1. Editorial

In 1998, Copenhagen hosted an AMR conference, The Microbial Threat, which called for a joint European strategy to deal with increasing levels of antimicrobial resistance. Since then, AMR has gained importance on the global agenda with the United Nations calling for action. The financial costs of AMR are well documented and without effective and prompt interventions, the attainment of several of the UN Sustainable Development Goals by 2030 will be in grave jeopardy.

A window of opportunity has opened: In addition to national governments, several major philanthropic organisations have acknowledged that investing in AMR control worldwide is paramount. Currently, on a global scale several projects implement surveillance and control programmes of bacterial resistance and antimicrobial use with focus on low- and middle income countries.

Overall and regardless of the cultural setting, the strategy for reduction of AMR is targeting major drivers. For example, access to antimicrobials needs restriction to situations, where treatment of disease is necessary, not where use of antimicrobials is simply convenient.

Interventions to reduce AMR require population-wide behavioural changes driven by policies, awareness and good governance. The awareness of resistance development as a side effect to use of antibiotics is often low among the general population in large parts of the world. Communication efforts and courage of politicians are required to change the perception of antimicrobials among users globally.

In general, Danish veterinarians and medical doctors have good knowledge of correct antibiotic treatment. However, despite good management of the major drivers, levels of AMR are also increasing in Denmark. AMR is a global problem and the risks from imported resistant bacteria from foods, feeds and travels remain. Therefore, Denmark has a direct interest in endorsing and supporting the international recommendations and initiatives around the world. The experiences and know-how gained over the last three decades in Denmark are important to disseminate worldwide and Denmark is actively mentoring and sharing our experiences and knowledge with many countries.

Another key message is the improvement of hygiene such as biosecurity, sanitation and food safety to prevent diseases. Further, once improved hygiene principles are in place, they need to be maintained. These areas are often neglected, not necessarily due to lack of knowledge, but because antimicrobial use is a feasible and sometimes less expensive option than the more time demanding principles of infection prevention. In addition, infection prevention often lacks the innate interest of innovation and therefore struggles to find funding.

In Denmark, these key interventions are implemented at often very high levels and continue to improve. Food safety in Denmark is good and farmers and abattoirs take pride in high standards. The new scheme of 'raising pigs without antimicrobials´ also seems sufficiently appealing for consumers to allow a premium price and to be economically viable. This creates incentives for farmers to abandon group treatments and to focus on the treatment of individual animals. Such schemes and other success stories are important to communicate to the world.

Presently, however, resistance monitoring systems on both veterinary and human side are challenged. Regardless of laboratory method applied, detailed surveillance of resistance mechanisms and clones demands bacterial isolates or at least biological samples. The introduction of easily used and quickly applied point of care tests in animal production units or in hospitals helps improving fast diagnostics of infectious conditions, but can be an antagonist to referral of samples to diagnostic laboratories, where data or isolates for DANMAP are submitted.

Already, very few veterinary diagnostic samples are available for DANMAP and surveys are often small, albeit frequent. The small sample sizes reduce the ability to maintain a surveillance that can readily detect changes in antimicrobial resistance levels as well as new emerging resistance mechanisms, which are pivotal for updating prudent use guidelines. Most significantly, the sample sizes do not permit the reliable detection of new resistance phenotypes, when these are at a low prevalence in the population. As some of the rare and potentially critical resistance phenotypes become more frequent in people and imported foods, the risk of introduction in food-producing animals also increases. The benefits of finding a new resistance early, of course, need balancing with the cost of analysing more samples.

The introduction of whole genome sequencing has been of great help in typing and characterisation of bacterial clones or resistance mechanisms such as plasmids. This has enabled very precise comparisons of microorganisms involved in hospital outbreaks as well as in foodborne transmissions. In DANMAP context, it is now used for many of the organisms under surveillance. The recent promising results obtained using metagenomics data, indicate that metagenomics in the future may lead to another new era in antimicrobial resistance surveillance.

DANMAP Steering Committee

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