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Molecular and Immunological Aspects of Anemia in Malaria

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Abstract

Anemia is an inevitable consequence of malaria especially in children and severe anemia becomes one of the complications in falciparum malaria. Anemia and malaria, both become serious problems in developing countries. For this reason a literature study was done to know the mechanisms and pathogenesis of anemia in malaria. Plasmodia live in red blood cells, consume and use hemoglobin for their growth and replication and at the end schizonts rupture and destroy their erythrocyte host cells. Those mechanisms bring us to the assumption that high parasitemia will cause higher degree of anemia. But severe anemia can be found also in children with low parasitemia and anemia can persist for weeks after parasite clearance by anti-malaria treatment. Literature study revealed that many other factors also play role in the development of anemia in malaria. First, infected erythrocytes with changes in surface property and lost deformability will be easily recognized and cleared up in the spleen. The presence of antibody and immune complex on the surface of erythrocytes makes them good targets for ADCC, complement-mediated lysis and erythrophagocytosis. This could involve non-infected erythrocytes, too. Macrophages and cytokines, especially TNF-α, IFN-γ and IL-1 have important role in malaria anemia. These cytokines enhance erythrocyte destruction, increase splenic clearance capacity, enhance erythrophagocytosis and depress bone marrow capacity for erythropoiesis. Cytokines also contribute in the increased uptake and intracellular storage of iron by macrophages, where iron is used for production and functioning of ROI and NO. Iron uptake and use in macrophages causes iron decrease in the circulation, and this causes decrease of parasite growth but also impairs erythrocyte production in bone marrow. Other cytokines, IL-10 and TGF-β, represent counter response against the effects of TNF-α and IFN-γ. IL-10 was proved to stimulate bone marrow function in vitro. IL-10 concentration is higher in malaria-resistant mice and TGF-β is found in resolving malaria infection. The reviewed reports could explain the mechanisms of anemia in malaria, but no conclusive reports of prevention and treatment suggested against the anemia related to the mechanisms mentioned. There were some reports about the effects of anti-malaria drugs on TNF, RNI and ROI production capacity, but still no practical use suggested.

Keyword : malaria, anemia, cytokines, antibody,

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