

Report

Nickel release from metal tools in United States barbershopsMalina Y. Peterson^{1,2}, BS  and Sara A. Hylwa^{2,3}, MD

¹University of Minnesota Medical School, Minneapolis, MN, USA, ²Park Nicollet Contact Dermatitis Clinic, HealthPartners Institute, Minneapolis, MN, USA, ³Department of Dermatology, University of Minnesota, Minneapolis, MN, USA

Correspondence

Malina Yamashita Peterson, BS
Park Nicollet Contact Dermatitis Clinic
7550 34th Ave S, Suite #101
Minneapolis, MN 55450
USA
E-mail: pete9929@umn.edu

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Introduction

Nickel remains the most common contact allergen by patch testing, with 17.5% of patch-tested patients in North America exhibiting a positive reaction.¹ Nickel contact allergy can cause hand eczema, which can decrease quality of life and increase healthcare costs.² In the European Union, consumer products that are intended for prolonged skin contact are regulated to release less than 0.5 µg/cm²/week of nickel.³ The European Chemicals Agency (ECHA) defines prolonged skin contact to

nickel as more than 10 minutes on three or more occasions within 2 weeks, or 30 minutes on one or more occasions within 2 weeks.⁴ However, the United States does not have regulations that restrict nickel release in consumer products.

Hairdressers and barbers are among the top occupations to develop occupationally related nickel allergy, according to retrospective analysis of patch-tested patients in North America.⁵ Three previous studies in Europe have examined nickel release in metal tools in the hairdressing trade, as seen in Table 1.^{6–8} These studies utilized dimethylglyoxime (DMG) test to assess

Abstract

Background Hairdressers and barbers are among the top occupations to develop occupationally related nickel allergy. While nickel release has previously been detected in metal items in the hairdressing trade, metal items in the barber trade have not been specifically tested. This study screened for nickel release from metal tools in United States barber trade.

Methods One hundred ninety-two metal tools from 12 barbershops in St. Paul, Minnesota, were tested with dimethylglyoxime test. An employee survey was conducted about each metal tool.

Results Nickel release was detected in 10 of 192 metal tools (5.2%). Items with nickel release included one of 57 scissors (1.7%), one of 32 trimmers (3.1%), four of 13 barbershop chairs (30.8%), three of six cape clips, and one of one nail clippers.

Conclusions Nickel release was detected in items unique to the barber trade. These items should be considered when preventing and assessing occupational nickel allergy in barbers.

Table 1 Summary of positive nickel release in metal tools for hairdressers

Study	Tested objects	DMG positive objects	n/n _{total}	% DMG positive
Thyssen et al. 2009 ⁶	Scissors, crochet hooks	Scissors, crochet hooks	8/213	3.7
Symanzik et al. 2019 ⁷	Scissors, hair clips, hair rollers, tail combs, whisks, tweezers, hand shower	Hair clips, tail combs, tweezers	21/229	9.2
Symanzik et al. 2021 ⁸	Scissors, hair sectioning clip, hair clip, hair rollers, tail combs, tweezers, straight razors, whisks, hand showers, crochet hooks	Hair clips, hair sectioning clips, tail combs, tweezers, straight razors, crochet hooks	131/475	27.6
Present study	Scissors, trimmer, clipper, razors, barbershop chairs, tweezers, shavers, airbrushes, cape clips, combs, lancets, nail clipper, easel, hair dryer	Scissors, trimmers, barbershop chairs, cape clips, nail clippers	10/192	5.2

DMG, dimethylglyoxime.

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for nickel release. Scissors, hair clips, hair sectioning clips, hair rollers, tail combs, whisks, tweezers, hand showers, straight razors, and crochet hooks were examined from hair salons in Denmark and Germany. Metal objects were found to be nickel positive at rates of 3.7%, 9.2%, and 27.6%. However, no studies have been conducted to test metal tools in the hairdressing or barbershop trade in the United States of America.

Barbers differ from hairdressers in their tools of trade. Barbers are more likely to utilize tools to cut shorter hair, such as razors, clippers, and trimmers, while hairdressers are more likely to use scissors and hair coloring treatments. To our knowledge, no studies have been conducted to test metal tools specific to barbers.

The aim of this study was to screen a wide spectrum of barbershop tools for nickel release in the United States of America.

Materials and methods

This study was conducted in St. Paul, Minnesota, in February 2021. This city was chosen as it is the capital of Minnesota and for its proximity to our clinic. This study was Institutional Review Board (IRB) exempt, as there were no human subjects.

Barbershops within the city of St. Paul were randomly selected, and verbal informed consent was obtained from the store manager. Stores were contacted in this manner until a sample size of 12 was reached. A sample size of 12 was chosen similar to a previous study to maintain adequate sample size while also maintaining safety during the COVID-19 pandemic.⁷ Barbershops were not segregated by price because the stores charged a similar price of 20–30 dollars for a standard haircut. COVID-19 precautions were taken, such as mask and eye protection, vaccination of the researcher, and testing after store hours.

