Systemic Contact Dermatitis Induced by Nickel as a Trigger for Atopic Dermatitis Exacerbation: A Case Report

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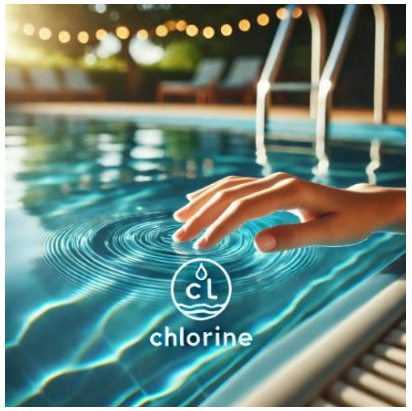
Learning Objective: Highlighting that dietary nickel–induced systemic contact dermatitis can trigger atopic dermatitis flares and underscoring the need to identify dietary allergens in refractory cases

Take-Home Message: Consider systemic contact dermatitis as a possible trigger in atopic dermatitis cases resistant to standard treatment

Triggers of AD

- **Successful management of atopic dermatitis requires identifying and avoiding factors that may exacerbate the disease:**

- ✓ Allergens
- ✓ Irritants
- ✓ Infectious agents (*S. aureus*, *Malassezia spp.*, *Herpes simplex virus*, *Molluscum contagiosum*)
- ✓ Physical triggers (e.g., sweating, friction from rough clothing, temperature extremes, low humidity)
- ✓ Psychological stress
- ✓ Cigarette smoke



Wollenberg et al., JEADV 2022

Systemic contact dermatitis

- Systemic contact dermatitis (SCD) is an inflammatory skin reaction that occurs after ingestion, infusion, or inhalation of an allergen previously responsible for allergic contact dermatitis
- Common causative agents: metals, medications, food additives
- SCD typically develops at sites of prior contact dermatitis and may present with urticaria or eczematous eruptions, including dyshidrotic eczema
- SCD may also present as pruritic vesicular hand eczema, flexural dermatitis, and generalized maculopapular eruptions, among other presentations
- In sensitized individuals with atopic dermatitis, SCD represents a systemic immune response that can trigger or exacerbate AD flares
- Atopy and conventional patch test sites to or food additives that flare upon ingestion are diagnostic of systemic contact dermatitis as a trigger and do not need to be confirmed by oral food challenge

Ahuja K et al. *Clin Rev Allergy Immunol.* 2024; 66(1):1–13. doi: 10.1007/s12016-023-08977-x

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Common dietary triggers of SCD

- Food additives (e.g., propylene glycol, carmine)
- Natural food components (e.g., cinnamic aldehyde, benzoic acid)
- Food proteins (e.g., grains such as oat)
- Nickel (e.g., chocolate, nuts, black tea)

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Table 1 Most common conventional allergens causing systemic contact dermatitis

