The Fleming Fund Project

Country Grant - Bhutan

Phase 1 Report

2016 - 2023

UKaid from the British people

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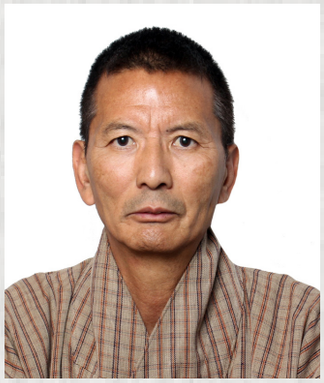
Foreword

Her Excellency Lyonpo Dechen Wangmo
Minister
Ministry of Health, RGoB
Member, Global Leaders Group on Antimicrobial Resistance

From the Minister's Desk

It is with great honor that I share the strides we've taken in our battle against antimicrobial resistance (AMR) in Bhutan, thanks to the unwavering support of the Fleming Fund. As a member of the global leaders group on AMR, I recognize the global, regional, and national burdens posed by AMR. This report mirrors the exceptional progress in fortifying our healthcare systems, a testament to the dedication of our healthcare professionals, researchers, and stakeholders. The invaluable partnership with the Fleming Fund has empowered us to elevate our AMR surveillance, laboratory capabilities, and data management systems. Together, we have not only launched a project in accordance with our national action plan to address AMR, ensuring the well-being of our citizens, but we have also introduced several one health strategies to motivate other nations in their efforts to combat AMR. This report is an invitation to delve into our experiences and lessons, a celebration of significant milestones achieved in our collective pursuit of a healthier future.

Happy Reading.



Mr. Pemba Wangchuk
Acting Secretary
Ministry of Health, RGoB

From the Secretary's Desk

Celebrating a gratifying moment of real-time success in Bhutan's mission against antimicrobial resistance (AMR) wouldn't be possible without the steadfast support of the Fleming Fund. This report stands as a testament to the remarkable progress achieved in strengthening our healthcare systems. The Secretariat, working closely with the Fleming Fund, has been instrumental in implementing AMR surveillance networks, capacity-building initiatives, and strategic interventions. The outcomes showcased reflect our unwavering commitment to evidence-based policies, significantly enhancing our national capacity in laboratory diagnostics, data management, and surveillance systems. Heartfelt appreciation to the Fleming Fund for their continued collaboration and support, and to our healthcare professionals, researchers, and stakeholders for their tireless efforts in safeguarding the health and well-being of our citizens.

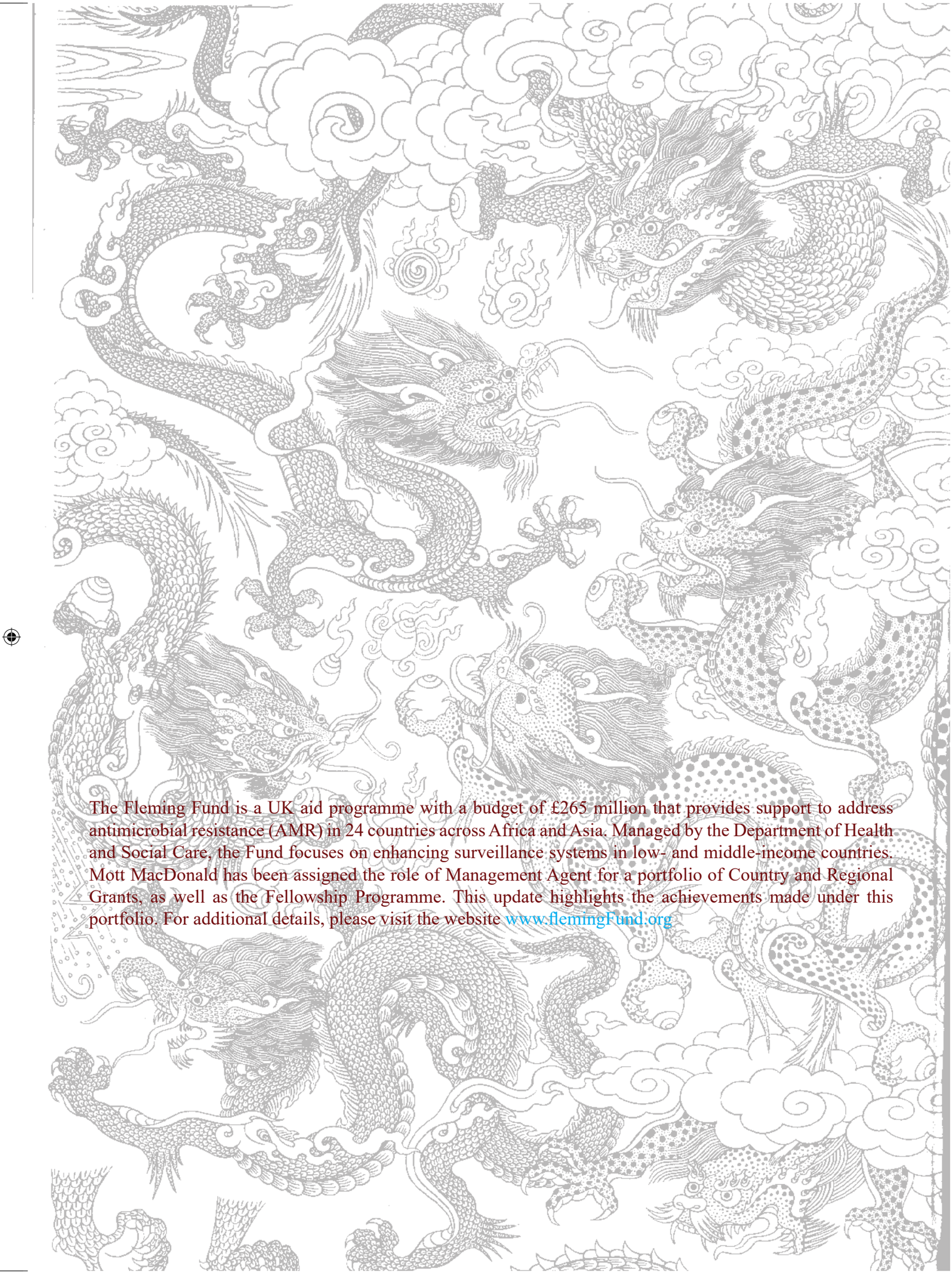
Thank you.

Mr. Sonam Wangda
Project Director
Fleming Fund, Ministry of Health, RGoB

From the Project Director's Desk

I am delighted to provide a comprehensive update on our collaborative initiatives to tackle antimicrobial resistance (AMR) in Bhutan. This partnership involves the Fleming Fund, the Ministry of Health, and the Ministry of Agriculture and Livestock. The report emphasizes the noteworthy impact of our joint efforts, highlighting achievements in AMR surveillance, laboratory diagnostics, and the improvement of the healthcare system through a one-health approach. We extend our appreciation to the Department of Health and Social Care, UK government for establishing the Fleming Fund grant initiated to combat AMR in developing nations, and Mott MacDonald, the management agent for the Fleming Fund project, for their unwavering support, guidance, and expertise, crucial to our success. Special acknowledgment is given to our dedicated healthcare professionals, researchers, members of the technical working group, the National AMR Technical Committee, and the Inter-ministerial Committee for One Health. Their relentless dedication and enthusiasm in adopting a one-health approach to address AMR and enhance health outcomes deserve recognition. I encourage readers to explore the detailed account presented in this report, finding inspiration in the progress made and urging them to join our continued endeavors toward a future where AMR is effectively managed, ensuring access to quality healthcare for everyone.

Thank You.



The Fleming Fund is a UK aid programme with a budget of £265 million that provides support to address antimicrobial resistance (AMR) in 24 countries across Africa and Asia. Managed by the Department of Health and Social Care, the Fund focuses on enhancing surveillance systems in low- and middle-income countries. Mott MacDonald has been assigned the role of Management Agent for a portfolio of Country and Regional Grants, as well as the Fellowship Programme. This update highlights the achievements made under this portfolio. For additional details, please visit the website www.flemingFund.org

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Background

1. The Fleming Fund
2. The Country Grant in Bhutan

The FlemingFund

The Fleming Fund is a global health initiative established by the Government of United Kingdom as an aid programme to tackle Antimicrobial Resistance (AMR) and improve the capacity of low and middle-income countries (LMICs) to combat infectious diseases. The Fund was named after the British Physician, Alexander Fleming as “Sir Alexander Fleming Fund”, who also discovered penicillin. It was established in 2015 in response to the growing global threat posed by AMR. The Fund is run by the international development firm Mott MacDonald under the authority of the UK Department of Health and Social Care. It collaborates with governments, non-governmental organizations, academics, and other stakeholders to improve data quality and surveillance systems.

Objectives and Strategies of the Fleming Fund

The Fleming Fund has a set of key objectives and strategies to achieve its mission of combating AMR effectively. These include:

Strengthening Surveillance Systems

The Fund aims to assist LMICs in developing reliable surveillance systems to track the prevalence and spread of AMR. This involves enhancing laboratory infrastructure, creating, and putting in place surveillance methods, training personnel in data collection and analysis and promoting information sharing.

Improving Laboratory Capacity

The Fund recognizes the importance of high- quality diagnostic laboratories in detecting AMR and infectious diseases accurately. It helps in upgrading laboratory infrastructure, acquiring necessary tools and supplies, educating laboratory staff, and setting up quality assurance and quality control systems.

Inter-Ministerial Committee for One Health (IMCOH): The primary decision-making authority for policies and interventions related to Antimicrobial Resistance (AMR) at the 5th IMCOH meeting, 19th October, 2023.

Enhancing Data Management and Use

Through data collection, analysis, interpretation, and reporting, the Fund helps countries improve their data management systems. This makes it possible to better understand the patterns and trends of AMR and infectious illnesses, resulting in treatments that are more focused and effective.

Building Workforce Capabilities

The Fund makes investments in training initiatives to improve the skills of policymakers, laboratory workers, healthcare professionals, and epidemiologists to combat AMR and infectious diseases. The Fund also promotes the creation of curriculum, training materials, workshops, and fellowship to further knowledge in AMR surveillance, infection prevention and control, and antimicrobial stewardship.

Promoting Antimicrobial Stewardship

The Fund advocates for the adoption of guidelines and optimal approaches, public awareness initiatives, and fostering partnerships among human health, animal health, and agriculture sectors to address the multifaceted challenge of antimicrobial resistance comprehensively. It is crucial to implement antimicrobial stewardship programmes within healthcare establishments as preserving the effectiveness of antimicrobial drugs and preventing the development of resistance require the conscientious application of these medications.

The Fleming Fund is a vital global health initiative focused on combatting AMR and strengthening LMICs' capacity to address infectious diseases. Through its comprehensive strategies, it has made significant progress in strengthening surveillance systems, improving laboratory capacity, enhancing data management, building workforce capabilities, and promoting antimicrobial stewardship. Its achievements have contributed to a more robust global response to AMR and have improved health outcomes in the LMICs.

About Department of Health and Social Care

The UK Department of Health and Social Care is responsible for the overall management of the Fleming Fund. They are responsible for oversight of Mott MacDonald and for the additional programmes and grants which make up part of the £265 million official development assistance (ODA) Fund. Please visit the Global Projects, section of the Fleming Fund's website for more details.

£1,559,

Management Agent with the officials of the Royal Government of Bhutan during the scoping visit for the Phase I Fleming Fund Country Grant in January 2018

Fleming Fund Project Management Unit with the Management Agent (Mott MacDonald) at the Ministry of Health in Bhutan , 21st November, 2023

,560.75

About Mott MacDonald

Mott MacDonald is a global engineering, management and development consultancy that aims to improve society by considering social outcomes in everything they do. They are the commercially appointed Management Agent for the Fleming Fund Country, Regional and Fellowship Grant programmes. They are responsible for grant scoping, placement and monitoring, coordinating, administration, risk management and supporting the Department of Health and Social Care with strategy and technical advice.

The Country Grant in Bhutan

The assistance is directed towards enhancing Bhutan's current surveillance systems for monitoring antimicrobial resistance (AMR). This includes implementation of activities leading to the gathering and analysis of quality data pertaining to the usage, consumption, resistance patterns, and treatment outcomes of antimicrobials. The goal is to utilize this information to inform evidence-based policies and interventions aimed at addressing and combatting AMR.

Funds are allocated for the enhancement of laboratory infrastructures within the nation. This encompasses the provision of renovations to create a standardized and secure working environment, as well as the supply of high-quality equipment and consumables to augment the capacity for testing and analyzing antimicrobial resistance (AMR).

Antimicrobial Stewardship units are instituted in designated healthcare settings, and protocols, along with strategies for surveillance of antimicrobial use, are formulated and put into action to promote the responsible and appropriate utilization of antimicrobial agents.

Reinforcing Surveillance Systems:

The support aims to strengthen Bhutan's existing surveillance systems for monitoring AMR in Human, animal and food. This involves collecting and analyzing data related to antimicrobial usage, resistance patterns, and treatment outcomes.

Developing Human Capacity:

The support is directed at building the expertise and technical skills of professionals within Bhutan. This capacity building encompasses various aspects, such as standardizing laboratory protocols, conducting surveillance, data collection, analysis, and reporting.

Promoting Appropriate Antimicrobial Use:

Protocols are developed to encourage the responsible and appropriate use of antimicrobial agents, including antibiotics.

Enhancing Laboratory Infrastructure:

Funds are allocated to improve laboratory infrastructure within Bhutan. This includes providing better resources and equipment to enhance the capacity for AMR testing and analysis.

These activities are designed to complement and support Bhutan's government health systems and are implemented in collaboration with relevant government agencies. Grant management and coordination are overseen by the Management Agent, Mott MacDonald, to ensure effective utilization of the funding and adherence to project goals. This collaborative effort is aligned with Bhutan's commitment to addressing the global challenge of antimicrobial resistance.

Professor Dame Sally Davies
Chief Medical Officer for England

"I am delighted that the UK government's Fleming Fund will be supporting the Royal Government of Bhutan in their efforts to tackle antimicrobial resistance (AMR). This partnership will facilitate the generation of vital data by strengthening laboratory capacity and building sustainable surveillance systems. Support to professional fellowships will help ensure this data is used to take action to reduce the threat in Bhutan. AMR is a global problem that demands intercountryal collaboration. Cross-country partnerships such as these are crucial to tackling this escalating threat."

Source : *www.flemingFund.org*

what's this grant all about?

It's aimed at filling some crucial gaps in how we keep an eye on antibiotic resistance (AMR) and how antibiotics are used (AMU) in Bhutan, both in the human and animal health sectors. It is to ensure collaboration between different stakeholders to share the data and understand AMR and AMU better through "One Health" approach.