In each barbershop, metal tools ($n = 192$) were identified based on the potential for prolonged skin contact in congruence with the ECHA definition.⁴ As seen in Table 2, metal tools included scissors, trimmers, clippers, razors, barbershop chairs, tweezers, shavers, airbrushes, cape clips, combs, lancets, nail clipper, easel, and hair dryer. Tools were tested in standardized areas of prolonged skin contact, as pictured in Figure 1. Barbershop chairs were tested on the hand-operated lever. An employee survey about the age, price, and manufacturer was conducted about each metal tool.

Nickel release was detected using the Nickel Spot Test (Delasco Dermatologic Laboratory & Supply, Inc., Council Bluff, IA), which was composed of 1% dimethylglyoxime in water, alcohol, and ammonium hydroxide. White cotton swabs from the brand Q-tips were utilized. Tools were not cleaned before testing. Testing was conducted accordingly: applied 2–3 drops of solution to cotton-tip applicator, firmly rubbed moistened tip to test object for 30 seconds, inspected for color change of cotton swab against white background. A color change of bright pink was considered positive. A color

Table 2 DMG test results of metal tools in the presented study

Metal tool	Nickel positive		No. stores with metal tool n/n_{total}
	n/n_{total}	%	
Scissors	1/57	1.8	12/12
Trimmer	1/32	3.1	12/12
Clipper	0/30	0	11/12
Razor	0/19	0	7/12
Barbershop chair	4/13	30.8	4/12
Tweezer	0/12	0	7/12
Shaver	0/9	0	5/12
Airbrush	0/6	0	4/12
Cape clip	3/6	50	5/12
Comb	0/3	0	1/12
Lancet	0/2	0	2/12
Nail clipper	1/1	100	1/12
Easel	0/1	0	1/12
Hair dryer	0/1	0	1/12
All	10/192	5.2	

DMG, dimethylglyoxime.

change to blue, green, or black was considered doubtful. A photo was taken of each DMG positive metal tool. Testing was repeated adjacent to the initial spot for any indeterminate or positive results. Any color other than pink was considered a negative result. A 1996 United States Jefferson nickel coin was used as a positive control at the beginning of each study day.

Results

DMG testing showed that 10 of 192 metal tools (5.2%) released nickel, as seen in Table 2. This included one of 57 scissors (1.7%), one of 32 trimmers (3.1%), four of 13 barbershop chairs (30.8%), three of six cape clips, and one of one nail clippers. Half (6) of the 12 stores had metal tools that were DMG positive. Nickel release was negative in the clippers ($n = 30$), razors ($n = 19$), tweezers ($n = 12$), shavers ($n = 9$), airbrushes ($n = 6$), combs ($n = 3$), lancets ($n = 2$), easel ($n = 1$), and hair dryer ($n = 1$) tested. No doubtful reactions occurred.

The number of manufacturers, price range, and age range for the nickel-releasing metal tools and all metal tools are shown in Tables 3 and 4, respectively. Three manufacturers produced barbershop chairs that were DMG positive, with a price range of \$600–\$1300 and an age range of 1–70 years.

Discussion

Nickel release was detected in 5.2% of metal items in the barbershops in St. Paul, Minnesota. This was comparable to the 3.7%, 9.2%, and 27.6% of metal items in hair salons in Denmark and Germany.^{6–8} This suggested similar overall rates of

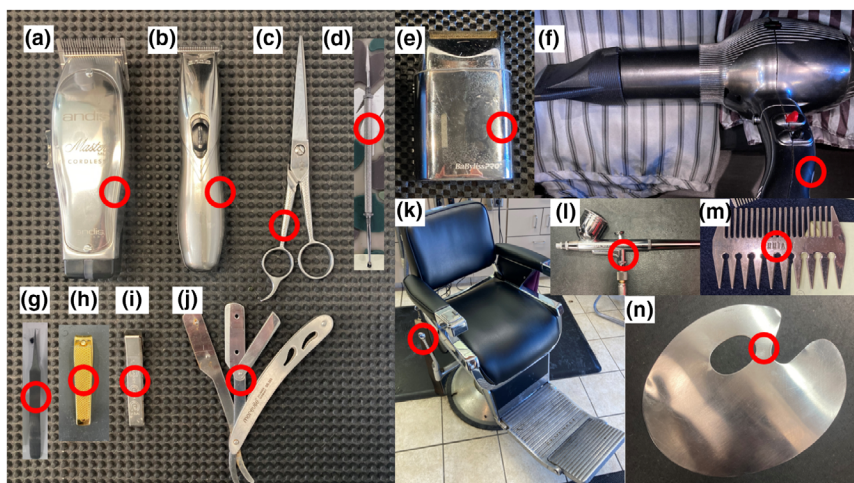


Figure 1 Metal tools with dimethylglyoxime testing areas marked with red circles. Includes (a) clipper, (b) trimmer, (c) scissors, (d) lancet, (e) shaver, (f) hair dryer, (g) tweezers, (h) nail clipper, (i) cape clip, (j) razor, (k) barbershop chair, (l) airbrush, (m) comb, and (n) easel

