Efficacy and safety relative to placebo of an oral formulation of cetirizine and sustained-release pseudoephedrine in the management of nasal congestion


Background  The aim of this study was to assess the clinical efficacy of an oral formulation of cetirizine 5 mg with sustained-release pseudoephedrine (PSE) 120 mg relative to placebo in patients with nasal congestion. Methods  Twenty-four patients with perennial rhinitis due to house-dust-mite (HDM) allergy were recruited in this crossover study. A treatment period of 1 week, in which cetirizine/PSE was administered twice daily, was followed by a washout period of at least 2 weeks and a further period of 1 week in which the alternative treatment was given to each patient. Immediately after the first dose of each medication (day 1), nasal congestion and related symptoms were assessed during a 7-h challenge with HDM feces, with the Vienna Challenge Chamber (VCC), to investigate onset of action of the preparation. A second challenge of 3-h duration, carried out at least 12 h after the final dose, was undertaken after 1 week (mean) of twice-daily treatment to assess residual effects of the formulation after achievement of steady state. Results  The oral formulation of cetirizine/PSE was significantly (P<0.001) superior to placebo in improving nasal obstruction during both challenges. The improvement in nasal airflow and nasal patency was significantly greater with cetirizine/PSE than with placebo (P<0.02). In addition, subjective assessment of nasal symptoms showed that cetirizine/PSE was significantly superior to placebo in both challenges for the sum of nasal obstruction scores (P<0.01). Both medications were well tolerated, and no serious adverse events occurred during the study. Conclusions  In this study, cetirizine/PSE relieved nasal congestion and other objective and subjective symptoms to a significantly greater extent than placebo. No serious adverse events occurred, and both regimens were equally well tolerated.

Cetirizine is a potent second-generation histamine (H_{1})-receptor antagonist, with negligible affinity for serotonergic and cholinergic receptors (1, 2), that is unlikely to be associated with the central nervous system and anticholinergic adverse effects of the first-generation antihistamines (e.g., chlorpheniramine and diphenhydramine) (3, 4). Cetirizine inhibits the migration of inflammatory cells in the skin (5) and bronchi (6), and inhibits the expression of adhesion molecules in the conjunctiva (7). Cetirizine has also been shown to reduce sneezing, nasal pruritus, and rhinorrhea considerably when used alone for the relief of the symptoms of both perennial and seasonal rhinitis at a dosage of 10 mg/day (8–11). Pseudoephedrine, an orally effective nasal decongestant with an action similar to that of ephedrine, has a rapid onset of action and shows less pronounced sympathomimetic
effects than ephedrine (4). The safety of pseudoephedrine has been demonstrated in a retrospective study of 100,000 prescriptions in three age groups (12), and the recommended dosage for slow-release preparations in adults and children aged 12 years and over is 120 mg twice daily (13).

Nasal congestion is present in various disorders, including the common cold, allergic or nonallergic rhinitis, and sinusitis. Although antihistamines reduce nasal vascular permeability and mucus production, they are associated with low efficacy in nasal congestion (14). Increases and decreases in nasal patency depend on changes in the sympathetic innervation that normally maintains the venous sinusoids at half their maximum contractile state (14). Thus, although α-adrenergic agonists such as pseudoephedrine do not alleviate sneezing and nasal discharge, they possess vasoconstrictive properties that reduce the supply of blood to and the extent of edema of the nasal mucosa (4). A combination of 5 mg of cetirizine and 120 mg of sustained-release pseudoephedrine, twice daily, has been shown to be more effective than either agent administered alone in the management of allergic rhinitis (15).

This study was a double-blind, placebo-controlled, crossover investigation to determine the efficacy and any residual effects after achievement of steady state of such a formulation when used in the relief of nasal congestion. The house-dust-mite (HDM) feces challenge in the Vienna Challenge Chamber (VCC) (16) was chosen as a suitable model for the evaluation of the efficacy of cetirizine with pseudoephedrine in these patients.

