

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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a marked decrease in submucosal collagen deposition as a result of treatment with topical budesonide.

A 7-year-old boy with allergic rhinitis, moderate persistent asthma, atopic dermatitis, and food allergy to egg, peanuts, and beef, documented since the age of 3 years, presented with dysphagia to solids, vomiting, and abdominal pain for the past several years, not relieved by treatment with lansoprazole. A modified barium swallow and esophagogram revealed stasis of the 12.5-mm barium tablet at the T2 to T3 level of the esophagus. Upper gastrointestinal endoscopy revealed a hazy exudate on the esophageal mucosa, which was friable and dull in appearance. His noncompliant esophagus was resistant to passage of the pediatric endoscope (8.1-mm diameter) beyond 24 cm from the incisors. Multiple biopsy specimens were obtained at 22 cm and revealed EE (>24 eosinophils per high-power field [HPF]), with erosions and marked submucosal fibrosis (Fig 1A and C). His medications at the time of this biopsy included montelukast sodium, an albuterol metered-dose inhaler, 0.1% mometasone furoate cream, lansoprazole, a sucralfate (Carafate) suspension, budesonide nasal spray, and cetirizine hydrochloride. Allergy skin prick testing revealed sensitivity to many inhal-

ant allergens and to previously documented food allergens, including egg, peanut, and beef. His peripheral white blood cell count was 15,700/ μ L, with an absolute eosinophil count of 200/ μ L. His total serum IgE level was 212 IU/mL. Spirometry revealed a forced expiratory volume in 1 second of 93% predicted, with 16% reversibility after treatment with 2.5 mg of nebulized albuterol.

Previous therapy, including elimination of egg, peanuts, and beef, was continued. Treatment with budesonide Turbuhaler, a novel treatment for EE, was initiated at 400 μ g twice daily for 1 month and then tapered to 400 μ g once daily. His symptoms improved significantly within 1 week. A subsequent upper gastrointestinal endoscopy and an esophageal biopsy were performed 2 months later. This revealed improvement in the compliance of the esophagus that, at this time, allowed passage of the pediatric endoscope into the stomach. The esophageal mucosa was without exudate and was no longer friable.

Tissue sections (4- μ m thick) were fixed in neutral-buffered formalin and stained with hematoxylin-eosin for detection of eosinophils or with the Masson trichrome stain for detection of collagen fibrils. Eosinophil counts were performed manu-

