

Usefulness of neonatal eosinophil counts as a marker of atopy?

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Eosinophil count (EC) were obtained from 312 newborns with and 172 without family history of atopy (FHA). The EC were higher in infants with than without FHA. Elevated EC were recorded in babies of parietaria sensitive mothers born in the spring, as compared to other seasons. The predictive value of EC with regard to development of atopic diseases up to 18 months of age was prospectively studied in 103 newborns with FHA. Using 5×10^8 cells/l as cut-off level the predictive allergy value was 41%. Elevated EC appears to be a marker of atopy in newborns.

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Environmental and genetic influences are important determinants of allergy (1) and as the prevalence of atopic disease seem to increase in our society (2) it is of interest to identify high allergic risk newborns that would benefit from allergy preventive measures (3).

So far however, no ideal methods to identify these high risk infants have been found. Determination of cord blood IgE levels is so far the most commonly used marker for the development of atopic diseases (4). It has recently been demonstrated that IgE levels in cord blood and during the neonatal period are related to and influenced by the maternal atopic states (5) and that the positive predictive value of IgE determination in cord blood and during neonatal period is low, ranging from 21% to 42% (5, 6).

Cord blood thrombocytopenia has been observed in newborns of atopic mothers (7). It has also very recently been suggested that there is a relationship between EC and family history of atopy (FHA) in newborns (8, 8b), and association with subsequent development of atopic disease has been observed in black infants (9). Further, Borres et al. demonstrated that eosinophilia at 3 months, but not at birth, precedes the development of atopic disease (10).

Our study was performed to determine the usefulness of eosinophil and platelet counts as markers of atopic risk in newborn.

Material and methods

A total of 312 newborns with FHA and 172 newborns without FHA participated in the study. Pre-term and low birth weight less than 2,500 g were excluded. Family history was defined as the presence of an obvious atopic disease in mother, father or sibling, combined with positive skin prick tests (SPT) and/or elevated S-IgE levels. Blood samples were collected on the third day of life by heel puncture at 8.00 am to avoid any influence of circadian rhythm on the eosinophil (11). To avoid admixture of maternal blood at parturition heel puncture was preferred to cord blood. Cell counts were performed with Unopette Becton-Dickinson method (12) and with Bürker hematocytometer. Of the 312 children of atopic parents 103 had reached 18 months of age at the time of the final control. Physical examination and SPT were performed by investigators blinded to the eosinophil results. Children who were classified as "definite atopy" had a history of allergy, which was verified by a positive SPT for the suspected allergen, and/or had a diagnosis of allergic disease made by a pediatrician. Infants with "probable atopy" had a history that indicated allergic disease, but it had not been confirmed by a positive SPT or by a doctor's evaluation.

Since eosinophil counts were not distributed normally, differences were analyzed by the non parametric Mann-Whitney and Kruskal-Wallis tests.

