

ONE HEALTH TECHNICAL BULLETIN

—Contact Megan.Howe@mottmac.com with any feedback —

Welcome to the second edition of the Technical Bulletin. In this issue we focus on One Health, giving you our take on why it's important, how it's used in our programmes, and the difference it can make. One Health is a key programme principal for the Fleming Fund - read on to find out more.

If you have any questions, comments or ideas, do get in touch with the editor, Megan Howe at Megan.Howe@mottmac.com.

Introduction

by **Dr Joanna McKenzie, One Health Advisor, Massey Univeristy**

Antimicrobial resistance (AMR) is a One Health issue because each of the One Health domains - people, animals, plants and the environment – play a role in it. Resistance is developed through the evolutionary process of “survival of the fittest”, in other words, microbes survive exposure to antimicrobials and become resistant.

Although the Fleming Fund works to tackle all antimicrobial resistance, the focus is on bacterial infections, rather than parasitic, viral and fungal infections. That's because much of the evolutionary pressure on bacteria stems from use of antibiotics in health care and in commercial farming of animals, fish and seafood, fruits and flowers, allowing bacteria to encounter antimicrobials throughout complex ecosystems.

Globally, poor hygiene and biosecurity also contribute to the development and spread of resistant bacteria in hospitals, communities, farms, food, the environment and among individuals.

To effectively tackle AMR, the sectors responsible must work together to identify new resistant bacterial threats, important resistance patterns and transmission pathways. If sectors work independently, patterns and transmission pathways will be missed which will reduce the effectiveness and efficiency of AMR mitigation efforts. Thus, to ignore One Health, would be to ignore the scale and scope of the problem.

Source: One Health, US CDC, <https://www.cdc.gov/onehealth/index.html>. The One Health concept promotes collaborative efforts across sectors and disciplines to “achieve optimal health for humans, animals and their shared environment”.

News

South East Asia

In Pakistan, the State Minister of Health attended the annual National Health Systems Research Symposium, hosted by Aga Khan University, and expressed his government's commitment to work with provinces and public and private key stakeholders on the implementation of the National Action Plan for AMR.

In Laos, a new National Strategic Plan 2019-2023 was endorsed by both the Ministry of Health and Ministry of Agriculture and Forestry, for formal launch during World Antibiotic Awareness Week.

In Timor-Leste, a workshop was organised by the Menzies School of Health Research, our Country Grantee, to launch the Fleming Fund project. The event was well-attended by partners from both the human and animal health sectors.

The FAO Regional Office for Asia-Pacific have launched Volume 1 of their Regional Antimicrobial Resistance Monitoring and Surveillance Guidelines, which covers ‘Monitoring and surveillance of antimicrobial resistance in bacteria from healthy food animals intended for consumption’.

The Value of One Health Surveillance

by Dr Joanna McKenzie, One Health Advisor, Massey University

As one of our core programme principles, the Fleming Fund has adopted a One Health approach to surveillance. As this article explains, One Health surveillance systems are crucial because they help identify the transmission, source and necessary control measures for infections, including newly emerging resistant strains. An example of this comes from my home country, New Zealand.

In May 2014, a previously unreported *Campylobacter jejuni* clone (ST6964) was isolated from two poultry carcasses from the same poultry company at surveillance site in New Zealand. Just two months later, this strain was identified in poultry from three other major companies and a month after that the first human case was observed.

As a result, more intensive surveillance of isolates from human campylobacteriosis cases and slaughtered poultry was implemented for 18 months. National surveys of isolates from human campylobacter cases and poultry carcasses were also conducted throughout 2015.

Samples were taken from poultry carcasses at slaughterhouses in a regional surveillance area and through a national survey of AMR. Antimicrobial susceptibility testing was conducted using disk diffusion and accompanied by whole genome sequencing on a subset of isolates. Regional sites also tested human stool samples from people with suspected campylobacteriosis and sent isolates containing resistant bacteria to the national public health laboratory. These surveys showed that the resistant clone had spread nationally from poultry to humans in a very short period.

Through continued One Health surveillance for *Campylobacter* spp. in poultry and humans, investigators identified that a new resistance pattern had emerged with resistance to both tetracyclines and fluoroquinolones in the same isolate.

