Respiratory Effects of Oral Capsaicin in Asthmatics Using Forced Spirometry

By Mike Chism
ABSTRACT

The bronchodilating effects of oral capsaicin (CAP) were analyzed by a repeated measures test on five subjects with obstructive airway disease and six non-asthmatic subjects. The subjects gave a baseline spirometry assessment, were administered 600 mg capsaicin, and gave more spirometry assessments at 30, 45, and 60 minutes. There were no significant differences in forced vital capacity (FVC), forced expiratory volume in one second (FEV₁), or peak flow (FEV₁/FVC). Side effects were seen in two subjects after administration of capsaicin. None of the side effects were considered clinically serious and none required treatment. Initial studies suggest that oral administration of capsaicin does not cause a significant difference in the peak flow, but continuing studies that involve induced asthma attacks and stress tests may help better understand the effects of capsaicin.

INTRODUCTION

Approximately seven percent of all Americans suffer from asthma (3). Nearly 300 million people worldwide are currently affected and the disease is estimated to increase to 400 million people by 2025 (10). Airway obstruction in asthma and the consequent symptoms of cough, shortness of breath, chest tightness, and wheezing are caused by a combination of airway smooth-muscle constriction and inflammation of the bronchi (4). Attacks can be prevented with a wide variety of drugs which relax the smooth muscle lining of the bronchi, decreasing air flow resistance. Asthma medications are classified according to their roles in the overall management of the disease. Some drugs act to relieve symptoms quickly while other are used for long-term control (9). The most widely-used quick relief β-adrenergic agonists are albuterol, levalbuterol, and perbuterol. They have an onset of action in five minutes or less, a peak effect in 30 to 60 minutes with a duration of action of four to six hours (9). Epinephrine is also a quick relief β-adrenergic agonists and is nearly as effective as albuterol in terminating an acute episode of airway obstruction (5). Epinephrine significantly increases forced vital capacity, forced expiratory volume in one second, maximal expiratory flow rate and maximal mid-expiratory flow (2).

Capsaicin increases excretion of epinephrine in the body by 81% which may affect smooth muscle relaxation in the lungs (8). Capsaicin, the pungent ingredient found in chili peppers, enhances
lipid and energy metabolism via catecholamine secretion from the adrenal medulla through sympathetic activation of the central nervous system increasing epinephrine secretions (6, 7, 11). The purpose of this study was to evaluate the bronchodilating effects of capsaicin administered orally to asthmatic and non-asthmatic subjects.

MATERIAL AND METHODS

This study was approved by the Human Subject Review Board of the Brigham Young University of Hawaii. Written informed consent forms were obtained from all the test subjects. Volunteers including those with asthma as gauged by the American Thoracic Society guidelines and non-asthmatic subjects were invited to participate in the study (1). Eleven volunteers, ranging in age from 21-26, male and female, were included in the study. Test subjects were instructed to avoid use of long-acting \( \beta \)-agonists, oral antihistamines and oral bronchodilators 24 hours before each visit. All respiratory tests took place in the evening.

Three spirometry assessments were taken the day of the examination immediately before the administration of capsaicin as a baseline reading. The subjects were administered 600 milligrams of capsaicin (Solaray Cool Cayenne 100,000 heat-unit dietary supplement) with a full glass of water. Three assessments of spirometry were made at 30 minutes, 45 minutes, and 60 minutes post capsaicin administration. The best of the three assessments of forced vital capacity (FVC), forced expiratory in one second \( (FEV_1) \), and peak flow \( (FEV_1/FVC) \) were recorded.

A repeated measures ANOVA was used to determine if there was a significant difference between the baseline and each time increment after the administration of capsaicin. The asthmatic and non-asthmatic subjects were separated and analyzed again by a repeated measures test.
RESULTS

There was a significant difference between the forced expiratory volume in one second (FEV1) for the 11 subjects (p=0.0). There were no significant differences between the FEV1s in the baseline assessment and each time increment post administration of capsaicin (p=0.723). The asthmatic subjects did not show a significant difference between the FEV1 pre and post administration of capsaicin (p=0.433) with baseline mean of 3.78 L and a 45 minutes assessment of 3.82 L. The non-asthmatic subjects did not show a significant difference between the FEV1 pre and post administration of capsaicin (p=0.207) with baseline mean of 3.75 L and a 45 minute assessment of 3.71 L.