INFRASTRUCTURE ENHANCEMENT SUPPORTED BY FLEMING FUND AT THE NINE SURVEILLANCE SITES

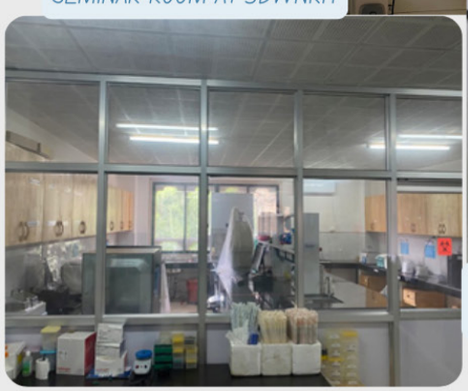
LAB REFURBISHED AT CRRH, GELEPHU

RO PLANT AT NCAH

AIR CONDITIONERS IN THE LABORATORIES

SEMINAR ROOM AT JDWNRH

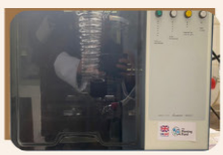
BIOMETRIC DOOR AT PHUENTSOLING

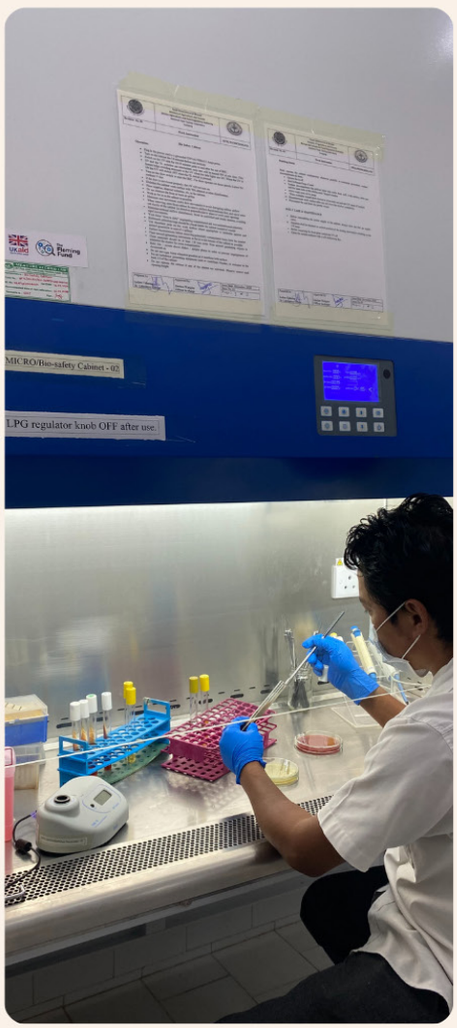


SAMPLE COLLECTION AREA AT RCDC

REFURSBISHED NATIONAL FOOD TESIING LABORATORY, YUSPANG, THIMPHU

LABORATORY EQUIPMENT SUPPORTED BY FLEMING FUND (DETAIL LIST IN ANNEXURE III)





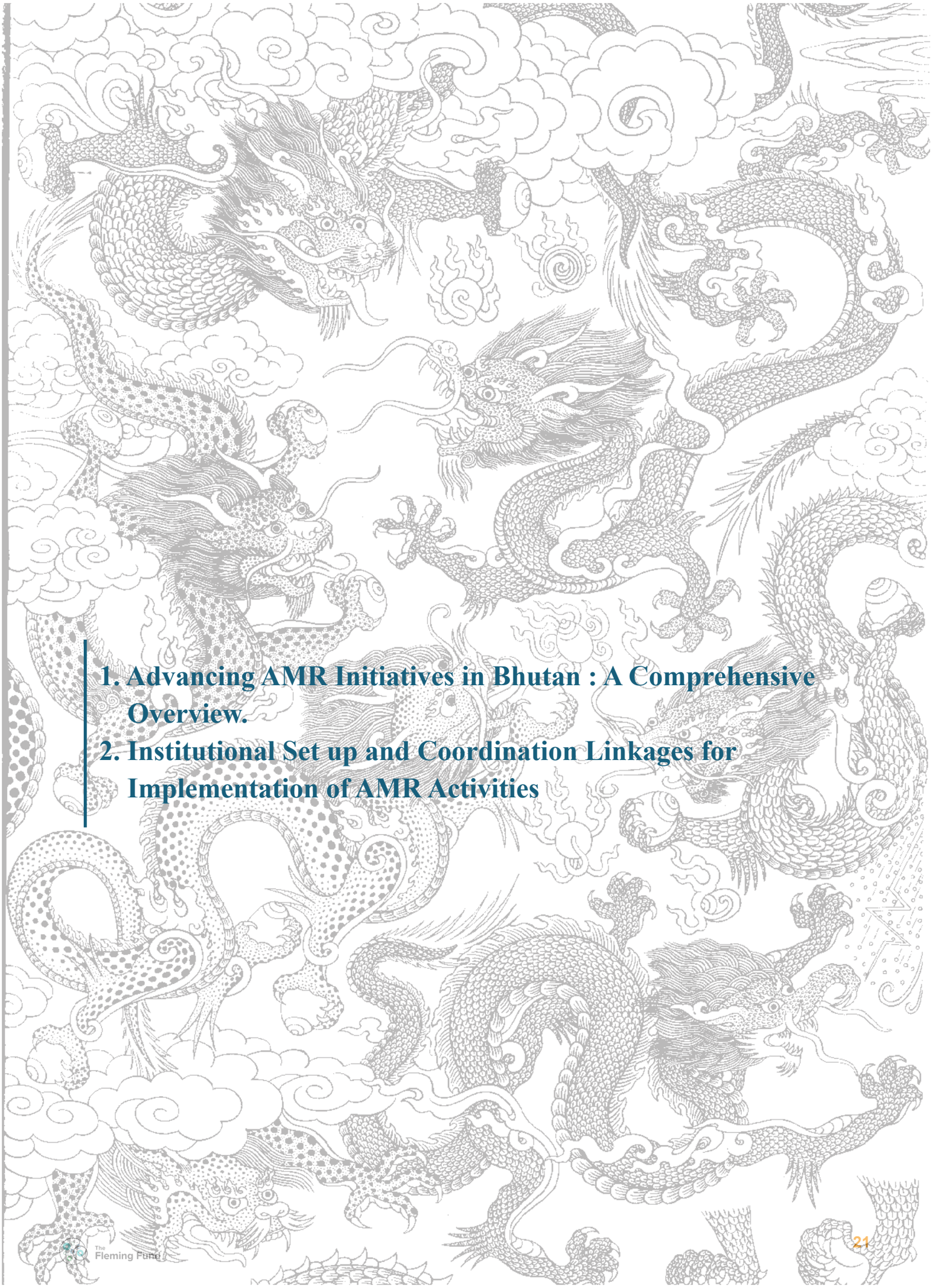
HIGH-END EQUIPMENT SUPPORT FROM FLEMING FUND

INAGURATION OF VITEK MS/MALDI-TOFF AT JDWNRH BY HER EXCELLENCY THE HEALTH MINISTER AND HONORABLE HEALTH SECRETARY, MOH

TRAINIG ON VITEK 2 COMPACT AT RCDC

BLOOD CULTURE MACHINE - BACT/ALERT 3D INSTALLED IN THE HUMAN HEALTH SURVEILLANCE SITES

AMR in Bhutan



1. Advancing AMR Initiatives in Bhutan : A Comprehensive Overview.

2. Institutional Set up and Coordination Linkages for Implementation of AMR Activities

Advancing AMR Initiatives in Bhutan

A Comprehensive Overview

Antimicrobial Resistance (AMR) poses a significant threat to global health, rendering once-effective medications ineffective against diseases. Recognizing the importance of addressing this issue, Bhutan has emerged as a proactive nation in the fight against AMR. It formulated its National Action Plan (NAP) in alignment with the Global Action Plan of 2015. However, like many other developing countries, Bhutan faced challenges due to insufficient funding for implementing its NAP. The Fleming Fund proved to be a valuable asset for Bhutan, as it secured the fund following a rigorous assessment of its proposal. The Fleming Fund was granted to Bhutan, and the following highlights showcase the supported activities, particularly addressing Objectives 1, 3, and 5 of the National Action Plan while also contributing to other objectives.

National Policy and Governance

Bhutan has developed a strong National policy framework and governance system to effectively handle AMR. The National Action plan created based on the “one Health” Approach was endorsed by the Lhengye Zhungtshog (cabinet) in May 2017. Bhutan has also created committes such as the Inter-ministerial committee for One Health (IMCOH), National AMR Technical Committee (NATC) and the Technical Working Group, which manages the execution of AMR projects and collaborates with pertinent parties.

Royal Government of Bhutan

NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE

[2018-2022]

This document was granted approval during the 130th Lhuengye Zhuntshog session held on 9th May 2017.

AMR Program
Department of Medical Services
Ministry of Health
Thimphu, Bhutan

Surveillance and Monitoring

Bhutan has implemented laboratory-based surveillance for Antimicrobial Resistance (AMR) in the major hospitals for both human and veterinary healthcare. Additionally, systems for monitoring and reporting the usage and consumption of antimicrobial agents within the country has also been instituted.

Processing of Sample for identification and AST at JDWNRH

Point Prevalence Survey (PPS) on Antimicrobial Use at ERRH, Mongar, 25th November, 2023.

AMR surveillance in poultry

Public Awareness and Education

The government, in partnership with WHO and other organisations, conducted campaigns to raise awareness about the responsible use of antimicrobials among the public, healthcare professionals, and livestock farmers. Awareness programmes on the risks associated with self- medication, the importance of completing prescribed courses of antibiotics, and the alternatives to antimicrobial treatment were initiated.

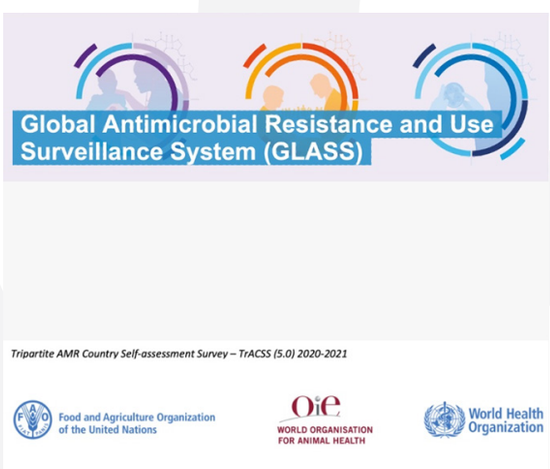
AMR sensitization/panel discussion on the National TV-BBS during the World Antimicrobial Awareness Week, 18th - 24th November, 2019.

AMR Awareness & education Proggram with Medical Students, JDWNRH, 18th - 24th November, 2022

Collaborative Workshop with Nurses for the Implementation of measures to prevent and control infections as a strategy to minimize Antimicrobial Resistance (AMR) at wangdue phodrang, 12th - 15th June, 2022.

Healthcare Practices

Bhutan emphasizes on encouraging the prudent use of antibiotics in medical settings. To maximise the use of antibiotics, decrease the establishment of resistance, and reduce negative consequences, Bhutan has created antimicrobial stewardship programmes in the major healthcare facilities. These initiatives emphasize the proper antibiotic prescription, the promotion of infection prevention and control practices, and the encouragement of interprofessional collaboration.



Bhutan actively participates in the GLASS and TRACSS

International Collaboration

Bhutan actively participates in regional and global initiatives and networks, such as the South- East Asia Regional Collaboration on AMR and the Global AMR Surveillance System.

Bhutan engages in knowledge sharing, technical assistance, and collaborative research efforts to strengthen its AMR response. The country also encourages cross-border collaboration to address the challenges posed by AMR collectively.

Bhutan's multifaceted approach to tackling AMR exemplifies its commitment to safeguarding public health. Through its comprehensive policy framework, robust surveillance systems, public awareness campaigns, and healthcare practices, Bhutan is making commendable strides in combatting AMR.

Enhancing Antimicrobial Resistance Efforts : Expected Outcomes

Improved Laboratory Skills and Conditions:

Allocating resources for improved training to elevate skills, strengthening biosafety and biosecurity in the workplace, and supplying high-quality laboratory equipment for accurate identification and susceptibility testing of bacteria to antimicrobial agents will ultimately contribute to higher-quality and more accurate data collection. This, in turn, facilitates the generation of reliable information and supports evidence-based policy and intervention formulation.

Strengthened One Health Workforce:

Forming a team of proficient individuals from both human and animal health sectors with diverse skills who collaborate to address antimicrobial resistance (AMR). These experts, hailing from various fields such as human health, animal health, and the environment, undergo training to comprehend and address AMR issues comprehensively through a One Health approach.

Stronger AMR Surveillance Systems:

Ensuring the enhancement of robust and efficient systems for monitoring antimicrobial resistance (AMR). This entails implementing improved processes at both the national and regional levels to effectively monitor, share, and alert about resistance trends and data, considering different levels and times of interventions.

Increased Demand for AMR Data:

Encouraging increased engagement of individuals and organizations at different levels (regional, national, local hospitals) to request and utilize quality antimicrobial resistance (AMR) data, which will be essential for making well-informed decisions on effectively addressing AMR at various tiers.

Better Understanding of Antimicrobial Use:

Obtaining a thorough insight into the utilization including inappropriate prescription of antibiotics and other antimicrobials in the country, informed decisions can be made to implement best practices, improve user-friendly antimicrobial guidelines, advocate for responsible use, and containment. This, in turn, will foster increased acceptance and adherence to antimicrobial guidelines developed specifically based on local context and prescription patterns.

The Principles of Fleming Fund

One Health

Taking a One Health approach to funding encompassing public health, animal health and agriculture and the environment.

Country Ownership

Implementing the National Action Plans which the country has developed (usually through an AMR Coordination Committee.

Alignment of Approach

Funding is aligned with what donors are funding and conforms with broader global initiatives, for example GLASS and the Global Action Plan on Antimicrobial Resistance.

Sustainability

Ensuring that sustainable systems are a critical part of the funding decisions taken.

AMR & AMU Data management training for the Animal health & food safety officials, 26th-30th December 2022,

Alignment of Fleming Fund Initiatives with National Action Plan

The Fleming Fund has been the primary source of financial support for the implementation of the National Action Plan (NAP). In the following, we offer a summary that outlines the execution of activities according to objectives, provides an update on the current status of NAP implementation, and suggests future plans in alignment with the objectives.

1. To establish a governance structure to spearhead the AMR activities.

A comprehensive governance structure has been established in Bhutan to oversee Antimicrobial Resistance (AMR) activities with a focus on transparency and accountability. The Inter-ministerial Committee for One Health now serves as the highest decision-making body, responsible for policy-making, resource mobilization, and advocating for One Health initiatives, including AMR. The National AMR Technical Committee (NATC) also the National steering committee for AMR in the country provides technical advice on AMR to the IMCOH, reviews work plans recommended by the TWG, and ensures collaboration among relevant sectors.

The AMR Technical Working Group (TWG) which comprises of experts from human and animal health sectors offers technical expertise and recommendations for AMR activities while also supporting the national coordinating center in carrying out AMR activities.

The National Coordination Centre (NCC), led by the National AMR Program at the Ministry of Health, oversees the national AMR surveillance system and collaborates with various sectors, strengthening AMR efforts in Bhutan.

National AMR Technical Committee Members at Paro. 24th - 27th August, 2019

AMR Technical Working Group members at Paro, 12th - 13th March, 2021

National Antimicrobial Stewardship team and the PMU discussing the institution of an antimicrobial stewardship unit to promote the rational use of antimicrobials with the hospital management team at ERRH, Mongar, 2019

2. To promote rational use of antimicrobial agents

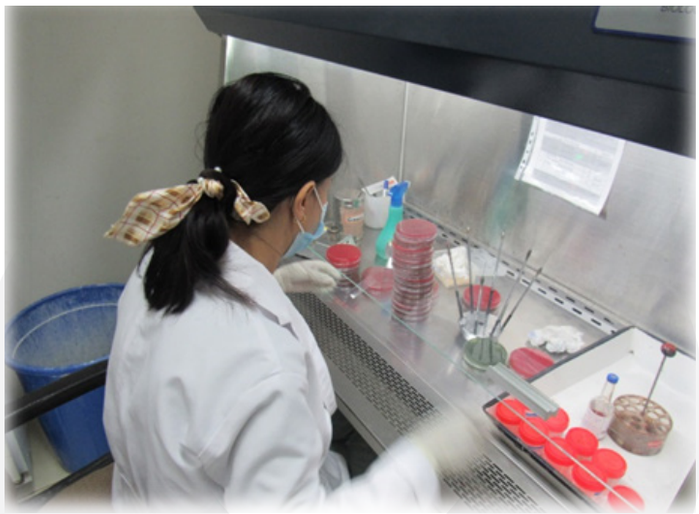
Bhutan is actively promoting the responsible use of antimicrobial agents by aligning its national antibiotic guidelines with the country's resistance patterns. This effort, supported by the Fleming Fund Project, involves reinforcing compliance through various means like audits, training, and awareness campaigns. Major hospitals are improving prescription monitoring, and there's an emphasis on better interdisciplinary coordination to ensure wiser use of antimicrobials. Furthermore, the establishment of an antimicrobial stewardship program, led by qualified professionals, has been initiated in referral hospitals, with plans to extend it to larger healthcare facilities and veterinary settings.

