

ORIGINAL ARTICLE

Nasal complaints and signs of disease in farmers – a methodological study

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Abstract

Conclusion. The methods used in this study are suitable for field studies that involve examinations of groups of workers. For individual examinations, there is no gold standard method that can discriminate work-related discomfort from other causes of rhinitis. **Objectives.** Studies of the effects of occupation on farmers' health have mainly focused on lower airways; few studies have examined effects on upper airways. This study investigated nasal functions in three groups of farmers (swine, milk and grain producers) and a control group using different methods, suitable for field studies. **Subjects and methods.** Health-related complaints were examined and several functional tests, such as expirogram, olfactory threshold test, acoustic rhinometry, nasal lavage with biomarkers of inflammation (eosinophilic cationic proteins (ECP), myeloperoxidase (MPO), tryptase, albumin) and allergy tests were performed. The different tests were correlated to nasal complaints and to each other. **Results.** Nasal blockage complaints were more common among farmers; overall, nasal polyps were more frequent in grain producers. Objective parameters showed more pronounced mucosal swelling in farmers and higher concentrations of ECP in nasal lavage compared with controls. Lung function, olfactory threshold, atopy frequency and allergen-specific IgE to the storage mite *Lepidoglyphus destructor* did not differ between farmers and controls. Mucosal swelling measured with acoustic rhinometry was more pronounced in subjects with nasal complaints, hypersensitivity, nasal polyps and symptoms from lower airways. There was a correlation between biomarkers in nasal lavage (MPO, albumin and ECP).

Keywords: Farmers, nasal lavage, nasal symptoms, olfactory tests, rhinomanometry, acoustic rhinometry, allergy

Introduction

In recent decades, field methods for detection of occupational diseases have aroused increasing interest. Relevant tests performed in or near exposure sites (preferably workplaces) to measure symptoms and signs of disease have been introduced. These kinds of methods should have high sensitivity, and the test equipment must be easy to transport and use. Field testing methods for investigating acute effects are of major interest, because such effects may decline rapidly. We have previously discussed methods to evaluate complaints and symptoms from upper airway diseases in groups of workers who are occupationally exposed to different substances,

such as wood dust, organic dust, formaldehyde and acrylates [1–3].

Farmers are exposed to different allergens and irritants in their work environments; for example, animal dander, storage and house dust mites, grain and hay dust, moulds and unspecific organic dust. Swine confinement workers may be exposed to ammonia, organic dust and endotoxins. Such exposures may cause allergic alveolitis, organic dust toxic syndrome (ODTS), bronchitis, and possibly asthma [4]. During ensilage tasks, farmers may be exposed to high nitrogen dioxide (NO₂) levels and air-borne dust particles may act as carriers of allergens to the lower airways [5]. Few studies have focused on farmers' symptoms from upper airways

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except for questionnaire studies [6,7]. In a previous study, we examined farmers by means of nasal inspection and different nasal tests [8]. In comparison with control subjects, farmers more frequently demonstrated hyperaemia of the nasal mucosa, nasal polyps, higher myeloperoxidase (MPO) levels in nasal lavage fluid (NAL), tendencies to more swollen nasal mucosa (measured by acoustic rhinometry) and impaired sense of smell.

Here we report the usage of different methods, suitable for field studies, to investigate nasal functions and correlate these methods to each other and to nasal complaints.

Subjects and methods

Subjects

The study group comprised 53 farmers (20 milk, 15 swine and 18 grain producers) and 15 control subjects who gave informed consent to participate. The farmers were recruited from two agricultural medical offices and had worked full- or part-time for at least 5 years. The control subjects worked in offices in the same geographical area as the farmers and were not born on farms or exposed to farming. The controls were sex- and age- (± 5 years) matched to the farmers. The study was performed in June during the hay-harvesting season. The Ethics Committee of Huddinge University Hospital, Karolinska Institutet approved the study.

Questionnaire

Before the medical investigations, all subjects responded to a questionnaire regarding work tasks, smoking habits, nasal medicines, current and previous complaints regarding upper and lower airways and allergies. The investigator (M.H.) checked the questionnaires for completion.

Expirogram

A Vitalograph measured forced vital capacity (FVC) and forced expired volume during the first second (FEV_1) adjusted for age, gender and height. The lung function values were compared to those reported by Quanjer et al. [9].