Material and methods

Subjects

Twenty-four adult patients, 10 male and 14 female, aged 18.4–32.5 years (mean 24.4 years), with a mean 10.5-year history of perennial allergic rhinitis due to HDM were randomized. Sensitivity to HDM was confirmed by anamnesis, radioallergosorbent testing (RAST), and skin prick testing performed in the 5 weeks preceding enrolment. Patients were recruited, and assessments carried out, outside the pollen season. Exclusion criteria were lactation and pregnancy, chronic disease that might interfere with the trial outcome (such as diabetes mellitus, asthma, or epilepsy, as well as renal, hepatic, or cardiac dysfunction), known allergy to cetirizine or other piperazines and pseudoephedrine, increased intraocular pressure, urinary retention, and drug or alcohol abuse. The current use, or use within the preceding 30 days, of any prescribed medication (with the exception of oral contraceptives, which were being taken by all female patients) was not permitted (particular emphasis was placed on patients receiving monoamine oxidase inhibitors or reserpine, and those receiving antibacterial treatments). Other drugs not allowed (with exclusion periods before the start of the study) were menthol (1 h), astemizole (6 weeks), other antihistamines (7 days), systemic corticosteroids (1 month), topical corticosteroids (2 weeks), and sympathomimetic agents (1 day).

Approval was obtained from the ethics committee of the University of Vienna, and the study was carried out in accordance with the Declaration of Helsinki. EEC rules for good clinical practice and local legislative requirements were adhered to. Information was given to and written informed consent obtained from each patient. The VCC complied with the recommendation for specific challenge rooms of the Subcommittee on Bronchoprovocation of Occupational Asthma (17).

Each patient was allocated to one of two groups by block randomization in a double-blind fashion. Patients then received either the formulation of cetirizine 5 mg with sustained-release pseudoephedrine 120 mg (cetirizine/pseudoephedrine) or a matched placebo twice daily for 1 week, followed by a washout period of at least 2 weeks before crossover to the alternative treatment for a further week. In each study period, the first challenge (7-h duration) took place directly after administration of the first dose, with the medication being given every 12 h for a mean of 1 week thereafter. The second challenge (3-h duration) took place 12 h after administration of the final dose. Compliance was monitored by counting of remaining capsules.

Challenge procedure

The VCC is a closed room where up to 12 patients at a time can be subjected to allergenic challenge under controlled and reproducible conditions for several hours (18). Patients in the VCC are under the constant supervision of staff who remain outside the room. Communication is possible through a window and via an intercom system. The chamber is charged with indoor air which is cleaned, cooled (24°C), and dried (30% humidity), and then loaded with a quantitatively determined amount of sensitizing material, the concentration of which, together with temperature and humidity, is monitored every 5 min.

The HDM challenge model in the VCC was first described in 1994 (16). In this study, the same HDM grains batch as for diagnostic purposes (by Allergon AB, Engleholm, Sweden) was used to provide a stable concentration (110 ng/m³) of Der p 1 throughout the challenge. Compared with normal daily
exposure in the bedroom, this is a proportionally high concentration (16). The distribution of HDM throughout the VCC was maintained at a constant and reproducible level by a special dispersal technique to ensure inhalation of similar amounts of material by each patient.

Two challenges were included in each treatment period. The first challenge was undertaken to investigate the onset of action of the trial medication, and took place directly after administration of the first dose. The second challenge, performed after 7 days of treatment, was administered 12 h after the final dose to study residual effects. It should be noted that, in addition to the periodic challenges experienced in this study, patients would also have been exposed to HDM day by day in their own home environments.

Digital imaging

During the first challenge, nasal airway permeability was determined by digital imaging at 0 (baseline), 1, 3, 5, and 7 h with a cold light source (Highlight 3000; Olympus Optical Co.) and spectral analysis by WCUE-3 software (Olympus Optical Co.). Images from a video enoscope (Wolf; Gleichen), mounted on a micromanipulator to guarantee reproducible imaging of the nasal cavity, were analyzed with a digital frame grabber (Matrox Magic, modified by Galai, Olympus Optical Co.). Before the evaluation, linear filters were used to increase optical resolution. In addition, airway patency was evaluated by planimetry scanning hardware with software devised by Poulsen (19). Airway patency was evaluated as the sum of both nostrils (between the septum and inferior turbinate) and expressed as area (mm²). Digital images were also assessed on a 7-point scale by five ENT specialists individually. The extent of reduction of the free airway section from baseline was denoted by up to three minus signs, and the extent of increase of the free airway section from baseline was denoted by up to three plus signs. No change was indicated by 0.

Anterior rhinomanometry

Active anterior rhinomanometry offers a very sensitive method to assess the objective clinical parameters of nasal obstruction (nasal flow, nasal resistance, and nasal flow decrease). Nasal flow and nasal resistance are observed at pressures of 75, 150, and 300 Pa.

