



HAL
open science

Nitrite and nitrite reductases: from molecular mechanisms to significance in human health and disease.

Nicoletta Castiglione, Serena Rinaldo, Giorgio Giardina, Valentina Stelitano,
Francesca Cutruzzolà

► **To cite this version:**

Nicoletta Castiglione, Serena Rinaldo, Giorgio Giardina, Valentina Stelitano, Francesca Cutruzzolà. Nitrite and nitrite reductases: from molecular mechanisms to significance in human health and disease.. *Antioxidants and Redox Signaling*, 2012, 17 (4), pp.684-716. 10.1089/ars.2011.4196 . pasteur-00952182

HAL Id: pasteur-00952182

<https://riip.hal.science/pasteur-00952182v1>

Submitted on 26 Feb 2014

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Nitrite and Nitrite Reductases: From Molecular Mechanisms to Significance in Human Health and Disease

To cite this article:

Nicoletta Castiglione, Serena Rinaldo, Giorgio Giardina, Valentina Stelitano, and Francesca Cutruzzolà. *Antioxidants & Redox Signaling*. August 15, 2012, 17(4): 684-716. doi:10.1089/ars.2011.4196.

Published in Volume: 17 Issue 4: June 18, 2012

Online Ahead of Print: March 16, 2012

Online Ahead of Editing: February 5, 2012

ABSTRACT

Nitrite, previously considered physiologically irrelevant and a simple end product of endogenous nitric oxide (NO) metabolism, is now envisaged as a reservoir of NO to be activated in response to oxygen (O₂) depletion. In the first part of this review, we summarize and compare the mechanisms of nitrite-dependent production of NO in selected bacteria and in eukaryotes. Bacterial nitrite reductases, which are copper or heme-containing enzymes, play an important role in the adaptation of pathogens to O₂ limitation and enable microorganisms to survive in the human body. In mammals, reduction of nitrite to NO under hypoxic conditions is carried out in tissues and blood by an array of metalloproteins, including heme-containing proteins and molybdenum enzymes. In humans, tissues play a more important role in nitrite reduction, not only because most tissues produce more NO than blood, but also because deoxyhemoglobin efficiently scavenges NO in blood. In the second part of the review, we outline the significance of nitrite in human health and disease and describe the recent advances and pitfalls of nitrite-based therapy, with special attention to its application in cardiovascular disorders, inflammation, and anti-bacterial defence. It can be concluded that nitrite (as well as nitrate-rich diet for long-term applications) may hold promise as therapeutic agent in vascular dysfunction and ischemic injury, as well as an effective compound able to promote angiogenesis. *Antioxid. Redox Signal.* 17, 684–716.