HUMAN AB0 BLOOD GROUPS: DIFFERENTIAL MEMBRANE PROTEIN CARBONYLATION IN RED CELLS

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The functionality of the AB0 blood group system remains as one of the most mysterious genetic polymorphisms in humans. Since its discovery several connections between blood groups and disease susceptibility have been hypothesized. Of a great interest for human adaptation is their association with other erythrocyte polymorphisms that provide survival advantages against malaria infection. These include G6PD deficiency, HbS and HbC as an adaptation pressure on the distribution of blood groups that has favored the worldwide prevalence of group 0 in the regions where malaria is endemic. A reduced adherence of parasitized red blood cells (RBCs) to other cells or organs is a suggestive mechanism to explain the malarial parasite selective pressure in favor of group 0. However, a definitive study to assess this hypothesis has not been conducted yet.

DNP-derivatized red cell membrane proteins from healthy donors with different AB0 blood group were compared by immunoblotting using anti-DNPH antibodies. Carbonylation profiles of each group were obtained for defatted and not defatted red cell membranes. The identification of carbonylated proteins was performed on excised band by MALDI TOF. Protein identifications were assigned using the MASCOT search engine. Stomatin, α and β spectrin were identificated in all groups but band 4.1, band 4.2 and cytoplasmic domain of band 3 were not found oxidized in blood group 0.

Band 4.1 is essential for parasite survival in infected RBCs. Band 3 is a receptor during parasite invasion of human erythrocytes, being deleted in malaria-resistant Southeast Asian ovalocytosis. Deficiencies of band 4.2 have been observed in hereditary spherocytosis, another resistant phenotype to severe malaria. In connection with these previous reports, our findings suggest a functional role of differential carbonylation in the AB0 group system to protect against malaria.