Nanoparticles are an innovative platform for cancer treatment that reduces systemic toxicity and allows for active targeting of tumor sites to enhance the therapeutic efficacy. Mesoporous silica nanoparticles (MSNs) have emerged as an attractive drug delivery system due to their high surface area, vast functionalization potential, and biocompatibility. The surface of MSNs can be modified with targeting agents that allow not only the specific interaction with cancer cells, but also targeting organelles inside the cells. In addition, active molecules such as photosensitizers and anticancer drugs can be chemically attached or physically loaded into the interior channels of MSNs. In this work, I will present our current efforts aimed to demonstrate the versatility of this platform to develop target-specific multifunctional delivery systems for the treatment of cancer. We have shown that by functionalizing MSNs with Cholera toxin subunit B proteins, this material can target the endoplasmic reticulum through a retrograde pathway in cervical cancer cells. Moreover, the modification of the MSN platform with a mucin-1 antibody allowed the accumulation of MSNs in breast cancer tumors in vivo as was demonstrated using a genetically engineer mouse model. The therapeutic abilities of the MSN-based drug delivery system were proved by the specific release of anticancer drugs such as cisplatin and gemcitabine in cancer cells over-expressing folate receptors. Finally, the successful combination of chemotherapy and photodynamic therapy using MSNs as nanocarriers for cisplatin and phthalocyanine was demonstrated in vitro. In conclusion, our work shows that MSNs is an excellent alternative for the development of target-specific multifunctional delivery systems to treat cancer.

**Keywords:** mesoporous silica nanoparticles, chemotherapy, photodynamic therapy

**References:**


**Presenting author's email:** jviveroe@uncc.edu