Terms of Reference for Request for Proposals

First Fleming Fund Country Grant to Nigeria

1 Overview of this grant

This is a Request for Proposals (RFP) for the first Country Grant to address critical gaps in surveillance of antimicrobial-resistant bacteria in Nigeria. It has been created in response to a Request for Support from the Nigeria Centre for Disease Control (NCDC) on behalf of the Federal Government of Nigeria. The grant will be funded by the UK Department of Health and Social Care (DHSC), under its Fleming Fund Grants Programme, which is managed by Mott MacDonald, the Management Agent.

This first Fleming Fund Country Grant for Nigeria will focus on putting in place the foundations for antimicrobial resistance (AMR) and antimicrobial use (AMU) surveillance in the human and animal health sectors, as well as some aspects of AMR surveillance in aquatic species and the environment. 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.

This grant will align with the National Action Plan for antimicrobial resistance (NAP) and with the investments made by other donors and stakeholders in this area. In both the human and animal health sectors, the grant will invest in the improvement of AMR and AMU data collection, management, analysis and use in multi-sectoral decision making, as well as in the reinforcement of both reference and surveillance site laboratories. This grant also includes small and focused components to engage environment and aquaculture stakeholders more actively to strengthen the One Health approach to AMR surveillance. The proposed programme in each of these sectors has a limited scope to begin building the capacity of environment and fisheries laboratories, and to understand better the issues faced in implementing surveillance in each sector. In addition, the grant will further develop and support the coordination with ministries, both federal and state-level, as well as between technical institutions involved in AMR/AMU surveillance.

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, if any, on the same back-to-back terms.

The grantee will need to work in close coordination with the National AMR Coordinating Committee (AMRCC), 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 no more than 36 months. Grant applications are expected to be in the region of £8-10 million, including all capital and recurrent costs, overheads and management costs.

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 antimicrobial 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 antimicrobial-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 antimicrobial-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.[1]

The Fleming Fund comprises a number of workstreams. One workstream provides support to the Tripartite Alliance – the Food and Agriculture Organization of the United Nations (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 bacterial infection, 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 24 low- and middle-income countries 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 undertake more detailed case study analysis in themes of interest (e.g. value-for-money) for programme learning and adaption 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.

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[1] http://www.who.int/antimicrobial-resistance/global-action-plan/en/

- There are few health facilities that routinely undertake bacterial culture; still fewer facilities that meet the requirements for accreditation, or who do routine Antimicrobial Susceptibility Testing.
- There is no culture of surveillance for AMR in routine healthcare delivery and there are barriers to developing surveillance
- There is little perceived use of surveillance data on any level including low demand for the data from 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, e.g. 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.
- 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 poor 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 poorly defined and applied quality assurance standards in laboratory testing.
- There is lack of understanding from basic surveillance of pathogens of 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 invests 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; and therefore, improved data quality.
- A strengthened One Health workforce with a range of relevant skills for AMR surveillance.
- Stronger AMR surveillance systems and processes at country and regional levels.
- Higher demand for AMR data at regional, country, subnational and facility levels.
- Better knowledge of country level patterns of practice and use of antimicrobials across sectors.

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

- An increase in quality and quantity of AMR data collected.
- AMR data is shared in country to support evidence-based policy and practice.
- AMR data is shared internationally to improve and inform the global response.

The Requests for Proposals (RFPs) for Country Grants have been designed to ensure that investments and activities contribute directly to outputs. The grantee is expected to adhere to and demonstrate this alignment and contribution to outputs in the application. A description of each output is provided in this RFP for the applicant to develop specific, measurable and budgeted activities that are well organised and phased to ensure the success of the implementation of the Country Grant.

2.4 Core principles within the Fleming Fund Grants Programme

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

1) **Country Ownership:** The Fleming Fund Grants Programme will be implemented in line with national plans and aspirations, as laid out in the National Action Plan. Unless there are good reasons not 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 OIE[2] and FAO[3] 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 field of improved laboratory capacity (both within and outside the sphere of AMR surveillance), improved disease surveillance, and the One Health approach. The Fleming Fund Grants Programme 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.

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 good 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 be for duration of approximately 18 months, providing structured learning, mentoring and skills development for four to eight Fellows in each project country. Rather than duplicate basic training, the Fellowships will focus on building advanced skills and leadership to promote the

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[2] OIE Standards, Guideline and Resolution on Antimicrobial resistance and the use of antimicrobial agents;

[3] The FAO Action Plan on Antimicrobial Resistance, 2016-2020.

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 Institution 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.

Mott MacDonald will be developing detailed Terms of References (TORs) for the Fellowships for Nigeria, and the Fellowships finalisation process is expected 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 Nigeria to date

This is the first Fleming Fund Country Grant to be released in Nigeria. In preparation for this grant Mott MacDonald carried out a Scoping Visit in May 2018, which was followed by Positioning Activities in June/July and August 2018 to refine the design of surveillance systems, conduct laboratory assessments, and to understand better the priority areas to be supported through this first Country Grant.

These activities culminated in identification of major gaps and needs for strengthening AMR and AMU surveillance in humans and animals, and to begin strengthening AMR and AMU surveillance in aquaculture and the environment, and informed agreement with NCDC about grant objectives and outputs.

3   The current AMR situation in Nigeria

3.1 AMR Committee and National Commitment

The AMR Coordination Committee (AMRCC) for Nigeria is nascent and members represent diverse human health, animal health and environmental-related government departments, research institutions, collaborating institutions and international partners, including the Food and Agriculture Organisation of the United Nations (FAO) and WHO at the federal level. The Nigerian CDC is the coordinating body for AMR-related activities for the AMRCC with Dr Joshua Obasanya, Director Prevention and Programs Coordination at the NCDC, as the Chair of the AMRCC.

There are relatively functional AMR Technical Working Groups (TWG) based on five thematic areas in alignment with the five pillars of the Global AMR Action Plan and the National Action Plan (NAP) for Nigeria. Each of the TWGs has a leader, who serves as the convener for the group, and members are drawn from interested institutions that work within the area of focus.

3.2 AMR Policy and National Action Plan

The Antimicrobial Use and Resistance Situational Analysis and Recommendations report was created in 2017 and released by the Federal Ministries of Agriculture, Environment and Health. This situational analysis informed the AMR National Action Plan (NAP) for Nigeria 2017-2022.

The AMR NAP for Nigeria was developed in May 2017, under the leadership of the NCDC (representing the Nigerian Federal Ministry of Health) with contributions from the Federal Ministries of Agriculture and Rural Development, the Federal Ministry of Environment; research and academic institutions; non-governmental partners and international development organisations. The goal of the NAP is to "*reduce, prevent and slow the evolution of resistant organisms and their impact on health care while ensuring optimal use and improved access to effective, safe and quality assured antimicrobials for continued successful management of infections".* The focus areas of the NAP are in line with the Global AMR Action Plan; these are:

a. Increasing awareness and knowledge on AMR and related topics;

b. One Health AMR surveillance and research;

c. Infection Prevention and Control in the tripartite sector;

d. Promote rational access to antibiotics and antimicrobial stewardship; and

e. Invest in research to quantify the cost of resistance and develop new antimicrobials and diagnostics.

Although the AMR NAP details the strategic interventions for each objective, the activities were not costed and are not currently included within Federal budgeting. The NAP is described as a "living" document, which could be revised and updated as and when additional issues are identified. Although there are short-, medium- and long-term goals indicated, the mechanism for measurement, monitoring and reporting of progress against the NAP to the various ministries requires development.

