The AMR Exchange: Global Voices, Share Solutions

Transcript

Episode 2: *AMR - The Quintessential One Health Challenge*

Which professional colleagues from Kenya, Uganda, Zambia, and Malawi undertake a fellowship that offers expert mentorship and training that will enable fellows to respond to the antimicrobial resistance crisis within their respective countries by enhancing antimicrobial resistance surveillance and stewardship. The University of Edinburgh, the host institution for the Fleming Fund Fellowship scheme provides comprehensive training, mentorship, and collaborative research opportunities to fellows. The fellows are all professionals from the human health, animal health, or environmental sectors. They all have the remit to tackle antimicrobial resistance. In each episode, we focus on an aspect of the Fleming Fund fellowship scheme. We speak to the fellows, we hear about their roles, and understand how antimicrobial resistance is affecting their patients, the farmers they work with, and how they approach and address antimicrobial resistance on both a day to day basis and also at the policy level. We hear about their training and how this is being utilised. We hear from the alumni fellows, those who have already undertaken a fellowship. We learn about the impact their fellowships have made and how they respond to antimicrobial resistance, and we also hear about the collaborative research that's already underway. My name is Nadia MacArthur. My name is Emily O'Reilly, and we're your host for this series, and we welcome you to join us. Welcome back to Episode two. In our previous episode, we took a deep dive into the global crisis of antimicrobial resistance or AMR and how the Fleming Fund fellowship scheme is helping tackle it through a one health approach. You gave our listeners an overview of AMR and what it means. That's right, Nadia. In episode one, I described what antimicrobial resistance is and how it spreads. Also in that episode, I spoke with Professor Til Bachman, who explained the structure and the vision behind the Fleming Fund fellowship scheme. We also heard from several inspiring fellows, policymakers, researchers, healthcare professionals, each contributing from different angles to address AMR in their countries. Hearing their stories was truly powerful. What struck me most was their passion and how their individual expertise, whether in the labs, government departments, or ministries or on the front line in the clinics or out talking to farmers, everyone comes together to build a broader cohesive picture of AMR. Exactly. And that's where the Fleming Fund Fellowship scheme comes in. It's part of the UK's global response to AMR, enhancing capacity in low and low middle income countries by supporting professionals across the human, animal, and environmental health sectors. Together, these fellows form a network of expertise tackling AMR at all levels from lab based diagnostics to national policy making. In episode one, we heard from Professor Till Bachman, one of the co directors of the scheme, who also introduced the co director Adrian Mwongi. Today we're delighted to welcome doctor Adrian Mwongi himself. He's a molecular epidemiologist, a BBSRC future Leader fellow, and he's the co director of the Fleming Fund Fellowship scheme. His work focuses on AMR and how it develops and how it spreads, particularly at the human animal interface and mainly in African countries. Brings incredible insights into metagenomics, TB research, and the structure of the Fleming Fund Fellowship

