International Journal of Cardiovascular Research

Short Communication

A SCITECHNOL JOURNAL

Nitric Oxide/Peroxynitrite Imbalance in Dysfunctional Endothelium–Clinical Implications

Tadeusz Malinski

Distinguished Professor

Abstract:

A dysfunctional endothelium is a common denominator of several cardiovascular diseases, including: hypertension, atherosclerosis, heart failure, diabetes, obesity and aging. Normal functioning endothelium mainly produces cytoprotective vasorelaxant, nitric oxide (NO) and traces of the cytotoxic vasoconstrictor, peroxynitrite (ONOO-). However, in dysfunctional endothelium, these proportions are reversed. The recent development of nanomedical systems allows for the simultaneous measurements, in situ, of small biomolecules like NO, ONOO- and superoxide (O2- in single a cell. NO is produced from L-arginine and O2 by a dimeric form of endothelial nitric oxide synthase (eNOS). However, destabilized/uncoupled eNOS dimer in dysfunctional endothelium can concomitantly produce O2- and NO. NO is a rapid scavenger of O2- to generate ONOO-, one of the most powerful oxidants in the cardiovascular system. ONOO- can also trigger a cascade of events leading to nitrosylation, nitration, apoptosis, necrosis,lipid peroxidation, enzyme inactivation and DNA modification. Using nanosensors, we found that absolute values of NO and ONOO- concentrations do not necessarily reflect the efficiency of the cardiovascular system. We observed that the balance between the concentrations of NO, [NO], and ONOO-, [ONOO-], was a more accurate metric. This balance between [NO]/[ONOO-] in functional endothelium varies between 2 and 6. However, if this balance falls below 1.0, it is usually associated with severe endothelial dysfunction in a diseased state. These nanomedical measurements of the [NO]/[ONOO-] balance/imbalance in a single endothelial cell can be used for the early diagnosis of cardiovascular dysfunction, as well as the design of early pharmacological intervention to restore endothelial function. The early diagnosis of the adverse balance of [NO]/[ONOO-] can be partially reversed with treatments of L-arginine, vitamin D3, nitroso albumin, and also by statins, β-blockers and some ACE inhibitors.

Biography:

Tadeusz Malinski PhD, Is the Marvin & Ann Dilley White Chair and Distinguished Professor of Biomedical Sciences at Ohio University. His research is interdisciplinary in the areas of Biochemistry, Biotechnology, and Nanomedicine. He was first in the world to measure, nitric oxide concentration in single cells and neurons with nanosensors.His ground-breaking discovery of the regulatory role of nitric oxide in the beating heart and the mechanism of dysfunction of nitric oxide synthase are historical contributions to world science. The dysfunction of nitric oxide synthase is a common denominator of several diseases of modern civilization heart failure, hypertension, diabetes, atherosclerosis, aging, obesity and stroke. His work appears in nearly 400 publications. He has received approximately 35 Awards and Distinctions among others:International Academy of Cardiology Award, Maria Curie Award in Biochemistry, and the Grand Gold Medal in Medicine from the Society of Arts, Sciences and Letters.

SciTechnol International Publisher of Science, Technology and Medicine

All articles published in International Journal of Cardiovascular Research. are the property of SciTechnol, and is protected by copyright laws. Copyright © 2021, SciTechnol, All Rights Reserved.