3. To institute surveillance and monitoring system on AMR and antimicrobials use.

It's essential to closely monitor the development of antibiotic resistance in organisms. Routine reports on resistance trends should be shared with prescribers and discussed in National Medicines Committee meetings to guide antibiotic recommendations and prescriptions. Supported by the Fleming Fund Project, nine sites, comprising five laboratories in human health and four in animal health, have been refurbished and designated as surveillance sites, fully equipped with necessary materials for lab-based AMR monitoring. Expansion plans include implementing lab-based AMR surveillance in six additional human health hospitals and two veterinary hospitals. The strategy also involves systematic monitoring, reporting, and communication of antibiotic usage data to relevant stakeholders in major hospitals.

Lab-based AMR surveillance and data management training using WHOnet for the laboratory professionals from both human and animal health sectors in Bumthang, 17th - 22nd April, 2021.

AST reading at NCAH



Processing sample at JDWNRH

4. To create and promote awareness on AMR through educational and public campaigns.

There is need to integrate a comprehensive AMR curriculum into university courses and establish an extensive training program for current professionals in the field. While few education and awareness programs on AMR are being conducted with support from WHO, there is no structured educational curriculum on AMR for health and livestock trainees, and Information Education and Communication (IEC) materials on AMR is inadequate. Nevertheless, plans to incorporate AMR concepts and principles into university curricula, mandatory core training on rational antimicrobial for all healthcare providers, structured orientation program for new recruits and expatriates, along with continuous medical education (CME) for in-service professionals focusing on antimicrobials are being put in place. Additionally, there are plans to enhance systematic and coordinated AMR awareness programs for the general public utilizing various media and materials on a regular basis.

Sensitization of clinicians on the microbiological testing and AMR, Paro. 18th - 20th October, 2021

5. To establish and promote a system of research on AMR.

To establish and nurture a research system focused on AMR, it is essential to allocate substantial financial and other resources to support these research endeavors. The outcomes of such studies will serve as invaluable evidence to guide future policy and planning decisions. While a few operational research projects have been undertaken with support from the Fleming Fund Project, including studies on Antimicrobial Consumption, Antimicrobial Use, and Knowledge, Attitudes, and Practices (KAP) surveys among professionals and the public, there is a current need for improved support in terms of both financial resources and the availability of qualified personnel for research. It's vital to create a favorable research environment for studying antimicrobial usage, establish planning processes based on evidence, and effectively utilize available research findings to shape activities related to antimicrobials, ultimately fostering greater enthusiasm for research initiatives. Plans to encourage and prioritize research have been initiated to facilitate effective interventions at all levels

6. To foster national and international collaboration.

There's a need to facilitate knowledge sharing, strengthen capabilities, and optimize data utilization. Encouraging participation in international AMR organizations is also crucial. Notably, Bhutan has established a close collaboration with the Peter Doherty Institute at the University of Melbourne, which hosts Bhutan Fleming Fellows through the Fleming Fund Fellowship Scheme. Furthermore, Bhutan is actively engaged in collaborations with the International Vaccine Institute in Korea for AMR data analysis and management. Additionally, Bhutan actively takes part in an external quality assurance (EQA) program known as EQASIA, which was initiated under the Fleming Fund Regional Grant. The country also participates in the IEQAS (International External Quality Assurance Scheme) provided by PPTC in New Zealand for external quality assurance. Bhutan maintains a close working relationship with the WHO regional office concerning AMR, regularly reporting on AMR, AMC (Antimicrobial Consumption) data to the Global AMR Surveillance System and the World Organization for Animal Health. It also reports Tripartite AMR Country Self-Assessment Survey data to WHO. Plans to collaborate with various institutes and agencies for initiatives related to Antimicrobial Stewardship and conduct economic studies on AMR in Bhutan are actively being developed.

The Deputy Director and Technical Lead for Antimicrobial Resistance (AMR) at the International Vaccine Institute (IVI) with the Health Minister of Bhutan during the handing over of the CAPTURA project report.

Experts from the International Vaccines Institute (IVI) , along with John Stelling, collaborating with health officials in Bhutan for AMR data management and WHOnet training

Fleming Fellows and health officials from Bhutan with the Mentors from Peter Doherty Institute, University of Melbourne

7. To strengthen control and regulatory system.

To strengthen control and regulations, it's vital to establish rules ensuring the quality, safety, and effectiveness of antimicrobials used in the country. Additionally, there should be limitations on the use of antibiotics in animal feed and non-medical applications. Although the 2003 Medicines Act of Bhutan doesn't explicitly address antimicrobial regulations, antibiotics are classified as prescription-only drugs, thus their sale in the private pharmacies is regulated.

However, since there's currently no regulatory framework for controlling non-medical antimicrobial use in animals and agriculture, plans are put in place to introduce such regulations into the medicines rules and regulations. This includes implementing regulatory processes to ensure the quality and safety of antimicrobials and restricting their non-medical usage.

Institutional Set up and Coordination Linkages for Implementation of AMR Activities

Note:
1. TWG AH (BAFRA, DOL, NCAH, Fellowship)
2. TWG HH (JDWNRH, RCDC, Fellowship)
3. OHS (Zoonosis, AMR program, KGUMSB, DOL)
4. RLDC (Regional Livestock Development Centre)
5. CRRH (Gelephu Central Regional Referral Hospital)
6. ERRH (Mongar Eastern Regional Referral Hospital)

IMCOH
(Inter Ministerial Committee for One Health)

OHS
(One Health Secretariat)

NATC
(National AMR Technical Committee)

Project Management Unit
(Fleming Fund)

National AMR Program

WHO/
FAO/
OIE

TWG HH
(Technical Working Group Human Health)

TWG AH
(Technical Working Group Animal Health)

AMSU JDW

Surveillance
RCDC

NRL
JDW/RCDC

AMR Surveillance
NCAH

AMR Surveillance
NFTL

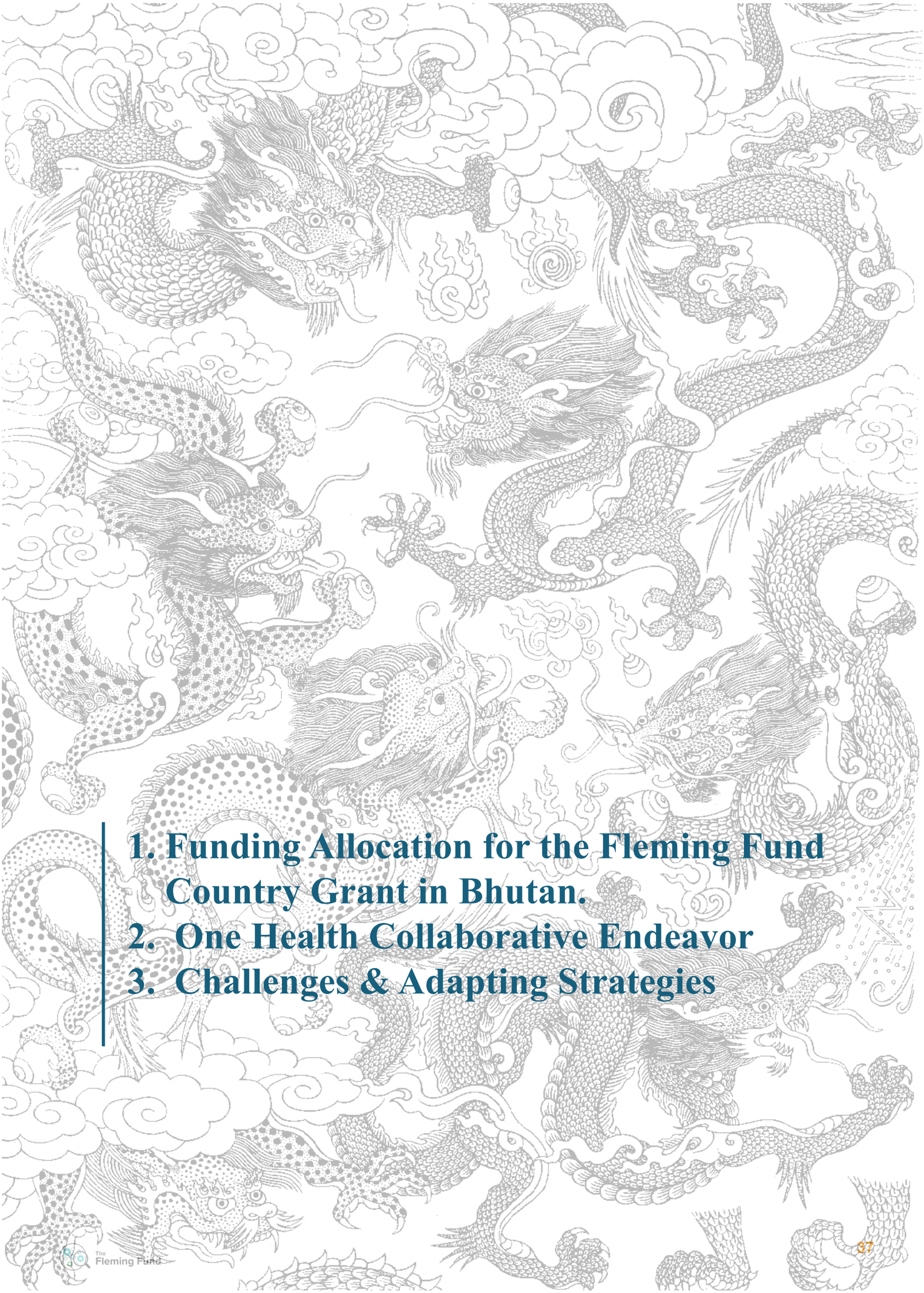
CRRH, ERRH and Phuntsholing General Hospital

RLDC,
Tsimasham

RLDC,
Kanglung

FLEMING FELLOWS

Investment Areas



1. Funding Allocation for the Fleming Fund Country Grant in Bhutan.
2. One Health Collaborative Endeavor
3. Challenges & Adapting Strategies

Funding Allocation for the Fleming Fund Country Grant in Bhutan

Laboratory Infrastructure Enhancement:

The project focused on improving laboratory infrastructure. Almost 232,436 pounds were invested which comprised of 14.9% of the overall grant. Achievements in this area include the establishment of quality laboratories equipped to conduct advanced AMR testing and research in 9 laboratories which included 5 in human health and 4 in animal health settings. A total investment of 232,436 pounds was allocated for the refurbishment of the laboratory spaces, constituting 14.9% of the total grant. This initiative extended to nine laboratories, comprising five in human health and four in the field of animal health.

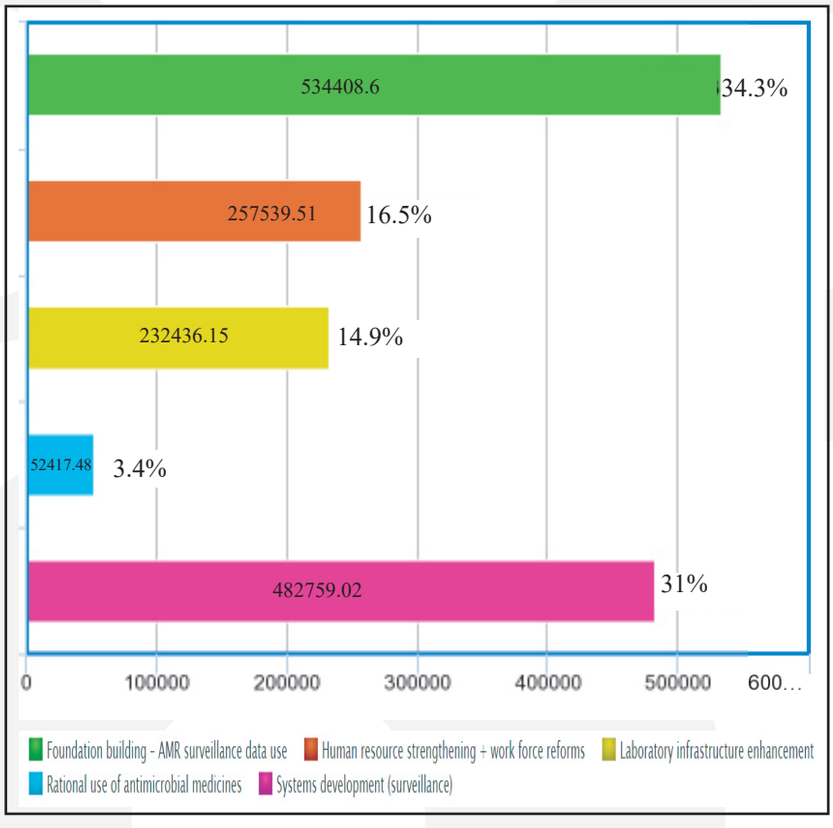
Human Resource Strengthening and Workforce Reforms:

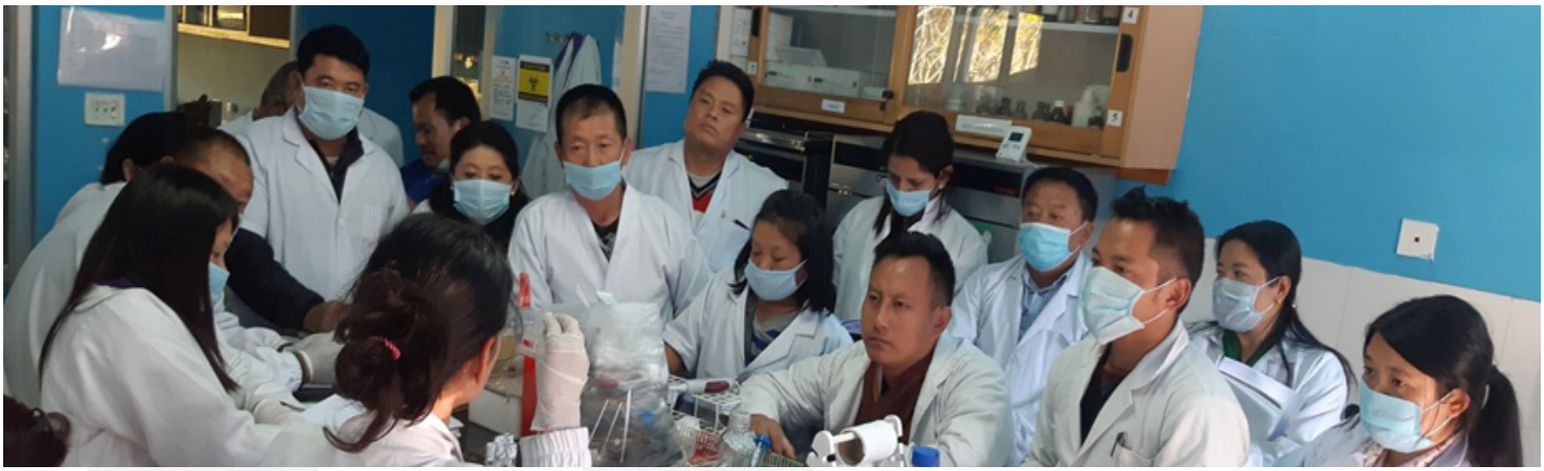
Initiatives were undertaken to improve the expertise and understanding of healthcare professionals and veterinary staff. Training programs and capacity-building endeavors were implemented to equip the workforce with the necessary skills to address antimicrobial resistance (AMR) effectively. A sum of 257,539.51 pounds was dedicated to the capacity building of health and veterinary personnel, representing 16.5% of the overall grant.

Promoting Rational Use of Antimicrobial Medicines:

The project advanced efforts to encourage responsible antibiotic usage by establishing Antimicrobial Stewardship Units, conducting prescription surveys, and implementing educational programs directed at healthcare professionals. The goal is to shift behavior towards more prudent use of antimicrobial medicines, leading to a decrease in unnecessary antibiotic prescriptions and improved patient care. An allocated sum of 52,417.48 pounds, representing 3.4% of the total grant, has been designated for this purpose.

*The details of the activities conducted under each of the investment types can be found in Annexure I Detailed Technical Implementation Plan.





Hands-on training of the laboratory personnel on the microbiology techniques for identification and susceptibility testing at NCAH. 10th - 14th October, 2022

Surveillance Systems Strengthening:

This encompassed the creation and implementation of robust systems such as the WHONET (for lab-based AMR data), G2C (database for management of veterinary medicines), LIMS(a database designed to manage information from veterinary laboratories nationwide) and VIS (database fro the management of veterinary clinical activities including antimicrobial usage), and NAPS (for AMU data) for collecting AMR, AMU and AMC data and reporting mechanisms. The initiative also covered the implementation of quality management systems in the laboratories. An allocation of £482,759.02, comprising 31% of the total grant, was dedicated to this endeavor.

