NITRIC OXIDE SIGNALING IN THE MICROCIRCULATION

Buerk DG, Barbee KA, Jaron D.

ABSTRACT

Several apparent paradoxes are evident when one compares mathematical predictions from models of nitric oxide (NO) diffusion and convection in vasculature structures with experimental measurements of NO (or related metabolites) in animal and human studies. Values for NO predicted from mathematical models are generally much lower than in vivo NO values reported in the literature for experiments, specifically with NO microelectrodes positioned at perivascular locations next to different sizes of blood vessels in the microcirculation and NO electrodes inserted into a wide range of tissues supplied by the microcirculation of each specific organ system under investigation. There continues to be uncertainty about the roles of NO scavenging by hemoglobin versus a storage function that may conserve NO, and other signaling targets for NO need to be considered. This review describes model predictions and relevant experimental data with respect to several signaling pathways in the microcirculation that involve NO.**[Crit Rev Biomed Eng. 2011; 39(5):397-433]**.

PMID:22196161

MODELING CA2+ SIGNALING IN THE MICROCIRCULATION: INTERCELLULAR COMMUNICATION AND VASOREACTIVITY

Kapela A, Nagaraja S, Parikh J, Tsoukias NM.

ABSTRACT

A network of intracellular signaling pathways and complex intercellular interactions regulate calcium mobilization in vascular cells, arteriolar tone, and blood flow. Different endothelium-derived vasoreactive factors have been identified and the importance of myoendothelial communication in vasoreactivity is now well appreciated. The ability of many vascular networks to conduct signals upstream also is established. This phenomenon is critical for both short-term changes in blood perfusion as well as long-term adaptations of a vascular network. In addition, in a phenomenon termed vasomotion, arterioles often exhibit spontaneous oscillations in diameter. This is thought to improve tissue oxygenation and enhance blood flow. Experimentation has begun to reveal important aspects of the regulatory machinery and the significance of these phenomena for the regulation of local perfusion and oxygenation. Mathematical modeling can assist in elucidating the complex signaling mechanisms that participate in these phenomena. This review highlights some of the important experimental studies and relevant mathematical models that provide the current understanding of these mechanisms in vasoreactivity. **[Crit Rev Biomed Eng. 2011;39(5):435-60]**.

PMID:22196162