scheme. Let's welcome Adrian. Hello. Thank you. Thank you for having me. I just wanted to open by hearing a little bit more about your own research and how that's evolved and how it's evolved to encompass AMR. Well, I was born and grew up in Uganda. I did all my studying in Uganda. I'm a veterinary doctor, trained in Makari. And my research work really started with the MSC with a scholarship to go to Norway, funded by the Quarter scholarship. And my work at that point was looking at the family of pathogens that cause tuberclosis, how they transmit from animals to humans. And I was specifically looking at pastoralists in the Qatar corridor in Uganda. And I did that for my MSC and did that for my PhD as well. And that's how I got employed here in Edinburgh to support a project that was funded by Welcome Trust to look at the same problem in Cameroon. TB is probably the best disease to look at antimicrobial resistance because it is at the extreme end where people will get TB on treatment for a minimum of six months. And if the first round doesn't work, you go on to the treatment of nine months. So the chances of you actually getting AMR is resistance is very high. So Um, that's how I made the jump from working on tuberculosis into the broader sense of antimicrobial resistance. And are you still engaged in that work specifically in Edinburgh, or is it kind of evolved a little bit more into some other areas and other pathogens? My group does several things, but the foundation of my group is working at the human animal interface. Currently, we're actually trying to understand how data that we collect from human health sector and the animal health sector and environment can be integrated because at the end of the day, if we're going to control anticrobial resistance, which comes from all these sectors, we need to understand how the problem is when we look at the unified view of the data. We're trying to find ways in which we can leverage digital tools or technology to support how data integrates How does that link in with the Fleming Fund Fellowship scheme? What is the linkage there? So I applied for the BBRC Future leader Fellowship, and luckily I got funded or selected to be part of contributing to this challenge. And what I chose to do was to look at farmers and the animals, and I chose to look at pigs because pigs actually have the same gut system as we do. They are one of the few monogastic animals that we keep on our farms. So it was a good model to try and understand if a farmer and a pig are in the same environment. What are the pressures that are driving the resistance we see either on the farm or in the hospital when the farmers go to that hospital with disease. I followed farmers for one year on the animals and some of the results that we have actually the paper has just been accepted in nature communications are quite interesting because farmers in urban areas, their gut systems are not any different from the animals. They carry the same resistance levels as the animals. While it's in the rural settings, the farm and animals are quite far apart. Is that because in the urban setting, living in closer proximity, whereas in the rural area, the pigs are foraging more? Is that the reason? It's possible. I mean, this is a multidimensional problems, and I can't tell you in the first paper we have covered that whole dynamic, but I think what we wanted to stress is that as countries in the global South move from extensive farming and free range farming into intensive farming, that will come with challenges of AMR because you would have to be baring more animals in a smaller space to meet the demand of the growing population and as people move from the rural areas into the urban areas. That will come with challenges. This whole paper was just looking at that. One of the things I've read that in Uganda is that pig population has actually increased hugely over the last few years. There is a drive to pig production. Yes. I mean, I think Uganda has one of the fastest growing pig production industry on the whole continent. Yes, Ugandans eat pork. They love their pork. And that demand is driving, obviously, farmers to come and sort of produce the pork closer to the market. That means that the peri urban settings are now increasingly having these farms, and that will, of

course, is providing the protein that is required, but that will also have implications on how AMR emerges and transmits. There any plan to look at the environment? Because I'm thinking about pigs in this pere urban environment and the waste, human waste, pig waste. I mean, are you going to look at the environmental aspects of that and look at the sewage? Hopefully, as you know, we leverage these results to get more resources, we will look at the environment. And also, as I said, the datasets that we have looked at, there's a lot of unexplained variation or differences. That we think are likely to come from elsewhere, and that might be the environment where the farmers or animal interacting. Remember that the farms themselves, where you have high use of antibiotics become sort of a pollution source. And if those farms are then connected to streams, they are connected to other environmental or would I say, say, water bodies, ways in which that pollution can leave the farm, it means that they contribute to how much one, antibiotic resistant bacteria we have, antibiotic residues that go into the water, but also the anticrobial resistant genes, and all these taken together become sort of the precursors how anticrobial resistance emerges. And so, coming back to the Fleming Fund fellowship scheme, how did you get involved with that specifically here at the university? So when I got the fellowship, I had to spend a year and a half in Uganda setting up this longitudinal cohort study, and around that time, the university was contacted as one of the potential host institutions. But the university has to demonstrate that they had ongoing activities in a specific country, and it was very easy to demonstrate because I was already doing some of the work. And obviously, as the university, there are a number of ongoing collaborative projects in any of the countries that we support. So it was easier to actually make the case that we already do work in those countries. If we draw back to the countries involved, we've got Uganda where you're from, Malawi, Kenya, Zambia, what are the specific AMR challenges from those countries and from the region more broadly? Are they the same AMR challenges elsewhere? Are there similarities, contrasts? They are broad challenges, and this will entirely depend on the sector we're talking about. If it is the health sector, low middle income countries as they're categorised, tend to have challenges with health, healthcare provision, and access. And so those inherently play into all the things that we talk about with EMR. I think a very strong health system actually probably is one of the biggest tool that you could use to fight EMR because if a significant proportion of your population cannot access healthcare, which means that when they are in trouble, they have to fend for themselves, then these drugs become the thing that they use. And if they don't use them correctly, it means that you're seeding the resistance. So as a whole, these countries relatively faced the challenges of weaknesses in healthcare provision and access. And by access, it might not necessarily mean the individuals accessing the hospitals, but actually also provisions coming to the hospitals, stockouts of medicines, medicines expiring in stores. So all those aspects create an environment that becomes challenging in the emergence, but also the control of MR, which is why working with government is really the best way to do it because all those things can only be changed by So as a vet who is now much more involved in the human healthcare system, have your perspectives around AMR changed at all? Not really. I think I want to answer this in two ways. If you're going to work on one health, you have to be able to sort of lean into sectors where you don't necessarily work. Also learn how they do things. You see the differences and similarities because you can use those then to negotiate difficulties working together. So it hasn't necessarily changed my perception on AMR. It has simply reinforced why we need to work together to control this problem because it can emerge from any sector. I think going back to your question on the challenges of AMR in these countries. I started off by saying it depends on the sector and I started with the human sector. Now, the veterinary sector is slightly different because the way governments fund the

