

ORIGINAL ARTICLE

Contact dermatitis and sensitization in professional musicians

Magdalena Kraft¹  | Steffen Schubert²  | Johannes Geier²  | Margitta Worm¹  |
for the IVDK¹

¹Department of Dermatology and Allergology, Allergy-Centre-Charité, Charité – Universitätsmedizin Berlin, Berlin, Germany

²Information Network of Departments of Dermatology (IVDK) at the University of Göttingen, Göttingen, Germany

Correspondence

Margitta Worm, Department of Dermatology and Allergology, Allergy-Centre-Charité, Charité – Universitätsmedizin Berlin, Charitéplatz 1, 10117 Berlin, Germany. Email: margitta.worm@charite.de

Background: Professional musicians have prolonged and intense physical contact with their instruments. This can lead to occupational skin diseases, particularly irritant and allergic contact dermatitis.

Objectives: To assess the skin diseases and sensitization patterns common among professional musicians.

Methods: A retrospective analysis of the data of the Information Network of Departments of Dermatology (IVDK) was performed, including data from 1997 to 2017.

Results: We identified 236 professional musicians. In this group, male sex (58.6%) and younger age (60.6% aged < 40 years) were common. The musicians suffered more frequently from facial dermatitis (23.7% vs 15.7%) and less often from leg dermatitis (5.1% vs 10.7%) than the control group (the non-musicians in the IVDK database). The most frequent diagnoses were allergic contact dermatitis, atopic dermatitis, and irritant contact dermatitis. The sensitization profile of the professional musicians was similar to that of the control group. In 8.9% of cases, an occupational background of skin disease was confirmed.

Conclusions: Severe occupational skin diseases among professional musicians are not as common as in classic “skin-damaging” professions. However, as these skin conditions can mostly be controlled with simple preventive measures, we recommend that this group should be patch tested and treated by a specialist.

KEYWORDS

contact dermatitis, contact sensitization, musical instrument, musicians, occupational skin diseases

1 | INTRODUCTION

Musicians are at risk of developing eczema because of intense contact with sensitizing and/or irritating substances in their instruments. Besides musculoskeletal diseases such as tenosynovitis, carpal tunnel syndrome, acute injuries,^{1–4} and neurological diseases (focal dystonia^{5,6}), skin diseases are also common among professional musicians.^{7–12} In particular, irritant contact dermatitis, allergic contact dermatitis and callosities have frequently been reported in this group.^{8,9}

A key factor in the development of eczematous skin lesions among professional musicians is the prolonged contact with a musical instrument, often under wet conditions caused by sweat or saliva. The most common instrument-related skin lesions include toxic and allergic contact dermatitis, and are further summarized in Table 1. Forms of irritant dermatitis are often named after the causative instrument; for example, fiddler's neck with clinical signs of lichenification and hyperpigmentation of the left side of the neck below the angle of the jaw, which occurs in violinists. Music instrument-associated skin traumata and infections, including paronychia, onycholysis, subungual haemorrhages in harpists, and atrophy or ischaemia of the lips in horn/trumpet players, have also been described.^{13,14,21}

The following collaborators of the IVDK (Information Network of Departments of Dermatology) contributed data: see Appendix S1.

TABLE 1 Overview of occupational skin diseases among musicians

Instrument group	Instruments	Irritant dermatitis	Culprit allergens	Other skin disease
Strings	Violin, viola, cello, double bass, guitar	Fiddler's neck Cellist's chest Guitar nipple ^{12,13}	Colophonium (rosin) ^{14,15} Exotic woods ^{14,16} Metals (nickel, cobalt, and chromium) ^{9,14,17} Propolis ⁹ <i>p</i> -Phenylenediamine ⁹	Paronychia ¹² Callosities ^{6,18}
Woodwinds	Flute, oboe, clarinet, bassoon, saxophone	Irritant cheilitis Flautist's chin ¹⁹	Exotic woods ^{16,20} Cane reed ¹⁴	Herpes labialis ¹⁴
Brass	Trumpet, trombones, horn, tuba	Horn player's lip ¹³	Metals ¹³	Herpes labialis ²¹ Satchmo syndrome (rupture of the orbicularis oris muscle) ¹³

The frequency and elicitors of allergic contact dermatitis among musicians are also instrument-related. The most common contact allergens reported in the literature are summarized in Table 1. Among string instrumentalists, these are: colophonium used in violin varnish or string waxing,^{14,15} exotic woods,^{14,16} metals such as nickel, cobalt and chromium in strings and other metal parts of instruments,^{9,14,17} propolis used in violin varnish, and *p*-phenylenediamine, which is sometimes used to stain wood or strings.⁹ Moreover, cases of contact allergy to exotic woods and cane reeds have been reported in woodwind players,^{14,16,20} and brass players are prone to developing contact allergies to metals, particularly nickel.¹³

These allergens have been identified and described in case reports and a few epidemiological studies; however, to our knowledge, a comprehensive analysis of the sensitization profile of musicians has never been performed. In this study, we address the most commonly occurring skin diseases among professional musicians, their sensitization profile, and the distributional pattern.

