

**AN ARTICLE ON ANTIMICROBIAL RESISTANCE****\*<sup>1</sup>Suruchi Singh, <sup>2</sup>Vikash Kumar Chaudhri and <sup>3</sup>Amit Kumar Singh**

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**ABSTRACT**

Antimicrobial resistance (AMR) is not a recent phenomenon, but it is a critical health issue today. Over several decades, to varying degrees, bacteria causing common infections have developed resistance to each new antibiotic, and AMR has evolved to become a worldwide health threat. With the dearth of new antibiotics coming into market, the need for action to avert a developing global crisis in health care is increasingly urgent. Much of the AMR problem stems from the misuse of antibiotic, particularly excessive use. The eradication of AMR is

neither a realistic nor a desirable goal. The aim should therefore be to contain resistance, to optimize the balance between the effective use of antimicrobials against infections, thus reducing morbidity, mortality and further spread of infection. Effective antibiotic stewardship is required to ensure that antibiotics are prescribed and used responsibly. This also requires a multi-stakeholder approach including the governments, policy-makers and planners, pharmaceutical industry, World Health Organization, health care professionals, public and the patients. WHO is engaged in guiding the response to AMR through: policy guidance, support for surveillance, technical assistance, knowledge generation and partnerships, including through disease prevention and control programmes; essential medicine quality; supply and rational use; infection prevention and control; patient safety; and laboratory quality assurance.

**KEYWORDS:** Antimicrobial resistance, Antibiotics, WHO.**INTRODUCTION**

The discovery and development of antimicrobials, during the 20<sup>th</sup> century, revolutionized the treatment of infectious diseases. The ability to use antimicrobials against infections caused by

microorganisms introduced the golden age of antimicrobials and led to the notion that premature death due to infectious diseases would become a thing of the past. However the introduction of antimicrobials into clinical practice has invariably led to the evolution of antimicrobial-resistant pathogens, thus rendering the drugs concerned ineffective for the treatment of the disease. Antimicrobial resistance (AMR) is the resistance of a microorganism to an antimicrobial medicine to which it was previously sensitive. Antimicrobial resistance is not a new phenomenon; however, the current magnitude and the speed with which the new resistance phenotypes have emerged elevate the public health significance of this issue. WHO is engaged in guiding the response to AMR through: policy guidance, support for surveillance, technical assistance, knowledge generation and partnerships, including through disease prevention and control programmes; essential medicine quality; supply and rational use; infection prevention and control; patient safety; and laboratory quality assurance. This also requires a multi-stakeholder approach including the governments, policy-makers and planners, pharmaceutical industry, World Health Organization, health care professionals, public and the patients. The obstacle for a few new antimicrobials on the horizon and the increasing frequency of AMR mean that we must redouble our efforts to preserve the agents at hand, while intensifying the search for new therapeutics. It's high time that we recognize Antibiotic's true value: "Precious Resource" or "A Giveaway Marketing Tool".

### **CAUSES FOR ANTIBIOTIC RESISTANCE**

The main cause of antibiotic resistance is overuse, abuse or misuse, due to incorrect diagnosis. Another cause is the use of counterfeit drugs. Increased globalization also causes the spread of drug resistance.

### **MECHANISMS OF ANTIBIOTIC RESISTANCE**

Resistance to antibiotic can be.

- Natural or intrinsic resistance caused by a spontaneous gene mutation in the lack of selective pressure due to presence of antibiotic.
- Acquired resistance is often caused by mutation in the chromosomal genes or by the acquisition of mobile genetic elements such as plasmids or transposons, which carry the antibiotic resistant gene.
- Genetic resistance is caused by the transfer of genetic material among bacteria by several means like conjugation, transduction and transformation.

- Phenotypic resistance is caused due to the changes in the bacterial physiological state such as the stationary phase, antibiotic persisters and the dormant phase.
- Biological mechanism of resistance may be due to reduced permeability or uptake, enhanced efflux, enzymatic inactivation, alteration or over-expression of the drug target, loss of enzymes involved in the drug inactivation.

### **METHODS FOR DETERMINING ANTIBIOTIC RESISTANCE**

Methods routinely used for testing of antibiotic susceptibility of bacteria include Kirby-Bauer (disk diffusion) method, Stokes method, E-test, agar and broth dilution method for the determination of minimum inhibitory concentration (MIC). The E-test is a popular quantitative technique for the determination of antimicrobial susceptibility.

### **MEASURES TO COMBAT ANTIBIOTIC RESISTANCE**

The eradication of AMR is neither a realistic nor a desirable goal. The aim should therefore be to contain resistance, to optimize the balance between the effective use of antimicrobials against infections, thus reducing morbidity, mortality and further spread of infection.

#### **Strategies for containing emergence of resistance**

- Education of professionals and patients
- Rapid diagnosis of bacterial infections
- Antimicrobial policies
- Restriction of drug availability
- Control of sensitivity data related to prescribers
- Regulation of use of antimicrobials in agriculture
- Use of drug combinations
- Choosing optimal agent, dose and dosage frequency for different infections.
- Using probiotics as alternatives to antimicrobials
- Increasing vaccinations
- Improving nutrition to increase immune competence.

#### **Strategies for containing transmission of resistance**

- Rapid diagnostic techniques
- Screening of patients and staff
- Improving immunity by vaccinations
- Isolation

- Handwashing
- Improving nutrition

On World Health Day 2011, WHO issued an international call for concerted action to halt the spread of antimicrobial resistance and recommended a six-point policy package for governments to.

1. Commit to a comprehensive, financed national plan with accountability and civil social engagement.
2. Strengthen surveillance and laboratory capacity.
3. Ensure uninterrupted access to essential medicines of assured quality.
4. Regulate and promote rational use of medicines in animal husbandry and to ensure proper patient care.
5. Enhance infection prevention and control.
6. Foster innovations and research and development of new tools.

#### **DRUG RESISTANCE WEBSITES**

- Alliance for the Prudent use of Antibiotics (APUA): <http://www.apua.org>
- Global Alliance of Antibiotic Resistance Data (GAARD): <http://www.apua.org/Miscellaneous/GaardDesc.pdf>
- Reservoirs of Antibiotic Resistance (ROAR): <http://www.apua.org/ROAR/roarhome.htm>
- World Health Organization, Antituberculosis drug resistance in the world: [http://www.who.int/gtb/publications/drugresistance/2004/drs\\_report\\_1.pdf](http://www.who.int/gtb/publications/drugresistance/2004/drs_report_1.pdf)

#### **CONCLUSION**

It is profound that the antimicrobial resistance will continue to develop to the currently available antimicrobials by either new mutations or the exchange of genetic information. The obstacle for a few new antimicrobials on the horizon and the increasing frequency of AMR mean that we must redouble our efforts to preserve the agents at hand, while intensifying the search for new therapeutics. It's high time that we recognize Antibiotic's true value: "Precious Resource" or "A Giveaway Marketing Tool".

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