veterinary sector is based on how the disease is likely to cause economic problems, what they call public good diseases and AMR doesn't fall in any of those. There are very few countries before the UN General Assembly in 2015 that actually were doing AMR surveillance in the veterinary sector. So the veterinary sector is really catching up on this. For the human health, the motivation is very clear because you want to preserve the drugs for the health. For the veterinary sector, usually they prevent diseases because those diseases could cause economic burden. I think one of the things as a vet, I have to reflect on what exactly is the motivation for us? Is it because we want to defend the use of antibiotics in the livestock sector for food production or use them prudently to reserve them for human health. Those questions I'm sure I'm not the only one who battles with them in the veterinary sector. Do you think the Fleming Fund fellowship scheme, bringing together fellows from the human healthcare sector, the animal healthcare sector, and of course, policy and environment as well, how far do you think the Fleming Fund fellowship can go to address these points that you've made around the motivation for controlling and addressing or monitoring AMR? I think the way the fellowship is designed, inherently, it sort of requires the fellows to work together and possibly asks those questions because the fellows are selected from these three pillars of AMR capacity enhancement, diagnostics, surveillance, and stewardship from both sectors, including the environmental health. They have to work together to deliver on a challenge that they have identified within their system. And inherently that will bring them to a point where they have to ask themselves why they are doing it. I remember when the Phase one fellows from Malawi just started and their collaborative project. I think some of the fellows in the medical side had never really worked that closely with the veterinary sector. So it took a while for them to make out how they would design things. Of course, we have to also acknowledge that the human health sector is more funded than the veterinary sector. And all these things come to play when you're running the collaborative project. And by the time they finished, they were a totally different group because they had agreed that this community breeding pottery system that the country has that has been running for the last 60 odd years, surely must represent some sort of risk, which they didn't know because these potry animals birds are bred in a specific nucleus owned by the government, and then they're distributed across the country. And chances are they have had meat on their table that has come from those farms. So the distance between the food and where it comes from came to play. So as clinicians or as pharmacists from the human health sector, they also were curious of knowing, you know, how does it affect. So that made a big difference? Yes. Yeah. One. We heard from Professor Til Bachman in the opening episode, who gave a great overview of how the Fleming Fund fellowship scheme works, how it's structured. With a view of developing our understanding of Fleming Fund fellowship scheme, could you elaborate further on how the funding works? Because I'm aware that there are different models of funding, country grants, regional grants, and fellowships. Can you explain how these differ and how the fellowship model fits into the overall picture? So I will answer this at different levels. Globally, the Fleming fund is an investment from the UK government that is delivered through the DHS, supporting 22 countries across the global South, but also supporting the global agencies like WHO and FAO. And at country level where we work, there are two strands of this funding the country grant, which supports the infrastructure, supports the development of labs and pipelines, how those labs can be supplied. And then the capacity enhancement, where we support fellows to develop skills to allow them to be able to contribute to the delivery of the National Action Plan. And then those are linked to original funding, which then takes sort of original view. So they have the original funding, and then within country, you have the fellowship scheme and the country grant. So the Fleming Fund Fellowship scheme is now in its