Allergy tests

Skin prick test (SPT) was performed with 10 common allergens (Soluprick SQ, ALK, Hørsholm, Denmark): birch, timothy, mugwort (*Artemisia vulgaris*), dog, cat, horse, mite (*Dermatophagoides pteronyssinus*), moulds (*Alternaria alternata*, *Cladosporium herbarum*, *Aspergillus fumigatus*) and as

reference, NaCl (0.9%) and histamine chloride (10 mg/ml) (ALK). In addition, a blood sample was taken for analysis of IgE antibodies against a mix of common inhalant allergens (Phadiatop®) and against the storage mite *Lepidoglyphus destructor* (Phadia AB, Uppsala, Sweden). A SPT was considered positive if at least 3 mm in diameter and a positive ImmunoCAP as ≥ 0.35 kU/L. Atopy was defined as a positive SPT and/or a positive Phadiatop result.

Nasal inspection

The same investigator conducted all nasal inspections (M.H.). With a traditional nasal speculum, anterior rhinoscopy was done to classify mucosal colour (livid, pale, hyperaemia), secretion (dry, watery, mucous, purulent) and to determine if the mucosa was atrophic or swollen. Nasal endoscopy with a Hopkin's optic 30° (Karl Storz, Germany) 15 min after two sprays of decongestant (xylometazoline 1 mg/ml, Novartis) in each nostril, was used to examine the middle meatus and the nasal cavity's posterior part.

Olfactory threshold test

The olfactory threshold was measured according to Cain et al. [10]. 1-Butanol was diluted in water in 12 steps from 0.0000004 to 4% (step 0 strongest, step 12 weakest). Subjects were exposed to one of two bottles (the other containing pure water), which delivered a weak air-stream toward the nose. They were asked to note which bottle contained the test substance. Three consecutively correct notations for each pair of bottles were required; the weakest correctly noted concentration was regarded as the olfactory threshold.

Acoustic rhinometry

The instrument and method were as described by Hilberg et al. [11]. In brief, the total nasal volume (VOL), measured from the nostril to 7 cm in the nasal cavity and the minimum cross-sectional area (MCA), were recorded with the subject in a sitting position. Four measurements of each nasal cavity were performed, and the mean value was used in the statistical analyses. The VOL and MCA were calculated as the sum of the mean values of the right and the left nasal volume and MCA, respectively. Highly divergent curves were discarded. Acoustic rhinometry was performed before and 20 min after application of decongestant.

Nasal lavage

Using a syringe with a tight-fitting nasal olive adapted to the nostril, 5 ml of isotonic saline solution at room temperature was instilled into each nostril at one time; test subjects sat in a 45° forward-leaning position. The saline solution was slowly instilled into the nasal cavity, kept there for 10 s, and withdrawn into the syringe three times. The lavage fluid was then centrifuged at 700 rpm for 10 min. The supernatant was saved and kept frozen (−18°C) and later analysed for ECP, MPO and albumin (Phadia AB). The tryptase concentration was also determined (Phadia AB). The detection limits for ECP, MPO, albumin and tryptase were 2.0 µg/l, 4 µg/l, 2 mg/l and 2 µg/ml, respectively.

The investigations schedule was: (1) questionnaire completion; (2) expirogram; (3) skin prick test; (4) nasal inspection (earliest 15 min after coming indoors); (5) olfactory threshold test; (6) acoustic rhinometry; (7) nasal lavage; (8) decongestant; (9) nasal inspection (15 min after decongestant); and (10) acoustic rhinometry.

Exposure measurements

Just a few farmers working with old farming procedures were exposed to high levels of dust, measured as time-weighted dust values over a working day. Farmers using modern technological equipment showed low values for organic dust exposure. Endotoxins and ammonia were not measured in swine farmers.

Statistics

The farmers were categorized as milk, swine and grain producers. These groups were compared with the control group. The Student's *t* test and Mann–

Whitney U test were used to analyse group differences of parametric and non-parametric variables, respectively. The correlation between the various test variables was analysed using Spearman's rank correlation coefficient (ρ). The χ^2 test or Fisher's exact test was used to analyse differences in the occurrence of various parameters.

Results

One milk producer dropped out from the post-decongestant part of the examinations and one swine producer received surgery for an intra-cranial aneurysm followed by anosmia and was thus excluded from the olfactory threshold test.

