The Torch
Vol. 2 (8)

Is nano giving chance to fight antimicrobial resistance?

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Over the years, antimicrobials have been employed as one of the most successful forms of chemotherapy to treat many infectious diseases. An antimicrobial is a substance that kills microorganisms or stops their growth. They are synthetic (sulphonamides and quinolones) or semisynthetic (methicillin and amoxicillin), or natural, i.e. obtained from plants (quercetin and alkaloids) or animals (lysozyme) or microbes (secondary metabolites). But the emergence of microbial resistance to several antibiotics is becoming a serious threat to the efficacy of current antimicrobial therapy. Antimicrobial resistance occurs when microbes change over time and make the medications used to cure the infections ineffective, which in turn makes the infections harder to treat. This is a major concern because a resistant infection may increase the risk of disease spread, severe illness and death. It occurs naturally but is facilitated by the inappropriate use of medicines including low-quality medicines, wrong prescriptions, poor infection prevention, self-medication, etc. For instance, when a person does self-medication with an antibiotic for some unknown infection, some microbes might die but some might survive showing resistance to that antibiotic. That resistant microorganism might multiply and can exhibit resistance to the antibiotic. Thus, the demand for research pertaining to antimicrobial agents to which the pathogenic microbes cannot develop resistance has increased. Based on studies, nanomaterials are regarded as a long-term solution to this ever-growing problem of antimicrobial resistance. They have been reported to exhibit antimicrobial effect against a wide range of drug-resistant infectious pathogens. They affect multiple biological pathways of microbes and these microbes have to undergo concurrent mutations to develop resistance against antimicrobial nanoparticles, which makes them a prospective antimicrobial. Hence, the nanomaterials could serve as a boon to overcome the problem of drug resistance.

Keywords: Antimicrobials, Resistance, Treatment, Infections, Nanoparticles

Citation:
Nidhi Singh. Is nano giving chance to fight antimicrobial resistance?. The Torch. 2021. 2(8). Available from: https://www.styvalley.com/pub/magazines/torch/read/is-nano-giving-chance-to-fight-antimicrobial-resistance.