



Gut microbiota maturity mediates the protective effect of siblings on food allergy

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INTRODUCTION

The mechanisms underlying the protective effect of older siblings¹ on allergic disease remain unclear but may relate to the infant gut microbiota^{2,3}.

OBJECTIVES

We investigated whether having older siblings decreases the risk of Immunoglobulin E (IgE)-mediated food allergy by accelerating the maturation of the infant gut microbiota.

METHODS

In a birth cohort assembled using an unselected antenatal sampling frame (n=1074), fecal samples were collected at 1, 6 and 12 months and food allergy status at 1 year was determined by skin prick test and in-hospital food challenge. We used 16S rRNA gene amplicon sequencing to derive amplicon sequence variants (ASVs). Among a random subcohort (n=323), microbiota-by-age z-scores (MAZ) at each time point were calculated by random forest model using fecal ASVs to represent the gut microbiota maturation over the first year of life.

RESULTS

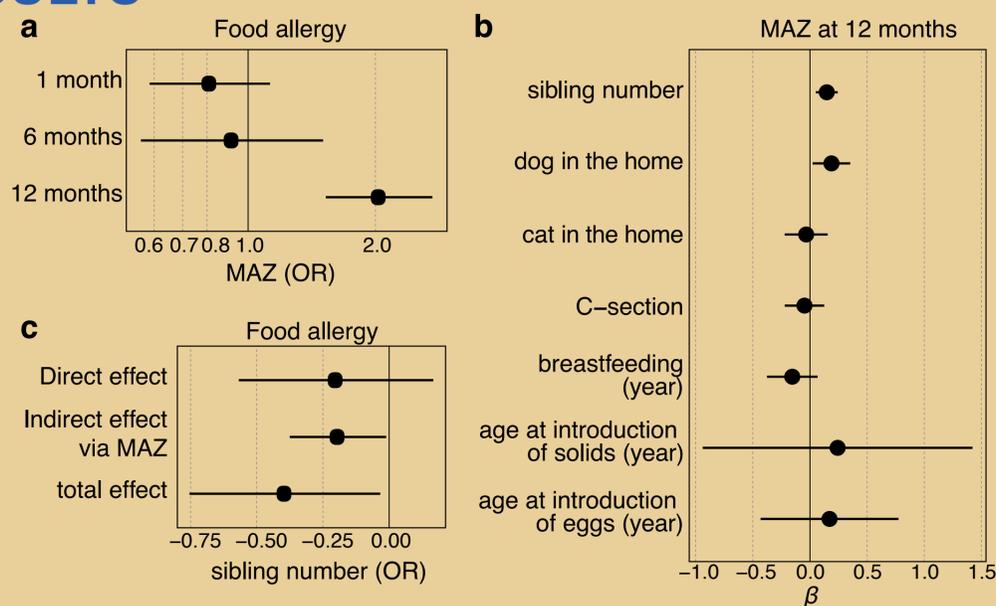


Figure 1. Covariates, microbiota-by-age Z-scores (MAZ), and food allergy. a. Each horizontal line represents a time point when the MAZ was calculated, with the odds ratio for food allergy at 1 year of age per 1-SD decrease in MAZ plotted as a dot. b. Each horizontal line represents a covariate, with its effect on MAZ at 12 months of age plotted as a dot and c. Mediation analyses of the protective effects of greater sibling number on food allergy mediated by MAZ. The 95% confidence intervals were displayed as the lines.

A higher MAZ at 1 year of age was associated with the reduced risk of developing food allergy at 1 year of age (OR=0.49; 95%CI (0.37, 0.66); p<0.001), but not MAZ at 1 and 6 months (fig 1.a). A greater number of siblings was associated with a higher MAZ at 1 year of age ($\beta=0.15$ per additional sibling; 95% CI (0.05, 0.24); p=0.003) (fig 1.b). MAZ at 1 year of age mediated 49% of the protective effect of greater sibling numbers on food allergy at 1 year of age (fig 1.c).

DISCUSSION

In the current study, as well as in COPSAC₂₀₁₀² PASTURE³, the protective effect of accelerated maturation of the gut microbiome related to late rather than early infancy. One possibility is that a more mature gut microbiome promotes the induction of regulatory T cells to food and other environmental antigens via increased production of SCFAs⁴.

CONCLUSIONS

The protective effect of older siblings on the risk of developing IgE-mediated food allergy during infancy is substantially mediated by accelerated maturation of the gut microbiota during the second 6 months of infancy.

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FURTHER INFORMATION

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