There was a significant difference between the forced vital capacity (FVC) for the 11 subjects (p=0.0). There were no significant differences between the FVCs in the baseline assessment and each time increment post administration of capsaicin (p=0.78). The asthmatic subjects did not show a significant difference between the FEV1 pre and post administration of capsaicin (p=0.91) with baseline mean of 4.76 L and a 45 minutes assessment of 4.72 L. The non-asthmatic subjects did not show a significant difference between the FEV1 pre and post administration of capsaicin (p=0.32) with baseline mean of 4.26 L and a 45 minute assessment of 4.19 L.

There were no significant differences between peak flows (FEV1/FVC) after administration of capsaicin to the eleven subjects (p=0.86). There were no significant differences between the peak flow in the baseline assessment and each time increment post administration of capsaicin (p=0.86). The asthmatic subjects did not show a significant difference between the FEV1 pre and post administration of capsaicin (p=0.72) (table 1, figure 1) with baseline mean of 79.4% and a 45 minutes assessment of 81.4%. The non-asthmatic subjects did not show a significant difference between the FEV1 pre and post administration of capsaicin (p=0.50) (table 2, figure 2) with baseline mean of 88.8% and a 45 minute assessment of 88.8%.
There were two asthmatic subjects that demonstrated mild obstruction during the examination. There were no significant differences between the FEV1 in the baseline assessment and each time increment post administration of capsaicin in the two individuals (p=0.58) with a baseline mean of 3.48 L and a 45 minute assessment of 3.49 L. There were no significant differences between the FVC in the baseline assessment and each time increment post administration of capsaicin (p=0.42) with a baseline mean of 4.58 L and a 45 minute assessment of 4.57 L. There were no significant differences between the peak flow in the baseline assessment and each time increment post administration of capsaicin in the two (p=0.12) with a baseline mean of 78.1% and a 45 minute assessment of 75.3%.

Table 1 - The peak flow (FEV1/FVC) over time in asthmatic subjects. There was no significant increase when capsaicin was administered.

<table>
<thead>
<tr>
<th>Time</th>
<th>Baseline (peak flow)</th>
<th>30 min (peak flow)</th>
<th>45 min (peak flow)</th>
<th>60 min (peak flow)</th>
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<tr>
<td>Subject 1</td>
<td>81%</td>
<td>80%</td>
<td>80%</td>
<td>79%</td>
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<td>Subject 2</td>
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<td>84%</td>
<td>81%</td>
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<tr>
<td>Subject 4</td>
<td>73%</td>
<td>72%</td>
<td>71%</td>
<td>67%</td>
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<tr>
<td>Subject 5</td>
<td>83%</td>
<td>80%</td>
<td>91%</td>
<td>93%</td>
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</tbody>
</table>
Table 2 – The peak flow over time in non-asthmatic subjects. There was no significant increase when capsaicin was administered.

<table>
<thead>
<tr>
<th>Time</th>
<th>Baseline (peak flow)</th>
<th>30 min (peak flow)</th>
<th>45 min (peak flow)</th>
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<tbody>
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Figure 1 – The peak flow over time in asthmatic subjects.
Figure 2 – The peak flow over time in non-asthmatic subjects.

CONCLUSION

There were no significant differences in the non-asthmatic subjects and this was expected. There were no significant differences between the peak flows for the asthmatic in this study. There were two asthmatic subjects that demonstrated mild obstruction of airflow in the baseline assessment of spirometry. Subject five significantly increased peak flow after 60 minutes and subject four did not respond to capsaicin. It is possible that subject four was a nonresponder and subject five was a responder. The asthmatic subjects avoided use of long-acting β-agonists, oral antihistamines and oral bronchodilators 24 hours before each visit, however, asthmatic subjects had no significant air flow constriction. Induced bronchial constriction pre administration of capsaicin may allow us to better determine capsaicin effects.

Capsaicin increases epinephrine excretion by 81% when ten grams of capsaicin is consumed (8). There was a significant lower dose of capsaicin given and no plasma epinephrine samples were taken. It
is unkown if the subjects’ plasma epinephrine increased due to the administration of capsaicin. The capsaicin caused abdominal pains in three of the subjects and burning in the throat in another subject, but no medical treatment was required. Follow-up studies may involve induced bronchoconstriction or a stress test before administration of capsaicin to determine if changes in peak flow occur. In conclusion, there were no significant differences post-administration of capsaicin in asthmatic subjects, but further tests must be conducted to confirm these results.

ACKNOWLEDGEMENTS

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REFERENCES


