THE FLEMING FUND
THE PETRI DISH

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

Editors Notes

Greetings to our readers - we hope you are healthy and staying well during this period.

Our issue this month includes a deep dive on Whole Genome Sequencing and some profiles from our Kenya Fellows. We have also included further information around our upcoming policy fellowships and the second round of fellowship grants.

Programme Updates & News

COVID-19 Courses & E-learning from ASLM and CDC

ASLM E-Learning
ASLM has developed courses to help e-learners better understand COVID-19 guidelines and how to manage COVID-19 diagnostics and treatment. To register for the courses, visit ASLM's website.

CDC Operational Considerations for Low- and Middle-Income Countries
To facilitate implementation of WHO COVID-19 technical guidance on infection prevention and control (IPC) activities for countries, CDC has developed operational considerations to help contain and prevent COVID-19 in healthcare facilities in non-US settings. These documents were created for healthcare facilities with limited resources (such as staff shortages and supply shortages), particularly in low- and middle-income countries. For more information, visit the CDC website.

Upcoming Fellowship Webinar

We will be holding a webinar for Fellows on Wednesday 5th August at 08:30 British Summer Time (07:30 UTC). This webinar will be an opportunity for Fellows to connect, raise questions, and will include two short presentations on relevant AMR/U/C topics. The Mott MacDonald Fellowships team will be sending out a link and agenda to all Fellows.

Quantification, Benchmarking & Stewardship of Veterinary Antimicrobial Usage Conference

The AACTING consortium has announced the third AACTING Conference, to be hosted 3-4 December 2020 in Hannover, Germany.

Abstract submission and Registration for the Conference are now open.

Further information is available on their website: https://aacting.org/aacting-conferences/

Royal Society of Biology: AMR the One Health Approach

A panel of experts from the Royal Society of Biology came together recently to discuss challenges and potential solutions to antimicrobial resistance. The event was held on zoom on the 21st May, 2020, however the discussion has been uploaded to Youtube and can be viewed online here.

Deep Dive: Whole Genome Sequencing (WGS)

Earlier this month, Dr Claire Gordon, Lead Clinical Microbiologist at Mott MacDonald led a question and answer session about WGS during a Fellowship webinar. Some highlights from the discussion are below:

Q: Claire, you have said an organism can acquire resistance genes but these genes need to be switched on. Can you elaborate?

Programme Updates & News

For a gene to be functional (i.e. made into a protein) it needs to be transcribed (from DNA to mRNA which is then translated into amino acids for protein assembly). This process needs to be controlled, otherwise the cell would be constantly producing proteins even when they are not needed. Each gene therefore has a starter region (promotor) which gives the signal to RNA polymerase that transcription should begin for that particular gene. Each gene also has an end signal (terminator) which stops translation at the right point.

When an organism acquires a resistance gene, it also needs to acquire the promotor and the terminator regions. Usually these are located next to the resistance gene sequence, but sometimes it is more complex, and control of the promotor region gene is influenced by other parts of the genome. This means that occasionally, the resistance gene is present but the regulatory regions are not, or are not switched on, and the gene doesn't function properly.

An example would be the ampC beta-lactamase gene in Enterobacterales. The gene is present in most Enterobacterales, but in some species (e.g. E. coli) is permanently switched off. You might find the gene when you do WGS, but it wouldn't actually mean that the isolate is resistant because the gene isn't functioning.
We did a lot of work in S. aureus and have shown that in the vast majority of cases, presence of a resistance gene usually also means presence of the regulatory regions and phenotypic resistance, and this is probably the case for other organisms. However, it's just something to be aware of, particularly if you are looking at unusual genes.

Q: How can I familiarise myself with bacterial genomes?

If you want to familiarise yourself with what the sequences look like, and some basic analysis, you could download a couple of sequences from the NCBI database to work with.

Usually you can download the sequences as fasta files. These are a very basic text file which you can open in a Word notebook (available on most PCs even if you don't have a Microsoft Office subscription). The file has some basic headers, and then the sequence: it should look something like this:

