

Terms of Reference for Request for Proposals

First Fleming Fund Country Grant to the United Republic of Tanzania

1 Overview of this grant

This is a Request for Proposals (RFP) for the first Country Grant to address critical gaps in surveillance of antibiotic-resistant bacteria in the United Republic of Tanzania. It has been created in response to a Request for Support from the Tanzanian Government. The grant will be funded by the UK Department of Health and Social Care, under its Fleming Fund Grants Programme, which is managed by Mott MacDonald, the Management Agent.

This first Fleming Fund Country Grant for Tanzania will significantly contribute to the implementation of Strategic Objective 2 of the National Action Plan on Antimicrobial Resistance: Strengthen the Knowledge and Evidence Based through Surveillance and Research¹. The Grant will focus on putting in place the foundations for antimicrobial resistance (AMR) and antimicrobial use (AMU) surveillance in the human and animal health sectors. It will facilitate a stronger One Health approach to surveillance bringing together multi-sectoral stakeholders to share surveillance data and gain a better understanding of AMR and AMU.

In the human health sector the grant will invest in the development and implementation of an AMR and AMU surveillance system, aligned with investments by other donors such as the American Society of Microbiologists (ASM) and the World Health Organization (WHO). In the animal health sector the grant will align with investments by the Food and Agriculture Organization (FAO) of the United Nations.

The Grantee will be responsible to Mott MacDonald for all aspects of the grant, including the management of any partners, their performance, technical delivery and financial accountability. The Grantee will be expected to sign the Grant Agreement and will be expected to enter into sub-granting arrangements with partners on the same back-to-back terms.

The Grantee will need to work in close coordination with the National Multi-sectoral Coordinating Committee (MCC) for AMR as well as Mott MacDonald and other national stakeholders. The Grantee will also be required to harmonise efforts on this Country Grant with other types of grants under the Fleming Fund Grants Programme, namely Regional Grants and the Fleming Fellowship Scheme.

This grant is expected to last 18 months, and subsequent grants may be made available for later years. Support to Tanzania is expected to be for up to three years in total. The initial grant application is expected to be in the region of £1-2 million, including all capital and recurrent costs, overheads and management costs.

¹ National Action Plan on Antimicrobial Resistance (2017 – 2022). The United Republic of Tanzania. Ministry of Health Community Development Gender Elderly and Children in collaboration with WHO and Ministry of Agriculture, Livestock and Fisheries. Dated April 2017.

2 Overview of the Fleming Fund

2.1 Introduction

The UK Government has established the Fleming Fund to respond to the global threat of drug-resistant infections, also known as antimicrobial resistance (AMR). The Fleming Fund will be a critical tool in achieving the resolution of the 68th World Health Assembly, 2015 (WHA A68/20), and in realising the ‘Political Declaration of the High-Level Meeting of the United Nations General Assembly (UNGA) on Antimicrobial Resistance, 2016’. These recognise that urgent cross sectoral rationalisation of antibiotic use and prevention and control of infections in humans, animals, food, agriculture, and aquaculture sectors are key to tackling AMR and calls for innovative research and development; affordable and accessible antimicrobial medicines and vaccines; improved surveillance and monitoring; increased governance on antimicrobial use; and increased international cooperation to control and prevent AMR.

The Fleming Fund aims to address critical gaps in surveillance of antibiotic-resistant bacteria in low- and middle-income countries (LMICs) in Asia and Sub-Saharan Africa. Countries in these areas are set to bear the highest burden of antibiotic-resistant infections. A Global Action Plan on Antimicrobial Resistance (AMR) has been developed by the World Health Organization which acts as the blueprint for a multi-stakeholder global response to averting a global health crisis caused by AMR.²

The Fleming Fund comprises a number of workstreams. One workstream provides support to the Tripartite Alliance – the Food and Agriculture Organization (FAO), the World Organisation for Animal Health (OIE) and the World Health Organization (WHO) – as part of the ‘One Health’ approach. Through funding to the Tripartite Alliance, the Fleming Fund has contributed to the development of National Action Plans in Sub-Saharan Africa, South and South-East Asia, and to the building of the evidence base and guidance for AMR surveillance. This work will be critical for the overall success of the Fleming Fund Grant Programme and underpins the delivery of the portfolio of Country and Regional Grants, as these will target capacity gaps identified in National Action Plans. The Fleming Fund also funds initiatives in academic institutions to develop guidance on the development of AMR surveillance systems.

The Fleming Fund Grants Programme is the largest stream of financial support available through the wider Fleming Fund. The UK Department of Health and Social Care has appointed Mott MacDonald as the Fleming Fund Management Agent for the Fleming Fund Grants Programme. Mott MacDonald is a global company with expertise in multi-sectoral international development and fund management. On behalf of the UK Government, Mott MacDonald is responsible for funding allocation and oversight of all investments made across the whole portfolio of grants in different activities in different countries.

The aim of the Fleming Fund Grants Programme is to improve the ability of recipient countries to diagnose drug-resistant infections, with an emphasis on antibiotics, and improve data and surveillance, to inform policy and practice at national and international levels. The overall goal is to avert the human and economic burden of AMR.

The geographic focus of the Fleming Fund Grants Programme is 20-24 LMICs from Sub-Saharan Africa, and South and South-East Asia. It will provide financial support over a five-year period from 2017 to 2021 to participating countries via three funding channels:

- Country Grants
- Fleming Fellowship Scheme Grants
- Regional Grants

Resources may also be available to conduct Operational Research on selected topics within these funding channels. These studies will provide an opportunity to better examine implementation ‘blockages’ or

² <http://www.who.int/antimicrobial-resistance/global-action-plan/en/>

undertake more detailed case study analysis in themes of interest (e.g. value-for-money) for programme learning and adaptation purposes.

The Fleming Fund will be independently evaluated and Itad, a specialist evaluation firm, has been appointed by the UK Department of Health and Social Care for this purpose.

2.2 Problem statement to be addressed by the Fleming Fund

The main issues to be addressed by Fleming Fund Country Grants are outlined below:

- There are too few trained microbiologists to undertake the volume of testing required for representative surveillance on AMR.
- There are few health facilities that routinely undertake bacterial culture; still fewer facilities that meet the requirements for accreditation, or who do routine antimicrobial drug susceptibility tests.
- Routine AMR surveillance in healthcare delivery is not practised or there is no culture of surveillance for AMR in healthcare delivery and there are barriers to developing it.
- There is little perceived use of surveillance data on any level including low demand for the data from decision- and policy- makers.
- There is a lack of knowledge on the use and consumption of antimicrobial agents across One Health sectors.
- There is a lack of antimicrobial stewardship.
- Logistical challenges are significant – transporting samples in a safe and secure manner under challenging transport conditions; ensuring a quality assured and sustained supply chain for reagents and consumables; and ensuring appropriate servicing of equipment are a few examples.
- Surveillance systems (national, regional and global) that do exist are often vertical in nature, are not linked, and are often unwilling to integrate.
- There are weak One Health structures and inadequate inter-sectoral collaboration.
- There is a heterogeneous picture across countries and regions in terms of starting points, political will, capability and donor interest and engagement.
- There are inadequately defined and applied quality assurance standards in laboratory testing.
- There is limited understanding from basic surveillance of pathogens on transmission patterns and drivers such as inappropriate use of antimicrobial drugs across all sectors.

2.3 Fleming Fund investment areas and outputs

To address the problems above, the Fleming Fund Grants Programme will invest in:

- Laboratory infrastructure enhancement.
- Human resource strengthening and workforce reforms.
- Surveillance systems strengthening.
- Building foundations for AMR surveillance data use.
- Promoting rational use of antimicrobial medicines.

Investment in these areas is expected to achieve the following outputs:

- Improved laboratory skills and conditions for bacterial identification and Antimicrobial Susceptibility Testing (AST); and therefore, improved data quality.
- Strengthened One Health workforce with a range of relevant skills for AMR surveillance.
- Stronger AMR surveillance systems and processes at country and regional levels.
- Stronger demand for AMR data at regional, country, sub national and facility levels.
- Better knowledge of country level patterns of practice and use of antimicrobials (particularly antibiotics) across sectors.

Fleming Fund outputs are expected to contribute to the following country outputs:

- Increase in quality and quantity of AMR data collected.
- AMR data shared in country to support evidence based policy and practice.
- AMR data to support the basis for sustained awareness campaigns in the future on AMR/AMU at country level.
- AMR data shared internationally to improve and inform the global response.

The RFPs for Country Grants have been designed to ensure that investments and activities contribute directly to outputs. Grantees are expected to adhere to and demonstrate this alignment and contribution to outputs in their applications.

2.4 Core principles within the Fleming Fund Grants Programme

The Fleming Fund is built on four core principles. Grantees are expected to demonstrate how they will align with these principles while implementing the grant.

- 1) Country Ownership:** The Fleming Fund Grants Programme will work closely with national governments to ensure that country plans and aspirations, as laid out in their National Action Plans, are implemented; will consult and work hand-in-hand with national governments to agree the approach and ensure sustainability. Grants and RFPs will conform to national priorities outlined in the National Action Plan and as articulated during Country Assessment visits. Unless there are good reasons to do so, Fleming Fund grants will chiefly invest in public sector laboratories and surveillance systems, thereby supporting national public health systems.
- 2) One Health:** The Fleming Fund recognises that the problem of AMR is a great danger to human health and cannot be controlled without a One Health approach. A specific set of One Health investment parameters has also been developed and is summarised below. This approach is aligned with key documents and guidelines from OIE³ and FAO⁴ as well as the Global Action Plan.
 - a. Collaborative multi-sectoral governance of AMR:** Leadership and resourcing of AMR surveillance and mitigation measures in all sectors that contribute to the emergence of AMR.
 - b. Integrated AMR and antimicrobial use and consumption surveillance in all sectors:** Surveillance in humans, livestock, aquaculture, crops, food and the environment to produce information that is interpreted by multi-sectoral teams to help understand factors associated with AMR emergence within and between sectors
 - c. AMR mitigation policies and programmes prioritised across multiple sectors:** Evidence-based policies and programmes for AMR mitigation measures that are prioritised across the relevant sectors, based on information generated through AMR and AMU/C surveillance in all sectors.
- 3) Alignment of Approach:** The Fleming Fund Grants Programme will seek to invest in areas which complement and build on work done to date, rather than create new systems. Grant applicants will need to demonstrate that they understand other actors' work in the fields of improved laboratory capacity (both within and outside the sphere of AMR surveillance), improved disease surveillance, and the One Health approach. Mott MacDonald will assess grants for duplication of efforts and/or the development of parallel systems. To the extent possible, prospective Grantees will need to demonstrate how their proposals add value to existing and planned investments and systems. Although there are prescribed specific outputs, the lead grantee will be expected to apply flexibility

³ OIE Standards, Guideline and Resolution on Antimicrobial resistance and the use of antimicrobial agents;

⁴ The FAO Action Plan on Antimicrobial Resistance, 2016-2020.

and innovativeness in these outputs based on experience to deliver the expected outcome and contribute towards achievement of national action plans.

