Short Communication

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Red Cell 2,3-Diphosphoglycerate Contents and Oxygen Affinity in Heterozygous Beta-Thalassaemia

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Key Words

2,3-Diphosphoglycerate
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Abstract

Red cell 2,3-diphosphoglycerate and whole blood P₅₀ have been found to be significantly higher in β -thalassaemia heterozygotes than in normal controls. Such increases could be considered as central mechanisms which compensate the mild anaemia of β -thalassaemia carriers.

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Introduction

In different haemolytic anaemias, red cell contents of 2,3-diphosphoglycerate (2,3-DPG) increase [3]. The resulting rise of P₅₀ values (PO₂ at 50% saturation) induces a greater removal of oxygen by the tissues. Since heterozygous β -thalassaemia is in many cases associated to some degree of haemolytic anaemia [4], we have investigated the red cell 2,3-DPG contents and P₅₀ levels in a group of β -thalassaemia carriers compared with normal controls.

Materials and Methods

We studied 30 symptom-free β -thalassaemia heterozygotes of both sexes (age: 18–45 years) and 20 normal controls of comparable age. The diagnosis of heterozygous β -thalassaemia was established on the basis of abnormal red cell morphology, decreased osmotic fragility, and increased Hb A₂ level. Red cell indices were obtained from Hemalog 8 counter. The red cell 2,3-DPG levels were determined with enzymatic assay (Sigma). Whole blood P₅₀ was measured using the mixing technique [2].

Results

The results obtained are summarized in table I. In β -thalassaemia heterozygotes the mean value of 2,3-DPG (21.1 μ mol/g Hb) was significantly higher than in controls (15.4 μ mol/g Hb); likewise, the mean level of the whole blood P₅₀ was higher in the thalassaemia group (27.1 mm

Hg) than in the controls (25.8 mm Hg). In both groups no close correlation between 2,3-DPG contents and P₅₀ values was observed.

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Table I. Mean values of blood haemoglobin, red cell 2,3-DPG and whole blood P₅₀ in thalassaemia carriers and normal controls

Discussion

The significant increase of mean red cell 2,3-DPG and whole blood P₅₀ levels in heterozygous β ^s-thalassaemia suggests that also in this condition an anaemia-compensating central mechanism takes place. This consists of a 2,3-DPG mediated increase of whole blood P₃₀ levels; that is, a shift to the right of the oxygen dissociation curve. Pearson et al. [5] reported in β ^s-thalassaemia carriers increased contents of 2,3-DPG, but normal P₅₀ levels. However, their study lacked their own controls.

In our study the failure to have found a close correlation between 2,3-DPG and P₅₀ values is not surprising, since changes in 2,3-DPG do not necessarily lead to changes of P₅₀, because of the interference of various factors, such as ATP, pH, and temperature [1].

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