Intermittent hypoxia-related alterations in vascular structure and function: a systematic review and meta-analysis of rodent data

Olfa Harki[1], Quentin Boete[1], Jean-Louis Pépin[1], Claire Arnaud[1], Elise Belaidi[1], Gilles Faury[1], Charles Khouri[1,2,3] and Anne Briançon-Marjollet[1,3]

[1]Université Grenoble Alpes, INSERM, CHU Grenoble Alpes, HP2 Laboratory, Grenoble, France. [2]Pharmacovigilance Unit and Clinical Pharmacology Dept, Grenoble Alpes University Hospital, Grenoble, France. [3]C. Khouri and A. Briançon-Marjollet are co-last authors and have contributed equally to the work.

Corresponding author: Anne Briançon-Marjollet (anne.briancon@univ-grenoble-alpes.fr)

Shareable abstract (@ERSpublications)
This meta-analysis of rodent studies firmly establishes that intermittent hypoxia (IH), as a model of obstructive sleep apnoea, alters vascular pressure, remodelling and reactivity. Severity of IH and rodent characteristics contribute to this impact. https://bit.ly/3fm45fB

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Abstract

Background Obstructive sleep apnoea and the related intermittent hypoxia (IH) are widely recognised as risk factors for incident cardiovascular diseases. Numerous studies support the deleterious vascular impact of IH in rodents but an overall interpretation is challenging owing to heterogeneity in rodent species investigated and the severity and duration of IH exposure. To clarify this major issue, we conducted a systematic review and meta-analysis to quantify the impact of IH on systemic artery structure and function depending on the different IH exposure designs.

Methods We searched PubMed, Embase and Web of Science, and included 125 articles in a meta-analysis, among them 112 using wild-type rodents and 13 using apolipoprotein E knockout ($ApoE^{-/-}$) mice. We used the standardised mean difference (SMD) to compare results between studies.

Results IH significantly increased mean arterial pressure (+13.90 (95% CI 11.88–15.92) mmHg), and systolic and diastolic blood pressure. Meta-regressions showed that mean arterial pressure change was associated with strain and year of publication. IH altered vasodilation in males but not in females and increased endothelin-1-induced but not phenylephrine-induced vasoconstriction. Intima–media thickness significantly increased upon IH exposure (SMD 1.10 (95% CI 0.58–1.62); absolute values +5.23 (2.81–7.84) µm). This increase was observed in mice but not in rats and was negatively associated with age. Finally, IH increased atherosclerotic plaque size in $ApoE^{-/-}$ mice (SMD 1.08 (95% CI 0.80–1.37)).

Conclusions Our meta-analysis established that IH, independently of other confounders, has a strong effect on vascular structure and physiology. Our findings support the interest of identifying and treating sleep apnoea in routine cardiology practice.