

Construction of 3D Tissue-Like Structure Using Functional Magnetite Nanoparticles

Akira Ito¹, Hiroyuki Honda², Masamichi Kamihira¹
(¹Dept. Chem. Eng., Fac. Eng., Kyushu Univ., ²Dept. Biotechnol, Sch. Eng., Nagoya Univ.)

Novel technologies to establish 3D tissue-like constructs are desired for tissue engineering. In the present study, magnetic force and magnetite nanoparticles were used to construct a layered keratinocyte sheet, a heterotypic layered co-culture system of hepatocytes with aortic endothelial cells (HAECs), and a vascular-like tubular structure consisting of HAECs, smooth muscle cells, and fibroblasts. Magnetite cationic liposomes, which have a positive surface charge in order to improve adsorption by cells, were taken up by the target cells. When a magnet was set under a tissue culture dish, magnetically labeled target cells were attracted and then adhered to form keratinocyte sheets or heterotypic-layers of HAECs with hepatocytes. For the tubular construction, when a cylindrical magnet was rolled onto magnetically labeled target cells, the cells were attracted to the magnet and formed a tube around it. These results suggest that this novel use of magnetite nanoparticles and magnetic force, which we refer to as “magnetic force-based tissue engineering (Mag-TE)”, offers a major advancement in tissue engineering. Also, we are now applying Mag-TE technique to pharmaceutical fields.