

Nickel-Free Alternatives Raise Awareness

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Allergic contact dermatitis to nickel is a global health problem. Worldwide, nickel continues to be the most prevalent and relevant contact allergen detected in tested populations for the last 30 years. Thus, the need for nickel-free products is palpable. We present a sustainable resource to aid providers and consumers in locating a wide variety of nickel free alternatives.

Nickel is a cheap and durable metal commonly noted as a cause of allergic contact dermatitis (ACD). It is ubiquitous with a wide range of utilizations, including coins, clothing, cell phones, laptops, dental and medical implants, personal care and household products, tools, and weapons.¹ Recent data from the North American Contact Dermatitis Group showed that 19.5% of 5085 tested adult patients had a positive reaction to nickel.² The prevalence of nickel allergy in the general population has been shown to be higher in women than men (17.1% vs 3%)³ in part due to cultural practices such as piercing and exposure to adornments containing nickel. However, because of the significant number of patients who self-diagnose or are evaluated by primary care, the numbers presented in dermatology literature are likely an underestimate of the true prevalence of nickel allergy. Self-diagnosis is not uncommon, as the clinical manifestations of nickel driven ACD (eg, earlobe dermatitis that recurs in association with wearing earrings) are often sufficient to correctly make the diagnosis without requiring patch testing. In addition, patients may self-implement nickel avoidance once the association between the dermatitis and the exposure to the nickel-releasing item has been made, thereby eliminating the need to seek physician directed care.

Invaluable resources are available to assist patients and physicians in generating lists of personal care products that are known to be devoid of a particular allergen(s).⁴ However, these lists are specifically aimed at personal hygiene products that have posted ingredient labels and do not include product alternatives to aid consumers with nickel avoidance. The goal of this manuscript is to develop a sustainable resource to aid providers and consumers in locating a wide variety of nickel free alternatives.

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We present a review of scholarly articles and retail websites that discuss market tested nickel-free products and/or alternatives to nickel containing products, providing online retail information for consumer purposes. Articles and websites were identified utilizing Google Web search terms: “nickel-free retailers/products/clothing/ tested products/brands/stores/belts/watches/jewelry/clothing/eye frames/jeans/cell phones/hair accessories/ferrule/personal care items” (Search queried April–May 2015). Additionally, physical and/or online retailers across all fields (department stores, independent retailers, exclusive online retailers, and so on) were searched for all available nickel-free products.

All web articles and retail websites were evaluated for exclusion and inclusion with specific predetermined criteria. Inclusion criteria include presence of certified nickel-free label and/or clear description of material used (ie, stainless steel, titanium, and so on). Exclusion criteria include articles or websites antedated before 2000, products containing alloys not specified as nickel-free, forums, or blogs. Products labeled “hypoallergenic” were not deemed sufficient for inclusion in our tables, as the term is neither specific nor sensitive for the avoidance or alleviation of nickel allergy.

RESULTS

Through an extensive online search, 79 individual brands were found to provide nickel-free products, including baby clothing, belts, cellphones, eye frames, ferrules, hair accessories, iPad cases, jeans, jewelry, makeup, personal care items, and watches. Of the retailers selling these brands, 34 were online-only, and 22 had physical store locations (Table 1).

Nickel Identification

Commercially available “nickel spot tests” that use dimethylglyoxime/ ammonia (DMG-ammonia) to detect nickel content in products became available in 1977.⁵ To test an object, the item is rubbed with DMG solution applied to a white cotton swab. If the concentration is at least 1:10,000, there is formation of a pink precipitate.⁶ The greater the concentration of nickel, the more intense the pink color.⁷ In addition, DMG may be used to test the operator, who is in contact with the nickel wares.^{8,9} The DMG detects nickel

TABLE 1. Direct-to-Consumer Available Nickel-Free Items: (Nickel-sensitive Consumers Should be Reminded to Personally Spot-Test Even Items Labeled “Nickel-Free” to Prevent Reaction)

