The Stubborn Germs That Are Getting the Upper Hand

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SPEAKERS

Iruka Okeke, Maggie Fox

Maggie Fox 00:00

Hello and welcome to One World, One Health where we take a look at some of the biggest problems facing our world. I'm Maggie Fox. This podcast is brought to you by the One Health Trust with bite-sized insights into ways to help address challenges, such as infectious diseases, climate change, and pollution. We take a One Health approach that recognizes that everything on this planet — the animals, plants, and people, and the climate and environment — are all linked.

Drug-resistant germs are winning. Scientists and public health experts call it antimicrobial resistance, the ability to escape the effects of the drugs developed to kill off these bacteria, viruses, and fungi. The World Health Organization (WHO), drug companies, researchers, and doctors have been calling the alarm on this problem for decades. Yet, it continues to get worse, as many as 1.3 million people are killed by drug-resistant infections every year. By 2050, that could rise to 10 million people killed every year by drug-resistant infections without urgent action. One-third of babies who die as newborns are killed by infections and more and more of the germs that cause these infections can resist the effects of drugs.

Drug-resistant superbugs can cause urinary tract infections, which affect more than 400 million people a year and kill nearly a quarter million of them. In this episode, we're chatting with Dr. Iruka Okeke, a bacterial geneticist at the University of Ibadan in Nigeria. She teaches in the Department of Pharmaceutical Microbiology and is an expert in how bacteria develop the ability to resist drugs. She's helped write a series of papers in the Lancet medical journal bringing attention to the problem of antimicrobial resistance. This problem is a big topic of international discussion in 2024 and the Lancet series was put together to help focus that discussion.

Iruka, thank you so much for joining us.

Iruka Okeke 02:01
Thanks for having me.
It's a pleasure to be here and to have the opportunity to talk about antimicrobial resistance.

Maggie Fox 02:09
Well, just how bad is this problem of drug resistance?

Iruka Okeke 02:14
Well, it's a huge problem! Of the problems that we recognize, it's a lot like how HIV and malaria are. That's not to say that those aren't large problems, but the issue with antimicrobial resistance is that something that will occur with every single infectious disease, and it's often unrecognized, because when people are infected with a pathogen, there's antimicrobial resistance, most of what's going around their minds are that they have this disease or that disease, and not necessarily that organism or the germ that is causing that disease is resistant to antimicrobials.

Maggie Fox 02:47
So, you know, you're sick, you're getting treatment, but you're not getting better. And you don't know why?

Iruka Okeke 02:53
Absolutely. First, the treatments are not cheap. So, it's a waste of resources to be giving people medicines that won't work, and, every time someone has an infection that isn't treated, the body's being damaged by the organism that causes the disease. So antimicrobial resistance has a lot of costs — physical costs, economic costs, and others.

Maggie Fox 03:12
Who's the most likely to be infected with these drug-resistant germs? Is it the elderly or babies? Or who is it?

Iruka Okeke 03:21
We're all prone to infections, not just humans, but even animals. But those who are young, old, immunocompromised for some reason, and pregnant are more likely to be infected. They are more likely to have infections that would not just clear naturally. So, these are the people who are most threatened by antimicrobial resistance.

Maggie Fox 03:43
Where do people catch these infections?

Iruka Okeke 03:47
Well, we never learn about bacteria! There are more bacteria than humans everywhere. Most bacteria are normally harmless and are always harmless. A few bacteria cause disease all the time, and a few bacteria what we refer to as opportunistic pathogens —they'll cause disease, some of the time.

So, we can get these infections from our environment, we can get them from other infected people, or we can also get a few pathogens transmitted by vectors, by other animals, by insects, and so on. I really think it's difficult to prevent yourself from being infected. Luckily, most of us who are healthy can clear those infections without any additional help, but a few of us will need antibiotics.

Maggie Fox 04:29
You talk in this Lancet paper, the series (on AMR) that you were part of, about the need for surveillance. I guess you can't know how bad a problem is if you don't measure it.

Iruka Okeke 04:41
Absolutely! Many years ago, when I was a student, I heard a health policy person say, “If you're playing tennis and not keeping score, you're just practicing. If you were doing the real thing, you'd be keeping score.” So, if you're really going to be serious about doing something about antimicrobial resistance, we need to know how big the problem is, whether it's getting worse and whether the things that we do are healthy. Without surveillance, we can't do any of those things.

