Antiviral Activity of the Graphene/Silver Nanocomposites against Enveloped Coronavirus and Nonenveloped Infectious Bursal Disease Virus

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Background/Objective

It is important to discover novel antiviral materials since more and more emerging infectious diseases are caused by viruses. Silver nanoparticles have showed strong antiviral activity and graphene holds great potential for antimicrobial material due to its large surface area, high carrier mobility and biocompatibility. To investigate the antiviral activity of graphene oxide (GO) sheets and GO sheets with silver particles (GO-Ag) against enveloped and non-enveloped viruses, feline coronavirus (FCoV) with envelope and infectious bursal disease virus (IBDV) without envelope were chosen.

Method

Morphology and sizes of GO and GO-Ag was characterized by transmission and scanning electron microscopies and X-ray diffraction. Cytotoxicity of compounds was determined by MTS assay. Virus inhibition assay was used to determine the antiviral activities of GO and GO-Ag against the infection of FCoV and IBDV.

Result

The cytotoxicity concentration causing 50% of cells dead (CC50) of GO and GO-Ag was 17.4 mg/ml and 19.7 mg/ml, respectively. GO-Ag has demonstrated antiviral activity against the infection of enveloped and non-enveloped viruses while GO only had antiviral activity against the infection of enveloped virus. The mechanism of antiviral activity need to be further studied in the future.

Conclusion

Novel nanomaterial, GO and GO-Ag, characterized in this study can be subjected to further application for the protection against emerging infectious viruses and the prevention of further transmission.