are identified to reduce the hospital acquired infection rates to be in par with the international standards.

Strategy 4- Optimise the use of antimicrobial medicines in human and animal health

This will be achieved through 3 specific objectives.

To ensure uninterrupted access to high quality antimicrobial medicines, strengthening the procurement procedures and storage facilities for all districts are given priority. Establishing testing facilities for quality of antibiotics is another milestone to achieve.

In this strategy establishing antibiotic stewardship programmes in health care settings is set as a 2 year milestone.

Strategy 5 - Prepare the economic case for sustainable investment and increase investment in new medicines, diagnostic tools, vaccines and other interventions

This is addressed with 3 specific objectives.

These objectives have already been addressed to a reasonable degree in the presently existing free healthcare service. Further strengthening and streamlining of the systems are given priority.

Finally it is emphasized that the collaboration, dedication and transparency is the corner stone of successful implementation of NSP on AMR and to move forward with the one health concept. Ad hoc implementation is detrimental for any action plan, irrespective of how

good and organized the system is. Therefore it is strongly suggested to conduct the activities with good intention, with high degree of discipline and transparency with a coordinated mutisectoral effort to achieve the common goal of combating AMR.

Introduction

Antimicrobials are a precious group of medicines which are used to treat infections caused by bacteria, viruses, fungi and parasites. Antimicrobials had revolutionised medicine in the past 70 years by saving many lives allowing procedures such as bowel surgery, organ transplantation and cancer therapy without much complications. It is important to note that in Sri Lanka, 12.7% of the total estimated health budget (amounting to Rs.3.3. billion) is spent on antimicrobials.

Recent years have seen an alarming increase in infectious diseases with MDR organisms, resulting in very high morbidity and mortality as well as increasing cost to the government, individuals and the society at large. Thus antimicrobial resistance has a negative impact on patient outcomes, poses a major threat for patient safety, increases health expenditure and results in loss of treatment options for infections. Further the pace of new antimicrobial development in the world too has slowed markedly in the past 20 years.

There is evidence that overall rates of antimicrobial resistance correlate with the use of antimicrobials.[1] When compared with other countries such as the United Kingdom, the resistance rates of organisms to antibiotics in Sri Lanka are much higher.[2,3,4,5,6,7] If we do not address this threat urgently and effectively we are doomed to failure.

As antimicrobial resistance became a global concern, the World Health Organization (WHO) has proclaimed it the central focus of World Health Day 2011.[8] In 2011, the member states of the WHO South East Asia Region, including Sri Lanka, became signatories to the Jaipur declaration which agrees to regulate the use of antimicrobial agents to prolong and

preserve their efficacy. World Health Assembly resolutions WHA 67.25 in 2014 and WHA A68/20 in 2015 both on antimicrobial resistance, urge countries to take urgent action at the national, regional, and local levels to combat resistance.[9] In May 2015, the World Health Assembly endorsed the Global Action Plan on antimicrobial resistance, which calls on all countries to adopt national strategies within two years (by May 2017).[10]

World Health Assembly Resolution WHA 68.7 entitled "Global Action Plan on antimicrobial resistance" reflects a global consensus that antimicrobial resistance poses a significant public health challenge. It also emphasised the paramount significance of achieving the five strategic objectives of the WHO Global Action Plan. The WHO's Global Action Plan for 2015 - 2020 to combat antimicrobial resistance emphasizes the development and implementation of national action plans to combat AMR. Further in 2015 a tripartite agreement was signed between WHO, world animal health organization (OIE) and food and agriculture organization (FAO) to take measures to minimise the menace of AMR.

It is important to be aware of the gravity of the situation in Sri Lanka. Report of national surveillance on antimicrobial resistance December 2014, submitted by the Sri Lanka College of Microbiologists (SLCM) to the Ministry of Health (MoH) has shown that once sensitive organisms are now resistant. Thirty percent (30 %) of *Salmonella* Typhi and *36% of Salmonella* Paratyphi are resistant to ciprofloxacin.[3] *Acinetobacter* species isolated from patients in intensive care units have shown a high level of resistance to meropenem. National surveillance on urinary tract infections too have shown a high resistance rate in coliforms to broad spectrum antibiotics like cefotaxime and ciprofloxacin.[3,4,5,6,7]

The MoH has taken the initiative to develop the National Strategic Plan (NSP) in collaboration with the SLCM under 'one health concept' in line with the global action plan, with multisectoral representation encompassing human health, animal health, fisheries and agriculture. One health concept represents human, animal and agriculture as a closely linked system. A National Advisory Committee on Antimicrobial Resistance (NAC-AMR) has been appointed with representation from all these sectors. Five strategic objectives had been recognised under which many activities are identified to be initiated and strengthened. National action plan implementation strengthening team (NAPIST) has been identified comprising multisectoral representation to implement activities identified in the NSP.