Product	Brand	Retailer	Comments
Baby Clothing	My O Baby	www.myobaby.com	All snaps are nickel-free
	Sage Creek Organics	www.sagecreekorganics.com	
	Carter's clothes	Macy's	
	Dordor & Gorgor	Amazon	
	Sofie + Me	www.sofieandme.com	
	Eco Print Works	www.ecoprintworks.com	
	Kee-Ka	Amazon, www.kee-ka.com	
Belt	NickelFreeBelts	www.nickelfreebelts.com; Amazon	Wide variety
	BELTISCOOL	Amazon	Wide variety
	Ferrer	Amazon	Entirely metal free
	NoNickel	www.nonickel.com; Amazon	Nickel-free certified by Athena allergy
	Tom Taylor Belts & Buckles	www.tomtaylorbuckles.com	Buckles made of sterling silver
	Pat Areias	www.patareias.com	Buckles made of sterling silver
	Vogt Silversmiths	Google; Amazon; Ebay; vogtsilversmiths.com	Buckles made of sterling silver
	RattlerStrap	Amazon	Buckles made of titanium
	RockBros	Amazon	Buckles made of titanium
	Hot Buckles	www.hotbuckles.com	Customizable
	NickelSmart	www.nickelsmart.com	Nickel-free certified by Athena allergy
Cellphone	iPhone 3, 4, 4s	Verizon, T Mobile, Sprint, AT & T	Tested nickel-free*
	Motorola V950 Rugged Flip, Droid	Verizon, T Mobile, Sprint, AT & T	Tested nickel-free*
	BlackBerry Torch, Curve	Verizon, T Mobile, Sprint, AT & T	Tested nickel-free*
Eye frame	Numerous	Seiko	Plastic, titanium
		Eyemart Express	Plastic, titanium
		Costco	Plastic (resin), titanium, polycarbonate
		Warby Parker	Cellulose acetate, titanium
Ferrule	Essence of beauty	LensCrafters	Plastic, titanium
	Eco Tools	CVS	Makeup brush
Hair accessories	Poppy's	CVS, Ralphs, Target	Makeup brush
	Hair Hardware	www.poppylovesparis.com	Brass bobby pins
	Goody Ouchless Flex line	www.hair-hardware.com	
	HMBdesigns	Amazon, Walgreens	
iPad case	Giddy Giddy	www.hmbdesigns.net	Brass hair clips
	Smart Case	www.giddygiddy.com	Baby hair accessories
	KHOMO	Apple, Amazon	Polyurethane
Jeans	Calvin Klein	Amazon	Polyurethane
		Macy's, Nordstrom, www.6pm.com, Amazon	Nickel-free buttons
	No Nickel brand	www.nonickel.com	Button & Rivet Pack
	Levis	Levis, Amazon, Walmart	Nickel-free buttons
	NickelSmart	www.nickelsmart.com	Button & Rivet Pack
	Clean Jeans	Industry of All Nations	Nickel-free buttons
	Sense Organics	www.sense-organics.com	Trousers and shorts for 2–6 y

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TABLE 1. (Continued)