Combined genomic analysis indicated that the new strain had emerged in New Zealand through multiple gene-related mechanisms, including mutation/substitution and the incorporation of prophages into the chromosome.

It was found to be unlikely to have resulted from fluoroquinolone use in poultry, as antimicrobial use surveillance showed that fluoroquinolones aren't used in the poultry industry in New Zealand. This shows that resistance could have been acquired via plasmids from the environment or from *de novo* mutations.

This case demonstrates how resistance can emerge and become widespread in a relatively short space of time. It illustrates that ongoing AMR phenotypic and genotypic surveillance in humans and food-producing animals is important to detect emerging resistant strains, investigate their source and inform control measures. When the microbiology results are considered alongside information on antimicrobial use in the animal sector, this provides additional evidence for the source of resistance.

We've used an example from a high-income country because it demonstrates the power of having an established mechanism for collecting, analysing and disseminating data on AMR from multiple sectors. It also demonstrates that classical microbiology skills for culture and sensitivity testing, alongside advanced molecular methods are essential for robust and sensitive surveillance systems.

Source: *Genomic Analysis of Fluoroquinolone- and Tetracycline-Resistant Campylobacter jejuni Sequence Type 6964 in Humans and Poultry, New Zealand, 2014–2016*, https://wwwnc.cdc.gov/eid/article/25/12/19-0267_article.

ESBL Tricycle Protocol: A One Health Approach to Global Surveillance

by Prof. Antione Andremont, Emeritus Professor at the Paris Diderot University Medical School

AMR is an archetypal “One Health” issue. Meaning that national surveillance systems aiming to show a realistic picture of AMR in a given country, need to gather data from humans, animals and the environment.

In 2015, this was confirmed by World Health Organization (WHO) when it released its Global AMR Action Plan, highlighting the importance of a One Health approach and an accompanying One Health surveillance system. However, at the time, the WHO had only developed the Global AMR Surveillance System (GLASS), which serves as a global AMR data repository for human health.

To make the system more holistic, the WHO recently brought together a task force to incorporate One Health aspects into the GLASS system that could be reproducible in countries worldwide.

This group began developing a protocol based on a single indicator, ESBL E. coli, that could be measured easily in humans, animals and the environment. Because the protocol covers three sectors and data gathering was meant to be simple and stable, it was nicknamed “Tricycle”.

In humans, it recommends samples are taken from positive blood cultures of patients in major hospitals in capital cities and from stools or rectal swabs from women at the point of delivery. In chickens, samples should be taken from the caeca of animals bought from major live poultry markets in large cities. In the environment, samples should be taken from water sources upstream and downstream from cities.

In the future, data gathered from sampling can be entered into a special module of GLASS platform online. A subset of the strains isolated will be saved for further molecular characterisation.

The Fleming Fund has supported Tricycle to pilot the protocol in a small number of countries, prior to finalisation. WHO will release the protocol to the public in early 2020. Thus far it has generated considerable interest is expected to make a significant contribution to global AMR surveillance.

Our Approach to One Health

by Dr Natalie Moyen, One Health Coordinator, Mott MacDonald

Our One Health approach starts with initial engagements with countries including assessing the One Health AMR governance structures, identifying cross-sector AMR policy and information sharing practices and assessing the capability of microbiology laboratories in animal and human health sectors. Grantees are then contracted to deliver projects that support these existing structures and policies. The programme facilitates collaboration in the following ways:

- Support to multi-sectoral governance structures with representatives from the One Health sectors, in which representatives discuss AMR activities and data generated through AMR and AMU surveillance and research in those sectors. This helps inform data-driven policy and programmes, and inform surveillance strategies and priorities.
- Common data gathered and shared for the same antimicrobials targeting the same bacteria across human and animal health
- Support for stakeholders to review and interpret all results - building understanding of the priorities in each discipline, and where the similarities and differences are found.
- Support for stakeholders to develop hypotheses about transmission routes and risk factors for transmission, and co-design surveillance and/or research to test these.
- Support to strengthen cross-sectoral collaboration through Professional Fellowships and Regional Grants, which facilitate information sharing and learning.

The Fleming Fund is a £265 million UK aid programme helping to tackle antimicrobial resistance in low and middle-income countries around the world. The programme is managed by the UK Department of Health and Social Care, in partnership with Mott MacDonald, the Fleming Fund Grants Management Agent.



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