

# Colophonium-related Allergic Contact Dermatitis Caused by Medical Adhesive Tape Used to Prevent Skin Lesions in Soldiers

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**Medical adhesive tapes are commonly recommended for the prevention of friction blisters during hiking and military marches. The aim of this paper is to report on the results of investigations into an outbreak of tape-related foot dermatitis in 26 military conscripts following continuous use of medical adhesive tapes for several days during a field exercise. Patch tests were performed using baseline series and aimed testing was performed with colophonium-related substances and different medical adhesive tapes. Contact allergy to the adhesive tapes used was found in 20 (77%) subjects, and contact allergy to colophonium in 16 (61%). Chemical analysis detected colophonium-related substances in the culprit tapes. Compared with consecutive dermatitis patients investigated at our Department of Occupational and Environmental Dermatology in the previous 10 years, conscripts with colophonium allergy had increased odds ratios for concomitant contact allergy to phenol formaldehyde resins and fragrance substances including hydroperoxides of limonene and linalool. The results show that prolonged use of medical adhesive tapes on intact skin carries a high risk for allergic contact dermatitis. Prior to their introduction on the market, medical devices should be assessed for possible side-effects.**

*Key words:* allergic contact dermatitis; colophonium; contact allergy; medical device; military personnel; occupational dermatitis.

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The use of adhesives on the skin can cause allergic contact dermatitis, a well-known side-effect of medical adhesive bandages and, more recently, of medical devices applied on the skin (1, 2). Among the allergens most commonly reported to cause allergic contact dermatitis to adhesives are colophonium and colophonium-related substances, rubber additives, and acrylates (1). The use of sports tapes, including medical adhesive tapes, has become increasingly popular for the treatment and prevention of exercise-related friction blisters (3–5), and is often advocated on internet sites and social media (5–7).

## SIGNIFICANCE

Adhesive tapes can be used for the prevention of friction blisters. However, this report shows that long-term use of adhesive tape over many days is an obvious risk for the development of contact allergy to substances in the adhesive, which may lead to severe foot dermatitis. This also carries a risk of future skin disease, as these substances are not only used in adhesive tapes, but also in professional life and in dental care procedures. This demonstrates that, prior to their introduction, medical devices should be assessed for possible side-effects.

To date, reports of allergic contact dermatitis caused by these products are rare (8–10).

This paper reports occupational allergic contact dermatitis caused by the use of medical adhesive tapes. In March 2022, a 24-year-old conscript, referred from military healthcare, was investigated at the Department of Occupational and Environmental Dermatology, Lund University, Skåne University Hospital, Malmö, Sweden because of severe foot dermatitis. Patch testing identified multiple contact allergies, including allergy to a medical adhesive tape. The tape had been used for the prevention of blisters when marching and the patient's history indicated that sensitization had most likely happened after entering the military service. The results of the investigation have been reported elsewhere (11), and caused us to inform the military health authorities. This led to the investigation of an outbreak of foot dermatitis in conscripts at another military unit in Sweden. During a field training exercise (manoeuvre) at the end of the summer of 2021 many conscripts, who had used medical adhesive tape for prevention of blisters, had developed foot dermatitis. The tape had been applied on intact skin prior to the exercise and there was a temporal association between the occurrence of dermatitis and use of medical adhesive tape for several days. The aim of this paper is to report the results of the patch test investigations in this group of conscripts.

## METHODS

### Subjects

In cooperation with the Occupational Health Care of the Swedish Armed Forces conscripts who had experienced foot dermatitis were investigated by the Department of Occupational and Environ-

mental Dermatology, Lund University, Skåne University Hospital, Malmö, Sweden. The conscripts had been identified by the military healthcare system and the investigations were performed at the military base in June 2022.

