



The  
**Fleming Fund**

## Our Activities: Surveillance Systems

# Establish Laboratory Capacity and Surveillance Systems



## Introduction

Strengthening surveillance systems and laboratories is the foundation of the Fleming Fund programme. In 2016, the UK's AMR Review identified investment in laboratories and surveillance systems across low- and middle-income countries (LMIC) was an essential component to tackle AMR globally. The Fleming Fund was developed to address chronic underinvestment in LMIC laboratory capacity and to support local, national and international AMR data use by strengthening surveillance systems. AMR data at the local level will help clinicians understand the role of infection and AMR in patients (human or animal). At the national level, data will help inform health policies and responses. And, at the global level, it will provide early warnings of emerging threats and help identify long-term trends. (UK AMR Review)

## Our Approach

Our approach to surveillance system strengthening is underpinned by our principles of country ownership, sustainability, One Health and alignment. Through a portfolio of tailored Regional and Country Grants, we allocate funding to train pharmacists, epidemiologists, veterinarians, clinical and laboratory staff, purchase new equipment, develop protocols for surveillance and laboratory practices, and install data management systems. We support a One Health approach to tackling AMR, investing in systems that share information within and across human, animal and environmental health sectors. Our commitment to One Health also means we support animal, food safety and environmental health laboratories, in addition to human health laboratories.

## Our Activities

### Equipment & Reagents

Accessing modern laboratory equipment and a steady supply of reagents and culture media is challenging for many laboratories. We invest in state-of-the-art microbiology equipment and support supply-chain systems that ensure reagents are delivered to surveillance sites. We also help laboratories establish systems to make their own culture media. To ensure reference laboratories can perform at scale with accuracy, we equip most of them with a MALDI TOF mass spectrometer and an Automated Susceptibility Testing instrument. Additional equipment such as biosafety cabinets, incubators and automated blood culture instruments for hospital laboratories are also purchased for other surveillance sites.

### Laboratory Refurbishments

Many laboratories do not have access to clean running water, electricity, back-up generators or access control systems. We support laboratories to undertake building renovations, improve biosecurity and biosafety standards, install water-filtration systems and back-up generators and improve plumbing and electrics throughout the laboratory buildings.

### Quality Management Systems

We support all sites to develop quality management systems to ensure that protocols and test procedures are followed safely and effectively. We support national reference laboratories both to develop national External Quality Assurance (EQA) systems across their surveillance sites and to enroll in a third-party EQA system that independently verifies national results.

### SOP & Protocol Development

Standard Operating Procedures for culturing, identification and susceptibility testing on samples provide comparable results. SOPs and protocols reduce errors and ensure all staff perform tests within the same parameters. We support laboratories to develop protocols for sample testing, biosafety, sample transport and quality assurance.

### Data Systems & Coordination

Many laboratories use paper logbooks or files for recording testing results making it difficult to report results efficiently to clinicians or to national and international databases. We support the installation of laboratory information management systems to effectively track samples, testing results and patient progress. Where needed, we also train surveillance sites to report results on WHONET, a software developed by the WHO to support national and local surveillance systems.

### Biosafety & Biosecurity

Secure waste disposal and laboratory safety procedures are essential to protect staff, the local community and the environment. We support laboratories to develop biosafety/biosecurity programmes, including installation of access management systems, biosafety cabinets and autoclaves, and ensuring there are robust waste disposal mechanisms for solid and liquid waste.

### Sample transport & Biorepository

Samples must be appropriately collected and transported to ensure accurate testing results. We support laboratories to develop proper transport and collection mechanisms locally and nationally for samples and isolates. We also support reference laboratories to develop biorepositories so that

important isolates can be appropriately stored for future research and testing.

### Systems Strengthening

In addition to building capacity in individual laboratories, we support systems strengthening, meaning we ensure that data generated in local laboratories is passed to national coordinating centres for interpretation and analysis. We support formalising data reporting and coordinating structures, reporting frequency and reporting protocols ensuring data received at the national level is comparable. We also encourage national data coordinating bodies to report human health AMR data to the WHO's Global AMR Surveillance System, GLASS.

### AMU/AMC Surveillance

We support antimicrobial use and consumption surveillance activities to understand how and how many drugs are used within a country. In animal health we help strengthen data collection on antimicrobial use on poultry farms and strengthen data reporting to the World Organisation for Animal Health (OIE). In human health, we support hospital laboratories to conduct Point Prevalence Surveys (PPS) which can inform education and antimicrobial stewardship programmes.



Top: staff in a laboratory in Uganda conduct disk diffusion testing  
Bottom: MALDI TOF machine delivered to the National Reference Laboratory in Uganda



## Laboratory Strengthening in Practice

### MALDI TOF Arrives in Uganda

Uganda’s national reference laboratory sits on a hill with a stunning view of green hills and the city in the distance. The building is clean and new, built a few years ago with support from the US Centers for Disease Control and Prevention. The laboratory spans several floors and the bacteriology unit is well equipped, except for the absence of a MALDI TOF mass spectrometer.

