Novel mucosal sampling methods are well tolerated and useful for microbiological and immunological research

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Background:

The nasal mucosa is a key site for host-pathogen interaction. Methods for sampling at the mucosa include nasal washing, nasosorption (collection of fluid onto an absorbent material) and nasal curettage (to remove cells from the mucosal surface). We investigated the relative tolerability of each method, when used in our Experimental Human Pneumococcal Carriage (EHPC) model.

Materials and Methods:

Healthy volunteers had nasopharyngeal inoculation with *Streptococcus pneumoniae* 6B on Day 0 as previously described (Figure 1)[1]. Carriage rates were monitored by serial nasal washings at baseline, 2, 7 and 14 days. Carriage positive participants also had a nasal wash on day 9.

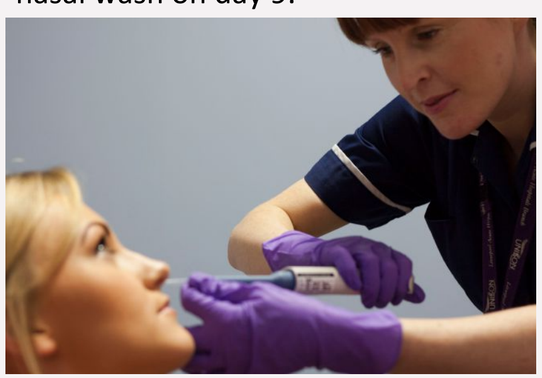

Figure 1: Innoculation with *S. pneumoniae*

In addition, nasosorption and nasal curettage was performed in some participants at baseline, 2 and 7 days. Post procedure symptoms ('pain', 'discomfort' and 'watering eyes') were reported on a Likert scale (Table 1). We compared symptoms within individuals from each sampling procedure, and also with a group which had nasal wash alone

Table 1. Modified Likert Scale

Likert scale key	
1	Not at all
2	slightly
3	moderately
4	very
5	extremely

Results:

Median pain, discomfort and lacrimation ratings were between 1 and 2 (Table 2).

Table 2. Summary of pain, discomfort and lacrimation ratings

	Median Likert rating (range)		
	Pain	Discomfort	Lacrimation
Nasal curettage	2 (1-4)	2 (1-4)	2 (1-5)
Nasal wash	1 (1-2)	2 (1-3)	1 (1-3)
Nasosorption	1 (1-2)	1 (1-3)	1 (1-3)

Compared to both nasosorption and nasal wash, nasal curettage caused more pain, discomfort and lacrimation (Figure 2).

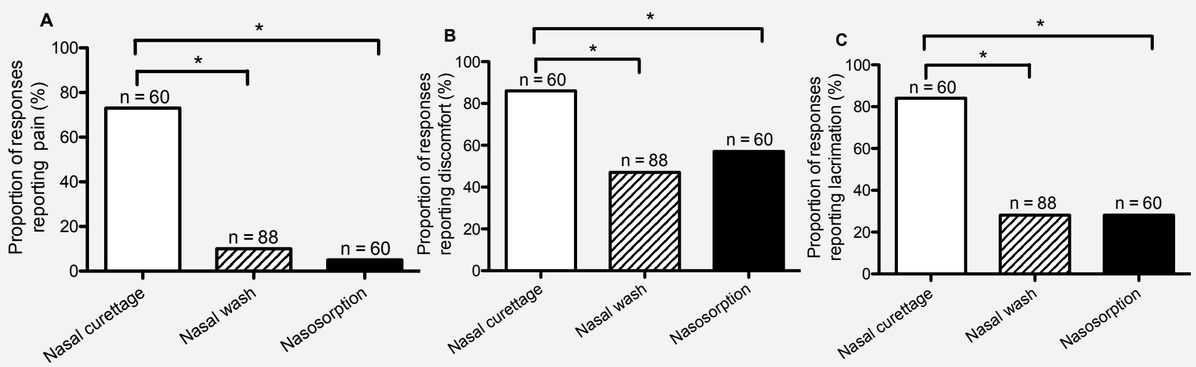

Figure 2: Twenty participants had nasal curettage, nasal wash and nasosorption. Procedures were rated using a modified Likert scale (Table 1). The proportion of responses that scored >1 for Pain (A), Discomfort (B) and Lacrimation (C) are displayed above. Responses in different groups were compared using a Freidman test * $p < 0.001$, ** $p < 0.05$.

Nasal wash caused significantly less discomfort ($p<0.05$) on Day 14 compared to Baseline (Table 3).

Sampling method	Variation in discomfort between all time points (p value)	Discomfort at Baseline compared to Day 14 (p value)
Nasal curettage	0.281	-
Nasal wash	0.047	0.021
Nasosorption	0.867	-

Table 3. Discomfort at different time points

Daily symptom logs for nasal and general symptoms were completed by 39 volunteers, 20 of which had nasal curettage and nasosorption. Additional nasal sampling did not result in a significant difference in symptoms.

Conclusions:

All sampling methods were well tolerated. Nasal curettage caused more symptoms than other methods. After nasopharyngeal inoculation with *Streptococcus pneumoniae*, nasal sampling did not increase reported symptoms above those from inoculation alone.

[1]Fitzgerald et al, Experimental Human Pneumococcal Carriage. J. Vis. Exp. (72), (2013).