[MUSIC PLAYING]

CECILIA STALSBY LUNDBORG: So welcome. My name is Cecilia Stalsby Lundborg. I am a professor here at Karolinska Institutet. And I have been working with the antibiotic use and antibiotic resistance for almost 30 years.

And today, we will talk about one of the absolute greatest current and future challenges to health care, global resistance to antibiotics. Antibiotics are lifesaving drugs. They have been called the miracle drugs. And they became available in the middle of the last century.

Before the era of antibiotics, many people died from common infections like pneumonia. And many types of surgery that we nowadays take for granted like a hip replacement surgery and organ transplants, they would not be possible without antibiotics. Many other types of surgery like Cesarean sections and hernia repairs, they would not be safe without antibiotics. Patients with a weakened immune system, like cancer patients, they often also need antibiotics. So as you can see, antibiotics are really crucial to an effective health system.

Antibiotics are seen as miracle drugs. And that has also become a problem. And as countries now become richer and health care develops, their use is increasing in most parts of the world. And unfortunately, during the past few decades, many bacteria have developed resistance towards antibiotics, making them less effective.

And look at this slide where it is shown when different kinds of antibiotics were first introduced and when the first resistance was reported. As you can see, resistance normally develops very quickly, in fact, often within a few years of a new class of antibiotics. Bacteria are very, very clever. We will never be able to outsmart them. So we need to do other things.

For a long time, antibiotic resistance was considered as something only relevant to high-income countries. But recently, it has become obvious that it is an issue in all countries. In fact, it is becoming one of the top priorities now on the global health agenda.

We know that the more antibiotics we use, the more resistance we get. We also know that too often antibiotics are used unnecessarily, for example, in viral infections like common cold where they have absolutely no effect. Instead, they have side effects. And they also negatively influence the good bacteria that we all have in our bodies.

Antibiotics are also used in animals, partly in treating sick animals, where it is justified. But antibiotics are also widely used in some countries as growth promoters in meat production, where it is not justified.

Antibiotic resistance has been a silent epidemic since antibiotics were first discovered. But now it has become more of a not-so-silent pandemic. The reason for the silence was that resistance was not known and was therefore not reported as a course of death. For example, if a person died from pneumonia, the cause of death would be reported as pneumonia. And we would not know if the bacteria causing the pneumonia was resistant to available antibiotics or not.

So how is resistance developed and spread? This is actually very, very complicated. But let's try to understand by looking at some simplified principles. Bacteria can become resistant to antibiotics either through developing this resistance on their own, known as mutation, or by acquiring the resistance from other bacteria, either vertically from generation to generation or horizontally from another bacteria.

As already mentioned, all antibiotic use influences in one way or the other the resistance development. There is a strong correlation between use and resistance, both at the individual and at the country level. At the individual level, the more antibiotic courses a person takes, the more likely it is that his or her normal bacteria will carry the resistance and potentially transfer resistance to a disease-causing bacteria.

At the country level, it has been shown that countries that use more antibiotics also have higher level of resistance. Factors that influence resistance spread is crowding, like in hospitals and daycare centers, travel, poor hygiene, and poor infection control, as well as environmental spread, for example, as through waste water containing antibiotic residues as well as antibiotic resistant bacteria. And all these contribute to spread of resistance.

So how do we prevent resistance? Well, preventing infections is the most important action, for example, through improved hand hygiene. Also, antibiotics should only be used when necessary, after an as appropriate diagnosis as possible. So underlying problems for the resistance development and spread are lack of point of care diagnostics and lack of new treatments. And finally, we need to limit the environmental spread.

As I said earlier, antibiotic resistance is now a priority on the global health agenda. But what does this mean? In 2014, the WHO, the World Health Organization's first global report on

antimicrobial resistance was published. It had a focus on antibiotic resistance because of its seriousness. And it showed that the even resistance to last resort antibiotics like carbapenems for life-threatening infections has spread to all regions of the world. And the resistance to one of the most widely used antibiotic groups, flouroquinolones, is very widespread. So what we once thought was only a problem for the high-income countries has now been shown to be a real global problem.

Also in 2014, the WHO passed a resolution on One Health, pointing to the importance of seeing human health animal health, and environment as one entity, one health. As resistance can easily spread between sectors, it is extremely important that stakeholders from these different sectors-- human health, animal health, and the environment-- work together.

So what actions can we take then? Well, this depends a lot on the data and information we have. Look at this map. It shows the availability on national data on resistance for nine selected bacteria/antibacterial drug combinations in 2013. The greener the country, the more data is available. And having access to relevant data, both at a national and at a subnational level, as well as the hospital and community level, is of course, the basis for actions.

In 2015, a situation analysis was published by the WHO. It was based on a survey conducted in countries in all of the six WHO regions. It focuses on the building blocks that are considered prerequisites to minimize antibiotic resistance. And based on this analysis and wide consultations, the Global Action Plan on antimicrobial resistance was launched, also in 2015.

And the key points for action are that we need to improve awareness and understanding. We need to strengthen the knowledge and evidence base. We need to reduce the incidence of infections. We need to optimize the use of antimicrobial medicines in both human and animal health. And we need to develop new medicines, new diagnostic tools, new vaccines, and other types of interventions to minimize resistance development and spread.

So now, we will take a quick look at TB, tuberculosis. TB is an example of a disease where resistance is a big problem and where resistance actually has received some attention. Compared to many other bacterial infections, TB has a very complicated treatment regimen, with several drugs that need to be taken for many months. Two types of resistant TB are often mentioned-- MDR-TB, multi-drug resistant TB, and XTR-TB, extremely drug resistant TB.

On this map, you see how widespread even extremely drug resistant TB is. All the country that are red are where at least one case has been reported.

So in conclusion, the most important points for you to remember about antibiotic resistance are there is a higher risk of mortality from infections caused by resistant bacteria. They need longer treatment periods. There is a higher risk for complications. The costs are higher. And also put other people at risk.

And remember, finally, that many infections are actually preventable. So that is the most important thing, to prevent infections.

It is difficult to separate deaths caused by antibiotic resistance from other causes, as in the example on pneumonia that I talked about before. For an old lady dying from pneumonia despite treatment, the cause of death will usually be reported as pneumonia. And if the bacteria was resistant to the treatment given will, in many cases, not be known.

But the rough estimate is that the number of deaths per year is now about 700,000. But if we do not act now, it could actually be as much as 10 million per year in 2050.

So now, you understand why antibiotic resistance has become a priority on the global health agenda.