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

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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-gluco-samine (GlcNAc), chitosan hexamer (6Glc), N-acetyl-chitohexaose (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 lypopolisaccarides (LPS), and 24hours post-treatment, the supernatanants 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 acti-vating the of HUVECs proliferations are weak, so the rich and rapidly vascularization in the novel granulation tissue, which are treated with chitin or chitosan, would be caused not only by chitin derivatives but also by intractions with other stimulated cells.