#### Patch test preparations

The patients were patch tested with the Swedish baseline series (Chemotechnique Diagnostics, Vellinge, Sweden), the department's extended baseline series including hydroperoxides of limonene 0.3% petrolatum (pet) and hydroperoxides of linalool 1.0% pet (Chemotechnique Diagnostics, Vellinge, Sweden), and colophonium 60% (12), prepared at the department. Furthermore, aimed testing was performed with abietic acid, hydroabietyl alcohol, Canada balsam, and 2,2'-methylenebis(6-tert-butyl-4-methylphenol), an antioxidant for polymers and adhesives, also known as Vulkanox® BKF (Lanxess, Cologne, Germany). The batch of the medical adhesive tape Optiplaste®-C (Essity, BSN Medical SAS, Vibraye, France) that the majority (25 out of 26) of the conscripts were using when they experienced dermatitis was tested, both as is and as acetone extracts prepared by ultrasonic bath (13). Another batch of the same brand, as well as other adhesive tapes supplied by the military unit were also included in the testing. Details of the test preparations for aimed testing are shown in **Table I**. Patch tests were applied in IQ Ultimate™ patch test units (Chemotechnique Diagnostics, Vellinge, Sweden) (25 mg of pet (petrolatum) and 20 µL of liquid test preparations), and removed by the patients after 48 h. One patient (case 21) had used Leukoplast medical adhesive tape (Essity, BSN Medical SAS, Vibraye, France) instead of Optiplaste®-C during the manoeuvre and, in addition to the patch tests described above, this patient also applied a piece of Leukoplast (as is) for 48 h.

#### Patch test readings

Patch test readings were performed on day 4 by the department's dermatologists. Test readings were classified according to the recommendations of the International Contact Dermatitis Research Group and the European Society of Contact Dermatitis (14, 15). For practical reasons it was not possible to perform a second reading on day 7. Instead, the patients took photographs of the test area using their own mobile phones on day 4 and were further

instructed to take photographs of the test areas on day 7 and send them to the department. A tentative second reading was made based on the photographs; 4 patients did not send photographs.

#### Chemical investigations

To get an overview of substances in the different tapes, screening of extracts used for patch testing was performed using gas chromatography–mass spectrometry (GC–MS). The GC–MS method has been described elsewhere (16).

#### Statistical analysis

For comparison of contact allergy frequencies retrospective patch test data of consecutive dermatitis patients aged 20 to 21 years investigated at the department between 2012 and 2021 were retrieved from the department's patch test database, in all 229 patients, 74 male and 155 female. Comparisons were limited to the data of the first reading of the patch test on day 3 or 4, and were calculated using 2-sided Fisher's exact test. A *p*-value of less than 0.05 was considered statistically significant. Odds ratios (ORs) were calculated using multivariate logistic regression analyses with adjustment for sex. Data were analysed with SPSS Version 28 (IBM Armonk, New York, USA).

#### Ethics

In accordance with the Department's protocol all patients undergoing investigations for suspected contact dermatitis were asked whether the investigation data could be used for research purposes. This was noted in the test database; data on patients who did not give permission for research use were excluded from further analyses. The use of the information in the database has been approved by the Swedish Ethical Review Authority (2020–02190).

## RESULTS

In all, 26 patients with a mean age of 20 years were investigated. The most common occupations prior to military service were student (*n* = 16), driver (*n* = 3) and electrician (*n* = 2). Other demographic and background data are shown in **Table II**. At the time of the investigation, none of the patients had ongoing dermatitis, but, in some cases, a post-inflammatory hyperpigmentation

**Table I. Patch test with the aimed test series in 26 conscripts with foot dermatitis due to adhesive medical tape**

Test preparation	Vehicle	Conc. (%)	Positive test <i>n</i> (%)
Colophonium <sup>a</sup>	Softisan	60	14 (54)
Abietic acid <sup>b</sup>	pet	10	8 (31)
Hydroabietyl alcohol <sup>b</sup>	pet	10	10 (38)
Canada balsam <sup>a</sup>	pet	25	11 (42)
2,2'-Methylenebis(6-tert-butyl-4-methylphenol) <sup>c</sup>	pet	1	0
<b>Adhesive tapes</b>			
Optiplaste®-C <sup>d</sup> batch 2	as is	100	18 (69)
Optiplaste®-C batch 2	acetone extract	100	15 (58)
Optiplaste®-C batch 2	acetone extract	10	14 (54)
Optiplaste®-C batch 7	as is	100	18 (69)
Strappal <sup>d</sup>	as is	100	3 (12)
Adapta <sup>tm</sup> e	as is	100	0
Fortelast <sup>of</sup>	as is	100	0

<sup>a</sup>Obtained from Sigma Aldrich (Steinheim, Germany), test preparations prepared at the Department of Occupational and Environmental Dermatology, Skåne University Hospital, Malmö, Sweden; <sup>b</sup>Chemotechnique Diagnostics, Vellinge, Sweden; <sup>c</sup>TCI Europe N.V., Zwijndrecht, Belgium; <sup>d</sup>Essity, BSN Medical SAS, Vibraye, France; <sup>e</sup>Meridius Medical GmbH, Oberhausen, Germany; <sup>f</sup>Lohmann & Rauscher, Rengsdorf, Germany.  
Conc.: concentration; pet: petrolatum; Optiplaste®-C batch 2: the batch used by the conscripts; Optiplaste®-C batch 7: a batch not used by the present conscripts, but used previously at the military unit.