Product	Brand	Retailer	Comments
Jewelry	Simple Whispers	www.simplywhispersstore.com	Surgical grade stainless steel, some further electroplated with 24 k gold
	Numerous	Target; Nordstrom; Walmart	
	Emitations	Sears, www.emitations.com	
	Zevaa	www.zevaa.com	Niobium
	NoNickel	www.nonickel.com	Nickel-free certified by Athena allergy
	Pugster	www.Pugster.com	Sterling silver, Murano glass
	Titanium Kay	www.TitaniumKay.com	
	Blomdahl	www.blohm Dahl.com	Medical grade titanium, plastic
	Supreme Jewelry	Kmart	
	West Coast Jewelry	Kmart	Stainless steel
	Crucible	Kmart	
	Palm Beach	Kmart	
	ELYA	Kmart	Stainless steel
	Jaclyn Smith	Kmart	
	Attention	Kmart	
	BONGO	Kmart	
	Sabrina Silver	Sears	Sterling silver
	Prime Pristine	Sears	
	Sea of Diamonds	Sears	
	INPINK Fashion Jewelry	Sears	
	Marimor Jewelry	Sears	
	Palm Beach	Sears	
	Supreme Jewelry	Sears	
	Silver Limit	Sears	
	Brielle	Sears	
	Accessories Unltd	Sears	
	Numerous	Avon; Kohls; J.C. Penney; www.overstock.com	Sterling silver
	Jennifer Rose	www.jrose.com	
	Bezel Box	www.bezelbox.com	Nickel-free, lead-free
	Exotic India Art	www.exoticindiaart.com	
Makeup	EyeCareCosmetics	www.butterflies-eyecare.co.uk/Eye-Care-Cosmetics.html	Mascara, lipstick, eyeliner, nail polish, etc.
	RMS Beauty	www.rmsbeauty.com	Coconut-based makeup
Personal care items	Panasonic close curves wet/dry shaver	Amazon	Electronic shaver
	Schick	Numerous online and instore locations	Quattro titanium blade disposable razor
	Artestile	Amazon	Tweezer, eyelash curler and nail scissors
	Topinox	Amazon	Tweezer, nail clipper, stainless steel
	Rubis Switzerland	Beautybar.com	Designer eyelash curler, stainless steel
	Koji	Amazon	Eyelash curler with “anti-metal allergy layer to prevent irritation”
	Maybelline	Amazon	Plastic eyelash curler
	Japonesque	Ulta.com	HD eyelash curler (plastic)

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TABLE 1. (Continued)

Product	Brand	Retailer	Comments
Watch	Kmart	Kmart	Stainless Steel
	Skagen	Amazon; Overstock; NickelFreeLife; PrincetonWatches	
	Tense	Amazon; NickelFreeLife; PrincetonWatches; www.tensewoodwatches.com/	
	Invicta	www.Nonickel.com ; PrincetonWatches	
	Lucien Piccard	www.Nonickel.com ; Amazon; Ebay; PrincetonWatches	
	Seiko	PrincetonWatches	
	Time Teacher	PrincetonWatches	
	Fossil	Amazon, Macy's, Nordstrom (www.fossil.com)	

Although some products may include additional information, all listed products are advertised by sellers as "nickel-free" alternatives.

*Items personally tested with DMG spot test by the authors.

contents of 0.44 $\mu\text{g}/\text{cm}^2$ or greater; however, levels of 0.05 $\mu\text{g}/\text{cm}^2$ have been shown to be sufficient to elicit nickel dermatitis.^{6,10} Thus, DMG sensitivity and specificity are not flawless (59.3% and 97.5%, respectively).¹¹ Nevertheless, because DMG tests are fast, compact, and simple, they are an extremely useful resource for consumers, retailers, and dermatologists (Table 2).

Of note, DMG test may result in blue, green, or black discoloration under the influence of other metals in the item being tested. Additionally, there is a chance the nickel testing solution may alter the appearance of the item being tested, when the detector reacts with the metal in an object, producing a colored hue. Although the colored hue is often removed by washing with water, it should nonetheless be used in a discrete region of the object. Moreover, many items may be plated with a non-nickel metal that may wear over time, leading to exposure of a nickel base; thus, it may be warranted to retest products again after some use or wear, as the test results may change with time.

Clothing

Several techniques are available to avoid contact with portions of clothing that contain nickel. For metal components of pants,

iron-on knee patches can be ironed over the inside aspect of the pant closure, or a small piece of fabric can be sewed over the metal portion. Closure pieces (such as a zipper, snap, or button) often contain nickel and can be exchanged for a plastic or other nickel-free pieces. The company Nickel Smart (Charlotte, North Carolina) sells nickel-free button and rivet packs. Duct tape can also be used as an interim solution to cover zipper handles, snaps, or buttons. Belt buckles commonly contain nickel¹²; to avoid contact in these settings, patients should consider seeking nickel-free belt buckles, and to test their own personal items, or have the nickel-containing buckle switched to a brass alternative. Bras have been reported to contain nickel in the small metal connecting hooks and in the underwire.¹³ Plastic clasps and painted clasps are available on the market. Bras with metal underwires can be replaced with alternatives containing plastic-based wires or the newer underfoam supports.

