# CARTAS AL EDITOR

## IgM and in C3 serum of peruvian mothers and cord blood of their infants.

Gentlemen:

Recently, we have presented data indicating that maternal nutrition during pregnancy is a component of the causal complex producing fetal growth retardation in chronically malnourished populations (1-3). We will present data suggesting that other variables, such as intrauterine infection, could also be important components of the causal complex mentioned above.

The low-socio-economic conditions that characterize the developing areas of the world favor not only severe malnutrition but also a high prevalence of infection in individuals of all age groups. This fact has been documented in a prospective study of intestinal infection in a typical Indian village of Guatemala (4). Approximately 40 per cent of newborns from this village exhibited high cord serum levels of immunoglobulin M (IgM) (4-6). This observation stimulated investigation of cord serum levels of the third component of the complement system (C3), a protein related to the immune response.

The results herein presented will be published in detail (7). We have studied the levels of C3 and IgM in serum of Peruvian mothers and newborns from three different socioeconomic groups: High Urban, Low Urban and Rural. The subjects involved in this study represent a random sample of deliveries occurring in a 4-week period in urban and rural areas. The high Urban group was from the upper middle class of Lima, on the Peruvian coast; the Low Urban group was from a slum area of Lima; and the Rural group was from vi-

llages bordering the city of Huancayo in the central highlands, which are similar in terms of infection and nutritional condition to the Guatemalan village which results stimulated this work.

Maternal venous blood was obtained within 6 hours to birth, and cord blood was collected from the mother's side by one of the authors (A. L.) inmediately after delivery. Specimens were refrigerated shortly after collection, and sera were separated within 48 hours and frozen to -60°C until testing. A pair (mother and child) was discarded whenever the IgM/IgA ratio in cord serum was below 1.5 indicating possible admixture with maternal blood (5). C3 and IgM were determined by radial immunodiffusion (8) using agar-antibody plates (Hyland, Los Angeles, California). The greatest variability was observed with the lowest concentration of standard sera (less than 0.6 mg/ml for C3 and less than 0.1 mg/ml for IgM); the coefficient of variation was less than 10% of all determinations (9).

Values of C3 in maternal and cord sera and values of IgM in cord sera are found in Table 1. The concentration of C3 was greater in maternal than in cord serum. The mean newborn/mother ratio ranged from 0.46 in the Rural to 0.66 in the Low Urban group, but the ratios were not different among the three groups. In addition, a significant correlation ($r=0.44$, $P<0.001$) was obtained between maternal and cord levels of C3. Maternal and cord C3 values were greater for the Rural than for the High Urban group ($P<0.05$).

In view of the variability observed, limits differentiating between "high" and "low" levels were estimated. Arbitrarily, serum C3 concentrations above 3.0 mg/ml (mothers), and 1.5 mg/ml (cord) were considered "high". These values were set according to analysis of distribution (rank tests).

Only one in 16 pairs from the High Urban group had "high" C3 values (Table 1). In the Rural group, "high" C3 was detected in more than half of mothers and newborns. Differences in frequency of "high" C3 between High Urban and Rural groups were significant for both mothers and newborns ($P<0.01$).

The frequency of "high" cord IgM ($\geq 0.20$ mg/ml) was greater in the Low Urban (60%) and Rural (44%) than in the High Urban group (6%) (Table 1). There was a signi-

**TABLE 1**

**SERUM LEVELS OF C3 AND IgM (mg/ml) IN THREE POPULATION GROUPS**

| Group and number of pairs (mother-child) | C3 | | | IgM | |
|---|---|---|---|---|---|
| | Mothers | Newborns | Newborn/ mother ratio | Mothers | Newborns |
| High Urban, at sea level, 20 (16)* | 2.20±0.18** (1.60-4.50) 1*** (6) | 1.06±0.12 (0.26-2.65) 1 (6) | 0.53±0.07 (0.06-1.39) | 1.76±0.27 (0.56-4.10) | 0.12±0.04 (0.00-0.61) 1 (6) |
| Low Urban at sea level 21 (20) | 2.18±0.23 (0.87-4.50) 5 (25) | 1.27±0.13 (0.39-2.75) 6 (30) | 0.66±0.09 (0.17-2.07) | 1.97±0.33 (0.61-7.00) | 0.34±0.05 (0.00-0.66) 12 (60) |
| Rural at 11,400 feet, 10 (16) | 3.65±0.29 (1.65-6.00) 10 (60) | 1.65±0.24 (0.19-3.70) 9 (56) | 0.46±0.06 (0.05-0.91) | 3.07±0.40 (0.85-7.20) | 0.30±0.05 (0.10-0.85) 8 (50) |

* Figures in parentheses are number of pairs left after discarding those in which cord serum showed and IgM/IgA ratio below 1.5.

** Mean ± one standard error, and rate in parentheses. Differences in C3 and IgM values are significant (t Test: $P < 0.05$) between Rural and the other two groups for mothers, and between Rural and between Rural and High Urban for newborns. In addition, differences in IgM values are significant between Low Urban and High Urban for newborns.

*** Number and percentage (in parentheses) of subjects with "high" levels ("High" C3:mothers $\geq 3.0$ mg/ml; newborns $\geq 1.5$ mg/ml "High" IgM: newborns $\geq 0.20$ mg/ml.)

ficant correlation coefficient between C3 and IgM levels in cord blood, in the Rural group ($r=0.64$, $P<0.005$), an observation not previously reported.

The Low Urban and the Rural groups exhibited a similar frequency of high IgM values to that observed in the Guatemalan village (5, 6), thus suggesting a general phenomenon in developing areas where the population is subjected to a tremendous infectious force. The likely explanation for higher C3 and IgM in the Rural group is frequent fetal antigenic stimulation. This in turn, could result from intrauterine infection. The present data deserves further analysis in view of the causal relationship existing between subclinical intrauterine infection and impaired physical and mental development (10). Long-term studies to explore the significance of the present findings, are underway in representative rural villages of Guatemala.

*Aarón Lechtig*
*Leonardo J. Mata*

Instituto de Nutrición de Centro América y Panamá (INCAP) Guatemala.

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