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Resistance requires revolution

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If the COVID-19 pandemic is an uphill slope, antimicrobial resistance is a steep mountainside. Focusing on individual behavioural change in order to limit resistance is not sufficient. To stand a chance of success, we need structural interventions such as less ambitious expectations for production efficiency, stricter regulation of antibiotic use and poverty reduction.

Antimicrobial resistance (AMR) is an enormous and rapidly evolving health challenge, and is as great a threat as climate change and terrorism (1). Resistance will cause serious social, economic and political consequences and lead to huge loss of human lives (2, 3). Before the COVID-19 pandemic, it was difficult to imagine an everyday life governed by fear of infection, but this is a possible future if antimicrobial resistance continues to develop at the same rate as today. Even though we use relatively small amounts of antibiotics in Norway, the threat is no less significant here, because as COVID-19 has shown us, pathogens do not respect borders. Resistance on the other side of the globe does not need many stopovers before reaching Norway. While there is consensus that antimicrobial resistance requires immediate action, opinions differ as to what ought to be done. Current strategies lack structural interventions.

Individual behavioural change and One Health

Perhaps the most central pillar in the international handling of antimicrobial resistance is antimicrobial stewardship, which mainly consists of strategies aiming to decrease antibiotic use by changing the behaviour of individuals (2-4). The spread of information is a key intervention in this tradition, and it is assumed that improved knowledge about resistance will lead to behavioural change in individuals. As a result, health professionals will choose to prescribe less antibiotics and patients and farmers will choose to use them less. Examples of actions that target behavioural change are campaigns that encourage people not to use antibiotics for viral infections, and limiting the spread of bacteria by means of improved hand hygiene. Another example is the World Antibiotic Awareness Week led by the World Health Organization.

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Individual behavioural change as a solution to antimicrobial resistance is a paradox, because the problem is not mainly an individual one. It differs from lifestyle, for example. An unhealthy lifestyle only increases the individual's own risk of disease, while antibiotic use in one place may lead to resistance in other places. It is not individuals who become resistant to antibiotics, but the microbes that spread out in the global community. Several international health forums have highlighted One Health as a strategy that can be used in addition to behavioural change (2, 3, 5), and the medical anthropologist Clare Chandler presents One Health as a contrast to the individual focus in current resistance practices (6). This perspective argues that antibiotic use cannot be understood in terms of human use alone, but through a complex interaction between humans, animals and the environment. One Health emphasises intersectoral collaboration between, for example, veterinarians, doctors, the food industry and climate advocates, in order to find a shared strategy for conserving antibiotics. Even though One Health may in theory include the structural causes of resistance, some scholars argue that in reality, it emphasises biological and ecological mechanisms for the spread of resistance, leading to the neglect of structural factors (7).

A number of scholars challenge attempts to change individual behaviour as a useful strategy to tackle resistance (4, 6-11). For instance, studies from low- and middle-income countries show that even though health professionals have excellent knowledge about resistance, they still prescribe more antibiotics than they know they should (8). This indicates that increased knowledge does not necessarily lead to changed practices, and several researchers point out that the documented effects of interventions aimed at individual behavioural change are doubtful (11). Behavioural change is also problematic since following a liberal train of thought, this makes *the individual* responsible for using less antibiotics. The premise for behavioural change is that the individual can choose to use less antibiotics, but for many, these medicines are a part of everyday life that they cannot relinquish.

Antibiotics as infrastructure

Antibiotic use needs to be understood through social, cultural, economic, material and structural factors (4, 6-11). Resistance is often not a consequence of individuals' irrational choices, but a symptom of structural circumstances. The certainty that antibiotics exist as an effective cure against bacterial infections, enables us to live in societies that need not take into account the possibility that these infections could be devastating. Antibiotics form a building block in systems that extend far beyond the responsibility of individuals, and Chandler's description of antibiotics as infrastructure can help us to think differently about resistance (6).