- 4) **Sustainability:** The Fleming Fund Grants Programme will focus assistance on national systems with a view to long-term sustainability. Investment size and scope should, as far as possible, be aligned with national government spending so that systems created with Fleming Fund grants are sustainable within the public health system. We also recognise that the public good of conducting AMR surveillance means medium- to long-term support, and it is expected that countries that demonstrate satisfactory performance will have access to additional funds to provide ongoing support.

2.5 Fleming Fellowship Scheme

The Fleming Fellowship Scheme is part of the broader Fleming Fund Grants Programme and is also managed by Mott MacDonald. Fellowships will provide grants to fund an 18-month programme of structured learning, mentoring and skills development for four to eight Fellows in each investment country. Rather than duplicate basic training, the Fellowships will focus on building advanced skills and leadership to promote the application of best practice in identified 'Beneficiary Institutions'. Beneficiary Institutions are organisations that add strategic value and complementarity to achieve the Fleming Fund's aims in the country and are likely to derive sustainable benefit from the Fellowship activities, such as AMR reference laboratories, national epidemiology units, hospitals and/or national drug administration agencies.

The initial focus will be on strengthening quality of laboratory diagnostic data and the analysis and use of AMR and AMU surveillance data in Beneficiary Institutions. The scheme will support individuals and institutions to build the sustainability of programmes that seek to address AMR. The data they generate will be applied to deliver evidence-based approaches to tackling AMR, for example to improve antimicrobial stewardship.

Each country's national AMR committee, with Mott MacDonald, will determine the priority areas to be supported through Fellowships and the Beneficiary Institutions under the Fellowship Scheme. Each Fellowship will be matched with a 'Host Institution' from a preselected pool. When these have been decided, the Fellowship application process will open. Following selection, each Fellow together with their Beneficiary and Host Institutions will develop a budgeted work plan which will be agreed and funded by the Fleming Fund through the Host Institution.

Activities will include mentoring, secondments, participation in collaborative projects and specialised training that will support the Fellows within their workplace. These institutions will also support Fellows' workplaces to allow Fellows to implement what they have learned.

We expect this process to run in parallel with the selection of the Grantee for the Country Grant, which will enable the Grantee and the Host Institutions to align their work programmes.

2.6 Fleming Fund activities in Tanzania to date

This is the first RFP for a Fleming Fund Country Grant to be released in Tanzania. In preparation for this grant Mott MacDonald carried out a Positioning Activities visit in April 2018 to understand and refine the design of AMR surveillance in humans and animals and conduct assessments of a small number of public health sentinel sites and veterinary laboratories. These positioning activities included support towards the development of a formal Request For Support (RFS) which involved working together with the secretariat and MCC to ensure that the sentinel sites chosen are representative of the AMR surveillance landscape in Tanzania. A discussion was held with WHO and FAO and other partners to understand their activities and ensure alignment.

Key stakeholders in the animal and human health sectors have been consulted throughout the process, including UN agencies and other development partners. This is to assist in alignment of Fleming Fund grant investments with other proposed activities. Positioning identified the priority gaps and needs for

strengthening AMR and AMU surveillance in humans and animals, identified other key stakeholders working in AMR and AMU surveillance, and informed agreement with the Tanzanian Government about grant objectives and outputs in line with Tanzania's National Action Plan for Antimicrobial Resistance.

3 The current AMR situation in Tanzania

3.1 National Action Plan for AMR

The Tanzanian National Action Plan (NAP) on Antimicrobial Resistance (2017 – 2022) was launched in April 2017⁵. Development of the NAP was coordinated by the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) (Pharmaceutical Services Unit) in collaboration with WHO and the Ministry of Livestock and Fisheries (MLF). The operational plan includes 10 priority activities to address five strategic objectives that align with the five priority actions in WHO's Global Action Plan on AMR. The monitoring and evaluation framework comprises indicators which will be measured in the process of implementation, with a midterm review planned for 2019 and an end of term evaluation in 2022.

A National Multi-Sectoral Coordinating Committee (MCC) on AMR is the national steering body that oversees and coordinates all AMR related activities in all sectors. The MCC meets quarterly to manage implementation of the NAP under the chairmanship of the Chief Medical Officer from MoHCDGEC. Membership of the MCC includes representatives from human, animal, plant and environment health as well as livestock and food production. Membership also includes the Prime Minister's Office One Health Coordination Desk and development partners and international organizations including the World Health Organization (WHO), Food and Agriculture Organization (FAO), US Centres for Disease Control and Prevention (CDC), Management of Science for Health (MSH) and World Organization for Animal Health (OIE) plus representatives from medical and agriculture universities.

The MCC is supported by a Secretariat which includes the national AMR focal points for the human and animal sectors, representatives from the Pharmaceutical Services Unit (PSU), the Epidemiology Unit and the National Health Laboratory and Quality Assurance Training Centre (NHLQATC) all under the MOHCDGEC as well as the Livestock Unit under the MLF.

The MCC has four technical working groups (TWGs) which are mandated with specific tasks including providing technical input, conducting situational analyses and development of the NAP in collaboration with the MCC. The four TWGs are:

- Awareness, effective communication and education
- AMR knowledge, surveillance, research and sustainable investments
- Sanitation, hygiene and infection prevention and control
- Antimicrobial use stewardship

The MCC has established Terms of References (TORs) for each TWG stipulating specific scope, roles and responsibilities. The TWGs interact with country representatives of the required sectors, as determined by their scope of work and report regularly to the MCC.

TWG activities include but are not limited to:

- Collaborate with MCC to formulate the NAP
- Operationalize the components of the NAP under their respective strategic objectives.
- Prepare annual work plan as per the NAP
- Report to MCC on the progress to the implementation of the respective strategic objective.

⁵ The National Action Plan on Antimicrobial Resistance 2017 – 2022. The United Republic of Tanzania Ministry of Community Development, Gender, Elderly and Children in collaboration with WHO and Ministry of Agriculture, Livestock and Fisheries. Dated April 2017.

- Proposal writing
- Provide updates on ongoing activities and provide technical advice to the MCC or National AMR Focal Point
- Medicines and Therapeutic (hospital level)

3.2 One Health

A One Health Strategic Plan was developed in 2015 with the support of the Cooperative Biological Engagement Program (CBEP) of the United States Department of Defence. Similar to work in neighbouring countries in the region, the plan aims to strengthen the institutional framework supporting One Health implementation to reduce the burden of zoonotic disease. It does not include any reference to AMR. AMR is a late entrant in the One Health strategies at national level.

A One Health coordinating desk comprising four staff is based in the Prime Minister's Office. The desk focuses on facilitating collaboration to address zoonotic diseases. AMR is led by the MCC which sits under MoHCDGEC. The MCC provides the mechanism for facilitating collaboration across the sectors to address AMR. Currently there is no intersection between the collaborative mechanisms to address AMR and zoonotic disease and the MCC provides the best feasible coordinating mechanism for AMR.

3.3 AMR Surveillance – human health

Tanzania is in the process of defining its strategy for AMR surveillance in human health which will be combined with those for Animal Health to form a unified One Health strategy. The surveillance plan is under active development. The plan aims to:

- Conduct routine surveillance on WHO priority pathogens isolated from priority specimens of both in- and out- patients. For wound swabs Tanzania would, in addition to the Global Antimicrobial Resistance Surveillance System (GLASS) pathogens, like to monitor antibiotic resistance in *Pseudomonas* species.
- Commence monitoring at each site with urine culture followed by blood culture, other sample type being added as the site demonstrated competence
- Determine antimicrobial susceptibility on WHO suggested antibiotics using either Clinical Laboratory Standard Institute (CLSI) or European Committee on Antimicrobial Susceptibility Testing (EUCAST) methods.
- Report from the surveillance sites monthly to the national reference laboratory;
- Report results systematically to clinical providers in the surveillance sites;
- Produce annual summaries of the surveillance data;
- Report results to GLASS.

The next steps are to finish the One Health AMR surveillance plan for both Human and Animal health sectors and develop the detailed operating procedures.

The National Health Laboratory Quality Assurance and Training Centre (NHLQATC) has been chosen as the reference laboratory for the system. Its role is clearly outlined in the surveillance plan and includes technical and supervisory support, assistance with procurement of reagents and equipment, provision of EQA, maintenance of a repository of isolates and confirmation of 10% of isolates and all with unusual resistance patterns.

For surveillance sites a three-phase expansion is envisioned.

1. In phase I there will be 5 surveillance sites, expanding to 15 at phase II. The phase I sites are at national and zonal reference hospitals, the highest level facilities in Tanzania.

2. Upon successful implementation of phase I, phase II sites at regional and other referral hospitals will be initiated.
3. Phase III brings in the remaining regional hospitals for nationwide coverage and a total of 25 sites.

The proposed phase I laboratories have been assessed using a tool from the CDC and the resulting report is in preparation. The MOHCDGEC has made a commitment to fund the surveillance system during the implementation period.

Tanzania has several academic institutions which are centres of excellence in microbiology. Muhimbili University of Health and Allied Sciences, which is administratively separate from the Muhimbili National Hospital and has its own teaching hospital (at Mloganzila), which may support surveillance at both hospitals. Kilimanjaro Christian Medical Centre (KCMC) in Moshi has a research wing Kilimanjaro Clinical Research Institute (KCRI) which hosts many national and international collaborations. KCRI is involved in consortia that have recently won two awards from the recent “AMR in a Global Context – Development Award” of the UK Medical Research Council. The Catholic University of Health and Allied Sciences at Bugando Medical Centre in Mwanza is also a centre of excellence in microbiology in Tanzania with a strong publication record and interactions with the Southern African Centre for Infectious Disease Surveillance in Tanzania (SACIDS) in Morogoro.

Tanzania is a member of the World Bank supported East African Public Health Network (EAPHN). Each country within the network has a particular area of specialism. For Tanzania this is teaching. NHLQATC is the major recipient of this assistance in Tanzania and has been involved in microbiology training both nationally and regionally.

The American Society of Microbiologists (ASM) has been supporting microbiology training in Tanzania since 2009. This program has been paid for under grants from the US-CDC. The training is based at NHLQATC, and has trained staff at national, zonal, and some regional hospital laboratories. The training concentrates on basic microbiology diagnostics and antibiotic susceptibility testing. They are supporting development of national microbiology Standard Operating Procedures (SOP) and helping laboratories move towards accreditation.

As part of an EAPHN sponsored project, NHLQATC is collating AMR data from network of 7 hospital laboratories. Data is collected using a spreadsheet that is emailed to a focal point in NHLQATC towards the end of each week. The data is re-entered into another format and analysed by the end of the week and results reported to the MoHCDGEC each Monday. This system contributes to regular sharing of AMR updates with the MoHCDGEC. It is a time limited project and is not nationally representative.

Tanzania has a strong CDC sponsored Field Epidemiology and Laboratory Training Program which has been operating since 2008. This ensures a supply of epidemiologists and laboratory technicians for analysis of surveillance data. However, there is a lack of knowledge on antimicrobial resistance and its analysis and this area will need to be supported.

