RES-058

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Promising Strategies For The Prevention And Treatment of Viral Diseases Due to *Lactococcus lactis* strain Plasma

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Background and Objectives

- Biogenics and probiotics contained in functional foods and dietary supplements have been reported to modulate intestinal function and enhance immune responses.
- Interferon-α (IFN-α) contributes to the early host defense against viral infections by inducing the expression of antiviral genes and suppressing viral replication.
- This study investigated the production of IFN-α and the phagocytic capacity of plasmacytoid dendritic cells (pDCs) in response to biogenic or probiotic bacteria. (pDCs) in response to biogenic and probiotic bacteria.

Materials and Methods

Bacterial strains and pDC Induction

A total of Nine probiotic strains were isolated from yogurt and dietary supplement products (Table 1). As shown in Fig. 1, bone marrow-derived dendritic cells (BM-DCs) were cultured in RPMI 1640 medium supplemented with Flt3L, maintained at 37 ℃ in a 5% CO_2 for 7 days. pDCs were purified using the EasySep™ Mouse CD11b Positive Selection Kit II.

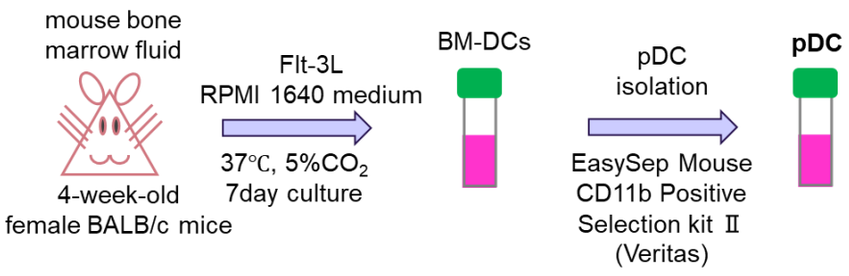

Fig. 1 Protocol of pDC induction

IFN- α Production from pDCs

Bacteria from each product were added to pDCs at 2×10^5 cells/mL. After incubation at 37 ℃ and 5% CO_2 for 24 hr, the concentration of IFN-α produced by pDC was measured by ELISA.

Table 1. Bacterial strains list.

Strain
Lactococcus lactis strain Plasma
Lactobacillus acidophilus L-92
Gluconacetobacter hansenii GK-1
Lactiplantibacillus plantarum L-137
Lacticaseibacillus paracasei MCC1849
Lactobacillus delbrueckii subsp. Bulgaricus OLL1073R-1
Bifidobacterium longum subsp. longum BB536,
Lactbacillus gasseri SBT2055
Lactocaseibacillus rhamnosus CRL1505

pDC Phagocytosis Assay (Fig. 2)

Micro cover glasses were placed in each well of a 24-well plate. Purified pDCs and FITC-labeled bacteria were subsequently added to the wells and co-cultured for 24 hr at 37 ℃ in a 5% CO_2. The cells were then incubated with an anti-mouse CD45R/B220 primary antibody for 2 hr. After washing, the cells were incubated with Alexa Fluor™ 546-conjugated goat anti-rat IgG, secondary antibody for 30 min at room temperature. Fluorescence images were obtained using a laser scanning confocal microscope (LSM900; Carl Zeiss).

