STRONG CHILDREN'S RESEARCH CENTER

Summer 2016 Research Scholar

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ABSTRACT

Title:
IgA concentration in breast milk and infant saliva may relate to food allergy incidence

Background:
Food allergy development typically occurs within the first year of life, when the infant's immune system is still developing. Breast milk can have a protective effect by providing immunomodulatory factors, such as anti-inflammatory secretory IgA (SIgA)[1] and cytokines upregulating IgA production.[2] It is thought that in early life breast milk is the infant's main source of IgA, which has a protective effect against infections and perhaps food allergies by excluding sensitizing food antigens, bacteria, and viruses in the gut.[1] SIgA, the predominant form of IgA found in breastmilk, is produced by B cells that have migrated from the gut to the mammary glands.[3] Thus, IgA specificity in breast milk can be directly impacted by the mother's gut microbiota and environmental exposures. Furthermore, the increasing rate of allergic disease in more developed countries may be a result of differing microbial pressure, such as the environmental exposures associated with farming vs. non-farming households.[4] This lab investigates the association between environmental exposure and the rate of allergic disease by comparing the Rochester population to the Old Order Mennonite population (OOM), which resides in Penn Yan, NY with lifestyle including home-grown food, exposure to pets and cattle, unpasteurized ("farm") milk, and home births among other things. We have demonstrated that they have a reduced rate of food and other allergic disease and asthma. Preliminary data has already revealed a significant difference in total IgA concentration in breast milk samples from the two populations, with the Mennonites expressing a higher level.

Objective:
The goal of this study was to develop and apply ELISA assays to compare IgA (IgA_1, IgA_2, SIgA, and Total IgA) concentrations in breast milk and infant saliva samples from the OOM and Rochester population.

Results:
The ELISA was developed and run to measure IgA_1 and IgA_2 concentrations in 36 OOM and 16 Rochester breast milk samples taken at 1-2 months. IgA_1, IgA_2, SIgA and total IgA concentrations were measured for 31 OOM and 38 Rochester infant saliva samples taken at around 6 months of age. The IgA_1 concentrations in breast milk were significantly different between the two populations, with the OOM demonstrating a higher level ($P<.01$, OOM=0.471 mg/ml, ROC=0.284 mg/ml). IgA_1, and total IgA concentrations in infant saliva were significantly different between the two populations, with the OOM demonstrating a higher level ($P<.05$, IgA_1: OOM=0.592 mg/ml, ROC=0.296 mg/ml, SIgA: OOM=0.618 mg/ml, ROC=0.345, Total IgA: OOM=0.774 mg/ml, ROC=0.265 mg/ml). There was no significant difference in IgA_2 concentrations in breast milk or infant saliva between the two populations ($P>.05$, Breast Milk:

OOM=0.031 mg/ml, ROC=0.026 mg/ml, Infant Saliva: OOM=0.053 mg/ml, ROC=0.031 mg/ml).

Conclusions:

The OOM population demonstrates significantly higher IgA concentrations in both breast milk and saliva than the Rochester population. This may be the result of the different living conditions and environmental stimuli. OOM typically follow a more traditional farming lifestyle involving higher microbial pressure, which would have an impact on the gut microbiome and likely IgA production. These results support previous observations that SIgA is associated with higher microbial pressure.[4] It remains to be seen in this cohort whether infants with low IgA develop higher rates of food and other allergic disease. Moving forward, this study could be enhanced by increasing the sample size for both populations, performing more replicates to yield precise average concentrations, and by analyzing antigen specific IgA in the samples.

References:

1. Järvinen KM, Westfall JE, Seppo MS, James AK, Tsuang AJ, Feustel PJ, Sampson HA, Berin MC. Role of maternal elimination diets and human milk IgA in the development of cow's milk allergy in infants. J Clin Exp Allerg. 2013; 44: 69-78.
2. Järvinen KM, Suárez-Fariñas M, Savilahti E, Sampson HA, Berin MC. Immune factors in breast milk related to infant milk allergy are independent of maternal atopy. J Allergy Clin Immunol. 2015; 135(5): 1390-1393
3. Järvinen KM, Bergmann Karl E., Bergmann Renate, 2015. Allergy, Immunity and Tolerance in Early Childhood. 1. Academic Press. Chapter 15, Breast-Always Best?; p235-244
4. Fagerås M, Tomičić S, Voor T, Björkstén B, Jenmalm MC., 2011, Slow salivary secretory IgA maturation may relate to low microbial pressure and allergic symptoms in sensitized children. Pediatr Res. 70(6):572-577.