Barrier hardeners, such as several coats of nail polish or a commercially available product, such as Nickel Guard, can be applied to cover metal surfaces in contact with skin¹⁴ (Table 3). This often requires multiple coats and frequent reapplication because the barrier will wear down with time and washings. Of note, nail polish may cause a secondary contact dermatitis from its own

TABLE 2. Nickel Spot Test Products

Product Name	Where Sold	Comments
Spot test for nickel	Delasco.com	Drop dispensing bottle containing 1% dimethylglyoxime and 10% ammonium hydroxide. Enough solution for 100–150 tests
Nickel alert	Nonickel.com , Athenaallergy.com , Amazon.com	Can be purchased in 2-pack or in package with Nickel Guard
Chemo nickel test	Chemotechnique.se	Manufactured by Laboratoire Destaing Chemotechnique Diagnostics
Reveal and conceal nickel spot test kit	SmartPractice.com , Myskinallergy.com	Solution and applicator in one, no cotton swabs necessary

TABLE 3. Commercially Available Barrier Hardeners

Item	Ingredients	Comments
Nickel guard "Protect"	Ethyl acetate, N-butyl acetate, nitrocellulose, isopropyl alcohol	Formulated for sensitive skin; does not contain Toluene, Formaldehyde or Dibutyl Phthalate Found on many websites: Nonickel.com; Athenaallergy.com; Amazon.com
Superglue liquid	Cyanoacrylate (methyl-2-cyanoacrylate or ethyl-2-cyanoacrylate)	More effective barrier with several coats; is often very sticky, can be difficult to apply multiple coats, takes much time to dry
Clear nail polish	Varies by brand	More effective barrier with fewer coats, often wears off after contact with liquid
Beauty secrets hardener	Ethyl acetate, SD Alcohol, Nitrocellulose, Adipic Acid/Neopentyl Glycol/Trimellitic Anhydride Copolymer, Isopropyl Alcohol, Trimethyl Pentanyl Diisobutyrate, Triphenyl Phosphate, Camphor, Benzophenone-1, Tocopheryl Acetate, Violet 2	These brands do not contain other allergens such as acrylate or formaldehyde; were shown in a study in 2008 to prevent nickel release ¹⁵
Orly nail lacquer	Ethyl acetate, butyl acetate, nitrocellulose, adipic acid/neopentyl glycol/trimellitic anhydride copolymer, isopropyl alcohol, tosylamide/epoxy resin, triphenyl phosphate, polyethylene terephthalate, propyl acetate, trimethyl pentanyl diisobutyrate, styrene/acrylates copolymer, acetyl tributyl citrate, synthetic fluorophlogopite, N-butyl alcohol, stearylaluminum hectorite, stearylaluminum bentonite, Mica, tin oxide, alumina, silica, trimethylpentanediyl dibenzoate, benzophenone-1, polyvinyl butyral, citric acid, dimethicone, trimethylsiloxysilicate, calcium aluminum borosilicate	
Krylon Acrylic Crystal Clear Spray Gloss	Propane, butane, toluene, medium aromatic hydrocarbons, naphthalene, acetone, ethyl-3-ethoxypropionate	Creates protective barrier without changing appearance of object; good for larger items like doorknobs or handles
Rustoleum Enamel Spray	Acetone, propane, toluene, n-butyl acetate, n-butane, solvent naphtha, light aromatic, 1,2,4-trimethylbenzene, aliphatic hydrocarbon	Used to create protective barrier on keys containing nickel; use over time may expose nickel on the teeth edges