3.3 AMR Surveillance – human health, animal health, aquatic species health, environmental health and One Health

Human Health: the human health AMR surveillance system in Nigeria has evolved during the last two years but there is currently no formal system in place at the federal, state or local government levels. Key stakeholders within the country underscore the need to undertake baseline studies, situation analysis, and integrated surveillance to find information and data about the AMR situation of the country. This is due to a lack of AMR data borne out of inadequate AMR surveillance at the state and federal levels. The NCDC has improved outbreak response to infectious diseases of bacterial origin such as cholera but has not yet been able to actively engage an AMR surveillance in public health settings for Healthcare Associated Infections (HAI) although recognising the critical importance.

Following the launch of the AMR NAP, Nigeria enrolled in the Global Antimicrobial Surveillance System (GLASS) and three laboratories have submitted January-December 2017 AMR data reports to GLASS. These laboratories are identified as:

- University of Ibadan College Hospital, Oyo State (AMR NRL 1);
- Lagos University Teaching Hospital, Lagos State; and
- Obafemi Awolowo University Teaching Hospital, lle-Ife, Osun State.

As clearly stated in the Situation Analysis of AMU and AMR in Nigeria in 2017, "there is paucity of evidence regarding the sale of antimicrobials without prescription"[4]. There are limitations to AMU data

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[4] Antimicrobial Use and Resistance in Nigeria, Situational Analysis and recommendations, Federal Ministries of Agriculture, Environment and Health 2017

availability for surveillance at either hospital or community level. There is data available through the NAFDAC regarding import registration, but the readiness of this data for use in an AMU surveillance system is unknown.

Animal Health: There is no formal AMR surveillance system for animal health in Nigeria. However, antimicrobial susceptibility testing (AST) is actively conducted in poultry and other animal species; most laboratories, including private laboratories, are able to perform AST for relevant poultry diseases. AST is also regularly conducted for mastitis isolates from dairy cattle. This AST capacity demonstrates an opportunity to build on existing systems in public animal health laboratories in Nigeria.

Antimicrobials are extensively used in livestock production, particularly poultry and pig production. Some data is available through registration of antimicrobials for use in animals and aquaculture. However, there is no accurate data available on volumes of antimicrobials used at farm level for the different livestock production sectors.

Aquatic species health: The Federal Fisheries Laboratory in Lagos, in partnership with the University of Ibadan, are currently conducting some laboratory testing in fish stocks, including confirmatory testing of bacterial isolates. Due to the high consumption of nationally produced fish in Nigeria, further understanding of both AMR and AMU in aquatic species is of interest for human health.

Antimicrobials are extensively used in aquatic species production. There is no reliable source of data on antimicrobial use in aquatic species, however, it is important to measure the volume of antimicrobials used at aquaculture level for both the formal and informal sectors supplying fish stocks for national consumption. As there is some capacity within Nigeria, it is reasonable to build this capacity further.

Environment: Like animal and human health, Nigeria currently has no AMR surveillance system for the environment. However, the Federal Ministry of Environment has indicated they are piloting a surveillance system for environmental indicators in 12 states, focusing on sanitation and hygiene, but it does not appear that there is long-term funding for this activity beyond the pilot.

The National Environmental Standards Regulatory and Enforcement Agency (NESREA) has five functional environment laboratories, but currently no capacity to engage actively in AMR surveillance activities.

One Health: The AMRCC is comprised of five core technical working groups (TWGs): education and awareness; surveillance; hygiene, IPC and biosecurity; antimicrobial stewardship; and research and development. The committee includes technical inputs from human, animal and environmental health, as well as representation from government, regulatory authorities, academia, research and civil sector organisations. A One Health approach has been adopted within the NAP through the engagement across sectors, and the need to build strong governance and reporting systems across key stakeholders in human, animal and environmental health

Currently, there is no One Health approach to integrating the results of AMR and AMU surveillance across humans and animals, aquaculture, food and the environment.

4   Scope of this Country Grant

This country grant will support the development of an AMR and AMU surveillance system in Human and Animal health – with some initial activities within aquatic species – and initiate participation of the environmental sector in AMR surveillance activities. This support will include:

- Strengthening the governance of One Health surveillance through an evidence-informed decision-making process. This includes the operationalisation of Technical Working Groups (TWGs) to guide the development of the surveillance system.
- Enhancement of Reference and Surveillance laboratories (see Table 1), which can include equipment, consumables and reagents, as well as infrastructure (e.g. refurbishment, renovation of existing building structures and installation of backup power supply).
- Skills and knowledge capacity building at sites indicated in Table 1. This can include the provision of training as deemed necessary following site assessments to support safe and secure bacterial identification and AST; production of quality AMR data; and the provision and maintenance of essential equipment.

Not all sites listed in Table 1 below have been assessed prior to the release of this RFP. The lead grantee will continue the needs assessment initiated during the preparatory phase of the RFP to finalise a procurement plan for all the laboratories considered in this Grant. This procurement plan will be negotiated and finalised in collaboration with the reference and surveillance laboratories, together with the Management Agent. The grant will also support AMU surveillance in animals and humans through the statutory mandated bodies or other capable bodies as agreed by the AMRCC, and finally will initiate capacity building of AMR surveillance in the environmental sector.

Table 1: List of Selected Laboratories for the Nigeria Country Grant[5]

Legend:	Sites assessed by the Management Agent		Sites to be assessed by the grantee	
No.	Name of site	Zone	City/State	Sector
1	NCDC National Reference Laboratory - Gaduwa	North Central	Abuja, FCT	Human
2	University College Hospital (UCH)	South West	Ibadan, Oyo	Human
3	Lagos University Teaching Hospital (LUTH)	South West	Lagos, Lagos	Human
4	Obafemi Awolowo University Teaching Hospital Complexes (OAUTHC)	South West	Ile-Ife, Osun	Human
5	University of Nigeria Teaching Hospital	South East	Nsukka, Enugu	Human
6	University of Ilorin Teaching Hospital (UITH)	North Central	Ilorin, Kwara	Human
7	National Hospital	North Central	Abuja, FCT	Human
8	Aminu Kano Teaching Hospital	North West	Kano, Kano	Human
9	Ladoke Akintola Teaching Hospital	South West	Osogbo, Osun	Human
10	Federal Medical Centre (FMC)	North East	Jalingo, Taraba	Human
11	University of Calabar Teaching Hospital	South	Calabar, Cross River	Human

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[5] Initial sites for inclusion – with the potential for additional sites to be added throughout the grant duration, as agreed upon by the AMRCC and the Management Agent.

12	National Veterinary Research Institute	North Central	Vom, Jos-Plateau	Animal
13	Veterinary Teaching Hospital, Faculty of Veterinary Medicine, University of Ilorin	North Central	Ilorin, Kwara	Animal
14	Veterinary Teaching Hospital, Faculty of Veterinary Medicine, University of Nigeria	South East	Nsukka, Enugu	Animal
15	Nigerian Fisheries Laboratory, Federal Department of Fisheries, Lagos	South West	Lagos, Lagos	Fisheries
16	Veterinary Teaching Hospital, Faculty of Veterinary Medicine, Usman Danfodio University	North West	Sokoto, Sokoto	Animal
17	University of Ibadan (UI), Department of Public Health, Veterinary School	South West	Ibadan, Oyo	Animal/ Fisheries
18	Veterinary Teaching Hospital, Faculty of Veterinary Medicine, Ahmadu Bello University	North West	Zaria, Kaduna	Animal
19	National Environmental Reference Laboratory (NESREA)	North West	Kano, Kano	Environment
20	National Environmental Surveillance Laboratory	TBD	TBD	Environment

4.1 Grant Objectives and Outputs

The five objectives and specific outputs proposed for the initial Fleming Fund Country Grant to Nigeria are listed in Table 2 below. Applicants are expected to respond to this RFP by developing and proposing activities that are both costed and demonstrate appropriate indicators of grant implementation. Reflection back to the NAP is encouraged.