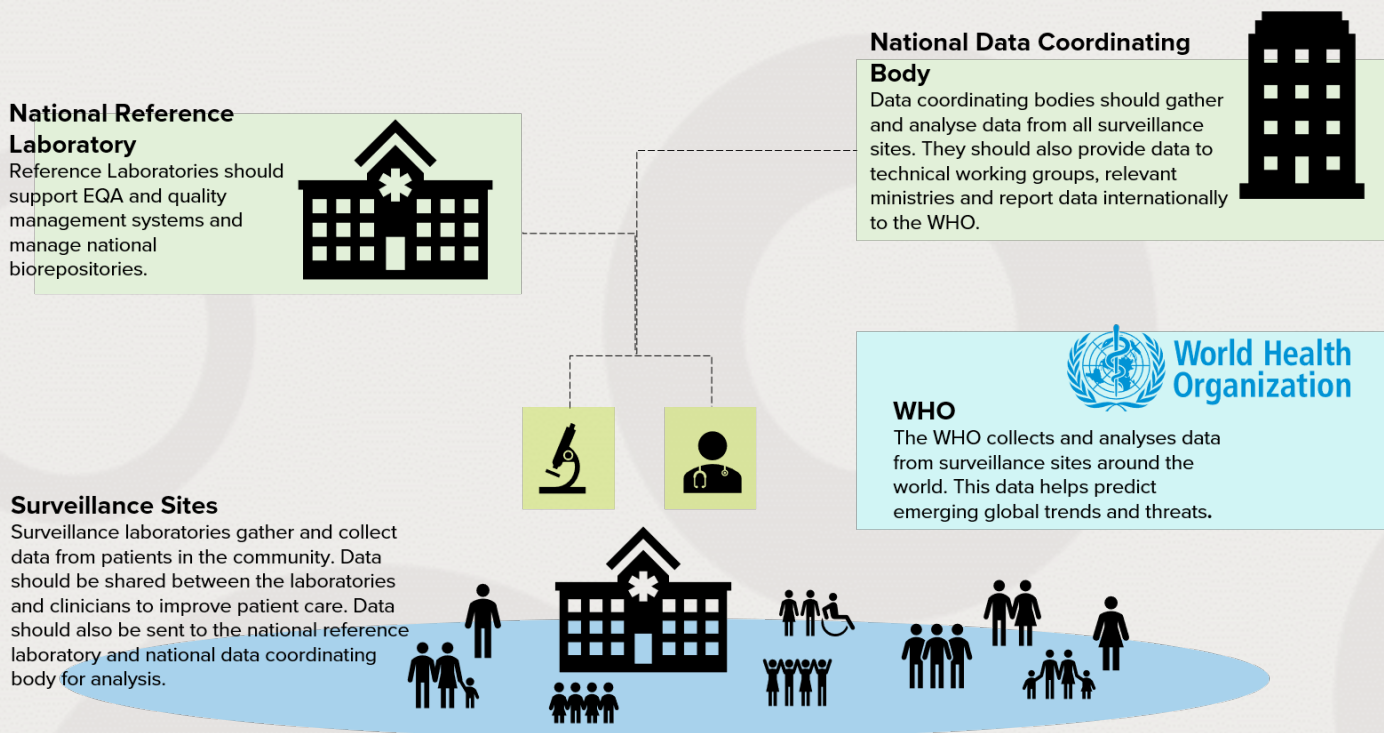
The acronym for MALDI-TOF is intimidating: it stands for matrix-assisted laser desorption/ionization-time of flight. But in short, it works by vaporising bacterial samples into small, charged particles that then “fly” into a vacuum tube. The speed at which the particles fly through the tube allows scientists to instantly identify the organism with high accuracy because every organism has its own “flight pattern”. To run the machine the laboratory staff pipe a microlitre (that’s one-millionth of a litre) onto a sterile metal plate which

is loaded into the machine. They press a button and results pop up on a computer screen within a few minutes.

The Fleming Fund is providing MALDI TOF mass spectrometers in reference laboratories around the world, because they provide extra fast results (in two minutes rather than 18-48 hours), can test 96 samples at a time, and cost only 50 cents a test versus 5-10 USD for standard testing. They are also highly accurate and use far fewer chemicals and disposables.

For national surveillance systems to mature, laboratory results must be regularly quality assured. And because microbiology is a highly manual process, samples can easily become contaminated, skewing results. The MALDI-TOF will provide a national benchmark for laboratories. Hospitals can regularly quality assure their results at the national reference laboratory, which now has the equipment to ensure testing is accurate.

## How does the Human Health Surveillance System work?



The Fleming Fund is a £265 million UK aid programme supporting up to 24 low- and middle-income countries generate, share and use data on antimicrobial resistance. Visit [www.flemingfund.org](http://www.flemingfund.org) for more information.