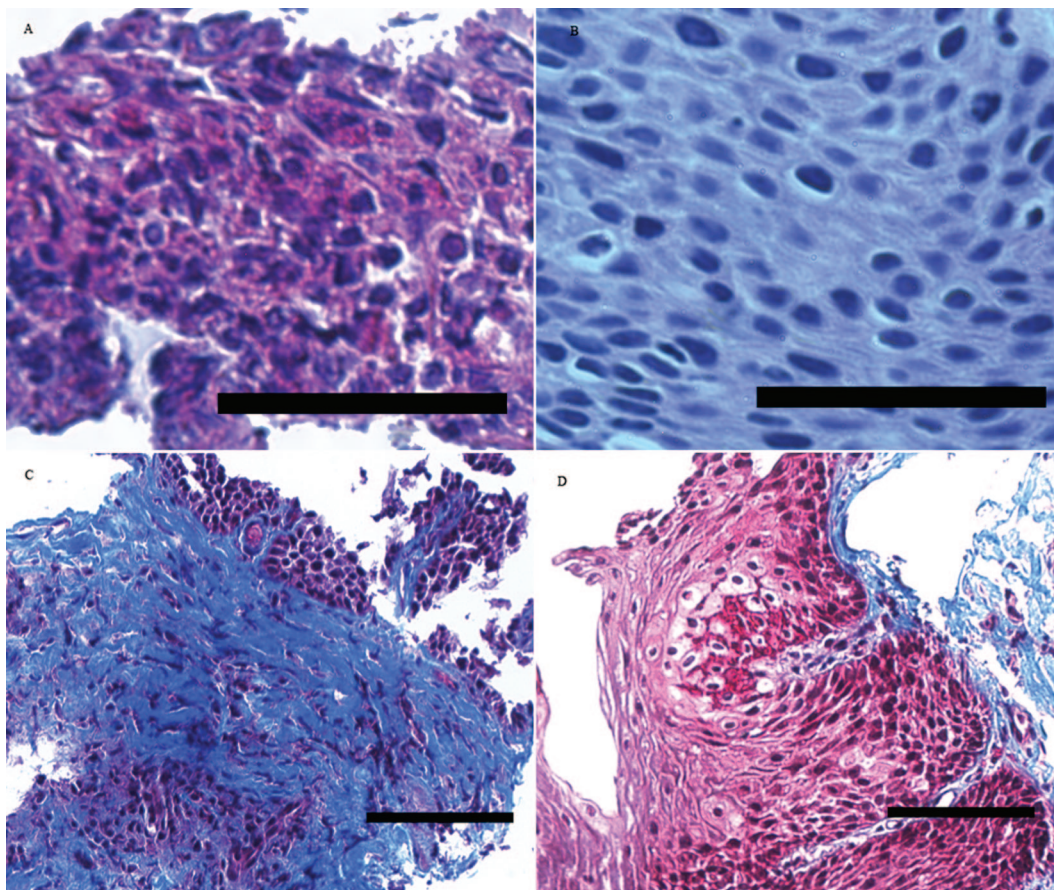


Figure 1. Staining of esophageal biopsy specimens with hematoxylin-eosin (A and B) and the Masson trichrome stain (C and D); specimens are shown before (A and C) and after (B and D) treatment with inhaled budesonide. The scale bar is 50 μ m in A and B and 100 μ m in C and D.

ally. Image analysis of the esophageal biopsy specimens was performed using a microscope (Eclipse E800M; Nikon Instruments Inc, Lewisville, Texas), a camera (model SPOT RT-SECCD; Diagnostics Instruments, Sterling Heights, Michigan), and software (IP lab 3.7; BD Biosciences, Rockville, Maryland). Briefly, the tissue was outlined on a photomicrograph, and an accurate calculation of the surface area was obtained. Image segmentation by hue was performed to quantify the proportion of tissue that stained blue with the Masson trichrome stain.

Pretreatment esophageal biopsy specimens showed 97 eosinophils per $\times 40$ HPF or 16 eosinophils per square millimeter of tissue in the most involved HPF (Fig 1A); 47.2% of the esophageal tissue stained positive with the Masson trichrome stain (Fig 1C).

Posttreatment esophageal biopsy specimens revealed resolution of eosinophilic infiltration, with 5 eosinophils per HPF or 0.5 eosinophils per square millimeter of tissue in the most involved HPF (Fig 1B), and a significant decrease in collagen deposition, with only 19.9% of the esophageal biopsy specimen staining positive with the Masson trichrome stain (Fig 1D). Subsequent spirometry at that time revealed a forced expiratory volume in 1 second of 106% predicted, with no significant reversibility after using the bronchodilator. Fourteen months after his second endoscopy, the boy remained symptom free while taking inhaled budesonide, 400 $\mu\text{g}/\text{d}$.

Further studies are needed to verify the effectiveness of a dry powder inhaler formulation of topical corticosteroid in the treatment of patients with EE and concomitant persistent asthma. We suggest that the use of image analysis for quantification of eosinophilic infiltration and submucosal collagen deposition would be optimal in the design of future studies investigating EE.

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THIMEROSAL IN INFLUENZA VACCINE: AN IMMEDIATE HYPERSENSITIVITY REACTION

Thimerosal is a mercury derivative used as a preservative and bacteriostatic agent. We report an immediate hypersensitivity reaction after skin testing with an adult influenza vaccine that seems to be due to thimerosal. The patient is a 31-year-old woman with seasonal allergic rhinitis and irritable bowel syndrome. She developed conjunctival erythema and local pain after using a thimerosal-containing contact lens solution 15 years before the evaluation. She then switched to and tolerated the same brand of contact lens solution without thimerosal. She received a booster dose of tetanus toxoid (0.05 μg of thimerosal per 0.5-mL dose) 2½ years before this evaluation without any difficulty. Because of her concerns regarding thimerosal, she received a thimerosal-free pediatric influenza vaccine 4 months earlier with no adverse events.

A skin prick test using the full-strength adult influenza vaccine (50 μg of thimerosal per 0.5-mL dose) generated a wheal consisting of a 3-mm induration with 25 mm of erythema with satellite lesions. Within 20 minutes, the patient developed generalized pruritus without hives, throat tightness, and a dry cough without wheezing on auscultation. Although her vital signs were stable, she was diffusely pruritic and short of breath. She was treated with 0.3 mL of epinephrine intramuscularly and 180 mg of fexofenadine orally. All symptoms resolved within 10 minutes. She returned to the clinic 2 months later for further skin testing (results of both sets of skin tests are given in the Table).

Allergic responses to thimerosal have been described, primarily as delayed-type local hypersensitivity reactions.¹ We found 1 case report² of a generalized reaction thought to be due to thimerosal in an influenza vaccine. However, the present patient is different from previous patients. First, the reaction was directly observed and there were no confounding ingestants. Second, we documented an immediate hypersensitivity reaction to the vaccine containing thimerosal and lack of a reaction to a similar vaccine without thimerosal.

Owing to the patient's history of contact sensitivity to thimerosal, the temporal relationship between skin testing with the adult vaccine and the clinically obvious reaction, and the otherwise similar constituents of the adult and pediatric vaccines, we postulate that this reaction was an IgE-mediated immediate hypersensitivity reaction to the thimerosal in the vaccine and that thimerosal probably acts

Authors have nothing to disclose.