3.4 AMU Surveillance – human health

Tanzania is one of 4 pilot countries for trialling WHO’s point prevalence survey tool to collect AMU data in hospitals. The AMR focal person, who is in the Pharmaceutical Services Unit, is coordinating data collection from 2 hospitals in Dar es Salaam (Muhimbili National Hospital and Mwananyamala Regional Hospital). The protocol allows data collection to take place over a period of up to 3 weeks. This process was ongoing at the time of the positioning activities visit to Mwananyamala. Data were completed for each hospital on a spreadsheet and transmitted to the WHO at national and HQ level. Similar to the reporting in the GLASS, there is need to have a discussion on how data collected will be fed back from the WHO to national governments. The pharmaceutical services unit, FDA and MSD would like to have some of the selected AMR surveillance sites to be selected for AMU surveillance and data to be collected using the WHO tool.

In 2017 Tanzania also performed a survey of national Antimicrobial Consumption in human health with data from the Tanzania Food and Drug Authority. They are hoping to repeat the exercise in 2018.

3.5 AMR Surveillance – animal health

There is no formal surveillance system for AMR in animals in Tanzania. A National Antimicrobial Resistance Surveillance Plan in food, agriculture and environment is currently being developed with the support of FAO. AMR surveillance plan operations shall be managed and implemented through the MLF under the Tanzania Veterinary Laboratory Agency (TVLA). There shall be a sector-specific TWG on AMR surveillance in the food, agriculture and environment sectors.

FAO launched a programme to support AMR and AMU surveillance in animals, with Fleming Fund support, on 6th April 2017 at the same time as the NAP launch.

The following activities have been conducted under the FAO programme to date

1. An AMR surveillance plan for animals is currently being prepared.
2. An AMR situation analysis has been conducted specifically focusing on food and agriculture as the Global Antibiotic Resistance Partnership (GARP) situation analysis (in 2015) was not sufficiently detailed in these areas.
3. National legal framework has been reviewed and the report is not yet finalized.
4. ATLASS mission has been supported to assess the Central Veterinary Laboratory (CVL).
5. The veterinary laboratory in Zanzibar has been strengthened.
6. Activities have been conducted during World Antibiotic Awareness Week
7. Four veterinary laboratory staff, from CVL, Arusha, Mwanza and Sokoine University of Agriculture (SUA), were trained at the Kenya Medical Research Institute (KEMRI) in AMR-related diagnostic testing, including culturing *Campylobacter*. FAO will support another training for other microbiology technicians in satellite laboratories in Tanzania in 2018, using these staff as trainers.
8. An external proficiency testing plan through the Danish Technical University will be supported, focusing on: *Escherichia coli*, *Staphylococcus aureus* and *Enterococci* in June 2018 then on *Salmonella* and *Campylobacter* in September 2018.
9. Reagents and training have been provided to support CVL run an inter-laboratory comparison programme amongst TVLA laboratories.

In addition, FAO will support a small Knowledge Attitudes and Practices (KAP) study on antibiotic use in beef and dairy cattle in a pastoral community around Arusha. Data will be collected from cattle owners bringing their cattle to a market place in Arusha.

3.6 Laboratory capacity – human health

The Tanzanian healthcare system is organised into a hierarchical system with national hospitals at the top followed by zonal then regional and district hospitals. Tanzania has national hospitals for both the mainland (Muhimbili National Hospital in Dar es Salaam) and for Zanzibar (Mnazi Moja Hospital in Stone Town). In addition to Muhimbili National Hospital, there are other three Zonal Hospitals on the mainland (Kilimanjaro Christian Medical Centre in Moshi, Bugando Medical Centre in Mwanza, Mbeya Zonal Referral Hospital in Mbeya). Surveillance is planned to take place at these five sites initially.

NHLQATC in Dar es Salaam is the designated national reference laboratory for AMR. The current role of the laboratory is to provide diagnostic and confirmation facilities, to provide oversight and training to low-level facilities. It is ISO 15189 accredited by the South African National Accreditation Service (SANAS) for culture and identification, a significant achievement. It provides a national external quality assurance (EQA) program three times yearly to more than 40 laboratories nationwide. NHLQATC takes part in an international EQA programme (National Institute for Communicable Diseases, South Africa). It conducts antimicrobial susceptibility testing (AST) on samples collected during investigation of reportable disease outbreaks, but does not have an ongoing, sustained role in quality assurance of subordinate laboratories. AMR data has not yet been analysed and NHLQATC requires assistance to improve its capacity to undertake analysis. NHLQATC's

limited role combined with the current government wide recruitment freeze has led to a small staffing complement in the laboratory. There is currently a staff of three, plus a volunteer. To take an expanded role as reference laboratory to the AMR surveillance system NHLQATC would require additional personnel.

NHLQATC has equipment that could allow it to make large quantities of agar plates for distribution to the surveillance system laboratories. This equipment is currently un-used due to lack of appropriate sized petri dishes. NHLQATC often experiences problems with stock-outs of supplies or reagents as well as consumables.

NHLQATC is also the home institution for the MoHCDGEC biomedical engineers. These engineers are able to service, calibrate and certify biosafety cabinets. However, the number of engineers is insufficient for the mainland and the engineer identified for Zanzibar did not complete her training. There is also a lack of budget for travel and upkeep of the engineers. This is a nationally important facility that should be supported to provide services to the surveillance system.

The surveillance sites for Phase I are all located in larger urban teaching hospitals. These hospitals were selected as having functioning microbiology services. Several of the laboratories are accredited by SADCAS for some tests, including for culture and sensitivity in the case of Bugando. All of them are taking part in international EQA schemes, paid for by various partners and arranged individually by hospital. For the purposes of the surveillance scheme it would be helpful if all the laboratories took part in a single scheme.

The laboratories possessed adequate biosafety systems however maintenance of these was not consistent. At Muhimbili and Mnazi Mmoja for example biosafety cabinets were non-functional. Several sites possess automated blood culture machines, however in Mbeya and KCMC these were non-functional due to lack of supplies or maintenance. In all laboratories supplies of reagents was inconsistent with frequent stock outs sometimes lasting several months.

All surveillance site laboratories, except for Muhimbili, are using DISA (disalab.com) a Laboratory Information Management System (LIMS). DISA is specified by MoHCDGEC which has the capability of analysing data from it, but is hosted at the sites, not centrally. NHLQATC is also using DISA. Muhimbili use a hospital wide information management system. In all sites data entry into the LIMS was routine for all samples. DISALab possesses a microbiology module however this was not observed in action. DISA is said to have powerful and easy to use report generation facilities. Bugando hospital use these facilities for monitoring quality parameters such as blood culture contamination. For the other surveillance sites however, the reported use of data was minimal. The national surveillance plan is recommending the use of WHONET for AMR (AST) data capture and analysis within the surveillance system. However, there are possible workflows for WHONET that could leverage the existing, functioning, data entry systems and combine them with the AMR specific analytic capabilities of WHONET. These options should be explored with existing site data managers.

3.7 Laboratory capacity – animal health

The Tanzanian Veterinary Laboratory Agency (TVLA) was established as an executive agency in 2012, merging the Central Veterinary Laboratory (CVL), the Tsetse and Trypanosomiasis Research Institute (TTRI) and the Veterinary Investigation Centres. TVLA is mandated to undertake diagnosis of animal diseases, regulate veterinary laboratories, conduct research on animal diseases and vectors, develop and produce vaccines and other biologicals and monitor animal feed quality.

TVLA offers laboratory diagnostic services throughout the country with the CVL in Temeke, Dar es Salaam and 11 satellite laboratories. The satellite laboratories are: the Centre for Infectious Diseases and Biotechnology (CIBD) and Tanzania Vaccine Production Institute (TVI) in Temeke, Dar es Salaam, 7 zonal laboratories in Arusha, Mwanza, Iringa, Tabora, Dodoma, Mtwara, and 2 laboratories working on vector-borne diseases (VVBD) in Kigoma and Tanga.

A national web-based Laboratory Information Management System (LIMS) links data from CVL and the zonal laboratories. The system, known as SILAB, is an Italian-designed system that was installed in 2013 with support from FAO. This system enables tracking of samples within laboratories plus tracking and monitoring of cases between the laboratories. The Ministry plans to link SILAB with a Livestock Information Management System

in the MLF. A further laboratory information system, Laboratory Inventory Network Application (LINA) will be installed in CVL with US support. LINA is designed to help laboratories efficiently manage their inventory of specialized molecular biology reagents. This may be a useful system for managing a biorepository of bacterial isolates generated through the AMR surveillance system.

CVL conducts diagnostic testing, acts as a referral centre for the satellite laboratories and monitors the quality of animal feed. CVL has one area designated as BSL3, which was supported with equipment from SADC, while the remainder of the laboratory being BSL1 - BSL2. The laboratory has a designated Quality Manager and is in the final stages of becoming ISO 17025 accredited for six diagnostic tests, not including AMR. The South African Development Community Accreditation Services (SADCAS) is the accreditation body. International proficiency testing is conducted by a range of institutions but not for AST. CVL has had many biosafety trainings run by the US Defence Threats Reduction Agency (DTRA), SANDIA laboratories, Association for Biosafety in Kenya and a 5-year Finnish government programme implemented from 2014 – 2018 on Strengthening Health and Biosecurity in Tanzania by Biodetection Capacity Building. CVL is a part of the Eastern African Regional Laboratory Network and the African Field Epidemiology Network (AFENET).

The CVL has been identified as the AMR reference laboratory for the animal health sector. The bacteriology laboratory has very experienced technicians who can culture and identify the priority bacteria identified for AMR surveillance, with the exception of *Campylobacter*. The lab can reliably conduct antibiotic susceptibility tests (AST) but needs to control for quality of AST. The bacteriology lab has not had investment for a very long time and needs some internal renovations to improve the workspace, removal of non-functional equipment, a major tidy-up and reorganisation of the workspace, some new equipment, calibration and maintenance of existing equipment and a continuous supply of good quality reagents and consumables. Staff require training in AST and culture methods for *Campylobacter*.

The zonal laboratories visited conduct very minimal diagnostic testing on samples from clinically ill animal cases. The flow of samples has declined since the introduction of charging for laboratory services in 2016. Microbiology technicians in the zonal laboratories have the capability to culture and identify bacteria such as *E. coli*, *Staphylococcus spp.*, *Streptococcus spp.* While the laboratories conduct some AST the quality of testing is extremely unreliable, using outdated reagents and non-standard protocols for AST. Antibiotic susceptibility is assessed by eye, with no measuring of inhibition zones. Results are recorded in a book as Resistant or Sensitive. Not all bacteriology cases from zonal laboratories are entered into SILAB.

Most bacteriology laboratories have had no investment for a very long time and need internal renovations, tidying up and reorganisation of workspaces, purchase of some equipment plus calibration and maintenance of existing equipment. Staff need training in AST and a regular supply of good quality reagents and consumables.

4 Scope of this Country Grant

4.1 Grant Objectives and Outputs

Grant objectives and outputs are summarised as follows. Section 6 provides more detail.