Director General of Health Services (DGHS) serves as the chairperson of NAC-AMR while Director General of Animal production and Health and Director General of Agriculture serve as co-chairs. Deputy Director General of Laboratory Services (DDGLS) of MoH is identified as the AMR focal point of the country. Focal points for three sectors other than human health too were identified: Veterinary and animal production – Director General Animal Production and Health , Fisheries – Deputy Director General, National Aquatic Resources Research and Development Agency (NARA) and Agriculture – Director General of Agriculture.

Development of resistance is a significant human health issue. However its implications are far beyond. Therefore Sri Lanka recognises the need for action in all sectors where antimicrobials are used.

Vision:

Minimise the development and spread of antimicrobial resistance using one health approach

Mission:

To promote infection prevention and control, to promote rational use of antimicrobials and to ensure the availability of safe and effective antimicrobials of good quality

Strategies

1. Improve awareness and understanding of antimicrobial resistance through effective communication
2. Strengthen the knowledge and evidence base through surveillance and research
3. Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures
4. Optimize the use of antimicrobial medicines in human and animal health
5. Prepare the economic case for sustainable investment and increase investment in new medicines, diagnostic tools, vaccines and other interventions

Implementation, Monitoring and Evaluation

Implementation of activities requires coordination across stakeholder groups. Implementation will be done in stages over a period of five years from mid-2017. NAP-IST will oversee implementation and report progress to NAC-AMR. Monitoring and evaluation will be supported by a monitoring and evaluation plan.

Strategy 1

Improve awareness and understanding of antimicrobial resistance through effective communication

Improve awareness and understanding of antimicrobial resistance through effective communication is a key strategic objective in the national strategic plan (NSP) to combat antimicrobial resistance.
Two specific objectives are defined under this strategic objective.

Specific objective 1.1

Increase national awareness of AMR

Awareness on the gravity of the antimicrobial resistance and the actions taken to combat it at the global level and at national level under one health concept including human health, animal health, agriculture and food production is a key specific objective in the NSP. Providing a foundation of knowledge as well as taking measures to have an effective sustainable continuation of awareness will enhance acceptance among the different categories of population encompassing prescribers, dispensers as well as the general public. This is planned to be achieved by targeting different audiences under one health concept based on evidence based public communication programmes.

Milestones:

Within 2 years

A. Ministry of Health, Department of Animal Production and Health(DAPH) , Ministry of Fisheries and Aquatic Resource Development (MoFAR) and Department of Agriculture (DOA) will strengthen current awareness programmes systematically among target groups

B. Implementation of world antibiotic awareness week in a national scale
C. Initiation of advocacy programmes to health administrators and relevant administrators/officers in other sectors
D. Establishing public communication targeting the community on rational use of antimicrobials
E. Conducting national knowledge, attitude and practice (KAP) studies in the community

Within 5 years

F. Implementation of a well organised system to have AMR awareness islandwide targeting different audiences under one health concept
G. Develop a systematic approach to ensure participation of prescribers in awareness programmes on AMR

Specific objective 1.2

Improve knowledge of AMR and related topics

Education incorporated intervention is an essential element of a programme which will influence behaviour in a community to slow down the emergence of antimicrobial resistance. This is planned to be achieved by incorporating AMR as a core component in education, training, certification and development.

Milestones:

Within 2 years

A. Introduction of AMR as a core component into in- service training programmes of medical, pharmacy , nursing and paramedical categories

B. Incorporating AMR in to in-service/ Continuing Professional Development (CPD) programmes of veterinary surgeons and extension officers
C. Include awareness programmes for regular agriculture extension programme to discourage the use of antibiotics as per the pesticide regulation act
D. Introduction of importance of combating AMR into working groups, training programmes of agriculture and in-service programmes

Within 5 years

E. Inclusion of AMR related topics as modules in school, undergraduate, postgraduate, animal husbandry schools, pharmacy, nursing and other relevant curricula
F. Development of tailor made training modules and implementing in-service training programmes islandwide in both the state sector and the private sector
G. Development of AMR related topics in university curricula and other training programmes related to aquaculture and fisheries

Strategy 2

Strengthen the knowledge and evidence base through surveillance and research

Paucity of surveillance data on antimicrobial resistance contributes to a poor understanding of the scale of the problem and hampers an effective response to it. It also makes it difficult to regularly update diagnostic and treatment guidelines based on strong scientific evidence and to implement effective measures to prevent and control infections.