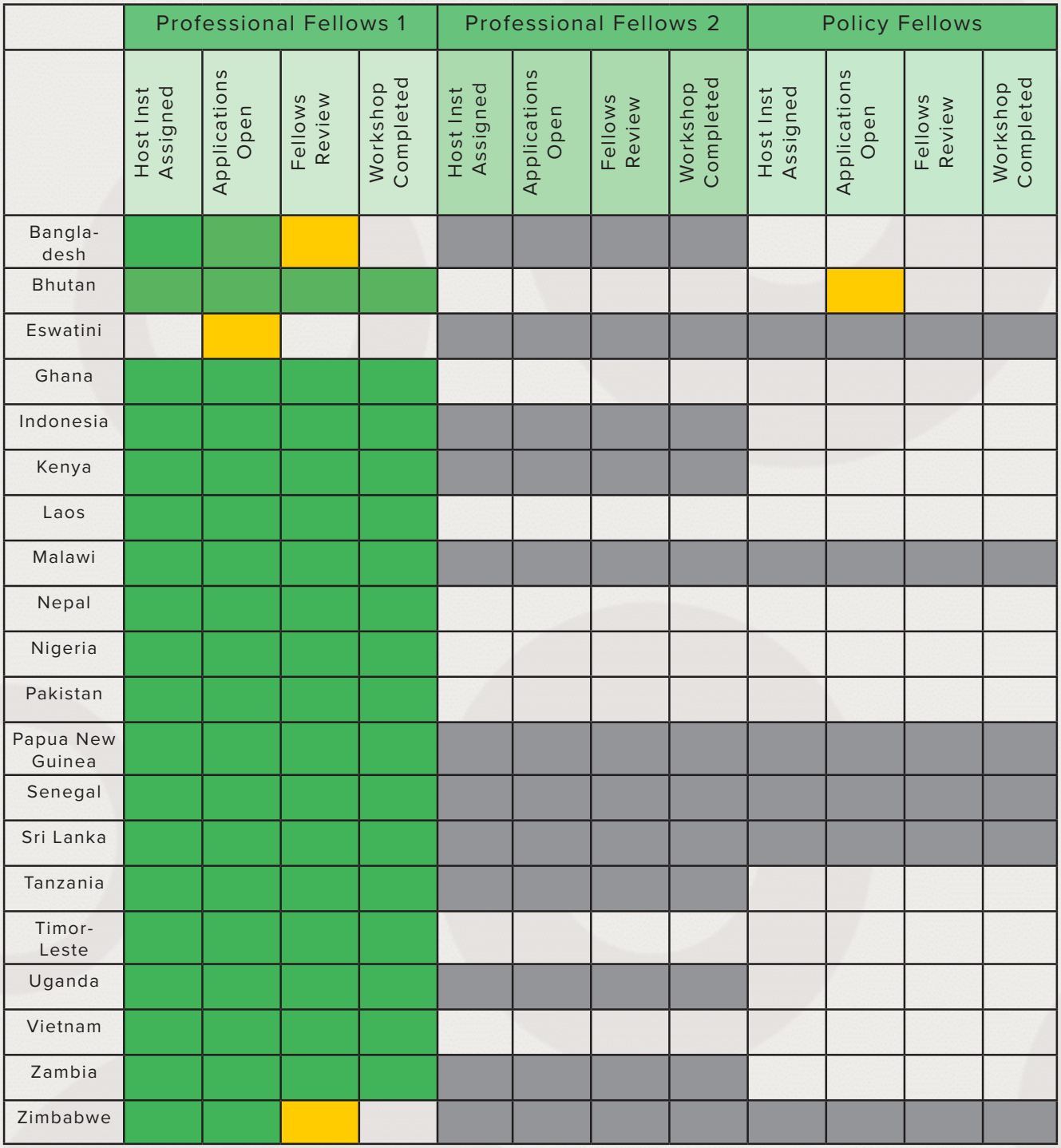
>dfrB gi|49313|emb|CAA78910.1| dihydrofolate reductase [Staphylococcus aureus]
atcgggttaaccatcgtcgtactgacgtacgggggtttcccaaa

but a lot longer – for a full genome it will be several million letters long. (I made up that sequence, so don't try and do anything with it!) The sequences from NCBI represent the final, clean, consensus reads, although usually in a series of shorter reads (contigs) rather than the end-to-end genome.

The fasta file can be uploaded to opensource online tools which can do some basic analyses such as look for resistance genes (e.g. https://cge.cbs.dtu.dk/services/ResFinder/ - choose assembled genome/contigs if using a fasta file)

You could also use https://www.geneious.com/, a genome visualisation/analysis programme which can you run from a PC or laptop. The full version needs a subscription, but you can get a free 1 month trial which might be fun if you want to see what assembled genomes look like and run some basic analyses. You will only be able to run a few sequences on Geneious as whole genomes use a lot of computer memory. But it is a good place to start for understanding what genomes look like and how to visualise and annotate them.