In active anterior rhinomanometry, the patient, wearing an airtight face mask and having the mouth closed, breathes through one nostril to evaluate the nasal flow while a sensor in the other nostril is used to measure the difference in prenasal and choanal pressure. The device (Rhinotest MP 441, Allergopharma Joachim Ganzer KG, Germany) used is connected to a DAS-based PC System. Transducer signals of transnasal airflow and pressure are amplified and digitized, allowing on-screen control, immediate printing, and saving of data for statistical purposes with a Gupta database.

Nasal airflow was measured immediately before, every 30 min during, and additionally 9 h after the start of each challenge at a sample pressure of 150 Pa.

Spirometry

Forced expiratory volume in 1 s (FEV₁) was measured immediately before patients entered the VCC and every 30 min during each challenge session for safety reasons. A further reading was taken 9 h after the start of each challenge.

Objective and subjective symptoms

Nasal secretions were measured every 30 min by weighing of handkerchiefs, and subjective symptom scores were recorded on diary cards every 15 min. The severity of these symptoms (running nose, blocked nose, sneezing, nasal itching, and eye itching) was recorded on a 4-point scale where 0 indicates no discomfort and 3 indicates severe discomfort. The patient's subjective global condition was scored on a 100-mm visual analog scale (VAS) where 0 mm indicates no discomfort and 100 mm indicates extreme discomfort.

Blood pressure

Seated systolic and diastolic blood pressures were used as an objective tolerability parameter, and were measured at the beginning and end of each challenge session.

Adverse events

Adverse events were recorded continuously from the investigator's observations and questioning at the time of each visit.

Data processing and statistics

All statistical tests were two-tailed at the 5% level of significance. Analysis of variance was used where a normal distribution and homogeneity of variance could be demonstrated.

Area under the parameter compared to the time curve (AUC) was calculated for each patient for nasal airflow and patency for the duration of each
Table 1. Results (mean ± standard deviation) for subjective symptoms and objectively measured parameters after allergenic challenge following single dose of cetirizine 5 mg with pseudoephedrine 120 mg or placebo (challenge 1). Unless stated otherwise, value given is sum of all observations for 7-h study period.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Active treatment</th>
<th>Placebo</th>
<th>P value (active treatment vs placebo)</th>
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</thead>
<tbody>
<tr>
<td>Subjective symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal obstruction score</td>
<td>34.2±16.9</td>
<td>49.5±14.7</td>
<td>0.0013</td>
</tr>
<tr>
<td>Running nose score</td>
<td>26.4±16.3</td>
<td>40.8±16.8</td>
<td>0.0021</td>
</tr>
<tr>
<td>Itching nose score</td>
<td>23.6±17.7</td>
<td>38.4±19.1</td>
<td>0.0068</td>
</tr>
<tr>
<td>Sneezing score</td>
<td>12.1±13.1</td>
<td>26.4±15.5</td>
<td>0.0022</td>
</tr>
<tr>
<td>Overall sum of nasal symptom scores</td>
<td>96.3±53.7</td>
<td>155.1±53.6</td>
<td>0.0004</td>
</tr>
<tr>
<td>Itching eyes score</td>
<td>10.8±14.2</td>
<td>13.8±17.8</td>
<td>0.2300</td>
</tr>
<tr>
<td>Overall subjective symptoms (VAS)</td>
<td>698.1±256.1</td>
<td>1136.2±259.1</td>
<td>0.0002</td>
</tr>
<tr>
<td>Rating of digital images (score)</td>
<td>27.4±16.5</td>
<td>43.4±11.9</td>
<td>0.0004</td>
</tr>
<tr>
<td>Objective parameters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal airflow at 150 Pa (cm²/s)-h*</td>
<td>282.277±74.588</td>
<td>216.597±68.102</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Nasal secretions (g-h)*</td>
<td>508.5±631.5</td>
<td>924.2±1072.8</td>
<td>0.0003</td>
</tr>
<tr>
<td>Nasal patency: sum of left and right nostrils (mm²·h)*</td>
<td>301.8±149</td>
<td>247.7±122.8</td>
<td>0.0009</td>
</tr>
<tr>
<td>FEV₁ (l-h)*</td>
<td>1544±416</td>
<td>1517±253</td>
<td>0.2144</td>
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</tbody>
</table>

*Calculated as areas under parameter vs time curves.

challenge. Sums of nasal secretions were calculated for each challenge, and sums of scores were calculated for nasal symptoms and VAS. Results were additionally collated for the first 3 h of the first challenge period. For all parameters, final readings were taken at 9 h (2 h after the end of the first challenge period and 6 h after the end of the second).

