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# AN OVERVIEW ON THE POTENTIAL OF ANTIBIOTICS

**Dr. S Nagendran*; Dr. Prerana Gupta****

*Department of Biochemistry, Teerthanker Mahaveer University,
Moradabad, Uttar Pradesh, INDIA
Email id: drsndran@gmail.com

**Department of Biochemistry, Teerthanker Mahaveer University,
Moradabad, Uttar Pradesh, INDIA
Email id: preranagupta1978@gmail.com

## ABSTRACT

*Since the late 1800s, scientists have noticed that the development of certain bacteria inhibits the growth of other germs. Natural anti-bacterials were discovered as a result of these findings of antibiosis between microorganisms. This article discusses key results from many national and worldwide combined organizations' educations on a short overview of antibacterial agent detection in recent years. In India, particularly in the emerging antibiotics, techniques for the appropriate choice of medication are needed to address a complex issue involving prescribers, dispensers, and consumers.*

**KEYWORDS:** *Antibiotic, Antibiotic resistance, Bacterial Infection.*

## INTRODUCTION

Infection therapies were mainly dependent on medical folklore prior to the early twentieth century. Over 2000 years ago, antimicrobial mixtures that were employed in the treatment of infections were reported. 1 To cure illnesses, several ancient civilizations, including the ancient Egyptians and Greeks, utilized carefully chosen mold and plant materials and extracts.In the late 1880s, Paul Ehrlich pioneered synthetic antibiotic chemotherapy as a science and the creation of antibacterials. He then suggested the concept of developing compounds that would function as a selective medication, binding to bacteria and killing them without hurting the human host. In 1907, he found a medicinally effective chemical, the first synthetic antibacterial salvarsan, now known as arsphenamine, after screening hundreds of colors against different species[1].

*Antibiotics:*

Selman Waksman and his colleagues coined the word antibiotic in 1942 in a journal article to designate any chemical generated by a microbe that inhibits the development of other bacteria in high dilution. Substances that kill bacteria but are not generated by microbes were omitted from this criteria (hydrogen peroxide). Synthetic antibacterial substances, such as sulfonamides, were also eliminated. The word "antibiotic" is now used to refer to any medicine that kills or slows the development of bacteria, regardless of whether the medication is generated by a microbe or not. Antimicrobial medication used to treat and prevent bacterial infections. Bacteria may be killed or inhibited by these substances. Antibiotic (which means "against life") is a word that is often used interchangeably with antimicrobial to refer to any chemical that is used to fight microorganisms. Antibacterial and antibiotic are two different things, according to some sources; antibacterial is used in soaps and disinfectants, while antibiotics are employed in medicine. Antibiotics were a game-changer in medicine in the twentieth century. This has resulted in widespread issues, prompting the Globe Health Organization to designate antimicrobial resistance as a "major danger." Antimicrobial resistance is occurring today in every area of the world and has the potential to harm anybody, of any age, in any nation[2]–[7].

*Medical Uses:*

Antibiotics are drugs that are used to cure or prevent bacterial and protozoan illnesses. When an infection is suspected of causing an ailment but the pathogen responsible has yet to be identified, empiric treatment is used. This entails the administration of a broad-spectrum antibiotic depending on the indications and symptoms given, and is started while test results are awaited, which may take several days.When the pathogenic bacteria responsible for the infection is identified, definite treatment may begin. Typically, this will include the administration of a narrow-spectrum antibiotic. The antibiotic used will also be determined by its cost. Identification is essential since it may decrease the expense and toxicity of antibiotic treatment, as well as the risk of antimicrobial resistance developing. Antibiotics may be used for non-complicated acute appendicitis to prevent surgery.

*Side-effects:*

Antibiotics are thoroughly tested for adverse effects before being approved for clinical use, and they are generally regarded as safe and well tolerated. Depending on the kind of antibiotic administered, the microorganisms targeted, and the particular patient, certain medicines have been linked to a broad range of undesirable side effects ranging from moderate to severe. Side effects may indicate the antibiotic's pharmacological or toxicological characteristics, as well as hypersensitivity or allergic responses. Newer medicines' safety characteristics are often less well known than those with a lengthy history of usage. Diarrhea is a common side effect caused by a shift in the species composition of the intestinal flora, which may lead to an excess of harmful bacteria like Clostridium difficile. Antibacterials may also alter vaginal flora, causing yeast species of the genus to overgrow.