**Table II. Background data on 26 conscripts with foot dermatitis, stratified by absence or presence of contact allergy to medical adhesive tape as demonstrated by patch test**

	Total <i>n</i> (%)	Contact allergy to medical adhesive tape		<i>p</i> -value <sup>a</sup>
		Yes <i>n</i> (%)	No <i>n</i> (%)	
Age				0.28
20 years	22 (85)	15 (79)	7 (100)	
21 years	2 (8)	2 (10)	0	
22 years	1 (4)	1 (5)	0	
24 years	1 (4)	1 (5)	0	
Sex				
Male	17 (65)	12 (63)	5 (71)	1
Female	9 (35)	7 (37)	2 (29)	
History of atopic dermatitis	5 (19)	3 (16)	2 (29)	0.59
Use of sports tape prior to military service	21 (81)	16 (84)	5 (71)	0.59
Dermatitis when using sports tape prior to military service	1 (4)	1 (5)	0	1

<sup>a</sup>Age: *p*-value for trend. All other comparisons: 2-sided Fisher's exact test.

could be seen. One patient had a history of medical adhesive tape-related dermatitis prior to the military service, probably caused by a medical adhesive tape with colophonium-containing adhesive (Leukoplast®).

The current skin problems started during the manoeuvre when the medical adhesive tape was used continuously for several days. For 9 patients this was the first time they had used medical adhesive tape, while 9 had used medical adhesive tapes intermittently in the weeks preceding the manoeuvre; data are missing for 8. The majority (25 out of 26) had used Optiplaste®-C, while 1 patient had used Leukoplast® tape. This patient had used Leukoplast prior to entering military service without any skin problems.

The results of patch testing with the Swedish baseline series and hydroperoxides of linalool and limonene are shown in **Table III**. In 19 of the 26 (73%) patients, test with Optiplaste®-C tape was positive (18 with positive tests to the tape as is, 15 with positive tests to acetone extracts), and a doubtful reaction was noted in another 3 patients (Table SI). Contact allergy to colophonium was detected in 16 patients (61%); 13 tested positive to colophonium 20% pet, and 15 to colophonium 60%

Softisan. A doubtful reaction to colophonium was noted in another 2 patients (Table SII). Contact allergy to hydroabietyl alcohol was found in 9, to abietic acid in 7, and to Canada balsam in 11. All patients with a positive test to hydroabietyl alcohol or abietic acid, and 10 out of 11 patients positive to Canada balsam also had allergic positive tests to colophonium. All patients with colophonium allergy had a positive test to Optiplaste®-C. None of those testing negative to Optiplaste®-C had contact allergy to colophonium or the colophonium-related allergens. The patient who, during the manoeuvre, had used Leukoplast instead of Optiplaste®-C had positive tests to both Leukoplast and Optiplaste®-C, as well as to colophonium, abietic acid and hydroabietyl alcohol. Tests with 2,2'-methylenebis(6-tert-butyl-4-methylphenol) were all negative.

Contact allergy to hydroperoxides of limonene was detected in 9 patients, 8 of whom were allergic to colophonium. Contact allergy to hydroperoxide of linalool was detected in 6 patients, all with concomitant colophonium allergy. Contact allergy to phenol formaldehyde resin 2 (PFR2) was detected in 3 patients, all with concomitant colophonium allergy.

**Table III. Frequency of contact allergy to the Swedish baseline series and hydroperoxides of limonene and linalool in 26 conscripts with foot dermatitis compared with consecutively tested dermatitis patients (control group)**

