Infant Th1 and Th2 Immune Activity and 18-month Atopic Dermatitis Risk

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BACKGROUND

- Risk for atopic dermatitis, a common inflammatory skin disease characterized by itchiness and rash, could be driven in part by imbalance between the Th1 and Th2 adaptive branches of the immune system; specifically, a Th2 overbalance, relative to Th1 [1-4]
- Studies have focused on differences in Th1 and Th2 cell populations and inflammatory markers produced by stimulated Th1 or Th2 cells *in vitro* [5-11], with less known about the role of peripheral inflammatory markers as indicators of atopic dermatitis risk.
- Studies investigating peripheral inflammatory markers consider those markers separately [12, 13], rather than modelling general Th1 or Th2 activity across subsets of markers.

OBJECTIVE

- The purpose of this study was to test whether Th1 or Th2 indices, and Th1:Th2 balance, calculated from inflammatory markers measured in peripheral blood at 3 months of age, predicted risk for atopic dermatitis at 18 months of age.

METHODS

- The sample consisted of 96 children, recruited as part of the Alberta Pregnancy Outcomes and Nutrition (APrON) Study. Mothers were recruited during pregnancy, and infants were assessed at 3 and 18 months postpartum.
- **Inflammatory markers**. A blood sample was collected from infants at 3 months old, and assayed on a multiplexing instrument for 11 inflammatory markers. Inflammatory markers were log-transformed, standardized, and averaged to calculate two indices:
  - Th1: IFNγ, IL12p70, IL2
  - Th2: IL10, IL13, IL4, IL5
  - Th1/Th2: An interaction term was calculated by taking the product of the Th1 and Th2 indices
- **Atopic dermatitis**. At 18 months, mothers reported whether an atopic dermatitis diagnosis had been made by a physician.
- **Covariates**: Maternal demographics, asthma diagnosis and pre-pregnancy body mass index (BMI) and child gestational age and sex.

RESULTS

- Sample characteristics are presented in **Table 1**
- Logistic regression models were used to test odds of atopic dermatitis diagnosis from Th1 and Th2 indices, and their interaction, controlling for covariates
- Higher Th2 index values at 3 months predicted greater odds of atopic dermatitis diagnosis at 18 months, *b(SE)*=1.4(.64), *p*=.03, *OR*=4.2. Adjusted Th2 index means for children with and without an atopic dermatitis diagnosis are presented in **Figure 1**.
- The Th1 index was not associated with atopic dermatitis diagnosis, *b(SE)*=.52(.69), *p*=.45, *OR*=1.7.
- The Th1-Th2 interaction term was not associated with atopic dermatitis diagnosis, *b(SE)*=-.75(.97), *p*=.44, *OR*=.47.

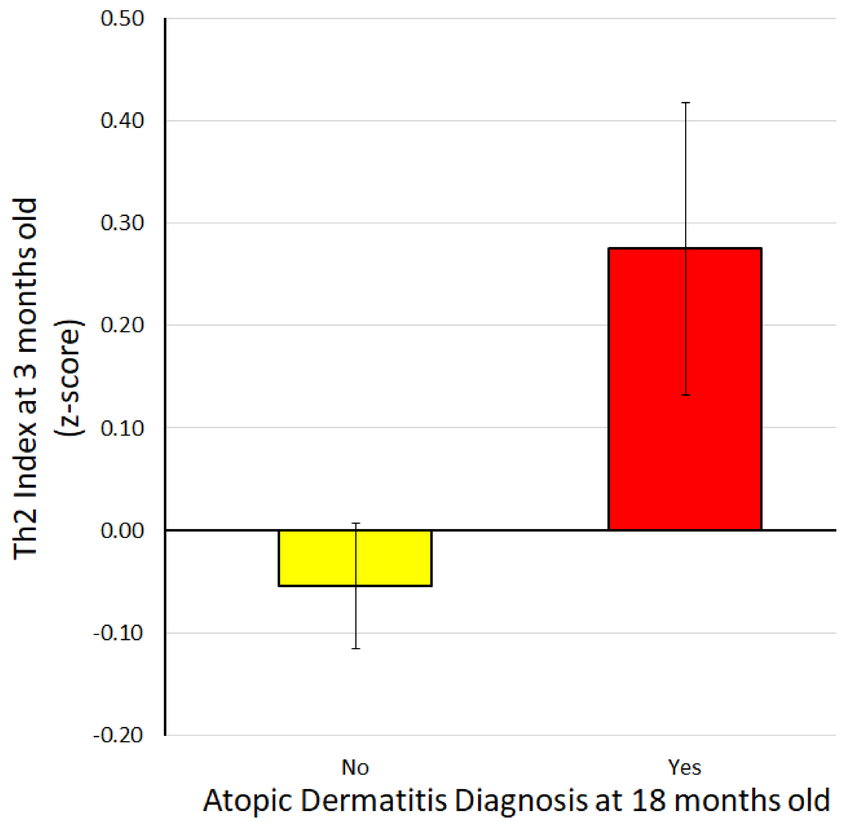

Table 1. Sample characteristics (N = 96)

Variable	Mean +/- SD or % (*N*)
Maternal age (years)	31.2 +/- 4.07
Household income ($1000)	86.9 +/- 20.3
Gestational age at birth (weeks)	39.5 +/- 1.36
Child sex (female)	51% (51)
Pre-pregnancy BMI (kg/m^2)	24.4 +/- 4.63
Maternal Asthma	6% (6)
3 month old Th1 Index (SD units)	0.0 +/- .707
3 month old Th2 Index (SD units)	0.0 +/- .579
18 month old Atopic Dermatitis	17% (17)

Figure 1. Average Th2 index at 3 months of age for children with or without an atopic dermatitis diagnosis at 18 months of age, independent of the Th1 index and the Th1:Th2 interaction. Means are adjusted for maternal age, household income, pre-pregnancy BMI, and asthma diagnosis, and child gestational age, and sex. Children who developed atopic dermatitis had significantly higher Th2 index at 3 months of age, compared to those who did not, $F(1, 101) = 4.8$, $p = .032$.

CONCLUSIONS

- Peripheral Th2 activity at 3 months of age predicted greater risk for an atopic dermatitis at 18 months of age.
- Th1 activity was not associated with atopic dermatitis risk, nor the balance of the Th1 and Th2 indices.
- These findings have implications for understanding early indicators of atopic dermatitis risk, and the role of immune function in atopic dermatitis etiology

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