

Advances in Experimental Medicine and Biology 1113  
Neuroscience and Respiration

Mieczyslaw Pokorski *Editor*

# Respiratory Ailments in Context

 Springer

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# **Advances in Experimental Medicine and Biology**

Neuroscience and Respiration

Volume 1113

**Series Editor**

Mieczysław Pokorski

More information about this subseries at <http://www.springer.com/series/13457>

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Editor

# Respiratory Ailments in Context

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*Editor*

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ISSN 0065-2598                      ISSN 2214-8019 (electronic)  
Advances in Experimental Medicine and Biology  
ISBN 978-3-030-04024-6              ISBN 978-3-030-04025-3 (eBook)  
<https://doi.org/10.1007/978-3-030-04025-3>

Library of Congress Control Number: 2019935806

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## Preface

The book series Neuroscience and Respiration presents contributions by expert researchers and clinicians in the multidisciplinary areas of medical research and clinical practice. Particular attention is focused on pulmonary disorders as the respiratory tract is up front at the first line of defense for organisms against pathogens and environmental or other sources of toxic or disease-causing effects. The articles provide timely overviews of contentious issues or recent advances in the diagnosis, classification, and treatment of the entire range of diseases and disorders, both acute and chronic. The texts are thought as a merger of basic and clinical research dealing with biomedicine at both the molecular and functional levels and with the interactive relationship between respiration and other neurobiological systems, such as cardiovascular function, immunogenicity, endocrinology and humoral regulation, and the mind-to-body connection. The authors focus on modern diagnostic techniques and leading-edge therapeutic concepts, methodologies, and innovative treatments. The action and pharmacology of existing drugs and the development and evaluation of new agents are the heady area of research. Practical, data-driven options to manage patients are considered.

Body functions, including lung ventilation and its regulation, are ultimately driven by the brain. However, neuropsychological aspects of disorders are still mostly a matter of conjecture. After decades of misunderstanding and neglect, emotions have been rediscovered as a powerful modifier or even the probable cause of various somatic disorders. Today, the link between stress and health is undeniable. Scientists accept a powerful psychological connection that can directly affect our quality of life and health span. Psychological approaches, which can decrease stress, can play a major role in disease therapy.

Clinical advances stemming from molecular and biochemical research are but possible if research findings are translated into diagnostic tools, therapeutic procedures, and education, effectively reaching physicians and patients. All this cannot be achieved without a multidisciplinary, collaborative, bench-to-bedside approach involving both researchers and clinicians. The role of science in shaping medical knowledge and transforming it into practical care is undeniable.

Concerning respiratory disorders, their societal and economic burden has been on the rise worldwide, leading to disabilities and shortening of life-span. COPD alone causes more than three million deaths globally each year.

Concerted efforts are required to improve this situation, and part of those efforts are gaining insights into the underlying mechanisms of disease and staying abreast with the latest developments in diagnosis and treatment regimens. It is hoped that the articles published in this series will assume a leading position as a source of information on interdisciplinary medical research advancements, addressing the needs of medical professionals and allied health-care workers, and become a source of reference and inspiration for future research ideas.

I would like to express my deep gratitude to Paul Roos, and Cynthia Kroonen of Springer Nature NL for their genuine interest in making this scientific endeavor come through and in the expert management of the production of this novel book series.

Mieczyslaw Pokorski

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# Methodological Implications and Repeatability of Nasal Nitric Oxide: Relevance for Challenge Studies

Frank Hoffmeyer, K. Sucker, H. Berresheim, C. Monsé, B. Jettkant, A. Beine, M. Raulf, T. Brüning, and J. Bünger

## Abstract

There is an interest in assessing changes in nasal NO (nNO) levels as an effect marker of upper airways. In this study, we examined methodologic influences on short and long term repeatability of nNO levels assessed by a portable electrochemical analyzer. Nine atopic and eighteen healthy subjects were exposed for 4 h to ethyl acrylate concentration of 0.05 ppm (sham) and mean concentrations of 5 ppm (either constant 5 ppm or variable 0 to 10 ppm). Sampling of nNO was performed by using passive aspiration during both breath-holding (634 ppb) or calm tidal breathing (364 ppb,  $p < 0.0001$ ). The intra-session (between-session) repeatability in terms of coefficient of variation was 16.4% (18.5%) using the tidal-breathing and 8.6% (13.0%) using the breath-holding method, respectively. Atopic subjects demonstrated a significant increase in nNO (breath-holding mean 16%, tidal-breathing mean 32%) after applying a constant ethyl acrylate concentration (5 ppm). Our findings suggest that the less elaborate tidal-breathing method might be

sufficient to detect significant changes at a group level. Given a lower coefficient of variation of breath-holding we assume there is an advantage of that approach at an individual level. Further research is needed to validate the usefulness of nNO in the evaluation of irritative, non-allergic responses.

## Keywords

Atopic subjects · Breath holding · Chemosensory challenge · Ethyl acrylate · Inflammation · Methodological approach · Nasal nitric oxide · Tidal breathing · Upper airway

## 1 Introduction

Sensations of odor and upper airway irritation are cited health effect in indoor air and occupational environments and have gained relevance for the setting of exposure limits (Brüning et al. 2014). Besides symptom complains, response to a chemosensory irritant can also be evaluated by examining local signs of nasal mucosal irritation (Arts et al. 2006). Concerning ethyl acrylate, a trigeminal intranasal perceptions and signs of nose irritation could be provoked by challenge with a concentration of 5 ppm (Hoffmeyer et al. 2016). Objective measures of upper airway irritation include rhinomanometry or acoustic

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