chemicals, thus sensitive or allergic patients should consider alternatives.¹⁵

Jewelry

It has been known for some time that piercings with alloys releasing concentrations of nickel greater than 0.2 $\mu\text{g}/\text{cm}^2$ per week predisposes to nickel sensitization.¹⁶ More recent studies have shown that not only do body piercings predispose to nickel allergy, but also the risk increases with an increase in the number of piercings; and, the risk is also increased with prolonged exposure to high nickel releasing alloys.¹⁷ Perspiration often aids in both the release of nickel from the object and transfer of nickel salts to the skin.¹⁸ Consumers should be aware that pieces of jewelry that are in contact with parts of the body that encounter moisture or sweat may be more prone to reactions.¹⁹ Similarly, items that cause more friction

or pressure on the skin will also increase risk of sensitization. For example a loose bracelet is less likely to cause dermatitis than a snug ring even if both items contain the same amount of nickel.²⁰

Costume jewelry often contains high levels of nickel and should be avoided in sensitized persons. Consumer demand for nickel-free jewelry options has led to an increased market availability of such alternatives. Companies such as Simply Whispers (Hanson, MA), James Avery sterling silver (Kerrville, TX), and Argentium silver (London, England) guarantee their products are nickel-free (Table 1). Replacement parts, such as earring posts (Simply Whispers), are available if only a portion of an item contains nickel. Of note, because of the link to piercing as a common source of nickel sensitization, consumers should confirm that the posts are nickel-free before piercings. Several manufactures, including Blomdahl (Halmstad, Sweden), a company dedicated to making nickel-free jewelry, sell "medical plastic" earrings.

If contact with nickel-containing items is unavoidable, especially if they are valuable or hold significant sentimental value, metal replating may be a cost-effective patient-preferred option.

A jeweler can electroplate the inner surface of an item with platinum or rhodium to decrease the amount of nickel release.²⁰ Rhodium is a less expensive, hard, corrosion-resistant metal in the same group as platinum, which may require more frequent replating depending on the amount of wear.²¹ Although “flash plating” is not recommended, electroplating can provide a longer-term solution compared to coating with nickel guard or nail polish, which requires frequent application.²⁰

Several case reports have linked nickel ACD in the military with the wearing of metal “dog tags.”²² A simple alternative is the use of “Dog tag” plastic-coated chains that can be found in most military uniform shops or online. For watches, patients should consider watchbands made of other materials than metal, such as surgical grade stainless steel, cloth, or plastic. As previously mentioned, barrier coatings may be applied to any metal portion of watches that will be in prolonged direct contact with skin.

Barrier creams have been used to prevent the absorption of nickel into the skin with contact; active ingredients include propylene glycol, lanolin, and petrolatum.²³ Emollient creams which restore the epidermal barrier help protect against chronic ACD flare-ups.²⁴ Chelating creams are agents known to bind nickel and prevent nickel ACD and can be applied to the skin beneath items containing nickel^{25,26} (Table 4). The most commonly used binding agent is ethylenediaminetetraacetic acid (EDTA), which can be found in a cream with 15% EDTA and 1% hydrocortisone.²⁵

Eyeglasses and sunglasses may commonly contain nickel in the metal frame.²⁷ Patients should consider testing any metal exposed on their eyeglasses frames to determine the presence of nickel. Some products may initially test nickel-free due to an outer coating which may wear with time leading to exposure of the underlying nickel. Thus, it is recommended to test items on several separate occasions over time or to remove the coating in a less noticeable area and retest for the base metals. Alternative solutions include purchasing frames made of plastic, titanium, or stainless steel.

Patients should be made aware of many metal alloys that are not labeled “nickel,” but may contain nickel as part of the composition. Gold is often made as an alloy with nickel to enhance its strength, especially “white gold.”²⁸ Known alloys may vary in their composition from product to product depending on their intended use. For this reason, consumers should be wary of certain metal

alloys even if they are not blatantly called nickel. Fortunately, there are numerous metal alloys that are considered safe for nickel-sensitized patients. These include brass (except high-strength yellow brass which contains 1% nickel), pewter, bronze (with 2 notable exceptions—nickel bronze and sea water bronze), and titanium (except nitinol which is a combination of titanium and nickel).²⁹ Stainless steel may contain 20% nickel, but the composition of the nickel in the alloy limits nickel release and is often tolerated for general use in nickel-allergic patients.³⁰ Stainless steel with a higher sulfur component has been shown to release more nickel, as have stainless steel items that are used with prolonged direct skin exposure and exposed to high perspiration areas.²⁰