2 | PATIENTS AND METHODS

The Information Network of Departments of Dermatology (IVDK) is a network that currently includes 56 departments of dermatology in Germany, Switzerland and Austria dedicated to the epidemiology of contact allergy. Its structure and routine operating procedures are described in detail elsewhere.²² Data are subjected to standardized quality control, added to the central IVDK database, and analysed according to international standards.^{23,24}

For this retrospective data analysis, we selected data of the years 1997 to 2016 from the IVDK database. Patch tests (PTs) and evaluation of reactions were performed according to German Contact Allergy Group guidelines.²⁵ For this data analysis, PT reactions on day (D) 3 were taken into account. In few exceptional cases, when a reading was performed on D4 instead of D3, this reading was selected. Readings coded as +, ++, or +++, that is, positive reactions with erythema, infiltration, papules, and/or (coalescing) vesicles, were rated as positive in dichotomized analyses if not otherwise indicated. PT preparations were purchased from Almirall Hermal (Reinbek, Germany). The PT exposure time was 24 hours in 28% of patients, and 48 hours in 72% of patients. With a few (temporary) exceptions, Finn Chambers (inner diameter of 8 mm) on Scanpor tape (SmartPractice Europe, Greven, Germany) were used as test chambers. Among the 209 698

patients patch tested during these years, we identified 236 professional musicians (including instrumentalists, but also other types of musician, eg, directors or composers) as a study group, and a control group consisting of 209 435 patients who had never been professional musicians and were not hobby musicians with suspected allergy to music instruments. The statistical significance ($P < 0.05$) of history items was calculated with the χ^2 test, and non-overlapping 95% confidence intervals (CIs) were used for the comparison of crude sensitization frequencies. We performed five distinct logistic regression analyses with dermatitis localizations (leg, face, ear, neck, and lip) as target (dependent) variables, and three dichotomized explanatory (independent) variables: occupation "musician", male sex, and age ≥ 40 years. Results are presented as odds ratio (OR) estimates with 95% profile-likelihood CIs. Data were managed and analysed with the statistical analysis software SAS, version 9.4 (SAS Institute, Cary, North Carolina).

3 | RESULTS

3.1 | Demographic and clinical data

In the study period from 1997 to 2016, we identified 236 professional musicians. Table 2 shows a brief overview of this group according to the MOAHLFA criteria. Professional musicians were more often male (58.6%) and younger (60.6% aged < 40 years) than members of the control group. They suffered more frequently from facial dermatitis (23.7% vs 15.7%) and less often from leg dermatitis (5.1% vs 10.7%). This effect remained significant after multivariate analysis including adjustment for age and sex, with ORs of 0.47 and 1.9 for leg and face dermatitis, respectively (Table 3). Also, the risk of developing skin lesions on the lips (OR 9.9), ears (OR 3.4) and neck (OR 2.7) was much greater among musicians (Table 3).

Approximately half of the musicians were patch tested to exclude allergic contact dermatitis (45%, data not shown). Forty-four per cent were tested for suspected contact allergy. The most frequent diagnoses made after patch testing were: allergic contact dermatitis (including allergic contact stomatitis) in 29.2% of patients, atopic dermatitis in 13.6%, and irritant contact dermatitis (including irritant cheilitis) in 10.1% (Table 2B). Furthermore, there were a few cases of other forms of eczema, psoriasis, urticaria, drug allergy, perioral dermatitis,

TABLE 2 (A) MOAHLFA index of professional musicians and the control group; (B) the most frequent diagnosis after patch testing in both groups

	Professional musicians, N = 236		Control group, N = 209 435	
	n	%	n	%
A				
Male	134	56.8***	76 894	36.7
Occupational dermatitis	21	8.9**	32 008	15.3
Atopic dermatitis	51	21.6	41 343	19.7
Hand dermatitis	62	26.3	57 787	27.6
Leg dermatitis	12	5.1**	22 367	10.7
Face dermatitis	56	23.7***	32 941	15.7
Age ≥ 40 y	143	60.6**	145 035	69.3
B				
Allergic contact dermatitis	69	29.2	56 927	27.1
Atopic dermatitis	32	13.6	24 670	11.8
Irritant contact dermatitis	24	10.1	22 997	10.9

Statistical significance was tested with the χ^2 test: ** $P < 0.01$; *** $P < 0.001$.

glossodynia, prurigo, and pruritus. In 21 patients (8.9%), an occupational background of skin disease was confirmed.

3.2 | Profile of sensitization to baseline allergens in professional musicians

Concerning the sensitization profile among musicians, Table 4 (top 10 allergens) and Table S1 (other allergens from baseline series) show

TABLE 3 Odds ratios (with 95% confidence intervals) of five separate logistic regressions models for five different localizations of skin lesions (as dependent variables); sex, age and occupation “musician” were used in each model as independent variables

	Occupation musician	Sex = male	Age ≥ 40 y
Leg dermatitis	0.47 (0.25-0.81)	1.22 (1.18-1.25)	6.03 (5.74-6.35)
Face dermatitis	1.93 (1.42-2.60)	0.49 (0.48-0.50)	0.97 (0.95-0.996)
Ear dermatitis	3.43 (1.35-7.07)	0.57 (0.51-0.63)	0.96 (0.87-1.06)
Neck dermatitis	2.77 (1.09-6.72)	0.49 (0.44-0.54)	0.99 (0.91-1.09)
Cheilitis	9.99 (4.93-17.91)	0.60 (0.52-0.69)	0.83 (0.73-0.94)

TABLE 4 The 10 most common sensitizations among allergens of the baseline series in professional musicians

