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SERUM SELENIUM CONCENTRATIONS IN NEWBORNS WITH HYPERBILIRUBINEMIA*

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Selenium is found primarily in the blood as the selenoenzyme, glutathione peroxidase (GP) in the erythrocytes. GP represents the major defense of the erythrocytes against the oxidative damage of cellular membranes. It has been reported that GP activities are low in the neonatal period. However, these activities in neonatal hemolytic processes are not known[1]. There are some reasonable suppositions regarding neonatal hyperbilirubinemia such as reduced GP levels in the erythrocytes due to an over-consumption of anti-oxidative systems which prevent the damage of cellular membranes, the release of intracellular material including GP in the serum following the rupture of cellular membranes, and possible abnormalities of GP metabolism in the body. Therefore, we decided to evaluate the serum selenium concentrations in neonatal idiopathic hyperbilirubinemia whose pathogenesis may involve a mild hemolytic process.

Material and Methods

We obtained blood samples from full-term neonates with idiopathic hyperbilirubinemia just before exchange transfusion on the second or third day of life. Their serum indirect bilirubin and hemoglobin levels ranged from 20 to 24 mg/dl and 9 to 14 g/dl, respectively. Blood groups, direct Coombs test, peripheral blood smear for erythrocyte malformations, reticulocyte count, serologic tests for TORCH infections, blood cultures, and erythrocyte glucose-6-phosphate dehydrogenase activity were studied before the diagnosis of idiopathic indirect hyperbilirubinemia was made. Control blood samples were obtained from a peripheral vein of healthy full-term neonates on the second or third day of life.

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The blood was kept in a polystyrol tube free of trace elements. After centrifugation, the serum Se concentrations were measured by the atomic absorption method[2]. The results were expressed as mean ± SEM and analyzed according to the Student's *t* test.

Results

The serum Se concentrations summarized in Table I indicate that the values of the newborns with hyperbilirubinemia who required exchange transfusions were the same as those of the controls ($p>0.05$).

TABLE I: Serum Se Concentrations of Newborns with or without Hyperbilirubinemia Who Required Exchange Transfusions

	Serum Se concentrations (ng/ml)		
	Mean	SD	SEM
Study group (n: 22)	42.99	14.07	3.00
Control group (n: 16)	43.73	18.21	7.43

Discussion

Glutathione peroxidase has a key role in the protection of the erythrocyte from the deleterious effects of oxidizing agents[1]. GP is significantly reduced in the red cells of newborn infants, but its activity is the same in both pre-term and full-term infants, and only reaches adult levels at 4-6 months of life[1,3-7]. It is possible that decreased levels of GP may be partially responsible for the increased oxidant sensitivity of normal erythrocytes in neonates[5]. However, this decrease is moderate and is not associated with an increased red-cell breakdown.

Since 1973, Se has been known to be an integral part of GP[8]. One mole of GP of erythrocytes contains 4 g atoms of Se[9]. The Se bound to GP probably accounts for about 60-75% of the total intra-erythrocytic Se[8]. Although the red blood cell concentrations of Se are the same in newborns as in adults[10], the Se concentrations in serum is age-dependent; the median value at birth (50 ng/ml) amounts to half of the median value in adulthood (102 ng/ml)[1].

This study was carried out with the hypothesis that elevated or reduced levels of serum Se concentrations would be found in newborns with hyperbilirubinemia. However, our results did not confirm this. So there may be another mechanism(s) to clear the excess Se (and Se-containing enzyme, GP) from the serum of newborns with hyperbilirubinemia who require exchange transfusion.

Summary

In this study it is demonstrated that the serum selenium concentrations are the same in full-term neonates with hyperbilirubinemia who require exchange transfusions as in the healthy controls (49.99 ± 3.00, n: 22 and 43.73 ± 7.43, n: 16, respectively; $p>0.05$).

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