Objective 1: Strengthen One Health AMR and AMU surveillance

- Output 1.1 The multi-sectoral AMR Knowledge, Surveillance and Research Technical Working Group shares with the MCC and AMR stakeholders AMR and AMU surveillance and research outcomes that have been combined across multiple sectors.
- Output 1.2 MCC integrates the knowledge generated through multi-sectoral AMR and AMU surveillance into decisions that guide the overall AMR programme in Tanzania.

- Output 1.3 MCC shares AMR knowledge generated through multi-sectoral AMR and AMU surveillance both nationally and internationally.

Objective 2: Strengthen AMR and AMU surveillance system in humans

- Output 2.1: MOH AMR and AMU Surveillance TWG oversees and provides technical support to the AMR surveillance system in humans in accordance with an MCC- approved ToR.
- Output 2.2: Increased capacity of NHLQATC to perform its function as a national reference laboratory for AMR surveillance.
- Output 2.3: Surveillance site laboratories are strengthened for AMR surveillance
- Output 2.4: Enhanced capacity of the national coordinating centre and surveillance sentinel sites to collect, analyse, report and utilize data from AMR surveillance
- Output 2.5: Improved quality at all surveillance laboratories
- Output 2.6: Improved biosafety at all surveillance laboratories
- Output 2.7: Support a functioning AMU surveillance system at selected sites
- Output 2.8: Clinical staff at the surveillance sites are fully engaged in the surveillance

Objective 3: Strengthen AMR and AMU surveillance system in food-producing animals

- Output 3.1: A MLF AMR and AMU Surveillance TWG functioning in accordance with a MCC-approved ToR
- Output 3.2: Central Veterinary Laboratory (CVL) strengthened as an AMR national reference laboratory
- Output 3.3: CVL, zonal laboratory Mwanza, zonal laboratory Arusha and SUA produce reliable quality bacterial culture, identification and Antibiotic Susceptibility Testing (AST) results
- Output 3.4: Biosafety and biosecurity measures are being applied within the surveillance laboratories and to the safe transport of samples and isolates between the laboratories
- Output 3.5: Good quality samples from broilers and layer hens are regularly sent to CVL and the zonal laboratories in Mwanza and Arusha
- Output 3.6: A national database of verified AMR results and demographic data is maintained in WHONET at the CVL
- Output 3.7: TVLA shares quarterly and annual reports of AMR surveillance results with the MLF AMR & AMU Surveillance TWG and the zonal laboratories
- Output 3.8: Directorate of Veterinary Services shares antimicrobial consumption (AMC) and antimicrobial use (AMU) data with the MLF AMR/AMU surveillance TWG and the zonal laboratories

4.2 Duration and phasing of the grant

The grant is expected to be implemented for 18 months.

Proposals for the grant should include an indicative budget, key personnel responsible and a work plan in the templates provided. The Grantee should propose which standard indicators will be used to measure success (see Section 9). These will be subject to review by the Mott MacDonald's Core Technical Team and sign-off by Mott MacDonald.

A second Country Grant may be available to Tanzania, dependent upon successful implementation of the first Country Grant. This could be subject to another competitive tendering exercise and further assessments later in the grant funding period.

4.3 Funding envelope

Grant applications are expected to be in the region of £1-2 million, including all capital and recurrent costs, overheads and management costs.

The Fleming Fund wishes to see value for money in the form of maximum outputs for the grant money invested. The Guidance Notes for the Grant Application Form provides different dimensions that should be considered as part of a VfM approach – economy, efficiency and effectiveness – and an indication of how we may assess VfM.

4.4 Procurement

A procurement plan and budget should be developed by the end of the inception phase. Pending approval from Mott MacDonald, the Grantee would be expected to facilitate the procurement process. Their choice of procurement route may be subject to assessment by the International Procurement Agency (IPA), a partner of Mott MacDonald in the Fleming Fund Grants Programme providing advisory services.

4.5 The Fleming Fellowship Scheme in Tanzania

Six Fleming Fellowships, from both the human health and animal health sectors, have been proposed for Tanzania. Successful applicants will receive specialised training in AMR and AMU data management and analysis, laboratory quality management, and advanced laboratory diagnostic skills.

Fellows are expected to become technical leaders in AMR and AMU surveillance in Tanzania, and it is hoped that they will play a role as mentors and active trainers in capacity building activities that will be implemented through this Country Grant. Therefore, once established, the Grantee is expected to work in collaboration with Fleming Fellows and potentially their Host Institutions (who provide remote support to the Fleming Fellows).

Summary terms of reference for all the Fellowships, currently under discussion with the Government of Tanzania, are attached in Annex 1. It is our expectation that, by the time the Grantee begins implementing the Country Grant, the Fellowships will be established.

It is important to note that training of other laboratory staff as specified below, should be designed and funded by the Grantee within this Country Grant application. The Fellowship Scheme is not designed to support training but is a longer-term scheme to develop expertise and practice amongst individual fellows.

5 Key partnerships, alignment and coordination

The Country Grant must be delivered in a way which supports the national effort, and which takes account of current capacity levels, absorptive capacity, alignment with others, and the particular challenges – cultural, political and linguistic – of working in Tanzania. The Grantee must also ensure that all inputs complement and build on work done to date and avoid duplication and development of parallel systems. The grantee should demonstrate a clear strategy on how the relationships with the government institutions will be maintained to ensure smooth delivery of the outputs. In particular, the way of working with the MCC and its TWGs should be clearly elaborated.

The delivery approach and inputs must be closely aligned with national priorities, as stated in the NAP and the human and animal AMR surveillance plans which are being integrated into One AMR surveillance plan. There must also be close alignment with inputs being provided by the American Society of Microbiologists (ASM), WHO, FAO and, where relevant, other development partners.

The Grantee must particularly bear in mind the need to ensure sustainability of AMR surveillance beyond the life of the grant. Prospective grantees will be expected to describe concrete strategies to promote sustainability of outputs in their proposals.

6 Complementing other grants from the Fleming Fund Grants Programme

The first Country Grant is expected to work effectively and synergistically with other grants under the Fleming Fund Grants Programme at the regional level. This relates to both the Fleming Fellowship Scheme (see section 2.5 and 4.5) and Regional Grants. The Regional Grants will focus on strengthening networking and data sharing on AMR at the regional level. The Grantee is expected to liaise, through Mott MacDonald, with such grants for maximising the sharing of AMR data and learning at the regional and global levels.

7 Lead Grantee Roles and Responsibilities

The main role of the Lead Grantee will be to plan and execute the 17 outputs and deliver the three objectives listed above. The Lead Grantee is responsible for providing, either through in-house resources alone, or through a partnership or consortium, the expert technical assistance and high-quality support needed to achieve agreed results.

The Lead Grantee is responsible for financial management and controls for the grant as a whole (including the contributions of sub-grantees if applicable) and for reporting to Mott MacDonald. Reporting of financial expenditure against budgeted activities is a requirement of the grant and grantee(s) will need to show evidence of sufficient capabilities to undertake these responsibilities.

The Lead Grantee is also responsible for monitoring and reporting on all activities under the grant as a whole (including the contributions of sub-grantees if applicable).

8 Measuring success

Country Grants are ultimately expected to generate results that can be tracked using a standard set of indicators that will monitor progress and achievements within and across Country Grants. A copy of the full list of indicators will be shared in the Application Pack.

However, Mott MacDonald recognises that, for much of this first grant, given the early stage of AMR surveillance in Tanzania, process level indicators will be more appropriate for both the inception phase and at least the early stages of the implementation phase. Therefore, proposals are expected to select from the standard indicator set where possible, or otherwise propose alternative SMART⁶ indicators in line with the outputs above.

In addition to measuring grant performance against the objectives and outputs stated above, the grant will also be monitored on the implementation of and adherence to the Fleming Fund core principles described above (see Section 2.4).

The Fleming Fund will be independently evaluated by Itad, a specialist evaluation firm, which has been appointed by the UK Department of Health and Social Care for this purpose. All grants are subject to review and evaluation by the evaluators, and full co-operation with the evaluators by all Grantees is expected.

9 Application requirements

9.1 Grant Eligibility Criteria

Potential grant applicants must satisfy the following eligibility criteria before applications will be assessed in detail. Applicants:

- Must demonstrate that they are competent organisations responding to this call for proposals;

⁶ 'SMART' indicators are specific, measurable, achievable, relevant, and time bound.

- Must have an appropriate track-record in supporting laboratory capacity development, surveillance, capacity building, and One Health.
- Must have experience of programme implementation in Tanzania.
- Must demonstrate that they are registered to work within the country, including the provision of essential documents such as articles of incorporation.
- Must demonstrate an understanding of the MoU process with the Government of Tanzania.
- Must be prepared to accept the Grant Agreement terms.
- Must be able to provide the same information and assurances for all sub-grantees, where the application is from a consortium.
- Should be able to provide all information required for due diligence checks, including clear evidence of financial standing and systems of financial management and control.
- Should be able to provide evidence of suitability in the form of references from clients and donors for previous work undertaken within the last three years.
- Can be a single organisation or consortia, though the latter must clearly identify a Lead Grantee with the appropriate governance and coordination mechanisms to manage sub-grantees.
- Can be:
 - National institutes – such as a university or research institutes;
 - Non-governmental organisations (NGOs);
 - UN Agencies;
 - Private companies;
 - Government-owned enterprises or institutions, provided they can establish that they are (i) legally and financially autonomous, (ii) operate under commercial law, and (iii) are not dependent agencies of national governments

9.2 How to apply

The Applicant Information Session (AIS) will be organised in Dar es Salaam on **20 July 2018**. The details of the venue will be shared with applicants who have registered their interest. Interest to attend the AIS must be registered by emailing flemingfundESA@mottmac.com by **16 July 2018**.

Prospective grantees must register interest to receive the Application Pack by emailing flemingfundESA@mottmac.com by **25 July 2018**. Please include the organisations name, the name, phone number and email address of the main focal point.

Ahead of the AIS, an advance **Application Pack** will be shared and will include the application form, budget and monitoring template, and Guidance Notes. Following the Applicant Information Session, the **official Application Pack** will be sent out on 26 July 2018 to prospective grantees who have registered interest by the 25 July, as per the details above.

To apply, please complete the application form and budget and monitoring template provided, in line with the Guidance Notes.

Note the key requirements set out at the beginning of the Country Grant application form:

- Your submission should be returned by the deadline indicated in the RFP.
- When submitting the application document, press “Reply All” from the Application Pack email that you received with the application documents attached. Do not send it to us from a new email, and do not modify the Subject-line. Only “Reply All” emails will register the documents in our system.
- Keep file sizes as low as possible - there is a 9MB size limit to each individual email that can be received by the grant submission software. You can submit documents by sending multiple emails attaching submission documents to each one. Please follow the instruction in 2 (above) using “Reply All”.

- Applicants should observe the word limit indicated for each question. Additional words outside the limit will be disregarded.
- All documents included as part of the proposal must be submitted in word, Excel, and PDF format (body font: Calibri 11pt). Do not send through as zipped files.
- You should include a covering letter, signed by the person authorised to represent your organisation for the submission of this proposal.

