In Vivo Pharmacokinetics, Biodistribution and Antitumor Effect of Novel Self-assembled Gelatin-oleic Acid Nanoparticles

B-J. Lee 1, C. H. Park 1, P. H-L. Tran 2, T. T-D. Tran 2
1 Ajou University, 2 Vietnam National University

Purpose
To investigate the pharmacokinetics and biodistribution in rats, anti-tumor activity in different tumor-bearing mice of novel self-assembled gelatin-oleic acid (GO) nanoparticles containing paclitaxel (PTX).

Methods
A new gelatin-oleic acid (GO) conjugate synthesized to form GO nanoparticles via self-assembly in an aqueous solution. The GO nanoparticles were further functionalized using folic acid (FA) as a targeting ligand for tumors. The biodistribution and pharmacokinetics of GO nanoparticles containing paclitaxel (PTX) were compared with Taxol® in rats. Anti-tumor activity and survival rate of GO nanoparticles were also examined in tumor-bearing mice.

Results
The in vivo studies confirmed that nanoparticles showed improved therapeutic effects on tumors and significantly reduced the toxic effects associated with Taxol®, even at the 50% lethal dose (LD50). The in vivo pharmacokinetics and biodistribution of the GO nanoparticles containing PTX indicated slower clearance, longer blood circulation and higher tumor selectivity as compared with Taxol®. Furthermore, the functionalized nanoparticles with FA were more effective than the non-functionalized nanoparticles for longer circulation in blood and improved targeted delivery to tumor sites. For survival studies, the GO nanoparticles could synergistically maximize the in vivo anti-tumor efficacy in mice, showing reduced tumor volume and longer survival rate in mice.

Conclusion
The current GO nanoparticles could be utilized for cancer therapy and drug delivery. Supported by a grant from the Korean Health Technology R&D Project, MOHW, Korea.