

## Short Communications

### Influence of vehicle on patch test response to nickel sulfate

MAURO GRANDOLFO, MARIA PIPOLI, CATERINA FOTI, DOMENICO BONAMONTE, LUIGI RIGANO<sup>1</sup>, GINO A VEÑA  
AND GIANNI ANGELINI

Department of Dermatology, University of Bari, Policlinico, Piazza Giulio Cesare, 70124 Bari, Italy

<sup>1</sup>Institute of Skin and Product Evaluation (ISPE), Milan, Italy

**Key words:** contact allergy; nickel sulfate; penetration enhancers; azone; Transcutol<sup>®</sup>; sodium lauryl sulfate; false-negative reactions; intradermal test; patch testing technique. © Munksgaard, 1996.

We have evaluated the effect of the percutaneous penetration enhancers azone, Transcutol<sup>®</sup> and sodium lauryl sulfate (SLS) on the patch test response to nickel.

#### Patients and Methods

3 groups of subjects were selected: 20 women with a clinical history of nickel allergy but negative patch test reactions to nickel sulfate 5% pet. (group A); 10 women with a positive patch test to nickel sulfate 5% pet. (group B); 10 women with both negative history and negative patch test to nickel sulfate 5% pet. (group C).

In groups A and C, SLS 0.5% aq. was first patch tested for 24 h and then a patch test with nickel sulfate 5% pet. applied on the same site. All patients were also patch tested with nickel sulfate 5% pet. + azone 10% pet., azone 10% pet. alone, nickel sulfate 5% pet. + Transcutol<sup>®</sup> 10% pet. and Transcutol<sup>®</sup> 10% pet. alone. Finally, in all subjects, an intradermal test with 0.1 ml nickel sulfate 0.001% aq. was performed on the volar forearm. In Group B, open tests with nickel sulfate 5% pet. + azone 10% pet. and nickel sulfate 5% pet. + Transcutol<sup>®</sup> 10% pet. were also made.

Nickel sulfate 5% pet. was supplied by Trolle Lassen (Copenhagen, Denmark) and the azone and Transcutol<sup>®</sup> by Gattefossé (Saint-Priest Cédex, France). Patch tests were performed according to standard technique, using Finn Chambers, Scanpor tape and 2 days occlusion. Readings were made on days 2, 3, 4 and 7.

#### Results

Positive results are reported in Tables 1 and 2. Of the 20 subjects in Group A, 11 (55%) reacted to nickel with each of the 3 percutaneous penetration enhancers. Intradermal testing elicited positive responses in only 6 (30%) of the same 20 subjects. In group B, 9 patients (90%) showed positive reactions to open tests with nickel sulfate 5% pet. with added azone and Transcutol<sup>®</sup>. All subjects in group C gave entirely negative results. Azone and Transcutol<sup>®</sup> alone did not elicit reactions of any type.

#### Discussion

Kieffer (1) found negative tests to nickel in 13 of 28 subjects with a history of contact dermatitis to metal. Mené (2) reported negative tests in 26 of 96 subjects. Möller & Svensson (3) reported 50 cases with negative patch tests to nickel, cobalt and chromium, among around 1000 subjects with a history of allergy to metals. To increase percutaneous absorption of nickel, various penetration enhancers have been used (propylene glycol, DMSO, SLS) (4-8), different nickel salts (2, 9), or higher concentrations of the metal (3, 10). An increase in positive reactions has also been obtained by means of intradermal tests with nickel in aq. solution (11), or by pre-treating the test site with various substances under occlusion for 24 h (12). Even simple occlusion with a Finn

Table 1. Skin test results in 20 subjects (group A) with clinical history of nickel allergy but negative patch tests

| Patch tests                                       | No. positive patients (%) | No. negative patients |
|---------------------------------------------------|---------------------------|-----------------------|
| nickel 5% pet.                                    | 0                         | 20                    |
| nickel 5% pet. + azone 10% pet.                   | 11 (55%)                  | 9                     |
| azone 10% pet.                                    | 0                         | 20                    |
| nickel 5% pet. + Transcutol <sup>®</sup> 10% pet. | 11 (55%)                  | 9                     |
| Transcutol <sup>®</sup> 10% pet.                  | 0                         | 20                    |
| SLS 0.5% aq. (24 h) + nickel 5% pet.              | 11 (55%)                  | 9                     |
| intradermal test                                  |                           |                       |
| nickel 0.001% aq.                                 | 6 (30%)                   | 14                    |

Table 2. Open test results in 10 subjects (group B) with positive clinical history and patch test to nickel

| Open test                                                                             | No. positive patients (%) |
|---------------------------------------------------------------------------------------|---------------------------|
| nickel 5% pet. + azone 10% pet.                                                       | 1 (10%)                   |
| nickel 5% pet. + azone 10% pet. and nickel 5% pet. + Transcutol <sup>®</sup> 10% pet. | 5 (50%)                   |
| nickel 5% pet. + Transcutol <sup>®</sup> 10% pet.                                     | 3 (30%)                   |
| total                                                                                 | 9 (90%)                   |

Chamber for 24 h on the site where the test will be applied may cause a rise in the positivity rate (13).