Table 3 DMG positive metal tools with corresponding manufacturer, price, and age

Metal tool	Nickel positive		
	No. Manufacturer	Price range (\$USD)	Age range (years)
Scissors	1	80	2
Trimmer	1	160	1
Barbershop chair	3	600–1300	1–70
Cape clip	1	0.5–4	1–10
Nail clipper	1	5	1

items with nickel release exist in the hair dressing trade and barber trade. Interestingly, items with nickel release were detected in only 50% of barbershops. Comparatively, items with nickel release were detected in 100% of hair salons in two studies by Symanzik et al.^{7,8} This variability may be explained by differences in items tested. It may be interesting to investigate rates of occupationally related nickel allergy in hairdressers compared to barbers.

This current study included items that have not previously been tested for nickel release, including scissors and straight razors. This current study detected nickel release in 1.7% of scissors, which was comparable with 0.5% and 0% of scissors in Denmark and Germany.^{6,7} This study detected nickel release in 0% of straight razors, which was less than the 15.6% of straight razors in Germany.⁸

The current study included items that have not previously been tested for nickel release, including trimmers, clippers, barbershop chairs, shavers, airbrushes, cape clips, lancets, nail clipper, easel, and a hair dryer. The metal tools were tested

Table 4 All tested metal tools with corresponding manufacturer, price, and age

Metal tool	All metal tools		
	No. Manufacturer	Price range (\$USD)	Age range (years)
Scissors	25	9–1200	0–17
Trimmer	5	58–200	0.3–10
Clipper	5	43–300	0.1–10
Razor	7	1–120	0–6
Barbershop chair	5	400–1800	0–70
Tweezer	5	2.5–32	0–4
Shaver	2	55–175	0.25–4
Airbrush	3	22–83	0–1
Cape clip	3	0.5–8	0.1–10
Comb	2	5–20	1
Lancet	1	10–12	0.1–1
Nail clipper	1	5	1
Easel	1	15	1
Hair dryer	1	130	1

because barbers endorsed prolonged and frequent skin contact. The barbershop chairs were tested because barbers endorsed frequent contact with the hand operated lever to adjust the height and rotate the chair. Although the exposure to barbershop chairs was frequent, it was less prolonged contact than to the metal tools. As barbershop chairs are specific to barbers, it is a unique potential source for nickel sensitization. Barbers may wish to test for nickel release before purchasing chairs even if they do not have nickel allergy because of the high price, \$400–\$1800 in this study. Similarly, those with known nickel allergy would benefit from nickel testing other tools of the trade with which they have prolonged contact.

Hairdressers and barbers are at increased risk of nickel allergy from occupational exposure in the United States of America.⁵ This risk is exacerbated by wet work and irritating chemicals, such as soaps and shampoos, as these promote skin barrier damage which increases allergen penetration and thus increases the risk of sensitization to contact allergens such as nickel.⁹ As nickel release was detected in barbershop items with prolonged skin contact, this is a relevant health hazard in barbers.

This study had some limitations. Generalizability is a major limitation because of the small sample size and location of this study. This study was conducted in St. Paul, which is the second-most populous city in the state of Minnesota. Therefore, this study may not be representative of the suburbs or rural areas of Minnesota. However, barbers stated metal items were purchased at national websites, barbershop schools, and national conferences, which may increase generalizability within the United States. Even so, certain tools and brands may have been missed because of the preferences of the sampled participants. Unlike the previous studies in Europe, this study did not include any hair rollers, whisks, or hand showers. This may reflect preferences of the barber trade in comparison to the hairdresser trade, as hairdressers are more likely to color hair. However, this may also be attributed to sampling error.

Another limitation was the accuracy of the DMG test. The sensitivity of the DMG test is 59.3%, and the specificity is 97.5%.¹⁰ Another limitation of this study was the small sample sizes. Metal items such as easel and hairdryer had a sample size of only one. Low power of studies decreases the chance of detecting true effects.

In summary, items with nickel release exist within the barber-shop industry in the United States. Although some metal items, such as scissors, overlap with the hairdressing trade, barber-shops utilize unique items that release nickel. These items

should be considered when preventing and assessing occupational nickel allergy in barbers.

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