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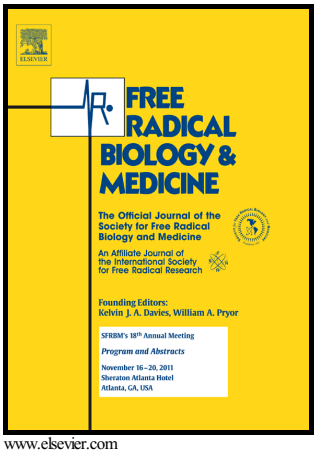

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The Intricate Role of Selenium and Selenoproteins in Erythropoiesis

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Abstract

Selenium (Se) is incorporated as the 21st amino acid selenocysteine (Sec) into the growing polypeptide chain of proteins involved in redox gatekeeper functions. Erythropoiesis presents a particular problem to redox regulation as the presence of iron, heme, and unpaired globin chains lead to high levels of free radical-mediated oxidative stress, which are detrimental to erythroid development and can lead to anemia. Under homeostatic conditions, bone marrow erythropoiesis produces sufficient erythrocytes to maintain homeostasis. In contrast, anemic stress induces an alternative pathway, stress erythropoiesis, which rapidly produces new erythrocytes at extramedullary sites, such as spleen, to alleviate anemia. Previous studies suggest that dietary Se protects erythrocytes from such oxidative damage and the absence of selenoproteins causes hemolysis of erythrocytes due to oxidative stress. Furthermore, Se deficiency or lack of selenoproteins severely impairs stress erythropoiesis exacerbating the anemia in rodent models and human patients. Interestingly, erythroid progenitors develop in close proximity with macrophages in structures referred to as erythroblastic islands (EBIs), where macrophage expression of selenoproteins appears to be critical for the expression of heme transporters to facilitate export of heme from macrophage stores to the developing erythroid cells. Here we review the role of Se and selenoproteins in the intrinsic development of