STATUS OF ERYTHROCYTE MEMBRANE SPECTRIN IN THALASSEMIA

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ABSTRACT

Spectrin was extracted at 4°C and at 37°C from 12 normal subjects, 2 subjects who were carriers of Hb E, 6 subjects who were carriers of thalassemia, 10 subjects with two types of Hb H disease (one was splenectomized), 6 subjects with β^{0}-thal/ Hb E (two were splenectomized) ; one with β^{+}-thal/ Hb E, 2 cases of splenectomized homozygous β-thal and one case of homozygous Hb E.

At 4°C extraction, spectrin dimer was found to be elevated in subjects who had hemoglobinopathy, either as carrier or in disease form when compared to normal, but there was no significant difference between carriers and disease form. The increase in spectrin dimer in all nonsplenectomized cases was correlated with the decrease of percent discocyte in peripheral blood (r_s=-0.6047, p = 0.001). In some cases with splenectomy the percent of spectrin dimer was in the high range but in all cases, it was higher than normal.

Extraction at 37°C yielded predominantly spectrin dimer with a small amount of spectrin tetramer, and the proportions were not significantly different among the subjects. In all nonsplenectomized patients with α-thal$_1$/α-thal$_2$, 2 cases of α-thal$_1$/ Hb CS and in β^{0}-thal/ Hb E cases, a fast moving band was detected. This was the product of proteolytic degradation of spectrin during preparation, since it was absent in the presence of the protease inhibitor, phenylmethylsulfonyl fluoride.

Excess chains in thalassemic red cells are unstable and can precipitate out in the form of Heinz bodies (HB). HB - containing cells were produced by incubating normal and two types of α-thalassemic red cells with 9mM phenylhydrazine at 37°C for 1 h. Spectrin extracted at 4°C from HB - cells were mainly in the form of tetramer, but the bands obtained were diffuse which prevented an accurate estimate of the tetramer/dimer ratio.

The transformation of spectrin dimer to tetramer at 30°C in thalassemic red cells was reduced compared to normal, and the effect was least pronounced in cells from subjects with Hb E and α-thal$_1$ trait.

The percent discocyte of the subjects with hemoglobinopathy was significantly lower than normal, especially in splenectomized cases, concomitant with the increase in abnormal red cell shapes. In splenectomized cases, the fraction of the red cells with high surface area to cell volume ratio (torocyte, codocyte, leptocyte) was elevated compared with normal and nonsplenectomized cases, but the fraction of fragmented red cells was reduced. When comparing between nonsplenectomized patients in two types of Hb H disease, keratocytes in α-thal$_1$/ Hb CS were significantly higher than in α-thal$_1$/α-thal$_2$ ($p = 0.025$).