No significant differences were found between the groups regarding age, sex, height or smoking habits (Table I). Questionnaire results revealed that the occurrence of current nasal problems was higher among farmers than controls (Table II). Nasal blockage was the most common complaint. Otherwise, there was no significant difference between the different groups regarding complaints from the lower airways, eyes and throat or the frequency of a recent common cold.

Questionnaire results revealed no differences in allergy histories between the groups, neither did objective measurements of atopy such as frequency of positive skin prick tests or Phadiatop or allergen-specific IgE against storage mite *L. destructor* (Table I).

Lung function did not differ significantly between the groups, but FEV₁ was low in all groups, compared with predicted values (Table III). When comparing questionnaire results with lung function, subjects with dyspnoea had lower FEV₁ (79 ± 13% of predicted) than persons without dyspnoea (94 ± 11%; *p* < 0.001, *t* test). Otherwise, no significant

Table I. Demographic data for different groups.

	Control group	Producers of		
		Milk	Swine	Grains
Number	15	20	15	18
Females: <i>n</i>	2	0	1	0
Height (cm): mean (SD)	179 (7)	180 (7)	179 (8)	180 (7)
Age (years): mean (SD)	46 (6)	45 (10)	52 (14)	57 (22)
Smokers: <i>n</i>	2	4	1	0
Positive allergy tests				
Skin prick test	2 (13%)	7 (35%)	5 (33%)	5 (28%)
Phadiatop	5 (33%)	5 (25%)	4 (27%)	6 (33%)
IgE to storage mite (<i>L. destructor</i>)	2 (13%)	3 (15%)	0 (0%)	3 (17%)

Number (*n*) and, for ordinal data, mean and standard deviation (SD) are noted. The numbers of positive allergy tests are given in the groups as *n* (%).

Table II. Complaints in eyes and in upper and lower airways in the groups, given as number of complaints and percentage.

	Control group (n = 15)	Producers of		
		Milk (n = 20)	Swine (n = 15)	Grains (n = 18)
Nasal complaints				
Current nasal problems	3 (20%)	11 (55%)*	8 (53%)	12 (67%)**
Impaired sense of smell	0 (0%)	4 (20%)	4 (27%)	3 (17%)
Runny nose	0 (0%)	6 (30%)*	1 (7%)	3 (17%)
Blocked nose	3 (20%)	7 (35%)	6 (40%)	9 (50%)
Use of nasal decongestants	4 (27%)	6 (30%)	2 (13%)	6 (33%)
Conjunctivitis:	1 (7%)	5 (25%)	3 (20%)	5 (28%)
Throat complaints	1 (7%)	4 (20%)	4 (27%)	4 (22%)
Lower airways complaints				
Work-related bronchitis	1 (7%)	5 (25%)	5 (33%)	2 (11%)
Phlegm	1 (7%)	2 (10%)	3 (20%)	4 (22%)
Dyspnoea	0 (0%)	4 (20%)	2 (13%)	2 (11%)
Recent common cold	2 (13%)	3 (15%)	4 (27%)	2 (11%)
Allergies				
Pollen allergy history	2 (13%)	0 (0%)	2 (13%)	3 (17%)
Animal allergy history	5 (33%)	3 (15%)	2 (13%)	3 (7%)

* $p < 0.05$ and ** $p < 0.01$ versus the control group (Fisher's exact test).

differences in lung function existed between atopics/non-atopics, smokers/non-smokers and subjects with/without nasal and/or lower airways complaints.

Nasal inspection disclosed hyperaemia of the nasal mucosa more frequently in farmers. Nasal polyps were significantly more common in grain producers, compared with the control group (Table IV) when investigated by endoscopy. In swine and milk producers, single cases were found with polyps; no one in the control group had nasal polyposis.

After decongestant, milk producers had greater nasal volume than the controls, and there was a tendency to greater nasal volume in swine and grain producers ($p < 0.10$) (Table V). The difference in nasal volume before and after decongestant was significantly greater in grain producers than in the control group. To correlate acoustic rhinometry results with symptoms and other test results, subjects were pooled on the basis of test results. Table VI shows that subjects with nasal complaints (especially nasal blockage), hypersensitivity to dust and irritants, nasal polyps and lower airway problems had greater differences in nasal dimensions

before and after decongestant, compared with subjects without such problems. The difference was most obvious for VOL. Otherwise, no significant differences existed in nasal dimensions between subjects with/without asthma, allergies, recent common cold and hyperaemia of the nasal mucosa or between smokers/non-smokers or between subjects recently exposed/not exposed to cattle or hay.