Strengthening surveillance of antimicrobial resistant organisms, tracking of the use of antimicrobials and laboratory capacity is essential to combat antimicrobial resistance.

Antimicrobial resistance surveillance systems must be expanded to veterinary and agriculture sectors in order to assure food safety and minimise the impact on human and animal health.

Four specific objectives are defined under this strategic objective.

Specific objective 2.1

Strengthen/establish the national surveillance system for antimicrobial resistance in human and animal sectors

Currently the Sri Lanka College of Microbiologists conducts two antibiotic resistance surveillance projects, one on clinically significant blood culture isolates -Antibiotic Resistance Surveillance Project (ARSP) and the other on significant urine culture isolates- National Laboratory Based Surveillance on Antibiotic Resistance (NLBSA). In animal sector, although there are few activities carried out, there is a need to establish an organised surveillance system for AMR. Currently insufficient data are available related to fisheries and agriculture.

Milestones:

Within 2 years

A. Strengthen existing national coordination system and centre for surveillance of AMR for human health sector
B. Prepare TOR for the national coordinating centre for AMR surveillance
C. Strengthening of existing surveillance system to establish

Sri Lanka Antimicrobial Resistance Surveillance (SLARS)

D. Establishment of national laboratory performance monitoring network at the MoH with special emphasis on AMR surveillance
E. Establish national AMR surveillance system for AMR in terrestrial and aquatic animals according to the OIE guidelines

Within 5 years

F. Expand SLARS to cover the laboratories performing microbiology including private sector
G. Establish a national database for AMR in accordance with OIE requirement
H. Establish a national database on illegal use of antibiotics in agriculture

Specific objective 2.2

Establish/strengthen national surveillance system for antimicrobial utilization in human, animal, aquatic products food industry and agriculture

National surveillance system for antimicrobial utilization and a feedback mechanism is mandatory to combat AMR.

Milestones:

Within 2 years

A. Conduction of periodic islandwide surveys on antimicrobial utilization in human
B. Dissemination of data on antimicrobial utilisation in the country
C. Strengthen the system and draw the action plan for implementation of recommendations derived from surveys

D. Design targeted surveillance systems
E. Strengthen the system to assess antibiotics at the level of importation, distribution and utilization in veterinary sector
F. Carry out a situational analysis of antimicrobial utilization in animals
G. Strengthen the system to assess utilization of antimicrobials in fishery
H. Increase awareness among stake holders and public on antimicrobial use in aquatic environments and AMR impacts
I. Develop a system to assess utilization of antibiotics in agriculture
J. Collection of information on the usage of antibiotics in agriculture

Within 5 years

K. Establish a regular functional surveillance system and data dissemination of antibiotic utilization in the country with trend analysis

Specific objective 2.3

Build laboratory capacity to produce high-quality microbiological data for patient management and support surveillance activities in both human and animal sectors

Currently the capacity to identify the pathogens to species level and detection of resistance mechanisms are limited in Sri Lanka. This should be enhanced through identified mechanisms. Inadequacy in infrastructure facilities, equipment and human resources is a common problem in many laboratories.

Milestones:

Within 2 years

A. Formulation of Laboratory Policy and National Laboratory Regulatory Act
B. Identify the gaps and limitations in the current microbiology/ analytical laboratory systems
C. Develop TOR for the National Reference Laboratory Net (NRLN)
D. Strengthen the existing laboratory facilities and human resources
E. Strengthen the laboratory capacity in quality assured setting to carry out the surveillance and certification in veterinary sector
F. Introduce laboratory facilities to detect antimicrobials in food of animal origin
G. Empower identified leading laboratories for detection of antimicrobial residues in food of animal origin

Within 5 years

H. Establish the NRLN
I. Strengthen the facilities of peripheral laboratories with human resources and infrastructure
J. Ensure accreditation of national reference laboratories
K. Develop monitoring/surveillance system to detect antimicrobials in animal originated food
L. Improve laboratory facilities (accredited laboratories)for analysis and certification of animal originated food products for domestic and export market

Specific objective 2. 4

Identify operational research priorities for responsible use of antimicrobial agents and better practice in human, animal health and agriculture

Identification of research priorities and allocation of budget for AMR activities is an essential need.

