

Clinical Communications

Cannabis allergy in a child with asthma chronically exposed to marijuana

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Clinical Implications

- Secondhand cannabis allergy may be a cause of undercontrolled asthma in children who are passively exposed to marijuana. Clinical response can be achieved by removing cannabis from the child's environment.

TO THE EDITOR:

Secondhand cannabis exposure is increasing as personal use becomes legalized in more states and countries. To date there have been a small number of reports^{1,2} describing secondhand cannabis allergy in children on the basis of acute exposure-response and/or positive testing, but none have reported an impact on chronic asthma. We present a case of secondhand cannabis allergy in a young child associated with chronic worsening of his asthma, which improved only after complete removal of cannabis from his environment.

A 6-year-old boy with a history of severe asthma, atopic dermatitis, and allergic rhinitis with sensitization to elm, cottonwood, alternaria, cat, and dog was closely followed in our clinic for poorly controlled asthma. His medications were escalated stepwise to a combination of mometasone/formoterol 200/5 µg/act 2 puffs twice daily, tiotropium 2.5 µg/act 2 puffs once daily, montelukast 4 mg daily, and additional beclomethasone 80 µg/act 2 puffs twice daily when sick. Despite this high-intensity medical regimen, he continued to suffer from almost daily symptoms of cough, shortness of breath, and nighttime awakenings. Impulse oscillometry was performed and demonstrated evidence of small airway obstruction, with a peripheral resistance/total resistance ratio ($R_5 - R_{20}/R_5$) of 40% (normal, $\leq 25\%$).³ At this point, a review of his social history revealed that family members were smoking marijuana in the patient's household. There was no tobacco or pet exposure. Furthermore, his parents noticed he had significantly more asthma symptoms when at the house of a cousin who was a marijuana grower. On the basis of this new information, we hypothesized that the patient may have developed a cannabis allergy, which was contributing to his refractory respiratory symptoms.

Because no standardized cannabis allergen extract is available, skin prick testing was done by "puddle" technique using a fresh cannabis strain brought by the patient's family. The cannabis leaf, stem, and bud were macerated into a saline mixture as described in earlier reports assessing cannabis allergy in adults.⁴ The patient tested positive to cannabis with a 9 mm × 8 mm wheal, whereas a control subject tested negative. We next performed a basophil activation test (BAT) to crude cannabis extract, because previous studies have suggested that BAT can discriminate between clinically significant and nonsignificant

cannabis skin sensitization.¹ BAT was performed to cannabis, peach, and tomato extracts, PBS (negative control), and anti-FcεR1 (positive control) using CD203c upregulation as a marker of basophil activation as previously described. Peach and tomato were tested because of their reported cross-reactivity with Can s 3, a nonspecific lipid transfer protein that is considered the major allergen in cannabis.¹ On stimulation with a 1:20 cannabis dilution, the patient demonstrated a 28-fold increase to cannabis over the PBS-negative control, representing 43% of the maximum stimulation by anti-FcεR1 (PBS, 0.58%; cannabis, 16.6%; and anti-FcεR1, 38.5%). For comparison, the negative control subject showed a 1.4-fold increase to cannabis, representing 0.7% of the maximum stimulation (PBS, 0.51%; cannabis, 0.72%; and anti-FcεR1, 95.3%). Results for tests to peach and tomato were negative, suggesting that the patient's cannabis sensitization may be due to a protein other than Can s 3. Multiple other proteins have been implicated in cannabis allergy, particularly in North America where Can s 3 appears to be less dominant.⁵ On the basis of these results, the patient's family was advised to stop smoking marijuana and remove all cannabis from the patient's environment. Three months later, the patient was seen for follow-up at which time impulse oscillometry measurements were again collected. He reported significant improvement in all symptoms, and his peripheral/total airway resistance measured by impulse oscillometry decreased to within normal limits at 22%.

In adults, smoking cannabis regularly is associated with chronic cough and peripheral airway obstruction⁶ and cannabis use is associated with allergic symptoms including rhinitis, conjunctivitis, asthma, and anaphylaxis.^{1,2} We are still in the very early stages of understanding the health effects of secondhand cannabis exposure in children. This case suggests that secondhand exposure might contribute to chronic asthma severity by increasing small airway obstruction and that decreasing exposure may significantly improve lung function. Because cannabis is an allergen that is smoked, respiratory disease could theoretically occur through nonspecific "irritant" effects on the airway (comparable to secondhand tobacco smoke exposure) and/or from allergic airway inflammation. We suspect that, in this case, the presence of marijuana smokers was a marker for widespread distribution of cannabis proteins in the child's environment. In addition, the marijuana grower's house likely contained high levels of plant and pollen materials, increasing the likelihood of both respiratory and dermal exposure to cannabis proteins. Sensitization has been reported in cannabis users who are actively or passively exposed to smoking or vaporizing the drug,² and in public safety and laboratory workers who handle cannabis.⁷

Although nonspecific skin prick test reactivity to crude cannabis occurs in atopic individuals, the crude cannabis BAT can be used to diagnose clinically significant cannabis sensitization, providing positive (66.7%) and negative (66.7%) predictive values in atopic patients similar to those achieved with purified Can s 3 (the current criterion standard for diagnosing cannabis allergy).⁸ We hypothesize that chronic exposure may mediate an allergic airway response with increased bronchial hyperreactivity to other triggers such as upper respiratory tract infections, as is commonly seen in children exposed to indoor allergens such as

dog, mold, and house-dust mite. In the scenario of chronic indoor allergen exposure, acute responses to exposure (such as urticaria and rhinoconjunctivitis) are often not reported. Our patient did not report these acute responses but did have increased respiratory symptoms in a high marijuana exposure environment (his cousin's house).

As cannabis use continues to gain acceptance and research uncovers its applications in the treatment of various diseases, there is increased need for recognition and study of the potential health risks associated with secondary exposure in children. Because cannabis is reported to have health benefits, fewer parents may now consider marijuana exposure as a substantial risk to themselves or their children.⁹ Thus, public health messaging should highlight emerging evidence of effects on children's health. Physicians should consider the possibility of secondhand cannabis exposure and allergy in any child with undercontrolled asthma.

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