Analysis of NAL revealed that farmers, especially animal producers, had higher concentrations of ECP than the control group: 5.0 µg/L (<2–18.8), 7.1 µg/L (<2–17.2) and 3.5 µg/L (<2–16.1) for milk, swine and control groups, respectively. Even MPO was significantly higher in milk and swine producers (98.6 µg/L (<8.0–311) and 135.4 µg/L (<8.0–258), respectively) compared with the control group (48.2 µg/L (<8.0–134)). Albumin did not differ significantly between the groups; however, values were higher in exposed groups. Tryptase in NAL was below the detection limit in all specimens. Subjects with positive skin prick test results had a significantly higher albumin concentration, 27.7 mg/l (3.2–86.2), and a tendency to higher ECP concentration,

Table III. Lung function in the groups: mean and standard deviation (SD).

	Control group (n = 15)	Producers of		
		Milk (n = 20)	Swine (n = 15)	Grains (n = 18)
FVC% predicted	104 (13)	100 (12)	100 (15)	97 (23)
FEV ₁ % predicted	93 (12)*	94 (12)*	89 (15)*	93 (10)**

* $p < 0.05$ and ** $p < 0.01$ versus predicted values within the group (t test, paired).

Table IV. Number of findings at nasal inspection: *n* (%).

	Control group (<i>n</i> = 15)	Producers of		
		Milk (<i>n</i> = 20)	Swine (<i>n</i> = 15)	Grains (<i>n</i> = 18)
Nasal polyps	0 (0%)	1 (5%)	1 (7%)	6 (33%)*
Hyperaemia of the nasal mucosa	2 (13%)	10 (50%)*	8 (53%)*	5 (28%)
Septal deviation	10 (67%)	16 (89%)	9 (60%)	13 (72%)

* $p < 0.05$ versus control group (Fisher's exact test).

4.9 $\mu\text{g/L}$ (<2 –17.2), than those with a negative test, 10.0 mg/l (2.6–89.4) and 2.5 $\mu\text{g/L}$ (<2 –18.8), respectively. Otherwise, no significant differences existed in inflammatory markers between persons with/without asthma, a recent common cold, current lower airways complaints, nasal polyps and hyperaemia of the nasal mucosa and between persons recently exposed to cattle or hay and between smokers/non-smokers. There was a fairly high positive correlation between three inflammatory markers (albumin, ECP and MPO) in NAL. The highest correlation was between ECP–MPO ($r = 0.83$, $p < 0.001$, Spearman's rank correlation coefficient), ECP–albumin ($r = 0.73$, $p < 0.001$) and MPO–albumin ($r = 0.67$, $p < 0.001$). A statistically significant positive, but fairly low, correlation was found between the difference in MCA before and after decongestant and the olfactory threshold and between FEV₁ (percentage predicted) and three inflammatory markers.

Olfactory threshold disclosed that milk producers had a tendency to higher threshold than the control group, with a median value of 10.0 (range 5–11) compared with 11.0 in the three other groups. When all subjects were pooled, subjects who had noted impaired sense of smell had higher median olfactory

threshold (8.0, range 0–11) than those with no such history (11.0, range 4–11), $p < 0.05$. Smokers also had a higher olfactory threshold (6.5, range 5–11) than non-smokers (11.0, range 0–11), and farmers harvesting hay within the last 2 weeks had a higher olfactory threshold than those who had not harvested hay. No significant differences were found for subjects with positive Phadiatop, positive skin prick test results, nasal blockage or bronchitis as compared to subjects without these signs. Subjects with nasal polyps had a threshold of 9.0 (0–11) compared to 10.5 (4–11) for those without polyps (NS).

Discussion

In previous studies occupational exposure to irritants has been related to an increased risk for rhinitis [12,13]. In this study, using a battery of tests and methods that fulfil our requirements for safety, reliability and easy transport, we found that farmers had more nasal complaints compared with a control group, especially blocked nose. The study was performed in the allergy season (June), which might explain the high frequency of complaints in farmers who handle grass, hay and silage. But compared to an earlier study [8], performed out of the pollen

Table V. Acoustic rhinometry in the groups.