This involved establishing and implementing robust systems, including WHONET for laboratory-based AMR data, G2C (database for management of vetenirary medicines), LIMS (a database designed to manage information from veterinary laboratories nationwide), and VIS (database fro the management of veterinary clinical activities including antimicrobial usage), as well as NAPS for AMU data. These systems were designed for the collection of AMR, AMU, and AMC data, along with reporting mechanisms. The initiative also covered the implementation of quality management systems in the laboratories.

Building Foundations for AMR Surveillance Data Use:

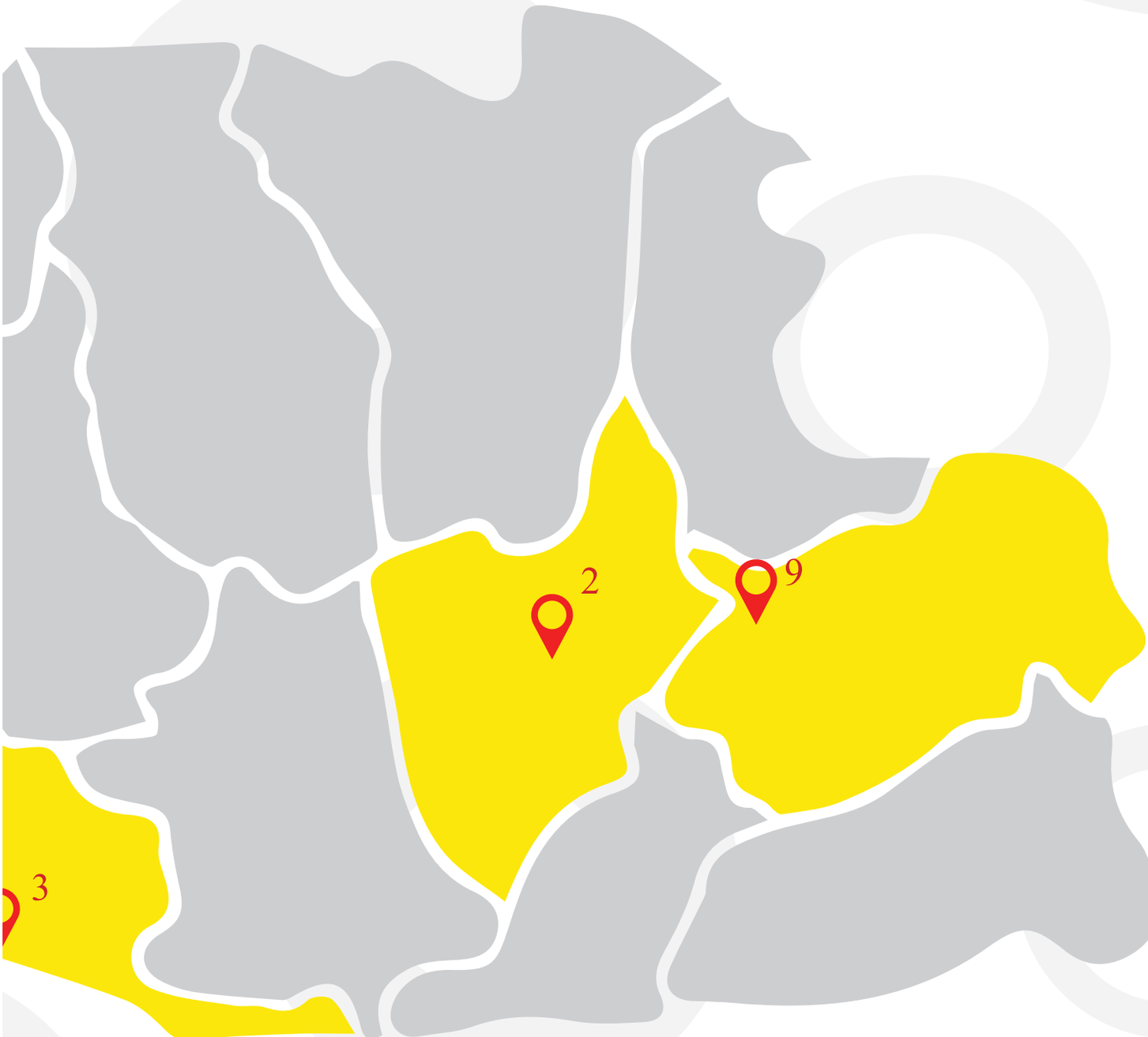
An essential element of the project focused on ensuring that the gathered data on antimicrobial resistance (AMR) was not only thorough but also utilized effectively. This entailed the development of frameworks and tools for the analysis and interpretation of surveillance data which will guide policymakers and healthcare providers in their guide decision-making. An allocation of 534,408.6 pounds, constituting 34.3% of the total grant, was designated for this specific purpose.

TWG and NATC members updating the country situation on AMR

9 Survelliance Sites

HUMAN HEALTH SURVEILLANCE SITES

1. Jigme Dorji Wangchuck National Referral Hospital, Thimphu
2. Eastern Regional Referral Hospital, Mongar
3. Central Regional Referral Hospital, Gelephu
4. Royal Center for Disease Control, Thimphu
5. Phuentsholing General Hospital, Phuntsholing



ANIMAL HEALTH SURVEILLANCE SITES

6. National Center for Animal Health, Thimphu
7. National Food Testing Lab, Yusipang
8. Regional Veterinary Hospital & Epidemiology Center, Phuntsholing
9. Regional Livestock Development Center, Kanglung

One Health Collaborative Endeavor

Collaboration

among human health, animal health, and environmental health sectors is a key component of the One Health approach through the Fleming Fund Country Grant in Bhutan. Here are some examples of collaboration among these three areas.

1. Sheep blood/sheep shed.

The sharing of sheep blood by the Animal Health laboratories with the human hospital surveillance labs was agreed upon during a meeting held from January 14 to 16, 2020, at Gelegphu, between the decision-making authorities from AH, including the Chief Program Officer (DoL), Program Director (NCAH), and Regional Directors (RLDCs Kanglung, Tsimasham, Zhemgang, and Wangdi), and the human health, supported by Felming Fund PMU. In addition, the protocol received technical approval and agreement from DoL and RLDC officials in accordance with the demands of the HH microbiological laboratories.

According to the agreement, the local veterinary laboratories will share the sheep blood needed for AMR surveillance at Regional Hospitals. In order to support the human hospitals/laboratories in giving sheep blood for the surveillance, it was intended that NCAH, RLDC Tshimasham, RLDC Zhemgang, and RLDC Kanglung will do so. The shelters were built in accordance with government regulations on open bidding for contract awards.

Sheep Shed,NCAH Serbithang,Thimphu

2. NEQAS

An essential component in upholding quality standards, the National External Quality Assurance Scheme (NEQAS) program was established at the Royal Centre for Disease Control (RCDC) in year 2021. Six rounds of the NEQAS program have been conducted, and moving forward, it will be executed biannually for all surveillance sites by the RCDC, ensuring the maintenance of quality standards.

3. Biosafety and biosecurity

In order to safeguard laboratory personnel, others, and the environment from potential exposure to hazardous microorganisms, biomaterials, and toxins, collaborative efforts between experts in human and animal health led to the development of biosafety and bio-security protocols. Furthermore, training programs were implemented to enhance the skills of laboratory personnel in both human and animal health for the effective implementation of these protocols.

4. Sample shipment plans

Pioneering as the first of its kind in the country, the implementation of a sample shipment service plan was deemed crucial due to the frequent transfer of pathogen isolates and biological samples within the country for referrals, high-level testing, bio repository activities, NEQAS, and other research endeavors. To facilitate this, a sample shipment service agreement was formalized with the Bhutan Postal Corporation Limited. Additionally, comprehensive training on the safe transportation of specimens, including proper packing according to IATA standards, was provided to relevant officials from laboratories involved in specimen transportation, as well as officials from the Bhutan Post.

Dr. NK Thapa and Ms. Pushpa with the sheeps transported to NCAH

Challenges during the project execution

Thimphu, Bhutan amidst the COVID-19 lockdown

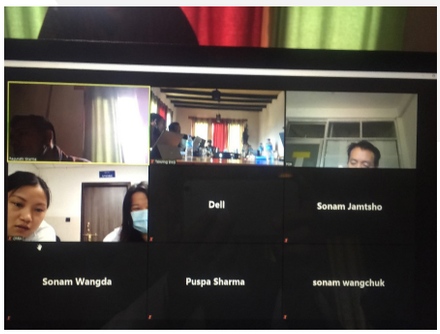
The project encountered numerous challenges and disruptions due to the COVID-19 pandemic and resulting restrictions, necessitating multiple no-cost extensions that extended the project timeline until December 2023. These difficulties included a shortage of crucial supplies, such as computers, servers, stationery, and laboratory consumables, within the country due to import dependence and border closures. Additionally, shipping and installing equipment became problematic due to international travel restrictions, which hindered the implementation of subsequent project activities.

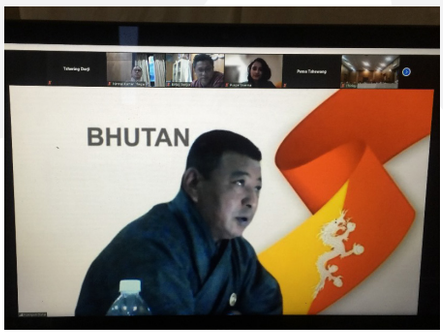
Furthermore, a substantial portion of the implementing partners, primarily comprising laboratory personnel, was reassigned to COVID-19-related efforts, leading to a deceleration in project activities. Using microbiology lab for COVID-19 testing introduced a potential risk to the project's operations. The project's budget remained underutilized, and restrictions on gatherings made it challenging to conduct trainings and workshops, especially those requiring hands-on laboratory training. Moreover, travel restrictions and reduced allowances led to lower participant turnout even if such events were organized.

Inadequate monitoring and supervision of the project sites were the result of increased risks and quarantine requirements. Finally, travel restrictions and associated protocols had a significant impact on the project's ability to conduct external trainings, tours, and meetings, which constituted a substantial portion of the overall project grant, accounting for nearly 35%.

Delayed Equipment Installation due to COVID-19 travel restrictions

Adapting Strategies: Navigating Challenges in Project Execution





Virtual meetings substituted in-person meeting amidst COVID-19 restrictions

Virtual installation of blood culture machine at the JDWNRH

While the project faced challenges due to the COVID-19 pandemic, the project management unit organized numerous Technical Working Group meetings to develop contingency plans for activities deemed high-risk. As a result, proposals were formulated to reassign budget resources from these high-risk activities to new initiatives. These included the establishment of webinar facilities, construction of sheep sheds, the expansion of the laboratory workforce through training, the augmentation of the project management team with new members, the local procurement of essential laboratory supplies, virtual equipment installations, online training sessions with incentives, operational research studies, and the outsourcing of specific tasks to local consultants.

These proposals underwent thorough evaluation and were presented for approval at meetings of the National AMR Technical Committee (NATC) and the Inter-ministerial Committee for One Health (IMCOH). Furthermore, they were subject to review and endorsement by the project's Management Agent, Mott MacDonald.

Practically all of the budget initially allocated to high-risk activities was effectively redirected toward more practical and feasible initiatives. These new activities were aligned with the project's intended outcomes and were shaped by the recommendations of the AMR committees, receiving strong support from the Management Agent.

Insights

1. Focals (Human & Animal Health)
2. Committee Chairperson
3. The Story

Human Health (Focal)

Dr. Tshokey
MBBS, Dip.Med.Micro, MD, PhD
Consultant Clinical Microbiologist & Head
Department of Pathology and Laboratory Medicine
JDW National Referral Hospital: Thimphu

1. AMR Surveillance Challenges & Fleming Fund Support:

Key issues in AMR surveillance in Bhutan?

How can the Fleming Fund help strengthen these efforts?

Challenges:

- Limited human resources both in numbers and expertise.
- Uninterrupted supply of laboratory consumables is a challenge.
- Data collection and analysis is a problem due to lack of dedicated people.
- Lack or limited clinical awareness of AMR, its problems and preventive responsibility amongst clinical staff.
- Limited laboratory (only four laboratories) in the country has microbiology services.
- Poor literacy on AMR and its problems amongst health workers and the general public.
- No dedicated funding from the ministry of health for AMR.

Strengthening AMR activities through FF

- Need to build on achievements of the previous funding.
- Previous funding focused more on infrastructure and supplies .
- Future funds will be mainly directed towards developing HR capacity for laboratory, infection prevention and control and instituting clinical pathways for management of infectious diseases in OPD, IPD and critical areas such as ICU.
- Invest in epidemiological capacity and data quality management.
- More awareness and communication between health workers and public on AMR.
- Initiate private sector involvement in awareness, prevention and control of antibiotic overuse and misuse.
- Focus on people living along the international borders to be more educated and aware on self prescription, easy accessibility and OTC antibiotics.

2. Health System Integration & One Health Collaboration:

How to integrate AMR control into Bhutan's health system?

Enhancing collaboration between animal and human health for a comprehensive One Health strategy.

- We have developed a common AMR surveillance guideline for AH and HH during the first grant This guideline is an example of how we can integrate One health in AMR activities.
- We are now involving the environmental sector with AH and HH activities, therefore all AMR activities are very inclusive and multi-sectoral.
- We have technical working groups for AH and HH and these members often meet together as joint TWG to discuss issues and formulate guidelines and SOPs.
- We also share common grounds in research and data analysis.
- We also share laboratory resources both in human resources and laboratory supplies whenever required.
- We help each other in training our sectors in matters of different expertise.

3. Capacity Development for AMR Combat:

What training initiatives are needed for Bhutanese healthcare professionals to combat AMR effectively?

How can the Fleming Fund aid in building sustainable capacities within the human health sector?

- We have benefited heavily in terms of infrastructure and lab supplies during the first round.
- In the second round, we plan to invest mainly in HR capacity building and infectious diseases prevention and control and management.
- Thus, we have to focus on:
- Laboratory HR training and increasing the pool of trained staff focusing on bacteriology, mycology and molecular techniques.
- We will train few lab staff (at least two from each center) outside the country for short trainings (diploma and certificate level) in bacteriology, mycology and molecular techniques.
- Infection prevention and control human capacity and system strengthening by training IPC focal persons of all hospitals. We also need to get few nurses and doctors certified in IPC to lead the programs
- We will train doctors on sepsis bundles and other infectious disease clinical pathways, develop guidelines and SOPs and perform cascade training on clinical pathways.
- We will train and implement clinical pathways in all hospitals.
- We need to train all other health workers on IPC, MDRO and their roles in preventing and control of MDROs in clinical practices.
- We need to initiate institutional and school education in AMR and MDROs.
- There is a need to train the IPC team and relevant clinicians on investigation, prevention and control outbreak of MDROs in the ICU and wards.

Animal Health (Focal)

Dr. NK Thapa
Animal Health Specialist II, NCAH
Thimphu

1. Challenges in Animal Health Surveillance and AMR Management in Bhutan:

What are the main challenges and gaps in animal health surveillance and AMR management?

How can the Fleming Fund grant help address these issues?

Gaps:

- Lack of efficient software programs for data collection on AMR, AMU/AMC.
- Inadequate lab capacity for AMR surveillance. Not all regional laboratories are capable of AMR surveillance.
- The current AMR surveillance is focused only on poultry value chain. There is no active surveillance in pork, beef and milk value chains.

FF contribution:

Supported enhancement of database programs – Laboratory information management system (LIMS) for AMR surveillance, Veterinary Information System (VIS) for AMU and G2C for AMC. Training was also provided to the users.

Referral lab was refurbished and equipped with high end equipment like vitek machine, freezers and lab consumables were provided. Some of these equipment's were also supplied to regional laboratories. Hands-on trainings were provided on microbiology and time to time ensuring the quality controls.

2. Fleming Fund Support for One Health Collaboration:

How can the Fleming Fund facilitate One Health initiatives, promoting collaboration between animal, human, and environmental sectors?

