Optimizing the cellular uptake of porous silicon dioxide microspheres

Spherical, porous silicon dioxide microparticles have promise to enhance the efficiency of chemotherapeutic drug delivery. These particles are capable of targeting specific tissues and crossing cell membranes to deliver the drugs directly to the cytosol. Yet there have been very few studies that determine the relationship between size, surface modifications, and dosage with cellular uptake. These studies are essential for maximizing cellular uptake while minimizing particle toxicity and for optimizing this potential drug delivery method. Here, we seek to combine the ideal particle diameter, surface modification, and dose to determine what type of particle is most advantageous for enhancing drug delivery. This was done by studying the cellular uptake of particles with varying the particle size, surface modification with tetraethylene glycol, and dose. Cellular uptake of modified and unmodified particles with diameters ranging from 150 to 2,500 nm were observed *in vitro* with both a confocal laser scanning microscope and a scanning electron microscope, and toxicity studies using MTS colorometric tests were performed to determine an ideal dosage range that minimizes adverse affects. Using the results, the optimal size range, modification, and dosage are reported.