Cancer therapy using mesoporous silica nanoparticles

Fuyuhiko Tamanoi
Dept. of Microbio., Immunol. & Molec. Genet., UCLA
Institute for Advanced Study, Kyoto University

Over the years, we have reported that mesoporous silica nanoparticles (MSNs) represent a versatile and powerful vehicle for the delivery of anticancer drugs. Because of the presence of thousands of pores, anticancer drugs can be stored and delivered to tumor. Surface modified MSNs can accumulate in the tumor when injected intravenously in the mouse tumor models. Injection of camptothecin loaded MSN result in significant inhibition of tumor growth.

We have recently reported that MSNs can be tuned for biodegradation. This is possible by employing the PMO (periodic mesoporous organosilica) synthesis method, biodegradable bonds such as disulfide, tetrasulfide or peptide-like bond can be incorporated into the framework of nanoparticles. We have shown that these biodegradable PMO nanoparticles exhibit excellent tumor accumulation ability and effective anticancer activity in the chicken egg tumor model for ovarian cancer. We observe clear advantage to use nanoparticles compared to free anticancer drug with respect to adverse effect on various organs.

ABSTRACT

Because of relative stability of the material, various nanomachines can be attached to MSN, resulting in the development of mechanized nanoparticles that respond to light and magnetic field. The light responsive MSNs take advantage of azobenzene that changes conformation upon light exposure. The magnetic field responsive MSNs take advantage of iron oxide core whose superparamagnetic property enables heat generation upon exposure to oscillating magnetic field, These mechanized nanoparticles can be used to carry out controlled release of anticancer drugs.