Peptide-Functionalized Carbon Based Nanoconjugate: Synthesis, Characterization and Biomedical Applications

Shubhi Joshi[1,3], Gaurav Verma[1,2], Avneet Saini[3]*

[1]Energy Research Centre, Panjab University, Chandigarh, India
[2]Dr. S. S. Bhatnagar University Institute of Chemical Engineering & Technology, Chandigarh, India
[3]Department of Biophysics, Panjab University, Sector 25, Chandigarh, India

ABSTRACT

Antimicrobial resistance is a global health threat aggravated by unregulated use of antibiotics. Need of the hour is development of novel antimicrobial agents with anti-bacterial activity and low propensity towards resistance development. The conjugation of peptides with graphitic nanoparticles such as graphene oxide (GO) and reduced graphene oxide (rGO) results in development of broad-spectrum anti-bacterial biomaterials with enhanced hemocompatibility. Peptide-functionalized nanoparticles have emerged as versatile tools for multifarious biomedical applications. Conjugation between the two promising classes of materials allows enhanced control over their biological behaviors thereby overcoming the intrinsic limitations of the individual materials. In the present work, we have investigated the interaction between GO/rGO and a novel antimicrobial peptide by application of different sophisticated analytical and microscopic techniques. The formed nano bioconjugates were evaluated for anti-bacterial activity against multi-drug resistant pathogenic organisms. For evaluation of futuristic biomedical applications, the hemolytic activity and cell viability of the nano bioconjugates was evaluated in comparison to GO/rGO alone. The peptide-functionalized graphitic conjugates exhibited enhanced anti-bacterial activity and biocompatibility. It is believed that with these properties, the peptide-functionalized graphitic nanoconjugate may find potential applications as a multifunctional platform in multifarious applications ranging from healthcare to environmental remediation.