

# Use of Aromatherapy Products and Increased Risk of Hand Dermatitis in Massage Therapists

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**Objectives:** To determine the 12-month prevalence of hand dermatitis among massage therapists, to investigate a potential association between hand dermatitis and the use of aromatherapy products, and to study potential associations with other known risk factors for hand dermatitis.

**Design:** Mailed survey.

**Setting:** Philadelphia, Pa.

**Participants:** Members of a national massage therapy organization who live in the greater Philadelphia region.

**Main Outcome Measures:** Self-reported and symptom-based prevalences of hand dermatitis.

**Results:** The number of respondents was 350 (57%). The 12-month prevalence of hand dermatitis in subjects was 15% by self-reported criteria and 23% by a symptom-based method. In multivariate analysis, statistically significant independent risk factors for self-reported hand dermatitis included use of aromatherapy products in massage oils, lotions, or creams (odds ratio, 3.27; 95% confidence interval, 1.53-7.02;  $P = .002$ ) and history of atopic dermatitis (odds ratio, 8.06; 95% confidence interval, 3.39-19.17;  $P < .001$ ).

**Conclusions:** The prevalence of hand dermatitis in massage therapists is high. Significant independent risk factors include use of aromatherapy products in massage oils, creams, or lotions and history of atopic dermatitis.

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**H**AND DERMATITIS CONSTITUTES 80% or more of cases of work-related dermatitis in the United States.<sup>1</sup> Hand dermatitis is a serious condition and often results in a change of occupation, interference with social activities, and even permanent disability.<sup>2</sup> As such, both irritant and allergic contact dermatitis are considered priority research areas as outlined in the National Occupational Research Agenda introduced in 1996 by the National Institute for Occupational Safety and Health.<sup>3</sup>

Massage is becoming increasingly popular. Current estimates indicate that there are between 260 000 and 290 000 practicing therapists and massage therapy students in the United States today, which is more than twice the number in 1996 (120 000 to 160 000).<sup>4</sup> Many massage therapists may be exposed to multiple factors known to increase the risk of developing hand dermatitis, such as wet work, frequent hand washing,<sup>5</sup> fragrance, dyes, detergents, latex,<sup>6</sup> and other irritants and allergens found in massage oils, creams, and lotions.<sup>7</sup>

Aromatherapy, the therapeutic use of essential oils, has also gained increased popularity in the United States. Essential oils are aromatic substances extracted from flowers, plants, and wood resins by a variety of methods, such as distillation or maceration. Allergic contact dermatitis to aromatherapy products has been demonstrated in several case reports and small case series.<sup>8-17</sup> The spectrum of skin reactions includes allergic contact dermatitis, irritant contact dermatitis, contact urticaria, and phototoxic reactions.<sup>18-20</sup> Observations in our clinic and a case series by Taraska and Pratt<sup>13</sup> suggest an increase in the use of aromatherapy oils by massage therapists and a possible heightened risk of hand dermatitis. To date, no large study, to our knowledge, has investigated hand dermatitis in massage therapists. The objectives of this questionnaire-based study were (1) to determine the prevalence of hand dermatitis among massage therapists in the greater Philadelphia region, (2) to specifically assess risk associated with the use of aromatherapy products, and (3) to investigate if there are associations with other known risk factors for hand dermatitis.

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1. History of hand dermatitis by self-report
  - Answering "yes" to the written question "Have you ever had dermatitis (rash, eczema) involving your hands?"
2. Current hand dermatitis (point prevalence)
  - Answering "yes" to the written question "Have you ever had dermatitis (rash, eczema) involving your hands?"
  - and
  - Answering "I have it at the moment" to the written question "When did you last have dermatitis on your hands?"
3. Chronic or recurrent hand dermatitis
  - Answering "yes" to the written question "Have you ever had dermatitis (rash, eczema) involving your hands?"
  - and
  - Answering "I have it at the moment," "not at the moment but within the past 3 months," or "between 3 and 12 months ago" to the written question "When did you last have dermatitis on your hands?"
  - and
  - Answering "only once but for 2 weeks or more" or "more than once or has been persistent" to the written question "How often have you had dermatitis on your hands?"
4. Definition of cases by symptom-based criteria
  - Marking 2 or more of the following in response to the question "What skin symptoms have you had on your hands during the past 12 months?"
    - Redness
    - Dry skin with scaling or flaking
    - Fissures or deep cracks
    - Weeping or oozing or crusts
    - Tiny water blisters (vesicles)
    - Papules (small bumps)
    - Rapidly appearing itchy hives, wheals, or welts (urticaria)
  - or
  - Marking 1 of the symptoms listed above and 2 or more of the following:
    - Itching
    - Burning, prickling, or stinging of the skin
    - Skin tenderness
    - Aching or pain

Figure. Definition of cases.

## METHODS

### SURVEY DESIGN

After approval by the University of Pennsylvania Institutional Review Board, questionnaires were sent to all 618 members of the American Bodywork and Massage Professionals in the Philadelphia area. The American Bodywork and Massage Professionals is a membership organization that serves massage, bodywork, somatic, and aesthetic professionals in the United States. The survey was performed by a modification of a common technique for conducting mail surveys.<sup>21</sup> Three mailings were performed, which included an introductory letter followed by 2 mailings with standardized questionnaires.

