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Comparison of Nasal Swabs with Nose Blowing for Community-Based Pneumococcal Surveillance of Healthy Children

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The nasopharynx (NP) is the preferred site for detection of Streptococcus pneumoniae in young children, but NP sampling is not well tolerated. We compared nose blowing with paired nasal swabs. The sensitivity of nose blowing was 46% (95% confidence interval [CI] 38 to 56%), which increased to 94% (95% CI, 85 to 98%) for children with visible secretions.

In order to improve the comparability of pneumococcal carriage studies during the era of pneumococcal conjugate vaccine introduction, the World Health Organization (WHO) established a working group to define standardized methods (3). Wherever possible, evidence-based recommendations were made; however, explicit links to published data were not always possible. Comparisons of alternative methods for use in respiratory bacterial carriage studies are needed to improve the feasibility of such studies, particularly with children. The nasopharynx (NP) is the preferred site for detection of Streptococcus pneumoniae (1, 2) and is similar to the oropharynx for detection of Haemophilus influenzae in swabs from infants (1) or sick children (2). Some studies report increased detection of H. influenzae in the oropharynx compared to the NP of healthy children less than 24 months of age (2). NP aspiration is useful if detection of viral and bacterial pathogens is to be maximized (6) and is superior to a swab for H. influenzae (4), but these are not necessarily well tolerated by well children. We aimed to assess the feasibility of collecting nasal secretions from children who refused a nasal swab (NS) but agreed to blow their noses (NB) and thus give a negative result for the NB method, 63% (5/8) were NS culture positive.

Baseline NSs were collected from 89 healthy Aboriginal children who were being assessed for eligibility to be randomized into a clinical trial. Pneumococci were recovered from 93% (83/89) NSs. When NB was used 87% (77/89) of the children were positive (RD = −6.7% [95% CI, −16 to 2]; \( P = 0.213 \) compared to NS). The combined methods identified 94% (84/89) carriage-positive children (Table 1). Almost all children were able to blow their noses or produce visible secretions on the tissue; of these, 95% (77/81) of the children were positive (Table 2). For the primary analysis we used an intention-to-treat approach and assumed that children unable to blow their noses were carriage negative. Of the children unable to blow their noses or produce secretions, and thus giving a negative result for the NB method, 63% (5/8) were NS culture positive.

Baseline NSs were collected from 296 children (approximately 90% non-Aboriginal) attending child care centers in the

<table>
<thead>
<tr>
<th>Table 1. Pneumococcal culture comparison of paired NS and NB collection methods for Aboriginal children aged 3 to 7 years living in remote Aboriginal communities</th>
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<tbody>
<tr>
<td><strong>NB result</strong></td>
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<tr>
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<td>Positive</td>
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<td>Negative</td>
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Sensitivity, 76/83 = 92% (95% CI, 83 to 97%); specificity, 5/6 = 83% (95% CI, 36 to 100%).

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city of Darwin. The pneumococcal carriage rate was 43% (127/296) according to the NS method. Swabs from 91% (269/296) of the children were good quality. When NB was used, 21% (62/296) were positive (RD = −22.0% [95% CI, −29.3 to −14.7]; \( P = 0.0000 \) compared to NS). The combined methods identified 44% (130/296) carriage-positive children (Table 3). Of 111 children who were able to blow their noses and produce visible secretions, 56% (62/111) were positive (Table 4). Of the 185 children unable to blow their noses, 35% (64/185) were NS culture positive.

For Aboriginal children, the sensitivity of NB was 92% (95% CI, 83 to 96%) and the specificity was 83% (95% CI, 36 to 99%). These values were 46% (95% CI, 38 to 56%) and 98% (95% CI, 95 to 100%), respectively, for children attending child care. The sensitivity of NB increased to 97% (95% CI, 91 to 100%) for Aboriginal children and to 94% (95% CI, 85 to 98%) for children attending child care if they had visible respiratory secretions.

We had previously found that children would tolerate insertion of an NS to about 3 cm for 5 seconds, whereas deeper insertion into the NP was vigorously opposed. Our study shows that collection by NB with a tissue may be an option for some children. A limitation of this study was that we chose to use collection in studies of pneumococcal carriage if nasal secretions cannot be obtained with a swab. If respiratory secretions could be obtained by NB into a tissue, pneumococcal recovery was almost identical to that with NSs (95% and 96%, respectively, for Aboriginal children and 56% and 57%, respectively, for children attending child care). For children from whom respiratory secretions cannot be obtained with a tissue, a proportion will be colonized with pneumococci (63% of Aboriginal children and 34% of children attending child care centers).

In conclusion, NB offers an alternative method of specimen collection in studies of pneumococcal carriage if nasal secretions can be detected. For children unable to produce visible secretions by NB, a proportion will be colonized and persistence with NS sampling is recommended.

### REFERENCES


