

Self-Collected Nasal Flocked Swabs for Respiratory Tract Sampling in Volunteers

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Lay Abstract

Acute upper respiratory tract infections are the most common cause of illness in children and in the institutionalized elderly. Timely laboratory diagnosis may allow antiviral therapy, avoidance or discontinuation of antibacterial agents, appropriate infection control, and improved hospital or community surveillance. Nasal swabs (NS) are less invasive than nasopharyngeal swabs (NPS) for sampling the respiratory tract and may be preferred in certain instances. Two new flocked NS were anatomically designed and shown to be essentially equivalent to the standard flocked NPS in respiratory epithelial cell. In this study we assessed the feasibility and adequacy of self-sampled NS compared to physician-collected NS. Overall, self-administered NS was easy, preferred, but collected significantly less cells than one by staff; however, may not supply sufficient cells for proper laboratory diagnosis. Studies with clinical correlation are now needed.

Abstract

Objective: Nasal swab (NS) collection for diagnosis of respiratory viruses is less invasive than nasopharyngeal swabs (NPS). Recently, we found that newly designed NS were essentially equivalent to NPS in sampling respiratory epithelial cells. In this study, we assessed the feasibility and quality of self-sampled NS compared with staff-collection.

Methods: We enrolled 35 volunteers, each of whom collected two self-administered NS (round and flat) using written and illustrated instructions; followed by another two NS (round and flat) collected by trained staff. The order of NS type was randomized. Discomfort, ease of administration, and preferences were assessed using a Likert scale. Swabs were placed in 1.0 mL Copan Universal Transport Medium, vortexed and centrifuged, and pellets resuspended in 1.0 mL of PBS. 25 microl suspensions were placed in wells on a glass slide, dried, fixed and counterstained with FITC labeled monoclonal antibody. Respiratory epithelial cells were enumerated using a fluorescent microscope at 400x magnification by an experienced microscopist blinded to swab type and administration. An average count from 4 fields was calculated when 10 or more epithelial cells were present per high-powered field (hpf); 10 fields were averaged if there was fewer than 10 cells/hpf.

Results: Among the 35 subjects, the mean (SD) cell yields for round swabs were 81.1 (44.8) and 43.2 (38.1) for researcher- and self-administered NS respectively ($P < 0.001$); cell yields for flat swabs were 76.6 (45.0) and 36.0 (29.9) ($P < 0.001$). While round NS collected more cells than flat NS, the difference was not statistically significant. However, using a widely-accepted definition of an adequate diagnostic smear of greater than 25 epithelial cells/smear, 69 of 70 self-collected and all 70 staff-collected specimens were of adequate quality. Overall, both flat and round NS were well tolerated with 75% of volunteers reporting no or mild discomfort. Self-administration of NS was easy (97%) and a majority of individuals (75%) were either neutral or preferred self-collection.

Conclusions: Self-administered nasal sampling was easy, preferred, but may be inferior to staff-collected swabs for sampling the upper respiratory tract. Studies with clinical correlation are now needed.

Background

- Respiratory epithelial cell collection by nasal swabs (NS) is less invasive than nasopharyngeal swabs (NPS) and showed equivalency between the standard flocked NS to the rayon NPS (Daley et al., 2005). The flocked NPS is the current gold standard.
- In 2006, two new flocked NS (round and flat) (Fig. 2) were anatomically designed to provide optimal nasal specimen collection and demonstrated to be essentially equivalent to the flocked NPS in epithelial cell yield in non-symptomatic volunteers (Castriciano et al., 2007).
- Use of NS may be preferred over NPS in some circumstances such as outbreak investigations or among neonatal and long-term care patients where the deeper sample may be more difficult to collect.

Objective

- The objective of this study was to assess the feasibility and quality of self-sampled NS compared with staff-collection using the two new flocked designs in non-symptomatic volunteers.

Methods

- Among 35 volunteers, two self-collected NS (round and flat) were performed using written and illustrated instructions; followed by another two NS (round and flat) collected by trained staff. The order of NS type was randomized.
- Discomfort, ease of administration, and NS preference was assessed using a 5-point Likert scale.
- Respiratory epithelial cells were extracted using standard laboratory protocol, fixed, and counterstained using FITC labeled monoclonal antibody onto a glass slide.
- Enumeration of respiratory epithelial cells was performed using a fluorescent microscope at 400X magnification by an experienced microscopist blinded to swab type and administration.
- In the case when greater than 10 cells was present per high power field (hpf), an average count from 4 fields was calculated; similarly, 10 fields were averaged when there was fewer than 10 cells/hpf.
- Statistical analyses were performed using SPSS 14.0.