Test substances	Conc.	Conscripts		Control group		p-value <sup>c</sup>
		Tested <sup>a</sup> n	Positive test <sup>b</sup> n (%)	Tested n	Positive test n (%)	
Potassium dichromate	0.5% pet	26	0	225	3 (1.3)	1.0
p-Phenylenediamine	1.0% pet	26	0	225	3 (1.3)	1.0
Thiuram mix	1.0% pet	26	0	228	5 (2.2)	1.0
Neomycin sulphate	20.0% pet	26	0	227	1 (0.4)	1.0
Cobalt(II)chloride hexahydrate	1.0% pet	26	0	225 <sup>d</sup>	7 (3.1)	1.0
Quaternium-15	1.0% pet	26	0	228	3 (1.3)	1.0
Nickel(II)sulphate hexahydrate	5.0% pet	26	1 (3.8)	225	31 (13.8)	0.21
Quinoline mix	6.0% pet	26	0	209	0	
Colophonium	20.0% pet	26	13 (50)	228	1 (0.4)	<b>&lt; 0.001</b>
Paraben mix	16.0% pet	26	0	227	0	
Black rubber mix	0.6% pet	26	0	227	2 (0.9)	1.0
Sesquiterpene lactone mix	0.1% pet	26	0	227	0	
Mercapto Mix	3.5% pet	26	0	227 <sup>e</sup>	1 (0.4)	1.0
Epoxy resin, Bisphenol A	1.0% pet	26	0	226	1 (0.4)	1.0
Peru balsam	25.0% pet	26	1 (3.8)	226	5 (2.2)	0.48
4-tert-Butylphenolformaldehyde resin	1.0% pet	26	1 (3.8)	227	1 (0.4)	0.19
Fragrance mix II	14.0% pet	26	2 (7.7)	227	3 (1.3)	0.084
Formaldehyde	2.0% aq	26	1 (3.8)	227	7 (3.1)	0.58
Fragrance mix I	8.0% pet	26	2 (7.7)	227	7 (3.1)	0.23
Phenol formaldehyde resin (PFR2)	1.0% pet	26	3 (11.5)	227	2 (0.9)	<b>0.008</b>
Diazolidinyl urea	2.0% pet	26	0	227	0	
MI-MCI	0.215% aq	26	0	227 <sup>f</sup>	14 (6.2)	0.37
Amerchol L-101	50.0% pet	26	0	227	1 (0.4)	1.0
Caine mix II	10.0% pet	26	0	227	1 (0.4)	1.0
Lichen acid mix	0.3% pet	26	0	227	0	
Tixocortol-21-pivalate	0.1% pet	26	0	227	1 (0.4)	1.0
Textile dye mix	6.6% pet	26	0	153 <sup>g</sup>	2 (1.3)	1.0
Budesonide	0.01% pet	26	0	226	0	
Methylidibromo glutaronitrile	0.5% pet	26	0	227	4 (1.8)	1.0
Hydroperoxides of linalool	1% pet	26	6 (23)	208	9 (4.3)	<b>0.003</b>
Hydroperoxides of limonene	0.3% pet	26	9 (35)	209	10 (4.8)	<b>&lt; 0.001</b>

The conscripts were patch-tested in 2022. The control group consisted of consecutively tested dermatitis patients aged 20–21 years investigated in the preceding 10 years (2012 to 2021). The data are based on the results at patch-test reading day 3 or 4.

<sup>a</sup>Total number tested; <sup>b</sup>total number with positive patch test; <sup>c</sup>Fisher's exact test; <sup>d</sup>Test concentration changed during the study period: 213 were tested with cobalt(II) chloride hexahydrate 0.5%, and 12 with cobalt(II)chloride hexahydrate 1.0%; <sup>e</sup>Test concentration changed during the study period: 215 were tested with mercapto-mix 2.0%, and 12 with mercapto mix 3.5%; <sup>f</sup>test concentration changed during the study period: 52 were tested with MI-MCI 0.02%, 163 with MI-MCI 0.02% + MI 0.20%, and 12 with MI-MCI 0.215%; <sup>g</sup>textile dye mix was included in the baseline series from 2015.

Aq: aqua; conc.: concentration; MI-MCI: methylisothiazolinone-methylchloroisothiazolinone; pet: petrolatum. Bold figures indicate statistically significant results (< 0.05).