Substance	Professional musicians (N = 236)				Control group (N = 209 435)		
	Tested (n)	Positive (n)	Positive, % (95%CI)	Age-standardized and sex-standardized positive, % (95%CI)	Tested (n)	Positive (n)	Age-standardized and sex-standardized positive, % (95%CI)
Nickel(II) sulfate 5%	216	20	9.3 (5.4-13.1)	14.6 (8.9-20.3)	184 541	27 221	16.5 (16.3-16.7)
Myroxylon pereirae 25%	215	20	9.3 (5.4-13.2)	10.5 (5.8-15.2)	186 222	15 800	7.3 (7.2-7.4)
Fragrance mix I 8%	214	15	7.0 (3.6-10.4)	6.6 (2.9-10.2)	185 820	17 219	8.4 (8.3-8.6)
Colophonium 20%	214	10	4.7 (1.8-7.5)	6.4 (2.6-10.3)	186 312	7808	4.0 (3.9-4.1)
Fragrance mix II 14%	144	10	6.9 (2.8-11.1)	5.7 (2.1-9.3)	121 261	6118	4.6 (4.4-4.7)
Cobalt(II) chloride 1%	215	9	4.2 (1.5-6.9)	4.1 (1.2-7.0)	185 986	10 192	6.0 (5.9-6.2)
Potassium dichromate 1%	215	7	3.3 (0.9-5.6)	3.2 (0.4-6.1)	186 298	8083	4.2 (4.1-4.3)
Propolis 10%	202	5	2.5 (0.3-4.6)	2.2 (0.1-4.2)	177 793	5114	2.6 (2.5-2.7)
Oil of turpentine 10%	215	5	2.3 (0.3-4.3)	2.6 (0.1-5.1)	186 392	3721	1.8 (1.8-1.9)
HICC (Lyrall) 5%	174	4	2.3 (0.1-4.5)	2.5 (0.0-5.2)	152 067	3301	2.1 (2.0-2.1)

Abbreviations: CI, confidence interval; HICC, hydroxyisohexyl 3-cyclohexene carboxaldehyde.

the results of PTs with the baseline series among professional musicians and, for comparison, of the control group. The most common sensitizations among musicians were to nickel (9.3%), *Myroxylon pereirae* (balsam of Peru; 9.3%), fragrance mix I (7%), fragrance mix II (6.9%), and colophonium (4.7%). After standardization for sex and age, there were no significant differences between professional musicians and the control group among the top 10 allergens from the baseline series. In contrast, significant differences were observed regarding methylchloroisothiazolinone (MCI)/methylisothiazolinone (MI), cetearyl alcohol, methyldibromo glutaronitrile, and thiuram mix. Professional musicians showed slightly less sensitization to these allergens than the control group (Table S1, Appendix S1).

Multiple sensitization, defined as more than one contact allergy to allergens from the baseline series in a patient, was similarly frequent among musicians and the control group (43% vs 49%, not significant; data not shown). The reaction severity (+ vs ++/+++) was also similar between both groups regarding most allergens shown in Table 4, except for propolis; all five reactions in the study group were ++ or +++.

3.3 | Common diagnoses among musicians with occupational skin disease

An occupational skin disease was diagnosed in 21 professional musicians (8.9%). This frequency is lower than the 15% average observed for other professions in the IVDK. Table 5 summarizes the characteristics of this group according to the MOAHLFA criteria. The most common diagnoses were: allergic contact dermatitis (38%; eight patients) and irritant dermatitis (23%; six patients) (Table 5B). Additionally,

there were three cases of other forms of eczema, and one case of psoriasis. The most common anatomical sites of the skin lesions were: the hands (including the fingers) (38%; eight cases), lips (28%; six cases), other regions of the face (three cases), and neck (two patients) (data not shown).

3.4 | Allergens causing occupational allergic contact dermatitis among musicians

The sensitization profile of musicians with occupational allergic contact dermatitis in comparison with all patients with allergic contact dermatitis in our database was analysed. Table S2 (Appendix S1) shows the MOAHLFA index of eight professional musicians and the total population with allergic contact dermatitis (control group; $n = 55\,996$). The professional musicians with allergic contact dermatitis were mostly female (75%; six patients). One third of them had lesions on their hands (38%; three patients), and in one third (38%; three patients) facial dermatitis was diagnosed. Owing to the small number of patients in the study group, the differences between the two groups were not statistically significant. The sensitizations identified in this group were to: colophonium and oil of turpentine (two cases each), palisander wood, *M. pereirae*, formaldehyde, fragrance mix I, benzoyl peroxide, and abietic acid (one case for each allergen) (Table 6). Three of those (colophonium, *M. pereirae*, and fragrance mix I) are among the top 10 allergens causing sensitization in the population of all patients with allergic contact dermatitis in our database (data not shown). There were no sensitizations to metals, including nickel, chromium, and cobalt. In five cases, participant's own substances were tested, three times with positive results: one patient reacted to his own colophonium but not to the colophonium in the baseline series, one patient reacted to the chinrest of his viola and palisander wood, and one patient reacted to his violin varnish, oil of turpentine, and the colophonium from the baseline series. Wet exposure as a cofactor of the diagnosis could be identified in one case.

