

## Julio Villena先生によるCFAI特別セミナーを実施しました。

令和6年10月10日(木)に、アルゼンチン国立乳酸菌研究所(CERELA-CONICET)のJulio Villena博士によるCFAI特別セミナーを実施しました。Villena先生は、知のフォーラムで2024年9月からの2か月間、東北大学大学院農学研究科に客員教授として訪問滞在しており、乳酸菌による粘膜免疫調節機構を中心とした研究・教育活動に従事されています。本講演では、「Development of functional foods with the capacity to improve respiratory health: impact on resistance to viral infections」をテーマとし、呼吸器疾患を改善する2つの発酵食品について研究成果をご講演頂きました。

1つ目は、*Lactocaseibacillus rhamnosus* CRL1505を含む発酵乳であり、腸のTh1応答の刺激によるIFN- $\gamma$ 産生誘導を介して呼吸器の抗ウイルス免疫を強化することを、臨床データとともに示されました。2つ目は乳アレルギーやラクトース不耐症向けの代替食品としての水ケフィアで、マウスを用いたウイルス感染モデルから肺組織の損傷を軽減することが紹介されました。これらの発酵食品は、腸-肺軸を通じて呼吸器免疫の恒常性を維持し、ウイルス感染防御を強化する、次世代プロバイオティクスとしての活用が期待され、セミナーでは多くの質問が寄せられました。

Villena先生は、本研究科動物食品機能学分野と長年の研究交流を重ねており、腸内微生物による粘膜免疫調節に関する多くの研究成果を基盤とし、それらの機能性発酵食品としての実装化まで精力的に取り組まれています。また2023年からはアルゼンチン国立乳酸菌研究所の主任研究者としてLaboratory of Immunobiotechnologyを主宰しており、更なる研究・学生交流の強化が期待されます。



2024

CFAI Special Lecture

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

Speaker: Julio Villena, PhD.

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**Thursday, October 10, 16:20 pm**

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 *Lactocaseibacillus rhamnosus* CRL1505 will be described. Orally administered *L. rhamnosus* CRL1505 stimulates Th1 response in the intestinal mucosa and induces the mobilization of IFN- $\gamma$ -producing CD4<sup>+</sup> 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- $\gamma$  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