Offending allergen documented by patch testing	Examples from the literature	Patient demographics	Location of rash (dermatitis unless noted)	Other
Carmine	Ferris et al. 2017 [71]	Female in her 50 s	Periorbital edema with dermatitis on the posterior neck, ears, back, and buttocks	Carmine was relevant to lip balm and chewable multivitamin
Carmine	Machler and Jacob 2018 [72]	4-year-old female	Erythroderma with severe facial involvement and periorbital swelling	Carmine was relevant to red velvet cupcakes and fruit punch
Cinnamomum zeylanicurm (positive patch tests to cinnamyl alcohol and fragrance mix 1)	Mertens et al. 2017 [73]	26-year-old female	Maculopapular skin eruption on the abdomen, arms, chest, legs, and thighs	Culprit source was an herbal tea (positive patch test to tea itself)
Components of balsam of Peru	Salam and Fowler 2001 [74]	75 patients had positive patch tests to BOP, FM, cinnamic aldehyde, or balsam of tolu; 24 men, 51 women, ages 15–78, median age 58, average age 53	Most common locations were hands, feet, and anogenital region	Almost half of the patients with positive patch tests to BOP or FM who followed a BOP reduction diet reported significant to complete improvement of their dermatitis
Compositae mix and propylene glycol	Rundle and Machler 2018 [57]	62-year-old female	Face, eyelids, and neck	Culprit sources were sunflower butter, dandelion teas, artichokes, and Echinacea tablets
Garlic (diallyl disulfide)	Burden et al. 1994 [75]	58-year-old male	Dyshidrotic eczema on the hands	Occurred for 35 years, episodes 1–2 × yearly, cleared within 2–3 weeks
Nickel	Veien 1997 [22]	Numerous cases	Dyshidrotic hand eczema, SDRIFE, eyelid, anogenital	Suggest placebo-controlled oral challenge with 2.5 mg nickel given as nickel sulfate (11.2 mg $NiSO_4(H_2O)_6$) prior to trial of low-nickel diet
Nickel	Veien et al. 1993 [76]	Numerous cases	Most commonly dyshidrotic eczema	Reduction of dietary intake of nickel may offer benefits
Nickel	Kaaber et al. 1978 [77]	Numerous cases	Dyshidrotic eczema on the hands	Some patients experienced an improvement in dermatitis with a nickel-free diet
Oat	Boussault et al. 2007 [20]	Numerous cases	Eczema prurigo-like lesions	Sensitization to oat occurred via application of emollient creams
Propylene glycol	Lowther et al. 2008 [25]	39-year-old female	Face, neck, hand	Dermatitis did not resolve with topical avoidance of allergens alone

BOP balsam of Peru, *FM* fragrance mix, *SDRIFE* symmetrical drug-related intertriginous and flexural exanthema

Case report

- An 8-year-old boy with atopic dermatitis (AD) presented with erythematous lesions in the antecubital and popliteal fossae, and in the groin (pubic region and radix penis)

- Initial treatment with topical corticosteroids and calcineurin inhibitors achieved good control, but recurrent eczema flares persisted in the groin area

Case report

- Patch testing revealed sensitization to a textile dye and to nickel
- Following recommendations to wear only white cotton underwear, his condition improved, although periodic flares still occurred

Case report

- Given that nickel can trigger SCD, we advised the patient's parents to reduce his dietary intake of nickel
- A leaflet listing high-nickel-content foods was provided, and a food diary was recommended
- The patient's parents observed that flares were associated with the consumption of large amounts of black tea (≥4 cups per day). After reducing black tea intake, the eczema went into remission

Foods High in Nickel

Legumes and Vegetables

- Soy, beans, lentils
- Tomatoes, potatoes, asparagus, cabbage
- Mushrooms, onions, spinach

Fruits

- Pears, bananas, dried fruits

Grains and Seeds

- Whole-grain wheat, oats, buckwheat
- Nuts and all kinds of seeds
- Raisins

Beverages and Sweets

- Tea, cocoa, chocolate

Protein Sources

- Fish and seafood
- Canned foods

Fabbro S Systemic Contact Dermatitis to Foods: Nickel, BOP, and More Curr Allergy Asthma Rep (2014) 14:463
Kulberg A et al Contact dermatitis as a systemic disease Clinics in Dermatology (2014) 32, 414–419

Nickel

- The average diet provides approximately 300–600 µg of nickel per day
- Oral intake of nickel sulfate (600–5,600 µg; 0.6–5.6 mg) can trigger eczema in nickel-sensitized individuals
- Nickel content in black tea varies widely — from 7.8–12 mg/kg in instant tea to up to 62.79 mg/kg in tea bags
- In nickel-sensitive individuals, large amounts of black tea may provoke systemic reactions, whereas smaller quantities (≤2 cups/day) are often well tolerated

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Conclusion

- Given that atopic dermatitis can be exacerbated by multiple triggers, systemic contact dermatitis should be considered a potential contributing factor in patients with recurrent or treatment-resistant disease

- As nickel is one of the most common contact allergens, possible sensitization to dietary nickel should also be taken into account when evaluating unexplained flares of atopic dermatitis