*Correlation with obesity:*

Antibiotics aren't known to induce obesity in people. Antibiotic exposure at an early age (6 months) has been linked to an increase in body mass in studies (at 10 and 20 months) Another research discovered that the kind of antibiotic used was important, with macrolides having the greatest risk of being overweight when compared to penicillin and cephalosporin. As a result, there is a link between early antibiotic exposure and human obesity, although whether this is a causative connection is unknown. Although there is a link between antibiotic usage and obesity in children, the impact of antibiotics on obesity in humans must be balanced against the benefits of clinically justified antibiotic therapy in infancy[8].

*Interactions:*

*Birth control pills:*

There are few well-controlled research on the effects of oral contraceptive failure and antibiotics. Antibiotics do not interact with birth control pills, according to the majority of research, including clinical trials that show the failure rate of contraceptive pills caused by antibiotics is extremely low (about 1 percent). Noncompliance (forgetting to take the pill), vomiting, or diarrhea are all factors that may lead to oral contraceptive failure. ethynyl estradiol serum levels in the blood are affected by gastrointestinal problems or interpatient variations in oral contraceptive absorption. Women with irregular periods are more likely to fail, therefore they should be encouraged to take backup contraception throughout antibiotic therapy and for one week thereafter. Backup contraception is indicated if patient-specific risk factors for decreased oral contraceptive effectiveness are identified.s

*Alcohol:*

Interactions between alcohol and some antibiotics may occur, resulting in adverse effects and reduced antibiotic treatment efficacy. While modest alcohol intake is unlikely to produce severe adverse effects with many common antibiotics, there are certain medicines for which alcohol consumption may induce serious side effects. As a result, the kind of antibiotic used determines the possibility for adverse effects and efficacy. Additionally, alcohol intake may decrease the effectiveness of doxycycline and erythromycin succinate. The reduced activity of the liver enzymes that break down the antibiotic molecule is another impact of alcohol on antibiotic action. Antibacterial action may be dependent on the bacterial development phase, and it often requires continued metabolic activity and bacterial cell division. These results are based on laboratory research, and they have also been proven to eradicate bacterial infection in clinical situations. Because antibacterial activity is often dependent on concentration, in vitro antibacterial activity characterization frequently involves determining the lowest inhibitory concentration and minimum bactericidal concentration of an antibiotic.

*Resistances:*

TThe development of antibiotic resistance in bacteria is a frequent occurrence. Resistance typically arises as a result of evolutionary processes that occur during antibiotic treatment. Antibiotic therapy may favor bacterial strains with physiologically or genetically improved resistance to antibiotics at high dosages. It may result in the preferred development of resistant bacteria under certain circumstances, while the medication inhibits the growth of vulnerable germs. Biodegradation of medicines, such as sulfamethazine-degrading soil bacteria introduced to sulfamethazine via treated pig feces, may lead to resistance. Bacterial survival is often due to inheritable resistance, although antibacterial resistance may also spread via horizontal gene transfer. Antibacterial resistance may come at a biological cost, lowering the fitness of resistant strains and therefore limiting the proliferation of antibacterial resistant bacteria in the absence of antibacterial chemicals, for example. Additional mutations, on the other hand, may compensate for this fitness cost and let these bacteria survive. Antibiotics and antibiotic resistance are both old substances and processes, according to paleontological evidence. Antibiotic targets for which mutations have a detrimental effect on bacterial reproduction or viability are useful. A mutation in the bacterial chromosome or the accumulation of extra-chromosomal DNA causes acquired resistance.

*Vaccines:*

Immune modulation or augmentation is used in vaccines. Vaccination either activates or strengthens a host's immunological competence to fight infection, resulting in macrophage activation, antibody production, inflammation, and other typical immune responses. Antibacterial vaccinations have resulted in a significant decrease in bacterial illness worldwide. Vaccines produced from attenuated whole cells or lysates have mostly been superseded with less erectogenic cell-free vaccines made up of purified components like as capsular polysaccharides and their conjugates, as well as inactivated toxins (toxoids) and proteins.

