



LEEDS
BECKETT
UNIVERSITY

Citation:

Allen, H and Hull, J and Backhouse, SH and Dickinson, J and De Carné, T and Dimitriou, L and Price, OJ (2019) The role of fractional exhaled nitric oxide in the assessment of athletes reporting exertional dyspnoea. In: European Academy of Allergy and Clinical Immunology, 01 June 2019 - 05 June 2019, Lisbon.

Link to Leeds Beckett Repository record:

<https://eprints.leedsbeckett.ac.uk/id/eprint/5792/>

Document Version:

Conference or Workshop Item (Accepted Version)

Published abstract

This is the peer reviewed version of the following article: (2019), Abstracts PDS. Allergy, 74: 130-331, which has been published in final form at <https://doi.org/10.1111/all.13959>. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions.

The aim of the Leeds Beckett Repository is to provide open access to our research, as required by funder policies and permitted by publishers and copyright law.

The Leeds Beckett repository holds a wide range of publications, each of which has been checked for copyright and the relevant embargo period has been applied by the Research Services team.

We operate on a standard take-down policy. If you are the author or publisher of an output and you would like it removed from the repository, please [contact us](#) and we will investigate on a case-by-case basis.

Each thesis in the repository has been cleared where necessary by the author for third party copyright. If you would like a thesis to be removed from the repository or believe there is an issue with copyright, please contact us on openaccess@leedsbeckett.ac.uk and we will investigate on a case-by-case basis.

THE ROLE OF FRACTIONAL EXHALED NITRIC OXIDE IN THE ASSESSMENT OF ATHLETES REPORTING EXERTIONAL DYSPNOEA

Hayden Allen¹, James H. Hull², Susan H. Backhouse¹, John W. Dickinson³, Taidgh De Carné⁴, Lygeri Dimitriou⁴, Oliver J. Price¹ PhD

¹Carnegie School of Sport, Leeds Beckett University, Leeds, United Kingdom (UK); ²Department of Respiratory Medicine, Royal Brompton Hospital, London, UK; ³Sports Therapy, Physical Activity and Health Research Group, School of Sport and Exercise Sciences, University of Kent, Chatham Maritime, UK; ⁴London Sport Institute, Middlesex University, London, UK.

Background: Exercise-induced bronchoconstriction (EIB) is a common cause of breathing difficulty in athletes. Fractional exhaled nitric oxide (FeNO) is an indirect marker of airway inflammation, recommended for the assessment and management of asthma; however, the role of FeNO in detecting and monitoring EIB has yet to be fully established. The aim of this study was therefore to evaluate the predictive value of FeNO to confirm or refute EIB in athletes presenting with exertional dyspnoea.

Method: Seventy athletes (male: $n = 45$) (age: 35 ± 11 years) reporting respiratory symptoms (i.e. wheeze, cough and dyspnoea) during exercise attended the laboratory on a single occasion. All athletes performed resting FeNO and spirometry pre-and-post a eucapnic voluntary hyperpnoea challenge (EVH) in accordance with international guidelines. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated for established FeNO thresholds: (intermediate [≥ 25 ppb] and high [> 50 ppb]) and evaluated against objective evidence of EIB: (EVH diagnostic cut-off [$-10\% \Delta FEV_1$ at two consecutive time-points] and [$-15\% \Delta FEV_1$ at one time-point]). The diagnostic accuracy of FeNO was calculated using receiver operating characteristics area under the curve (ROC-AUC).

Results: All had normal resting lung function ($> 80\% FEV_1$ pred). The prevalence of EIB was 33% ($-10\% \Delta FEV_1$) and 23% ($-15\% \Delta FEV_1$) (median (IQR) $\Delta FEV_1 = -7\%$ (10.02)). FeNO values ≥ 25 ppb and > 50 ppb were observed in 49% and 23% of the cohort, respectively. ROC-AUC for FeNO was 75% ($-10\% \Delta FEV_1$) and 86% ($-15\% \Delta FEV_1$). Sensitivity, specificity, PPV and NPV are presented in Table 1.

Conclusion: Our findings indicate that FeNO > 50 ppb provides good specificity for a positive EVH test; however, should not replace indirect bronchoprovocation for diagnostic purposes. The high proportion of athletes reporting breathing difficulty in the absence of EIB highlights the requirement to consider alternative causes of exertional dyspnoea during clinical work-up.

Table 1. FeNO sensitivity, specificity, PPV and NPV for the detection of EIB.

| | | -10% Δ FEV ₁ | | -15% Δ FEV ₁ | | |
|---------------------|---|--------------------------------|----|--------------------------------|----|----|
| | | + | - | + | - | |
| FeNO (25ppb) | + | 16 | 18 | + | 13 | 21 |
| | - | 7 | 29 | - | 3 | 33 |
| FeNO (50ppb) | + | 11 | 5 | + | 11 | 5 |
| | - | 12 | 42 | - | 5 | 49 |

| FeNO | | | | | |
|------------------------|--|--------------------------------|-------|--------------------------------|-------|
| | | -10% Δ FEV ₁ | | -15% Δ FEV ₁ | |
| | | 25ppb | 50ppb | 25ppb | 50ppb |
| Sensitivity (%) | | 70 | 48 | 81 | 69 |
| Specificity (%) | | 62 | 89 | 61 | 91 |
| PPV (%) | | 47 | 69 | 38 | 69 |
| NPV (%) | | 81 | 78 | 92 | 91 |

| EVH | -10% Δ FEV ₁ | | -15% Δ FEV ₁ | |
|-----------------|--------------------------------|-------|--------------------------------|-------|
| FeNO | 25ppb | 50ppb | 25ppb | 50ppb |
| Sensitivity (%) | 70 | 48 | 81 | 69 |
| Specificity (%) | 62 | 89 | 61 | 91 |
| PPV (%) | 47 | 69 | 38 | 69 |
| NPV (%) | 81 | 78 | 92 | 91 |