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Macrophage activity stimulated by chitosan in vitro

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Chitosan is well known as a wound healing promotor when applied topically on the wound and it could increase immune response and resistance to infection when given systemically. Macrophages play a major role in increasing non-specific immune response and resistance to infection, and also supply various mediators for succeeding systemic immunoresponse and wound healing. There are however very few reports describing the direct effects of chitosan on macrophages. The purpose of this study was to investigate the changes on phagocytic activity and cytokine production of macrophages after direct stimulation by chitosan.

Macrophages were stimulated by chitosan particles with mean diameters of 3.2 and 5.0 μm. Phagocytic activities were evaluated by flowcytometric analysis and microscopic observation. Macrophage phagocytic activities were increased significantly by chitosan particles with 5.0 μm. Mannan, a mannose receptor agonist, evidently showed inhibitory effects on macrophage phagocytic activity when supplemented at concentrations of 2.5mg/ml. This result indicates that chitosan directly accelerates the phagocytic activity of macrophages, and that this activation is mediated by mannose receptors on macrophages. Production of IL-1β, IL-6, GM-CSF and IFN-γ in the culture media of macrophages stimulated by chitosan were assayed. Significant increase of IL-1β, IL-6 and GM-CSF activities were found in the culture media. These results suggest that the cytokines produced by macrophages act as an enhancer of immunity through activated T- and B- cells when chitosan is applied systemically.

In conclusion, this study showed that chitosan may directly increase macrophage functions, such as phagocytic activity mediated by mannose receptor and the production of cytokines IL-1β, IL-6 and GM-CSF.

Pathological Studies of Captive Dolphins in an aquarium

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Lesions and causes of death in captive dolphins were examined for the purpose of prevention of diseases and care of captive dolphins. Twenty-five dolphins, including 20 bottlenose dolphin2 (*Tursiops tryncatus*), 3 harbor porpoises (*Phocoena phocoena*) and 2 finless porpoises (*Neophocaena phocaenoides*), (13 males, 12 female ; approximately 6 months to 23 years old) that had been kept in 3 aquariums in Hokkaido and one aquarium in the Chubu district