*Phytochemicals:*

Some antioxidant dietary supplements, such as grape seed extract, also include phytochemicals (polyphenols), which have antibacterial effects in vitro. Phytochemicals have been shown to decrease peptidoglycan production, harm microbial membrane structures, change the hydrophobicity of bacterial membrane surfaces, and alter quorum sensing. With the rise in antibiotic resistance in recent years, researchers are looking into the possibility of novel plant-derived antibiotics.

## LITERATURE REVIEW

S. Sengupta et al. discussed about roles of antibiotics and antibiotic resistance[9]. Antibiotics are chemotherapeutic drugs that have been used to treat bacterial infections in clinical practice since the 1940s. However, after the widespread development and spread of antibiotic-resistant bacteria, the advantages provided by these magic bullets have been significantly diminished. While it is clear that overuse and misuse of antibiotics contributes substantially to the development of resistant strains, antibiotic resistance has also been found in wild bacteria from distant locations that are unlikely to be affected by human activity. Antibiotic biosynthetic genes and resistance-inducing genes are known to have evolved billions of years ago, long before antibiotics were used clinically. As a result, it seems that antibiotics and antibiotic resistance determinants play additional functions in nature that are frequently overlooked due to the overemphasis on antibiotics' therapeutic significance and the problem presented by antibiotic resistance in pathogens. Antibiotics are often found at sub-inhibitory quantities in the natural environment, serving as signaling molecules that aid quorum sensing and biofilm development. They also affect host-parasite interactions and play a key role in the generation of virulence factors (e.g., phagocytosis, adherence to the target cell, and so on). Antibiotics and antibiotic resistance in the naturally existing microbial population are poorly understood from an evolutionary and ecological standpoint. As a result, more research into the function of antibiotics in nature is required. Studies into the complexities of microbial physiology promise insight into the intricacies of microbial physiology and are expected to offer some guidance in preventing the development and spread of antibiotic resistance. This article summarizes some of the most current research on the function of antibiotics and the genes that confer antibiotic resistance in nature.

G. Cheng et al. discussed about Antibiotic alternatives[10]. Sub-therapeutic doses of antibiotics have been used in food-animal feeds for decades to protect animals from illness and enhance production performance in contemporary animal husbandry. Meanwhile, worries about the development of antibiotic-resistant bacteria as a result of overuse of antibiotics and the advent of less new drugs have spurred attempts to create "antibiotic alternatives." The question of whether the alternatives can really replace antibiotics is still being debated. This article covers current developments in antibiotic alternatives as well as their future prospects. Immunity modifying agents, bacteriophages and their lysins, antimicrobial peptides, pro-, pre-, and synbiotics, plant extracts, pathogenicity inhibitors (bacterial quorum sensing, biofilm, and virulence), and feeding enzymes are all extensively addressed. Finally, the viability of antibiotic alternatives is thoroughly examined. It's difficult to predict if alternatives will be able to replace antibiotics in veterinary care in the near future. At this moment, the best and quickest approach to minimize the negative consequences of antibiotic misuse and guarantee the safety of animal-derived food and the environment is to use antibiotics wisely and develop scientific monitoring systems.

## DISCUSSION

Antibiotics are antimicrobial substances that are effective against microorganisms. Antibiotic medicines are extensively utilized in the treatment and prevention of bacterial infections since they are the most common kind of antibacterial agent. Bacteria may be killed or inhibited by these substances. Antibiotics are very useful in the battle against illness, but they may also be dangerous in certain cases. Antibiotics may induce allergic reactions and severe, perhaps life-threatening diarrhea, which is caused by the bacterium Clostridium difficile (C. diff). Antibiotics should be given for 7 to 14 days in most cases. Shorter treatments may sometimes be just as effective. Your doctor will choose the appropriate antibiotic kind and duration of therapy for you.

## CONCLUSION

Antibiotics have saved millions of lives and revolutionized contemporary medicine, but their effectiveness is waning. Antibiotics: The Essential Elements Healthcare workers, health systems, hospitals, clinics, and nursing homes may all play a role in advancing antibiotic use. Antibiotics are used to cure, prevent, and regulate illness in food animals, as well as to enhance feed utilization in certain instances. Antimicrobial agents ensure food safety and quality by decontaminating or sanitizing animal production facilities, transport facility equipment, and effective hygiene during food processing. Following the Fundamental Elements has already improved the quality of antibiotic recommendations in several hospitals. Patients get the greatest antibiotic therapy when antibiotic regimens and protocols are approved.

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