Results

Of the 24 patients who entered the study, three withdrew (one for personal reasons, one because of adverse events after receiving cetirizine/pseudoephedrine [see adverse events section], and one as a precaution against a risk perceived by the patient of respiratory complications) after the first study period and were excluded from the efficacy evaluation. For all efficacy parameters, results were obtained during and up to 9 h after the start of each challenge.

Subjective symptoms

For challenge 1 (7-h observation after a single dose), the statistically significant superiority of cetirizine/pseudoephedrine over placebo was observed for all efficacy parameters scored by patients, with the exception of itching eyes (Table 1). In general, as shown in Table 2, similar results were obtained after the second challenge (3-h observation after multiple doses). During both challenges, VAS scores indicated that patients receiving placebo experienced a level of discomfort at least 50% greater than that experienced by those receiving cetirizine/pseudoephedrine (Tables 1 and 2). As shown in Fig. 1 (mean total nasal symptom score), greater symptomatic improvement with cetirizine/pseudoephedrine than with placebo was maintained throughout the period of observation for each challenge. In particular, marked differences in nasal congestion scores were seen between cetirizine/pseudoephedrine and placebo (34.2 vs 49.5 [P=0.0013] for challenge 1, and 15.4 vs 20.3 [P=0.0015] for challenge 2).

There were no significant differences between study groups 9 h after the start of either challenge for all subjective parameters.

Objective efficacy parameters

For both challenges (as shown in Tables 1 and 2), AUCs for nasal airflow were approximately 30% higher after cetirizine/pseudoephedrine than after placebo (282.277 vs 216.597 [cm²/s]·h; P<0.0001 for challenge 1, and 122.639 vs 96.754 [cm²/s]·h; P=0.0001 for challenge 2), and nasal airflows were similar for both treatment groups at 9 h for both challenges (i.e., several hours after the end of the HDM challenge). Mean flows during each challenge are shown in Fig. 2. The leveling off of the deterioration in nasal airflow in challenge 1 indicates a rapid onset of action (approximately 30 min) for cetirizine/pseudoephedrine.

Total nasal secretions were considerably higher with placebo during both challenges (Fig. 3). Nasal patency, expressed as the AUC of the free nasal airway area against time between the septum and inferior turbinate, was at least 20% greater in...
Cetirizine and sustained-release pseudoephedrine

Table 2. Results (mean ± standard deviation) for subjective symptoms and objectively measured parameters after allergenic challenge following multiple doses of cetirizine 5 mg with pseudoephedrine 120 mg or placebo (challenge 2). Unless stated otherwise, value given is sum of all observations for 3-h study period

<table>
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<tr>
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<td>20.3±7.1</td>
<td>0.0015</td>
</tr>
<tr>
<td>Running nose score</td>
<td>8.9±8.9</td>
<td>15.9±8.3</td>
<td>0.0018</td>
</tr>
<tr>
<td>Itching nose score</td>
<td>10.8±8.2</td>
<td>15.2±8.9</td>
<td>0.0759</td>
</tr>
<tr>
<td>Sneezing score</td>
<td>3.5±6.4</td>
<td>9.6±8.5</td>
<td>0.0083</td>
</tr>
<tr>
<td>Overall sum of nasal symptom scores</td>
<td>38.5±25.5</td>
<td>61.1±23.9</td>
<td>0.0021</td>
</tr>
<tr>
<td>Itching eyes score</td>
<td>4.3±6.8</td>
<td>7.4±8.9</td>
<td>0.0020</td>
</tr>
<tr>
<td>Overall subjective symptoms (VAS)</td>
<td>297.1±166.2</td>
<td>455.1±130.9</td>
<td>0.0002</td>
</tr>
<tr>
<td>Rating of digital images (score)</td>
<td>8.2±5.9</td>
<td>7.4±4.4</td>
<td>0.6113</td>
</tr>
</tbody>
</table>

