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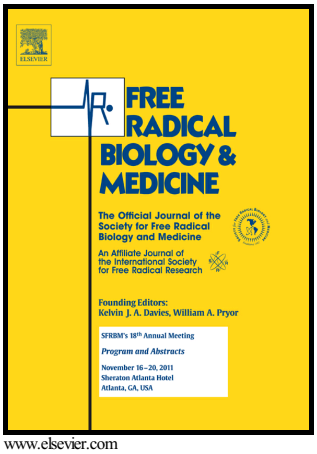

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Diffusion of nitric oxide and oxygen in lipoproteins and membranes studied by pyrene fluorescence quenching

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Abstract

Oxygen and nitric oxide are small hydrophobic molecules that usually need to diffuse a considerable distance to accomplish their biological functions and necessarily need to traverse several lipid membranes. Different methods have been used to study the diffusion of these molecules in membranes and herein we focus in the quenching of fluorescence of pyrenes inserted in the membrane. The pyrene derivatives have long fluorescence lifetimes (around 200 ns) that make them very sensitive to fluorescence quenching by nitric oxide, oxygen and other paramagnetic species. Results show that the apparent diffusion coefficients in membranes are similar to those in water, indicating that diffusion of these molecules in membranes is not considerably limited by the lipids. This high apparent diffusion in membranes is a consequence of both a favorable partition of these molecules in the hydrophobic interior of membranes and a high diffusion coefficient. Altering the composition of the membrane results in slight changes in diffusion, indicating that in most cases the lipid membranes will not hinder the passage of oxygen or nitric oxide. The diffusion of nitric oxide in the lipid core of low density lipoprotein is also very high, supporting its role as an antioxidant. In contrast to the high permeability of membranes to nitric oxide and oxygen, the permeability to other reactive species such as hydrogen peroxide and peroxynitrous acid is nearly five orders of magnitude lower.