An inception phase will be initiated upon lead grantee appointment. The duration of this phase will be determined during grant agreement, but will not exceed twelve months, and a final implementation plan will be agreed upon at the end of the inception phase. All proposals should include the full implementation plan, as the inception phase is for refinement, not development of, the full implementation plan.

Sustainability is key to the success of this Country Grant. The current NAP is not costed and there is currently no formal financial commitment to activities within the NAP from either federal, state or local level government within Nigeria. The lead grantee will be expected to undertake a sustainability assessment, and a key response within the proposal for this Country Grant should include strategies to engage with the Nigerian government to build consensus for sustainability of investment beyond this Country Grant.

During the inception phase, the grantee will:

- Complete, facilitate or begin work on the Outputs with the AMRCC, as outlined below.
- Collaborate with the Fleming Fellows and their Host Institutions to understand the Fellowship workplans.
- Conduct needs assessment at the remaining surveillance sites using the tools and methodology provided by the Management Agent
- Finalise the procurement plans for a) equipment and renovation needs for the surveillance sites and b) consumables and reagents to conduct safe and secure quality bacterial identification and susceptibility testing

Table 2: Objectives and Outputs of the Nigeria Country Grant

Objective/Output	Inception	Implementation
Objective 1: **Strengthen One Health governance structure for AMR and AMU surveillance**		
Output 1.1: A well-functioning One Health National Steering Committee (OHNSC), National AMR Coordinating Committee (AMRCC) at NCDC (also functioning as the One Health National Steering Committee (OHNSC) Secretariat), based on an agreed TOR to support and provide guidance for AMR activities	x	
Output 1.2: A National One Health (or Multisectoral) AMR and AMU Surveillance Technical Working Group (TWG), reporting to the AMRCC, is operational with an agreed TOR, including quarterly and annual reporting by the TWG, comparing AMR patterns in humans, animals, aquatic species and the environment, also including AMU in humans and animals.	x	
Output 1.3: Evidence-based recommendations to further strengthen AMR/AMU surveillance under One Health are provided by the TWG of the AMRCC to the OHNSC	x	x
Output 1.4: A state-level AMR engagement plan aligned with the NAP, through engagement in zonal planning forum, which includes knowledge and capacity building		x
Output 1.5: A national One Health AMR and AMU Symposium is held		x
Objective 2: **Strengthen AMR and AMU surveillance system in the human health sector**		
Output 2.1: A framework for establishing a permanent National Reference Laboratory (NRL) for human health at NCDC, Gaduwa, is developed and approved by the OHNSC	x	
Output 2.2: ToRs for the 2 AMR NRLs (UCH, Ibadan and Gaduwa, Abuja) and a general MoU between surveillance sites and the NRLs are developed and agreed by the OHNSC	x	
Output 2.3: Needs and capacity assessment for both NRLs and remaining surveillance sites are completed using the Management Agent assessment tool	x	
Output 2.4: Bacteriology laboratories at the NRLs and surveillance sites are renovated to reach an internationally recommended standard for safe and secure bacterial identification and susceptibility testing	x (plan)*	x
Output 2.5: The NRLs are equipped and operational to support the AMR surveillance sites with an OHNSC-approved TOR	x (plan)*	x
Output 2.6: The bacteriology laboratories are equipped and operational at AMR surveillance sites, generating and sharing AMR data with the appropriate NRL and other stakeholders	x (plan)*	x
Output 2.7: Quality assured AMR data is transmitted from both NRLs to the surveillance and epidemiology department at NCDC for further analysis and onward transmission onto GLASS and sharing with OHNSC and other stakeholders		x
Output 2.8: Biosafety and biosecurity measures are in place at NRLs and surveillance sites; and for the transportation of specimen nationally and internationally	x (plan* and implement)	x
Output 2.9: An AMU surveillance programme to collect and analyse AMU data linked to prescription from participating surveillance sites is	x	

Objective/Output	Inception	Implementation
developed and approved by the HH AMR/AMU surveillance TWG and approved by the OHNSC		
Output 2.10: A multidisciplinary team composed of pharmacists and data managers is strengthened at the epidemiology and surveillance unit at NCDC to analyse and integrate AMU surveillance data	x	
Output 2.11: The AMU surveillance programme is first piloted at 3 surveillance sites. Lessons learned are used to adjust the methodology and expand the implementation to the full network of sites	x	
Output 2.12: AMR stewardship committees are established and functioning in all surveillance sites	x	
Output 2.13: Assess the feasibility of engaging state and local government level laboratories as AMR surveillance sites with clear recommendations and strategic planning. Work with the OHNSC toward acceptance of strategic planning		x
Output 2.14: Staggered planning for state and local government level-led clinical laboratories engagement in AMR activities developed and approved by the OHNSC for consideration		x
Output 2.15: Inventoried biorepositories of relevant isolates from surveillance laboratories, together with appropriate IT and support systems, are established at NRL sites		x
Output 2.16: Establish the national External Quality Assessment (EQA) system for the reference and surveillance laboratories, and analyse and disseminate results through the OHNSC		x
Objective 3: **Strengthen AMR and AMU surveillance in food animals**		
Output 3.1: The National Veterinary Research Institute (NVRI) is equipped and operational as the AMR National Reference Laboratory (NRL)	x (plan)	x
Output 3.2: TORs developed and approved by the animal health AMR and AMU surveillance TWG and the OHNSC to define the roles and responsibilities of the national animal health AMR NRL to lead the AMR surveillance in Animal Health	x	
Output 3.3: A population-based AMR surveillance system in poultry is established to generate data on resistance in 3 priority zoonotic bacteria/bacterial groups: *E. coli*, *Salmonella* species, and *Enterococcus faecium/ Enterococcus faecalis,* for the antimicrobials identified as surveillance priorities by WHO[6,7]	x (plan)	x
Output 3.4: Biosafety and biosecurity measures are in place and are applied within the NRL and the surveillance sites and for the safe transport of samples	x (plan)*	x
Output 3.5: A stepwise sampling strategy is established for AMR surveillance in animals. Initially this should focus on the poultry sector, with caecal or faecal sampling performed at defined points in the supply chain and tested for the presence of indicator organisms and associated resistance.	x (plan)*	x

[6] GLASS – Manual for Early Implementation: http://www.who.int/antimicrobial-resistance/publications/surveillance-system-manual/en/

[7] http://www.who.int/medicines/publications/WHO-PPL-Short_Summary_25Feb-ET_NM_WHO.pdf

