Advances in Medical Ethics

Extended Abstract

Vaccine 2019: Microbiota, immunology and vaccines to tackle antimicrobial resistance- Ivana Haluskova Balter- CHD group, France

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Abstract

Bacteria, viruses, parasites, and fungi those are resistant to drug cause 700,000 death each year. By 2050 superbugs inured to treatments could cause up to 10 million deaths annually and costs the global economy US$100 trillion. AMR (antimicrobial) resistance is regarded nowadays as a major threat to global public health. The issue is receiving high-level political attention (G7 and G20 in 2017 for the first time). Pandemics, drug resistance and neglected diseases framing health as a "global security issue". The list was drawn up in a bid to guide and promote research and development (R&D) of new antibiotics, as part of WHO's efforts for AMR (27th Feb 2017). Tuberculosis (MDR/XDR) and latent tuberculosis represent a major issue to tackle attract global attention as witnessed by recent WHO and interministerial meeting in November 2017 and high-level UN meetings which have been held in September 2018. The problem of resistance gets worsened due to declining number of new antibiotics and the limited number of new classes. Antibiotic use influences the composition of microbiota in each individual. Similar trends are seen in drug development and use for the treatment of tuberculosis. Microbiota is a complex and diverse bacterial community specific to each individual involved in host health and immunity. Microbiota under 3 years old fluctuates substantially and is more impressionable to environmental factors than the adult microbiota. Antibiotics shape the ecology of the gut microbiota in profound ways, causing lasting changes. To illustrate, antibiotic use is one of the known risk factors for Clostridium difficile infections. There is no simple relationship between antibiotic-mediated depletion of the colonic microbiota and the induction of C. difficile spore germination with subsequent toxin production. Rather, antibiotic exposure might directly stimulate C. difficile proliferation (that is, cause the germination of spores, which are the usual type of cells that are acquired and can remain quiescent in the gut) and toxin production, which occurs in late log phase. Clostridium difficile is the leading cause of antibioticassociated diarrhea, both in healthcare facilities and in the community.

This medical urgent issue triggered increased interest to look on new antibiotics preserving microbiota, antibiotic inactivators, and monoclonal antibodies, gut microbiota modulating therapies like fecal microbiota transplantation, fecal bacteriotherapy, probiotics (controversial feedback) and finally vaccines. Gut exposure to antibiotic is accompanied by risk to spread antimicrobial resistance genes. Antibiotic resistance genes can cause phenotypic resistance through a variety of mechanisms, including the enzymatic inactivation of the antibiotic, the modification of the antibiotic target and the prevention of the accumulation of lethal intracellular concentrations of the antibiotic through efflux pumps. Therefore, a multifaceted strategy to promote and prioritize highly potential alternatives to tackle AMR like vaccines development is required. As an example, vaccines like diphtheria and tetanus did not prompt resistance. In 1980 the smallpox vaccine had eradicated the naturally circulating virus worldwide without generating resistance. Additionally, the introduction of live vaccines like measles and BCG has been associated with a much larger reduction of morality that can be explained by the prevention of the targeted infections and recent research like LATV pertussis highlights the importance of "off-target" effects to be evaluated in depth. Thoughtful and innovative vaccines development taking into account host microbiota "superorganism" and immune crosstalk - immune system "training " opens the large avenue for future development and vaccine research. Accurate diagnostic and surveillance with a better understanding of the genetic and immunologic background of host-specific response and pathogen evolution drive successful and innovative research. Innovative vaccines, as a highly potent tool and valuable alternative from a long term perspective, are clearly recognized as a major tool for public health already. Further strong support to promote research on alternative tools to tackle antibiotic resistance needs joint endorsement including regulatory and economic stakeholders along with necessary partnerships at the global level

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