Of the 3 patch test penetration enhancers that we used, 2 had not been used as such before: azone, or dodecylazacycloheptan-2-one (1-dodecylhexahydro-2H-azepin-2-one), comes from transutaneous drug delivery work (14, 15); Transcutol<sup>®</sup> (Carbitol<sup>®</sup>: diethylene glycol monoethyl ether), with the empirical formula  $C_6H_{14}O_3$ , is used as an absorption enhancer in various topical medicaments and cosmetics (15, 16). Our results show that both Transcutol<sup>®</sup> and azone are effective enhancers of the percutaneous absorption of nickel, without irritant or allergic reactions of their own.

### References

- Kieffer M. Nickel sensitivity. Relationship between history and patch test reaction. *Contact Dermatitis* 1979; 5: 398–401.
- Menné T. Nickel allergy-reliability of patch test evaluated in female twins. *Dermatosen in Beruf und Umwelt* 1981; 29: 156–160.
- Møller H, Svendsen A. Metal sensitivity: positive history but negative test indicates atopy. *Contact Dermatitis* 1986; 14: 57–60.
- Mendelow A Y, Forsyth A, Florence A T, Baillie A J. Patch testing for nickel allergy. The influence of the vehicle on the response rate to topical nickel sulfate. *Contact Dermatitis* 1985; 3: 29–33.
- Fullerton A, Andersen J R, Hoelgaard A. Permeation of nickel salts through human skin in vitro: effect of vehicles. *Br J Dermatol* 1988; 118: 509–516.
- Van Ketel W G. Patch testing with nickel sulfate in DMSO. *Contact Dermatitis* 1978; 4: 167–168.
- Lindberg M, Sagstrom S, Roomans G M et al. Sodium lauryl sulphate enhances nickel penetration through guinea pig skin. Studies with X-ray microanalysis. *Scanning Electron Microscopy* 1989; 1: 221–224.
- Frankild S, Andersen K E, Nielsen G D. Effect of sodium lauryl sulfate (SLS) on in vitro percutaneous penetration of water, hydrocortisone and nickel. *Contact Dermatitis* 1995; 32: 338–345.
- Wall L M, Calnan C D. Occupational nickel dermatitis in the electroforming industry. *Contact Dermatitis* 1980; 6: 414–420.
- Dooms-Goossens A, Naert C, Chrispeels M T, Degreef H. Is a 5% nickel sulphate patch test concentration adequate? *Contact Dermatitis* 1980; 6: 232.
- Meneghini C L, Angelini G. Intradermal test in contact allergy to metals. *Acta Dermato-venereologica* 1979; 59: (suppl 85) 123–124.
- Allenby C F, Goodwin B F J. Influence of detergent washing powders on minimal eliciting patch test concentrations of nickel and chromium. *Contact Dermatitis* 1983; 9: 491–499.
- Seidenari S, Manzini B M, Belletti B. Pretreatment of the test area with 1-day occlusion improves the response rate to  $NiSO_4$  5% pet. patch tests in subjects with a positive history of nickel allergy. *Contact Dermatitis* 1995; 33: 152–156.
- Hou S Y E, Flynn G L. Enhancement of hydrocortisone permeation of human and hairless mouse skin by 1-dodecylazacycloheptan-2-one. *J Invest Dermatol* 1989; 93: 774–779.
- Hadgraft J, Walters K A, Guy R H. Epidermal lipids and topical drug delivery. *Semin Dermatol* 1992; 11: 139–144.
- Barthélémy Ph, Farah N, Laforet J P. Transcutol<sup>®</sup> Product profile. Gattefossé, Saint-Priest Cédex, France, 1995.

## Contact urticaria syndrome from formaldehyde with multiple physical urticarias

CLAUDIO TORRESANI, IMARA PERITI AND LADAN BESKI

Department of Dermatology, Parma University, Via Gramsci 14, I-43100 Parma, Italy

**Key words:** formaldehyde; contact urticaria syndrome; physical urticaria; nurse; healthcare workers; hospital workers; occupational. © Munksgaard, 1996.

Contact urticaria syndrome (CUS) from formaldehyde (1–5) is less well-known than allergic contact dermatitis.

### Case Report

A 42-year-old non-atopic nurse, who had worked in a surgical department for 11 years, developed urticaria, with rhinitis and occasional bronchospasm in September 1994. Urticarial episodes occurred more often at work than at home. She had also had a slight intermittent

hand eczema for the past 5 years. Patch tests carried out by her occupational physician with the GIRDCA standard series and a healthcare series had been ++ to Kathon CG and balsam of Peru, and ?+ to formaldehyde.

In December 1995, we noted that her urticarial lesions favoured exposed skin and that she also had dermographic, aquagenic, cholinergic and delayed pressure urticarias. Open tests (6, 7) on the back with Kathon CG 0.01% aq., balsam of Peru 25% pet., formaldehyde 1%

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.