Objective/Output	Inception	Implementation
Output 3.6: Established mechanisms for collecting information on antimicrobial use (AMU) in the animal health sector including: sample data on antimicrobial usage in poultry; charting the value chain and distribution pathways for antimicrobials from importation to farm use; and collation of data at the Federal level on the importation of veterinary drugs	x	x
Output 3.7: Quarterly and annual reports of AMR patterns for the zoonotic bacteria/antimicrobial combinations in poultry (layers and broilers populations) are shared with the Animal Health AMR/AMU surveillance TWG, the AMRCC and the OHNSC		x
Output 3.8: Inventoried biorepositories of relevant isolates from surveillance laboratories, together with appropriate IT and support systems, are established at the NRLs	x (plan)	x
Output 3.9: Establish the national External Quality Assessment (EQA) system for the reference and surveillance laboratories, and analyse and disseminate results through the OHNSC	x	x
Objective 4: **Establish a foundation for AMR surveillance in aquatic species**		
Output 4.1: A situational analysis of the University of Ibadan (UI) and Federal Fisheries aquaculture laboratory in Lagos is conducted to determine both need and capacity as the AMR bacteriology laboratory sites for aquatic species	x	
Output 4.2: A population-based AMR surveillance system in aquatic species established to generate data on resistance in aquatic species / pathogens *relevant to human health* as identified in the situational analysis and in guidelines produced by e.g. FAO		x
Objective 5: **Establish a foundation for AMR surveillance in the environment**		
Output 5.1: A situational analysis of environmental laboratory stakeholders is conducted to determine the requirements for an AMR bacteriology laboratory sentinel site for environmental health	x	
Output 5.2: Based on the findings of the situational analysis, environmental laboratory, stakeholders are supported to produce reliable results for ESBL-mediated resistance in *E. coli*		x

* Where an output is marked "plan" this can include all planning activities required for the output – for example, site visits, procurement activities, planning training timetables and activities, agreement with key stakeholders, etc.

4.2 Duration of the grant

This grant is expected to last no more than 36 months.

4.3 Funding envelope

Grant applications are expected to be in the region of £8-10 million, including all capital and recurrent costs, overheads and management costs.

Mott MacDonald is responsible for driving Value for Money (VfM) on behalf of the UK Department of Health throughout the Grant programme and will carefully consider how the proposal addresses "efficiency", "effectiveness", "economy" and "equity" in delivering the Request for Proposal (RFP) outputs in relation to the proposed costs. The Guidance Notes for the Grant Application Form provides different dimensions that could be considered as part of a VfM approach and an indication of how we may assess VfM.

Laboratory equipment, reagents and consumables

An indicative procurement plan for laboratory equipment, reagents and consumables was compiled during the site assessments conducted by the Management Agent for the sites in Table 1, above. The first round of procurement will be based on these assessments to ensure early start up.

The remaining sites (indicated in grey in Table 1), will be assessed by the grantee, who will develop a further second round procurement plan during the inception phase. The assessments will utilise the tools provided by the management agent and will include assessment of infrastructure to determine what renovations are required. For human health laboratory sites, applicants should include a placeholder budget of £200,000 per sites. For animal health laboratory sites, the applicants should include a placeholder budget of £100,000 per site.

During the inception phase, the grantee will work in consultation with the Management Agent, the Management Agent's procurement supplier (International Procurement Agency) and the UK Department of Health and Social Care, to determine the most suitable method of procurement for laboratory equipment, and to develop reliable stock management and supply systems for consumable and reagents.

The lead grantee will also be expected to

1. assist with the importation and delivery of equipment and consumables to recipient sites;
2. work closely with the procurement partner (whether IPA or an alternative organisation) to ensure the appropriate delivery sequence of items;
3. maintain an asset register of all items defined as assets by the programme;
4. regularly monitor the items that have been procured by Fleming Fund Grants Programme to ensure:
    (i) items are being used for intended purpose;
    (ii) items are being maintained appropriately; and
    (iii) to report any misuse or misappropriation of assets to the Management Agent.

5   Grantee Roles and Responsibilities

The main role of the grantee will be to plan and execute outputs and deliver the objectives listed above. The Grant is designed as an AMR laboratory capacity building and systems strengthening intervention. The 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 strengthen the selected reference and surveillance sites' capability and capacity to generate and share AMR surveillance data on both a national and international basis.

6   Key measures of success

Country Grants will eventually be 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, for the first Country Grant, it is important to note that:

(i)   Applicants are not expected to select from and use these indicators for this first Country Grant. While it is possible that some of the formal indicators may trigger towards later stages of the grant award, the likelihood of this will be reviewed and discussed by Mott MacDonald with the successful applicant.

(ii)   For the purposes of this first grant, process level indicators will be used to track progress against the work plan. The grantee is expected to utilise the indicators proposed above or to propose alternative SMART indicators in line with the outputs summarised above.[8] These will then be negotiated and agreed with Mott MacDonald as the Management Agent.

(iii)   No Country Grant will be expected to use all the Fleming Fund indicators. Instead a relevant sub-set of indicators will be proposed by the grantee for joint agreement with Mott MacDonald.

(iv)   The Fleming Fund will be independently evaluated by ITAD, a specialist evaluation firm, who have been appointed by the UK Department of Health and Social Care for this purpose. 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 grant principles described above. All grants are subject to review and evaluation by the evaluators, and full co-operation with the evaluators by all grantees is expected.

7   Key partnerships, alignment and coordination

The Country Grant must be delivered in alignment with the AMR National Action Plan for Nigeria and should support the national effort and take account of current capacity levels, future absorptive capacity, alignment with other AMR related initiatives including those undertaken by multilateral agencies such as FAO and WHO. In addition, the Grantee will need to build strong collaboration and coordination with local academic and research institutions at different levels for technical and other support.

8   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 and the Regional Grants.

It is anticipated that Nigeria will receive several Fleming Fellowships, for animal health, human health and the environment sectors. Successful applicants will receive specialised training in AMR and AMU data management and analysis, laboratory quality management, and in advanced laboratory technical skills.

Upon completion, Fellows are expected to become technical leaders in AMR and AMU surveillance in Nigeria, 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).

In addition, 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.

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[8] SMART indicators refer to indicators that are specific, measurable, achievable, relevant, and time bound.

9   Application requirements

9.1 Grantee Eligibility Criteria

Lead grantee applicants must satisfy the following eligibility criteria before applications can be assessed:

- Eligible lead grantee organisations are: National institutes (such as universities or research institutes); Non-Governmental Organisations; UN Agencies; Private companies
- Can be a single organisation or consortium; if a consortium, lead grantee applicant must evidence it has the appropriate governance, coordination mechanisms, and documented track record to manage sub-grantees
- Must demonstrate that they are registered to work within the country, including the submission of essential documents such as; current business registration certificate or equivalent, articles of incorporation, current tax clearance certificate, social security certificate, annual audited statements for the past three years
- Lead grantee applicant must demonstrate they are competent and sufficiently experienced in successfully supporting laboratory capacity development, disease surveillance, capacity building, and One Health in LMICS
- Lead grantee Applicant must be able to provide all information required to demonstrate that adequate and tested financial management controls and levels of authority are in place and are adhered to
- References from clients for previous work undertaken within the last five years are welcome

9.2 How to apply

Prospective lead grantees must register their interest to apply by emailing flemingfundWA@mottmac.com to receive an invitation to **the Applicant Information Session,** and an example of the Application Pack.

The Applicant Information Session (AIS) will be organised **in Abuja, Nigeria on 07 November 2018**. The details of the venue will be shared with applicants registering their interest.

Ahead of the AIS, an example Application Pack will be shared and will include the application form, budget and milestones template and Guidance Notes. Following the AIS, the **official Application Pack** will be sent out to prospective Grantees who have registered their interest to apply for the grant.

To apply, please complete the application form and budget and monitoring template provided, in line with the Guidance Notes, by the deadline indicated in Section 9.5.

