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Effects of chitin and its derivatives on the activation
of human umbilical vein endothelial cells

Yukiko Irie

*Laboratory of Veterinary Surgery,
Department of Veterinary Clinical Sciences,
School of Veterinary Medicine,
Hokkaido University, Sapporo 060, Japan*

Chitin and chitosan are used widely in veterinary clinics because they have excellent biocompatibilities and accelerate wound healing. It has been shown that in the novel granulation tissue, in which chitin or chitosan are applied, the granulation tissue formed earlier than that without chitin and chitosan. There is also rich and rapid infiltration of inflammatory cells, mainly neutrophils, and neovascularization can be observed histologically.

In this study, it was investigated whether chitin and its derivatives can accelerate the proliferation of endothelial cells and stimulate the secretion of cytokines from these cells, the purpose of which is to reveal the mechanism of rapid neovascularization in the granulation tissue in which chitin or chitosan are applied.

When human umbilical vein endothelial cells (HUVECs) were stimulated by chitin, chitosan, D-glucosamine (Glc), N-acetyl-D-glucosamine (GlcNAc), chitosan hexamer (6Glc), N-acetylchitohexaose (6GlcNAc), low molecular chitosan (Chitosan-ML), 37% and 80% deacetylated chitin (DAC37 and 80), N-sulfonated DAC70 (N-S-DAC70), sulfonated chitin (S-Chitin) and heparin

with or without human basic fibroblast growth factor (bFGF) for 72 hours, their proliferative activities were enhanced a little by a number of chitin derivatives.

Then, HUVECs were stimulated by chitin, chitosan, Glc, GlcNAc, 6Glc, 6GlcNAc, ChitosanML, N-S-DAC70, S-Chitin and lipopolysaccharides (LPS), and 24 hours post-treatment, the supernatants from the different treatment groups were detected for the presence of cytokines using commercial ELISA kits. Interleukin (IL)-1, IL-6, IL-8, tumor necrosis factor (TNF) were detected in the supernatant of N-S-DAC70, IL-8 was the only one detected in the supernatants of other chitin derivatives.

It is concluded that some chitin derivatives can accelerate the HUVECs proliferation and stimulate secretion of cytokines, especially IL-8. However, their abilities in activating the HUVECs proliferations are weak, so the rich and rapid vascularization in the novel granulation tissue, which are treated with chitin or chitosan, would be caused not only by chitin derivatives but also by interactions with other stimulated cells.