TABLE 5 MOAHLFA index (A) and the most common diagnosis (B) of professional musicians with occupational skin disease

	Musicians with occupational skin disease (N = 21)	
	n	%
A		
Male	11	52
Occupational dermatitis	21	100
Atopic dermatitis	4	19
Hand dermatitis	8	38
Leg dermatitis	0	0
Face dermatitis	9	43
Age ≥ 40 y	9	43
B		
Diagnosis		
Allergic contact dermatitis	8	38
Irritant dermatitis	6	23

TABLE 6 Sensitizations among professional musicians with occupational allergic contact dermatitis (allergens in pet., except where otherwise indicated)

Substance	Test concentration (%)	Musicians with occupational allergic contact dermatitis (N = 8)	
		Tested (n)	Positive (n)
Colophonium	20	6	2
Oil of turpentine	10	7	2
<i>Myroxylon pereirae</i> (balsam of Peru)	25	7	1
Palisander wood		1	1
Formaldehyde aq.	1	7	1
Fragrance mix I	8	7	1
Benzoyl peroxide	1	4	1
Abietic acid	10	1	1

4 | DISCUSSION

The frequency of skin conditions related to professional activities among musicians varies from 20%^{8,11,18} to 50%.⁷ In one small survey by Rimmer et al,¹² almost all individuals who responded to a questionnaire ($n = 24$) reported occupation-related skin problems. In our database, we identified 236 professional musicians among >200 000 tested patients. In 9% of this study group, an occupational background of the skin disease was confirmed. This low proportion is similar to that in social workers and nursery school teachers, and highly divergent from those in professions commonly associated with occupational skin diseases, such as hairdressing and nursing (data from the IVDK database; not shown). This may indicate that severe occupational skin diseases, which require treatment and elaborate testing in a dermatological clinic, are not as common in professional musicians. This finding is complementary to published data from epidemiological survey studies, as the majority of skin problems reported in those surveys were mild and had an obvious aetiology (eg, callosities)^{8,18}; therefore, these patients would probably not be referred to a dermatology department.

In a study by Gambichler et al, 412 musicians were assessed, 22% of whom had an occupational skin disease.⁸ Almost 60% of these were callosities. Fiddler's neck was diagnosed in 19% of cases and allergic contact dermatitis was also diagnosed in 19% of cases. Professional performance was slightly to moderately affected in 25% of musicians with instrument-related skin disorders, and only two individuals were severely affected.⁸ In another epidemiological study from Italy, Patruno et al reported a similar frequency of instrument-related skin lesions (21% of all participants).¹⁸ In almost all cases, the diagnosis was callosities/irritant contact dermatitis, and there was a single case of allergic contact dermatitis (1/628).

These epidemiological studies and our data (as we found only 8 [3%] cases of occupational allergic contact dermatitis among 236 professional musicians in our database) support the hypothesis that instrument-related allergic contact dermatitis is rare. This may be explained by the fact that, even if the musicians have prolonged contact with irritant substances and contact allergens, with mechanical

friction and some moisture (such as saliva or sweat), it is not a profession with typical occlusive and moisture conditions and contact with toxic substances, which lead to extensive skin damage.

The type IV sensitization profile of professional musicians is comparable to that of the control population. The slight differences observed regarding MCI/MI and thiuram mix can be explained by the apparent absence of occupational exposure of musicians to these substances.

The localization of skin lesions differed significantly between musicians and the control group. This could not be explained by differences in age or sex. As facial dermatitis is more frequent and leg dermatitis less common in professional musicians, and these regions have different levels of exposure to various occupational stress factors, one may speculate that, even if occupational skin diseases in our population are rare, occupational factors may contribute to or aggravate non-occupational skin disorders in professional musicians. On the other hand, we cannot exclude the possibility that other factors not included in the analysis, such as education, marital status, and multimorbidity, may be confounders.

Among the small population of professional musicians with occupational allergic contact dermatitis, colophonium and related allergens (oil of turpentine and abietic acid²⁶) were identified as the most common contact allergens. However, these sensitizations occurred in two patients: one with sensitization to colophonium and oil of turpentine, and one with sensitization to abietic acid, oil of turpentine, and their own colophonium. Colophonium (colophony, rosin) has been described as being one of the most common contact allergens among musicians.^{14,27,28} It is a resin from pine tree containing >100 different substances. Cross-sensitization with *M. pereirae* (balsam of Peru) is possible,^{15,29} which may have been the case in one patient in our population.

There were no cases of sensitization to metals in our data, which was surprising, as metals (mostly nickel) are commonly described sensitizers and causes of dermatitis among musicians. Gambichler et al reported that, of 17 musicians with allergic contact dermatitis, 11 were sensitized to nickel, 1 to colophonium, and 1 to lanolin.⁸

In conclusion, by using the IVDK database, we identified 236 professional musicians who showed certain demographic characteristics (male and age < 40 years) and clinical patterns (mostly face and hand dermatitis). Only a small percentage of the patch tested professional musicians suffered from occupational skin disease. Allergic contact dermatitis was the most common diagnosis among occupational skin diseases in our study group; however, according to absolute numbers, it is a rare diagnosis (only eight cases). As this condition can be easily treated in the majority of cases with simple preventive measures, such as the avoidance of contact allergens (eg, instrument exchange;^{16,30}), we strongly recommend that patch testing should always be performed in musicians with suspected occupational skin disease. Furthermore, the testing should include a baseline series accompanied by case-specific series and the patient's own substances. These patients should be seen and treated by a dermatologist and specialist in occupational medicine. This is necessary because, in some cases, the skin disorder may significantly impair both professional performance and the patient's quality of life.