Progress: Fellowship Scheme



Kenya Fellowship Biographies

SUSAN GITHII
AMR Laboratory, Human Health, National Public Health Laboratory

Susan Githii works at the National Public Health Laboratory (NPHL), Kenya. Currently, she is the focal person for coordinating the laboratory activities in Antimicrobial Resistance (AMR) surveillance. She also coordinates an online mentorship on AMR surveillance using the ECHO (Extension for Community Health Outcomes) platform for the laboratory personnel conducting the AMR surveillance.

GRACE BARTONJO
AMR Surveillance, Human Health

National Public Health Laboratory Grace works at National Public Health Laboratory (NPHL), Kenya. She is currently the Deputy in-Charge in the Strategic Information Unit, engaged actively in NPHL data management including AMR surveillance data. Grace holds a master's degree in Epidemiology and Laboratory Management and a BSC in Microbiology. Her qualification, experience in surveillance and epidemiological work enables her to better address AMR/AMU surveillance to combat this problem globally, regionally and nationally.

KARIM WANGA
AMU/C Surveillance, Human Health
National Public Health Laboratory

Karim Wanga has a bachelor's degree in pharmacy and a master's degree in pharmacy (Pharmacoepidemiology and Pharmacovigilance) from the University of Nairobi. He now works at the Pharmacy and Poisons board, Kenya where he is the AMR focal point as well as head of Post-Market Surveillance, under Product Safety Section.

EDITH KAGIO CHEGE
AMR Laboratory, Animal Health
Ministry of Agriculture, Livestock and Cooperatives, State Department of Veterinary Services

Edith is a laboratory technologist in the Ministry of Agriculture, Livestock and Co-operatives, State Department of Veterinary Services. In this role, Edith also works at the Regional Veterinary Investigation Laboratories, Karatina which serves the central and some parts of the north eastern part of the country.

ELVIS MADARA WAGA
AMU/C Surveillance, Animal Health
Veterinary Medicines Directorate

Dr. Elvis Madara Waga is a Veterinary Surgeon working for the Veterinary Medicines Directorate (VMD) as a veterinary intern. He graduated from the University of Nairobi with a Bachelor's degree in Veterinary Medicine.

Dr. Elvis' roles at the directorate include assisting in licensing and inspection of veterinary pharmacies and pharmaceuticals and conducting post-market surveillance activities. He also works on screening for registration of new pharmaceutical products and data management on imported and exported veterinary pharmaceuticals.

HOST INSTITUTION DIRECTORY

Host Institutions	Regions				Expertise					
	WA	EA	SA	SE	HL	AL	HS	AS	HU	AU
University of Edinburgh	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Oxford University, Clinical Research Unit				✓	✓	✓	✓	✓	✓	✓
National Institute for Communicable Diseases	✓	✓			✓	✓	✓	✓	✓	✓
Technical University of Denmark, National Food Institute	✓	✓	✓	✓		✓	✓	✓		✓
The University of Hong Kong, School of Public Health				✓	✓	✓	✓	✓	✓	✓
Fondation Merieux	✓				✓	✓	✓	✓	✓	✓
London School of Hygiene & Tropical Medicine with RVC & LIDC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Erasmus University Medical Centre			✓	✓	✓	✓	✓	✓	✓	✓
The Peter Doherty Institute of Infection & Immunity	✓		✓	✓	✓	✓	✓	✓	✓	✓
Brigham & Women's Hospital (WHONET)	✓	✓	✓	✓	✓		✓	✓	✓	
American Society for Microbiology	✓	✓	✓	✓	✓	✓	✓	✓		
Mahidol University			✓	✓	✓	✓	✓	✓	✓	✓
International Livestock Research Institute	✓	✓	✓	✓		✓		✓	✓	✓
African Society for Laboratory Medicine	✓	✓			✓	✓	✓	✓	✓	✓
Aga Khan University		✓	✓		✓		✓			
Public Health England with the Animal and Plant Agency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Association Pasteur International Network	✓	✓		✓	✓	✓	✓		✓	✓

REGIONS

SE - South East Asia: Laos, Vietnam, Pakistan, Timor-Leste, Papua New Guinea
SA - South Asia: Nepal, Bhutan, India, Sri Lanka, Indonesia, Bangladesh
EA - East and Southern Africa: Uganda, Tanzania, Kenya, Zambia, Malawi, Eswatini, Zimbabwe
WA - West Africa: Ghana, Nigeria, Sierra Leone, Senegal, Burkina Faso

SECTOR EXPERTISE

HL - Laboratory, Human Health
AL - Laboratory, Animal Health
HS - AMR Surveillance, Human Health
AH - AMR Surveillance, Animal Health
HU - AMU Surveillance, Human Health
AU - AMU Surveillance, Animal Health

The Fleming Fund is a £265 million UK aid investment 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 Grant Management Agent.

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