Note the key requirements set out at the beginning of the Country Grant Application Form:

- When submitting the application document, press "Reply All" from the **official Application Pack** automated 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 (above) using "Reply All" to the original email.
- The submission deadline is: **10 December 2018, 17:00 WAST (GMT+1).**
- Applicants should observe the word limit. Additional words outside the limit will be disregarded.

- All documents included as part of the proposal must be submitted by separate e-mail 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.
- Your application is conditional upon your acceptance of the grant agreement (format will be shared in the application pack).

Proposals that do not satisfy these criteria may not be accepted.

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).

We would be assessing the application on the following key areas:

- 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

9.4 Restrictions/limitations

Any potential conflict of interest known at the time of registration should be flagged to the Management Agent at that time. If a potential conflict of interest arises after that point in time, the prospective lead grantee must clearly disclose this in the proposal.

9.5 Key dates

Publication of RFP: 26 October 2018

Deadline for registering interest to attend the Applicant Information Session: 02 November 2018 17:00 WAST (GMT+1)

Applicant Information Session: 07 November 2018

Deadline for registering to apply for Grant: 0**8 November 2018** 17:00 WAST (GMT+1)

Application deadline: **10 December 2018** 17:00 WAST (GMT+1)

Anticipated start date of grant: 28 January 2019

9.6 Contact details and support information

Any questions on the Request for Proposals should be sent to flemingfundWA@mottmac.com **The Management Agent will endeavour to respond to queries within 72 hours.**

10 Detailed Objectives and Outputs

10.1   Objective 1: Strengthen One Health governance structure for AMR and AMU surveillance

Output 1.1: A well-functioning One Health National Steering Committee (OHNSC), National AMR Coordinating Committee (AMRCC) at NCDC (also functioning as the One Health National Steering Committee (OHNSC) Secretariat), based on an agreed TOR to support and provide guidance for AMR activities. There is currently no One Health National Steering Committee at the federal, state or local government level and decision-making on AMR currently resides with the AMRCC at NCDC. The grantee is expected to   liaise with the AMRCC to form a One Health National Steering Committee, akin to an inter-ministerial committee, to be the highest decision-making body for AMR surveillance in Nigeria. Members of the OHNSC are expected to be Ministers/Senior Directors from the Federal Ministry of Health; Federal Ministry of Agriculture and Rural Development; and Federal Ministry of Environment. The lead grantee will specifically support the AMRCC to:

- Establish the OHNSC with clear roles and responsibilities based on an agreed ToR
- Collaborate with the OHNSC to develop an action plan
- Coordinate meetings of the OHNSC at least once every quarter
- Share surveillance reports with the OHNSC and provide guidance to ensure easy understanding
- Motivate the OHNSC to advocate for local resources for AMR activities in the country to ensure sustainability of the project

The NCDC is currently coordinating AMR activities in Nigeria but membership of the group is not very representative of the key stakeholders within the AMR fraternity. Meetings of the AMRCC are not currently based on an agreed timetable; therefore, some key stakeholders miss out when a meeting is convened at short notice. The lead grantee will support the NCDC to strengthen the AMRCC by:

- Including all key stakeholders as members of the AMRCC, with consideration for representation at state and federal levels
- Developing a ToR for the AMRCC to be approved by the OHNSC if possible
- Developing an activity plan and timetable for execution (including monthly/quarterly meeting days)
- Conducting a sustainability assessment in collaboration with the AMRCC and the Management Agent
- Hosting regular meetings to provide a platform for sharing information generated through the AMR and AMU surveillance in humans, animals (including aquatic species) and the environment
- Presenting the surveillance results in a more comprehensive way to the NSC to influence policy
- Undertaking periodic reviews of the surveillance information being shared to identify gaps and propose ways to fill the gaps

Output 1.2: A National One Health (or Multisectoral) AMR and AMU Surveillance Technical Working Group (TWG), reporting to the AMRCC, is operational with an agreed TOR, including quarterly and annual reporting by the TWG, comparing AMR patterns in humans, animals, aquatic species and the environment, also including AMU in humans and animals. The AMRCC of Nigeria established TWGs based on the five pillars of the National Action Plan but these groups seldom meet. The lead grantee will work with the AMRCC to reinvigorate the TWGs by:

- Developing a ToR for their operation (to be approved by the AMRCC/OHNSC)
- Supporting them to hold regular meetings (at least once every quarter)

The AMR and AMU Surveillance TWG will support the AMRCC to review all surveillance reports in animals (including aquatic species), humans and the environment before they are shared with the AMRCC and the OHNSC. The timelines for reporting will be agreed with the AMRCC, with a preference for quarterly and annual reporting. Initial assessment of AMR and AMU data sources, availability, data integrity and initial analysis should be conducted within the inception phase to inform the AMR and AMU surveillance system design during implementation. Although the Nigeria AMRCC design includes sector-specific TWGs, and there is recognition of the need for sector specific discussion regarding AMR and AMU surveillance, the intention of this Country Grant is to develop the multi-sectoral surveillance TWG to achieve a One Health approach to AMR and AMU surveillance. There should be a clear strategy to minimize the number of meetings while clearly demonstrating value for money (VfM) when bringing key stakeholders together.

Output 1.3: Evidence-based recommendations to further strengthen AMR/AMU surveillance under One Health are provided by the TWG of the AMRCC to the OHNSC

The TWG is responsible for understanding the contribution of the integrated surveillance results to knowledge of the epidemiology of AMR in Nigeria and potential links between humans, animals, aquaculture and the environment. The TWG will identify knowledge gaps and recommend future surveillance and/or research to fill these gaps, and, where there is sufficient evidence, recommend policies and programmes to control AMR in humans, therefore supporting evidence-based decision making by the various sectors.

Initial evidence-based recommendations should be delivered within the inception period, based on the assessment of data source availability, integrity and initial analysis of both AMR and AMU data. The recommendations within the inception period will inform the surveillance design for the implementation period.

Output 1.4: A state-level AMR engagement plan aligned with the NAP, through engagement in the zonal planning forum, which includes knowledge and capacity building

The proposed surveillance sites for AMR in humans are federal facilities but the plan is to engage some state level health facilities as the project unfolds. The lead grantee will work with the AMRCC and the TWG to develop a state-level AMR engagement plan, which should be in line with the NAP. It is expected that the lead grantee will collaborate with the AMRCC to identify high impact state level facilities to be engaged as surveillance sites during the implementation period.

Output 1.5: A national One Health AMR and AMU Symposium is held

To ensure sharing of key findings and knowledge generation of surveillance activities throughout the duration of the Country Grant, a national symposium should be considered. This event should bring key AMR stakeholders together to engage with decision-makers and implementers at all government levels. The output should be key positioning for evidence-informed decision-making that influence the uptake of AMR activities beyond this Country Grant. This event should be mindful of evidenced outputs, as well as the application of value for money.

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

Output 2.1: A framework for establishing a permanent National Reference Laboratory (NRL) for human health at NCDC, Gaduwa, is developed and approved by the OHNSC

In addition to UCH, Ibadan, the NCDC laboratory at Gaduwa in Abuja has been earmarked as a second National Reference Laboratory (NRL) for human health, however, the laboratory is not yet ready to operate

as the AMR NRL for human health. The lead grantee is therefore expected to work with the NCDC to develop a framework for setting up the NCDC laboratory in Gaduwa as one of the AMR NRLs for human health.

Output 2.2: ToRs for the 2 AMR NRLs (UCH, Ibadan and Gaduwa, Abuja) and a general MoU between surveillance sites and the NRLs are developed and agreed by the OHNSC

A ToR is required for both AMR NRLs, including the need to further develop a Memorandum of Understanding (MoU) between each NRL and the surveillance sites. The MoU will indicate the mutual responsibilities of each party (the NRL and the surveillance sites) during and after the lifetime of the project.

