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Patch testing results in adult patients with dermatitis during the coronavirus disease 2019 pandemic

Allergic contact dermatitis (ACD) represents a delayed hypersensitivity reaction to a contact allergen with variable presentations, including erythema, vesiculation, or lichenification, depending on the allergen, exposure, and chronicity. Patch testing (PT) is the reference standard for identifying contact allergens implicated in ACD. Among the general adult population, ACD has a prevalence of approximately 21%. Positive PT reactions in the evaluation of occupational ACD occur in up to 25% to 36% of health care workers (HCWs). Relevant allergens detected in HCWs include the following: formaldehyde, formaldehyde-releasing preservatives (quaternium-15, 2-bromo-2-nitropropane-1,3-diol), glutaraldehyde, and rubber accelerators (carba mix, thiuram mix). ACD related to personal protective equipment (PPE) is well documented, including during the coronavirus disease 2019 (COVID-19) pandemic. Facial mask ACD attributed to N95 and non-HCWs. Glutaraldehyde-positive PT reaction was noted in 17% of patients in the COVID-19 pandemic group compared with 6% in the pre–COVID-19 group (P = .02). Other positive PT allergens in patients with facial dermatitis included the following (COVID-19 pandemic vs pre–COVID-19): formaldehyde (22% vs 6%), glutaraldehyde (17% vs 6%), and textile dye mix (13% vs 0%).

To the best of our knowledge, this is the first descriptive study comparing PT results in the evaluation of suspected ACD before and during the COVID-19 pandemic. Our data reveal significantly higher rates of positive PT reaction to FM and glutaraldehyde in the COVID-19 pandemic period. In addition, a significantly higher rate of positive PT reaction to FM in patients with facial dermatitis was noted.

FM represents a common positive PT allergen with an overall prevalence of up to 9.2%, and its components are found in personal care products, cleaning solutions or detergents, hand soaps, and sanitizers. Positive PT reaction to FM was detected at a higher than usual reported rate in the COVID-19 pandemic group. This may be attributed to small sample size or a true increase in FM sensitization in our cohort. One patient in each group also had positive PT reactions to FM and glutaraldehyde.

Glutaraldehyde, a disinfecting agent and preservative, is used for sterilizing medical equipment. Thus, HCWs may exhibit higher sensitization rates through occupational exposures. In 1 study, glutaraldehyde had a 3.6% positive PT prevalence among HCWs and non-HCWs. Glutaraldehyde-positive PT reaction was noted

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Table 1
Frequency of Positive Patch Test Allergens

| Patch test allergens                  | Pre-COVID (n = 65) | COVID-pandemic (n = 34) | All patients (n = 99) | Pvalue |
|--------------------------------------|--------------------|-------------------------|-----------------------|--------|
| Positive patch test (to any allergen) | 35 (54)            | 30 (88)                 | 65 (66)               | <.001  |
| Carmine 2.5%                         | 12 (18)            | 9 (26)                  | 21 (21)               | .35    |
| Nickel sulfate hexahydrate           | 10 (15)            | 8 (24)                  | 18 (18)               | .31    |
| Fragrance mix I                     | 6 (9)              | 11 (32)                 | 17 (17)               | .004   |
| Disperse blue 10G                    | 5 (8)              | 15 (15)                 | 10 (10)               | .30    |
| Textile dye max                     | 3 (5)              | 6 (18)                  | 9 (9)                 | .06    |
| Formaldehyde 2%                     | 3 (5)              | 6 (18)                  | 9 (9)                 | .06    |
| Glutaraldehyde                      | 2 (3)              | 6 (18)                  | 8 (8)                 | .01    |
| Cobalt (II) chloride hexahydrate     | 6 (9)              | 1 (3)                   | 7 (7)                 | .41    |
| Methylisothiazoline 0.2%             | 2 (3)              | 4 (12)                  | 6 (6)                 | .17    |
| Propolis                            | 5 (5)              | 3 (9)                   | 5 (5)                 | .33    |
| 4-Phenylenediamine base             | 4 (6)              | 0 (0)                   | 4 (4)                 | .29    |
| Bacitracin 20%                       | 2 (3)              | 2 (6)                   | 4 (4)                 | .60    |
| Cocamidopropyl betaine              | 2 (3)              | 2 (6)                   | 4 (4)                 | .60    |
| Balsam of Peru 25%                   | 2 (3)              | 2 (6)                   | 4 (4)                 | .60    |
| Quaternium 15                       | 1 (2)              | 2 (6)                   | 3 (3)                 | .27    |

Abbreviation: COVID-19, coronavirus disease 2019.

Among HCWs in the pre–COVID-19 and COVID-19 pandemic groups. Glutaraldehyde and formaldehyde are chemical disinfectants. Glutaraldehyde is used for sterilization during the manufacturing process of some PPE as a safer alternative to formaldehyde, which is a known human carcinogen. Despite regulations on formaldehyde use for sterilization, both glutaraldehyde and formaldehyde have been detected in respirators and surgical masks. Increased exposure to these contact allergens may lead to new allergic sensitization and clinical ACD.

The retrospective nature and paucity of documented PPE use in most cases represented study limitations. The small sample size precluded a subanalysis of other location-specific dermatitis. The small number of HCWs in this study may have limited the detection of differences in PT-positive allergens.

In summary, these observational findings suggest that FM and glutaraldehyde could represent relevant contact allergens in patients presenting with suspected ACD after the start of the COVID-19 pandemic. Although mask mandates have eased, certain individuals continue to wear PPE more consistently, including HCWs, immunocompromised patients, and those in certain work environments. These individuals may carry an increased risk of allergic sensitization with cutaneous exposures and, thus, providers should consider fragrance, glutaraldehyde, and other previously noted contact allergens as potential culprits in the evaluation of new-onset dermatitis. Identification of allergens by PT can guide management and patient education in avoidance. Additional investigation and future prevalence data would be useful in confirming these findings.

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Delayed IgE–mediated hypersensitivity to *Arthrospira platensis* (spirulina)

Spirulina is the commercial name of lyophilized *Arthrospira platensis*, a filamentous cyanobacteria (blue-green microalgae) naturally found in tropical and subtropical lakes. It is considered to be one of the richest protein sources of microbial origin. There is a growing interest in spirulina from the food, cosmetic, and health industries because of its high protein content (62%–68% dry mass), and the presence of essential amino and fatty acids, minerals, and vitamins.1–3

We present a case of a healthy 48-year-old woman with delayed hypersensitivity to spirulina. In January 2022, the patient presented to the emergency department with mild left plantar aspect swelling and acute tongue swelling starting approximately 3 hours and 7 hours.

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