second phase. You're also part of phase one. From your perspective, how has the programme evolved? What changes or improvements stand out? So in phase one, we were focused on the skill sets that we gave the fellows to support how quality data is generated across these three themes, the diagnostics, surveillance, and stewardship. The second phase then focuses on how that data is taken, processed, and used for decision making. So there are two specific remits for phase one and phase two. But of course, overarching were the policy fellows who, at any given stage, either phase one or phase two, were using that information to write up our policy briefs. What happens after the fellowship? How involved are the alumni fellows? Is there a particular story from a fellow or alumnus that has stayed with you? So, luckily, we were given resources to maintain some activities with the alumni, and this bit of funding allows the alumni to meet, reflect on what they could do, but also find activities that they could jointly take on as part of contributing to the National Action Plan activities. And we have also seen or just meeting locally, but actually they get to meet continental level. Um, so there are still activities that allow the alumni to be engaged with the current phase, contributing directly and or actually mentoring the current phase, but also keeping the activities going. Now, about something that stuck out that stuck out the fellows. I mean, there are many, and coming from Uganda, I think I have a bit more understanding of some of the fellows there. And I think my favourite is with William Olum. William came to join the fellowship as a head pharmacist in origin Refer Hospital in Gina. And William had he obviously had worked in the hospital for a long time, so he knew exactly the challenges that the hospital faced. But I think the fellowship allowed him to one, get the skill sets, but also, I think, challenged him a bit more to get those things that had been challenging him before into real action. So I really think for William the fellowship allowed him to get on and do things that were challenging him. An example was they had stockouts in this hospital of disinfectants, where you obviously have to be reliant on the government supplying those. But if you're running a hospital, you can't have stockouts on disinfectant because the infection and control processes are 24 hour processes, you can't stop them. He started using his chemistry to make these disinfectants, writing up protocols. And checking how well what he had produced actually, you know, whether it was different from what comes from the usual supply chain. And I think he found out that actually, you don't have to have stock out. Every hospital has a pharmacist who has done chemistry and they can do this. And so he was sending out these protocols and teaching other pharmacists how to do it. And I think it's got on across the country. So he goes around teaching other hospitals how to do it, and hospitals come to benchmark with him. Second thing is his hospital was the first to have antibiogram. It's a way for you to know which antibiotics are working vis vis how they're used in the hospital. Whenever a doctor orders for a drug, the pharmacist looks at the antibioram and say, Okay, actually, I think you should use this because most of the patients who come here we use that. This is now fashionable, but this is something he did three years ago. Um, and still, he had this, you know, he wrought down protocols on how to teach others. I feel sad that William has retired now, but when I talked to him a week and a half ago, he said, You know, I hope what I've done, you know, remains and people continue my legacy of trying to support others. But for me, not to say, you know, I don't recognise the impact of others, I think William, for me, stands out as a fellow. That's truly wonderful. Very resourceful Yes, yeah. Fellowships often offer more, much more than financial support. In your view, what makes a fellowship truly transformative? Transformative for the fellow, I hope. Well, I don't know. Let you answer that question from a fellow's point of view, and I'll say this as an observer of how the fellows have grown. The number of fellows who when they joined the fellowship were on a certain career level, but now they have grown into leads of certain either sectors in their own

countries. And we have fellows who are now employed at regional level, who are supporting the efforts at regional level. I don't think every fellow that we have I think most of the fellows have actually grown in the last three years in terms of either career network, collaboration, and from the academic side, of course, publications. Yes, they have been involved in publications. And in fact, some of them have been involved in publications that are defining how antibiotic resistance control guidelines are delivered, evaluated, and yeah, assessed. What kind of impact do you hope to see in these regions as a result of the fellowship? I think the impact of the fellowship might not be seen in the short term. But I think what the fellowship has done in the short term is to create a community of practise, a community across the continent, dare I say, because the fellows link up to other capacity building networks that are run by other institutions. And so they're involved in talking together at continental level, but I think they talk more at regional level. And by doing so, actually, I think they are building a community of practise that is needed. The strange thing about one health as a discipline that you need for this isn't like medicine where you go to a medical school, you study medicine, you do your internship, you join an established community of practise that has specific guidelines of delivering medicine. We're asking the fellows to do is actually to become a community of practise for AMR, and there isn't a defined way of how that community of practise will emerge. So the fellows really are the pioneers of how that is done. Isn't going to use the word pioneers pioneering. So, Adrian, we've touched on One Health, but you actually lead the Digital One Health lab here in Edinburgh. Could you tell us more about that? So just reflecting on what I've talked about my journey, actually, the lab is sort of a conference of many, many things. But All those things are trying to answer, how do we integrate data? How do we organise data that we can use to support decision making for public health? And Digital one health really is leveraging technology to allow how data is integrated. We're currently working on a number of aspects of how we do that from supply chain integration with some industry in Scotland to how data gets integrated across the Ministries of Health, agriculture, and environment in Uganda, Tanzania and Rwanda. And how does that tie in with the Fleming Fund fellowship scheme in terms of the work of either of any of the current or alumni fellows, does it? It does, as I mentioned, the second phase of the Fleming fund is focusing on how we use data. And so some of this data could have been collected from individual sectors, but in order for us to use it in a truly one health sense, we have to integrate this data. And as I said, this data comes with a certain range of limitations to use it from the ethical, social, and legal point of view, especially if it comes from the human health sector. So we have to adhere to those, but as well provide a minimum amount of data that can be used to answer public health questions. When we talk about data and integration, are there any lessons and approaches that we can learn from here in Scotland and the rest of the UK about how AMR is approached and tackled from countries like Uganda, Zambia, Kenya, and Malawi. Is there anything we can take on board and learn from other countries in terms of tackling AMR in our context here in Scotland where we are now? I mean, AMR is a quintessential one health problem, which means we have to have some sort of flexibility, and we have to be able to compromise on certain things to allow for the public health good, you know, to be delivered. So if you were to look at how countries, for example, deal with data integration, and you're putting the countries we're working with in the LMIC on one side and developed countries, you know, in Europe on one side. The flexibility that exists with data integration across the sector, in my view, is much higher on these systems that have matured, literally ossified. That's really difficult to get sectors to share data across sectors. That is true even here in Scotland when you want to deal with one health problem. Because there's more data available

