

Assessment of nasal and sinus nitric oxide output using single-breath humming exhalations.

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Abstract

Nasal nitric oxide (NO) levels increase greatly during humming compared to silent exhalation. In this study, the physiological and anatomical factors that regulate NO release during humming have been characterised in 10 healthy subjects and in a model of the sinus and the nose. Single-breath humming caused a large initial peak in nasal NO output, followed by a progressive decline. The NO peak decreased in a step-wise manner during repeated consecutive humming manoeuvres but recovered completely after a silent period of 3 min. Topical nasal application of an NO synthase inhibitor reduced nasal NO by >50% but had no effect on the increase evoked by humming. Silently exhaled nasal NO measured immediately after repeated humming manoeuvres was between 5-50% lower than basal silent NO exhalation, suggesting variable continuous contribution from the sinuses to nasal NO. Among the factors known to influence normal sinus ventilation, ostium size was the most critical during humming, but humming frequency was also of importance. In conclusion, humming results in a large increase in nasal nitric oxide, which is caused by a rapid gas exchange in the paranasal sinuses. Combined nasal nitric oxide measurement with and without humming could be of use to estimate sinus ventilation and to better separate nasal mucosal nitric oxide output from sinus nitric oxide in health and disease.