Proceedings of the Nutrition Society (2013), **72 (OCE4)**, E264 doi:10.1017/S0029665113002899

Summer Meeting, 15–18 July 2013, Nutrition and healthy ageing

Probiotic modulation of dendritic cell function is influenced by ageing

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Dendritic cells (DCs) are critical in the dialogue between the host immune system and exogenous stimuli. During ageing there are functional alterations in DCs[(1)], which may contribute to increased risk of infection and a poor response to influenza vaccination in older individuals. There is increasing interest in the potential for probiotics to modulate DC function[(2)]. This *in vitro* study examined the effects of four probiotic strains, *B. longum* bv. *infantis* CCUG 52486, *B. longum* SP 07/3, *L. rhamnosus* GG (*L.* GG) and *L. casei* Shirota (LcS), on the activation of DCs from young or older subjects, and on their ability to stimulate T cells in the mixed leukocyte reaction (MLR).

PBMC obtained from 8 healthy young (20–30 y) and 8 healthy older (65–75 y) subjects. Low density cells (LDCs), enriched source of DCs, was obtained by overnight incubation of PBMC and removal of non-adherent cells. Probiotics grown anaerobically in MRS broth and harvested in the exponential phase. LDCs stimulated for 24 h with 1 μg/ml LPS or probiotic bacteria. For MLR experiments, un-stimulated/stimulated young or old LDCs were incubated with allogeneic young or old T cells in different combinations for 5 d. T cells activation markers and proliferation were tested by flow cytometry.

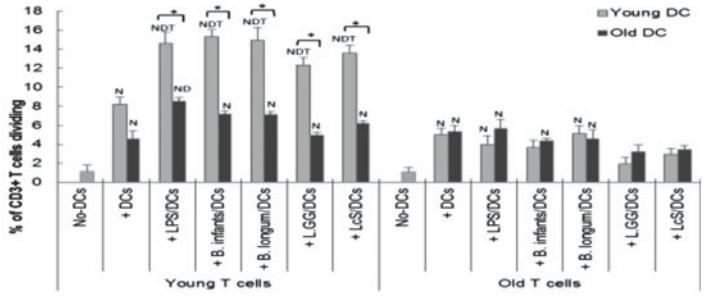

Fig 1. Effect of probiotics on proliferation of T-cells in the MLR. Mean and SE for $n = 8$ subjects in each age group. ^{N} $P<0.05$ relative to no DC control for T cells with the same age group; ^{D} $P<0.05$ relative to DC only incubated T cells with the same age group; ^{T} $P<0.05$ relative to older T cells with the same treatment.

All four probiotics enhanced expression of CD40, CD80 and CCR7 on both young and older DCs, with no differences between strains. Probiotics enhanced TGF-β and TNF-α production by old DCs only. LcS induced more IL-12 and IFN-γ production by DC than other strains, while *B. longum. infantis* CCUG 52486 favoured IL-10 production. Stimulation of young T cells in the MLR with DC was enhanced by probiotic pretreatment of old DCs, which demonstrated greater activation (CD25), gut-homing ability (integrin β7) and TGF-β than untreated controls. However, pretreatment of young or old DCs with LPS or probiotics failed to enhance the activation and proliferation of T-cells derived from older donors (Fig. 1).

Ageing increases the responsiveness of DCs to probiotics, but this is not sufficient to overcome the age-related decline in T cell function. Probiotics alter innate properties of older DCs, but appear to have less influence on adaptive properties.

This work was funded by the Biotechnology and Biological Sciences Research Council's Diet and Health Research Industry Club (BBSRC-DRINC), UK.

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