An international survey on nasal nitric oxide measurement practices for the diagnosis of primary ciliary dyskinesia

Supplementary File

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Results

Comparisons between centres using chemiluminescence or electrochemical devices

In 7 sites, the only source of training was an industry representative, most often in centres using an electrochemical device (5/23 versus 1/31 centre using a chemiluminescence device and one centre unable to state which technology was used).

The chemiluminescence technique was more frequently used in centres performing more than 25 tests per year compared to centres performing less than 25 annual tests (25/38 versus 8/27; \( P = 0.004 \)), and in centres measuring nNO in infants under 2 years of age when compared to centres testing children 2 years or older or 5 years or older (13/16 versus 8/18 and 12/27, respectively; \( P = 0.040 \)).

The sampling flow was known by the respondents in 42 centres, more frequently in centres using only chemiluminescence (21/23) as compared to half of the sites using the electrochemical technique (21/41; \( P = 0.002 \)).
When comparing centres using only chemiluminescence devices ($n = 23$) to those using only electrochemical devices ($n = 31$), the former more frequently sampled always or often both nostrils (22 versus 15; $P < 0.001$) and never sampled only once a single nostril (0 versus 13; $P < 0.001$).

At almost every site using a chemiluminescence device, ambient NO was measured daily or before each measurement (33/34) while it was only done in 17/41 sites using an electrochemical device ($P < 0.0001$).

Centres reporting ambient NO levels were more likely to have a chemiluminescence device (22 centres with chemiluminescence device among the 27 centres who reported ambient NO) compared to centres not reporting ambient NO levels (11 centres with chemiluminescence device among the 38 centres who did not reported ambient NO) ($P < 0.0001$).

