Preparation and investigation of anticancer effect of nano drug delivery systems for curcumin based on graphene oxide-polyglycerol and reduced graphene oxide-polyglycerol hybrids carriers

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Abstract
In this study, nano drug delivery carriers based on graphene oxide and reduced graphene oxide-polyglycerol hybrids were prepared. Functionalization of nano graphene oxide and reduced graphene oxide was accomplished through noncovalent interaction between the π conjugated system of graphene materials and the aromatic segment in the focal point of polyglycerol polymer. Polyglycerol is a hydrophilic and biocompatible polymer that its conjugation with graphene materials leads to an increase in the colloidal stability and a decrease in the nonspecific interaction of graphene materials. Curcumin as an anticancer hydrophobic natural drug with low systemic bioavailability was simply loaded on these nanohybrids via π-π stacking force between the π conjugated systems of graphene materials and curcumin. The results showed that loading capacity of curcumin at reduced graphene oxide hybrid (49%) is higher than graphene oxide hybrid due to restored of π conjugated system in reduced graphene oxide. Anticancer efficiency of these drug hybrids was investigated by MTT assay. Results showed that these drug carriers have sufficient biocompatibility. Also these nano drug delivery systems showed a cytotoxic effect that was comparable to that of free curcumin. The reduced graphene oxide hybrid is preferred for delivery of curcumin due to its higher loading capacity that can provide efficient dose of drug in low level of carrier.

Keywords: Nano Drug Delivery System, Graphene Family Materials, Curcumin.