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Immediate and delayed contact reactions to white and green tea blends

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Key words: airborne; allergic contact dermatitis; *Camellia sinensis*; case report; catechins; contact urticaria; epigallocatechin; gallic acid derivatives; histamine release test; occupational;

Tea, the hot water infusion of the young buds and leaves of *Camellia sinensis* (L.) Kuntze (Theaceae), is the most widely consumed of produced beverages in the world. Despite the large production and worldwide consumption, relatively few reports of immediate hypersensitivity to tea have appeared, mainly in tea workers.¹⁻⁵

We report a case of immediate and delayed contact sensitization in an occupational setting.

Case report

A 49-year old female wine and tea merchant, suspected of contact urticaria/dermatitis to white tea, was referred for further testing. She had no personal history of atopy or skin disease, but her daughter had hay fever. The patient had handled different tea blends since 2013: the tea was packed in 1 or 3 kg bags on arrival to the shop and manually replaced in tea caddies, causing some release of tea dust. From the beginning of 2020, the patient developed an itchy rash of the face, neck and V of neck as well as periorbital oedema, itching in the mouth and rhinitis, but no asthma, within 5 minutes after exposure to white and green tea dust. The rash might last 3-4 days and antihistamines had some effect. She tolerated drinking white and green tea infusions.

For protection, she began to wear long sleeves, gloves, half-face masks, and goggles and was able to continue her work. Allegedly, nothing was changed in the production of the tea blends.

In January 2021, 2 flavoured white teas and 5 flavoured blends of white and green tea, wetted with water, were applied to the volar aspect of the patient's forearm under Scanpor tape for 20 minutes. There was no significant reaction after 20 minutes, but after one hour, the patient developed large urticarial reactions to 2 teas and 3 mm reactions to another 3 (Table 1). The results of subsequent histamine release (HR) tests to the 5 teas are shown in Table 1. Prick test to standard inhalant allergens were positive to birch, grass, and mugwort pollen as well as house dust mites and, to a lesser degree, dog and *Alternaria alternata*.

The baseline series supplemented with infusions of the 2 white teas, and Compositae mix II 5% pet. were applied to the back in Finn Chambers on Scanpor® (SmartPractice, Phoenix, AZ, U.S.A.) for 2 days. The only positive reaction on day (D) 3 and 7 was a crescendo 2+ reaction to *p*-*t*-butylphenol formaldehyde resin of old relevance. On D3, tea leaves from tea no. 2 (Table1), wetted with water were applied semioclusively to the back for 2 days: on D4 (= D7 reading) there was palpable erythema surrounded by urticaria under the tea leaves patch (Fig.1 online). The patient stated that there was no reaction when she removed the patch, and that the itchy erythema appeared on D3. The late-appearing reaction was interpreted as a 1+ reaction of current relevance.

There were no reactions to patch tests with tea leaves of tea no.2 in 5 controls (D3 and D7 readings), and no reactions to tea blends nos. 1 and 2 applied to the forearms for 20 minutes in another 5 controls.

Discussion

White, green and black tea are among the major tea types, classified according to variation in harvesting, processing, including fermentation, and also the variety of *Camellia sinensis* used.⁶ Previously, nasal and respiratory symptoms in tea workers have been ascribed to either irritation and/or sensitization to

moulds.^{2,4,7} As our patient had a small reaction to *Alternaria alternata* compared to her reactions to pollen, this is less likely to be the explanation of her symptoms.

The only common ingredients in the 5 teas tested are the tea leaves. Epigallocatechin gallate, a polyphenol, has been shown to be the causative agent of occupational green tea-induced asthma.⁸ Unachukwu et al. have shown that there is inter- and intra-variation in the total catechin content in different white and green tea types, dependent on factors involved in cultivation, processing, handling and packing.⁶ The 5 teas thus may differ although they contain the same tea types. As certain white and green teas may have comparable levels of catechins, it is possible that the mucosal symptoms and the urticarial reactions are elicited by epigallocatechin gallate in this patient with atopic diathesis.⁶ In general, tea is rich in gallic acid derivatives, and esters of these have been shown to be moderate to strong sensitizers.⁹ Whether the patient's dermatitis was caused by these or other phenolic compounds is not clarified, as contact dermatitis to tea from *Camellia sinensis* has not been reported previously, although Livingood & Pillsbury reported flare of eczema after ingestion of tea in a female patient.¹⁰ We cannot rule out reactions to the aromatic ingredients of the teas, but as they were different from each other, it is less likely that they were the primary allergens. In conclusion, the history, clinical tests and HR tests suggest concomitant immediate and delayed hypersensitivity reactions to tea.

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Fig.1. Day 4 reading: the tea leaves were placed in the middle of the marked area (excoriated lesions)

Table 1. Results of open test and HR tests to 5 tea blends

Tea no.	1	2	3	4	5
Ingredients	China Pai Mu Tan (white tea), freeze-dried raspberries, vanilla, vanilla cream extract, vanilla aroma, raspberry aroma	China Pai Mu Tan (white tea), China Sencha (green tea), freeze-dried peaches, grape fruit pieces, peach aroma, grape fruit aroma	China Pai Mu Tan (white tea), China Sencha (green tea), candied ananas, lemon zest, pink pepper, rhubarb aroma, strawberry aroma	China Pai Mu Tan (white tea), China Sencha (green tea), licorice root, freeze-dried cranberries, cranberry aroma	Sencha (green tea)*, Pai Mu Tan (white tea)*, apple*, orange peel*, goji berries*, quince peel*, natural aroma*
Open clinical test after 1 hour	7 x 8 mm	7 x 22 mm	3 x 3 mm	3 x 3 mm	3 x 3 mm
HR test	negative	negative	positive	positive	positive

*organic