Centres using only a chemiluminescence device more frequently reported results only in nL.min$^{-1}$ (14 vs 7) when compared to those using only an electrochemical device (1 vs 28) ($P < 0.0001$). In contrast, centres using an electrochemical device more frequently reported results only in ppb (25 vs 6) compared to centres using only chemiluminescence (5 vs 19) ($P < 0.0001$).
| QUESTIONS                                                                 | ANSWERS                              |
|--------------------------------------------------------------------------|--------------------------------------|
| **Basic Information about you**                                          |                                      |
| Name, surname (optional)                                                 |                                      |
| Centre/ hospital (Name, Town, Country)                                   |                                      |
| Do you perform nasal NO (nNO) measurement in patients with suspicion of Primary Ciliary Dyskinesia? | YES / NO                             |
| If NO, please do not answer the survey but kindly forward it to people performing nasal NO measurement at your centre |                                      |
| **Staff**                                                                |                                      |
| 1 You are?                                                              | Drop down or button: 1 answer         |
| Technician                                                              |                                      |
| Physiologist/Respiratory therapist                                       |                                      |
| Pulmonologist                                                           |                                      |
| Paediatric pulmonologist                                                |                                      |
| Paediatrician                                                           |                                      |
| ENT                                                                      |                                      |
| Nurse                                                                   |                                      |
| Physiotherapist                                                         |                                      |
| Post-doctoral trainee                                                   |                                      |
| Other (detail):                                                          |                                      |
| 2 At your centre who is performing nasal NO?                            | (Drop down or buttons: ≥1 answers)   |
| Technician                                                              |                                      |
| Physiologist/Respiratory therapist                                       |                                      |
| Pulmonologist                                                           |                                      |
| Paediatric pulmonologist                                                |                                      |
| Paediatrician                                                           |                                      |
| ENT                                                                      |                                      |
| Nurse                                                                   |                                      |
| Physiotherapist                                                         |                                      |
| Post-doctoral trainee                                                   |                                      |
| Other (detail):                                                          |                                      |
| 3 All staff considered; how many people are measuring nNO at your centre?| number                               |
| **Generalities on Tests**                                               |                                      |
| 4 How many tests are performed in your centre per year?                 | <10 / 10 - <25 / 25-100 / 100-200 / > 200 |
|   | Question                                                                 | Answer Options                                      |
|---|---------------------------------------------------------------------------|-----------------------------------------------------|
| 5 | Do you sometimes postpone nNO testing for particular circumstances such as: recent respiratory infection, block nose, high ambient NO etc...? | YES / NO                                            |
| 6 | How long do you want patients to be infection free before undertaking nNO measurement? (weeks) | Drop down 1 answer: I don’t delay for infections, 1, 2, 3, 4, 5, 6, >6 weeks |
| 7 | Do you test children?                                                     | YES / NO                                            |
|   | if YES starting age for testing                                           | Drop down 1 answer: 0-6 months 6-12 months, 1year, 2y, 3y, 4y, 5y, 6, >6y |
| 8 | Do you test adults?                                                       | YES / NO                                            |
| 9 | Do you use chemiluminescence device?                                      | YES / NO                                            |
|   | If YES specify (e.g. Ecomedics, Sievers)                                  | text                                                |
| 10| Do you use electrochemical device?                                        | YES / NO                                            |
|   | If YES specify (e.g. NIOX Vero)                                           | text                                                |
|   | If you are unsure whether your device is chemiluminescent / electrochemical, please specify brand | text                                                |
| 11| Which methods do you regularly use to measure nNO?                        | YES / NO                                            |
|   | blow against resistor or party-favour                                     | YES / NO                                            |
|   | breath hold                                                               | YES / NO                                            |
|   | hum                                                                       | YES / NO                                            |
|   | tidal breathing                                                           | YES / NO                                            |
|   | If YES, your preferred method is?                                         | 1 answer drop down                                   |
| |   | mouth open                                                                |                                                     |
| |   | closed                                                                    |                                                     |
| |   | indifferent                                                                |                                                     |
| |   | pursed lips                                                               |                                                     |
| 12| Are you using any other methods (not mentioned above) to measure nNO?     | text                                                |
| 13| Do you have a standardised operating procedure (SOP) for each technique?  | YES / NO                                            |
|   | If YES, please share it with us by emailing it to Lynn (L.E.Reeves@soton.ac.uk) and to Nicole (nicole.beydon@aphp.fr) |                                                     |
| Question                                                                 | Response |
|-------------------------------------------------------------------------|----------|
| Do you know the sample flow you are using for measurements in children? | YES / NO |
| If Yes, which ranges of flows do you use?                               | ≥ 1 answer |
|                                                                         | 0,25 - 0,40 L/min |
|                                                                         | 0,40 - 0,60 L/min |
|                                                                         | 0,60 - 0,80 L/min |
|                                                                         | ≥ 1 L/min |
| Do you measure NO from each nostril?                                    | 1 answer |
|                                                                         | always |
|                                                                         | often |
|                                                                         | sometimes |
|                                                                         | never |
| How many measurements do you routinely perform on each nostril?         | 1 answer |
|                                                                         | 1 |
|                                                                         | 2 |
|                                                                         | ≥ 3 |
| If you compare two measurements how many ppb or % would you consider as reproducible nasal NO results? | 1 answer |
|                                                                         | in ppb |
|                                                                         | in %  |
| Do you report?                                                          | ≥1 answer |
| nasal NO value in ppb?                                                  | YES / NO |
| nasal NO value in nL/min?                                               | YES / NO |
| the sample flow?                                                        | YES / NO |
| the ambient NO?                                                         | YES / NO |
| practical problems (crying, nose busy...)?                             | YES / NO |
| Do you have a standardised report for nNO results?                      | YES / NO |
| If YES, please share it with us by emailing it to Lynn (L.E.Reeves@soton.ac.uk) and to Nicole (nicole.beydon@aphp.fr) |          |
| Which cut-off values do you use (1 per method, state the units at the beginning) |          |
| Units                                                                   | ppb or nL/min |
| blow against resistor or party-favour                                   | number     |
| Breath hold | Number |
|------------|--------|
| Hum        | Number |
| Tidal breathing | Number |
| Other      | Number |

**Training staff and environmental considerations**

| Question                                                                 | Answer   |
|-------------------------------------------------------------------------|----------|
| Do you have a training programme for measuring nNO?                     | YES / NO |
| If YES, please share it with us by emailing it to Lynn (L.E.Reeves@soton.ac.uk) and to Nicole (nicole.beydon@aphp.fr) |          |
| If Yes, select who is training your staff?                              | ≥1 answer |
| A designated member of your team                                        |          |
| A representative from the analyser company                              |          |
| A designated trainer from another institution from the PCD foundation / a reference centre |          |
| Training workshops (e.g. BEATPCD, consortia workshops)                  |          |
| Other (detail)                                                          |          |

| Question | Answer |
|----------|--------|
| Do you perform machine calibration? | YES / NO |

| Question                     | Answer |
|------------------------------|--------|
| Do you measure ambient NO?   | 1 answer |
| before each measurement      |        |
| daily                        |        |
| often                        |        |
| sometimes                    |        |
| never                        |        |

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| If not "never" above which value in ppb, do you consider ambient NO high (ie. with possible consequence on nasal NO result)? | Number |

| Question                                                                 | Answer   |
|-------------------------------------------------------------------------|----------|
| If ambient NO is high, do you take it into account when interpreting nNO? | YES / NO |

*Free text box for additional comments*