# Innovation to Save Antibiotics – Prize-Winning Diagnostics for UTIs

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**SPEAKERS**

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**Maggie Fox** 00:01
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 we're all in this together and everything on this planet — the animals, plants, and people, and the climate and environment — are all linked.

Antibiotic resistance is a big problem, and we talk about it a lot on this podcast. It happens when bacteria can withstand the effects of antibiotics. Sometimes we call them drug-resistant superbugs. The trouble is, you can't tell by symptoms alone whether someone is infected by a drug-resistant germ. You can't even tell what species of bacteria is causing an infection, and it might be a virus or even a fungal infection. Different antibiotics treat different types of bacteria. Of course, antibiotics are no good against viruses or fungal infections, so doctors test patients when they can. The trouble is those tests can take days to come back, precious days during which patients may go untreated or get the wrong treatment. Fast tests, best of all, on-the-spot tests, can tell a caregiver right away what the best treatment is for someone. This means they don't waste time with the wrong antibiotic, which can also drive the evolution of more drug-resistant bacteria.

In this episode, we're chatting with Jasmin Major, who works with an organization called Challenge Works. They award the Longitude Prize, which recognizes innovation in medicine. The latest prize has gone to a company that invented a fast test for urinary tract infections, which affect more than half of women sometime in their lives. Jasmin, thanks so much for joining us.

**Jasmin Major** 02:05
Thank you for having me. Maggie

**Maggie Fox** 02:08
Jasmin, we talk about antimicrobial resistance (AMR) a lot on this podcast. One thing we don't talk about too much, however, is diagnostic tests. Can you tell us why testing is so important?

**Jasmin Major** 02:21
So, antibiotics, as your listeners will know, are at the heart of modern medicine. Cancer therapy, transplants, and so many procedures rely on us having access to effective antibiotics. But after such a long time of using antibiotics inappropriately, using them when they're not needed or using them in a way that isn't targeted to the patient. Bacteria are developing resistance to these antibiotics at a much quicker pace, and that threatens a future where we don't have access to these life-saving drugs.

So, diagnostics can help clinicians to better manage the antibiotics that we do have, so that they're only being used when they're needed and in a targeted way. So, in that way, they (diagnostics) can help us safeguard these precious drugs, and (not only) conserve them, but also potentially bring in previously retired antibiotics back into use.

But importantly, we need them (diagnostics) at the point –of-care. So, if I go to my clinician with symptoms of an infection, they can confirm on the same day whether I have an infection and prescribe the right treatment for me, but only if I need an antibiotic. Then that saves me from a fate where I'm given treatment after treatment that doesn't work for me, with devastating impacts on my health; or on the other hand, I'm given a treatment that I don't need, worsening resistance.

So, the Longitude Prize on antimicrobial resistance was set out in 2014, a decade ago, to incentivize the development of a rapid point-of-care diagnostic that could tell the clinician, if a patient has a bacterial infection, and, if so, what antibiotic will work for them. So, the program is very much focused on diagnostics, but that's in no way to say that diagnostics are a silver bullet for AMR, and they're one essential tool in the toolkit as part of a coordinated approach to tackling AMR.

**Maggie Fox** 04:17
Jasmin, can you tell us a little bit about the company that won the most recent prize?

**Jasmin Major** 04:21
Sure, so the prize has been won by a Swedish company called the Sysmex Astrego. They first started competing in the prize 10 years ago with an early idea that had been developed in the laboratory, which was then made into a commercial product thanks to them forming a startup with a team that was already working in the industry and now with winning the eight million pounds (£8 million) prize, we hope to see that propel them and catalyze their solution to be scaled up and accessible in lots of different settings across the world.

**Maggie Fox** 04:53
Their test detects whether bacteria are causing someone's urinary tract infection (UTI) and then identifies whether it is antibiotic-resistant. Can you talk about why that's so important?

**Jasmin Major** 05:07
UTI, which the (prize-winning test) is focused on, is an extremely common infection. It affects 92 million people across the world every year, and it costs the US health system almost $2 billion in expenditure every year. Because of the lack of rapid, accurate diagnostics at the point-of-care, clinicians prescribe antibiotics to patients with symptoms of UTI, empirically — not necessarily, based on actionable information from a diagnostic — (to determine) whether the patient needs an antibiotic, and if so, which one to prescribe?