Proposals that do not satisfy these criteria may not be accepted and will be returned.

9.3 Evaluation criteria

The Application Pack will include the application form, indicating the scoring and weighting for each section of the application. The Application Pack will also contain Guidance Notes explaining what we are looking for in terms of a good quality response for each question, including approach to Value for Money (VfM).

In particular we are looking for a Grantee / Grantees who can demonstrate its:

- technical capacity to address the different aspects of AMR covered by this Country Grant.
- ability and preparedness to bring stakeholders together in an effective and productive working arrangement, promoting a One Health approach.
- ability to operate effectively in Tanzania.

9.4 Restrictions/limitations

Any conflict of interest, or potential conflict of interest, should be declared to Mott MacDonald when applicants are registering their interest to apply for the grant. If a conflict of interest, or potential conflict of interest, arises after that point the prospective grantee must clearly declare this in their proposal.

9.5 Key dates

Publication of RFP: 12 July 2018

Registration to apply for the grant is open **between 12 July and 25 July 2018**.

Deadline for registering interest to attend the Applicant Information Session: 16 July 2018 17:00 EAT (GMT+3)

Applicant Information Session: 20 July 2018

Deadline for registering interest to receive the official Application Pack: 25 July 2018 17:00 EAT (GMT+3)

Application deadline: 24 August 2018

Anticipated start date of grant: 15 October 2018

9.6 Contact details and support information

Any questions on the Request for Proposals should be sent to flemingfundESA@mottmac.com. Mott MacDonald will endeavour to respond to queries within three working days.

10 Detailed Objectives and Outputs

10.1 Objective 1: Strengthened One Health AMR and AMU surveillance

Output 1.1 The multi-sectoral AMR Knowledge, Surveillance and Research Technical Working Group shares with the MCC and AMR stakeholders AMR and AMU surveillance and research outcomes that have been combined across multiple sectors.

Background information

The NAP lists the activities of the TWGs as including but not limited to the following:

- Collaborate with MCC in formulation of the NAP.
- Operationalize National AMR Action plan under their respective strategic objectives.
- Prepare annual work plan as per National AMR Action Plan.
- Report to MCC on the progress in implementing the respective strategic objectives.
- Proposal writing.
- Provide updates on ongoing activities and provide technical advice to the MCC or National AMR Focal Point.

To date, the multi-sectoral Knowledge, Surveillance and Research TWG has contributed to development of the NAP and is currently working on development of the sector-based AMR Surveillance Plans. As AMR and AMU surveillance systems begin to generate data, the role of this TWG will expand to monitoring the implementation of the surveillance systems, understanding the results that are generated by surveillance in each sector, reporting on progress with implementation of the surveillance systems, reporting on the knowledge that is generated through the surveillance systems.

Suggested items in a more specific ToR include:

- Hold quarterly meetings that are timed so that the outcomes from the TWG meetings are reported to and discussed at the MCC quarterly meetings.
- Provide quarterly reports to the MCC on the progress of AMR and AMU surveillance in the human and animal sectors and combined results from human and animal sectors.
- Provide an annual report to the MCC that:
 - Summarises the data collected through the AMR and AMU surveillance programme in human and animal sectors and the knowledge generated through the surveillance
 - Summarises the research conducted on AMR and AMU in Tanzania
 - Summarises the knowledge on AMR and AMU in Tanzania by integrating the information generated through AMR and AMU surveillance with the outcomes of research and other sources of data and/or information on AMR and AMU in Tanzania.
 - Recommends to the MCC (annually) priorities for future surveillance and research
 - Recommends to the MCC any policies or programmes to manage AMR based on the evidence generated through surveillance and research.
- Maintain a national repository of up-to-date AMR data from all sectors using WHONET. Maintain an up-to-date national repository of data collected through AMU surveillance.

Role of the Grantee

The role of the Grantee is to ensure the AMR Knowledge, Surveillance and Research TWG has the resources and capability to function as a multi-sectoral TWG that understands the information generated through AMR and AMU surveillance and research and provides expert technical advice to the MCC.

The role of the grantee would include, but not be limited to:

- Providing financial support for and facilitating organisation of quarterly meetings of the Knowledge, Surveillance and Research TWG.
- Facilitating development of a more specific ToR for members so they are clear about the role of the TWG and their specific responsibilities.
- Providing technical support when requested in the technical analysis of reports and facilitating the implementation of recommendations
- Building capacity of members of the TWG to understand and interpret the results of AMR and AMU surveillance.
- Building capacity of members of the TWG to present evidence-based recommendations to the MCC regarding policies and actions to facilitate responsible antibiotic use and reduction in AMR.
- Ensuring that the sector-based reports that provide input for the meetings and the multi-sectoral report that is an outcome of the meetings are deposited with and securely stored by the Secretariat to the MCC.
- Ensuring that an up-to-date national electronic AMR and AMU data repository, including data from all sectors that are collecting data, is maintained by the AMR Secretariat in WHONET as a backup to the databases maintained by the individual sectors.

Integration of the Country Grant with the Fleming Fellowship Scheme

The Fleming Fellowship Scheme proposes to support the following six Fellowships within the human and animal sectors:

- AMR surveillance fellowships in the epidemiology units of the NHLQATC and the TVLA
- Laboratory fellowships in the CVL and NHLQATC
- AMU surveillance fellowships in the Pharmaceutical Services Unit of the MoHCDGEC and the Division of Veterinary Services (see Annex 1 for further details on the fellowships).

The Fellows will be expected to become technical leaders within their sector-based TWGs and contribute to sustained cross sectoral sharing of results in the multi-sectoral Knowledge, Surveillance and Research TWG, and so the Grantee should facilitate their involvement in, or engagement with, the TWG.

Expected outcomes

By the end of the grant we expect the following outcomes:

- The multi-sectoral Knowledge, Surveillance and Research TWG is operating effectively and sustainably, with a TOR that outlines clear roles agreed for individuals and the group as a whole.
- Active collaborative participation by both the human and animal health sectors in deliberation and decision making at national level.
- Increased capacity within the TWG to understand and interpret AMR and AMU data.
- Sharing with the MCC of AMR and AMU surveillance results that have been combined across the multiple sectors, together with recommendations for future research priorities, programming and policies.
- National repositories of up-to-date AMR and AMU data are maintained.

Output 1.2 MCC integrates the knowledge generated through multi-sectoral AMR and AMU surveillance into decisions that guide the overall AMR programme in Tanzania

Background information

The MCC is already a well-functioning national multi-sectoral AMR coordinating committee that has worked together to produce the NAP and is now leading the implementation of the NAP. The committee has members from the multiple sectors, including human health, animal health, environment and others as indicated in the NAP. A particular challenge faced in Tanzania is the members of the MCC are distributed widely across

Tanzania and significant cost is involved in bringing MCC members together for meetings. The MCC has in place a programme of quarterly meetings which are currently funded by the ASM.

Role of the Grantee

The role of the Grantee would include but is not limited to complementing the resources provided by the AMS and ensuring the MCC has the resources and capability to do the following:

- Involve representatives from the multiple sectors in the quarterly meetings
- Consider the technical information provided by the multi-sectoral Knowledge, Surveillance and Research TWG on progress of the multi-sectoral AMR and AMU surveillance and remediate issues that arise in either sector.
- Understand the key indicators of the AMR situation in humans and animals in Tanzania based on the technical information provided by the multi-sectoral Knowledge, Surveillance and Research TWG
- Decide on future surveillance priorities and policies or programmes to manage AMR.

Expected outcomes

By the end of the grant we expect that the following outcomes will have been achieved:

- The MCC is operating effectively and sustainably, with active participation by representatives from the multiple sectors.
- The MCC facilitates implementation of the AMR and AMU surveillance programmes in human and animal sectors.
- The MCC makes evidence-based decisions on future surveillance priorities and policies or programmes to manage AMR.

Output 1.3 MCC shares AMR knowledge generated through multi-sectoral AMR and AMU surveillance both nationally and internationally.

Background information

The NAP list the following knowledge-sharing outputs under Intervention 5.2: Establish and support system for sharing AMR research.

- A national AMR bulletin is published quarterly.
- Human AMR surveillance results reported to GLASS.
- A national AMR scientific conference is organised.

We propose that these outputs share the knowledge generated both through research and the AMR and AMU surveillance programmes.

Role of the Grantee

The role of the Grantee would include but is not limited to providing resources and facilitating the sharing of AMR and AMU information on Tanzania via the three mechanisms listed above.

Expected outcomes

By the end of the grant we expect that the following outcomes will have been achieved:

- AMR and AMU information shared nationally and internationally.
- Improved cross-sectoral understanding of AMR and AMU in Tanzania.

10.2 Objective 2: Strengthened AMR and AMU surveillance system in the human health sector

Output 2.1: MOH AMR and AMU Surveillance TWG oversees and provides technical support to the AMR surveillance system in humans in accordance with a MCC-approved ToR

Background information

A multi-disciplinary AMR and AMU Surveillance TWG would provide the human health sector-based expertise to support AMR and AMU surveillance in humans. The TWG would include relevant technical experts and stakeholders in AMR and AMU surveillance such as infectious disease specialists, microbiologists, epidemiologists. Suggested roles and responsibilities of the TWG to be validated by the MCC in a ToR include:

- Provide technical input to the design and support implementation of AMR and AMU surveillance in humans.
- Discuss and interpret human AMR and AMU surveillance results.
- Understand what the surveillance results contribute to knowledge about AMR and the links between AMU and AMR in animals and people in Tanzania.
- Identify priorities for further surveillance and/or investigations in humans.
- Maintain a repository of the results from AMR and AMU surveillance in human.
- Share and compare human AMR and AMU surveillance results with the results from other sectors in the multi-sectoral AMR Knowledge, Surveillance and Research Technical Working Group.
- Identify opportunities for collaborating with the animal health sector in training, equipment procurement and maintenance, purchase of reagents, etc.

Role of the Grantee

The Grantee could provide support for the MOH AMR and AMU Surveillance TWG by funding regular (e.g. quarterly) meetings of the TWG to implement the ToR described above. Additionally, the Grantee may provide expert support to the multi-sectoral TWG if needed.

Integration of the Country Grant with the Fleming Fellowship Scheme

The 3 proposed human health fellows (laboratory, AMR and AMU surveillance, see annex 1 for details) would provide leadership and technical support for the MOH AMR and AMU Surveillance TWG, so the Grantee should facilitate their involvement in, or engagement with, the TWG.

Expected outcomes

By the end of the grant we expect that the following outcomes will have been achieved:

- The human health AMR and AMU Surveillance TWG, with an agreed ToR, has met at least quarterly.
- Reports and key AMR and AMU surveillance documents discussed during the meetings are stored (with back-ups) by the AMR focal point.
- Representatives from the TWG have contributed results from AMR and AMU surveillance in humans and other sources of information on AMR in humans to the multi-sectoral AMR Knowledge, Surveillance and Research TWG.
- The National AMR Surveillance System Strategy drafted and costed. This will include clearly outlined clinical case definitions and laboratory methods.
- An annual costed action plan has been agreed.
- A plan for AMU surveillance has been developed.
- A monitoring and evaluation plan has been developed.