ACKNOWLEDGEMENTS

We thank all departments and colleagues who contributed data to this study (in alphabetical order): Aachen (J. M. Baron), Aarau (J. Grabbe),

Augsburg (A. Ludwig), Basel (A. Bircher), Berlin B.-Frank. (B. Tebbe and R. Treudler), Berlin BWK (A. Köhler), Berlin Charité (B. Laubstein, T. Zuberbier, and M. Worm), Bern (D. Simon), Bielefeld (I. Effendy), Bochum (Ch. Szliska, M. Straube, and H. Dickel), Bochum BGFA (M. Fartasch), Bremen (D. Meyersburg, N. Patsinakidis, and M. Zutt), Buxtehude (P. Große-Hüttmann and P. Hausenblas), Dermatologikum (V. Martin, K. Reich, K. Breuer, and D. Vieluf), Dessau (A. Jung and U. Lippert), Dortmund (B. Pilz, P. J. Frosch, B. Mydlach, C. Pirker, R. Herbst, K. Kügler, and U. Beiteke), Dresden (G. Richter, R. Aschoff, P. Spornraft-Ragaller, and A. Bauer), Dresden Friedrichst. (A. Koch), Duisburg (J. Schaller), Erlangen (K.-P. Peters, T. L. Diepgen, M. Fartasch, M. Hertl, and V. Mahler), Essen (H.-M. Ockenfels and U. Hillen), Falkenstein (H. Schwantes and D. Vieluf), Freudenberg (Ch. Szliska), Geier Göttingen (J. Geier), Gera (J. Meyer, H. Grunwald-Delitz, and M. Kaatz), Graz (B. Kränke and W. Aberer), Greifswald (M. Jünger), Göttingen (Th. Fuchs, J. Geier, and T. Buhl), Halle (G. Gaber, D. Lübke, and B. Kreft), Hamburg (M. Kiehn, R. Weißbecher, E. Coors, and J. Witte), Hamburg BUK (K. Breuer, U. Seemann, and C. Schröder-Kraft), Hannover (T. Schaefer, Th. Werfel, and A. Kapp), Heidelberg (A. Schulze-Dirks, M. Hartmann, U. Jappe, M. Hartmann, and K. Schäkel), Heidelberg AKS (H. Dickel, T. L. Diepgen, and E. Weisshaar), Heilbronn (H. Löffler), Homburg/Saar (F. A. Bahmer, P. Koch, and C. Pföhler), Jena (M. Gebhardt, A. Bauer, W. Wigger-Alberti, M. Kaatz, S. Schliemann, and S. Schliemann), Kiel (J. Brasch), Krefeld (A. Wallerand, M. Lilie, and S. Wassilew), Lausanne (P. Spring and C. Curdin), Lausanne CEDDECC (P. Spring), Leipzig (R. Treudler), Lippe Detmold (St. Nestoris), Lübeck (J. Kreuzsch, J. Grabbe, I. Shimanovich, U. Jappe, K. Hartmann, and Å. Recke), Mainz (D. Becker), Mannheim (Ch. Bayerl, D. Booken, C.-D. Klemke, W. Ludwig-Peitsch, and A. Schmieder), Marburg (I. Effendy, H. Löffler, M. Hertl, and W. Pfützner), Minden (J. Hoffmann and R. Stadler), München LMU (T. Oppel, B. Przybilla, P. Thomas, T. Schuh, R. Eben, and S. Molin), München Schwabing (M. Agathos, K. Ramrath, M. Georgi, K. Ramrath, and G. Isbary), München TU (J. Rakoski, U. Darsow, and T. Biedermann), Münster (B. Hellweg, R. Brehler, and M. Behring), Nürnberg (I. Müller, D. Debus, A. Bachtler, K. Ertner, and V. Baur), Oldenburg (M. Padeken and O. Kautz), Osnabrück (W. Uter, S. M. John, H. J. Schwanitz, N. Schürer, H. Dickel, Ch. Skudlik, and S. M. John), Prager und Partner (V. Martin and W. Prager), Rostock (H. Heise, J. Trcka, and D. Rothaupt), Stuttgart (J. Rieker-Schwiebach), Tübingen (G. Lischka, M. Röcken, T. Biedermann, and J. Fischer), Ulm (H. Gall, G. Staib, and P. Gottlöber), Ulm BWK (H. Pillekamp), Ulm Univ.-Klinik (J. Weiss), Wuppertal (O. Mainusch and J. Raguz), Würzburg (J. Arnold and A. Trautmann), Zwickau (B. Knopf, D. Teubner, and D. Mechtel), and Zürich (B. Ballmer-Weber and A. Navarini).

CONFLICTS OF INTEREST

The authors have no conflicts of interests to report.

