

Measurement of nasal NO concentration as a screening method for PCD diagnostics

Endogenous NO, which modulates physiological processes, is generated from the amino acid L-arginine by the enzyme NO synthase. The gaseous NO is lipophilic and diffusible. It has a bacteriostatic effect by inactivating specific enzymes from microorganisms.

The nasal NO concentration is between several hundred up to more than 1000 parts per billion (ppb) for healthy people. PCD patients show significantly lower levels (<200 ppb) than healthy people or patients suffering from other respiratory diseases. The reason for this lower production of NO still remains unclear.

Due to its high sensitivity for detecting PCD, NO measurement is an excellent screening method. However, the measurement of NO concentration alone is insufficient for establishing the diagnosis of PCD. Several factors like an acute, severe infection of the paranasal sinuses can lead to decreased values and are no sign of PCD. Additionally, rare cases of PCD show a normal NO production rate.

The measurement of the nasal NO concentration requires special nasal sensors. Currently, two tools are evaluated in studies and established on the market (NIOX Flex[®], Fa. Aerocrine, Solna, Sweden and NO Analyzer CLD 88 sp, Fa. Eco Medics, Duernten, Switzerland). Other available tools are currently not evaluated sufficiently and therefore cannot yet be recommended.

Measuring the nasal NO production requires to perform a breathing maneuver (exhalation against slight resistance) that leads to an elevation of the soft palate. This separates the nasal airways from the lower respiratory tract. Thus, nasal NO is not diluted by bronchial NO, which has a far lower concentration.

The exhalation against resistance maneuver requires a sufficient cooperation by the patient. Reproducible results can be obtained in patients aged five years or older. Protocols for younger children are currently being established but are not yet sufficiently validated; therefore measurements in small children should be interpreted with caution.

The evaluated values depend on the standard flow sampling rate, which is used to extract the air from the nose. In daily clinical practice it is adequate to indicate the NO concentration as ppb. In order to compare values measured by different devices, it is necessary to convert the concentration values into the NO production rate applying the following formula:

NO production rate (nl/min) = NO concentration (ppb) × standard flow rate (l/min).

A NO production rate below 77 nl/min is strongly suspected for PCD (**Leigh, M. W. et al. Standardizing Nasal Nitric Oxide Measurement as a Test for Primary Ciliary Dyskinesia. *Ann. Am. Thorac. Soc.* (2013).**)

These values should lead to further diagnostic work-up.