Output 2.2: Increased capacity of NHLQATC to perform its function as a reference laboratory for AMR surveillance.

Background information

NHLQATC has been identified as the national reference laboratory. A summary of its current capacity is outlined in Section 3.5 above.

Role of the Grantee

The Grantee is expected to support NHLQATC to take up its role with minimal delay. Grantee proposals must identify strategies to ensure sustainability of NHLQATC's greater role beyond the life of the grant.

Areas for support include:

- **Bio repository.** A secure repository of isolates is an important asset to allow further investigation of the pathogens isolated. Purchase of ultra-low temperature (-80°C) freezers is needed. Before installation, power supply both on mains and back up sources should be considered. The repository needs to be inventoried and isolates need to have epidemiological data associated with them. Finally, there need to be clear policies for its use, for example which isolates get selected for banking, for how long they are retained, and how access is granted for their use.
- **Supervision.** NHLQATC needs to expand its supervisory role as a reference laboratory. This will include assisting NHLQATC in provision of SOPs and bench aids suitable for subordinate laboratories to use and supporting NHLQATC's provision of bacteriology EQA to its subordinate sites. This may also include supportive supervision of subordinate laboratories.
- **Training.** NHLQATC staff need to receive training in techniques that allow more detailed characterisation of pathogens and resistance mechanisms than the simple disc diffusion testing that they are currently conducting. This should include both phenotypic and genotypic methods. Wherever possible this should be practical rather than theoretical, based on samples in their collection. Given the limited human resource available at NHLQATC the scope of this work should be delivered at NHLQATC and at an agreed activity level.
- **Epidemiology.** The epidemiology unit at NHLQATC is strong but has limited experience with handling AMR/AMU data. For the surveillance system to provide useful results the epidemiology staff will need training on AMR and AMU data analysis. Software (e.g. WHONET) that allows data entry and analysis will need to be installed and configured. At national level there is need for a detailed discussion on how to integrate the systems and ensure effective reporting to GLASS. IT systems that allow back up of data and input of data from subordinate laboratories should be considered.
- **Maintenance.** Maintenance of laboratory equipment is a problem in Tanzania. Of particular concern are the biosafety cabinets which are maintained by biomedical engineers based at NHLQATC. The costs for these engineers to maintain biosafety cabinets at surveillance sites can be supported by the grant. The possibility of supporting the training of more additional engineers in future grants should be investigated.
- **Supply of Reagents and Consumables.** It is important that the surveillance system has a reliable supply of consumables, which at the same time avoids oversupply and expiries. A mechanism to ensure this should be explored. These may include stock control systems at the laboratories. It may also include working with key suppliers, preferably within the country, to ensure availability of stock. A mechanism should be designed that takes into consideration the national policy and guidelines in the procurement and supply of consumables ensuring the most efficient and effective way of availing the products.

- **Equipment:** In order to perform confirmation and advanced phenotypic susceptibility testing, NHLQATC should be provided with automated equipment such as the Becton Dickinson Phoenix, Biomerieux Vitek 2 or similar.
- **Strategy for dealing with biosafety level 3 pathogens.** As the national reference laboratory it is important that NHLQATC is prepared for handling dangerous pathogens. The laboratory should be assisted to develop plans for dealing with these. The resultant plans may be beyond the scope of the current grant to fund.

Integration of the Country Grant with the Fleming Fellowship Scheme

In order to support this central institution, it is planned that NHLQATC will be the Beneficiary Institution for the Fleming Fund Laboratory and AMR Surveillance Fellowships (see Annex 1 for details). The Grantee must propose a programme of work that integrates with and complements the proposed Fellowships.

Role of the Grantee

The Grantee could provide expert support to NHLQATC as well as purchasing equipment. A plan for reagent and consumable supply could be developed in consultation with relevant partners including other donors.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- A secure, inventoried, biorepository system in place together with policies for its operation (e.g.: selection of isolates for saving, arrangement for accessing isolates, etc.). This will include freezers and software for maintaining an inventory.
- Training in advanced techniques for pathogen identification and antibiotic resistance mechanisms characterisation delivered to staff at NHLQATC.
- NHLQATC delivers quality support services in bacteriology to its subordinate laboratories including documentation, EQA, and confirmation of results.
- NHLQATC has decided on software for surveillance data and analysis, it has been installed and training delivered.
- All specialist laboratory equipment at the NHLQATC bacteriology laboratory has a maintenance plan in place and implemented.
- A plan for sustainable supply of bacteriology reagents and consumables developed.
- Automated identification and susceptibility equipment purchased and installed and reagents supplied
- Agreed plans for handling dangerous pathogens in place and implemented.

Output 2.3: Surveillance site laboratories are strengthened for AMR surveillance

Background information

All the surveillance sites in Phase I possess functioning microbiology laboratories however they will need support to provide high quality surveillance data. Some laboratories are missing equipment that will be needed for the surveillance, for example automated blood culture machines and freezers for storage of isolates. Existing machines require maintenance. Stock out of reagents and consumables, particularly the more specialised and temperature sensitive materials, is common. The relatively low use of these materials in Tanzania makes it difficult for suppliers to maintain stocks of these with good expiry dates.

Role of the Grantee

The grantee will need to assess the equipment requirements of the laboratories taking into account using their own and other recent assessments. Working with ministries and other donors to avoid duplication the grantee could purchase necessary equipment and arrange for existing equipment to be serviced. Working within existing systems such as NHLQATC wherever possible the grantees should ensure consistent supply of quality

reagents and consumables. The grantee might assist in the development of training on the study protocols and its provision to sites.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- The following sites supported: Muhimbili National Hospital, Mnazi Mmoja Hospital, Kilimanjaro Christian Medical Centre, Bugando Medical Centre, Mbeya Zonal Referral Hospital
- Automated blood culture and other identified equipment purchased
- Purchase of small ultra-low temperature freezers for all sites.
- Laboratory staff trained and mentored on the surveillance protocol
- Maintenance and calibration of equipment supported
- Stocks of reagents and consumables necessary for surveillance ensured

Output 2.4: Enhanced capacity of the national coordinating centre and surveillance sentinel sites to collect, analyse, report and utilize data from AMR surveillance

Background information

The infrastructure needed to collect and analyse the data from AMR surveillance will need to be built. The draft surveillance plan envisions data entry occurring at the sites and being aggregated at NHLQATC. It has been suggested that the software WHONET be used at the site and national level for data collection and analysis.

Role of the Grantee

The grantee may work with the human health AMR TWG to ensure that is entered at the surveillance site and is transmitted regularly to NHLQATC. The grantee may ensure that NHLQATC can aggregate and check data quality. Training and other assistance could be given to NHLQATC so that it can analyse the resulting data and report it to the AMR TWG.

Integration of the Country Grant and Fleming Fellowship scheme

An AMR Surveillance Fellow based within NHLQATC will significantly contribute to this output (see Annex 1 for details). The Grantee is expected to propose a programme of work that integrates with and complements the proposed Fellowship.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- WHONET installed and training given at NHLQAT and the sites
- Integration of existing information systems with WHONET explored
- NHLQATC supported to collect and check the quality of data
- Both national and sentinel surveillance sites trained and mentored on analysis of AMR surveillance data

Output 2.5: All laboratories are operating to a quality standard

Background information

It is important that all laboratories are working to the same high standard. To achieve this laboratory staff need to be trained on the study SOPs. Appropriate quality control organisms need to be available on site and used to monitor the quality of work. Proficiency of staff needs to be regularly tested and reported back to the TWG, especially in the early stage of the system an international EQA scheme will offer frequent and

independent verification of proficiency. The national EQA scheme must also be strengthened for the anticipated expansion of the surveillance system.

Role of the Grantee

The grantee could provide technical advice and training to NHLQATC and the surveillance sites. Control organisms could be purchased for all sites or a system of distribution of control strains from NHLQATC arranged and supported.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- Improved surveillance SOPs and bench aids are in place and use.
- Reference strains for IQC are available and being used. The resulting IQC data is being collected and monitored regularly.
- A strengthened national EQA scheme is supported, with all surveillance sites participating
- A single common international EQA being performed at all Phase I surveillance laboratories

Output 2.6: Improved Biosafety at all surveillance laboratories

Background Information

Biosafety and biosecurity should be reviewed in all laboratories in the AMR surveillance programme at the beginning of the Grant period to identify the biosafety and biosecurity issues that need to be addressed in each laboratory, including issues such as: training, laboratory access, equipment use and maintenance,

Role of the Grantee

Training should be provided to laboratory staff and on-going audits conducted to ensure adequate biosafety and biosecurity. Care must be taken to avoid unnecessary duplication of training and other biosafety measures by careful co-ordination with government and other donors.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- The laboratories are equipped with appropriate safety equipment and staff are wearing personal protective equipment while conducting testing.
- All biosafety cabinets are regularly maintained and calibrated. A sustainable system of maintaining the biosafety cabinets and other associated equipment is in place. Staff have been trained on their use.
- All waste is disposed of in a safe manner and documentation procedures are up to date.
- All staff are trained and supervised to the appropriate level for their job descriptions / roles and measures are put in place to enhance retention of trained staff at facility level
- Appropriate ongoing supervision of Biosafety and Biosecurity is undertaken by training and appointment of a Biosafety Officer.
- At least 2 members of staff at each site have been trained in safe transport of samples to and from the reference laboratory. Materials needed are available at the site.

Output 2.7: A functioning national AMC surveillance system and AMU at selected sites supported.

Background information

As described in section 3.5.

Role of the Grantee

The grantee can support the development of a national strategy and plan for AMC and AMU surveillance. At the site the grantee can provide support for data collection, for example training and computer equipment, National level aggregation and analysis of AMC and AMU data surveillance sites.

Integration of the Country Grant with the Fleming Fellowship scheme

An AMU Surveillance Fellow based within the Pharmaceutical Services Unit of the MoHCDGEC will significantly contribute to this output (see Annex 1 for details).

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- A national protocol for AMU and AMC surveillance has been developed
- AMU surveillance has been conducted at some surveillance sites
- AMU and AMC data has been analysed and summaries of it reported to the human health surveillance TWG at least annually.

Output 2.8: Clinical staff at the surveillance sites are fully engaged in the surveillance

Background information

For surveillance to succeed all staff involved in the surveillance must be aware of the value of the surveillance and be trained in its protocols. In some sites numbers of samples submitted to the laboratory are currently relatively few for microbiology. Clinical staff in the hospital need to feel engaged in the surveillance and value the results both for the care of individual patients and as general prescribing advice. This means that clinical staff must be trained in the surveillance protocol. Results from the study should be fed back for patient care as swiftly as possible. Analysis of aggregate results should be performed on site to encourage engagement and lesson learning.