**Table IV. Comparison of contact allergy frequencies between conscripts investigated for foot dermatitis and a control group of consecutively tested dermatitis patients aged 20–21 years**

Test substances	Conc.	Conscripts		Controls		OR (95% CI)
		Total n <sup>a</sup>	Positive test n (%)	Total n	Positive test n (%)	
Nickel(ii)sulphate hexahydrate	5% pet	26	1 (3.8)	225	31 (14)	0.3 (0.04–2.7)
Colophonium	20% pet	26	13 (50)	228	1 (0.4)	<b>220 (25–1,903)</b>
4-tert-Butylphenolformaldehyde resin	1% pet	26	1 (3.8)	227	1 (0.5)	<b>19 (1.1–335)</b>
Phenol formaldehyde resin 2 (PFR2)	1% pet	26	3 (12)	227	2 (0.9)	<b>9.7 (1.4–66)</b>
Formaldehyde	2% aq	26	1 (3.8)	227	7 (3.1)	1.5 (0.2–14)
Peru balsam	25% pet	26	1 (3.8)	226	5 (2.2)	1.2 (0.1–11)
Fragrance mix I	14% pet	26	2 (7.7)	227	7 (3.1)	2.9 (0.5–21)
Fragrance mix II	8% pet	26	2 (7.7)	227	3 (1.3)	3.9 (0.6–26)
Hydroperoxides of linalool	1% pet	26	6 (23)	208	9 (4.3)	<b>5.8 (1.8–19)</b>
Hydroperoxides of limonene	0.3% pet	26	9 (35)	209	10 (4.8)	<b>13 (4.3–42)</b>

The conscripts were patch tested in 2022. The control group consisted of consecutively tested dermatitis patients aged 20–21 years investigated in the preceding 10 years (2012 to 2021). The data are based on the results of patch test reading on day 3 or 4.

<sup>a</sup>total number included in the regression analyses.

OR: odds ratio; CI: confidence interval; Conc.: concentration and vehicle; aq: aqua; pet: petrolatum. Bold figures indicate statistically significant results (95% CI > 1 or < 1).

The ORs of contact allergy to colophonium, hydroperoxides of linalool and limonene, 4-tert-butylphenolformaldehyde resin, and PFR2 were significantly increased among the conscripts compared with the control group of consecutive dermatitis patients (Table IV).

In 6 (23%) patients, no contact allergy could be ascertained by testing. There was no statistical difference in sex ratio, history of atopic dermatitis or history of exposure to sports tapes prior to military service between those with established contact allergy and those without (Table II).

Chemical analyses with GS-MS demonstrated the presence of colophonium-related substances in Optiplaste<sup>®</sup>-C. The results were similar for the 2 different batches investigated. The extracts of Optiplaste<sup>®</sup>-C also contained the antioxidant 2,2'-methylenebis(6-tert-butyl-4-methylphenol). Neither limonene, linalool nor hydroperoxides of limonene or linalool were identified.

## DISCUSSION

Dermatitis due to medical adhesive bandages is commonly caused by irritant contact dermatitis (17, 18). However, in the current study the majority of the conscripts (77%) with foot dermatitis related to the use of medical adhesive tape had allergic contact dermatitis caused by the medical adhesive tape. In no case could occupational exposure to colophonium before the military service be ascertained. Although 21 of the patients had been exposed to medical adhesive tape before entering military service, only in 1 case was there a history indicating previous contact allergy to colophonium-containing medical adhesive tape. The findings therefore indicate a very high risk for allergic contact dermatitis related to the routine use of medical adhesive tape for prevention of chafing and friction blisters, presumably exacerbated by the heat and perspiration induced by exercise, and by the continuous use of the medical adhesive tape for several days.

The high frequency of colophonium contact allergy (61%) among the conscripts who developed a foot der-

matitis during the manoeuvre is striking, and in sharp contrast to the low prevalence of colophonium allergy (0.4%) found among young adults (20 to 21 years old) investigated for dermatitis in our department during the last decade. Furthermore, in Swedish dermatitis patients, the prevalence of colophonium contact allergy has declined from > 5% to 3.5% since the 1990s (19, 20) and, in the general population in Sweden, colophonium allergy appears to be uncommon, with a prevalence of 0.7% reported in adults (21), and 0.45% in adolescents (22).