	Control group (<i>n</i> = 15)	Producers of		
		Milk (<i>n</i> = 19)	Swine (<i>n</i> = 15)	Grains (<i>n</i> = 18)
VOL (0–7 cm)				
Before decongestant	22.6 (5.5)	28.2 (13.6)	28.6 (9.4)*	21.1 (6.2)
After decongestant	27.4 (5.4)	34.9 (9.2)**	35.4 (16.1)	32.4 (9.6)
Difference between before and after decongestant	+4.8 (6.2)	+6.7 (8.6)	+6.8 (11.1)	+11.3 (5.7)**
MCA				
Before decongestant	1.17 (0.22)	1.23 (0.26)	1.32 (0.38)	1.08 (0.34)
After decongestant	1.28 (0.23)	1.46 (0.20)*	1.38 (0.31)	1.25 (0.31)
Difference between before and after decongestant	+0.11 (0.19)	+0.19 (0.22)	+0.06 (0.30)	+0.18 (0.31)

Mean and standard deviation (SD) noted. VOL is the total nasal volume 0–7 cm from the nasal opening and MCA is the minimum cross-section area in this distance range.

* $p < 0.05$ and ** $p < 0.01$ versus the control group (Student's *t* test).

Table VI. The difference in VOL and MCA before and after decongestant in relation to presence/absence of different risk factors/symptoms.

Risk factors/symptoms	Presence/absence	VOL	MCA
Pollen allergy history	Yes (<i>n</i> = 6)	10.9 (10.6)	0.10 (0.20)
	No (<i>n</i> = 62)	7.2 (8.0)	0.14 (0.26)
Positive skin prick test	Yes (<i>n</i> = 23)	7.5 (7.1)	0.12 (0.25)
	No (<i>n</i> = 45)	7.5 (8.8)	0.14 (0.26)
Positive Phadiatop	Yes (<i>n</i> = 21)	8.3 (7.8)	0.08 (0.25)
	No (<i>n</i> = 47)	7.1 (8.5)	0.16 (0.25)
Nasal complaints	Yes (<i>n</i> = 33)	10.3 (8.1)**	0.18 (0.27)
	No (<i>n</i> = 35)	4.8 (7.5)	0.09 (0.24)
Nasal blockage	Yes (<i>n</i> = 24)	11.5 (9.0)**	0.20 (0.26)
	No (<i>n</i> = 44)	5.3 (6.9)	0.10 (0.25)
Rated nasal blockage	Yes, much (<i>n</i> = 6)	12.9 (10.4) ^(*)	0.06 (0.17)
	Yes, little (<i>n</i> = 20)	8.8 (3.9)	0.25 (0.26)*
	No (<i>n</i> = 42)	6.1 (9.1)	0.09 (0.25)
Hypersensitive to irritants	Yes (<i>n</i> = 13)	13.5 (10.7)**	0.18 (0.25)
	No (<i>n</i> = 55)	6.1 (6.9)	0.12 (0.26)
Hypersensitivity to dust	Yes (<i>n</i> = 18)	11.4 (9.0)*	0.22 (0.25)
	No (<i>n</i> = 50)	6.1 (7.5)	0.11 (0.25)
Nasal polyps	Yes (<i>n</i> = 8)	12.3 (7.9) ^(*)	0.35 (0.27)**
	No (<i>n</i> = 60)	6.9 (8.1)	0.11 (0.24)
Phlegm	Yes (<i>n</i> = 10)	12.6 (13.8)*	0.14 (0.28)
	No (<i>n</i> = 58)	6.6 (6.6)	0.16 (0.25)
Wheezing	Yes (<i>n</i> = 5)	15.7 (15.1)*	0.24 (0.27)
	No (<i>n</i> = 63)	6.9 (7.2)	0.13 (0.26)
Work-related bronchitis	Yes (<i>n</i> = 13)	11.4 (12.2) ^(*)	0.13 (0.19)
	No (<i>n</i> = 55)	6.6 (6.8)	0.14 (0.27)

Mean and standard deviation (SD) noted.

