Role of red blood cell in the regulation of endothelial function

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Red blood cells (RBC) are the simplest cells of mammalian organism and functions other than oxygen transport were hardly attributed to these cells until recently. However, RBC are now recognized as important modulators of endothelial function. During the development of nitric oxide (NO) concept in the regulation of vascular tonus, RBC were placed in the schema as a powerful scavenger of NO, thereby affecting the delicate balance determining the exposure of vascular smooth muscle to this important vasoactive biomolecule. However, further investigations revealed that RBC may play more active role in the regulation of vascular function. Earlier reports indicated that RBC may relase adenosine triphosphate (ATP) under mechanical stress, which in turn stimulates NO synthesis in endothelial cells via P2 receptors. More recently, it has been clearly demonstrated that RBC possess functional NO synthesizing mechanisms, generating and exporting NO from RBC. We have recently demonstrated that shear stress affecting on RBC activates NO synthase (NOS) and increases NO export from RBC. These observations suggest that RBC may play an important role in the regulation of vascular functions, by actively generating and releasing NO, in circulatory regions with increased shear forces. It can be speculated that this NO-related influence of RBC on endothelial-vascular function may not only be targeted to the vascular smooth muscle tonus control, but also affect other endothelial functions, contributing to the maintenance of the quiescent status of endothelium.