Role of the Grantee

The grantee should assist with the development of course content for training clinicians in study protocols and clinical use of antimicrobial susceptibility information. They will assist with delivery of this content at surveillance sites. The grantee can assist with monitoring the uptake of surveillance and with troubleshooting lack of compliance if it occurs.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- Training to clinical staff at proposed surveillance sites delivered.
- Trained staff can correctly identify patients fitting the surveillance criteria and demonstrate an understanding of how to incorporate bacteriology results into their clinical practice.
- Increased linkages with the relevant clinicians and management committees to ensure adequate actions to improve sample collection and management.
- There is an increase in the number of samples collected and sent to the laboratory for microbiological analysis which is free at the point of use to patients.

10.3 Objective 3: Strengthened AMR and AMU surveillance system in the animal health sector

The first round of AMR surveillance in animals will be an active surveillance programme targeting resistance to specified antibiotics in selected zoonotic enteric bacteria in healthy broilers and layer hens in Dar es Salaam,

Arusha and Mwanza as shown in Table 1. CVL and the zonal laboratories in Mwanza and Arusha will conduct AST on samples collected under this AMR programme, and CVL will be the national AMR reference laboratory. The bacteriology laboratory at Sokoine University of Agriculture (SUA) is also included within the AMR surveillance network. While the SUA laboratory will not test samples from healthy poultry, it will contribute data from AST conducted on samples from clinically ill animals to the national AMR database. Likewise, CVL and the two zonal laboratories will contribute passive surveillance data from AST conducted on samples from clinically ill animals to the national AMR database. Some support will be provided through the Grant to strengthen the SUA laboratory to ensure reliable AST data is submitted under the surveillance programme.

Table 1. Number of samples to be collected for AMR surveillance in broilers and layers.

Poultry Sector	# samples /lab/year	Total #/3 labs/year
Broilers	130-135	400
Spent layer hens	130 - 135	400

Output 3.1: A MLF AMR and AMU Surveillance TWG functioning in accordance with an approved ToR

Background information

A multi-disciplinary MLF AMR and AMU Surveillance TWG would provide animal health sector-based expertise to support AMR and AMU surveillance in animals. The TWG would include relevant technical experts from different disciplines and stakeholders in AMR and AMU surveillance in the animal health sector, such as: the AMR focal point for animal health, microbiologists, epidemiologists and veterinary product experts from TVLA, DVS, SUA.

Suggested roles and responsibilities of the TWG to be validated by the MCC in a ToR include:

- Provide technical input to the design and support implementation of AMR and AMU surveillance in animals.
- Discuss and interpret animal AMR and AMU surveillance results.
- Understand what the surveillance results contribute to knowledge about AMR and the links between AMU and AMR in animals and people in Tanzania.
- Identify priorities for further surveillance and/or investigations in animals.
- Maintain a repository of the results from AMR and AMU surveillance in animals.
- Share and compare animal AMR and AMU surveillance results with the results from other sectors in the multi-sectoral AMR Knowledge, Surveillance and Research Technical Working Group.
- Identify opportunities for collaborating with the human health sector in training, equipment procurement and maintenance, purchase of reagents, etc.

Role of the Grantee

The Grant could provide support for the TWG by funding regular (e.g. quarterly) meetings of the MLF AMR and AMU Surveillance TWG to implement the ToR described above. Additionally, the Grant may provide expert support to the TWG if needed.

Integration of the Country Grant with the Fleming Fellowship scheme

The 3 proposed animal health fellowships (laboratory, AMR and AMU surveillance) would provide leadership and technical support for the TWG (see Annex 1 for details), together with other technical leaders working in this area.

Expected outcomes

By the end of the grant we expect that the following outcomes will have been achieved:

- A MLF AMR and AMU Surveillance TWG, with an agreed ToR, has met at least quarterly.
- Reports and key AMR and AMU surveillance documents discussed during the meetings are stored (with back-ups) by the AMR focal point.
- Representatives from the MLF AMR and AMU Surveillance TWG have contributed results from AMR and AMU surveillance in animals and other sources of information on AMR in animals to the multi-sectoral AMR Knowledge, Surveillance and Research TWG.

Output 3.2: Central Veterinary Laboratory (CVL) strengthened as an AMR reference laboratory

Background information

The Central Veterinary Laboratory (CVL) in TVLA has been identified as the national AMR reference laboratory for animals. The CVL will provide leadership and support for the two zonal laboratories (in Mwanza and Arusha) that are participating in the surveillance network plus linkages through data sharing with the bacteriology laboratory in SUA.

A particular challenge that is faced in Tanzania is the large distance between CVL which is located in Dar es Salaam and the zonal laboratories, especially the laboratory in Mwanza. Road travel between Dar es Salaam and Mwanza is very time-consuming and infrequently undertaken, as a result there is limited contact between CVL and the zonal laboratory in Mwanza. For the AMR surveillance programme to be successful the zonal laboratories will need regular supervision and contact with CVL, to ensure they are engaged and contributing to the programme through collection of samples, diagnostic testing and sharing AST results. This is likely to require regular visits (minimum of quarterly visits) from CVL to the zonal laboratories in Mwanza and Arusha. The Grant could support more efficient travel through funding flights and accommodation to increase the contact between CVL and Mwanza plus road trips and accommodation to facilitate contact with the zonal laboratory in Arusha.

Role of the Grantee

The Grant could provide support for the CVL to undertake the following responsibilities in its role as AMR reference laboratory:

- Supervision and diagnostic expertise to support zonal laboratories.
- Maintain quality diagnostic systems in zonal laboratories contributing to surveillance, including:
 - Coordinate production of bench guides/flow charts
 - Upgrade current SOP to include all the bacteria in the surveillance programme
 - Training/mentoring on QC and IQAS
 - EQAS amongst zonal veterinary laboratories and the microbiology laboratory at SUA.
- Maintain an inventoried national biorepository of isolates produced by all laboratories in the surveillance network.
- Maintain an ATCC strain collection.
- Collate & verify AMR surveillance diagnostic data from the contributing laboratories.
- Participate in an international EQAS.
- Develop the capability to undertake the following more advanced diagnostic methods:
 - ESBL, acquired AmpC (pAmpC) and/or carbapenemase-producing organism confirmation
 - *Salmonella* spp serotyping
 - Minimum Inhibitory Concentration (MIC) tests on a subset of isolates, stratified into resistant, intermediate and susceptible from disk diffusion results, to identify epidemiological cut-off

values (ECOFF) which ensures the comparability of data over time at the country level and also facilitates the comparison of resistance patterns between countries.

Integration with FAO and the Fleming Fellowship scheme

FAO may fund the Danish Technical University to implement an EQAS programme for CVL. FAO may also fund CVL to run an EQAS with the two zonal laboratories and SUA. The Grantee will need to align with any activities that FAO does support.

A Laboratory Fellowship based in the CVL will significantly contribute to this output (see Annex 1 for details).

Expected outcomes

By the end of the grant we expect that the following outcomes will have been achieved:

- Updated SOP for culture, identification and AST of all the bacteria included in the AMR surveillance programme is being used in all the microbiology laboratories in the surveillance programme.
- CVL has strengthened the capability of microbiology technicians from the participating laboratories in culture, identification and AST.
- An inventoried national biorepository of bacterial isolates from all laboratories is securely maintained at CVL.
- A collection of all the necessary ATCC strains is maintained at CVL.
- A national database of verified AMR data is maintained by CVL using WHONET.
- CVL runs an EQAS with the zonal laboratories participating in the AMR surveillance programme and with the microbiology laboratory at SUA.
- CVL achieves satisfactory results in an international EQAS.
- CVL has the capability to conduct phenotypic testing to confirm ESBL-, acquired AmpC and/or carbapenemase-producing organisms.
- CVL has the capability to serotype the major *Salmonella* species found in animals.
- CVL has conducted MIC tests on a representative sample of isolates stratified into resistant, intermediate and susceptible from disk diffusion results to obtain ECOFF values.

Output 3.3: CVL, zonal laboratory in Mwanza, zonal laboratory in Arusha and SUA produce reliable quality bacterial culture, identification and Antibiotic Susceptibility Testing (AST) results

Background information

There is good capability at CVL to culture and identify a range of bacteria, with the exception of *Campylobacter*. Hence developing capability at CVL to culture *Campylobacter* will be included in this programme. The laboratory has the capability to conduct AST according to internationally recognised protocols. However, quality control measures need to be improved to ensure accuracy of AST.

Bacteriology staff in the zonal laboratories have the capability to culture and the priority bacteria identified for the surveillance programme, with the exception of *Campylobacter*. They are currently conducting AST on a very small number of samples from clinically ill animals. However, results are extremely unreliable as they are using out of date stock and unreliable practices that do not follow standard protocols. Hence, further training of bacteriology technicians is required in the zonal laboratories to conduct reliable AST. Furthermore, the experienced bacteriology technicians at CVL and the two zonal laboratories are nearing retirement and it is important that succession planning is put in place to train younger staff to conduct bacteriology and AST.

In general all three TVLA bacteriology laboratories require reasonably low-input renovations, plus a clear-out of non-functional equipment and old samples stored in freezers and fridges and reorganisation of the work environment. Some equipment is needed to support bacteriology in the three TVLA laboratories. All

equipment in the laboratories needs to be calibrated and serviced prior to initiating the AMR surveillance testing. Good quality media and antibiotic disks need to be provided.

There is good capability to conduct AST in the bacteriology laboratory at SUA. However, the senior experienced technician is about to retire and succession planning needs to be managed. There is only a small throughput of samples from clinically ill animals, with the majority of work contributing to research projects. The laboratory lacks some equipment and has limited supplies of reagents for culture, identification and AST. The laboratory has no electronic system for storing the results of culture, with all data stored in paper form. The Southern African Centre for Infectious Disease Surveillance (SACIDS) will provide \$150,000 to support purchase of equipment at SUA.

Laboratory technicians at CVL, the zonal laboratories and SUA require training in protocols and quality control measures to produce reliable culture and AST results for *E coli*, *Salmonella*, *Enterococci* and *Campylobacter* (CVL only). The zonal laboratories and SUA laboratory must participate in an EQA (inter-laboratory comparison) programme run by CVL.

FAO has provided some support in this area already with a separate stream of Fleming Funding. Six veterinarians, from CVL, Mwanza, Arusha, Iringa and SUA were funded to participate in a 2-week diagnostic training workshop run at Kenyan Medical Research Institute (KEMRI) in Nairobi during March 2018. FAO funded a further training for bacteriology technicians in Arusha in May 2018 using the personnel trained at KEMRI to support the training of the technicians. In addition, FAO may fund an EQAS programme for CVL with the Danish Technical University and may fund CVL to run an EQAS with zonal laboratories in Tanzania.

Role of the Grantee

The Grantee could provide support to the laboratories to produce reliable results by procuring quality reagents and consumables, including media and antibiotic discs.

The Grantee will also procure and install the equipment that the laboratories requires for quality microbiology testing, and organise servicing and calibration of equipment.

Where necessary, the Grantee can support CVL to provide further training and mentoring to ensure laboratories use best laboratory standards for identification and antibiotic susceptibility testing including use of SOPs, monitoring of equipment and internal quality control checks on assays.

Integration with FAO, SACIDS and the Fleming Fellowship scheme

The Grantee will need to ensure the activities supported through the Country Grant align with the programme that is funded by FAO. The Grantee will also need to complement the SACIDS programme with respect to supporting the purchase of a limited amount of equipment for the SUA laboratory.