ORCID

Magdalena Kraft  <https://orcid.org/0000-0002-2770-9947>

Steffen Schubert  <https://orcid.org/0000-0002-2359-2518>

Johannes Geier  <https://orcid.org/0000-0002-5047-8948>

Margitta Worm  <https://orcid.org/0000-0002-3449-1245>

REFERENCES

- Kok LM, Huisstede BM, Voorn VM, Schoones JW, Nelissen RG. The occurrence of musculoskeletal complaints among professional musicians: a systematic review. *Int Arch Occup Environ Health*. 2016;89:373-396.
- Gasenzer ER, Klumpp MJ, Lux EA, Neugebauer EA. [Performing arts medicine and pain management in musicians in Germany]. *MMW Fortschr Med*. 2017;159:51-54.
- Okoshi K, Minami T, Kikuchi M, Tomizawa Y. Musical instrument-associated health issues and their management. *Tohoku J Exp Med*. 2017;243:49-56.
- Zuskin E, Schachter EN, Kolčić I, et al. Health problems in musicians—a review. *Acta Dermatovenerol Croat*. 2005;13:247-251.
- Liu S, Heyden GF. Maladies in musicians. *South Med J*. 2002;95:727-734.
- Rosenbaum AJ, Vanderzanden J, Morse AS, Uhl RL. Injuries complicating musical practice and performance: the hand surgeon's approach to the musician-patient. *J Hand Surg Am*. 2012;37:1269-1272.
- Baccouche D, Mokni M, Ben Abdelaziz A, Ben Osman-Dhahri A. Dermatological problems of musicians: a prospective study in musical students. *Ann Dermatol Venereol*. 2007;134:445-449.
- Gambichler T, Uzun A, Boms S, et al. Skin conditions in instrumental musicians: a self-reported survey. *Contact Dermatitis*. 2008;58:217-222.
- Crépy MN. Skin diseases in musicians. *Eur J Dermatol*. 2015;25:375-383.
- Onder M, Aksakal AB, Oztas MO, Güner MA. Skin problems of musicians. *Int J Dermatol*. 1999;38:192-195.
- Nethercott JR, Holness DL. Dermatologic problems of musicians. *J Am Acad Dermatol*. 1991;25:870.
- Rimmer S, Spielvogel RL. Dermatologic problems of musicians. *J Am Acad Dermatol*. 1990;22:657-663.
- Vine K, DeLeo V. Dermatologic manifestations of musicians: a case report and review of skin conditions in musicians. *Cutis*. 2011;87:117-121.
- Gambichler T, Boms S, Freitag M. Contact dermatitis and other skin conditions in instrumental musicians. *BMC Dermatol*. 2004;16:4.
- Lombardi C, Bottello M, Caruso A, et al. Allergy and skin diseases in musicians. *Eur Ann Allergy Clin Immunol*. 2003;35:52-55.
- Gasenzer ER, Neugebauer EA. [Contact allergies in musicians]. *Dtsch Med Wochenschr*. 2012;137:2715-2721.
- Jue MS, Kim YS, Ro YS. Fiddler's neck accompanied by allergic contact dermatitis to nickel in a viola player. *Ann Dermatol*. 2010;22:88-90.
- Patrino C, Napolitano M, La Bella S, et al. Instrument-related skin disorders in musicians. *Dermatitis*. 2016;27:26-29.
- Collet E, Jeudy G, Dalac S. Cheilitis, perioral dermatitis and contact allergy. *Eur J Dermatol*. 2013;23:303-307.
- Pröhler C, Hamsch C, Tilgen W. Allergic contact dermatitis of the lips in a recorder player caused by African blackwood. *Contact Dermatitis*. 2008;59:180-181.
- Barkvoll P, Attramadal A. Recurrent herpes labialis in a military brass band. *Scand J Dent Res*. 1987;95:256-258.
- Schnuch A, Geier J, Lessmann H, et al. Surveillance of contact allergies: methods and results of the Information Network of Departments of Dermatology (IVDK). *Allergy*. 2012;67:847-857.
- Uter W, Schnuch A, Gefeller O. Guidelines for the descriptive presentation and statistical analysis of contact allergy data. *Contact Dermatitis*. 2004;51:47-56.
- Uter W, Mackiewicz M, Schnuch A, et al. Interne Qualitätssicherung von Epikutantest-Daten des multizentrischen Projektes "Informationsverbund Dermatologischer Kliniken" (IVDK). *Dermatologie in Beruf und Umwelt*. 2005;53:107-114.
- Schnuch A, Aberer W, Agathos M, et al. Durchführung des Epikutantests mit Kontaktallergenen. Leitlinien der Deutschen Dermatologischen Gesellschaft (DDG) und der Deutschen Gesellschaft für Allergie und klinische Immunologie (DGAKI). *J Dtsch Dermatol Ges*. 2008;6:770-775.
- Fisher AA. Allergic contact dermatitis in a violinist. The role of abietic acid—a sensitizer in rosin (colophony)—as the causative agent. *Cutis*. 1981;27:466-473.
- Vandebuerie L, Aerts C, Goossens A. Allergic contact dermatitis resulting from multiple colophonium-related allergen sources. *Contact Dermatitis*. 2014;70:117-119.
- Fischer AA. Dermatitis in a musician. Part I: allergic contact dermatitis. *Cutis*. 1998;62:167-168.
- Fisher AA. Allergic contact dermatitis from musical instruments. *Cutis*. 1993;51:75-76.
- Haroun-Díaz E, Rodrigues-Barata R, Cuesta-Herranz J, Conde-Salazar L. Contact dermatitis due to lubricant oils in a Brass musician. *Ann Dermatol*. 2017;29:127-129.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

How to cite this article: Kraft M, Schubert S, Geier J, Worm M, for the IVDK. Contact dermatitis and sensitization in professional musicians. *Contact Dermatitis*. 2019;80: 273–278. <https://doi.org/10.1111/cod.13191>

Table S1 Allergens of the standard series not included in the table 4. Observed reaction frequencies (percentage of positive reactions) with 95% confidence intervals are shown for professional musicians. Age- and sex-standardized frequencies with 95% confidence intervals are shown for professional musicians and the control group.