What key areas of collaboration are essential for effective AMR control?

- Support the one health secretariat which is recently established at RCDC. Carry out joint studies wherever involvement is required.
- Support joint investigations, surveillance and outbreak response to develop technical capacity in OH response.

3. Sustainability:

How do you foresee the long-term impact and sustainability of Fleming Fund-supported interventions in building resilience against AMR in Bhutan's animal health sector?

Are there specific measures or strategies to prioritize for lasting positive outcomes?

- The building up of HR capacity by providing training of the personnel involved will help to some extent too carry out the activities and also the equipment will support the activities for considerable period of time.
- Regularizing AMR/AMU/AMC surveillance in the routine work of the referral and regional laboratories.
- Regular activities are supported by the Government. This will ensure sustainability in the long run.

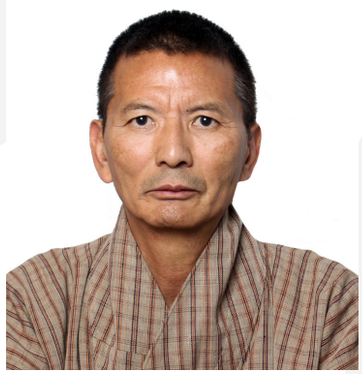
Committee Chairperson

"Fleming Fund Partnership: Strengthening Global Collaboration to Tackle Antimicrobial Resistance (AMR)"

The UK government's Fleming Fund provided vital support to Bhutan's efforts in combatting antimicrobial resistance (AMR), a global health concern. Through the Fleming Fund, Bhutan received assistance that boosted its capabilities, implements effective strategies, and safeguarded the effectiveness of antimicrobial treatments.

The partnership enhanced one health governance and collaboration in tackling AMR in Bhutan. By investing in system development, infrastructure, and data-related capacities, the collaboration enabled Bhutan to make informed decisions based on evidence. Sustained surveillance systems are crucial for monitoring AMR trends and identifying emerging risks, empowering Bhutan to take targeted actions, allocate resources effectively, and assess intervention effectiveness in reducing AMR.

Global collaborations are imperative in addressing the widespread threat of AMR, as it knows no borders. Partnerships between countries allowed the exchange of best practices, knowledge, and resources. By learning from one another's experiences, nations can jointly develop comprehensive strategies to combat AMR comprehensively. The collaborations promote research, innovation, and capacity-building, all of which are crucial components in the battle against AMR. By working together, countries can maximize their impact and strive for a sustainable solution that benefits the entire world.



Mr. Pemba Wangchuk
The Acting Secretary, Ministry of Health
Chairperson, IMCOH

“Significant Achievements and Collaborative Impacts of the Fleming Fund Support in Bhutan”

The support from the Fleming Fund has played a pivotal role in addressing Antimicrobial Resistance (AMR) challenges in Bhutan. This assistance has led to the strengthening of veterinary laboratories, the establishment of AMR testing capacities, and the development of human resources in laboratory and epidemiology fields. Additionally, Bhutan has improved its IT-based database systems and technology in the veterinary domain, leading to enhanced awareness of AMR.

The first phase of the Fleming Fund project has yielded significant achievements, providing strong evidence that this partnership will generate crucial data and establish sustainable surveillance systems to combat AMR effectively in Bhutan. Furthermore, the project has fostered collaboration and networking among One Health sectors, strengthening linkages with neighboring countries, referral laboratories, and the wider AMR expert community.

This cross-country partnership will play a vital role in addressing the global health challenge of AMR through the sharing of expertise, resources, and harmonized disease prevention and control measures, particularly in collaboration with India.

Mr. Thrinley Namgyel
Secretary, Ministry of Agriculture and livestock
Chairperson, IMCOH

“Significant Impact and Collaborative Progress in Addressing AMR: A Testament to the Fleming Fund Partnership”

The partnership between the Royal Government of Bhutan and the Fleming Fund played a pivotal role in addressing and mitigating the threat of Antimicrobial Resistance (AMR) in Bhutan. The collaboration has fostered a collective understanding of AMR as a shared challenge requiring a multisectoral approach. It has laid a strong foundation for addressing AMR collaboratively by strengthening stakeholder collaboration, enhancing human resources, and improving laboratory capacity. The assistance has played a critical role in several key areas like

Strengthening Laboratory Capacity, Enhancing Surveillance, Human Resource Capacity Building, Awareness Campaigns, One Health Collaboration and Standardizing Laboratory Protocols.

AMR is a global challenge that transcends borders, necessitating cross-country collaboration. Areas where such partnerships can be enhanced include sharing best practices and knowledge, improving global surveillance and information sharing systems, sharing expertise and resources, and standardizing policies and regulations regarding antimicrobial use and stewardship. Collaborative efforts are essential to effectively combat AMR on a global scale.

Dr. Sangay Rinchen
Offtg, Program Director, National Center for Animal Health
Chairperson, NATC

“Enhancing AMR Assessment and Sustainable Capacity Building Through Fleming Fund Support”

The Fleming Fund (FF) support has played a vital role in establishing and streamlining Antimicrobial Resistance (AMR) assessment in the country. It enabled the setup of AMR testing facilities in both regional laboratories for Animal Health and Human Health. Prior to this support, the capacity for AMR assessment and analysis was limited to the National Laboratory at Serbithang. Now, regional laboratories have the capability to conduct AMR assessments, which is expected to promote the judicious use of antibiotics in the animal sector.

The project has also contributed to building expertise in AMR, surveillance planning, and analytical capacity. To ensure sustainability, recurring costs for surveillance and monitoring, including the purchase of consumables and reagents, have been integrated into the regular budget.

Furthermore, the project facilitated the establishment of networks for quality control, referral services, expertiseexchange, and proficiency testing. These networks are expected to support cross-border collaboration and information exchange, recognizing that AMR is a global issue requiring concerted efforts from all countries and stakeholders.

Dr. Narapati Dahal
Health Specialist
Department of Livestock , MoAL
Chairperson, Technical Working Group

THE QUESTIONNAIRE INTERVIEW STORY

Kinley Wangchuk
In-Charge
Clinical Microbiology and Molecular Diagnostic Laboratory
JDWNRH, Thimphu

Pushpa Maya Sharma
Dy. Chief Laboratory Officer, NCAH
Thimphu

Anil Rai
Dy. Chief Laboratory Officer, NFTL
Thimphu

Kinley Gyem
Dy. Chief Laboratory Officer, B.Sc, MPH, RCDC
Thimphu

With unwavering dedication, Bhutan embraced the Funding, determined to maximise its impact on the country's healthcare system. The grant's positive impact was felt across the laboratory facilities, as the primary objective of enhancing infrastructure became a reality. Dilapidated buildings were renovated, state-of-the-art technology was installed, and laboratories were equipped with modern tools to combat the challenges of diagnosing infectious diseases effectively.

As the Fleming Fund's support flowed in, the availability and quality of diagnostic equipment and supplies saw a significant improvement. Diagnostic labs that once faced shortages now had an ample supply of reagents, test kits, and essential equipment. This bolstered Bhutan's diagnostic capabilities, enabling quicker and more accurate disease detection and surveillance.

One of the most profound ways the Fleming Fund contributed was through a series of specialized training programmes and capacity-building initiatives for lab technicians. Workshops, seminars, and scholarships for advanced training abroad empowered these technicians with up-to-date knowledge and expertise. As the technicians grew in skill, so did Bhutan's healthcare system, as accurate and timely diagnoses became the norm rather than the exception.

Sangay Wangchuk
Laboratory Technician, CRRH
Gelephu

The impact was unmistakable. Disease surveillance and response capabilities were enhanced, allowing Bhutan to detect outbreaks faster and respond swiftly to potential health threats. The success stories of preventing infectious disease outbreaks spread like wildfire, and Bhutan's healthcare system earned well-deserved recognition on the global stage.

But the real magic happened in the collaboration between the Fleming Fund and local stakeholders, especially the dedicated lab technicians.

Their commitment to strengthening Bhutan's healthcare system was unparalleled. They became the unsung heroes, working tirelessly behind the scenes, and their expertise and dedication formed the bedrock of the country's healthcare progress.

The Fleming Fund's engagement with local stakeholders wasn't just about financial support. It was about building a sustainable and resilient healthcare ecosystem. The Fund actively sought feedback from lab technicians and other stakeholders, fostering a culture of continuous improvement. This two-way partnership resulted in innovative approaches, streamlined processes, and improved quality control measures.

Tshewang Dorji
Sr. Laboratory Technician, PGH
Phuntsholing

Bindu Parajuli
Laboratory Technician, RVHEC
Phuntsholing

Nima Dorji
Laboratory Technician, ERRH
Mongar

Samdrup Zangmo
Laboratory Technician, RLDC
Trashigang

Annexure

1. Detailed Technical Implementation Plan(TIP)
2. Terms of Reference
3. List of Equipment & Consumable
4. Documents Developed

Detailed Technical Implementation Plan(DTIP)

Activity No.	Activity Name	Investment Type	Total Expenditure in GBP as of December 2023
1.1.1	Project Management Unit Recurent cost	Foundation building – AMR surveillance data use	194230.68
1.1.3	Meetings between the PMU +focal persons, NATC and MA	Foundation building – AMR surveillance data use	6622.31
1.1.4	Establishment of Webinar Facilities and Subscription to project management and Tele Conferencing Application	Foundation building – AMR surveillance data use	14594.33
1.2.1	IMCOH meeting	Foundation building – AMR surveillance data use	5571.49
1.3.1	Meeting with Human Health and Animal Health officials to establish the One Health Secretariat	Foundation building – AMR surveillance data use	15500.04
1.3.2	Revise ToR developed and approved for One Health Secretariat for inclusion of AMR	Foundation building – AMR surveillance data use	230.03
1.3.3	Establishing One Health Secretariat office	Foundation building – AMR surveillance data use	10292.01
1.4.2	Conduct Quarterly meetings for the NATC (5times)	Foundation building – AMR surveillance data use	11830.36
1.5.2	DTIP with all associated annexures (importantly annexure 9 A and 9 B), and other annexures as appropriate, submitted to the Management Agent	Systems development (surveillance)	6548.7
1.6.1	Conduct Quarterly Meeting for AMR TWG to review of AMR and AMU surveillance results from the sectors	Foundation building – AMR surveillance data use	14968.29
1.7.3	Produce Fleming FUnd country grant project report book	Foundation building – AMR surveillance data use	931.53
2.1.1	ToRs developed and approved by NATC	Rational use of antimicrobial medicines	1101.37
2.1.2	Conduct quarterly meetings of the TWG for AMR/AMU in human	Rational use of antimicrobial medicines	3252.36
2.1.3	Development of AMU and AMC surveillance strategy	Rational use of antimicrobial medicines	2327.42
2.1.4	Development of AMR surveillance guidelines	Systems development (surveillance)	4101.13
2.1.5	Review, revise and disseminate microbiology and QC manual SOPs – participants from each laboratory (JDWNRH, CRRH, ERRH, PGH)	Systems development (surveillance)	3386.04
2.1.6	Development of guidelines and standard operating procedures for collection, storage and shipment of infectious substances	Systems development (surveillance)	4643.44
2.1.7	Purchase and subscription of CLSI standards and protocols (2020 version)	Systems development (surveillance)	6844.85

2.1.8	Development of plan for in country sample shipment mechanism with the Bhutan Post services	Foundation building – AMR surveillance data use	4233.25
2.2.1	ToR developed for JDWNRH as reference laborotory and approved by NATC on roles and responsibilities		838.64
2.2.2	Set up of AMR and AMU Office in three referral hospitals	Rational use of antimicrobial medicines	9286.96
2.2.4	Procurement of computer and accessories for labs at JDWNRH, Mongar, Gelephu and Phuentsholing & NCAH, RLDC Tsimasham, RLDC Kanglung, NCAH Thimphu, NFTL, BAFRA)	Laboratory infrastructure enhancement	53511.43
2.2.5	Develop online app of the antibiotic guideline (responsive app for computer, mobile, tablet)	Rational use of antimicrobial medicines	15458.67
2.2.6	Conduct Audit on adherence to the National Antibiotic guideline	Rational use of antimicrobial medicines	5231.88
2.2.7	TA to review existing LQMS manual for compliance with international guidelines and revision of LQMS in JDWNRH, RCDC and Surveillance sites	Systems development (surveillance)	5671.88
2.2.9	In country workshop organising refreshers course on basic collection, identification and AST & GLP for surveillance sites at JDWNRH	Human resource strengthening + work force reforms	6586.77
2.2.10	In country refreshers course on data entry in WHONET for surveillance site at JDWNRH	Human resource strengthening + work force reforms	8241.95
2.2.11	Workshop for clinicians on interpretations of Microbiology reports by JDWNRH	Human resource strengthening + work force reforms	55554.28
2.2.13	Attachment training on basic bacteriology techniques	Systems development (surveillance)	11972.71
2.2.14	Pilot project (Screening for C.difficile in hospitalized patients in three major Hospitals with Genexpert)	Systems development (surveillance)	14937.81
2.3.2	Structural renovation of microbiology laboratory	Laboratory infrastructure enhancement	17252.68

2.3.3	Development and Implementation NEQAS guideline and protocol	Systems development (surveillance)	15492.86
2.3.4	Enrol and Participate for International EQAS by RCDC	Systems development (surveillance)	12766.39
2.3.5	Training on biorepository by TA	Human resource strengthening + work force reforms	2154.64
2.3.7 & 3.3.7	Transportation of culture isolates as per TWG guidelines (see 2.1.5)	Systems development (surveillance)	8590.24
2.3.6	Purchase of inventory/ sample management software and associated equipment for the biorepository	Laboratory infrastructure enhancement	6848.19
2.3.8	Training on sample lyophilisation at RCDC	Human resource strengthening + work force reforms	133.41
2.3.9	Surveillance site training for laboratory staffs of sentinel sites on biorepository including simulation exercises	Human resource strengthening + work force reforms	2847.66
2.4.1	Renovation and redesigning of laboratory initiated at Gelephu, Phuentsoling and Mongar	Laboratory infrastructure enhancement	39766.56
2.4.6	Meeting to develop protocol and agree on collection of Sheep blood for preparation of blood agar from RVLs for HH sites	Systems development (surveillance)	2712.53
2.4.7	Maintenance of sheep,collection and transportation of sheep blood at all sites	Laboratory infrastructure enhancement	52934.34
2.5.1 & 3.5.1	Develop Biosafety and biosecurity manual by RCDC	Foundation building – AMR surveillance data use	6797.56
2.5.2	Training in Biosafety and Biosecurity to bacteriology personnel	Human resource strengthening + work force reforms	6513.44
2.5.3	Workshop on biosafety and IPC measures for hospital staff- all sentinel sites IPC from JDWNRH (Q5,6,7)	Human resource strengthening + work force reforms	8729.33

2.5.4	Certification of existing Biosafety equipment by BMED	Systems development (surveillance)	7792.48
2.5.5	International and domestic sample transportation (IATA certification and training by WHO or others)	Foundation building – AMR surveillance data use	18569.42
2.6.1	On site joint supportive supervision from JDWNRH & RCDC	Systems development (surveillance)	2452.87
2.7.1	Conduct PPS on AMU at JDWNRH	Rational use of antimicrobial medicines	7456.05
2.7.2	Training on WHO AMC tool organised for JDW, Sentinel sites and DRA	Human resource strengthening + work force reforms	10497.79
2.7.7	Finalization of AMR, AMU and AMC surveillance report by the reference sites	Systems development (surveillance)	1144.57
2.7.10	Conduct Training on QGIS	Human resource strengthening + work force reforms	7561.73
2.7.11	Conduct Training on R. statistic	Human resource strengthening + work force reforms	3845.57
2.7.12	Prescription Survey on AMR and AMU at Community Pharmacies in the country	Human resource strengthening + work force reforms	15018.28
2.7.4	Software support provided to JDWNRH,AMSU and University for AMR and AMU data analysis	Systems development (surveillance)	11579.32
2.7.5	Hardware and software support provided to the epi unit at RCDC for AMR epidemiology data analysis	Laboratory infrastructure enhancement	2521.19
2.7.6	Workshop conducted for RCDC, JDWNRH in basic AMR data analysis and reporting	Human resource strengthening + work force reforms	7136.28
2.8.1	Capacity need assessment of three surveillance sites (Dewathang, Samdrup jongkhar, Samtse and Tashigang) on AMR surveillance capacity by local assessors	Laboratory infrastructure enhancement	2629.34
2.9.1	Train 3 biomedical engineers on the maintenance and calibration of basic laboratory equipment's (pH meter; balance; micropipette)	Human resource strengthening + work force reforms	21307.99

