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Opinion

Antimicrobial Resistance and Management Strategies

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Abbreviations: IDSA :Infection Diseases Society of America; SHEA: The Society of Healthcare Epidemiology of America

Opinion

Antimicrobial agents have been proved a boon for the new world and have helped in erasing a lot of life threatening disease which could have killed a number of people and devastated the well being of the society. However, the first decade of the 21st century have witnessed the emergence and spread of antibiotic resistance in pathogenic bacteria around the World, and the consequent failure of antibiotic therapy, which has led to hundreds of thousands of deaths annually. AMR in microbes is defined as their unresponsiveness to standard doses of clinically relevant antimicrobial drugs. It is the property of microbes that overpower the antagonistic effects of antibiotics, to which they were earlier sensitive, resulting in their survival despite exposure to standard doses of antibiotic. This natural phenomenon further gets accelerated by the selective pressure generated by the use of more correctly, misuse of antibiotics. AMR has emerged as a threat to the current effective treatment for an ever increasing range of microbial infections. It results in reduced efficacy of antibiotics, making treatment complicated, and time consuming, costly, or sometimes even impossible [1].

The discovery of each and every new antibiotic has been followed by reports of emerging resistance against it [2]. The rapid emergence of resistance toward current day antibiotics generates a potential scope for modern and novel antibiotics for futuristic approaches [3]. AMR is affecting diverse populations globally and requires a cheap and effective treatment/prevention strategy for public well-being [4-10].

Epidemiology

A study of the microbial world would impress that "antibiotics are old-established natural products that have had common, but changing and manifold, physiological uses throughout evolutionary time" even as far back as the 'RNA world' [11], which probably was the forerunner of the present DNA world. Antibiotics are used as growth promoters, prophylactics and therapeutic agents in veterinary medicine. It is estimated that this use equals that used in medicine. This largely uncontrolled field adds to the antibiotic selection pressure. Certain areas in hospitals like ICUs and areas with immunosuppressed and debilitated patients as well as treatment like topical and Gradual dissemination to the community through population interaction spreads the organisms widely. Over the years bacterial populations undergo changes in their antibiotic susceptibility which may be foreseen considering changes in antibiotic prescribing practices.

Antimicrobial Stewardship Programs

The formal guidelines for ASPs were developed in 2007 by the Infection Diseases Society of America (IDSA) and the Society of Healthcare Epidemiology of America (SHEA) [12]. Typically, ASPs are executed by multidisciplinary antimicrobial utilization teams comprising physicians, pharmacists, microbiologists, epidemiologists and infectious disease specialists, with adequate experience in their respective fields. Many studies demonstrated that ASPs have the potential to restrict the emergence and spread of resistance [13].

Control of Antimicrobial Resistance

All strategies aim at optimizing the antibiotic stress in the environment, decrease unintended interaction between antibiotics and pathogens, restrict the spread of resistant organisms and treat infections with the minimum amount of antibiotic necessary to cure. The common methods being focused on are [14]

a. Surveillance of antibiotic use and resistance rates.

b. Optimizing antibiotic use with treatment guidelines.

c. Education of professionals and the public.

d. Prevention with infection control measures and immunization.

e. Industry involvement, financial resource mobilization and drug development.

f. Regulatory issues with central prescribing restrictions and advertising restrictions.

g. Audit with evaluation of interventions, audit of compliance and physician feedback.

h. International cooperation.

These objectives will be successful if a common infection like a cold is precisely diagnosed and treated with the right antibiotic for the shortest time to ensure eradication of the bacterial infection when it occurs. In India, as in other developing countries, we do not take the initial steps. Antimicrobial resistance is a major emerging infection and needs to be tackled as much.

Strategies to Minimize Antibiotic Resistance

Strategies to minimize antibiotic resistance include education which is a very important strategy. Others include the multidisciplinary core group, including physicians, pharmacists, microbiologists, epidemiologists and infectious disease specialists, which can be the teachers educating various members of society. Apparently, it is now clear that antibiotic use can increase the emergence of antibiotic-resistant bacteria, and reducing prescribing is one of the effective ways to reduce selection pressure. Reducing antibiotic use in agriculture, especially in food animals, is also important. To strengthen the immune system and promote the growth of food animals, various methods, including optimal usage of existing vaccines, improved hygiene, using health-improving enzymes, probiotics, prebiotics, and acids, and utilizing bacteriocins, antimicrobial peptides, and bacteriophages, as substitutes for antibiotics, should be given due consideration. The guideline for the farmers should be made. Farmers should not use medically important antibiotics such as carbapenems and vancomycin, and should consider the use of vaccines, bacteriocins, antimicrobial peptides, and bacteriophages as the alternatives of antibiotics. To strengthen the immune system in food animals, the utilization of enzymes, probiotics, prebiotics, and acids is a good choice.

Effective molecular techniques are being developed for identifying resistance genes as diagnostic biomarkers for cessation of antibiotics treatments. Hence forth it is clear that with the rising status of the problem all the sects of the society need to come under one roof, in order to minimize the catastrophe, antibiotic resistance.

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