Understanding antibiotics metaphorically as infrastructure is challenging, because this requires awareness of the ways in which antibiotic use is taken for granted. As an infrastructure, antibiotics can perhaps be compared to a tsunami. In Oslo, the geological conditions suggest that a tsunami is unlikely to happen, and we can build infrastructure such as buildings, sewage systems, emergency services and transport systems without taking this possibility into account. In Japan, on the other hand, the geology indicates that a tsunami is likely to happen, and accordingly the infrastructure there must include advanced warning systems, buildings that are constructed not to collapse, seawalls and contingency plans for the rapid evacuation of residents in exposed areas. Since we have global access to efficient antibiotics, we can construct societies as if bacterial infections were almost non-existent, in the same way as we can build infrastructure in Oslo on the assumption that a tsunami is not going to happen. Hospitals can have relatively small infection wards and carry out treatments such as surgery, cytostatic drugs and transplantations without a high risk of infection. The authorities can accept bacteria in drinking water. People can live in fairly cramped conditions with poor hygienic standards and have unprotected sex without being sick. Employers can expect employees not to need sick leave due to bacterial infections. General practitioners can see 50 patients in a day,

because if they rapidly prescribe a broad-spectrum antibiotic to half of them, these patients will be happy and many of them will soon recover. Farmers can put hundreds of pigs in the same enclosure without risking the spread of bacteria, and in some countries, even use antibiotics as a growth-promoting supplement to produce larger cuts of meat.

Individual behavioural change as a solution to antimicrobial resistance is a paradox, because the problem is not mainly an individual one

Antibiotics enable fundamental values in the modern world, such as standardisation, modernisation, urbanisation and globalisation (6). Antibiotic use has led to unnatural expectations as to speed of action. Humans and animals have become a more reliable labour force since we rarely need to be off work when we have antibiotics as a quick fix (10). This in turn enables standardisation and streamlining in society more generally, which results in more predictable economic growth. Predictability and the high speed induce modernisation by enabling development to happen faster. Antibiotics also make it possible for the labour force to be concentrated in overcrowded cities even though the sanitary conditions are under increasing strain because infections are easily cured. We can also travel worldwide without the fear of being infected or of introducing new bacteria to other societies, because the diseases can be swiftly treated anyway.

If antibiotics is infrastructure, we may not notice the resistance crisis until it is too late. Only when resistance is widespread will the infrastructure collapse. What will happen if (or when) antibiotics disappear? Infection wards at hospitals will be overcrowded, more patients will suffer from infection complications after surgery, and more refugees will struggle with chronic bacterial infections because of contaminated drinking water. The number of sick leaves for simple infections such as urinary tract infections will increase, and productivity will decrease. There will be long queues for GP appointments, adolescents will catch untreatable sexually-transmitted diseases, meat will become expensive and scarce, and we risk a general fear of social contact and contagion similar to that experienced during the COVID-19 pandemic.

Reducing global inequality

Antibiotics conceal poverty and poor living conditions by compensating for many things that do not work in the society. Some people are more reliant on antibiotics than others, not least refugees living in poor conditions. Here, antibiotics are crucial to keep the community going, since the structural conditions are poorer. For example, the drinking water is not just a little contaminated now and again, but highly contaminated all the time. People do not just live close together but also in overcrowded tents. General practitioners do not just see 50 patients a day, but maybe twice as many. Hospitals do not just have a small infection ward – there may not even be a hospital. And so on. Losing access to antibiotics, either due to resistance or stricter regulations for use, will have far greater consequences in poor living conditions. The consequences may include a massive increase in sickness and death, decreased productivity, more economic misery and decreased social mobility.

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Actions to stop the suffering of the poor must target the complex and underlying causes of the suffering (12). Global inequality and poverty are central up-stream explanations for resistance because they increase dependence on antibiotics. Improved living conditions and well-being will increase the chances of being able to manage without these medicines. There are especially high rates of resistance in low- and middle-income countries (3) and in refugee camps (13), and it is particularly important that strategies to limit resistance are adapted to these contexts by targeting the underlying structural factors. Not just for the sake of the poor and the refugees, but also because resistance spreads rapidly from being a local problem to becoming a global one.

New social structure

To succeed in limiting antimicrobial resistance, we need new international strategies that take into account the importance of structural conditions for antibiotic use. An understanding of antibiotics as structurally conditioned makes the challenge greater. It requires more political will and resources to change social values and societal practices than to conduct campaigns encouraging more hand washing. These structural measures could include less ambitious expectations for production efficiency, improving global sanitary conditions, reducing poverty and implementing stricter international regulations for antibiotic use in agriculture.

This is not an impossible challenge, and several scholars have emphasised interdisciplinary collaboration between medicine and social sciences such as anthropology as a means of revealing new connections between structural conditions, antibiotic use and resistance. This in turn can create a foundation for structural interventions (9, 11, 14). A possible first step for doctors and medical students in Norway is to instigate interdisciplinary research projects that investigate antibiotic use as a consequence of structural conditions.

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