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Design and characterization of novel phytanyl substituted Gemini surfactants for improved DNA transfection vectors

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To achieve successful ovarian cancer gene therapy, safe and efficient gene delivery systems are needed. Non-viral delivery vectors have several potential advantages (low toxicity, lack of immune response, ease of production) over the widely used viral vectors for delivering therapeutic genes. Gemini surfactants are a family of surfactants containing two surfactant monomers that are linked by a spacer group. An advantage of this structure is increases in gemini surfactant-DNA binding efficiencies. Based on a rational design approach, a series of novel phytanyl substituted gemini surfactants were synthesized and characterized. The nanoparticles were composed of the gemini surfactant, plasmid coding for *GFP*, and one neutral lipid, DOPE. The transfection particles at varying charge ratios of gemini surfactant to DNA were characterized using measuring size and zeta potential. *In vitro* study of the phytanyl gemini surfactants as gene delivery vectors in ovarian cancer cells was investigated. The transfection particles at different charge ratios demonstrated varying, but significant transfection efficiencies. At a charge ratio of 5:1, the phy-3-12 and phy-3-18 showed the highest transfection efficiency, while the phy-3-16 had the highest transfection efficiency at the charge ratio of 2:1. Furthermore, the transfection particles were determined by small angle X-ray scattering (SAXS). The structure obtained by SAXS indicated that the activity of gemini surfactants as gene delivery vectors can be related to the structure of the particles.

Biography

Haitang Wang is currently completing a PhD in the Department of Chemistry at the University of Waterloo under the supervision of Dr. Shawn Wettig. Previously Haitang has completed a BSc in Chemistry and MSc in Biological Science and Technology at the Dalian University of Technology in China, and a MSc in Biology at the University of Waterloo. Her research interests are in safe and efficient gene delivery systems, non-viral delivery vectors, the use of derivatives of gemini surfactants to improve DNA transfection, and the mechanism of how the structure of gemini surfactants affects cancer gene therapy.