Maggie Fox 05:08
And I guess you can't even know what's out there if you're not looking for it.

Iruka Okeke 05:13
Absolutely! I mean, the thing about antimicrobial resistance surveillance is that it's not hard to do. It's technically easier to do surveillance for antimicrobial resistance compared to COVID-19 surveillance. During the pandemic, every country had a COVID-19 surveillance program, or sooner or later, they were using very high-tech molecular techniques to do COVID-19 surveillance. So, you can use basic bacteriology techniques and get a lot of information about antimicrobial resistance. But we need every country to be doing that, too.

Maggie Fox 05:44
And how can countries do this? Is that a responsibility of individuals in national governments?

Iruka Okeke 05:48
Yes, every ministry of health is supposed to have an agency or an office that is responsible for antimicrobial resistance surveillance. What that office will typically do is collect (antimicrobial) resistance information from hospitals. So that's one very easy, inexpensive way of doing surveillance because hospitals are already collecting this data to take care of patients. However, I must admit that when you are doing surveillance only in hospitals, you're biasing yourself to the sickest people. So, it's also important to do some sort of surveillance in the community, not just among humans, but also among animals and in the environment.

Maggie Fox 06:27
But are hospitals always collecting this information? Even in the US, you hear about people who are infected, and you know, the hospital hasn't even bothered to test people for what they've got.

Iruka Okeke 06:37
Hospitals are not testing enough. In some parts of the world, they're not testing at all. This is a huge problem. If you don't have the laboratory facilities, if you don't have the experts who can do it, and importantly, if you don't have the consumables, then it becomes impossible to test people. So, we do need to enable hospitals to test people routinely.

There's a recent study called the Mapping Antimicrobial Resistance and Antimicrobial Use Partnership (MAAP) study that was completed recently in Africa that found that very few African hospitals are doing any testing at all. Most of those that are doing some testing are tertiary care referral hospitals. These are the hospitals that receive patients with the worst infections. So, if we're only getting data from those sorts of institutions, we're not getting a representative look at what the resistance problem is.

Maggie Fox 07:28
So, how do countries do more of this? How can they be encouraged? How can they be helped to do more?

Iruka Okeke 07:35
I think firstly, recognizing that testing is something that's needed for taking care of patients. When countries are building, equipping, and enabling hospitals, they think of doctors and nurses, but they should also think of medical lab scientists, microbiologists, and the resources these professionals need to work. That is one thing that is essential.

Secondly, when testing occurs, the data from those tests must be collated. In many hospitals, particularly African hospitals, what happens is a test result is given to a patient and his or her caregiver on a piece of paper. So, getting that information to the surveillance office in the Ministry of Health becomes nearly impossible. So, we need to digitize records and ensure that the people who are doing the testing are not overworked with recollecting the data and sending it to authorities that might be able to collate it.

The third thing, I think is that people who are treating patients need to ask for surveillance data. Very often people make empiric treatment decisions without the information they need. If they're asking for this data, there'll be more of an impetus to generate the information in the first place.

I think everybody who might become ill is a stakeholder in this. If you're going to a hospital and the doctor says, “I think you have an infection”, then as a patient it's a good idea to ask, “Well, please can I be tested?”. The doctor will certainly start treating you before the results come out. But then it's good to know if your first antimicrobial cause doesn't work. It's good to know what should be used instead.

Maggie Fox 09:08
And as you say caregivers need to know because they need to know that something drug-resistant might be going around right now.

Iruka Okeke 09:15
Absolutely. Some of the most important values of surveillance data and testing data is that when you test a number of patients, when you need to make an empiric decision for the next patient, you can do that in an informed way. You can know that "The last hundred patients that came to my hospital that were infected with this pathogen had a resistant infection, so I should be using something else to treat empirically or that the last hundred patients had susceptible infections, which means that I don't need to resort to expensive drugs, I can use cheaper drugs."

Maggie Fox 09:48
And you also talk about doing more than just looking at people who are currently Ill. (Can you) talk about that kind of surveillance?

