

Patch Testing and Allergen-Specific Inhibition in a Patient Taking Dupilumab

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Positive patch test findings after the initiation of dupilumab therapy, an interleukin-4 α receptor inhibitor used for moderate-to-severe or recalcitrant atopic dermatitis (AD), have recently been reported,^{1,2} suggesting that the allergic contact dermatitis (ACD) pathway is not inhibited by dupilumab. We present a case that suggests that the response to dupilumab therapy may be nuanced and that there may be an allergen-specific response.

Report of a Case

A woman in her 40s initially presented with papulovesicular dermatitis and severe pruritus predominantly on the hands and feet for 3 years. Her original patch test result was positive for multiple allergens (with reactions ranging from weak [1+] to strong [3+]), including nickel sulfate (2+), bronopol (2+), methylisothiazolinone (3+), *Compositae* mix (1+), and hydroperoxides of linalool (2+). The patient subsequently began allergen avoidance and a low-nickel diet, with occasional use of topical crisaborole and clobetasol, 0.5%, and reported significantly improved symptoms (80%).

Ultimately, she was prescribed dupilumab by her primary care physician owing to recurrent periorbital dermatitis and a desire to broaden her low-nickel diet. After 2 months taking dupilumab, she underwent a second patch test for nickel sulfate, bronopol, methylisothiazolinone, *Compositae* mix, and hydroperoxides of linalool. Repeated patch testing while the patient was taking dupilumab revealed reactions to bronopol (2+) and methylisothiazolinone (3+) but no reaction to nickel sulfate, *Compositae* mix, and hydroperoxides of linalool.

Discussion

Although there are recent reports of positive patch test results after initiating dupilumab therapy,^{1,2} this patient had reactions to only some of the allergens to which she tested positive before dupilumab therapy: bronopol and methylisothiazolinone. She had no reaction to 3 chemicals (ie, nickel, *Compositae*, and hydroperoxides of linalool) that she reacted to prior to initiation of dupilumab therapy. This is significant because it may indicate that there are certain allergen profiles that can be dampened by dupilumab, whereas others are unaffected by the influence of the drug on the allergy response pathway.

In the past, the pathogenesis of ACD has been attributed to inflammatory activation of the helper T-cell subtype 1 (Th1)/T_H17 pathway following exposure to allergens. This

proposed pathway described ACD as a single immunological pathway for all allergens.³ Dhingra et al⁴ determined that different contact allergens elicit unique immune pathways. They found that nickel on the skin induced T_H1/T_H17 polarization, whereas fragrance elicited the T_H2/T_H22 pathway with minor stimulation of the T_H1/T_H17 pathway. Interestingly, while nickel followed the purported ACD inflammatory pathway, fragrance did not, with a profile closely resembling that of AD. Interestingly, our patient did not have reactions to nickel, hydroperoxides of linalool, or *Compositae* mix while taking dupilumab, which may indicate that immune reactions to these allergens are mediated by the AD pathway.

A subset of patients with ACD have coexisting AD, a disease process characterized in part by an overexpression of T_H2 and T_H22 cytokines.^{3,5} Dupilumab's influence on the immune response has raised the question of whether it interferes with response to patch testing in the setting of ACD. Previous reports^{1,2} suggest that patients can have positive patch test reactions while undergoing dupilumab therapy. The present case supports this finding, but also suggests that there may be an allergen-specific effect. The patient had concurrent AD and ACD and a repeated positive response to certain patch-test allergens before and after taking dupilumab; given the findings reported by Dhingra et al⁴ that not all contact allergens create identical immune responses, this selective repeated reaction indicates that dupilumab may inhibit certain molecular pathways but not others.

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