Cytotoxic effect of magnetite nanoparticles on mesothelioma cells

○**Shofu Matsuda[1], Takuya Nakanishi[1], Eri Nakajima[2], Hong Zhang[1], Akane Tanaka[3], Hiroshi Matsuda[3], Tetsuya Osaka[1,2]***

[1] Graduate School of Advanced Science and Engineering, Waseda University, 3-4-1 Okubo, Shinjuku, Tokyo 169-8555, Japan.

[2] Department of Nanoscience and Nanoengineering, Waseda University, 3-4-1 Okubo, Shinjuku, Tokyo 169-8555, Japan.

[3] Division of Animal Life Science, Institute of Agriculture, Tokyo University of Agriculture and Technology, 3-8-1 Harumi-cho, Fuchu, Tokyo 183-0057, Japan

*E-mail address: osakatets@waseda.jp

Recently, magnetite (Fe_3O_4) nanoparticles (MNPs) have been receiving great attention in biomedical applications, such as in magnetic resonance imaging, magnetic hyperthermia, and drug delivery, because of their magnetic properties and biocompatibility. Malignant masothelioma is an aggressive tumor associated with asbestos exposure. Primary treatment of mesothelioma is surgical resection, radiation therapy, and chemotherapy, whose efficiency remains poor. Therefore, developing new mesothelioma treatment that overcomes the issue is very important. In this study, considering future application of MNPs to mesothelioma treatment, effect of the addition of MNPs on cell viability was investigated for human mesothelioma cells *in vitro*.

MNPs with diameter of ~10 nm were synthesized by adding aqueous spermine, or *N*,*N*'-bis(3-aminopropyl)butane-1,4-diamine to aqueous solution containing ferrous chloride and ferric chloride [1]. The MNPs were added to the medium containing three histological types of human mesothelioma cells, i.e. NCI-H28 (epithelioid), NCI-H2052 (sarcomatoid), and MSTO-211H (biphasic) cells, and after 24-h incubation, cell death were evaluated by flow cytometry after staining with propidium iodide and thiazole orange. The same experiments were carried out on human breast cancer MCF-7 cells for comparison.

A dose-dependent increase in the percentage of non-viable cells was observed for mesothelioma MSTO-211H cells, but not for breast cancer MCF-7 cells. It should be noted here that, for mesothelioma NCI-H28 and NCI-H2052 cells, cell death was little observed even at high dose of MNPs, which suggests specificity in cytotoxic effect of MNPs to MSTO-211H cells. The cell death of MSTO-211H cells induced by the simple addition of MNPs suggests that the addition of MNPs to mesothelioma, even without an external magnetic field, can be a useful approach in the mesothelioma treatment.

Details including the mechanism of cell death for MSTO-211H will be discussed at the Symposium.

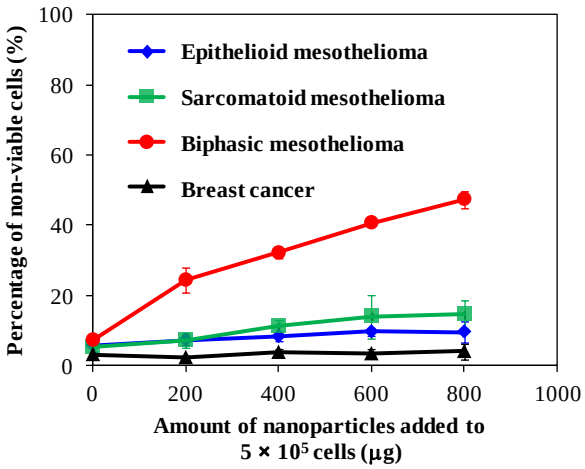

Figure 1 Percentage of non-viable cells depending on the amount of nanoparticles added to 5×10^5 cells.

Reference:

[1] T. Osaka, et al., *J. Colloid Interface Sci.*, **314**, 274-280 (2007); T. Osaka, et al., *Colloids Surf. B*, **71**, 325-330 (2009).