The lead grantee is expected to support the NRL to perform its roles and responsibilities effectively. This should be demonstrated in the proposal in addition to identifying strategies to ensure sustainability of the reference laboratories greater role beyond the life of the project.

Output 2.3: Needs and capacity assessment for both NRLs and remaining surveillance sites are completed using the Management Agent assessment tool

The Fleming Fund Management Agent's team assessed the UCH laboratory, Ibadan, as a surveillance site during first Positioning Activities in July 2018. With the decision to include Gaduwa, Abuja as an AMR NRL for human health as well, the lead grantee is expected to assess both facilities for human health to understand the needed resources for the facilities to perform reference laboratory functions.

Output 2.4: Bacteriology laboratories at the NRLs and surveillance sites are renovated to reach an internationally recommended standard for safe and secure bacterial identification and susceptibility testing.

During the Positioning Activities, the team's laboratory assessments found that the Bacteriology units of the facilities needed some refurbishment to be able to perform their functions as AMR surveillance sites or NRL. The grantee will be provided with the completed assessments and will be required to undertake the necessary renovations, including ensuring a reliable power supply. The grantee will need to work with the management agent's procurement consultant, IPA, to develop a procurement plan for equipment and analyzers, and a reliable supply chain for consumables and reagents.

Output 2.5: The NRLs are equipped and operational to support the AMR surveillance sites with a OHNSC-approved TOR

The lead grantee and the AMRCC are required to support the facility to perform its expected duties effectively.

Areas for support by the grantee include:

- **Biorepository.** A secure repository of isolates is an important asset to allow future characterisation of the pathogens isolated. Purchase of ultra-low temperature (-80°C) freezers is needed, with reliable mains and back-up power sources, or alternatively the use of freeze drying equipment for long term isolate storage should be explored. The repository needs to be inventoried and isolates linked with the relevant epidemiological data. An appropriate inventory system such as PACS should be installed. 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. Samples / isolates should not be utilised for commercial use.

- **Isolate Transport.** A mechanism of transport of isolates to and from the reference laboratory is needed. The lead grantee should work with the reference lab to implement a sustainable and bio-secure means of getting QC and EQA strains from the reference laboratory and isolates from the surveillance sites, including sample tracking. NCDC should be consulted regarding existing transport

infrastructure that is already in use, or in planning stages to ensure shared use of transport systems where appropriate.

- **Supervision.** The reference laboratory will need support to undertake a supervisory role. This will include assistance in development of SOPs and bench aids suitable for use by surveillance site laboratories. The reference laboratory should monitor the quality of the surveillance sites by following EQA and IQC results as well as other quality parameters such as blood culture contamination rates. Supervisory/training visits to the sentinel sites need to be supported.

- **Training/mentoring.** The reference laboratory will find the best mechanism to train and mentor personnel within the surveillance sites. Sustainability should be taken into consideration in developing the training/mentoring approach.

- **EQA.** Most of the surveillance sites currently do participate in EQA schemes. The reference laboratory in consultation with the AMRCC/TWG should be supported to put in place an EQA scheme for all surveillance sites.

- **Maintenance.** There are challenges in maintenance of laboratory equipment in Nigeria due to lack of technical knowledge about certain brands of laboratory equipment. The lead grantee should therefore support maintenance contracts for key specialist equipment.

- **Provide advanced testing services.** The lead grantee should be able to provide technical advice and training if needed on advanced testing that may not yet be feasible or which is above what can be reimbursed by the health insurance system. This might include the use of MALDI TOF Mass Spectrometry identification, or confirmation of antimicrobial resistance using advanced phenotypic and genotypic methods.

- **Whole Genome Sequencing (WGS).** The lead grantee should support the laboratories in careful planning to define specific surveillance questions to be answered by WGS which may be supported at the regional level or by academic partnerships.

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

- A secure, inventoried, biorepository system in place together with policies for its operation (e.g. selection of isolates for saving, arrangement for accessing isolates, safe transfer of isolates, etc.).

- Reference laboratory delivers quality support services in bacteriology to the surveillance laboratories, including documentation and confirmation of results.

- A maintenance plan is in place and implemented for all specialist laboratory equipment; this plan includes a budget and adequate resources are made available.

- Agreed plans for handling dangerous pathogens in place and implemented.

Output 2.6: The bacteriology laboratories are equipped and operational at AMR surveillance sites, generating and sharing AMR data with the appropriate NRL and other stakeholders

The management agent will share the assessment performed during positioning activities to aid the grantee in developing sustainable procurement and stock management systems at the surveillance sites. The grantee will also undertake needs assessments, using the tool supplied by the management agent, at the additional sites in Table 1, above, and will work with the procurement agent to equip all laboratories, including ensuring a reliable power supply and support with computers and other IT equipment for data processing and sharing.

Output 2.7: Quality assured AMR data is transmitted from both NRLs to the surveillance and epidemiology department at NCDC for further analysis and onward transmission onto GLASS and sharing with OHNSC and other stakeholders

The AMR NRLs for human health will collate all the human health AMR surveillance data, provide quality assurance, and transmit the data to the NCDC for onward transmission onto GLASS and sharing with the OHNSC and other stakeholders. The lead grantee is expected to build the capacity of the NCDC in epidemiology, data analysis and management.

Output 2.8: Biosafety and biosecurity measures are in place at NRLs and surveillance sites; and for the transportation of specimen nationally and internationally

The lead grantee will be expected to provide training and other inputs to ensure a high level of biosafety and biosecurity in all the laboratories.

By the end of the grant we expect that the following results will have been achieved in each laboratory:

- The laboratory is equipped with appropriate safety equipment and staff are wearing personal protective equipment while conducting testing.

- All biosafety cabinets are regularly maintained and calibrated, and staff have been trained on their use.

- All waste is disposed of in a safe manner.

- All staff are trained and supervised to the appropriate level for their job descriptions / roles.

- Appropriate ongoing supervision of biosafety and biosecurity is supported by training and the appointment of a Biosafety Officer.

Output 2.9: An AMU surveillance programme to collect and analyse AMU data linked to prescription from participating surveillance sites is developed and approved by the HH AMR/AMU surveillance TWG and approved by the OHNSC

The lead grantee is expected to conduct a situational analysis to explore the statutory / mandatory status of AMU data at the federal and state levels, working with the AMRCC and the TWG for AMR/AMU surveillance for human health to develop an AMU data gathering system, designed for participating surveillance sites. This should include an implementation and training plan where required.

Output 2.10: A multidisciplinary team composed of pharmacist and data managers is strengthened at the epidemiology and surveillance unit at NCDC to analyse and integrate AMU surveillance data

Within NCDC, there is capacity to integrate AMU data into surveillance reporting. The lead grantee is expected to work closely with NCDC to ensure there is a multidisciplinary team to provide data system strengthening to the NCDC. This can include, but is not limited to, data source identification, data gathering and verification, quality assurance, combining multiple data sources to inform key variables/indicators, data analysis and reporting.

Output 2.11: The AMU surveillance programme is first piloted at 3 surveillance sites. Lessons learned are used to adjust the methodology and expand the implementation to the full network of sites

The AMU data surveillance system should be piloted by the lead grantee, with feedback to the TWG for surveillance. A quality improvement process should be initiated to ensure that learning from the pilot is delivered onwards as the surveillance system is rolled out further to all participating surveillance sites. All sites should be contributing actively to deliver data and improve upon data sources within the first 12 months of the grant.