It is not known to what extent the conscripts had been exposed to contact allergens prior to military service. However, compared with the consecutive dermatitis patients, the frequencies of contact allergy to common contact allergens, such as metals, preservatives, or fragrance-related substances of the baseline series, were not elevated among the conscripts (Table III). The sensitization to colophonium was most likely an occupationally acquired contact allergy in the majority of cases. The clearly increased ORs indicate an elevated risk for contact allergy to PFR2, 4-tert-butylphenolformaldehyde resin and hydroperoxides of limonene and linalool among the conscripts (Table IV). The findings are statistically significant, but the wide confidence interval (CI) reflects the low number of subjects; hence the magnitude of the increase in ORs must be interpreted with some caution. The presence of simultaneous contact allergies to colophonium and to hydroperoxides of linalool and limonene, PFR2, and 4-tert-butylphenolformaldehyde resin in the group of conscripts is in line with previous reports in the literature that demonstrated associations between contact allergy to colophonium and other plant-derived allergens, such as fragrances, and also to phenol formaldehyde resins (23–26). In the current study, contact allergy to PFR2, most often an occupational allergen, was frequent (19%) among colophonium-allergic patients, but in no case could a history of exposure to PFR2 be ascertained. The sensitization to colophonium and PFR2 is of special concern, as it can cause problems in the patients' future including their professional careers. Furthermore, the

patients' future use of medical devices and dental care procedures could also carry a risk for colophonium exposure (27–29).

The most common concomitant allergen was limonene hydroperoxide. Presence of limonene has been reported in adhesives both with and without colophonium (30), which indicates the possibility of simultaneous exposure to colophonium and limonene. However, chemical analysis did not indicate limonene or hydroperoxides of limonene in the adhesive tapes used by the conscripts.

The high frequency of contact allergy to Canada balsam is possibly related to resin components, such as abietic acid, and terpenes, such as limonene, contained in Canada balsam (31).

Contact allergy to colophonium was investigated using 2 different concentrations. In 3 patients contact allergy to colophonium was detected only with colophonium 60% Softisan. In 1 patient, colophonium 20% pet was positive, while there was only a doubtful reaction to colophonium 60% Softisan (Table SII). Therefore, testing with both preparations, rather than only colophonium 20% petrolatum, increased the number of detected colophonium contact allergies from 13 to 16.

In 20% of those with a contact allergy to Optiplaste®-C the culprit allergen was not identified. The possibility of a false-negative test cannot be fully ruled out, and in 2 cases doubtful reactions to colophonium were observed at the first patch-test readings (Table SII). However, other possible allergens, including those formed by modifications and oxidation of colophonium (32), must also be considered, and this is subject to further investigations.

Friction blisters are common skin health problems in military conscripts (33–35). The use of adhesive tapes for prevention of friction blisters has been recommended by the Swedish Armed Forces for many years (36). However, foot dermatitis related to the use of adhesive tapes has not been registered previously in the records of the Swedish Military Health Authorities (personal communication). According to the manufacturer, during the last 5 years, more than 500,000 units of Optiplaste®-C have been sold worldwide (1 unit is a box of either 5 or 12 individual rolls of Optiplaste®-C). Of these more than 130,000 units have been sold in Sweden. During this time period the manufacturer received 4 complaints of low adhesion (1 from Sweden and 3 from elsewhere in the world), and complaints of skin reactions have only been reported from the Swedish Armed Forces. As complaints of skin reactions to Optiplaste®-C have been rare, one possibility is that the current batch of Optiplaste®-C differs from other batches. However, the chemical analyses showed similar results for both batches investigated, and 13 of the 18 patients with contact allergy to the culprit batch also showed contact allergy to test with the other batch.

In Sweden, adverse effects of medical devices should be reported to the Swedish Medical Agency. In the cur-

rent case there was a clear delay in reporting. The same has been found with regard to adverse skin side-effects from other medical devices (37). The fact that there have been no previous reports of adverse skin reactions to Optiplaste®-C in Sweden may therefore also be due to negligence to report, or to the fact that it is easier to just change to another product. Furthermore, when medical adhesives are used as sports tape, the users are not always aware that these products are medical devices, which also may contribute to incomplete reporting. For manufacturers of medical devices reporting is crucial, as it enables them to keep track of possible side-effects and make modifications to the products.

In conclusion, the routine use of medical adhesive tapes by military conscripts for the prevention of friction blisters before long marches was associated with a high frequency of severe foot dermatitis and a high frequency of allergic contact dermatitis caused by the medical adhesive tape, in most cases associated with colophonium allergy. The adhesive tapes used are medical devices. This emphasizes the risk of introducing new products and routines without prior assessment of possible side-effects and the need for vigilance regarding side-effects, not only with pharmacological products, but also with medical devices.

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The data that support the findings of this study are available from the corresponding author on reasonable request.

*Conflicts of interest:* MB is a member of the Expert Panel for Fragrance Safety (<http://fragrancesafetypanel.org/>). The other authors have no conflicts of interest to declare.

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