A Laboratory Fellowship based in the CVL will significantly contribute to strengthening quality systems within the zonal laboratories (see Annex 1 for details).

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- Laboratories have the necessary equipment that have been calibrated and serviced plus a suitable working environment to conduct reliable diagnostic testing for AMR.
- Bacteriology laboratory staff produce reliable culture, identification and AST results for the agreed bacteria as assessed by a relevant external quality assessment programme and by records of appropriate internal quality control.
- All laboratories maintain accurate records of AMR diagnostic results using WHONET and regularly send the results to CVL.

Output 3.4: Biosafety and biosecurity measures are being applied within the surveillance laboratories and to the safe transport of samples and isolates between the laboratories

Background information

Biosecurity issues to be considered include:

- Secure laboratory access
- PPE available
- Biosafety cabinets functioning and used appropriately in each laboratory
- Equipment is available for triple packaging & transport of isolates and staff are applying this to the safe transport of isolates from the zonal laboratories to CVL.

Role of the Grantee

The Grantee should review biosafety and biosecurity in the four laboratories in the AMR surveillance programme at the beginning of the Grant period to identify the issues that need to be addressed. Furthermore, the Grantee needs to integrate support provided through the CG with support provided by other donors to avoid duplication.

Integration with other donor programmes

CVL and some of the zonal laboratories have had considerable training in biosafety and biosecurity, as described in section 3.6 above. The Grantee will need to ensure that support provided under the Grant aligns with and does not duplicate support provided by other donors.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- The laboratories are equipped with appropriate safety equipment and staff are wearing personal protective equipment while conducting testing.
- Biosafety cabinets are operational and being used by staff appropriately.
- All waste is disposed off in a safe manner.
- All staff are trained and supervised to the appropriate level for their job descriptions / roles
- Samples and/or isolates are transported safely.
- Appropriate ongoing supervision of Biosafety and Biosecurity is undertaken by training and appointment of a Biosafety Officer.

Output 3.5: Good quality samples from broilers and layer hens are regularly sent to CVL and the zonal laboratories in Mwanza and Arusha

Background information

Field or laboratory staff will be responsible for regularly collecting samples from healthy poultry in Dar es Salaam, Arusha and Mwanza and delivering these to the CVL and the two zonal laboratories.

A sampling plan needs to be designed at the beginning of the grant period to collect samples from an agreed number of poultry in each area.

A SOP for collecting samples should also be prepared at the beginning of the grant period, if not already available, and sample collectors trained.

Good quality reagents and consumables need to be purchased for sample collection and transport.

Role of the Grantee

The Grantee will need to procure sufficient consumables and transport media for samples. The Grantee will also need to support development of a SOP if one is not available and support training of field staff to collect and transport samples. Costs of sample collection may need to be covered under the Grant i.e. transport costs.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- Field and/or laboratory staff collect appropriate samples for AMR testing that are labelled appropriately, transported in a safe manner, arrive at the laboratories in good condition for diagnostic testing, and are accompanied by appropriate epidemiological and demographic information that is labelled to match the samples.
- Field and/or laboratory staff have sent the required number of samples to the laboratories for diagnostic testing.
- Enhanced transport system for isolates from zonal laboratories to CVL for confirmation.

Output 3.6: A national database of verified AMR results and demographic data is maintained in WHONET at the CVL

Background information

WHONET is not yet installed in any veterinary laboratories in Tanzania. The database needs to be customised for Tanzania, installed in each of the surveillance laboratories and staff trained to enter the AST results that are correctly matched to demographic data for each sample. A computer, printer and UPS will need to be purchased for CVL and the two zonal laboratories to maintain the WHONET database.

Each laboratory would be responsible for maintaining an accurate database of the samples that they test for AMR and would send a monthly dataset to CVL for updating the national AMR database.

An SOP needs to be developed to guide use of WHONET and the arrangements for sharing the data from WHONET with CVL.

Results from AST conducted on clinical animal samples should also be entered into the database as well as those collected for AMR surveillance in healthy birds so that AMR associated with animal illness is also analysed. A system for transferring data from laboratories to CVL needs to be agreed. Training provided for data management person in CVL (collating and verifying data from laboratories)

The government laboratory network in Tanzania, which does not include SUA, has a nationally networked web-based Laboratory Information System known as SILAB. FAO is funding a SILAB technician from Italy to visit Tanzania in July 2018 to address issues. The expert will be asked to investigate and recommend how WHONET can be integrated with SILAB to avoid double entry of data. If it is feasible to integrate WHONET with SILAB the Grant could support an IT expert to link the two databases.

Role of the Grantee

The Grantee could support this by funding a consultant to customise WHONET for the veterinary laboratories in Tanzania, install the software in CVL, the two zonal laboratories and SUA, and provide training in data entry and using WHONET for data analysis. This input for veterinary laboratories could be integrated with similar input for the human surveillance sites.

Fund and facilitate meetings between CVL and zonal laboratories and SUA to trouble shoot issues around entering data into WHONET and sharing with CVL. These could be the same meetings as described for output 3.7 in which results of AMR data analysis are reported back to the contributing laboratories.

Integration of the Country Grant with the Fleming Fellowship scheme

The AMR surveillance fellow based in TVLA will contribute to facilitating the flow of AMR data from zonal laboratories and SUA to CVL and maintaining a national AMR database (see Annex 1 for details).

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- Results for all samples tested under the surveillance programme are entered into WHONET or similar software, with laboratory results accurately matched to demographic details for each sample.
- Data is regularly backed up.
- Data is regularly sent from zonal labs and SUA to the CVL for collation into a national database.

Output 3.7: TVLA shares quarterly and annual reports of AMR surveillance results with MLF AMR & AMU Surveillance TWG and the zonal laboratories

Background information

An epidemiologist at TVLA will be responsible for epidemiological analysis of the data collected through AMR surveillance. The AMR results should be interpreted in the context of data collected on AMU in the surveillance populations.

Role of the Grantee

It would be useful for the Grantee to support quarterly meetings with all contributors to AMR/AMU surveillance in TVLA to share and discuss results and issues related to data supply, quality, etc.

- An epidemiologist in TVLA conduct epidemiological analysis of AST data from surveillance of healthy poultry populations as well as that from AST conducted on clinical cases (including data from SUA)
- Training in AMR data analysis and interpretation
- Support quarterly meetings with zonal laboratories and SUA (data contributors)
 - Share & discuss results
 - Discuss issues related to data supply and quality.

Integration with the Fleming Fellowship Scheme

Analysis and interpretation of the AMR surveillance data will be supported by the AMR Surveillance Fellowship based in TVLA (see Annex 1 for details). Hence, the major area of support provided by the country Grant will be to fund regular meetings as described above.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- TVLA is producing results from analyses of the AMR surveillance data and sharing with the MLF AMR and AMU Surveillance TWG and other stakeholders as necessary.

Output 3.8: DVS shares antimicrobial consumption (AMC) and antimicrobial use (AMU) data with the MLF AMR and AMU surveillance TWG and the zonal laboratories

Background information

The Tanzanian Food and Drug Authority (TFDA) records data on antimicrobials imported into Tanzania for use in humans and animals. Legally imported antibiotics are reported to represent the majority of antibiotics used in Tanzania, hence analysis of the TFDA data would provide a reasonably accurate representation of antimicrobial consumption (AMC) in Tanzania.

Tanzania has reported AMC data to the OIE's first two rounds of data collection. It was indicated that support to improve forms and protocols for extracting data from the TFDA system plus training in AMC data analysis and interpretation would be useful to understand AMC in Tanzania.

FAO will support a knowledge attitudes and practice study of beef and dairy cattle farmers around Arusha.

Role of the Grantee

The Grantee could provide technical expertise to support the above needs described for AMC and AMU.

Integration with the Fleming Fellowship Scheme

An AMU Surveillance Fellowship based in DVS will collect and analyse AMU data from poultry farmers in Arusha (see Annex 1 for details).

The role of the Grantee would be to ensure that input on progress and results of the AMU surveillance is contributed to the quarterly MLF AMR and AMU Surveillance TWG and the Multi-sectoral Surveillance, Research and Knowledge TWG meetings.

Expected outcomes

By the end of the grant we expect that the following will have been achieved:

- TVLA is producing results from analyses of the AMC and AMU surveillance data and sharing with the MLF AMR and AMU Surveillance TWG and other stakeholders as necessary.

Annex 1: Possible Fleming Fellowships in Tanzania

Sector	Fellowship	Beneficiary Institution	Understanding AMR	Surveillance expertise	Diagnostic training	Laboratory quality management systems	Data collection, analysis and use	OH Technical working group	Collaborative project
Human	Laboratory	NHLQATC			Culture, identification and AST Phenotypic testing for resistance (e.g. ESBL+)	Benchtop guidelines SOPs Quality control External quality assurance ISO accreditation – Preparatory activities		Discuss AMR and AMU results from humans and animals Present AMR results from humans (with Surveillance Fellow)	To be discussed at the time of agreeing on the Fellowship workplans
Human	AMR Surveillance	NHLQATC		Contribute to designing future targeted AMR surveillance			Analyse AMR surveillance data Understand data biases Interpret AMR results in consultation with microbiologist and AMU data	Discuss AMR and AMU results from human and animals Present AMR results from humans (with Laboratory Fellow)	To be discussed at the time of agreeing on the Fellowship workplans
Human	AMU Surveillance	Pharmaceutical Services Unit, MoHCDGEC					Conduct survey of prescribing practices in 1 or a small group of hospitals Analyse and interpret AMU surveillance results Work with clinicians to modify prescribing practices to reduce potential for AMR	Discuss AMR and AMU results from human and animals Present AMU results from humans so that AMR results are related to AMU patterns	To be discussed at the time of agreeing on the Fellowship workplans

Sector	Fellowship	Beneficiary Institution	Understanding AMR	Surveillance expertise	Diagnostic training	Laboratory quality management systems	Data collection, analysis and use	OH Technical working group	Collaborative project
Animal	Laboratory	CVL			Culture, identification and AST Phenotypic testing for resistance (ESBL+)	Benchtop guidelines Quality control ATCC strains External quality assurance		Discuss AMR and AMU results from human and animals Present AMR results from animals (with Surveillance Fellow)	To be discussed at the time of agreeing on the Fellowship workplans
Animal	AMR Surveillance	TVLA		Contribute to designing future targeted AMR surveillance			Collate and analyse existing AMR data (clinical cases) Analyse AMR surveillance data Understand data biases Interpret AMR results in consultation with microbiologist and AMU data	Discuss AMR and AMU results from human and animals Present AMR results from animals (with Laboratory Fellow)	To be discussed at the time of agreeing on the Fellowship workplans
Animal	AMU Surveillance	DVS					Design and implement a survey to collect antibiotic use data from poultry farmers in the Arusha area. Analyse and interpret AMU surveillance results.	Discuss AMR and AMU results from human and animals Present AMU results from animals	To be discussed at the time of agreeing on the Fellowship workplans