Output 2.12: AMR stewardship committees established and functioning in all surveillance sites

Most of the surveillance sites assessed during the Positioning Activities did not have antimicrobial stewardship committees. The lead grantee should work with site to form an AMR committee for each site, which should include laboratory staff, clinicians, and pharmacists. The lead grantee is expected to ensure that the group is formalized with clear ToR and an action plan.

Output 2.13: Assess the feasibility of engaging state and local government level laboratories as AMR surveillance sites with clear recommendations and strategic planning. Work with the OHNSC toward acceptance of strategic planning.

During implementation of the project, the lead grantee, in consultation with the AMRCC, will assess additional state and local authority levels laboratories to determine readiness for inclusion in AMR surveillance sites for human health. The number of laboratories to be included will be determined during the implementation phase of the project. Recommendations and a strategic plan for implementation at state and local levels will be presented for acceptance by the OHNSC. Dependent upon both state readiness and approved planning, state-level engagement within this Country Grant will be determined by both the AMRCC and the Management Agent.

Output 2.14: Staggered planning for state and local government level-led clinical laboratories engagement in AMR activities developed and approved by the OHNSC for consideration.

Following a feasibility assessment of state and local government level laboratories to determine readiness for engagement in AMR surveillance activities, the lead grantee will submit a staggered list of sites along with an implementation plan to the AMRCC/TWG for review and approval. Depending on both state readiness and approved planning, state-level engagement within this Country Grant will be determined by both the AMRCC and the Management Agent.

Output 2.15: Inventoried biorepositories of relevant isolates from surveillance laboratories, together with appropriate IT and support systems, are established at NRL sites

A secure repository of isolates is an important asset to allow further investigations of the pathogens isolated. Purchase of ultra-low temperature (-80°C) freezers, or alternatively installation of lyophilisation equipment, is needed, with due consideration of mains power supply, back-up power and UPS. The repository needs to be inventoried and linked to the relevant epidemiological data: an appropriate inventory system should be agreed and installed. Finally, there need to be clear policies for its use, for example which isolates get selected for banking, how long they are retained, and how access is granted for their use.

Output 2.16: Establish the national External Quality Assessment (EQA) system for the reference and surveillance laboratories, and analyse and disseminate results through the OHNSC

The lead grantee will collaborate with the TWG for human health AMR surveillance and the AMRCC to establish an external quality assessment system for the human health NRL and surveillance sites. Prospective lead grantees should indicate their ideas and strategies in their proposals.

10.3 Objective 3: Strengthen AMR and AMU surveillance in food animals

Output 3.1: The National Veterinary Research Institute (NVRI) is equipped and operational as the AMR National Reference Laboratory (NRL)

The National Veterinary Research Institute (NVRI) is earmarked as the NRL for animal health AMR surveillance. The NVRI is well-equipped with both diagnostic and research facilities in virology with limited bacteriology research. It has an historical record of sustained research excellence with highly skilled and well-

trained veterinarians and technicians. It also has a clear line of laboratory management system, which makes it easier for collaboration between different laboratories in the institute and with outside laboratories.

In terms of AMR surveillance capacity, NVRI has the right calibre of personnel with knowledge and skills for AMR surveillance in animal health. However, the institute currently faces challenges which will hamper its ability to function well as the NRL for animal health. To overcome the challenges to function well as the NRL for animal health, the lead grantee will support the NVRI with the following:

- Renovation and refurbishment of the diagnostic bacteriology laboratory

- Training of key laboratory personnel in bacterial identification and antimicrobial susceptibility testing (AST)

- Provision of requisite equipment and reagents to improve quality and efficiency in bacteria identification and AST

- Provision of equipment for improved measurement of zones of inhibition

- Development of reliable antimicrobial susceptibility testing as per international guidelines (e.g. CLSI, EUCAST), including methods for standardising inocula

- Develop the capability to undertake more advanced diagnostic methods such as: ESBL confirmation, acquired AmpC (pAmpC) screening, carbapenemase-producing organism confirmation, *Salmonella spp* serotyping, and Minimum Inhibitory Concentration (MIC) tests (e.g. by broth dilution) on a specified subset of isolates

- Develop and maintain quality systems in the AMR surveillance laboratories including activities such as providing national guidelines and SOPs for all priority bacteria, working with laboratories to prepare bench guides/flow charts, training/mentoring laboratories on Quality Management Systems, running proficiency testing for the AMR surveillance laboratories, and maintaining reference strains for quality assurance

- Provision of computers and data back-up system for storage of AST results for subsequent data analysis

- Train and mentor laboratory staff in the surveillance sites to conduct bacterial culture, identification and AST

- Collate and verify AMR surveillance diagnostic and demographic data from the surveillance laboratories

- Maintain a national biorepository of isolates from all laboratories in the surveillance network with an inventory linking data on source demographics/risk factors, and provision of improved storage (e.g. freezer or lyophilization system) for organisms collected as part of the surveillance programme (details under Output 3.8).

The assessment conducted by the management agent will be provided for the grantee, but it is further recommended that they visit the NVRI after signing the grant contract with Mott MacDonald to verify the resources required.

Output 3.2: TORs developed and approved by the animal health AMR and AMU surveillance TWG and the OHNSC to define the roles and responsibilities of the national animal health AMR NRL to lead the AMR surveillance in Animal Health

As in human health, the lead grantee will collaborate with the TWG for animal health AMR and AMU to develop a ToR to define clearly the mutual roles and responsibilities of the NRL and the surveillance sites.

Output 3.3: A population-based AMR surveillance system in poultry established to generate data on resistance in 3 priority zoonotic bacteria/bacterial groups: *E. coli*, *Salmonella* species, and *Enteroccoccus faecium/ Enterococcus faecalis,* for the antimicrobials identified as surveillance priorities by WHO[9,10]

The lead grantee will work with the NRL for animal health to develop a population-based surveillance system using the protocol developed by Massey University for animal health AMR and AMU. Sites are indicated in Table 1.

Output 3.4: Biosafety and biosecurity measures in place and are applied within the NRL and the surveillance sites and for the safe transport of samples

Please refer to output 2.8.

Output 3.5: A stepwise sampling strategy is established for AMR surveillance in animals. Initially this should focus on the poultry sector, with caecal or faecal sampling performed at defined points in the supply chain and tested for the presence of indicator organisms and associated resistance.

The lead grantee will work with the TWG to support the NVRI to establish a stepwise sampling framework for animal health AMR/AMU surveillance. This should initially focus on the poultry sector, with an approach to sampling appropriate for the supply chain (i.e. whether poultry are sold through commercial slaughterhouses, small slaughter points, or live bird markets), and with reference to available guidelines (e.g. OIE, FAO, or in-house guidelines which can be supplied by the Management Agent)

Output 3.6: Established mechanisms for collecting information on antimicrobial use (AMU) in the animal health sector including: sample data on antimicrobial usage in poultry; charting the value chain and distribution pathways for antimicrobials from importation to farm use; and collation of data at the Federal level on the importation of veterinary drugs

The TWG for AMR in animal health will advise the lead grantee and the AMRCC on the best mechanism for collecting information on antimicrobial use in animal health. Prospective lead grantees should include their strategy in their proposals.

The Country Grant should cover, at minimum: preparing a flow chart of the distribution pathways of antimicrobials for veterinary use; planning the survey and undertaking field work at a representative sample of production sites / methods, providing TA to the person responsible for analysing the national-level data on antimicrobial importation/consumption and reporting this data to OIE.

