

# New Sensitization to House Dust Mites in Cefteram-Induced Occupational Asthma: A Case Report

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Occupational asthma (OA) can improve after cessation of exposure; however, some patients suffer from persistence or aggravation of their asthmatic symptoms. Here we report a case of a new sensitization to house dust mites during the follow-up period in a 37-year-old female patient with OA induced by cefteram pivoxil powder (cefteram powder). She was previously diagnosed with OA caused by inhalation of cefteram powder. Consequently, she left her job and had been well for 9 subsequent years. She began to experience aggravation of her rhinitis and asthmatic symptoms again several months prior to presentation. Her skin-prick test results had converted to strongly positive responses to two types of house dust mites. The serum levels of eosinophil cationic protein (ECP) and the total and specific immunoglobulin (Ig)E levels against the two types of house dust mites were elevated. An inhalation challenge test with *Dermatophagoides farinae* was performed, and significant bronchoconstriction (21.1% reduction in the forced expiratory volume in the first second) with asthma symptoms was observed at 10 minutes. To our knowledge, this is the first case demonstrating a new sensitization to house dust mites in a patient with OA caused by cefteram powder. Regular monitoring, including skin-prick tests and measurement of specific serum IgE/ECP levels, may help to screen potential cases.

**Key Words:** Asthma; cefteram; *Dermatophagoides farinae*; occupation

## INTRODUCTION

Occupational asthma (OA) can improve after cessation of exposure; however, some patients suffer from persistence or aggravation of their asthmatic symptoms even when they have been removed from the workplace.<sup>1</sup> In patients with toluene diisocyanate (TDI)-induced asthma, which is the most prevalent cause of OA in Korea,<sup>2</sup> the development of a new sensitization to common inhalant allergens was found to be associated with chronic persistent asthmatic symptoms.<sup>3,4</sup> Several reports have examined OA due to antibiotics<sup>5,6</sup>; however, few have described the long-term prognosis of OA induced by antibiotics. Here we present a novel case of a new sensitization to house dust mites in a patient with OA caused by cefteram pivoxil powder.

## CASE REPORT

The patient was a 37-year-old woman who had been diagnosed 9 years prior with OA caused by inhalation of cefteram powder.<sup>7</sup> Her skin-prick test at her initial visit revealed negative responses to common inhalant allergens, except for a positive response to cefteram powder (10 mg/mL). She left her work-

place and had been well for 9 subsequent years; her asthma was controlled with a medium dose of inhaled corticosteroid/long-acting  $\beta$ -2 agonist and leukotriene receptor antagonist based on regular follow-up.

She experienced aggravation of her rhinitis and asthmatic symptoms again several months prior to presentation. At presentation, her blood differential count, serum biochemistry, and chest and paranasal sinus radiographs showed no abnormality, with normal lung function. However, her skin prick test results had converted to strongly positive responses to two types of house dust mites: *Dermatophagoides pteronyssinus* (18×14/50×44 mm) and *Dermatophagoides farinae* (18×9/46×46 mm). The total immunoglobulin (Ig)E level was elevated to 119 kU/L (normal: 0–114 kU/L), with high serum specific IgE levels to *D. pteronyssinus* and *D. farinae* of 4.35 and 7.63 kU/L, respec-

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**Table.** Changes in the spirometry results and clinical parameters

Parameters	Year				
	2001	2003	2007	2008	2010
FEV1 (%)	107.35	107.2	100.9	97.1	93.9
Skin prick tests (mm/mm)					
<i>D. pt</i>	2×2/20×14	1×1/10×10	ND	2×2/2×2	18×14/50×44
<i>D. f</i>	1×1/6×4	(-)	ND	(-)	18×9/46×46
Cefteram	22×19/55×43	3×2/26×13	ND	ND	ND
Histamine	6×4/30×25	3×2/21×12	ND	3×2/13×10	3×3/30×16
Total IgE (kU/L)	ND	ND	96	73	119
Specific IgE (kU/L)					
<i>D. pt</i>	ND	ND	<0.35	<0.35	4.35
<i>D. f</i>	ND	ND	<0.35	<0.35	7.63
ECP (μg/L)	ND	ND	4.97	10	23.2
TEC (/μL)	284.07	ND	25.8	35.7	377.3

