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Probiotic supplementation during perinatal period or after weaning reduces allergic airway disease in A/J but not C57BL/6 mice

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Studies have shown that gut microbiota can influence allergic disease. Consequently, strategies that modulate gut microbiota, such as probiotics, may alleviate allergic disease. Interestingly, studies using the same probiotic have shown inconsistent results for effects on allergic disease; it is possible that the host's genetics and gut microbiota influence probiotics' effects. Our objective was to elucidate if probiotic consumption during the perinatal period or after weaning can reduce Th2 airway inflammation in the inbred mouse strains A/J and C57BL/6 (B6). It is known that A/J are more predisposed to Th2 airway inflammation than B6. We first examined the gut microbiota composition and its importance to allergic inflammation in A/J and B6. Next, we administered *Bifidobacterium longum* 5^{1A} during the whole perinatal period or after weaning as well as during the whole asthma protocol. Experimental asthma was initiated in 6-week-old mice using ovalbumin. Twenty-four hours after the last challenge, lung inflammation and function were analyzed. Interestingly, our results show that A/J had lower microbiota diversity than B6. Additionally, when A/J acquired gut microbiota from B6 by embryo transplantation, they showed reduced eosinophil airway infiltration, similar to that in B6, indicating that gut microbiota may have a greater influence on skewing toward the Th2 phenotype than host genes. Subsequently, probiotic treatment reduced allergic inflammation and airway hyperresponsiveness, independently of life stage, only in A/J. These results indicate that when probiotics are used to treat allergic disease, the host's genetics and gut microbiota composition should be considered.

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