Output 3.7: Quarterly and annual reports of AMR patterns for the zoonotic bacteria/antimicrobial combinations in poultry (layers and broilers populations) are shared with the Animal Health AMR/AMU surveillance TWG, the AMRCC and the OHNSC

The lead grantee will ensure that the NRL shares quality assured data and reports on AMR patterns for zoonotic bacteria/antimicrobial combinations in poultry and fisheries with the animal health AMR/AMU surveillance TWG. The format and timing of reporting should be agreed between the lead grantee and the NRL; and approved by the TWG.

[9] GLASS – Manual for Early Implementation: http://www.who.int/antimicrobial-resistance/publications/surveillance-system-manual/en/

[10] http://www.who.int/medicines/publications/WHO-PPL-Short_Summary_25Feb-ET_NM_WHO.pdf

Output 3.8: Inventoried biorepositories of relevant isolates from surveillance laboratories, together with appropriate IT and support systems, are established at the NRLs

As in human health, a secure repository of isolates is an important asset to allow further investigations of the pathogens isolated. Purchase of ultra-low temperature (-80°C) freezers, or alternatively installation of lyophilisation equipment, is needed, with due consideration of mains power supply, back-up power and UPS. The repository needs to be inventoried and linked to the relevant epidemiological data: an appropriate inventory system should be agreed and installed. Finally, there need to be clear policies for its use, for example which isolates get selected for banking, how long they are retained, and how access is granted for their use.

Output 3.9: Establish the national External Quality Assessment (EQA) system for the reference and surveillance laboratories, and analyse and disseminate results through the OHNSC

The lead grantee will collaborate with the TWG for animal health AMR surveillance and the AMRCC to establish an external quality assessment system for the animal health NRL and surveillance sites. Prospective lead grantees should indicate their ideas and strategies in their proposals.

10.4 Objective 4: Establish a foundation for AMR surveillance in aquaculture species

There are efforts in Nigeria to assess AMR/AMU in aquatic species, through the partnership between the Federal Fisheries Laboratory in Lagos, and the University of Ibadan (UI). To enable continued capacity building and given the interest in national aquatic species consumption and the impact of AMR on human health, this Country Grant will build on the knowledge existing to contribute to the provision of One Health data for evidence-informed decision-making. These activities will be focused on the two sites listed above and will work alongside the animal health sector.

Output 4.1: A situational analysis of the University of Ibadan (UI) and Federal Fisheries aquaculture laboratory in Lagos is conducted to determine both need and capacity as the AMR bacteriology laboratory sites for aquatic species

To better understand the need and capacity of the current lead sites to engage actively in AMR surveillance within aquaculture, a situational analysis should be conducted. This situational analysis should include understanding both the external needs within aquaculture in Nigeria, as well as the current capacity of the Federal Fisheries Laboratory in Lagos and the University of Ibadan (UI) to conduct AMR diagnostics that would support the knowledge gaps in aquaculture.

Given the small scale of aquatic species AMR surveillance in this Country Grant we propose that the NVRI NRL for AMR surveillance in animals provides initial support to the aquatic species laboratories contributing to AMR surveillance. The feasibility of this should also be considered within the situational analysis.

The NVRI would be responsible for:

- Training and mentoring laboratory staff in the aquatic species surveillance laboratories to conduct bacterial culture, identification and AST

- Developing and maintaining quality systems in the aquatic species surveillance laboratories including activities such as providing national guidelines and SOPs for priority bacteria, working with laboratories to prepare bench guides/flow charts, training/mentoring laboratories on Quality Management Systems, running proficiency testing, including with international EQAS, and maintaining reference strains for quality assurance.

As the animal health laboratory at UI is also a sentinel site, transport systems can be used from UI to the NVRI when required. The outcome of this will be a consideration of where the aquaculture NRL for AMR could potentially be positioned once there is further expansion, but a specific aquaculture NRL is not a priority for this grant.

Output 4.2: A population-based AMR surveillance system in aquatic species established to generate data on resistance in aquatic species / pathogens *relevant to human health* as identified in the situational analysis and in guidelines produced by e.g. FAO

The lead grantee will develop a pilot for a population-based AMR surveillance system for fisheries, with isolates tested at the NVRI to inform the need for development of a dedicated aquaculture reference laboratory. Priorities for the pilot should be informed by the situational analysis performed for output 4.1, with a focus on aquatic species / pathogens relevant to human health or as informed by guidance from FAO /OIE.

10.5 Objective 5: Establish a foundation for AMR surveillance in the environment

In comparison to the human and animal health sectors, the environment sector in Nigeria is much less developed in terms of AMR. Due to the duration of this Country Grant, it is important that environmental health be integrated, with the recognition that environment outputs will remain introductory and investigative. This Country Grant will include a small component to strengthen the foundation for AMR surveillance in the environment. Initially, only one laboratory site has been included, with the potential of expanding to one other if deemed appropriate. The support to environment laboratories will focus on testing for ESBL resistance in *E. coli* following the integrated surveillance approach proposed by WHO's Tricycle project. This will begin to build laboratory capacity plus data management and analysis capacity in the environmental sector and provide the multisectoral technical working group with experience in integrating the outcomes of environmental AMR surveillance with the outcomes from human, animal and aquaculture surveillance.

Output 5.1: A situational analysis of environmental laboratory stakeholders is conducted to determine the requirements for an AMR bacteriology laboratory sentinel site for environmental health

To better understand the need and capacity of key environmental laboratory stakeholders to engage actively in AMR surveillance within environment, a situational analysis should be conducted. This situational analysis should include understanding both the external needs within environment in Nigeria, as well as the current capacity of environment laboratories within both NESREA and the Ministry of Environment to conduct AMR diagnostics that would support the knowledge gaps in aquaculture.

Given the small scale of environmental AMR surveillance in this Country Grant we propose that the reference laboratory for AMR surveillance in animals provides initial support to the environmental laboratories contributing to AMR surveillance. The feasibility of this should also be considered within the situational analysis.

The NVRI would be responsible for:

- Training and mentoring laboratory staff in the environmental surveillance laboratories to conduct bacterial culture, identification and AST

- Develop and maintain quality systems in the environmental surveillance laboratories including activities such as providing national guidelines and SOPs for priority bacteria, working with laboratories to prepare bench guides/flow charts, training/mentoring laboratories on Quality Management Systems, running proficiency testing, including with international EQAS, and maintaining reference strains for quality assurance.

- Undertake more advanced diagnostic methods such as: ESBL, acquired AmpC (pAmpC), carbapenemase-producing organism confirmation.

Transport systems directly to the NVRI NRL or from participating animal health sentinel sites will need to be considered. The outcome of this will be a consideration of where the environment NRL for AMR could potentially be positioned once there is further expansion, but a specific environment NRL is not the priority for this grant.

Output 5.2: Based on the findings of the situational analysis, environmental laboratory stakeholders are supported to produce reliable results for ESBL-mediated resistance in *E. coli* In the inception phase, the grantee will assess the current capacity of environmental laboratories within both NESREA and the Ministry of Environment to conduct ESBL-mediated resistance testing in *E coli*, to determine the support needed for the laboratory to improve capacity to undertake AST on a subsample of *E. coli* isolates cultured from environmental samples.

The grantee will support the AMR reference laboratory to provide diagnostic training for microbiology technical staff in the environmental surveillance laboratory and strengthen quality management systems within this laboratory.