Personal Care Products

Numerous personal care products are made with nickel, including nail clippers, tweezers, safety pins, eyelash curlers, and razors.³¹ Many of these items can be replaced with stainless steel options. Granted, these are often slightly more costly than the nickel alternatives. Tweezers and eyelash curlers that have silicon or rubber coating may protect from nickel release. Razor blades should be tested for nickel because of the potential for widespread nickel exposure with use. Panasonic (Newark, NJ) carries a variety of electric razors for both men and women that are nickel-free and hypoallergenic. Disposable razors with titanium-plated blades are sold by Schick (New Providence, NJ).³² Makeup brushes commonly contain nickel if there is a metal portion on the handle or a ferrule. Tape can be used to wrap the nickel-containing parts. Hair clips are another known source of nickel exposure and can be replaced with plastic alternatives.³³ Cosmetic items, such as mascara or eyeshadow have been reported to contain nickel.³⁴ Consumers who have suffered from contact dermatitis around the orbit should seek “nickel-free” cosmetics that can be safely used by most sensitized patients (Table 1).

Household Items

Many common household items may contain nickel: keys, alkaline batteries, scissors, doorknobs, drawer pulls and handles, thimbles, tools, coins, utensils, pens, pencils, and cigarette lighters. In 2002, Herro et al³⁵ demonstrated how brushed nickel and chrome fixtures in homes may lead to hand dermatitis. This same study showed that brushed nickel has been shown to be less causative of dermatitis than polished nickel items.³⁵ Clear spray coating can be used to cover the surface of nickel-containing items, though it likely will need to be maintained and resprayed over time. Krylon Acrylic Crystal Clear Spray Gloss (Krylon Products Group, Cleveland, OH), which is an acrylic polymer coating, has also shown to create a protective barrier over common household items that contain nickel without changing the appearance of the object.³⁵ Although it likely requires maintenance and respraying, this technique would be useful for items, such as doorknobs, drawer handles, and pulls that are used daily.

TABLE 4. Chelating Cream Options

Product	Available Formulations
EDTA	15% EDTA, 1% Hydrocortisone
Clioquinol	3% clioquinol with 1% hydrocortisone (Ala-quin) not recommended in children, contraindicated in infants younger than 2 years
DPTA	10% DPTA

DPTA indicates diethylene triamine pentaacetic acid.

Keys with paint coatings found at hardware stores are less likely to release nickel, and plastic coverings can be put over the handle portion. Many keys can also be cut out of brass or anodized material. Several enamel sprays by Rustoleum (Vernon Hills, IL) were compared in a study by Hamann et al³⁶ in 2013, by testing keys for nickel before and after spray coating. After several coats of spray, despite usage, the key handles no longer tested positive using DMG nickel detection testing, whereas sprayed keys tested positive for DMG on the teeth portion of the key after usage.

Although it is unlikely that the amount of nickel released from stainless steel cooking utensils is significant enough to cause nickel sensitization,³⁰ alternatives to stainless steel pots and pans include enameled cast iron (Le Creuset, Fresnoy le Grand, France), and titanium cookware (Woll, Saarbrücken, Germany).^{37,38} There are many manufacturers of flatware that indicate their stainless steel products contain no nickel with the label “18/0” which refers to the percentage of chromium and nickel, respectively, which are combined with iron to make stainless steel.

Tools have been known to cause hand contact dermatitis related to nickel.³⁹ Patients should seek items with rubber or plastic handles when available. For items, such as hammers, wrenches, and other household tools, the surfaces most frequently contacted by skin can be covered with duct tape or electrical tape. While using items known to contain nickel, patients should use gloves to prevent contact or keep contact minimal. This is an important tactic for tools that contain nickel when nickel-free replacements are costly or difficult to obtain. Heavy-duty work gloves or rubber or vinyl gloves can be used whenever appropriate. Weapons known to be made of or plated with nickel can be coated with titanium nitride to prevent contact with the nickel surface. Glove use is also recommended. The use of a holster may also decrease contact with nickel.