Milestones:

Within 2 years

A. Identify a multisectoral group to study the current situation and to identify operational research priorities
B. Review existing research priorities in all sectors and get them incorporated into the national programme of AMR
C. Review research on antimicrobials used in aquatic environments and its impacts and incorporate in the national programme on AMR
D. Identify a group to study the current situation on the use of antibiotics in agriculture sector

Within 5 years

E. Conducting identified research priorities in AMR and use of antimicrobials in human and animal sector
F. Allocate adequate funds for the identified research priorities in AMR
A. Identification of research priorities if required after studying information collected on the usage of antibiotics in agriculture
B. Establish a database and laboratory network to share information on food safety

Strategy 3

Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

Inadequate measures to prevent and control infections contribute to the spread of microorganisms resistant to antimicrobial medicines compromising patient and healthcare worker safety.

Reduction of the incidence of infection through effective sanitation, hygiene and infection prevention measures is a key strategic objective in the NSP to combat antimicrobial resistance.

Five specific objectives are defined under this strategic objective.

Specific objective 3.1

Development of organizational/functional structure for practicing recommended infection prevention and control activities

Having a well structured national infection prevention and control (IPC) programme with a national IPC unit is essential for optimal functioning of the activities related to IPC in healthcare institutions islandwide. Hence, existing national IPC programme needs to be reorganised with the view of augmenting the IPC activities, strengthening technical guidance, improving infrastructure development, human resource allocation, and enabling a suitable environment by proper designing of units.

Milestones:

Within 2 years

A. Formulation of national policy on IPC
B. Establishment of national IPC unit with an administrative arm (DDGLS- National focal point) and technical arm (SLCM) with adequate budget

C. Defining TOR for national IPC unit
D. Formulation of the national IPC guidelines in hospitals and updating the hospital infection prevention and control manual
E. Initiation of commemoration of global hand washing day and world hand hygiene day at national level annually
F. Strengthening modular based training at recruitment of IPC staff
G. Strengthening in-service training of infection control staff on a regular basis
H. Improving human and other resource allocation to healthcare for IPC activities
I. Establishing properly equipped IPC units in hospitals where services of microbiologists are available
J. Streamlining waste management in healthcare
K. Initiation of updating of existing guidelines for building constructions in hospital settings in relation to IPC

Within 5 years

L. Strengthening of monitoring mechanisms on the compliance of national policy on IPC
M. Implementation of well organized and properly functioning national IPC unit with TOR
N. Establishing properly equipped IPC units in hospitals where there is no service of a microbiologist is available
O. Develop a system to ensure participation of IPC staff in training programmes
P. Implementation of guidelines for building constructions in hospital settings in relation to IPC
Q. Initiation of proper implementation of national IPC guidelines through regular audits

R. Having well established mechanism for commemoration of global hand washing day and world hand hygiene day annually

Specific objective 3.2

Capacity building for implementing IPC activities in healthcare setting

Improving knowledge of healthcare staff at different levels is mandatory for proper implementation of IPC activities in different healthcare settings. This needs to be carried out by strengthening of the existing training programmes and establishment of new training programmes. Furthermore, sustainability of the training too needs to be ensured for the continuation of activities which is an essential component. Education with incorporation of active interventions into the curricula of different categories of healthcare staff is another successful intervention which would influence implementation of better IPC activities.

Milestones:

Within 2 years

A. Initiation of well-organised regular in-service training, CPD in state and private sectors on IPC for all relevant healthcare staff members
B. Well focused education on IPC to different categories of healthcare staff through revision of medical, nursing, paramedical and support staff curricula

Within 5 years

C. Ensure a well-organised mechanism for regular in-service training, CPD in state and private sector on IPC for all relevant healthcare staff is in place

Specific objective 3.3

Surveillance and assessment of compliance with IPC practices

Surveillance and audits play a key role in the successful implementation of IPC activities in healthcare setting. Through well-organised audit and surveillance mechanisms, the compliance of healthcare staff on IPC activities can be assessed as well as nationwide different infection rates can be compared. The infection rates in different healthcare settings are extremely useful for accreditation purposes as well as for selection of healthcare facilities by consumers.

