HMOs boost the immune system

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Key message

> HMOs stimulate the development of a bifidogenic microbiome, which is boosting a maturation of the immune system into a balanced TH1/TH2 development resulting in a reduced risk of allergic disease.

Abstract

Breast milk is the natural and ideal food for infants, providing the energy and nutrients that every infant needs during the first four to six months of life in the correct quality and amount. Breast feeding is shown to influence immune responses through the bioactive, immune-modulating properties of breast milk and through the impact of breast milk on intestinal microbiota. Observational studies have shown stool bacterial composition differs between breastfed and formula-fed infants and both breastfeeding and the resulting gut microbiota are linked to the better health of the breastfed infants. Human milk oligosaccharides (HMOs) are non-digestible carbohydrates with unique structures. They are the third largest solid component in breast milk. The amount of HMOs in mother's milk is a dynamic process as it changes over time. Many factors such as duration of lactation, environmental and genetic factors influence the amount of HMOs. Breastfed infants

have a microbiome which is richer in bifidobacteria than cow's milk based formula fed infants not supplemented with prebiotic oligosaccharides. Dysbiosis induces qualitative and quantitative changes in the microbiota which can directly affect immunological mechanisms leading to allergic diseases. HMOs support the infants' immune system through four potential mechanisms: supporting the growth of beneficial bacteria in the gut and eliminating pathogens, as well strengthening the gut barrier function and guiding a maturation on the immune system towards a balanced Th1/Th2 response[1]. HMOs provide protection against allergy and infectious diseases directly through the interaction of the gut epithelial cells or indirectly through the modulation of the gut microbiota, including the stimulation of the bifidobacteria. Human milk observational studies found that some HMOs in human milk, specifically 2'FL and LNnT, were associated with lower incidence of IgE-associated eczema, and lower prevalence of allergic sensitization and skin problems[2]. Clinical data suggest that the addition of HMOs to infant formula is safe and well tolerated, inducing a normal growth and suggesting a trend towards a health benefit. New clinical data show that the supplementation of infant formula with 2´FL + LNnT (2:1) promotes the development of a high level bifidobacteria dominated gut microbiota community close to that observed in breastfed infants[3]. It is known since many years that babies who developed an allergy have fewer bifidobacteria in their early life gut microbiota prior to the development of symptoms, than those who do not develop allergy. The addition of two HMOs supports a bifidobacteria predominant gut microbiota which will decrease the incidence of allergic disease. In a clinical study in infants fed a formula with 0.2 or

1 g 2'FL/L, there was a lower percentage of subjects with reported eczema than in the control group[4].
There were also 2 studies performed in infants with cow's milk allergy (CMA). The first ever study with an extensively hydrolysed formula (eHF) supplemented with the two HMOs (2´FL + LNnT), confirmed their safety and hypo-allergenicity for infants with CMA[5]. Another recent study in infants with CMA was performed with the objective to assess growth and tolerance of the same formula, and showed normal growth and good tolerance in infants with CMPA. Moreover, the per protocol analysis suggests a reduced risk of lower respiratory tract and ear infections, as well as lower antibiotic and antipyretic use[6].
HMOs positively influence host epithelial and immune cell responses with documented clinical benefits for breast- and formula-fed infants. The addition of HMOs in infant feeding could be a new promising scientific concept in allergy prevention and management.

References:

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