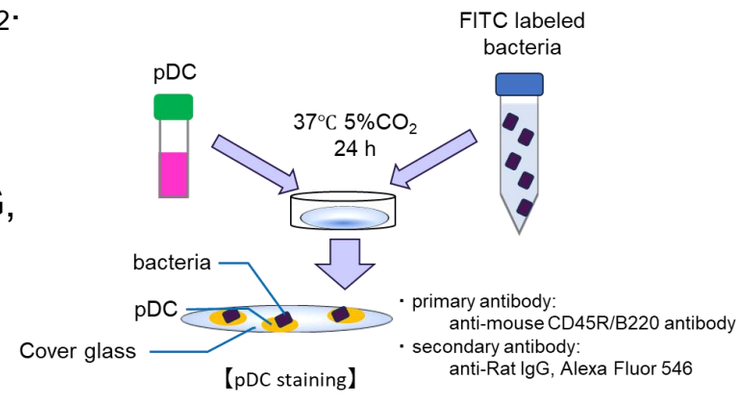

Fig. 2 pDC Phagocytosis Assay

Results

Images from Laser Scanning Confocal Fluorescence Microscopy

- To assess phagocytic activity, FITC-labeled bacteria and pDCs stained with Alexa Fluor 546 were visualized (Fig. 3). In the merged images, *L. lactis* strain Plasma, *L. paracasei* MCC1849, *B. longum* subsp. longum BB536 and *L. rhamnosus* CRL1505 were observed to colocalized with pDCs, as indicated by overlapping fluorescence signals.
- Z-stack analysis further demonstrated that numerous *L. lactis* strain Plasma cells were localized within the central optical plane of pDCs (Fig. 4). In contrast, *L. paracasei* MCC1849, *B. longum* subsp. longum BB536 and *L. rhamnosus* CRL1505 cells appeared colocalized at approximately +1.2 μm above the central plane of pDCs suggesting surface association rather than complete internalization.

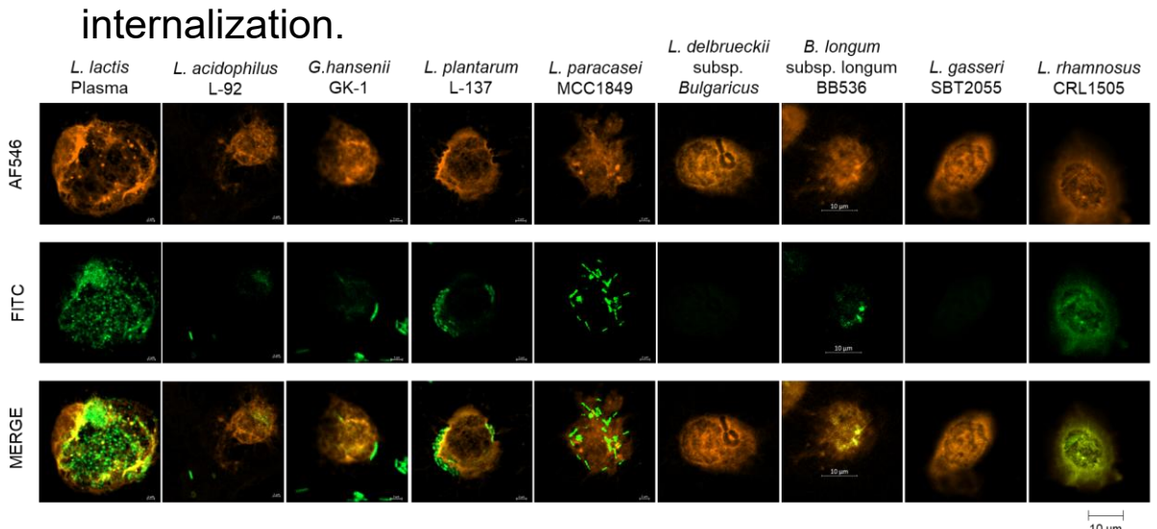

Fig. 3 Confocal fluorescence microscopy images of plasmacytoid dendritic cells co-cultured with each strain. pDCs were stained with Alexa Fluor™ 546-conjugated anti-mouse CD45R/B220 antibody (red), and bacterial strains were labeled with FITC (green).

