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Effects of a novel probiotic, *Bifidobacterium longum bv. infantis* CCUG 52486 with prebiotic on the B-cell response to influenza vaccination

S. M. Enani, C. E. Childs, A. Przemska, C. Maidens, H. Dong, I. Rowland, K. Tuohy, S. Todd, M. Gosney and P. Yaqoob

Department of Food and Nutritional Sciences, University of Reading, Reading RG6 6AP

Bifidobacterium longum bv. infantis CCUG 52486 has immunomodulatory properties, which are strongly influenced by ageing[1]. The PRIMAGE (Probiotics, Immunity and AGEing) study examined the influence of this probiotic in combination with a commercial prebiotic (BioEcolians; glucooligosaccharide) on the immune response to influenza vaccination in young and older subjects; effects of the B cell response are reported here.

58 young (18–35 y) and 54 older (60–85 y) subjects were treated with *Bifidobacterium longum bv. infantis* CCUG 52486 (5×10^8 CFU/day) and glucooligosaccharide (8 g/d) combined as a powder, or with placebo (maltodextrin) (9 g/day) for 8 weeks in total, with the seasonal (2010–2011 northern hemisphere) influenza vaccination being given at 4 weeks. Blood samples were taken at weeks 0, 4, 6 and 8 and peripheral blood mononuclear cells (PBMCs) were isolated and cryopreserved for analysis. B cell phenotype and expression of immunoglobulin (Ig) A and G were analysed by multi-parameter flow cytometry.

The absolute numbers of memory and plasma B-cells at baseline were significantly lower in old subjects compared to young subjects and there was also a significantly lower number of class switched IgA^+ and IgG^+ memory and total IgA^+ and IgG^+ B-cells in older subjects. Seroconversion to all three vaccine subunits was significantly lower in the older subjects (data not shown) and successful seroconversion associated with a significantly greater increase in IgG^+ memory ($P<0.05$) and total IgG^+ B-cells ($P<0.05$) 2 weeks after vaccination. In the older subjects, treatment with the pre- and probiotic increased the number of IgG^+ memory B-cells and total IgG^+ B-cells compared with the placebo group 4 weeks after vaccination ($P<0.02$ and $P<0.05$ respectively) (Data not shown).

Table 1. B-cell profile in old and young subjects at baseline. Significant difference from young is denoted as (*) $P=0.05$; (**) $P=0.01$; (***) $P<0.001$

	Absolute number × 1000/1 ml			
	Young ($n=58$)		Old ($n=54$)	
	Mean	SE	Mean	SE
Immature cells	7.8	0.8	6.9	0.7
Naive cells	141.5	8.9	119.2*	8.7
Memory cells	72.3	4.5	53.7**	3.8
IgA^+ memory cells	14.2	1.3	9.7**	0.8
IgG^+ memory cells	12.1	1.5	6.1***	0.7
Plasma cells	3.7	0.4	2.0***	0.2
Total IgA^+ B-cells	21.5	1.7	14.1***	1.0
Total IgG^+ B-cells	19.2	2.0	10.2***	1.0

In conclusion, ageing was associated with lower numbers of class switched B cells. The pre- and probiotic enhanced the production of IgG^+ memory and total B-cells following vaccination in old subjects. IgG expression is associated with successful seroconversion, but in older subjects, the increase in IgG was not sufficient to enable comparable seroconversion to the young subjects.

1. You J, Yaqoob P (2012) *FEMS Immunol Med Microbiol* **66**, 353–362.

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