Substance	Test concentration	Professional musicians n=236			Control group n=209 435	
		tested n	positive n	positive %	Age- and sex-standardized positive % (95% CI)	t
Formaldehyde	1% aq.	215	4	7 [3.6-10.4]	3.0 [0.1-6.0]	1
Lanolin (wool fat) alcohols	30%	215	3	1.4 [0.0-0.3]	1.9 [0.0-4.1]	1
Methylchloroisothiazolinone Methylisothiazolinone (MCI/MI)	100 ppm aq.	212	2	0.9 [0.0-2.2]	1.1 [0.0-2.9]	1
Methyldibromo glutaronitrile	0.2%	105	2	1.9 [0.0-4.5]	2.1 [0.0-5.0]	
Methyldibromo glutaronitrile	0.3%	76	2	2.6 [0.0-6.2]	1.8 [0.0-4.2]	
Epoxy resin	1%	214	2	0.9 [0.0-2.2]	0.6 [0.0-1.5]	1
N-Isopropyl-N'-phenyl-p-phenylene diamine (IPPD)	0,1%	215	2	0.9 [0.0-2.2]	0.8 [0.0-2.1]	1
<i>p</i> -tert.-Butylphenol formaldehyde resin (PTBFR)	1%	187	2	1.1 [0.0-2.5]	1.1 [0.0-2.7]	1
Ylang Ylang oil	10%	88	2	2.3 [0.0-5.4]	1.7 [0.0-4.3]	
Cetearyl alcohol	20%	215	1	0.5 [0.0-1.4]	0.2 [0.0-0.6]	1
Mercaptobenzothiazole	2%	182	1	0.5 [0.0-1.6]	0.7 [0.0-2.1]	1
Paraben mix	16%	215	1		0.6 [0.0-1.9]	1
Zinc diethyldithiocarbamate (ZDEC)	1%	215	1	0.5 [0.0-1.4]	0.6 [0.0-1.9]	1
Jasmine absolute	5%	85	1	1.2 [0.0-3.5]	0.6 [0.0-1.7]	
Sandalwood oil	10%	85	1	1.2 [0.0-3.5]	1.2 [0.0-3.4]	
Bufexamac	5%	173	0	0.0 [0.0-1.7]	0.0 [0.0-1.7]	1
Mercaptobenzothiazole	1%	8	0	0.0 [0.0-31.2]	0.0 [0.0-31.2]	
Thiuram mix	1%	215	0	0.0 [0.0-1.4]	0.0 [0.0-1.4]	1
Mercapto mix (CBS, MBTS, MOR)	1 %	215	0	0.0 [0.0-1.4]	0.0 [0.0-1.4]	1
Methylisothiazolinone	0.05% aq.	78	0	0.0 [0.0-3.8]	0.0 [0.0-3.8]	
Bronopol	0.5%	168	0	0.0 [0.0-1.8]	0.0 [0.0-1.8]	1
Compositae mix	5%	75	0	0.0 [0.0-3.9]	0.0 [0.0-3.9]	
Compositae mix II	5%	52	0	0.0 [0.0-5.6]	0.0 [0.0-5.6]	

Table S2 MOAHLFA index of professional musicians versus the control group with allergic contact dermatitis

	Musicians with occupational allergic contact dermatitis (n=8)		Control group (n = 55 996)	
	n	%	n	%
Male	2	25	20063	36
Occupational dermatitis	8	100	12572	23
Atopic dermatitis	2	18	9438	17
Hand dermatitis	3	38	18138	32
Leg dermatitis	0	0	6949	12
Face dermatitis	3	38	11284	20
Age≥40 years	3	38	38958	70

Collaborators for the Information Network of Departments of Dermatology (IVDK):

This list of collaborators was uploaded to manuscript central and is not identical with persons listed in the acknowledgements (prior to references) within the manuscript.

Dr. med. Ulrike Beiteke , Department of Dermatology, Dortmund Hospital, Dortmund, Germany .

Prof. Dr. med. Joachim Dissemund , Department of Dermatology, University Hospital, Essen, Germany .

Prof. Dr. med. Timo Buhl , Department of Dermatology, Venereology and Allergology, University Medical Center Göttingen, Göttingen, Germany .

Prof. Dr. med. Knut Schäkel , Department of Dermatology, Ruprecht Karls University, Heidelberg, Germany .

Prof. Dr. med. Claudia Pföhler , Department of Dermatology, Saarland University Medical School, Homburg, Germany .

Prof. Dr. med. Jochen Brasch , Department of Dermatology, University Hospitals of Schleswig-Holstein, Campus Kiel, Kiel, Germany .

Prof. Dr. med. Margitta Worm , Allergy Unit, Department of Dermatology and Allergology, Charité - Universitätsmedizin Berlin, Berlin, Germany .

Prof. Dr. med. Andrea Bauer , Clinic and Policlinic for Dermatology, Medical Faculty Carl Gustav Carus, TU Dresden, Dresden, Germany .

Dr. med. Burkhard Kreft , Department of Dermatology and Venereology, Martin Luther University Halle-Wittenberg, Halle (Saale), Germany .

Dr. med. Sibylle Schliemann , Department of Dermatology, Jena University Hospital, Jena, Germany .

Prof. Dr. med. Ulf Darsow , Department of Dermatology and Allergology, Technical University Munich, Munich, Germany .

PD Dr. med. Detlef Becker , Department of Dermatology, University of Mainz, Mainz, Germany .

Dr. med. Stephan Forchhammer , Department of Dermatology and Allergology, University Medical Center Tübingen, Tübingen, Germany .

Prof. Dr. med. Karin Hartmann , Department of Dermatology, University of Luebeck, Luebeck, Germany .

Dr. med. Jana Witte , Department of Dermatology and Venereology, University Medical Center Hamburg-Eppendorf (UKE), Hamburg, Germany .

Prof. Dr. med. Wolfgang Pfützner , Clinical & Experimental Allergology, Department of Dermatology and Allergology, Philipps-University Marburg, Germany .

Dr. med. Brigitte Coras-Stepanek , Department of Dermatology, Allergology and Environmental Medicine, Hospital Munich Schwabing, Munich, Germany .

