



## Art of prevention: A piercing article about nickel<sup>☆</sup>

K. Markel, BS<sup>a</sup>, N. Silverberg, MD<sup>b</sup>, J.L. Pelletier, MD<sup>c,d,e</sup>, K.L. Watsky, MD<sup>f</sup>, S.E. Jacob, MD<sup>g,\*</sup>

<sup>a</sup> Loma Linda University School of Medicine, Loma Linda, California

<sup>b</sup> Icahn School of Medicine at Mt. Sinai, Mt. Sinai St. Luke's–Roosevelt Hospital Center, New York, New York

<sup>c</sup> Department of Pediatric Dermatology, Northern Light Health, Bangor, Maine

<sup>d</sup> University of Vermont Medical School, Burlington, Vermont

<sup>e</sup> University of New England College of Medicine, Biddeford, Maine

<sup>f</sup> Department of Dermatology, Yale University School of Medicine, New Haven, Connecticut

<sup>g</sup> Department of Dermatology, Loma Linda University, Loma Linda, California

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Allergic contact dermatitis (ACD) is a category of inflammatory skin conditions resulting from an interaction between a chemical and the skin that results in a type IV delayed-hypersensitivity immune response. Some risk factors for the development of ACD may be genetic, but acquisition of ACD is believed to be due to exposure. One of the most common causes of ACD is the ubiquitous metal, nickel. The European Union addressed the increasing rates of nickel sensitization by instituting the Nickel Directive in 1994. This mandates that products intended for prolonged contact with the skin should release no more than 0.5 ug/cm<sup>2</sup>/week, with a specific restriction on piercings (wounded skin) limited to 0.2 ug/cm<sup>2</sup>/week. The

institution of the directive has led to significantly decreased rates of nickel sensitization across Europe (Fors et al., 2012).

Notably, Denmark, the first country to adopt restrictions on nickel release, has seen a marked reduction in sensitization rates, along with concomitant drops in health care costs, estimated at \$2 billion over the last 20 years (Garg et al., 2013; Thyssen et al., 2007). Extrapolating from Denmark's success in a population 1.8% that of the U.S. population, there is much to be gained from following their lead. In addition to the amelioration of suffering and the promotion of health, a nickel directive in the United States could save \$113 billion over the next two decades (Jacob et al., 2015).

Ear piercing is believed to be the most common source of nickel sensitization (Fig. 1; American Academy of Dermatology, 2018; Meijer et al., 1995; Mortz et al., 2002; Torres et al., 2009). A 2001 study by Ehrlich et al. (2001) demonstrated only a 4.0% nickel sensitization rate in males with no piercings compared with 11.1% and 14.4% in males with one or multiple piercings, respectively. When compromised by the trauma of piercing, skin penetration by allergens

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\* Corresponding Author.

E-mail address: [sjacob@contactderm.net](mailto:sjacob@contactderm.net) (S.E. Jacob).



Fig. 1. Example of allergic response to piercing.

may be enhanced; in particular, penetrating wounds provide direct entry of the allergen to the dermis and dermal dendritic cells.

Children represent an at-risk group for ACD, which comprises 20% to 25% of all diagnoses of childhood dermatitis (Bruckner and Weston, 2002). In a recent publication from the Pediatric Contact Dermatitis Registry Inaugural Case Data of 1142 pediatric patients, 48% of pediatric patients had a positive patch test, with the most common allergen being nickel in 22% of those patients (Goldenberg et al., 2016). Notably in 2008, in a study of 25,626 patients, Rietschel et al. (2008) observed rates of nickel sensitivity in children by patch testing to be 14.1% for boys and 32.4% for girls. In a subsequent study, the North American Contact Dermatitis Group reported on 44,097 patients between 1994 and 2014 and found that 17.5% of patients tested were patch-test positive for nickel sensitivity, making nickel the leading allergen in all age groups worldwide (Fransway et al., 2013).

In 2008, the American Contact Dermatitis Society Public Relations Committee presented a resolution to the American Academy of Dermatology (AAD) advocating for a European Union–like nickel directive. The next year, the AAD published an article in support of a nickel directive. Two years later, in 2011, the American Medical Association House of Delegates adopted the resolution (Jacob et al., 2009). In response to requests from the American Medical Association, the Consumer Products Safety Commission (CPSC) responded: “The issue of nickel sensitization and consumer products is one that the CPSC and its staff have been aware of, since the agency’s inception [1972]”. The CPSC also noted that there is a safety standard for children’s jewelry that addresses nickel, cadmium, and other hazardous chemicals. However, compliance is voluntary (CPSC, 2016).

In 2015, the American Contact Dermatitis Society developed a set of four priorities and communicated to the AAD:

RESOLVED, that the AAD take a lead role in reducing exposure to Nickel in the U.S. by way of the following: 1. Develop educational materials and prioritize a public campaign on the consequences of nickel exposure. 2. Consider advocacy directed to nickel sensitization and allergy to be a high priority for the AAD. 3. Encourage industry to voluntarily reduce the use of nickel in products that contact the skin. 4. Advocate with the Consumer Product Safety Commission, Congress, and the Surgeon General on making this a priority of their public health policies.

In action, an AAD workgroup was created, which led to the initiative “Nickel allergy: How to avoid exposure and reduce symptoms” (Larsson-Stymne and Widström, 1985), progress toward an AAD

expert panel on ACD, and a sustained public awareness campaign in partnership with sister dermatology groups.

In June 2016 in Chicago, Illinois, the American Contact Dermatitis Society organized a North American Nickel Summit that brought together representatives of government and industry, as well as physicians from Europe and the United States, to further review and consolidate recommendations to reduce nickel sensitization rates. All of these physician groups have been working vigorously to stem the tide of nickel sensitization, although public health awareness can only go so far. The need for federal regulations on the industry level of production remains critical to alleviate the burden of ACD both in terms of financial strain and patient well-being.

### Practical intervention pearl

Although abstinence is the greatest opportunity for prevention (Rundle et al., 2018), the best practice for piercing would be to have a professional use plastic, nickel-free metal, or a low-nickel-releasing stainless steel such as AISI 304, 316L, or 430, all of which release less 0.03  $\mu\text{g}/\text{cm}^2/\text{week}$ , which is significantly below the European Union safety standard of 0.2  $\mu\text{g}/\text{cm}^2/\text{week}$ <sup>8</sup> (Haudrechy et al., 1997).

A poorly studied but popularized strategy used after piercing and during healing is called flossing. This method is propagated today by piercers and YouTube beauty channels. This process is one in which a piece of thread is passed in and out of a pierced hole in an effort to keep the hole clean and open. This may reduce the risk of nickel ACD, but it confers other risks. The technique can increase the risk of infection by introducing bacteria from the dental floss braid into the traumatized skin (Ivey et al., 2018; Katz et al., 1981).

Once ears have been pierced, an alternative to flossing that also prevents exposure to metals in an open wound is wearing plastic loops until the wounds have healed (Ivey et al., 2018). After the pierced skin is healed, the earrings may then be replaced with sterling silver, titanium, low-nickel-release stainless steel, or >18 karat gold.

To protect the skin against the most common causes of ACD, avoid piercing the skin, especially when young, particularly with posts that contain nickel-releasing metals. This adage is particularly important to follow early in life to reduce ongoing nickel contact and the risk of developing allergy. Lastly, delaying piercing until after the placement of high-nickel-containing orthodontics may reduce sensitization risk by a factor of 1.5 to 2 (Fors et al., 2012).

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