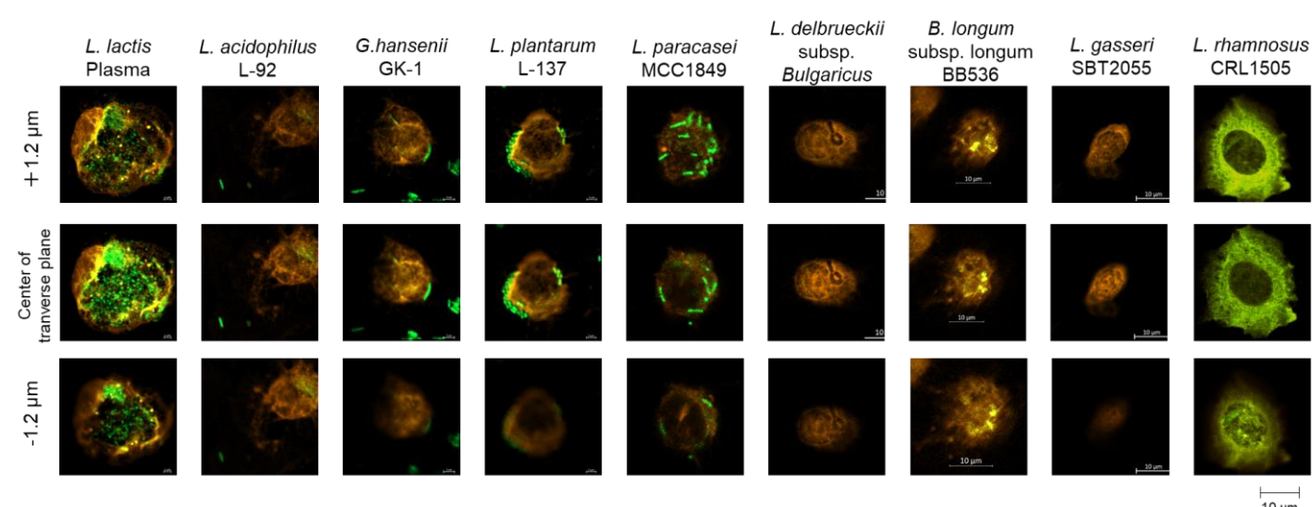

Fig. 4 Confocal fluorescence microscopy images of plasmacytoid dendritic cells co-cultured with each strain. pDCs were stained with Alexa Fluor™ 546-conjugated anti-mouse CD45R/B220 antibody (red), and bacterial strains were labeled with FITC (green).

IFN- α production by pDCs

The product containing *L. lactis* strain Plasma induced IFN-α production under conditions equivalent to the recommended daily intake (1×10^{11} cells), yielding a concentration of 73.8 ± 2.5 pg/mL (mean ± SD), as shown in Fig. 5. IFN-α production was below the detection limit for all strains except *L. lactis* strain Plasma.

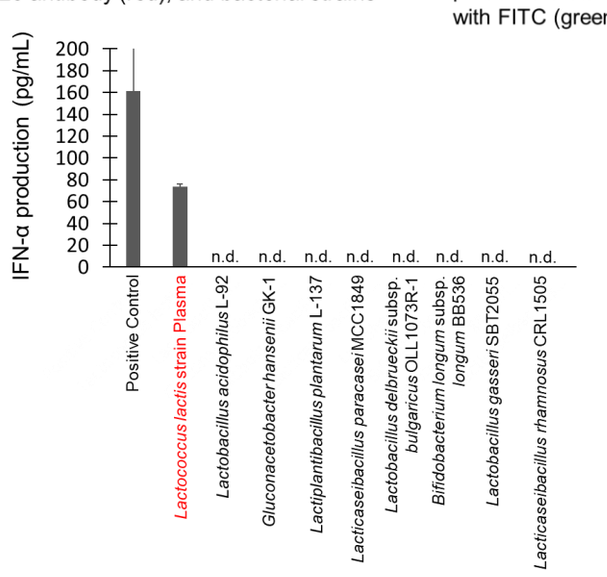

Fig. 5 Comparison of IFN- α production from plasmacytoid dendritic cells induced by each strain. n.d., not detected.

Conclusions

L. lactis strain Plasma, a novel therapeutic agent, may be effective for treatment and prevention of viral infection. Especially, *L. lactis* strain Plasma appears to be a promising functional postbiotic for enhancing innate immunity, particularly against respiratory viral infections.