2.9.2	calibration of basic laboratory equipment by biomedical engineers at JDWNRH and RCDC (pH meter, balance, micropipette)	Human resource strengthening + work force reforms	1358.72
2.9.3	calibration of basic laboratory equipment by biomedical engineers at Surveillance sites	Human resource strengthening + work force reforms	151.37
2.11.1	Procurement of consumables (media and reagent) for JDWNRH, ERRH, CRRH, PGH and RCDC	Systems development (surveillance)	138429.03
2.11.2	Procurement of AST and ID cards for VITEK 2 Compact and VITEK MS	Systems development (surveillance)	36026.37
2.11.5	To conduct point prevalence survey (PPS) using National Antibiotics Prescription Survey (NAPS) tool (VENUE: JDWNRH, ERRH, CRRH & Phuentsholing District Hospital)		3196.99
2.11.7	Short term Training on TDM of Antibiotics at ICUs/Medical wards at Ramathibodi Hospital, Thailand	Human resource strengthening + work force reforms	2743.68
2.11.8	Antibiotics panel sensitization workshop	Foundation building – AMR surveillance data use	2113.22
3.1.2	TWG meeting minutes and all relevant document repositories maintained and shared	Human resource strengthening + work force reforms	309.04
3.1.3	Conduct sensitization workshop on Fleming Fund project activities for all members involved in FF	Human resource strengthening + work force reforms	2447.43
3.1.6	Conduct workshop on AMR for TWG in using outputs generated and interpret reports by external Technical Assistance partner	Foundation building – AMR surveillance data use	8639.92
3.1.7	Establishment of Webinar Facilities and subscription to Tele Conferencing Application	Foundation building – AMR surveillance data use	10118.45
3.2.2	Update existing SOP for culture, identification and AST for salmonella, E coli, enterococci, campylobacter, klebseilla by TWG in collaboration with NVL	Systems development (surveillance)	2646.3
3.2.4	Training of microbiology technician in culture, identification and AST (disc diffusion) for E coli, salmonella by NVL	Human resource strengthening + work force reforms	4301.75

3.2.5	Training (in-country) on advanced microbiology for laboratory staff in use of vitek, AST (MIC) and molecular (PCR) and phenotypic testing to confirm ESBL-, biorepositories establishment and management, barcoding, acquired AmpC and/or carbapenemase-producing pathogens and serotyping of salmonella spp, E coli , enterococci	Human resource strengthening + work force reforms	4494.08
3.2.6	Purchase of inventory/ sample management software and associated equipment for the biorepository at NVL	Systems development (surveillance)	6848.19
3.2.7	Training on maintenance of ATCC batch organism for participating laboratories by local TA and development of SoP	Human resource strengthening + work force reforms	1549.22
3.2.8	Training of staff on laboratory quality assurance by NVL and RCDC	Human resource strengthening + work force reforms	6908.79
3.3.1	Infrastructure and Renovation plan for each lab developed	Laboratory infrastructure enhancement	43653.29
3.3.4	Certification of existing biosafety cabinets and laboratory equipments	Systems development (surveillance)	18917.61
3.3.5	Calibration of PCR machines, micro-pipettes, balance by BMED	Systems development (surveillance)	2622.17
3.3.6	Training of microbiology technician in culture, identification and AST by NVL, RCDC AND JDWNRH	Human resource strengthening + work force reforms	2425.14
3.5.2 & 2.5.2	Training of surveillance laboratory staff on biosafety and biosecurity by ToT	Human resource strengthening + work force reforms	714.5
3.5.4	Construction of biological pit, refurbishment of lab at NCAH & procurement of UPS	Laboratory infrastructure enhancement	12985.54
3.6.1	Develop sampling protocol (broiler and layer) by TWG in collaboration with NVL	Systems development (surveillance)	3147.51
3.6.3	Train laboratory staffs on sample collection, packaging and transportation from layers and broilers by NVL	Human resource strengthening + work force reforms	4946.99
3.6.4	Collection, packaging, transport and testing of samples from the study sites (800 samples to be collected)	Systems development (surveillance)	33147.96
3.7.1	Develop sampling protocol for locally grown chicken meat by TWG in consultation with NFTL	Systems development (surveillance)	3505.73

3.7.3	Train laboratory staffs on sample collection, packaging and transportation from meat shop by NVL and RCDC	Human resource strengthening + work force reforms	2717.41
3.7.4	Collection, packaging, transport and testing of samples from the study sites (300 samples to be collected	Systems development (surveillance)	4300.77
3.8.3	Training of laboratory staff on use of LIMS by NVL	Human resource strengthening + work force reforms	7812.2
3.8.4	Update and customisation of LIMS as per laboratory needs for NVL	Foundation building – AMR surveillance data use	26621.71
3.8.5	Customization of LIMS system for NFTL to capture and store food AMR data	Foundation building – AMR surveillance data use	21158.1
3.8.6	Training of Laboratory staff on use of WHONET database in 2 RLDCs and NFTL by NVL.	Human resource strengthening + work force reforms	6185.73
3.10.1	Train RLDCs and Dzongkhag staffs on use of G2C database for management of antibiotic data by NGN, ICTD and NCAH	Human resource strengthening + work force reforms	35474.09
3.10.2	Veterinary information System database and recommend customization to include veterinary prescVeterinary information System database and recommend customization to include veterinary prescription data (AMU) by TWG ription data (AMU) by TWG	Foundation building – AMR surveillance data use	47021.05
3.10.3	Collect data on AMU from districts by NVH	Foundation building – AMR surveillance data use	8864.14
		Total	1320059.51

TERMS OF REFERENCES

I. The Inter-Ministerial Committee for One Health (IMCOH)

The IMCOH is responsible to make policy decisions and guide respective agencies on One Health activities based on the recommendations provided by the National One Health Technical Committee (NOHTC) and National AMR Technical Committee (NATC).

Members

1. Secretary, Ministry of Health (MoH)
2. Secretary, Ministry of Agriculture and Forests (MoAF)
3. Head, Department of Disaster Management (DDM)
4. Head, Department of Public Health (DoPH)
5. Head, Department of Medical Services (DMS)
6. Head, Department of Livestock (DoL)
7. Head, Bhutan Agriculture and Food Regulatory Authority (BAFRA)
8. Drug Controller, Drug Regulatory Authority
9. Head, Department of Forests and Park Services (DoFPS)
10. President, KGUMSB
11. Head, College of Natural Resources (CNR), Royal University of Bhutan (RUB)
12. Representative, National Enviro¬nment Commission (NEC)
13. Head of OHS (Member Secretary)
14. Representative from the Private Sector
15. Co-opt members as and when required

Terms of Reference for IMCOH

1. Make policy decisions for the implementation of One Health Strategy plan and National AMR Action
2. Plan (NAAP);
3. Where required to seek approval of national level policy decisions from Committee of Secretaries or the Cabinet for the implementation of OH Strategy plan and NAAP;
4. III.Review and approve the recommendations submitted by the National One Health Technical Committee
5. (NOHTC) and National AMR Technical Committee (NATC);
6. Mobilize resources for implementation of One Health activities as recommended by NOHTC and NATC;
7. Carry out high-level advocacy on One Health and AMR;
8. Accord approval for One Health Strategic plan and NAAP, including amendments
9. Review and approve any other issues related to One Health and AMR.
10. Provide directions for strengthening and investments in One Health approach to tackle zoonotic diseases and AMR issues Facilitate research and international collaboration on One Health and AMR

Meetings and Procedures

- The IMCOH will meet once annually and as and when required. The IMCOH will be chaired by the Secretaries of MoH and MoAF on rotational basis.
- The meeting shall convene only when 2/3rd of the members are present
- The chair shall invite co-opt members based on agenda and relevance
- One Health Secretariat shall function as secretariat to the AMR TWG Committee

II. One Health Secretariat (OHS)

The One Health Secretariat will be responsible for day-to-day coordination and communication between the OH stakeholders.

Mandates of the One Health Secretariat

1. Shall function as the secretariat for Inter-ministerial Committee for One Health (IMCOH);
2. Shall facilitate mainstreaming and institutionalizing of One Health Program in Bhutan;
3. Shall coordinate and drive development of national OH agenda;
4. Shall coordinate and drive implementation of OH activities;
5. Shall coordinate and organize OH meetings, conferences and workshops;
6. Shall mobilize fund for implementation of OH activities;
7. Shall promote collaborative research and capacity building on OH activities;
8. Shall coordinate and liaise with national, regional and international OH network and organizations;
9. Shall develop and maintain OH webpage for information sharing;
10. Shall monitor and evaluate implementation of OH activities; and
11. Shall publish one health activity progress reports.

OHS shall be supported by the core focal officers, designated one each from the following agencies:

1. Zoonotic Disease Control Program, DoPH, MoH
2. National AMR program, DMS, MoH
3. Animal Health Division, DoL, MoAF
4. Representative from KGUMSB

Additionally, the designated core focal officers shall form the OHS, and carry out the functions of the OHS until the OHS is approved as a separate office and until dedicated staff is appointed. The head of the OHS shall be designated by IMCOH on rotational basis annually.

III. National AMR Technical Committee (NATC)

The NATC will function as a national steering committee for the AMR.

Members:

1. Chairperson, National Medicine Committee (NMC)
2. Chairperson, National Veterinary Medicine Committee (NVMC)
3. Chief Regulatory Officer, Drug Regulatory Authority (DRA)
4. Medical Superintendent, JDWNRH
5. Chief, HCDD, DMS
6. Chief, Animal Health Division, DOL
7. Program Director, NCAH, DOL
8. Chief, Analytical and Certification (ACD), BAFRA
9. Head, RCDC
10. Co-opt members as and when required

Terms of References NATC:

1. Shall provide technical advice to the IMCOH on the matters related to AMR;
2. Shall review and approve the AMR work plan;
3. Shall review and provide decisions on the recommendations made by the AMR TWG;
4. Shall review, assess and provide guidance on the implementation of NAAP including Fleming fund country grant;
5. Shall assess and approve the TORs, SOPs and guidelines developed by the AMR Technical Working Group;
6. Shall identify and strengthen collaboration between relevant sectors;
7. Submit proposals requiring policy interventions to IMCOH
8. Shall carry out any specific tasks assigned by IMCOH.

Operational mechanism for NATC

- NATC shall convene on quarterly basis
- The members shall elect chair and vice chair by majority vote on annual basis
- The meeting shall convene only when 2/3rd of the members are present
- The chair shall invite co-opt members based on agenda and relevance
- National AMR Program shall function as secretariat to the NATC

IV. AMR Technical Working Group (TWG)

TWG for AMR shall comprise of technical experts from relevant different sectors, both from the human and animal health. They shall function as a technical advisory group for the National AMR Technical Committee. The TWG shall advise and provide technical recommendations to NATC.

Members of AMR TWG from Human Health

1. Microbiologist, Microbiology Unit, JDWNRH
2. Pharmacologist, AMSP, JDWNRH
3. Pharmacist, Pharmacy Department, JDWNRH
4. Laboratory Officer, JDWNRH
5. Microbiologist, RCDC, DoPH, MOH
6. Epidemiologist, RCDC, DoPH, MoH
7. Regulatory Officer, DRA
8. Co-opt member

Members of AMR TWG from Animal Health

1. Microbiologist, NCAH
2. Representative, NVH, Thimphu
3. Epidemiologist, NCAH
4. AMR focal Person, NCAH
5. Representative from Animal Health Division
6. Livestock Section, BAFRA
7. Microbiologist, NFTL, BAFRA
8. Co-opt members

Terms of Reference for AMR TWG

1. Shall review and/or revise and develop TORs, SOPs and guidelines related to AMR activities
2. Shall provide technical recommendation and support to the NATC and National AMR program on matters related to AMR
3. Shall provide technical support to National AMR program
4. Shall develop, review and recommend study designs and methodologies for AMR research/ studies.
5. Shall consolidate and interpret study findings and provide recommendations to formulate policies and strategies to address the AMR issues;
6. Shall support resource and data sharing with relevant sectors to strengthen OH approach in the field of AMR
7. Shall carry out any specific tasks assigned by NATC

Operational mechanism for AMR TWG

1. Technical Working Group meeting shall convene on quarterly basis
2. The members shall elect chair and vice chair by majority vote on annual basis
3. The meeting shall convene only when 2/3rd of the members are present
4. The chair shall invite co-opt members based on agenda and relevance
5. National AMR Program shall function as secretariat to the AMR TWG Committee

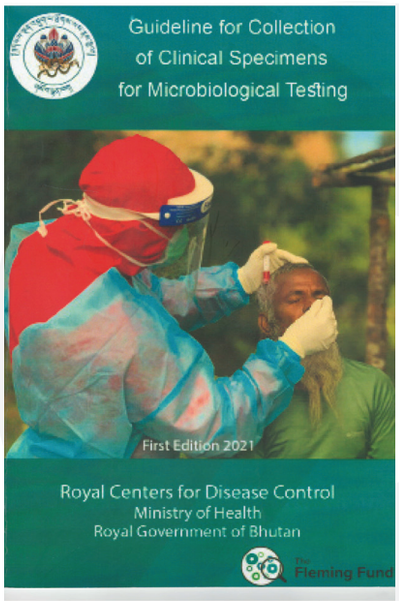
List of Laboratory Equipment and Consumables supported by Fleming Fund through International Procurement Agency (IPA)

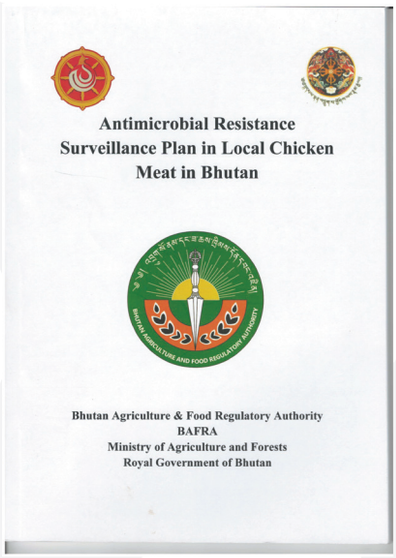
Sl.No	Name of Equipment/Consumables	Surveillance Site	Qty.	Surveillance Site	Qty.	Surveillance Site	Qty.	Surveillance Site	Qty.	Surveillance Site	Qty.	Surveillance Site	Qty.	Surveillance Site	Qty.	Surveillance Site	Qty.	Surveillance Site	Qty.
1	Filtered air drying cabinet (hot oven)	JDWNRH, Thimphu	0	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	1
2	Cryoblock	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	1
3	Freeze dryer (Lyophilizer)	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	4	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
4	Dessicator (+ silical gel or equivalent dessicant)	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	0
5	Box, UN 6.2, Pathoshield P4	JDWNRH, Thimphu	10	CRRH, Gelephu	80	RCDC, Thimphu	0	ERRH, Mongar	80	PGH, P/ling	0	RVH&EC, Pling	20	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
6	Light microscope	JDWNRH, Thimphu	2	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
7	Bunsen burner(s)	JDWNRH, Thimphu	2	CRRH, Gelephu	2	RCDC, Thimphu	2	ERRH, Mongar	2	PGH, P/ling	2	RVH&EC, Pling	2	NCAH, Thimphu	3	RLDC, Kanglung	2	NFTL, Yusipang	2
8	Loop Sterilizer	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	2	RLDC, Kanglung	1	NFTL, Yusipang	1
9	Hotplate (for drying slides)	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
10	Hotplate (for drying slides)	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
11	Stainless Steel PetriDish Can	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	1	PGH, P/ling	0	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	1
12	Benchtop nephelometer with appropriate tubes	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	1
13	Doubel distillation system	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	1
14	Conductivity meter portable	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	1
15	Water bath	JDWNRH, Thimphu	0	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	0
16	Laboratory glass washer	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	1
17	Analytic balance (readability 0.01g)	JDWNRH, Thimphu	0	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
18	Precision balance (readibility 0.001g)	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
19	Hot plate stirrer	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	0
20	PH meter	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	1
21	Cayboy for dispensing distilled water	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	1	NCAH, Thimphu	1	RLDC, Kanglung	1	NFTL, Yusipang	1
22	Mechanical single channel micropipettes	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	1
23	Automatic pipette controller	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	5	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
24	Counting chamber	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
25	Calliper	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	1	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
26	Microwave oven for media preparation	JDWNRH, Thimphu	1	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	1	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
27	KIT DENSICHEK PLUS INSTRUMENT/STANDARDS	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
28	VITEK 2 COMPACT 60	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
29	SAMSUNG SL-M4020ND 230V PRINTER	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
30	ARROW-APC SMT-1500 UPS 230V	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
31	KIT VTK RP5810 8.01 MEDIA	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
32	CD, V2S 8.01 USER DOCUMENTATION, W3	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
33	ARROW-MONITOR HP E202	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
34	VK2 OBSERVA HONEYWEL 1400G BCR	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
35	BACT ALERT 3D	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
36	SAMSUNG SL-M4020ND 230V PRINTER	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
37	VITEK MS INSTRUMENT	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
38	ELOTOUCH ET1502L TOUCHSCREEN	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
39	ARROW MONITOR HP E202	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
40	ARROW UPS SMART APC 2200VA 230V	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
41	VC MYLA PC	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
42	69285 - UNSENSITIZED TUBES 1X2000	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
43	93059 - DENSICHEK CALIBRATION STANDARD	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
44	V1200 - SMALL DISPENSER 1	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0