there is more data, but the data custodians, I think, much more scared of the repercussions of sharing the data rather than what the data could do in terms of the public health good because you're always navigating that. And actually, I would argue it is also unethical not to share data that could have been used for public health decision making. And so in a way, we're trying to find the balance of where this should be done. So I find that there's a fair bit more flexibility in systems in the global South than the flexibility you have here. And what we're trying what idea we want is to see how we find a common ground in terms of sharing data that supports decision making, especially for complex problems like EMR. So if some of the collaborative projects and some of the approaches adopted, because of the Fleming Fund fellowship scheme, if they were to evidence the positive outputs in addressing AMR from sharing data and integrating their systems, do you think that evidence would be useful here as well, and it would drive that I think that journey. I think, for example, for the Fez one Malawi, how data was collected at household level, about the pathogen, about the animals. Data is going to be used to answer a question about something that is quintessential Malawian. This breeding system is unique to Malawi. And so if a country can rally around solving a problem and bringing data from across sectors to answer that problem, I think that is something, you know, even Scotland or the UK can learn from. Is there a particular moment during your involvement with the Fleming Fund Fellowship scheme that has either shaped or reinforced your commitment to the programme? I think and I say this from sort of hindsight. It's not something I probably recognise at that point in time, but I think the need to allow different disciplines and expertise to negotiate a common ground on how they solve a common problem, and facilitating that for me is a turning point because as we preach the use of interdisciplinary approaches for solving global health problems, I think we need to focus a bit more on how we enable disciplines to find a common ground because therein lies the sustainability of how to do it. If you allow people to arrive at a solution, then they own it. And I think that's what I have learned over, you know, the last couple of years that we've worked with the fellowships, being an enabler and allowing fellows navigate working together, and you see that, you know, blossom into something even beyond the fellowship, I think, yeah, that has changed my view on how we approach interdisciplinary working. As we wrap up, what message would you like to leave with the current fellows? Wow, for the current fellows, it is always hard when you're starting to deliver on your either individual fellowship or collaborative project. But if you keep at it, work together as a group, results to come. Be open minded, expand your network because you will need that network as you grow into your careers. And yes, it is a complex problem that we are trying to find solutions to, and this is just simply one piece of the puzzle to that solution. Well, thank you so much, Adrian, for sharing your time, your insights, and your passion for this crucial work. Thank you for having me. In future episodes, we'll be following up with Fleming Fund Fellowship alumni. We're going to be talking to the mentors. And most excitingly of all, we're going to be with the Ugandan fellows. We're going to be talking about their collaborative project, their field work, and how this work and the research that they're undertaking collaboratively together is going to help them address AMR in Uganda. This project is funded by the Department of Health and Social Care's learning Fund using UK Aid. The views expressed in its publication are those of the authors and not necessarily those of the UK Department of Health and Social Care or its management agency McDonald.