Milestones:

Within 2 years

A. Formulation of a well-organized mechanism for generation and dissemination of data on already identified quality indicators namely hand hygiene compliance rate and Methicillin Resistant *Staphylococcus aureus* bacteraemia rate islandwide
B. Developing a feedback mechanism for improvement based on above data
C. Establishing a data base to monitor the availability of resources to practice IPC in healthcare
D. Identification of inclusion criteria to define selected health care associated infections
E. Strengthening of IPC in aquaculture through surveillance and monitoring of best management practices

Within 5 years

F. Ensure that the milestones identified in the two year plan are in place

Specific objective 3.4

Public awareness on IPC

Public awareness through effective communication on IPC plays an important role to build enthusiasm and strengthen and deliver knowledge.

Milestones:

Within 2 years

A. Developing a programme to educate the public regarding IPC

Within 5 years

B. Ensure the public education programme is effectively implemented

Specific objective 3.5

Strengthen a national infection prevention and control programme in animals and in agriculture

Having a strong IPC programme plays a major role to reduce disease occurrence in animals. This will minimise the use of antimicrobials in animals subsequently reducing the public health risk due to AMR. Improving biosecurity measures, effective and efficient disease mitigation programmes including testing and vaccination, farmer awareness, adopting zoo-sanitary measures and monitoring and evaluation system for corrective measures will be contributory activities to successfully achieve these objectives.

Milestones:

Within 2 years

A. Develop modules on biosecurity, animal welfare and epidemiology for CPD programmes for veterinary professional and veterinary undergraduate curriculum
B. Strengthen the monitoring programme on disease mitigation and biosecurity in poultry
C. Develop the monitoring programmes for other animals,(livestock, companion, wild, zoo and aquatic animals)
D. Strengthen vaccination and sero monitoring programmes
E. Strengthen border control and quarantine facilities for international trade
F. Strengthen quarantine regulations for the prevention of entering bacterial plant pathogens into the country
G. Introduction of culture practices for the management of bacterial plant diseases

Within 5 years

H. Improve capacity building of veterinarians and supporting staff for disease diagnosis with novel techniques
I. Improve laboratory capacity for disease diagnosis and infection prevention
J. Invent novel vaccines, therapeutics and biological reagents and other alternatives for antibiotics
K. Introduce real time disease reporting system and relevant software
L. Introduce a programme for system evaluation on corrective measures

M. Development of integrated disease management packages in agriculture sector

Strategy 4

Optimize the use of antimicrobial medicines in human and animal health

Indiscriminate use of antimicrobials gives rise to development of antimicrobial resistance. The indiscriminate use may be on human health or in animal husbandry. Therefore rational use of antimicrobials in human as well as in animal health is of utmost importance to reduce development of resistance to antimicrobials.

Three specific objectives are defined under this strategic objective.

Specific objective 4.1

Ensure uninterrupted access to high-quality antimicrobial medicines

The first objective of the National Medicinal Drug Policy for Sri Lanka is "To ensure the availability and affordability of efficacious, safe and good quality medicines relevant to the health care needs of the people in a sustainable and equitable manner". [11]

National Medicines Regulatory Authority Act, No. 5 of 2015 was passed as an Act of Parliament in March, 2015.[12] This gives provisions for regulations for setting out the procedures to be followed, including the specified time limits, for the conduct of respective evaluations; to give effect to the Good Manufacturing Practices (GMP) guidelines, Good Review Practices (GRP) and any other applicable guidelines as may be recommended by the Authority; and in respect of bioequivalence and biowaiver data relating to generic medicines submitted for evaluation.

Animal disease act no. 59 of 1992 empowered the Veterinary Drug Control Authority (VDCA) to regulate and control manufacture, import, export and sale of veterinary drugs efficiently and effectively and also to ensure the safe use of drugs on animals.

The above documents lay the foundation to develop the milestones for this specific objective.

