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Allergic Reactions to Tattoos: Retrospective Analysis of North American Contact Dermatitis Group Data 2001-2016

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To the Editor:

Thirty-eight percent of Americans between the ages of 18 and 29 have ≥ 1 tattoo and, of those, 70% have >2 .¹ Previous reports of allergic contact dermatitis (ACD) to tattoos implicated paraphenylenediamine (PPD) and various metals including aluminum, chromate, mercury, nickel, cadmium, iron, cobalt, copper, titanium, manganese.²⁻⁴ Liszewski et al indicated that metallic elements are rarely used in modern permanent tattoo inks.² We sought to identify allergens and the characteristics of patients with tattoo-related dermatitis using retrospective data from the North American Contact Dermatitis Group (NACDG) from 2001 to 2016. Patients with an allergic reaction to “tattoo/tattoo ink” (which includes henna) were included.

Overall, 38,543 individuals were patch tested during the study period; 29 (0.08%) had tattoo-related ACD (Table 1). Two-thirds were female and most were young adults (age 19-39 years). Over half reported a history of atopy. Positive NACDG screening series allergens associated with tattoos included: paraphenylenediamine (n=22, 81.5%) and cobalt, balsam of Peru, and nickel sulfate (n=1, 4.0% each) (Table 2). All reactions were clinically relevant (36.0% current, 64.0% past). Tattoos were identified as the source of 5 positive reactions not tested on the NACDG screening series (names of non-NACDG allergens are not collected). Occupational relevance was identified in 3 individuals: a designer, livestock farmer, and hairdresser/cosmetologist

Adverse reactions to tattoos include infections, sarcoidosis, and isomorphic conditions (e.g. psoriasis, lichen planus); a diagnostic approach for suspected allergic cutaneous reactions to permanent tattoos was proposed by Silvestre and Gonzalez-Villaneuva.⁴ The current study found that, albeit rare, tattoos/tattoo inks are associated with ACD. PPD was responsible in most cases. This is not surprising given that PPD is often added to red henna (“black henna”) to give a darker, long-lasting but temporary, tattoo. In addition, PPD may cross-react with azo compounds present in tattoo inks (especially red and green) which pose a greater toxicologic risk than metal fractions.⁵ Liszewski et al found 44 distinct pigments in 1416 permanent tattoo inks; 25% of these pigments had been reported to cause ACD. Further, no permanent tattoo inks were identified that contained PPD and relatively few tattoo inks which listed metallic elements.²

This study identified few cases of occupational ACD to tattoos. In addition to tattoo artists, farmers involved in tattooing livestock and hairdressers/cosmetologists providing cosmetic tattoo services may be exposed to tattoo inks.

Important limitations include the lack of distinction between temporary and permanent tattoos. Many cases of PPD sensitivity were likely due to temporary tattoos or cross-reactions to azo compounds in permanent tattoos. Additionally, the suspected cause of ACD is not collected as part of the NACDG database and therefore, we cannot comment on how many patients with suspected tattoo contact dermatitis were negative on patch testing. Regardless, our data underscores the findings of Liszewski et al² that metallic elements are rarely associated with allergic reactions to tattoo inks. Importantly, there were relatively few cases of ACD to tattoos.

Sincerely,

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Demographics	n (N=29) (%)
Male	10 (34.5)
Age (mean)	30.8
>40 years	6 (20.7)
≤18 years	6 (20.7)
19-39 years	16 (55.2)
40-59 years	6 (20.7)
≥60 years	1 (3.5)
Caucasian	24 (82.8)
History of atopy*	16 (55.2)
Occupational-related tattoo exposure	3 (10.3)

Table 1. Demographics of patients with skin conditions related to tattoos.

*Includes patient-self reported history of allergic rhinitis, childhood eczema, and/or asthma

	Paraphenylenediamine	Balsam of Peru	Cobalt	Nickel
# of reactions	22	1	1	1
Strength of reactions*				
Very strong (+++)	11	0	0	1
Strong (++)	7	0	1	0
Mild (+)	4	1	0	0
Clinical relevance**				
Definite	1	0	0	0
Probable	2	0	0	0
Possible	4	1	1	0
Past	15	0	0	1

Table 2. Strength and relevance of tattoo-related allergens.

*Strength was classified as +/-mild (infiltrated/possible papules), ++/strong (edematous/vesicular), +++/extreme (spreading/bullous/ ulcerative), +/-/doubtful (macular erythema only), irritant, or negative.

**Clinical relevance was defined as “definite” (patch test to tattoo verified to contain allergen was positive), “probable” (allergen could be verified as present in tattoo), “possible” (tattoo likely to contain allergen), or past exposure.