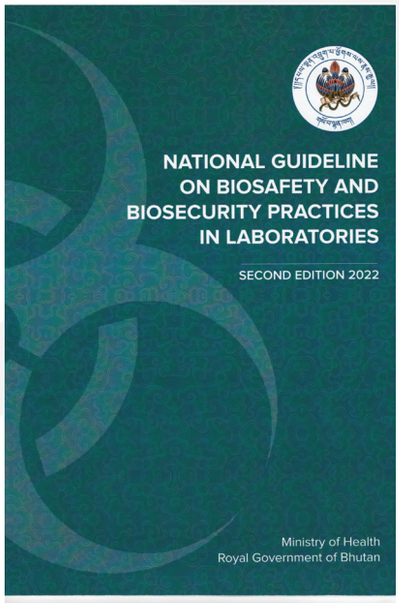
45	V1204 - SALINE SOLUTION 3X500ML	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	1	RLDC, Kanglung	0	NFTL, Yusipang	0
46	414534 - AST - P628 TEST KIT 20 CARDS	JDWNRH, Thimphu	10	CRRH, Gelephu	0	RCDC, Thimphu	12	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	15	RLDC, Kanglung	0	NFTL, Yusipang	0
47	423864 - AST - N405 TEST KIT 20 CARDS	JDWNRH, Thimphu	10	CRRH, Gelephu	0	RCDC, Thimphu	25	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	15	RLDC, Kanglung	0	NFTL, Yusipang	0
48	423869 - AST - N406 TEST KIT 20 CARDS	JDWNRH, Thimphu	10	CRRH, Gelephu	0	RCDC, Thimphu	25	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	15	RLDC, Kanglung	0	NFTL, Yusipang	0
49	423870 - AST - N407 TEST KIT 20 CARDS	JDWNRH, Thimphu	10	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
50	420739 - AST-YS08 TEST KIT 20 CARDS	JDWNRH, Thimphu	5	CRRH, Gelephu	0	RCDC, Thimphu	2	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	2	RLDC, Kanglung	0	NFTL, Yusipang	0
51	421040 - AST-ST03 TEST KIT 20 CARDS	JDWNRH, Thimphu	2	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
52	21341 - GN TEST KIT VTK2 20 CARDS	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	25	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	15	RLDC, Kanglung	0	NFTL, Yusipang	0
53	21342 - GP TEST KIT VTK2 20 CARDS	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	12	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	15	RLDC, Kanglung	0	NFTL, Yusipang	0
54	21343 - YST TEST KIT VTK2 20 CARDS	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	2	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	2	RLDC, Kanglung	0	NFTL, Yusipang	0
55	21345 - BCL TEST KIT VTK2 20 CARDS	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
56	21346 - NH TEST KIT VTK2 20 CARDS	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	1	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
57	21347 - ANC TEST KIT VTK2 20 CARDS	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
58	410893 - VITEK MS - DS	JDWNRH, Thimphu	20	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
59	411071 - VITEK MS - CHCA	JDWNRH, Thimphu	10	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
60	411072 - VITEK MS- FA	JDWNRH, Thimphu	1	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
61	411721 - VITEK - MS SILICA ORANGE GEL	JDWNRH, Thimphu	3	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
62	0483P - E COLI ATCC 8739	JDWNRH, Thimphu	2	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
63	Hekteon Enteric Agar	JDWNRH, Thimphu	77	CRRH, Gelephu	0	RCDC, Thimphu	13	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
64	Muller Hinton broth	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	10	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
65	Muller Hinton Agar II	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	10	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
66	Bact/Alert FA Plus	JDWNRH, Thimphu	0	CRRH, Gelephu	5 (Boxes)	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
67	Back/Alert FN Plus	JDWNRH, Thimphu	0	CRRH, Gelephu	5 (Boxes	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
68	Bact/Alert PF Plus	JDWNRH, Thimphu	0	CRRH, Gelephu	5 (Boxes)	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
69	MacConkey Agar (MAC)	JDWNRH, Thimphu	0	CRRH, Gelephu	9	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	10	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
70	Nutrient Agar	JDWNRH, Thimphu	0	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
71	Blood Agar Base	JDWNRH, Thimphu	0	CRRH, Gelephu	15	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	10	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
72	Mueller Hinton Agar (MHA)	JDWNRH, Thimphu	0	CRRH, Gelephu	15	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	10	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
73	Tryptone (Trypticase) Soy agar (TSA)	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
74	Triple Sugar Iron Agar (TSI)	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
75	Buffered Peptone Water Broth	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
76	C.L.E.D	JDWNRH, Thimphu	0	CRRH, Gelephu	8	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	5	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
77	Sodium Hydroxide Solution 1M (1N)	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	3	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
78	Hydrocholric Acid, 37%	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
79	NaCL	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
80	Glycerol	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
81	DMSO	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	3	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
82	hydrogen peroxide (H202)	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
83	Gram Stain kits	JDWNRH, Thimphu	0	CRRH, Gelephu	30	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	12	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
84	McFarland Equivalence Turbidity Standard Set	JDWNRH, Thimphu	0	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
85	rabbit plasma	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
86	staphaurex Disposable reaction card or equivalent	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	4	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
87	Optochin discs	JDWNRH, Thimphu	0	CRRH, Gelephu	5	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	4	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
88	Lancefield grouping kit	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
89	Novobiochin disc	JDWNRH, Thimphu	0	CRRH, Gelephu	5	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
90	Oxidase strips	JDWNRH, Thimphu	0	CRRH, Gelephu	22	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	11	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
91	Indole (Kovac's reagent)	JDWNRH, Thimphu	0	CRRH, Gelephu	5	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
92	API 20E	JDWNRH, Thimphu	0	CRRH, Gelephu	5	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	5	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0

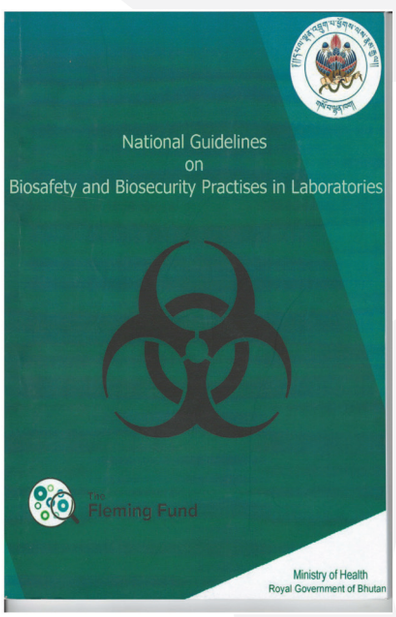
93	Salmonella Polyvalent 0	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
94	Salmonella Polyvalent H	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
95	Typhi Vi Standard Serum	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
96	Haemophilus Test Medium (HTM)	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
97	X-factor	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
98	V-factor	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
99	X+V factors	JDWNRH, Thimphu	0	CRRH, Gelephu	3	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
100	Disk dispenser	JDWNRH, Thimphu	0	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
101	Ampicillin (AMP)	JDWNRH, Thimphu	0	CRRH, Gelephu	8	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	5	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
102	Oxacillin (OX)	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
103	Benzylpenicillin	JDWNRH, Thimphu	0	CRRH, Gelephu	4	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
104	Cefoxitin (FOX)	JDWNRH, Thimphu	0	CRRH, Gelephu	6	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
105	Ceftriaxone (CRO)	JDWNRH, Thimphu	0	CRRH, Gelephu	10	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	4	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
106	Cefotaxime (CTX)	JDWNRH, Thimphu	0	CRRH, Gelephu	4	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
107	Ceftazidime (CAZ)	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
108	Cefixime (CFX)	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
109	Cefepime (FEP)	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
110	Ertapenem (ETP)	JDWNRH, Thimphu	0	CRRH, Gelephu	1	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
111	Meropenem (MEM)	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
112	Azithromycin (AZM)	JDWNRH, Thimphu	0	CRRH, Gelephu	2	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
113	Gentamicin (GEN)	JDWNRH, Thimphu	0	CRRH, Gelephu	6	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	3	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
114	Amikacin (AMK)	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
115	Tigecycline (TGC)	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
116	Cotrimoxazole (SXT)	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
117	Ciprofloxacin (CIP)	JDWNRH, Thimphu	0	CRRH, Gelephu	6	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	3	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
118	Combination antibiotics for ESBL-Ceftriaxone	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
119	*E.coli* ATCC® 25922	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	1	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
120	E.coli ATCC® 35218	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
121	*K. pneumoniae* ATCC® 700603	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
122	*P. aeruginosa* ATCC® 27853	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
123	S. aureus ATCC® 29213	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
124	S. aureus ATCC® 43300	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
125	E. faecalis ATCC® 29212	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
126	S. pneumoniae ATCC® 49619	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
127	H. influenza A TCC 49766	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	3	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
128	Staphylococcus aureus ATCC 25923	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	2	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
129	autoclave tape	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0
130	swabs (for MH plate)	JDWNRH, Thimphu	0	CRRH, Gelephu	0	RCDC, Thimphu	0	ERRH, Mongar	0	PGH, P/ling	0	RVH&EC, Pling	0	NCAH, Thimphu	0	RLDC, Kanglung	0	NFTL, Yusipang	0

Documents Developed



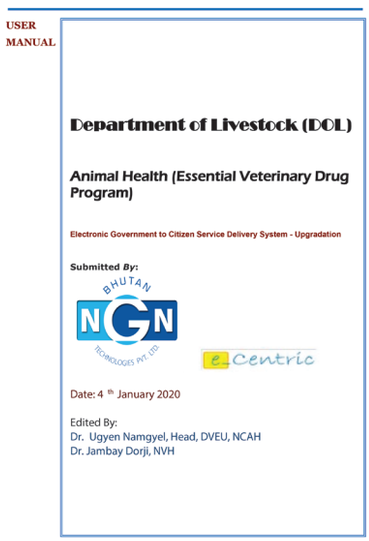


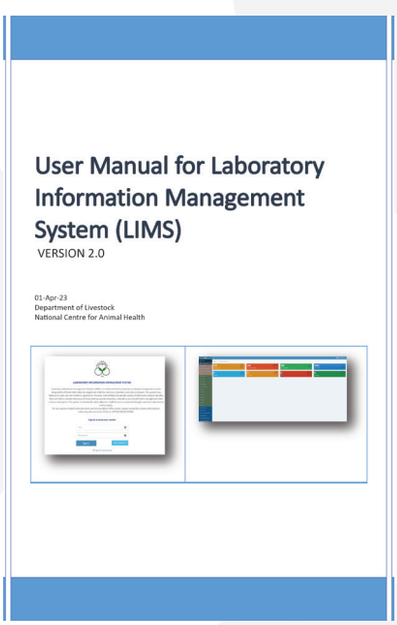


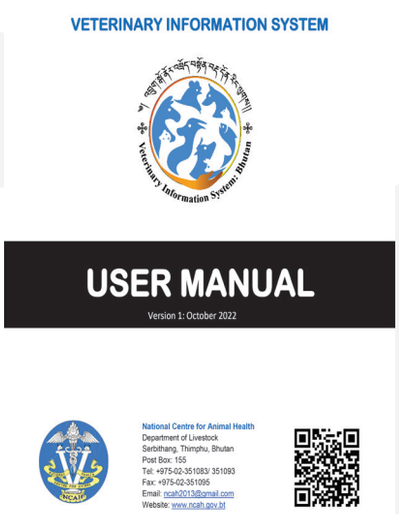


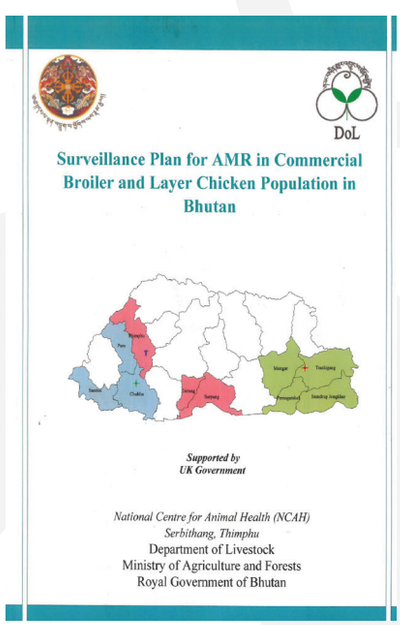
National AMR surveillance guideline

2020









NATIONAL CENTRE FOR ANIMAL HEALTH,
NATIONAL VETERINARY LABORATORY,
MICROBIOLOGY: BACTERIOLOGY

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SOP No.	Title	Version No.	Total Pages
NCAH/LAB/BACTO 37	SOP on Antimicrobial disk susceptibility tests	2	7

Issue Date	Effective Date	Review Period

Function	Name	Designation	Signature
Prepared by	Puspa M Sharma	Deputy Chief Laboratory Officer	
Verified by	N.K Thapa	Head, LSU	
Approved by	Sangay Rinchen	Offtg. Program Director, NCAH	

Distribution:	
Location	Bacteriology section, NCAH

REVISION SUMMARY

Version No	Effective Date	Reason for Change	Details of the change
02		Original release	• Antimicrobial panels revised based on animal species • Revision in scope, objective, method and result Interpretation as per CLSI M02, 2018

Document Type: Standard Operating Procedure	**Issue No:**
Document No: NCAH/NVL/BACTO 37	**Issue Date:** 19th of June 2023
Supersedes Version No:02	**Page No:** Page 1 of 9

Microbiology Unit
Department of Pathology & Laboratory Medicine
Gelephu Central Regional Referral Hospital
Sarpang, Bhutan

CLINICAL MICROBIOLOGY LABORATORY QUALITY MANUAL
1st Draft
As per ISO 15189: 2012

Department of Pathology & Laboratory Medicine, GCRRH
Sarpang, Bhutan

Royal Government of Bhutan
Ministry of Agriculture and Forests
Bhutan Agriculture and Food Regulatory Authority (BAFRA)
National Food Testing Laboratory

Revision 00	Standard Operating Procedure (SOP) on Sampling of Local Chicken from the Meat shop	NFTL/SOP/Sampling/7.3/01

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Issue Date	Effective Date	Review Period
01-09-2020	01-09-2020	01-09-2022

Function	Name	Designation	Signature
Prepared by	Mr. Anil Rai	Sr. Laboratory officer	
Verified by	Ms. Dechen Wangmo	Officer In-charge	
Approved by	Mr. Jamyang Phuntsho	Chief, Food Safety and Quality Division	

Distribution:	
Location	Microbiology Laboratory, NFTL

REVISION SUMMARY

Version No	Effective Date	Reason for Change	Details of the change
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Document No: NFTL/SOP/Sampling/7.3/01	**Issue Date:** 1st September, 2020
Supersedes Version No:	**Page No:** Page 1 of 6

Royal Government of Bhutan
Ministry of Agriculture and Forests
Bhutan Agriculture and Food Regulatory Authority (BAFRA)
National Food Testing Laboratory

Revision 00	Quality Operating Procedure (QOP) *Isolation & Identification of Campylobacter Spp.*	NFTL/SOP/MICRO/7.2/22

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Issue Date	Effective Date	Review Period
01-08-2020	01-08-2020	01-08-2022

Function	Name	Designation	Signature
Prepared by	Mr. Anil Rai Dr. Kinley Penjor	Sr. Laboratory officer Sr. Regulatory and Quarantine Officer	
Verified by	Ms. Dechen Wangmo	Officer In-charge	
Approved by	Mr. Jamyang Phuntsho	Chief, Food Safety and Quality Division	

Distribution:	
Location	Microbiology Laboratory, NFTL

REVISION SUMMARY

Version No	Effective Date	Reason for Change	Details of the change
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Document Type: Standard Operating Procedure	**Issue No:**
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Supersedes Version No:	**Page No:** Page 1 of 12

Royal Government of Bhutan
Ministry of Agriculture and Forests
Bhutan Agriculture and Food Regulatory Authority (BAFRA)
National Food Testing Laboratory

Revision 00	SOP for *Isolation & Identification of Salmonella spp.*	NFTL/SOP/MICRO/7.2/24

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Approved by	Mr. Jamyang Phuntsho	Chief, Food Safety and Quality Division.	