Milestones:

Within 2 years

A. Strengthen the pre-marketing authorization to ensure availability of safe, efficacious and optimum quality antimicrobials
B. Address the gaps identified in the existing system of registration to ensure a regular and uninterrupted supply of antimicrobials in the country
C. Ensure registration of an adequate number of essential and complementary antimicrobials
D. Strengthen the procurement and distribution procedure to ensure uninterrupted supply of good quality antimicrobials throughout the year
E. Plan the capacity building for testing of all antimicrobials
F. Ensure storage , transport ,distribution and disposal facilities of antimicrobials conform to WHO standards in all health institutions of all districts
G. Strengthening public - private partnership with manufacturers and other stakeholders at different levels of supply chain to enhance uninterrupted supply of quality assured antimicrobials

H. Establish / strengthen a system to evaluate effectiveness of antimicrobials used in animal sector and make available effective drugs
I. Storage, transport and disposal facility at drug importers, manufacturers and distributors to be surveyed and deficiencies identified in animal sector
J. Introduce standards to ensure the quality of antimicrobials repacked locally in animal sector
K. Establish a proper/authorized system for sale of veterinary drugs within the country

Within 5 years

L. Ensure that the national testing laboratory has the capacity to test the quality of all antimicrobials used in humans
M. Review and update legislations on quality of antimicrobials
N. Establish/Identify a national laboratory for quality testing of antimicrobials used in veterinary sector and improve the laboratory capacity
O. Establishment of proper / authorised system for storage and sale of drugs for aquaculture use

Specific objective 4.2

Improve and measure appropriate use of antimicrobial agents in human health care

Inappropriate use of antibiotics in healthcare settings augments the development of antimicrobial resistance in microorganisms and cause serious and difficult to treat infections.

Categorisation of antimicrobials for prescriptions, following the standard traffic light system, was introduced by the MoH. Already the red light antimicrobial prescription is in place in government hospitals.

Milestones:

Within 2 years

A. Ensure to publish Gazette notification of national policy on AMR
B. Approve TOR for antimicrobial stewardship multidisciplinary committees and teams within the purview of the Drug and Therapeutic committees
C. Establish antibiotic stewardship programmes in all hospitals (public and private) where service of a Consultant Microbiologist is available
D. Monitoring of the activities on antimicrobial stewardship of the healthcare facilities (public and private) by the MoH supported by the senior hospital management, who are accountable for the outcomes
E. Ensure adequate resource allocation for implementation and evaluation of the activities of antimicrobial stewardship programmes
F. Antibiotic authorisation levels to be extended to orange category. Identify orange light category of antibiotics for approval of continuation of treatment
G. Have legislations in place to limit availability of red light antimicrobials in outpatient setting and in community
H. Strengthen and enforce the legal framework to stop unauthorized prescribing and dispensing of antimicrobials
I. Strengthening legislation related to registration of all health care facilities
J. Professional bodies to develop code of conduct for appropriate training, education, marketing, purchasing and use of antimicrobial agents
K. Empowerment of community on rational use of antibiotics

Within 5 years

L. Strengthen the legislation on prescription writing of antimicrobials
M. Ensure all hospitals have established antibiotic stewardship programmes
N. Initiate prescription audits for rational use of antimicrobials
O. Ensure that antibiotic stewardship programmes are an essential component for registration of health care facilities

Specific objective 4.3

Ensure prudent use of antimicrobial agents in terrestrial and aquatic animals and agriculture

Although provisions under Animal disease Act (No 59 of 1992)and Animal feed Act (15 of 1986)are currently available to regulate the importation, manufacturing and distribution of antimicrobials in veterinary sector, several gaps have been identified to fulfil the regulatory mechanism that needs to ensure prudent use. The implementation of existing regulation is hampered due to limited resources. Establish/strengthen the monitoring and evaluation systems to ensure prudent use of antimicrobials emerge as an important issue when considering the rate of development of antimicrobial resistance in the country.

Milestones:

Within 2 years

C. Strengthen the legislations to prevent residues in food of animal origin
D. Establish national standards for food of animal origin to ensure food safety

E. Phasing out of growth promoting antibiotics in animal husbandry
F. Strengthen the database to monitor importation, formulation and distribution of antimicrobials in veterinary sector
G. Strengthen/ expand the regulations related to veterinary drug control to ensure prudent use of antimicrobials in veterinary sector
H. Establish antibiotic stewardship programme and monitoring system in veterinary sector
I. Improve human resources and laboratory capacity to implement antibiotic stewardship programme in veterinary sector
J. Prepare guidelines for antimicrobial usage in veterinary sector as done in human health sector
K. Improve human resource and laboratory facilities related to AMR in the fisheries sector
L. Expand the regulations related to use of drugs in aquatic environment in relation to fisheries and aquaculture

Within 5 years

M. Establish domestic and export market for antibiotic free high quality animal originated food products
N. Implement regulations established under veterinary drug control
O. Implement monitoring and evaluation system for prudent use of antimicrobials in veterinary sector

Strategy 5

Prepare the economic case for sustainable investment and increase investment in new medicines, diagnostic tools, vaccines and other interventions

Cost benefit evaluation is a major component for profitable investment on innovation or introduction of new medicines, diagnostic tools, vaccines and other alternatives related to treat or prevent infections. In order to carry out economic evaluation baseline information regarding AMR, disease situation benefit of prevention measures and availability of human resources etc. is needed. Therefore surveillance and research need to be done to collect data on economic benefit.

