Lead concentrations in early human milk of urban and rural mothers

D. Vavilis¹, J. Bontis¹, T. Agorastos¹, G. Angelikakis², V. Zournatzi¹,
A. Loufopoulos¹, A. Constantinou¹, A. Patsourou¹

¹2nd Department of Obstetrics and Gynecology, Aristotle University of Thessaloniki,
²Nutrition Department of Technical Education Institute of Thessaloniki (Greece)

Summary

The aim of this study was to determine and compare lead concentrations in breast milk between urban and rural women. Colostrum from 51 women living in the city of Thessaloniki (exposed to increased air lead concentration, 0.54 µg/m³) and from 40 women living in rural areas (exposed to significantly lower air lead concentrations) was analyzed by atomic absorption spectrometry. Urban women showed slightly higher lead concentrations (mean ± SD: 0.090 ± 0.029 µg/ml) than rural women (mean ± SD: 0.084 ± 0.024 µg/ml). This difference was not statistically significant. These results suggest that the lead content of human milk is not influenced by the concentrations of this environmental pollutant in the air.

Key words: Human milk; Lead; Air pollutants; Heavy metals.

Introduction

Increased urbanization and industrialization have resulted in atmospheric pollution and concomitant health problems. Lead as a persistent atmospheric pollutant of considerable developmental toxicity, deserves special attention.

During the last 25 years there has been a growing body of evidence that lead exposure is associated with deficits in infant’s growth during the first year and children with high blood lead levels are at risk for neuropsychological deficits [1, 2, 3].

Breast milk is the ideal nutrient for the newborn, but unfortunately also a possible route of excretion for lead. Given that a proportion of total lead intake occurs through inhalation of either air particulates containing lead, or automobile exhaust, it might be interesting to evaluate the influence of atmospheric lead pollution on human milk in a heavy traffic city.

Material and Methods

Ninety-one healthy women, aged 18-41 years, were enrolled in the study. Fifty-one of the subjects (Group I) were living in the city of Thessaloniki and the remaining 40 (Group II) were from rural areas. It should be noted that air lead concentrations in the city of Thessaloniki, an industrial heavy traffic city with one million inhabitants, has ranged from 0.54 to 0.67 µg/m³ in the past two years. On the contrary, air concentrations of this pollutant were 15-fold lower in the studied rural regions. These measurements were carried out by the Ministry of Macedonia and Thrace, Northern Greece. All the examined mothers delivered “per vias naturales” 91 normal neonates. The duration of pregnancies varied from 37 to 41 weeks and the mean parity was 1.8.

On the 4th to 5th day of their uneventful puerperium, the mothers were instructed to collect, approximately 10 ml of milk in acid-washed lead-free polystyrene containers. Between 9 a.m. and 1 p.m. milk was drawn either manually or by a hand pump under supervision of the nursing staff. Milk samples were stored at a temperature of -20°C until analysis. Before the analyses, milk proteins, including casein, were precipitated using trichloroacetic acid and the samples were filtrated. Lead concentration of the filtered samples was then determined by graphite atomic absorption spectrometry. A Perkin Elmer 2100 spectrometer was used.

Means and standard deviation (SD) were calculated and the two groups were compared by the Student t-test.

Results

The distributions of lead concentrations in the milk of the 51 urban women (Group I) and 40 rural women (Group II) are illustrated in Figure 1. The mean lead concentration of the urban samples was 0.090 ± 0.029 µg/ml and the determined values ranged from 0.050 to 0.250 µg/ml. On the other hand the mean lead concentration of the rural samples was 0.084 ± 0.024 µg/ml and the determined values ranged from 0.050 to 0.140 µg/ml.

Although urban women showed slightly higher lead concentrations in breast milk than rural women, the difference was not statistically significant.

Discussion

According to previous studies lead concentrations in human milk range widely from 0.008 µg/ml to 0.126 µg/ml [4-13]. The findings from our study are consistent with this overall picture. Although there appears to be a large range of lead values from all the studies, none of them singularly constitutes a threat to the breast-fed neonates. Taking into account that the average daily milk
women, as reported by Rockway et al. [17] do no correlate with urban or rural locations of the subjects.

In conclusion, it seems that the lead content of human milk is not influenced by the concentrations of this environmental pollutant in the air. Furthermore, it does not appear that breast-feeding infants are at any risk of lead exposure via milk.

References


Address reprint requests to:
D. VAVILIS, M.D.
37 Kassandrou str.
546 33 Thessaloniki (Greece)