

Labor: An immunologically beneficial process for the neonate

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Leukocyte counts and lymphocyte subpopulations were measured in umbilical cord blood obtained from normal pregnancies delivered either vaginally or by elective cesarean section. In the group delivered vaginally there were significantly higher median values for neutrophils, monocytes, and natural killer cells. The leukocytosis associated with labor is selective for mediators of nonspecific or innate immunity. Labor may be an immunologically beneficial process for the neonate. (*AM J OBSTET GYNECOL* 1994;171:1271-2.)

Key words: Labor, fetal leukocytosis, immunology, flow cytometry

During the neonatal period, when adaptive immune responses are still relatively immature,¹ neutrophils, monocytes, and natural killer cells, which do not depend on prior exposure to foreign antigen to mount an immune response, may play a vital role in host defense. Although several studies have documented that labor is associated with neonatal leukocytosis,^{1, 2} the nature of this leukocytosis remains to be determined.

Patients and methods

In a cross-sectional study of normal singleton pregnancies delivered at term either by elective cesarean section ($n = 20$) or vaginally ($n = 20$) the umbilical cord was clamped and umbilical venous blood was collected. The full blood cell count was determined with a Coulter S-Plus counter (Coulter Electronics, Luton, United Kingdom), blood films were stained by the May-Grünwald-Giemsa method for the differential nucleated cell count, and flow cytometry was used to measure lymphocyte subpopulations. Mann-Whitney *U* tests were used to determine the significance of any differences between the two groups.

Results

In the vaginal delivery group compared with the cesarean section group there were higher median values for leukocytes (Fig. 1; vaginal delivery $12.80 \times 10^9/L$, cesarean section $10.30 \times 10^9/L$, $t = 3.91$, $p < 0.001$), neutrophils (Fig. 1; vaginal delivery $7.17 \times 10^9/L$, cesarean

section $3.71 \times 10^9/L$, $t = 3.98$, $p < 0.001$), monocytes (Fig. 1; vaginal delivery $0.86 \times 10^9/L$, cesarean section $0.51 \times 10^9/L$, $t = 2.18$, $p < 0.05$), and CD3⁺ and CD16⁺/CD56⁺ (natural killer) cells (Fig. 1; vaginal delivery $0.44 \times 10^9/L$, cesarean section $0.31 \times 10^9/L$, $t = 2.19$, $p < 0.05$). There were no significant differences between the two groups in the total lymphocyte count (vaginal delivery $4.73 \times 10^9/L$, cesarean section $4.98 \times 10^9/L$, $t = 0.34$), CD3⁺ cells (vaginal delivery $2.86 \times 10^9/L$, cesarean section $3.35 \times 10^9/L$, $t = 1.15$), CD19⁺ cells (vaginal delivery $0.77 \times 10^9/L$, cesarean section $0.67 \times 10^9/L$, $t = 1.12$), CD4⁺ cells (vaginal delivery $2.06 \times 10^9/L$, cesarean section $2.21 \times 10^9/L$, $t = 0.51$), CD8⁺ cells (vaginal delivery $1.01 \times 10^9/L$, cesarean section $0.99 \times 10^9/L$, $t = 0.49$), and CD4⁺-to-CD8⁺ ratio (vaginal delivery 1.80, cesarean section 2.18, $t = 1.20$).

Comment

This study has demonstrated that labor is associated with fetal leukocytosis. Furthermore, leukocytosis appears to be selective for neutrophils, monocytes, and natural killer cells, which are cellular mediators of innate or nonspecific immunity. The finding of selective leukocytosis suggests that the term fetus behaves in a fashion similar to the adult, presumably in response to elevated levels of catecholamines and cortisone.

The finding of neutrophilia is in agreement with data from previous studies on the effect of labor on cord blood neutrophil number.² Prenatal neutropenia may be of potential benefit, because high circulating numbers of neutrophils could be harmful to the fetus during the acute stress of labor, which may result in widespread neutrophil activation and extensive endothelial damage.²

The data of this study suggest that the acute stress of labor may be an immunologically beneficial process for the neonate. This conclusion is supported by the findings of previous studies that labor improves the cyto-

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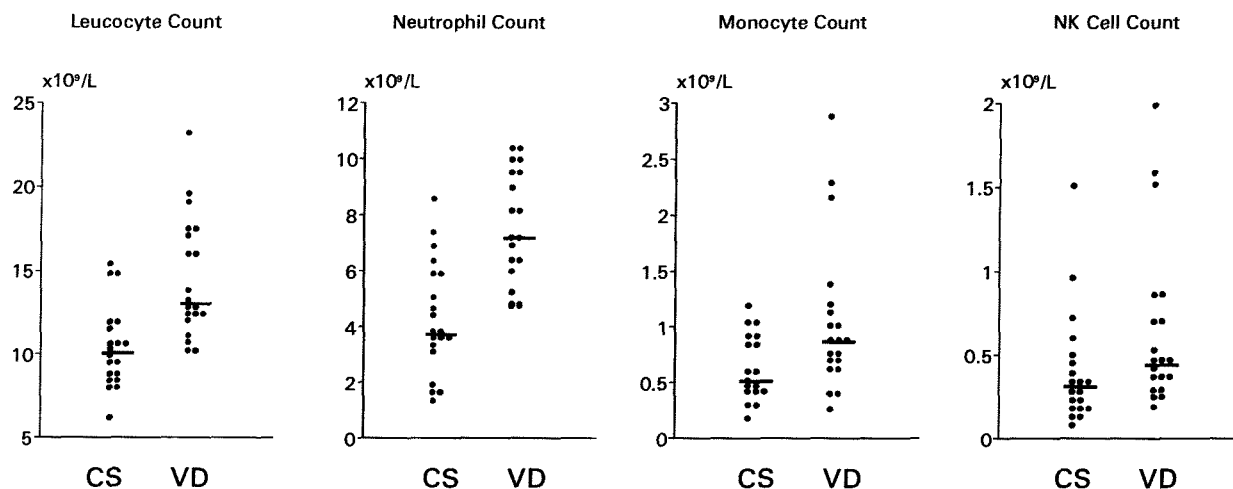


Fig. 1. Total leukocyte, neutrophil, monocyte, and natural killer (NK) cell number ($\times 10^9/L$) in neonates delivered either by elective cesarean section (CS) or vaginally (VD). Horizontal bar, Median value for each group.

toxic function of neutrophils, natural killer cells, and monocytes.^{1, 2}

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