An *In Vitro* and *In Vivo* Approach of Hydrogen Sulfide-Responsive Drug Release Driven by Azide-Functionalized Mesoporous Silica Nanoparticles

Shu-Pao Wu

Department of Applied Chemistry, National Chiao Tung University, Hsinchu 300, Taiwan

E-mail: spwu@mail.nctu.edu.tw

Abstract:

A folic acid decorated azide functionalized biocompatible mesoporous silica nanoparticles (MSNPs) was constructed to target tumor cells through folate receptor (FR), a widely expressed receptor in cancer cells. In colon and ovarian cancer cells, high endogenous H_2S levels are found. They can be used as a trigger for the azide reduction, which leads to the cleavage of ester linkage and results in DOX release from MSNP nanocarriers. Additionally, confocal cell images of HCT-116, HT-29, A2780, SKOV3, and HeLa cells treated with nanoparticles revealed an effective internalization of MSNPs in these cells. Interestingly, DOX-loaded MSNP-N_3-FA treated HT-29 cells showed a significant decrease in the cell viability, whereas, there was no substantial change in HeLa cells. We also demonstrated that DOX-loaded MSNP-N_3-FA has superior *in vivo* chemotherapy efficacy compared to free DOX. These observations indicated that the designed nanocarriers on MSNP-N_3-FA specifically respond in the presence of H_2S. MSNP-N_3-FA is the first potential nanocarrier for endogenous H_2S based efficient DOX release for colon and ovarian cancers.