주제발표-1

Development of New Materials of Ginseng by Nanoparticles

Deok Chun Yang*, Ramya Mathiyalagan, Dong Uk Yang,
Zuly Elizabeth Jiménez Pérez, Joon Hurh and Jong Chan Ahn
Department of Oriental Medicine Biotechnology and Ginseng Bank,
College of Life Science, Kyung Hee University, Korea

For centuries, *Panax ginseng* Meyer (Korean ginseng) has been widely used as a medicinal herb in Korea, China, and Japan. Ginsenosides are a class of triterpene saponins and recognized as the bioactive components in Korean ginseng. Ginsenosides, which can be classified broadly as protopanaxadiols (PPD), protopanaxatriols (PPT), and oleanolic acids , have been shown to flaunt a vast array of pharmacological activities such as immune-modulatory, anti-inflammatory, anti-tumor, anti-diabetic, and antioxidant effects. In recent years, a number of ginseng and ginsenoside researches have increasingly gained wide attention owing to its unique pharmacological properties. Although good efficacies of ginsenosides have been reported, lack of target specific delivery into tumor sites, low solubility, and low bioavailability due to modifications in gastro-intestinal environments limit their biomedical application in clinical trials. As a result to this major challenge, nanotechnology and drug delivery techniques play a significant role to solve this problematic issue. Thus, we reported the preparation of poly-ethylene glycol (PEG) and glycol chitosan (GC) functionalized to ginsenoside (Compound K and PPD) conjugates via hydrolysable ester bonds with improved aqueous solubility and pH-dependent drug release. *In vitro* cytotoxicity assays revealed that PEG-CK, and PPD-CK conjugates exhibited lower cytotoxicity compared to bare CK and PPD in HT29 cells. However, GC-CK conjugates exhibited higher and similar cytotoxicity in HT29 and HepG2 cells. Furthermore, GC-CK-treated RAW264.7 cells did not exhibit significant cell death at higher concentration of treatment which supports the biocompatibility of the polymer conjugates. They also inhibited nitric oxide production in lipopolysaccharide (LPS)-induced RAW64.7 cells. In addition to polymer-ginsenoside conjugates, silver (AgNps) and gold nanoparticles (AuNps) have been successfully synthesized by green chemistry using different *m*. The biosynthesized nanoparticles demonstrated antimicrobial efficacy, anticancer, anti-inflammatory, antioxidant activity, biofilm inhibition, and anti-coagulant effect. Special interest on the effective delivery methods of ginsenoside to treatment sites is the focus of metal nanoparticle research.In short, nano-sizing of ginsenoside results in an increased water solubility and bioavailability. The use of nano-sized ginsenoside and *P. ginseng* mediated metallic nanoparticles is expected to be effective on medical platform against various diseases in the future.

Key words: Ginsenoside, Green synthesis, Polymer nanoparticles, Metal nanoparticles, Drug-delivery, Anticancer activity