This could be achieved best by collaboration between private and state sector as well as between developed and developing countries.
Four specific objectives are defined under this strategic objective.

Specific objective 5.1

Prepare an economic case to secure and use financing for diagnostic tool - Making available the diagnostic tools

Early diagnosis of infections aided by detecting inflammatory markers and performing other investigations to exclude or diagnose infections are important in practising rational use of antimicrobials as well as to prevent further spread of disease. Early detection of antimicrobial susceptibility is also crucial to reduce use of unnecessary antimicrobials.
Efficient and effective diagnostic tools are necessary. In addition, these tools can be used for disease surveillance, sero monitoring programmes for vaccines evaluation and for food safety measures.

Milestones:

Within 2 years

A. Establish a directorate to assess and recommend new diagnostic tools related to infectious diseases in human sector
B. Identify a team of specialists to assess and recommend new diagnostic tools related to infectious diseases in human sector
C. Research on development of novel diagnostic techniques in veterinary sector and fisheries
D. Establish/strengthen analytical techniques for food safety in veterinary sector and fisheries
E. Secure financial support for identified research in veterinary sector and fisheries
F. Establish diagnostic techniques for antibiotic residue analysis on agricultural products

Within 5 years

G. Annual reports on need of new diagnostic tools related to infections
H. Develop a system for distribution of newly introduced diagnostic tool/equipment and monitor its utilization
I. Research on development of novel diagnostic techniques in human health
J. Establish diagnostic techniques for antibiotic residue analysis on agricultural products

Specific objective 5.2

Prepare the economic case for sustainable investment in medicine - Availability of necessary medicine

Good quality generic antimicrobials as well as other medicines are important in treating infections cost effectively to minimise development of antimicrobial resistance.

Milestones:

Within 2 years

A. Further strengthen the mechanism for granting marketing authorization of antimicrobials and other medicines useful in managing infections
B. Promotion of local manufacturing of relevant antimicrobials

Within 5 years

C. Ensure that mechanisms for granting market authorisation for good quality generic antimicrobials and other related medicines are well established and functioning
D. Initiate development of new medicines in veterinary sector in collaboration with international institutions
E. Development and ensuring availability of antimicrobials for fish and aquatic organisms which do not interfere with humans

Specific objective 5.3

Prepare the economic case for sustainable investment in vaccines

Vaccine is one of the best alternatives to minimize antimicrobial usage. Vaccines will help to prevent infections and thus will reduce the need for antimicrobial use and in turn will reduce the development of antimicrobial resistance.

Especially in animal sector identifying of proper organisms and production of effective vaccines is a demanding task when considering the huge investment, time duration and work load. However, in animal sector production of local vaccines using locally isolated organisms gives rise to more promising effects in certain diseases than imported vaccines.

Milestones:

Within 2 years

A. Advocacy for policy makers on the importance of financing strategies, pertaining to investments on vaccine preventable infections in humans
B. Strengthen the system to assess the periodic need of vaccines considering reduction of AMR
C. Strengthen the financial support to improve currently producing vaccines in veterinary sector
D. Perform regular cost benefit analysis for the vaccination programme using locally produced vaccines in veterinary sector
E. Initiate collaboration with international institutes for these research in veterinary sector

Within 5 years

F. Assessment based introduction of vaccines for prevention of infections
G. Research on development of novel vaccines in veterinary sector

Specific objective 5. 4

Prepare the economic case for sustainable investment in other interventions

Implementing the activities identified in the NSP to combat antimicrobial resistance requires prudent financial strategies. Further, availability of competent human resources to execute the activities identified too plays a major role.

Milestones:

Within 2 years

A. Advocacy for policy makers on the importance of financing strategies pertaining to programmes/ projects related to AMR
B. Regular Capacity building programmes for human resources required for activities identified in the NSP on AMR

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