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Potential of herbal drug and antibiotic combination therapy

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Indiscriminate use of antibiotics has led to the emergence and spread of antimicrobial drug resistance in microbes that has become a global threat. Therefore, to reduce the spread of drug resistance, researchers are studying the effect of combination therapy against various diseases. Synergistic combinations have been proved to reduce the emergence of resistant mutants. The study of combinations of antibiotics and herbal antimicrobials is a new approach for the treatment of infectious diseases. The efficacy of the combination depends on interactions of drugs combined; hence, synergistic combinations not only reduce the mutant strains’ emergence but their toxicity too. In addition, a combination of herbal antimicrobials and antibiotics exhibit more antimicrobial activity and are effective against mixed infections too. It is because the plant products are more promising antimicrobials in spite of the fact that their antimicrobial activity is milder than commercially available antibiotics. Microbes do not become resistant to herbs. Herbal drugs inhibit the action of efflux pumps making bacteria unable to remove antibiotics from their body. Plant extracts have the ability to bind to protein domains leading to modification or inhibition of protein–protein interactions. Therefore, bacteria are unable to easily develop resistance to the multiple or chemically complex phytochemicals present in plant extracts. For example, berberine exhibits an antibacterial effect on Staphylococcus epidermidis and significantly inhibits its biofilm formation. Herbs have important properties, such as antimicrobial, immunomodulatory, healing ability, etc.; their requirement has increased owing to their efficacy and potency in the treatment of various bacterial infections. Some of the examples are tulsi (Ocimum sancum), cinnamon (Cinnamomum cassia), turmeric (Curcuma longa), garlic (Allium sativum), ashawgandha (Withania somnifera), etc. Combined therapy (i.e. combination of plant extracts) is traditionally used as synergy among herbal drugs has shown effective results but the combination of herbal antimicrobials and antibiotics provides an alternative way of treatment of resistant microbes. The synergistic action plays an important role in combination therapy. Therefore, antibiotics that cause more side effects or no longer effective as therapeutic agents could be used by reducing dose exploiting their synergy with herbal drugs. In this way, novel antimicrobial combinations could be developed for the treatment of diseases caused by multidrug-resistant bacteria.

Keywords: Antibiotic resistance, Multidrug-resistant bacteria, Combination therapy, Herbal drug and antibiotic combination, Plant extracts, Herbs, Synergy, Synergistic action

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