

ENDOTHELIAL CELL RESPONSES TO FLUID SHEAR STRESS

Akira Kamiya

Abstract

Implications of vascular endothelial cell (EC) responses to flow-oriented wall shear stress are outlined from the bioengineering viewpoint. These responses regulate the adaptive remodeling of the vascular system including capillary networks, in a negative feedback mechanism maintaining the shear stress level constant. The preserved set point of the stress is selected so as to optimize the mass transport function of the system. To initiate such shear-dependent responses, EC has a mechanosensor conjugated with second messengers, one of which is cytoplasmic Ca^{2+} transient. The evidence that wall shear stress is the real factor inducing the transient, is visualized from an *in vitro* flow loading experiment to cultured ECs using mediums differing in viscosity.

Keywords: shear stress, adaptation, remodeling, vascular system, capillary network, mechanoreceptor, calcium ion, viscosity, ATP