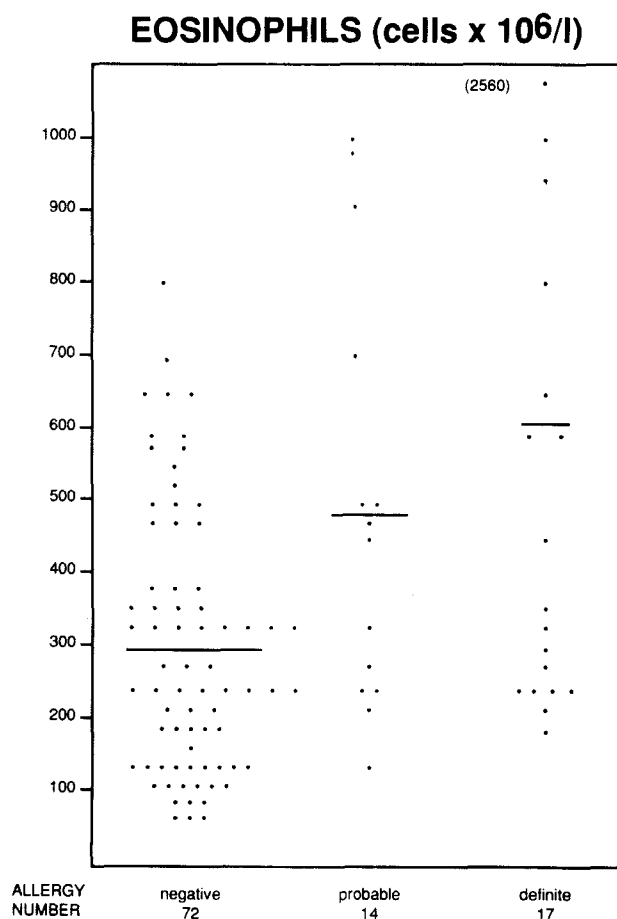


Fig. 1. Neonatal eosinophil counts in relation to atopic symptoms up to 18 month of age.

Results

The EC in newborns with FHA (mean 382; range 32–2560; median $320 \times 10^6/l$) were significantly higher than in a control group of newborns without FHA (mean 266; range 30–960; median $256 \times 10^6/l$) ($p < 0.005$). In addition, newborns with biparental FHA had significantly higher EC (mean 459; range 32–2560; median $356 \times 10^6/l$) than babies with uniparental FHA (mean 295; range 32–1056; median $224 \times 10^6/l$) ($p < 0.001$). Furthermore, in a group of 76 newborns from mothers who had clinical symptoms exclusively to *Parietaria* pollen and were SPT positive too higher EC were recorded in babies who were born in April–June (mean 360; range 96–1120, median $288 \times 10^6/l$) than in those born in November–February (mean 279; range 32–640; median $224 \times 10^6/l$) ($p < 0.01$). The EC were also influenced by sex, i.e. male newborns with FHA (mean 382; range 32–1280; median $320 \times 10^6/l$) had higher EC than female newborns with FHA (mean 297; range 32–2560; median $256 \times 10^6/l$) ($p < 0.02$). The EC were similar in babies with paternal and maternal atopy (data not shown).

Infants who developed definite atopy ($n = 17$) during the first 18 months of life had higher neonatal EC (mean 586; range 192–2560 $\times 10^6/l$) than those who did not develop any atopic symptoms ($n = 72$; mean 294; range 32–810 $\times 10^6/l$). The neonatal EC in the infants who developed probable atopic symptoms was in between the other two (mean 492; range 128–1020 $\times 10^6/l$) ($p = 0.002$), (Fig. 1).

The positive allergy-predictive value of neonatal EC in peripheral blood was 41%, using 500 eos $\times 10^6/l$ as a cut-off, as 10 of 24 newborns with EC above 500 $\times 10^6/l$ had developed atopic symptoms by 18 months of age.

The neonatal platelet count were similar in babies with and without FHA (mean $257 \times 10^9/l$ and $245 \times 10^9/l$ respectively), nor was there any difference between newborns from atopic (mean $260 \times 10^9/l$) or non-atopic mothers (mean $245 \times 10^9/l$). Atopic women gave birth to more boys than girls (90 males, 69 females), as previously observed by others (13).

Discussion

Eosinophilia is associated with positive skin prick tests in a non atopic population (14), with bronchial responsiveness (15), with late phase asthmatic reaction (16) and with severity of asthma (17). Eosinophil counts have also been suggested as a means to monitor allergic disease activity (18). We observed a relationship between elevated EC and FHA in newborn babies. A similar relation to FHA was recently reported for Eosinophil Cationic Protein (19). The positive predictive value of EC for allergy up to 18 months of age was, however, only 41%.

The month of birth influences the risk for development of allergy to inhalants (20). We observed that the neonatal EC were higher in babies of *Parietaria* sensitive mothers, who were born during the pollen season. A possible explanation for this could be transplacental transfer of lymphokines modifying fetal immunologic responses. Thus, one may hypothesize that an atopic mother could enhance eosinophil production in her newborn baby by Th2-cell products particularly IL-5, which has a low molecular weight (21).

Higher EC in males than in females have been reported, both in healthy children (22), and in 9-year old children of smoking parents (23). We could confirm this in newborns.

We did not find any relationship between neonatal platelet counts and FHA, nor any difference in this respect between platelet counts in babies from atopic or non atopic mothers, in contrast to a

previous report (7). In conclusion, an elevated EC is a marker of atopy in newborns.

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