So often they are dispensing antibiotics that the patient may not need or that might not work for them, with potentially detrimental impacts to the patient's health, but also contributing to speeding up the development of resistance.

So, with this test, the clinician can identify whether the patient has a UTI within 15 minutes, and if they do, in 30 to 45 minutes it will tell what antibiotic they will respond to. Giving a clinician actionable information at the point-of-care can inform what treatment decision they make. Currently, it takes two to three days to find out what antibiotic a patient will be sensitive to. So, this really means that they (clinicians) can make informed decisions that are based on personalized information from the patient's test result at the point-of-care.

**Maggie Fox** 06:29
Is there something else that could cause the symptoms of a UTI that's not bacteria? Or are there different bacteria that cause these infections?

**Jasmin Major** 06:37
There are a huge number of different bacteria that can cause these infections, including both gram-negative bacteria, gram gram-positive bacteria, but as you say, not necessarily bacteria —It could be fungi. The cause of a UTI can vary quite a lot depending on where you are in the world. So, in most cases, in many contexts, including the UK and the US, *Escherichia coli* (E. coli) causes most UTIs. But that's not necessarily the case everywhere.

**Maggie Fox** 07:06
When you talk about gram-negative and gram-positive bacteria —they are just different types of bacteria, but they require completely different antibiotics to treat them.

**Jasmin Major** 07:14
Exactly. They're two different classifications of bacteria, but different causes of UTIs, as you say, will need different treatments. So, when diagnostic companies are developing their tests, they tend to begin

by focusing on a small number of causes and a small number of pathogens that cause UTIs which are the most common. Then as they continue to develop and validate their tests in the real world —meaning they test samples that have been given by real patients in clinical settings— they start to see whether their tests can detect other rare types of pathogens and less common causes of UTIs, to see whether their test is applicable for a wide range of uses, wide range of different UTIs caused by different pathogens.

**Maggie Fox** 07:53
One thing that you noted in the prize announcement that intrigued me is that some antibiotics are no longer used because so many bacteria have become resistant to them. But it's not a hundred percent infection or even fifty percent infection, it's sometimes just twenty to thirty percent infection, which means it might be possible to start using some antibiotics again.

**Jasmin Major** 08:17
Sure, just to take an example, if you may believe that I'm a clinician and a patient, call the patient —Sam —comes in to see me with symptoms or UTI, I hear more about their symptoms, and I think that I should prescribe them an antibiotic. I think about prescribing them antibiotic A, but 25 percent of the population is resistant to antibiotic A, so I prescribe them antibiotic B instead, which is problematic in several ways. Sam might not need the antibiotic in the first place. Taking antibiotic B unnecessarily speeds up resistance to this drug, and before you know it, another portion of the population is resistant to antibiotic B, and you're on to antibiotic C.

There's another scenario where Sam does need the antibiotic, but for 75 percent of the population, antibiotic A is effective. But as a clinician, I wouldn't know that, because I don't have the diagnostics at the point-of-care to give me that information. So, if I had access to a diagnostic like the PA-100 AST System (a high-tech, rapid point-of-care test for UTIs) developed by Sysmex Astrego at the point-of-care, I could test whether my patient would respond to antibiotics and whether they are in that 75 percent population. In that way, these novel diagnostics can help bring back antibiotics that are out of routine use.

**Maggie Fox** 09:35
Could this test be developed to diagnose other types of infections, such as respiratory infections?

**Jasmin Major** 09:43
That's a really good question. The Longitude Prize on AMR was set up 10 years ago in search of a novel rapid diagnostic test that could help conserve antibiotics, but it didn't specify what that test had to target, or which infection it should focus on. But when assessing the potential for products within the prize to achieve the transformative impact that we were looking for, the judges did think about the potential that different solutions had to be transferable to other infections, beyond the first one that they were focusing on.

The winning test, the PA-100 AST System, is a UTI test. It is the first application of this novel, groundbreaking technology.  But once that product is out in the world, scaled up, and reaching more patients, the company will start to investigate in more detail what the other applications of the technology might be. So, the focus is on UTI, but there's potential for it to be transferred to other cases. So yeah, we're excited to see where they take it.

**Maggie Fox** 10:42
Jasmin, thank you so much for joining us.

**Jasmin Major** 10:44
Thank you so much for having me. It's really good to talk.

**Maggie Fox** 10:47
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