Distribution:	
Location	Microbiology Laboratory, NFTL

REVISION SUMMARY

Version No	Effective Date	Reason for Change	Details of the change
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Document Type: Standard Operating Procedure	**Issue No:**
Document No: NFTL/SOP/MICRO/7.2/24	**Issue Date:** 1st August 2020
Supersedes Version No:	**Page No:** Page 1 of 10

NATIONAL CENTRE FOR ANIMAL HEALTH,
NATIONAL VETERINARY LABORATORY,
MICROBIOLOGY: BACTERIOLOGY

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Document Type: Standard Operating Procedure	**Issue No:**
Document No: NCAH/NVL/BACTO 37	**Issue Date:** 19th of June 2023
Supersedes Version No:02	**Page No:** Page 1 of 9

Royal Government of Bhutan
Ministry of Agriculture and Forests
Bhutan Agriculture and Food Regulatory Authority (BAFRA)
National Food Testing Laboratory

Revision 00	SOP for *Isolation & Identification of Escherichia coli*	NFTL/SOP/MICRO/7.2/25

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Royal Government of Bhutan
Ministry of Agriculture and Forests
Bhutan Agriculture and Food Regulatory Authority (BAFRA)
National Food Testing Laboratory

Revision 00	SOP for *Isolation & Identification of Enterococcus Spp.*	NFTL/SOP/MICRO/7.2/23

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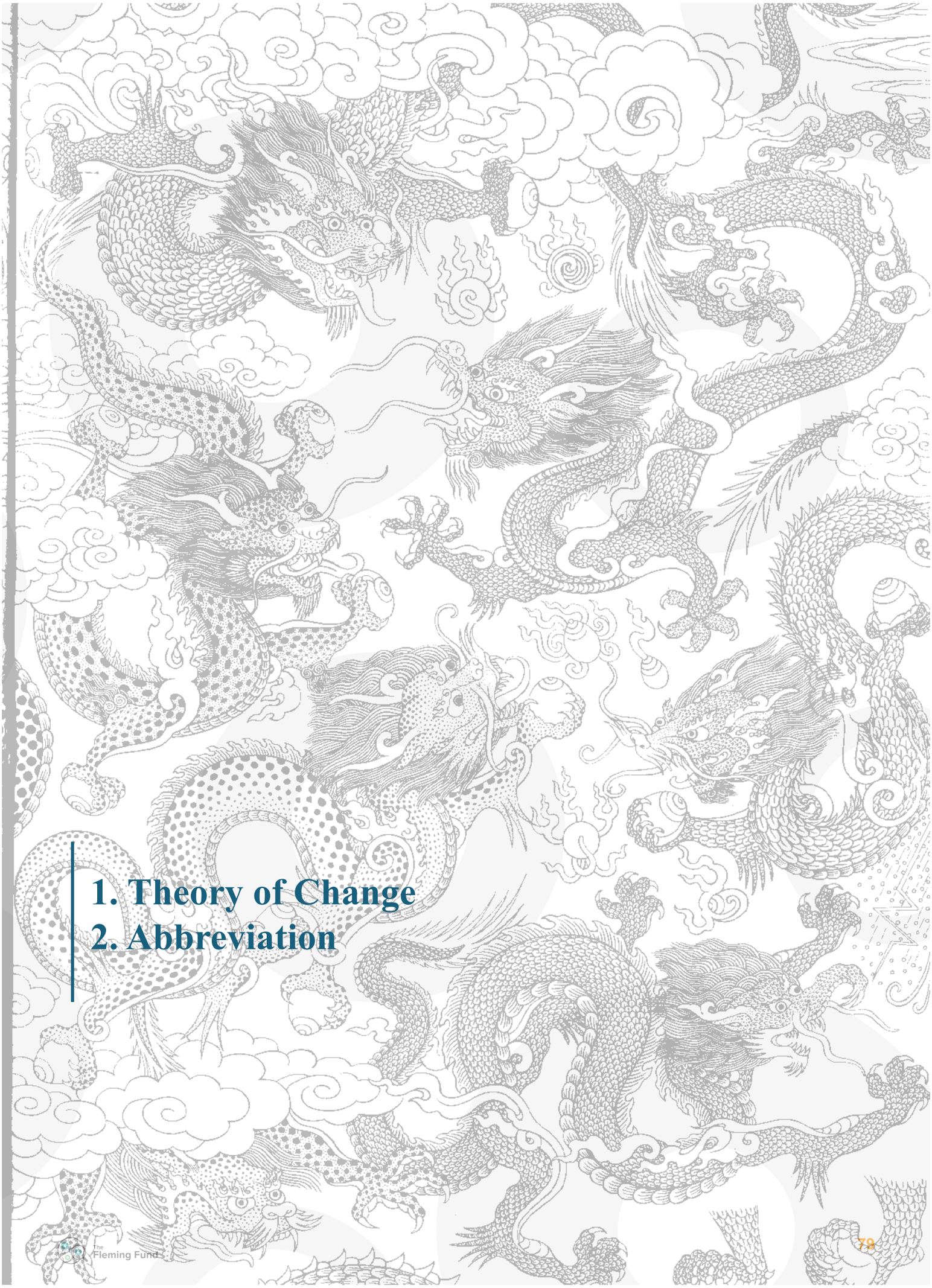
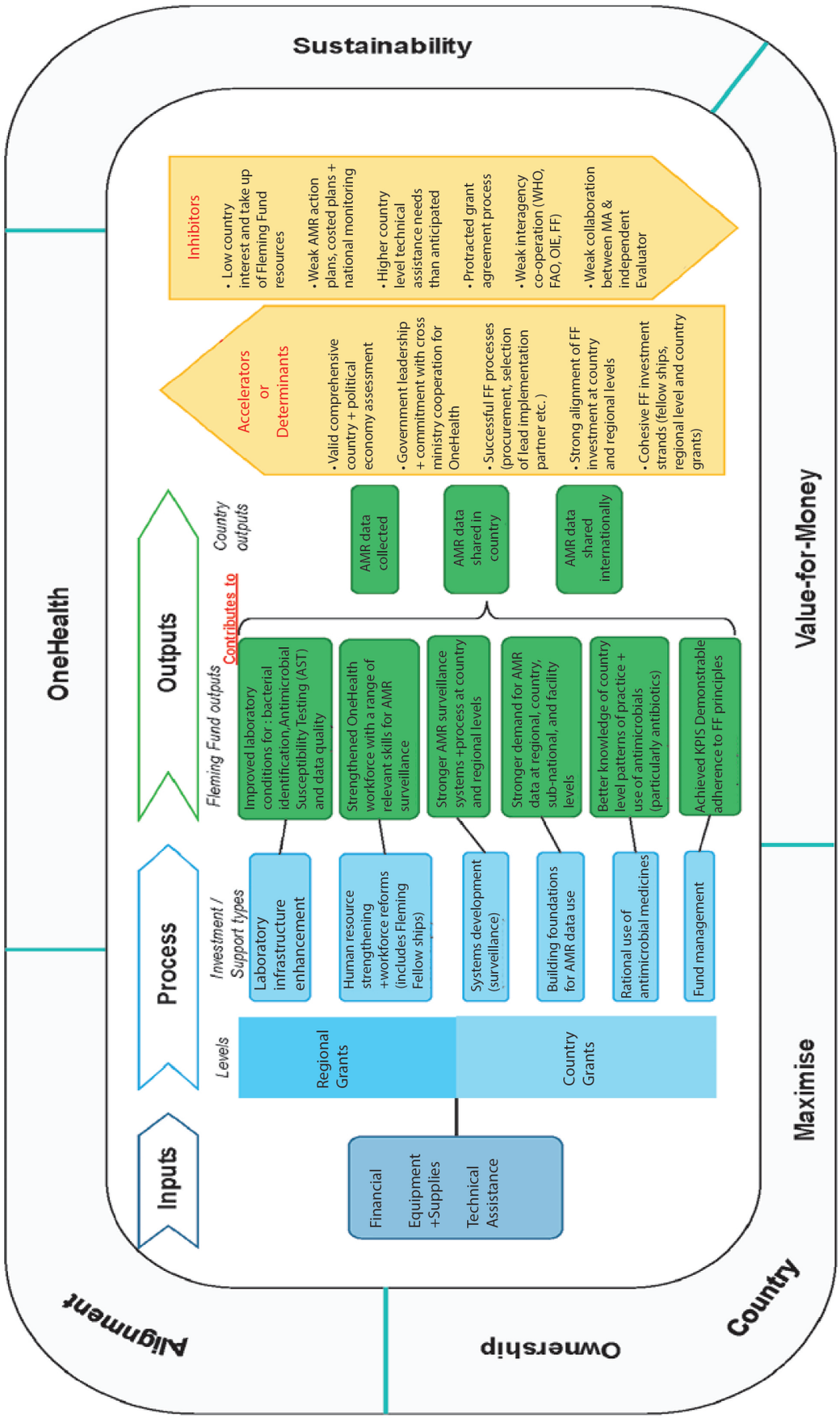
Document No: NFTL/SOP/MICRO/7.2/23	**Issue Date:** 1st August 2020
Supersedes Version No:	**Page No:** Page 1 of 8

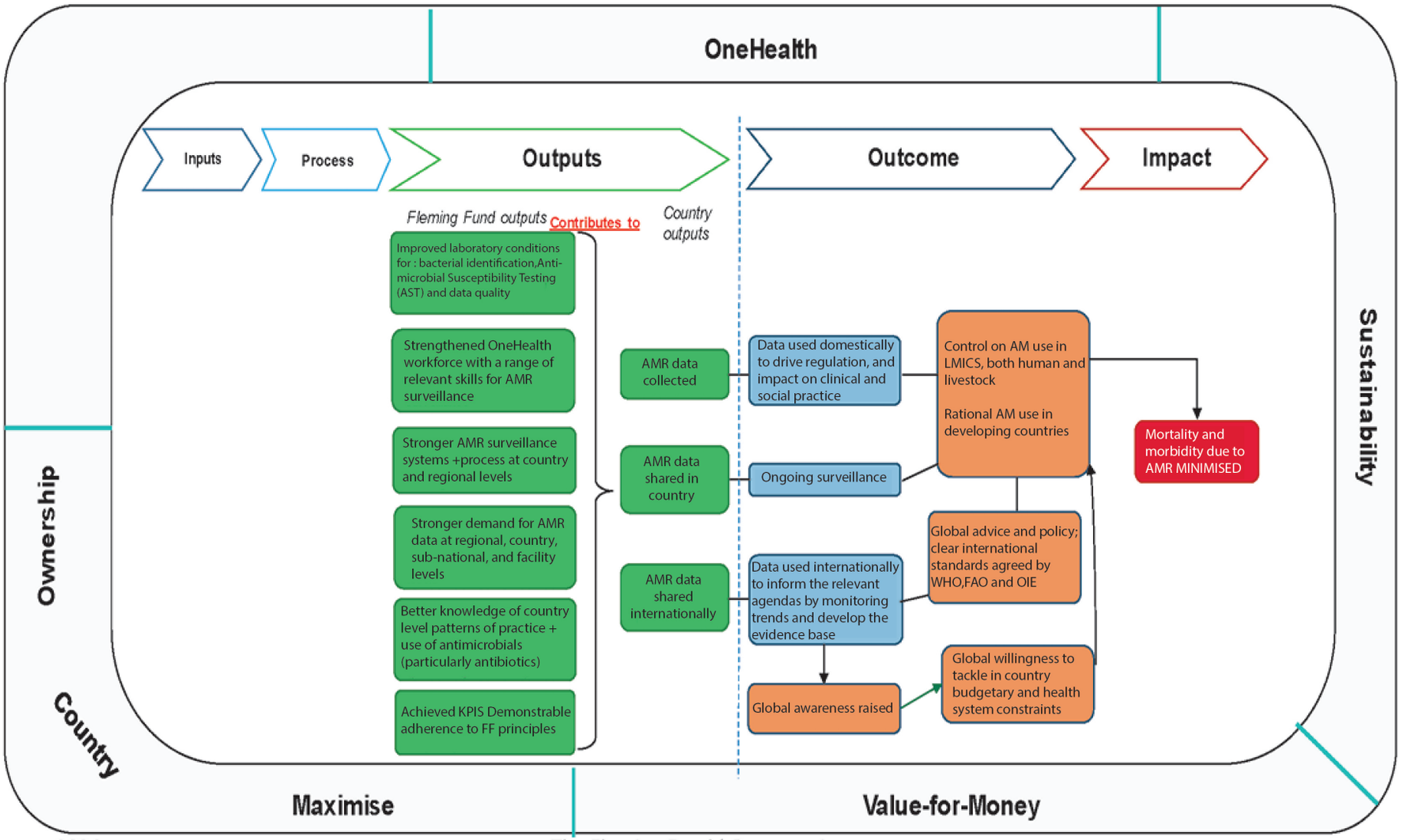
Abbreviation



1. Theory of Change
2. Abbreviation

Theory of Change





Abbreviation

AH	Animal Health
AMC	Antimicrobial Consumption
AMR	Antimicrobial Resistance
AMU	Antimicrobial Use
BAFRA	Bhutan Agriculture and Food Regulatory Authority
BMED	Bachelors of Biomedicine
CME	Continuous Medical Education
DoL	Department of Livestock
DTIP	Detailed Technical Implementation Plan
EQA	External Quality Assurance
HH	Human Health
IATA	International Air Transportation Association
ICU	Intensive Care Unit
IEC	Information education and Communication
IEQAS	International External Quality Assurance Scheme
IMCOH	Inter-Ministerial Committee
KAP	Knowledge, Attitudes and Practices
LIMs	Laboratory Information Management System
LMICs	Low- and Middle-income Countries
LQMS	Laboratory Quality Management System
MDRO	Multidrug-resistant Organisms
NAP	National Action Plan
NAPS	National Antibiotics Prescription Survey
NATC	National AMR Technical Committee
NCAH	National Centre for Animal Health
NCC	National Coordination Centre
NEQAS	National External Quality Assessment Scheme
NFTL	National Food Testing Laboratory
NVL	National Veterinary Laboratory
OH	One Health
OPD	Outpatient Department
PMU	Project Management Unit
PPS	Point Prevalence Survey
RCDC	Royal Centre for Disease Control
RLDC	Regional Livestock Development Center
RVLs	Rice Virtual Lab in Statistics
SOPs	Standard Operating Procedure
ToRs	Terms of Reference
TWG	Technical Working Group
VIS	Veterinary Information System
WHO	World Health Organization