Iruka Okeke 09:55
Absolutely. Where do we get infections from? As I mentioned, bacteria are all around us, but they're also in our food chain. We eat them. They come from animals, our pets, and wildlife. So, we really need to know what sorts of organisms are present in animals around us, as well as what's in our environments, whether they may come in contact with humans and if they're resistant to anti microbials.

There are actually inexpensive modules. The WHO has a module known as Tricycle Surveillance or Tricycle protocol that has inexpensive ways that you can sample not just patients in hospital but also healthy people, like healthy pregnant women who visit hospital from the community regularly, as well as animals that are used for food, and the environment, for example, water and wastewater. So, if you use a protocol, like the Tricycle protocol or something similar, you can have a sense of what resistant organisms are circulating in the environment in which we live. Therefore, what sorts of interventions will we need to be able to contain resistance?

Maggie Fox 10:56
Now, the environment is a big word, and you talk about the environment a lot. But can we describe it to people who might not be thinking about it? What does it mean to be catching this in the environment? It's not just germs floating in the air, right?

Iruka Okeke 11:10
Germs circulating in the air are the least of the problems. There are not that many that would cause resistance. There are a lot of germs that come out of people and out of animals into our sewage or into where our waste goes if you're living like me in a place where there isn't sewage. So, all of those

organisms are circulating among humans via the environment. So, it's good to know what's out there. Secondly, water flows into cities via rivers and streams, and out of the cities. So, knowing what's in that water is very helpful for understanding what's in the environment.

Those are just two examples.

There are lots of examples in literature. For example, wild birds flying in organisms (carrying the organisms) or flying out organisms (taking organisms) from a particular place, essentially, the whole world is a city (to these organisms) and we must be aware that these organisms unlike people can move from one country to another without passports. So, it will be good for us to track them.

Maggie Fox 12:08
Iruka, what got you interested in this field in the first place?

Iruka Okeke 12:11
Well, as a graduate student, I was working in a school of pharmacy. There is a lot of work on antimicrobial discovery in pharmacy schools, and I was interested in why we need to discover antimicrobials, realizing that antimicrobial resistance even then was a problem.

I am very interested in bacteria. If you're not bothered by being sickened by them, they look beautiful in petri dishes. So, I wanted to be doing something with bacteria. When I started working with bacteria, I realized that bacterial infections are one of the greatest causes of illness and death among children under five years old, particularly in African settings. So, in addition to enjoying working with these organisms, it became obvious to me that working with these organisms and understanding mechanisms of resistance was very important for protecting children and other vulnerable groups from microbial-resistant organisms.

Maggie Fox 13:01
When you were putting together this first paper in the Lancet series, what did you decide to emphasize?

Iruka Okeke 13:07
I think one of the take-home messages from paper one is that we've made enormous progress in some areas of infectious disease, for example, children dying before the age of one has dropped substantially due to several interventions carried out in the last few decades.

Unfortunately, we're not making progress in all areas. For example, although deaths of children less than five years old are dropping, deaths of neonates — newborn children in their first month of life, remain stagnant. That's because many newborns are getting neonatal sepsis. Neonatal sepsis infections these days are often resistant to the antibiotics that can be used to treat that condition.

So that's one concern that we have about antimicrobial resistance.

Another concern is that we're living to be much older, this is a good thing. I mean, life expectancy has increased substantially all over the world. But as we live to get older, we become frailer, our immune systems don't work as well. So, older people tend to be more vulnerable to infections, and then they're more likely to need antibiotics to stay alive and live a productive life. So, we really need to get a handle on antimicrobial resistance for that reason.

Another thing is that there's a lot of antimicrobial resistance in infections that should be vaccine-preventable, like typhoid fever, pneumonia caused by *Streptococcus pneumoniae.*
So, we need to track this resistance, but (more) importantly, we need to deploy these vaccines, we need to ensure that everybody has access to them, so they don't get infections in the first place. Then, they won't need antimicrobials to be treated. It's very important to understand that resistance is not just a problem in humans, even animals get infections. They get sickened by pathogens, and when these pathogens are resistant to antimicrobials, that's a problem. It increases costs for farmers and then increases the cost of our food and then this has a knock-on effect on food security. So, we must think about antimicrobial resistance holistically.

Maggie Fox 15:05
Iruka, thank you so much for chatting with us today.

Iruka Okeke 15:09
Thank you. It's been a pleasure.

Maggie Fox 15:12
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