

Letters

INVESTIGATION OF OLFACTORY THRESHOLD RESPONSES IN CHRONIC RHINITIS SUBTYPES

Studies have not established clear immunologic or nonimmunologic mechanisms for nonallergic rhinitis (NAR),¹⁻³ although autonomic dysfunction has been suggested to play a central role.⁴ Patients with NAR commonly experience symptoms provoked by odorants, such as perfumes and smoke. It has been hypothesized that patients with NAR have abnormalities in their olfactory transduction pathway, leading to pathologic changes in the olfactory mucosa.⁵ Few studies⁶⁻⁸ have investigated odorant discrimination in patients with chronic rhinitis subtypes. One study⁷ reported greater olfactory loss in patients with NAR in response to common odorants, such as formalin, camphor, the Indian saffron spice *asafetida*, and oil of peppermint, compared with patients with allergic rhinitis (AR) and control subjects, with males manifesting greater olfactory loss than females for all odorants, except *asafetida*.⁶ Other studies reported that decreased olfaction in those with NAR was age dependent. To further elucidate the role of olfaction in chronic rhinitis subtypes, olfactory threshold (OT) was measured in patients with AR, NAR, and mixed rhinitis compared with control subjects without rhinitis symptoms, controlling for nasal congestion by acoustic rhinometry. We hypothesized that patients with NAR compared with patients with AR would have an increased OT because of their increased clinical response to odorants.

Patients were recruited from a suburban allergy practice using historical information from their records to establish diagnoses of AR ($n = 16$), NAR ($n = 17$), and mixed rhinitis, consisting of AR and NAR components (defined as symptoms correlating with positive skin prick test results in addition to symptoms triggered by nonallergic stimuli) ($n = 16$). Control subjects had no rhinitis symptoms ($n = 13$). This study was approved by the University of Cincinnati institutional review board.

Acoustic rhinometry was used to measure congestion factor, the percentile difference between baseline and maximally decongested values and volume factor, the total volume (in cubic centimeters) of the nasal cavity in the analysis segment.⁹

There is an automated, self-administered, validated instrument (OLFACT-RL; Osmic Enterprises Inc, Cincinnati, Ohio) was used to measure OT. A single staircase with reversal paradigm is used (Fig 1).¹⁰ Stimuli consisting of 12 binary dilutions of 1-butanol (starting at 4%, vol/vol) are presented in ascending concentration, starting midway through the range, until the patient correctly identifies the odorant-containing stimulus twice in a row, at which point the reversal procedure is initiated. The subject is presented

Single Staircase With Reversal Paradigm

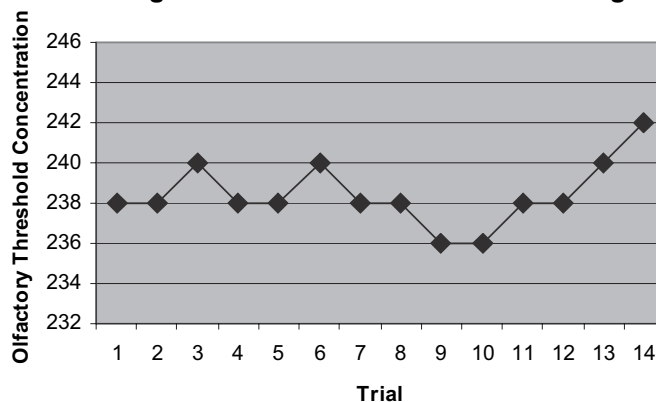


Figure 1. Example of a single staircase with reversal paradigm obtained using an automated, self-administered, validated instrument (OLFACT-RL; Osmic Enterprises Inc, Cincinnati, Ohio) to measure olfactory threshold.