^(*)*p* < 0.10, **p* < 0.05 and ***p* < 0.01 versus subjects without the risk factor/symptom (Students *t* test).

season, nasal complaints were not significantly more pronounced in June in any of our groups – not even in individuals with allergy. Allergy histories, positive skin prick test results or Phadiatop did not differ significantly by group, and our results did not indicate that allergic subjects were over-represented in those groups with nasal complaints. The finding of low FEV₁ in swine producers is in line with results reported by other authors [14].

An interesting finding is that eight farmers had nasal polyps. Most of them were grain producers. No polyps were found in the control group. In the general Swedish population the prevalence of nasal polyps is estimated to be 2.7% [15]. Nasal polyps are an expression of inflammation and, as seen in this study, there are signs of a general inflammatory process in farmers' nasal linings. This group is exposed to several irritants (e.g. dust, gases, aerosols and allergens), which frequently pass the middle turbinate and meatus, where polyps are known to start. The literature contains limited support for a correlation between nasal polyps and occupation [16], but there is extensive information on the

correlation between occupational exposure to dust and nasal cancer [17].

Acoustic rhinometry measures were of limited value in differentiating farmers from controls when looking at values before decongestion. After application of xylometazoline to both nostrils, a more pronounced reduction of nasal mucosal swelling was seen in farmers (especially grain farmers) compared with controls. This might be due to the fact that the test was done during harvesting. With xylometazoline, we can expect a reduction of the vascular component of the swollen mucosa but no effect on fibrosis or hyperplasia. The difference in VOL or MCA before and after decongestion correlated well with nasal complaints. VOL seemed to correlate to a higher extent than MCA. There was a linear correlation for rated nasal blockage. Even for subjects with nasal polyps, nasal hyper-reactivity and lower airway symptoms there was a significant correlation to nasal mucosal swelling, as measured with acoustic rhinometry before and after decongestion. However, there was no correlation with skin prick test results or Phadiatop.

Subjects with wheezing and phlegm had significantly more nasal mucosal swelling. These findings appear to agree with other studies that indicate a relationship between symptoms from the upper and lower airways. In subjects with an inflammatory process in the lower airways, there is a high risk of simultaneous nasal lining inflammation [18], pointing to the fact that both lungs and nose should be investigated in subjects with airway complaints.

Our study shows that acoustic rhinometry is suitable for field studies of occupational rhinitis, as reported earlier [19]. It is easier to perform than rhinomanometry as it does not require technical staff, and all data are stored on the computer's hard disc for later analysis. Compared with nasal peak-flow measures, acoustic rhinometry has a lower coefficient of variance but takes more time and cannot be performed by the subject. Acoustic rhinometry is obviously useful on a group level, but as normal values are lacking it is of limited use on an individual level.

The nasal lavage findings were only significant concerning ECP in animal farmers, while MPO was almost significant compared with controls. MPO is a marker of leukocyte activity [20] and is not known to change with allergy season. We regard the elevated values as an expression of a non-specific inflammation, as reported earlier in workers exposed to fuel-oil ash [21]. By measuring granulocytes in nasal and bronchial lavage, Wang and co-authors found a significant increase after inhalation of swine dust in volunteers [22]. In grain producers, it was interesting to see that inflammatory parameters were not higher in this study compared to our earlier study [8], although mucosal swelling was more pronounced and this group of farmers was in an active hay-harvesting period.

When comparing different objective tests to each other, we found a high correlation between the inflammatory markers in NAL. For other tests, FEV₁ correlated significantly with lavage parameters, and olfactory threshold scores correlated with differences in MCA before and after decongestion. The smell threshold test also correlated with the subjective feeling of impaired sense of smell, proving the smell test to be of clinical importance.

The olfactory threshold correlated to smoking habits in this study, which is in line with other studies [23,24]. Comparisons of olfactory threshold to acoustic rhinometry showed a significant correlation between the olfactory threshold score and differences in nasal minimal cross-sectional area before and after decongestant. For subjects with nasal polyps, the olfactory threshold was impaired but not statistically significant.

The aim of the study was to correlate symptoms and results from different tests (expirogram, olfactory threshold test, acoustic rhinometry, nasal lavage with biomarkers of inflammation and allergy tests) to each other. We found that many of these methods are suitable for use under field conditions for examinations on a group level. However, on an individual basis, there is still no perfect method that can discriminate work-related discomfort from other causes of rhinitis.

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