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CFAI Special Lecture

“Development of functional foods with the capacity to improve respiratory health: impact on resistance to viral infections”

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Venue; Lecture room #1, Aobayama-Commons

Research from the last two decades has reported the impact of the intestinal microbiota on the respiratory immunity through the modulation of the gut-lung axis. It was conclusively demonstrated how the variations in the intestinal microbiota affect the responses of respiratory epithelial cells and antigen presenting cells against respiratory pathogen's attack. Moreover, the selection of specific microbial strains (immunobiotics) with the ability to modulate immunity in distal mucosal sites made possible the development of functional foods to strengthen respiratory defenses. In this talk, the development and characterization of two types of functional foods with the capacity to improve respiratory health will be revised. On the one hand, milk-based products containing the immunomodulatory strain *Lacticaseibacillus rhamnosus* CRL1505 will be described. Orally administered *L. rhamnosus* CRL1505 stimulates Th1 response in the intestinal mucosa and induces the mobilization of IFN- γ -producing CD4⁺ T cells from the intestine to the respiratory tract, where they stimulate alveolar macrophages (AMs). The CRL1505 strain activates AMs and enhances their ability to produce type I interferons and IFN- γ in response to respiratory syncytial virus (RSV) and influenza virus (IFV). Dairy products containing the CRL1505 strain were successfully used to reduce the incidence and severity of respiratory infections in children. On the other hand, water kefir could be an alternative to milk-based products for its application in persons with lactose intolerance or milk allergy and could be incorporated to vegan diets. Using mice models, we demonstrated that the oral administration of water kefir can modulate the respiratory Toll-like receptor (TLR3)-mediated innate antiviral immunity and improve the resistance to RSV infection. The treatment of mice with water kefir improved the production of IFNs and antiviral factors in the respiratory tract after the activation of the TLR3 signaling pathway, differentially modulated the balance of pro- and anti-inflammatory cytokines produced by AMs, reduced RSV replication and diminished lung tissue damage. Maintaining a proper balance between anti-inflammatory and pro-inflammatory mediators is vital for ensuring an effective and safe antiviral immune response, and the results show that water kefir would help to maintain that balance promoting a controlled inflammatory response that defends against infection while minimizing tissue damage. The incorporation of functional foods with the ability to modulate the gut-lung axis in the daily diet can ensure a reinforcement in respiratory immunity homeostasis and an improved protection against viral respiratory infections.

Keywords: gut-lung axis, respiratory immunity, probiotics, *L. rhamnosus* CRL1505, water kefir, viral infections