sequentially with 3 stimuli and asked to identify which stimulus differs from the other 2 (1 contains an odorant, the other 2 clean air). If the patient correctly identifies the stimulus, the trial is repeated. If the patient incorrectly identifies the stimulus, on the following trial, the next higher concentration is administered. On the following trial, the patient is presented with the next lower concentration. If the correct response is made, the trial is repeated; if a second correct response is made, the next lower concentration is presented on the following trial. An incorrect response causes a reversal and the next higher concentration is presented on the following trial. Testing is completed when 4 reversals of the staircase have occurred. The OT represents the mean of the last 3 reversals of the staircase. If an incorrect response is made at step 1 (highest concentration), or 2 consecutive correct responses occur at step 12 (lowest concentration), the test is terminated. An increased OT between 242 and 246 (hypo-osmia) means a higher concentration (4%–1% 1-butanol, vol/vol) is needed for detection and the subject is less sensitive to the odor and a decreased OT between 224 and 228 (hyperosmia) means a lower concentration (0.0078125% 1-butanol, vol/vol) is needed for detection and the subject is more sensitive to the odor. The normal OT range is between 230 and 240 (0.5%–0.015625% 1-butanol, vol/vol). Statistical analyses included descriptive statistics (mean and SD) and correlation analysis by the Pearson product moment correlation using SAS statistical software, version 9.1 (SAS Institute Inc, Cary, North Carolina).

A total of 62 patients (median age, 48 years; age range, 13–74 years) were enrolled. Of the patients, 24 (39%) were male and 38 (61%) were female; most subjects were white. No statistical difference in demographic characteristics be-

Authors have nothing to disclose.

Table 1. Data for Olfactory Thresholds, Volume Factors, and Congestion Factors for Rhinitis Subtypes^a

Diagnosis	Olfactory threshold	Volume factor, cm ³	Congestion factor, %
AR (n = 16)	233.9 (4.7)	29.1 (36.6)	26.3 (38.4)
MR (n = 16)	233.9 (4.1)	45.9 (52.5)	67.1 (71.4)
NAR (n = 17)	234.1 (3.6)	57.3 (42.3)	69.0 (50.5)
Control (n = 13)	232.9 (5.6)	ND	ND

Abbreviations: AR, allergic rhinitis; MR, mixed rhinitis; NAR, nonallergic rhinitis; ND, not done.

^aData are given as mean (SD). For olfactory threshold, the normal range is 230 to 240 (decreased, 242–246; and increased, 224–228). For volume factor, the normal range is 0 to 29 cm³ (mild, 30–59 cm³; moderate, 60–89 cm³; severe, 90–119 cm³; and very severe, >119 cm³). For congestion factor, the normal range is 0% to 49% (mild, 50%–74%; moderate, 75%–124%; severe, 125%–179%; and very severe, >179%).

tween groups was observed. Olfactory threshold levels between rhinitis subtypes and control subjects independent of nasal congestion were similar (Table 1) and did not vary with age or sex (data not shown).

In summary, no differences in olfaction between different rhinitis subtype groups were found, indicating that neither impaired nor overactive olfaction is a feature of NAR and that mechanisms other than olfaction account for these patients' aberrant reactivity to odorants. Further investigation is required to develop clinical tools for more precise phenotyping of patients with NAR to better elucidate the underlying mechanisms of this chronic rhinitis subtype.

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TREATMENT OF EOSINOPHILIC ESOPHAGITIS WITH INHALED BUDESONIDE IN A 7-YEAR-OLD BOY WITH CONCOMITANT PERSISTENT ASTHMA: RESOLUTION OF ESOPHAGEAL SUBMUCOSAL FIBROSIS AND EOSINOPHILIC INFILTRATION

Eosinophilic esophagitis (EE) is being increasingly recognized in children and adults with dysphagia, food impaction, vomiting, abdominal pain, and heartburn not responsive to gastric acid suppression. Esophageal biopsy specimens in patients with EE demonstrate intraepithelial eosinophilic infiltration and fibrosis when compared with the specimens of healthy individuals and of patients with gastroesophageal reflux disease.¹ Successful treatment of EE with moderate- to high-dose swallowed inhaled fluticasone propionate has been reported.^{2–4} However, in a recent, randomized, double-blind, placebo-controlled trial,⁵ histologic resolution occurred in only 10 of 20 patients with EE treated with high-dose swallowed fluticasone propionate. In addition, reports of EE being successfully treated with elemental diets, selective elimination diets, anti-interleukin 5 monoclonal antibody, and oral corticosteroids have been published. None of these studies have reported on the outcome of esophageal submucosal fibrosis with therapy. Herein, we present a case of a young boy with asthma and EE successfully treated with 2 months of inhaled dry powder budesonide. Using quantitative image analysis, we demonstrate, for the first time to our knowledge,

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