Objective parameters

<table>
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<tr>
<th>Parameter</th>
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<th>Pvalue (active treatment vs placebo)</th>
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<tbody>
<tr>
<td>Nasal airflow at 150 Pa (cm²/s) h⁺</td>
<td>122.639±29.028</td>
<td>98.754±30.941</td>
<td>0.0001</td>
</tr>
<tr>
<td>Nasal secretions (g h⁻¹)</td>
<td>162±327.6</td>
<td>362±327.6</td>
<td>0.0035</td>
</tr>
<tr>
<td>Nasal patency: sum of left and right nostrils (mm² h⁻¹)</td>
<td>159.5±87.8</td>
<td>129.9±75.6</td>
<td>0.0112</td>
</tr>
<tr>
<td>FEV₁ (L)</td>
<td>66±170</td>
<td>649±146</td>
<td>0.023</td>
</tr>
</tbody>
</table>

*Calculated as areas under parameter vs time curves.

patients who had received cetirizine/pseudoephedrine than in those who had received placebo (Tables 1 and 2) (Fig. 4). The ENT specialists’ ratings of the digital images showed statistical significance during the first challenge only.

No significant difference was observed between groups for mean (AUC) FEV₁ in the first challenge (Table 1). However, there was a small but statistically significant difference in favor of cetirizine/pseudoephedrine in the second challenge (Table 2). Systolic and diastolic blood pressures showed no statistically or clinically significant changes from baseline throughout.

**Adverse events**

Adverse events, all of which resolved after the study, were reported in 15 patients (62.5%). The total number of patients reporting at least one adverse event was 13 for cetirizine/pseudoephedrine and 16 for placebo. One patient left the study because of moderate vesical spasm, disturbed micturition, severe dry mouth, agitation, anxiety, and shaking chills. These effects were believed to be associated with the study medication. Adverse events were of a mild to moderate nature in all other patients and did not necessitate withdrawal from treatment. Bronchospasm was most frequent, being reported on 17 occasions by 10 patients. Other mild to moderate events, reported once only, included dry mouth, agitation, anxiety, nervousness, vesical spasm (known to be associated with pseudoephedrine [13]), and tiredness. Mild stomach pain was reported three times by the same patient after both cetirizine/pseudoephedrine and placebo, and moderate stomach pain, considered likely to be associated with cetirizine/pseudoephedrine, was reported on one occasion. Effects on resting systolic and diastolic blood pressure were similar for cetirizine/pseudoephedrine and placebo.

![Fig. 1. Development of mean total nasal symptom scores during house-dust-mite (HDM) challenge. Each point represents aggregate score (total possible score of 12) for symptoms (rhinorrhea, itching nose, sneezing, and nasal obstruction). Each individual item was scored on 4-point scale where 0 = no discomfort and 3 = severe discomfort. VCC: Vienna Challenge Chamber.](image)
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Fig. 2. Development of mean nasal airflow rates measured by anterior rhinomanometry at 150 Pa during HDM challenges; VCC: Vienna Challenge Chamber.

Fig. 3. Mean weight of nasal secretions during HDM challenge; VCC: Vienna Challenge Chamber.

Discussion

Although rhinitis and sinusitis are not life-threatening disorders, they are a leading cause of restricted activity and loss of productivity at work, home, and school, and most patients who present with nasal or sinus disease also complain of nasal congestion. The scale of the potential problems associated with this type of disorder is shown by the estimated 40 million patients with nasal disorders and the 33 million annual clinic visits in the USA alone (14).

The suitability of the model chosen in this study for the investigation of the efficacy of cetirizine/pseudoephedrine in nasal congestion is illustrated by the high prevalence of HDM in the home environment, with large amounts of material being found in bedding, mattresses, and carpeting (4). However, exposure of patients to HDM in a controlled and reproducible manner is not possible under normal living conditions, and the VCC, described for the first time in 1987 (18), provides an environment in which patients can be subjected to reproducible stimuli that induce rhinitis and nasal congestion. The availability of such facilities enables investigators to make direct comparisons of different therapies for the relief of these symptoms.

Two of the measures chosen for this study, anterior rhinomanometry and nasal secretion weight, are well-known objective techniques for the assessment of nasal congestion and rhinitis. Although rhinomanometry has been criticized for not yielding reliable results in some patients, this has been attributed to the effects of nasal cycling and posture (21). The natural nasal cycle was accounted for in this study by calculating AUC for the sum of right and left nostrils, and data are available to show close correlation between symptom scores for nasal congestion, nasal cytology, and objectively measured inspiratory nasal resistance increase (21).