Results

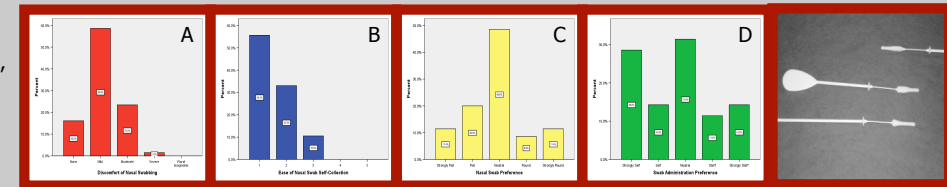


Figure 1. Evaluation of Discomfort (A) and Ease of Use (B) of Self-Swabbing and Preferences for Nasal Swab Type (C) and Administration (D)

Figure 2. Flocked Nasal Swabs (Top: Flat, Bottom: Round)

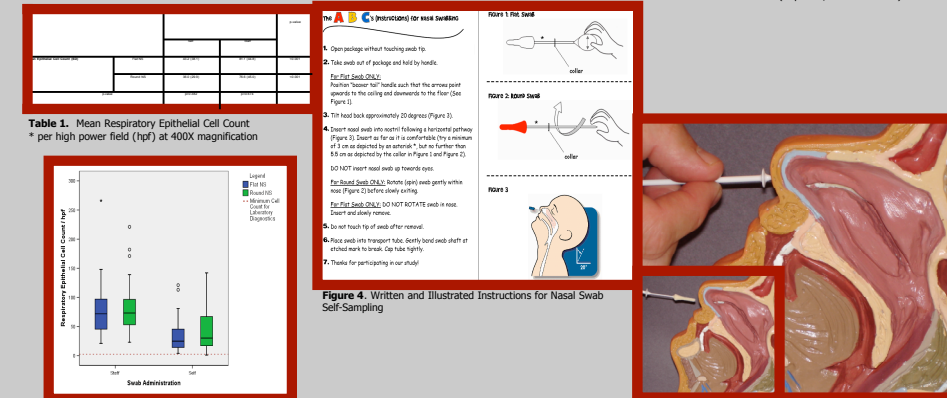


Figure 3. Distribution of Respiratory Epithelial Cells from Nasal Swabbing

Figure 5. Sagittal View of Nasal Swab Insertion

Discussion

- Self-administered NS collected significantly less respiratory epithelial cells than staff collected NS.
- An arbitrary reference of 25 cells per smear as a minimum standard necessary for proper laboratory viral diagnostic testing was used to determine the adequacy of nasal specimen samples.
- In non-symptomatic volunteers, self-collected nasal specimens appear to provide sufficient cell.
- Studies in symptomatic individuals are needed and results may differ in discomfort and ease of self-swabbing and cell yield as inflammation of the nasal cavity may influence sampling depth.
- The generalizability of the study results may be limited as volunteers consisted of hospital and laboratory personnel.

Conclusion

- Self-administered nasal swabs were easy to perform and preferred, but collect significantly less respiratory epithelial cells than staff-administered nasal swabs.
- Self-collected NS may provide adequate cell numbers for respiratory viral diagnostic testing. Studies with clinical correlations are now needed.
- Validation of self-sampled NS in symptomatic patients will have important implications and applications to community surveillance or diagnosis in patients who currently are not benefiting from diagnostic testing.

References

Daley P, Castriciano S, Chermesky M, Smieja M. Comparison of flocked and rayon swabs for collection of respiratory epithelial cells from uninfected volunteers and symptomatic patients (2006) Journal of Clinical Microbiology, 44 (6), pp. 2265-2267.
 Castriciano S, So G, Buracond S, Savarese M, Smieja M. Sampling Respiratory Epithelial Cells by Nasal or Nasopharyngeal Flocked Swabs. ECCMID Annual Conference, Munich, Germany March 31-April 5, 2007.