



HOKKAIDO UNIVERSITY

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INFORMATION

Hokkaido University conferred the degree of Doctor of Veterinary Medical Science (equivalent to Ph. D.) on September 30, 1997 to 1 Recipient.

The title of his thesis and other information are as follows :

Studies on an immunopotential of peptidoglycan
derived from *Bifidobacterium thermophilum*

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The immune systems of mammals, including swine, change complicatedly from the fetal period to the neonatal period. Recently, there have been many studies on immune-response ability in the prenatal period and the complexity of the immune mechanism has become clear. The mammalian immune response from the fetal to the neonate stage is controlled by a complex mutual feedback effect. The transition from a negative immune response to the positive immune response from the fetal to the neonatal period was demonstrated. On the other hand, bacterial flora in the human and animal intestine have a great influence in the host and, in particular, have an important relation to development of local and total immune responses and maturation. However, their detailed functions are unknown. This study examined the immune activation effect in piglets with aging and several immune reactions of mice when they were orally administered peptidoglycan (PG) of *Bifidobacterium thermophilum* from swine intestinal flora. I also orally administered PG from *B. thermophilum* to suckling piglets and confirmed the immune responses of the small intestinal mucosa by means of the changes of Ig-bearing cell counts. After PG treatment, the numbers of IgA-bearing cells of the lamina propria in the intestinal mucosa

were significantly higher than those of the non-treated group at 5 and 6 weeks of age. The change from IgM-bearing cells to IgA-bearing cells (class switch) was accelerated by PG-treatment and immunocytes matured earlier. These findings indicated lower numbers of *E. coli* in various portions of the small intestine and a decrease in the incidence of post weaning diarrhea syndrome of the treated animals as compared with the control group. In the mice, it was observed that the *E. coli* were expelled from the body and the survival rates of the PG-administered group were significantly higher than those of the non-treated control group. The same results were obtained in the phagocyte function. The phagocytic activity of neutrophils from the spleen and peritoneal cavity and alveolar macrophages of mice were activated and these bactericidal activities increased. Furthermore, the cytotoxic activity of the natural killer (NK) cells from the spleen and the mesenteric lymph node and intraperitoneal cytotoxic T lymphocytes and concanavalin A stimulated lymphocytes in response to tumor cells were enhanced by PG treatment. It is clear that the consecutive oral administration of PG may be a very effective procedure for the enhancement of cellular immunity.

The results confirmed that PG of *B. thermophilum* activated immunopotentiality and immunoresistance systems both locally and systematically and caused immunofunction to mature more rapidly. Thus, the application of the oral administration of PG provides a useful method of

prophylaxis against the invasion of bacteria. Moreover, PG feeding may also be very effective for the management of domestic animals/livestock and very useful in helping to economically develop large populations of animals.

Original papers of this thesis appeared in "J. Vet. Med. Sci.", Vol. 49, 235–243 (1987), "J. Vet. Med. Sci.", Vol. 56, 433–437 (1994), "J. Vet. Med. Sci.", Vol. 56, 1129–1133 (1994), "J. Vet. Med. Sci.", Vol. 58, 85–86 (1996).