Electronics

The recent increase of ACD seen in adolescents may be partially attributed to the increasing usage of cell phones, which are a common source of nickel. A 2011 Denmark study demonstrated that up to 20% of the cell phones tested with DMG were nickel positive.⁴⁰ Cell phones with fashionable designs and metallic accents are more likely to contain free nickel compared to cell phones with rubber coatings.⁴¹ The most common symptom of cellphone-ACD is a unilateral facial eruption involving the cheek and ear.⁴² Patients should be made aware of the potential risk for nickel exposure in their cell phones and take this into account when selecting a cell phone, or consider testing a phone first with nickel detector. Utilization of a phone cover that creates a barrier between the metallic body of the phone and the skin is recommended. Another effective and simple method is using duct tape to cover metallic parts. Patients should also be encouraged to test cases for nickel.

The iPad (Apple Inc, Palo Alto, CA) has been shown to induce nickel allergy contact dermatitis.⁴³ A study in 2012 demonstrated positive nickel release from 35% of laptop computers and 100%

of computer mice with metallic parts tested with DMG spot test.⁴⁴ Because not all devices of a particular brand or model have tested positive for nickel, users should test their personal devices if they suspect nickel; users can also consider purchasing and using laptop “skins” or keyboard protectors made for each laptop model which can cover nearly the entire metal surface, including keys and the track pad.

Lifestyle

Besides avoidance of obvious physical contact sources, other lifestyle modifications may provide relief to some patients suffering from nickel ACD. A low nickel diet has led to symptom improvements in several cases of nickel ACD.^{20,45,46} However, dietary avoidance of nickel can be difficult due to nickel in water and soil that may vary by region.⁴⁷ Nevertheless, there are certain foods known to have higher nickel content that patients can avoid for a trial of 1 to 2 months to see if their dermatitis improves.^{47,48} Foods known to have high nickel content include wholegrain flour, oats, soybeans, shellfish, nuts and legumes.^{47,48} Smoking has been associated with a higher rate of sensitization to nickel, and specifically found to increase nickel levels in both blood and urine. Thus, reduction or avoidance of cigarettes may be beneficial to nickel-sensitive patients.^{49–52}

DISCUSSION

As nickel sensitization continues to rise, simultaneous education about and avoidance of nickel-containing items is imperative for sustained symptom relief and prevention of future ACD.^{53,54} Similar to gluten allergy, nickel ACD awareness has driven increased market demand for consumer alternatives. Nickel-free options may be even more critical because continuous lifetime utilization may help avoid any sensitization.

Across Europe, the public health initiatives mandating nickel release limitations have shown over a decade of success with significantly decreased sensitization rates.^{55,56} If similar stringent guidelines were to be implemented in the United States, projected cost savings of \$5.7 billion US dollars per year may be reached.⁵⁷ Because the United States population is 56 times greater than that of Denmark (318,881,992 vs 5,627,235 persons),^{58,59} where nickel regulation began, there is greater impedance to change.

Several companies have taken leadership roles by self-implemented nickel restriction and development of nickel-free options. Specifically, both Levi Strauss & Co (Levi's, Dockers, dENiZEN, Signature by Levi Strauss & Co.) and VF Corporation have a policy to ensure that materials, chemicals, parts, and other goods used or supplied in the manufacture of LS&Co are nickel-free.^{60,61} Along this same line, Nonickel.com is a family-owned company focused on providing nickel-free products (belts, belt buckles, watches, and jewelry, in addition to nickel test kits and protective coatings), which have been tested and certified by the company to have met the “undetectable” nickel release standard.

We commend the companies who have taken the lead in this public safety initiative and look toward the future of collaboration between medical professionals, industry, manufacturers, and legislators on increasing public awareness and policies limiting consumer products' nickel content as a preventive and sustained avoidance measure.

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