Nasal airway digital imaging is a new, elegant, and very discriminating method for the visualization and quantification of the free cross-sectional area of the nasal valve (i.e., the flow-limiting area of the upper respiratory tract). The sum of left and right nasal patencies was considered in order to account for nasal cycling. The similarity between data obtained by anterior rhinomanometry and the digital imaging technique for nasal patency should be noted. These objective data also correlated with patients' subjective scores of nasal obstruction (an attempt to score the overall sensation of congestion in the nasopharynx). Indeed, the trend toward improvement across the parameters measured reflects the relief of nasal congestion seen with cetirizine/pseudoephedrine. After 1 week of treatment with cetirizine/pseudoephedrine, the actively treated group started challenge 2 with superior nasal airflow rates and in better overall symptomatic condition compared with patients who had received placebo (Fig. 2), and showed a reaction...
pattern similar to that seen in the first challenge. Furthermore, no priming effects and no late-phase reactions were seen in either patient group.

The plots of nasal secretion weight vs time (Fig. 3) and nasal airflow at 150 Pa vs time (Fig. 2) in challenge 1 both show clearly the rapid onset of action of cetirizine/pseudoephedrine (shown by the rapid attainment of clinical efficacy compared with placebo), approximately 30 min after administration. Further inspection of Figs. 1–4 shows the residual therapeutic effect of cetirizine/pseudoephedrine 12 h after administration (as seen in the second challenge) to be equivalent to the effect seen 7 h after the first dose (as seen in challenge 1). This indicates a long duration of action for the formulation used, with relief of nasal congestion (indicated by nasal airflow in Fig. 2) being maintained across the 12-h dose interval after steady-state plasma levels have been attained. The half-life of pseudoephedrine is normally 5–8 h, but the formulation used in this trial guarantees the sustained release of pseudoephedrine and consecutively the long-lasting effectiveness in relieving nasal congestion.

All objective criteria showed highly significant improvements relative to placebo with cetirizine/pseudoephedrine. Improvements for both challenge periods were also clearly evident for most subjective parameters. Although a statistically significant advantage was not shown for nasal itching in challenge 2 and ocular pruritus in challenge 1, there was a strong trend in favor of cetirizine/pseudoephedrine in both instances. The reasons for the lack of statistical significance for the rating of digital images by five ENT specialists in challenge 2, and of the apparent disparity between the results of this test and all other objective parameters of nasal congestion in challenge 2 (as well as the subjective nasal obstruction scores), are unclear. However, it should be noted that this rating of digital images was based on the subjective opinions of individual clinicians, and was thus likely to be less reliable or consistent than the objective measures used. Furthermore, there was good agreement overall between objective data and subjective symptoms.

Although there were three withdrawals, only one was related to adverse events after administration of cetirizine/pseudoephedrine. Most of the adverse events comprised mild to moderate bronchospasm, a reaction that is not unexpected in patients undergoing the type of provocation used in this study. It is interesting that, in this study, cetirizine/pseudoephedrine was associated with significantly higher FEV₁ values in challenge 2. In addition, of the episodes of bronchospasm recorded, 11 were seen with placebo and only six with cetirizine/placebo. Significantly, cetirizine/placebo also compares favorably with two other comparable treatments investigated previously for the relief of nasal congestion (22), in that there was no increase relative to placebo in resting systolic or diastolic blood pressure with cetirizine/pseudoephedrine. This concurs with previous data that show pseudoephedrine to be well tolerated by patients with controlled hypertension (23).

In conclusion, the combination of cetirizine/pseudoephedrine was significantly more effective than placebo after single and multiple doses in the relief of nasal congestion and other objective and subjective nasal parameters in this study of patients sensitive to HDM. Furthermore, a time of onset of action after the first dose of approximately 30 min was indicated by nasal airflow results in challenge 1. The incidence of adverse events was similar for cetirizine/pseudoephedrine and placebo.

Therefore, cetirizine/pseudoephedrine is effective in the management of nasal congestion and is suitable for further investigation, including comparisons with other agents, using the VCC model. These results also indicate a long duration of action for this formulation of cetirizine/pseudoephedrine that ensures consistent and sustained relief of symptoms over the 12-h interval between doses.

References