Prof. Dr. med. Christoph Skudlik , Institute for Interdisciplinary Dermatologic Prevention and Rehabilitation (iDerm) and Department of Dermatology, Environmental Medicine, and Health Theory, University of Osnabrück, Osnabrück, Germany .

Dr. med. Nicola Wagner , Department of Dermatology, Erlangen University Hospital, Erlangen, Germany .

Prof. Dr. med. Werner Aberer , Department of Dermatology and Venerology, Medical University of Graz, Austria .

Prof. Dr. med. Steffen Emmert , Department of Dermatology and Venereology, University Medicine Rostock, Rostock, Germany .

Prof. Dr. med. Jens Malte Baron , Department of Dermatology and Allergology, University Hospital of Aachen, Aachen, Germany .

Dr. med. Katharina Siedlecki , Department of Dermatology and Allergology, Klinikum Augsburg, Augsburg, Germany .

Dr. med. Vera Baur , Department of Dermatology, Paracelsus Medical University Nuremberg, Nürnberg, Germany .

PD Dr. med. Astrid Schmieder , Department of Dermatology, Venereology and Allergology, University Medical Center and Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany .

Prof. Dr. med. Elke Weisshaar , Department of Clinical Social Medicine, Occupational and Environmental Dermatology, University Medical Center, Heidelberg, Germany .

Dr. Heidrun Grunwald-Delitz , Department of Dermatology, Wald Klinikum Gera, Gera, Germany .

Prof. Dr. med. Axel Trautmann , Department of Dermatology, Venereology, and Allergology, University Hospital Würzburg, Würzburg, Germany .

Prof. Dr. med. Andreas Bircher , University Hospital Basel, Department of Dermatology, Basel, Switzerland .

Prof. Dr. med. Christiane Szliska , Department of Dermatology, Bethesda Hospital, Freudenberg, Germany .

Prof. Dr. med. Johannes Weiß , Department of Dermatology and Allergy, University of Ulm, Ulm, Germany .

Prof. Dr. med. Isaak Effendy , Department of Dermatology, Bielefeld Medical Center, Bielefeld, Germany .

Prof. Dr. med. Michael Jünger , Department of Dermatology, University Medicine Greifswald, Greifswald, Germany .

Prof. Dr. med. Randolph Brehler , Department of Dermatology, University Hospital Münster, Münster, Germany .

PD Dr. med. Sonja Molin , Department of Dermatology and Allergology, Ludwig-Maximilians-University, Munich, Germany .

Prof. Dr. med. Thomas Werfel , Department of Dermatology and Allergy, Division of Immunodermatology and Allergy Research, Hannover Medical School, Hannover, Germany .

PD Dr. med. Heinrich Dickel , Department of Dermatology, Venereology and Allergology, Ruhr University Bochum, Bochum, Germany .

Juliane Rieker-Schwienbacher , Center for Dermatology, Phlebology and Allergology, Klinikum Stuttgart, Stuttgart, Germany .

PD Dr. med. Dieter Vieluf , Department of Allergology, Photodermatology and Occupational dermatology, Dermatologikum Hamburg, Hamburg, Germany .

Prof. Dr. med. Rudolf Stadler , Department of Dermatology, University Hospital, Johannes Wesling Klinikum, Minden, Germany .

Prof. Dr. med. Dagmar Simon , Department of Dermatology, Bern University Hospital, Bern, Switzerland .

Prof. Dr. med. Manigé Fartasch , Institute for Prevention and Occupational Medicine of the German Social Accident Insurance, Institute of the Ruhr University Bochum (IPA), Bochum, Germany .

Prof. Dr. med. Alexander Navarini , Department of Dermatology, University Hospital Zurich, Zurich, Switzerland .

PD Dr. med. Regina Treudler , Leipzig Interdisciplinary Allergy Center (LICA), Department of Dermatology, Venereology and Allergology, University Medical Center, Leipzig, Germany .

Dr. med. Stefan Nestoris , Clinic for Dermatology, Klinikum Lippe-Detmold, Detmold, Germany .
Dr. med. Dirk Mechtel , Clinic for Skin Diseases and Allergology, Heinrich Braun Klinikum, Zwickau, Germany .
Dr. med. Claudia Schröder-Kraft , Institute for Interdisciplinary Dermatologic Prevention and Rehabilitation (iDerm) of the University of Osnabrück and Dermatologic Center, BG Trauma Hospital Hamburg, Hamburg, Germany, .
Prof. Dr. med. Harald Löffler , Department of Dermatology, SLK Hospital Heilbronn, Heilbronn, Germany .
Prof. Dr. med. Matthias Fischer , BG Clinic Falkenstein of Occupational Diseases, Falkenstein, Germany .
Dr. med. André Koch , Department of Dermatology and Allergology, Academic Teaching Hospital Dresden-Friedrichstadt, Dresden, Germany .
Prof. Dr. med. Ulrike Raap , Department of Dermatology, University of Oldenburg, Oldenburg .
Prof. Dr. med. Jürgen Grabbe , Department of Dermatology, Cantonal Hospital Aarau, Aarau, Switzerland.
Dr. med. Julie di Lucca , Department of Dermatology, University Hospital Center CHUV, Lausanne, Switzerland .
Prof. Dr. med. Markus Zutt , Department of Dermatology and Allergology, Medical Center Bremen-Mitte, Bremen, Germany .
Dr. med. Philipp Spring , Dermatological and Dermato-Surgical Center CEDDECC, Lausanne, Switzerland .
Dr. med. Welf Prager , Practice for Dermatology, Allergology and Phlebology Prager and Partner, Hamburg, Germany .