FEV1, forced expiratory volume in the first second; *D. pt*, *Dermatophagoides pteronyssinus*; ND, not done; *D. f*, *Dermatophagoides farinae*; Ig, immunoglobulin; ECP, eosinophil cationic protein; TEC, total eosinophil count.

tively (normal: <0.35), which had previously been undetectable. The eosinophil cationic protein (ECP) level was elevated to 23.2 μg/L (normal: 0–13.50 μg/L), with a normal peripheral total eosinophil count (377.3/μL), as shown in Table.

We speculated that she was newly sensitized to house dust mites, which aggravated her asthma symptoms. An inhalation challenge test with *D. farinae* was performed, and significant bronchoconstriction (21.1% reduction in the forced expiratory volume in the first second [FEV1]) with asthma symptoms was observed at 10 minutes, with no late asthmatic reaction.

## DISCUSSION

Antibiotics are well known to induce OA in exposed workers.<sup>7–11</sup> Few studies have described the outcome of OA caused by antibiotics, and no published report has demonstrated an OA case presenting a new sensitization to common inhalant allergens. Because of TDI-induced asthma caused by low-molecular-weight agents, >50% of patients with TDI-induced asthma have persistent asthmatic symptoms with long-standing airway inflammation, even with complete avoidance of exposure.<sup>12,13</sup> Additionally, new sensitization to common inhalant allergens was found in 13 TDI-induced asthmatic patients (36%) during a >3-year follow-up period. Most of these patients exhibited persistent asthmatic symptoms, and the house dust mite was the most common sensitizing allergen.<sup>3</sup> These findings suggest that the airway mucosa of these patients have persistent airway inflammation such as epithelial desquamation, which makes these patients vulnerable to new sensitization to commonly exposed inhalant allergens such as indoor allergens. Once sensitization to an occupational agent occurs, incident sensitization to common allergens can also arise.<sup>14</sup> The patient in the present

study displayed persistent asthmatic symptoms with airway inflammation, although she had left her workplace and had taken asthmatic medications. Her airway mucosa may also have been vulnerable to a new sensitization to common inhalant allergens because she had been exposed to the house dust mite, the most common indoor allergen in Korea, which may have induced worsening of airway inflammation. Further studies are needed to understand the mechanism using a large cohort study.

In a review of TDI-induced asthma,<sup>3</sup> the mean onset time of new sensitization was 4.93 years, and the associated risk factor was long duration of asthmatic symptoms before the diagnosis. The prevalence of atopic status was higher in new sensitized group, but not significantly so. In the present study, the patient showed new sensitization to house dust mites after 9 years despite taking regular anti-asthmatic medications and completely avoiding the workplace. She was a non-smoker and non-atopic. She had lived in an ordinary house with a similar level of dust-mite exposure. Regular monitoring for almost 10 years was needed to detect her new sensitization to common allergens. We suggest that OA patients with persistence or aggravation of asthmatic symptoms during follow up should be evaluated for possible new sensitization to common inhalant allergens. Further studies are needed to clarify the risk factors for new sensitization in OA caused by antibiotics in a large cohort study.

To detect such occurrences, regular monitoring using skin-prick tests and specific IgE levels may be helpful.<sup>3,12</sup> The present study suggests that an elevated serum ECP level could be a useful marker for symptom aggravation arising from new sensitization. Numerous studies have shown that ECP is well correlated with the degree of airway inflammation in asthma and the severity of atopy.<sup>15–17</sup> Measuring the ECP level is simpler than us-

ing the skin-prick test or measuring the specific IgE level.

In conclusion, we report a case of a patient with OA induced by ceftoram pivoxil powder who was newly sensitized to house dust mites. We suggest that OA patients with persistence or aggravation of asthmatic symptoms during follow up should be evaluated for possible new sensitization to common inhalant allergens.

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