### QUESTIONNAIRE

This questionnaire was broadly based on a standard occupational skin questionnaire newly developed by the Nordic Skin Study Group (Nordic Occupational Skin Questionnaire—NOSQ-2002/LONG)<sup>22</sup> and tailored to the assessed potential exposures and risk factors for massage therapists. Further adjustments to the questionnaire were made in response to feedback from a small group of massage therapists to whom the questionnaire was piloted.

### CASE DEFINITIONS

In prior questionnaire-based studies,<sup>23-25</sup> 2 methods have been used to define cases of hand dermatitis: (1) self-reported diagnoses, based on respondents answering yes to a question such as "Have you had eczema on your hands in the past 12 months?" and (2) symptom-based diagnoses, based on meeting a set of

complex predetermined criteria from a list of skin complaints. Case definitions for current, chronic or recurrent, and history of hand dermatitis are provided in the **Figure**. Diagnoses of hand dermatitis by symptom-based criteria were created based on an adaptation of features from several of the most-accepted case definitions used in previous studies (Figure).<sup>22,25-27</sup>

Previous studies have demonstrated reasonable associations between self-reported aggravators of skin symptoms and clinical skin testing to the reported substances.<sup>28,29</sup> Self-reported aggravators of skin symptoms were obtained from responses to the question, "What do you consider to be the most important things at the workplace that worsen your hand dermatitis?" Response choices or categories were determined by a pilot study, which involved 20 individuals from the target population, as well as a list of factors known to influence hand dermatitis and found to be potential exposures in this population.

To estimate the impact of hand dermatitis on quality of life, a series of questions were generated from the NOSQ-2002/LONG.<sup>22</sup> The answers to these questions generally reflect the severity of the skin condition and its impact on the workplace. Criteria for inclusion in the study included returning the completed questionnaire, reporting current employment as a massage therapist or bodyworker, and working at least 1 h/wk or with at least 1 client per week.

## DATA ANALYSIS

Data were analyzed using univariable and multivariable logistic regression models. Multivariable models included variables significant on univariable analyses, as well as sex and history of atopic dermatitis. Multivariable models were tested for significance of interaction among variables. Subjects for whom data were missing for a particular variable were excluded from analyses that included that variable. All analyses were performed using Stata statistical software version 6.0 (Stata Corp, College Station, Tex).

## RESULTS

### POPULATION CHARACTERISTICS

Three hundred fifty completed questionnaires (57%) were returned before the deadline for analysis of data. Fifty-eight respondents failed to meet inclusion criteria, which required reporting current employment as a massage therapist and at least 1 client or 1 hour of work in this capacity per week. The remaining 292 subjects were included in the analysis.

The study population included 246 women (84%) and 43 men (15%). Three respondents chose not to reveal their sex. There were 261 therapists (89%) who used modalities that required frequent use of massage oils, and 30 (10%) who used modalities without oils. One respondent did not answer this question. Thirty-one massage therapists (11%) fulfilled criteria for atopic dermatitis. One hundred fifty-eight (54%) reported nasal allergy, and 38 (13%) reported history of asthma. The median frequency of hand washing was 10 times per day (range, 1-101) (**Table 1**).

Overall, 47% reported use of aromatherapy products in oils, creams, or lotions, and 39% reported use of aromatherapy candles, burners, or incense. Overall, only 21% of respondents reported ever having used protective gloves while working. The most common massage

**Table 1. Patient Demographic Data**

Variable	Result
Respondents who met study criteria, No.	292
Age, mean (SD), y	42.9 (10.7)
Duration of employment (range), y	5 (1-29)
Hours of work per week (range)	12.5 (0-48)
Clients per week (range)	11 (0-50)
Sex, No. (%)	
F	246 (84)
M	43 (15)
Atopic background, No. (%)	
Total	172 (59)
Atopic dermatitis	31 (11)
Nasal allergy	158 (54)
Asthma	38 (13)
Hand washing, No. of times per day (range)	10 (1-101)
Use of aromatherapy products, No. (%)	
Total	199 (68)
In oils	137 (47)
In candles, burners, or incense	113 (39)
Use of protective gloves while working, No. (%)	62 (21)

modalities or techniques used were Swedish massage (70%), deep tissue or myofascial (30%), Reiki (5.1%), Shiatsu (7.9%), neuromuscular release (5.8%), reflexology (4.1%), craniosacral (2.4%), acupressure (2.1%), lymphatic (1.0%), and trigger point (0.7%).

### HAND DERMATITIS

The 12-month prevalence of hand dermatitis by self-reported criteria was 15% (n=45). This included 44 (17%) of the oil-exposed therapists and 1 therapist (2%) who used a no-oil modality. The prevalence of current hand dermatitis was 5% (n=13). Chronic or recurrent hand dermatitis was reported in 24 respondents (8%). The locations of skin symptoms in self-reported cases were as follows: fingertips (36%), palms (33%), dorsum (49%), wrists (27%), and forearms (16%). By symptom-based methods, the 12-month prevalence of hand dermatitis was 23% (n=66). The following hand symptoms were most commonly reported in respondents with symptom-based cases of hand dermatitis: erythema (70%), dryness with scale (77%), fissures (46%), pruritus (36%), and aching or pain (35%).

### RISK FACTORS

The effects of possible risk factors (sex, age, atopic background, frequency of hand washing, use of aromatherapy products, use of protective gloves, amount of work) on a reported history of hand dermatitis were investigated (**Table 2**). In univariate analysis, the risk of hand dermatitis was higher for massage therapists with histories of atopic dermatitis (odds ratio [OR], 8.69; 95% confidence interval [CI], 3.87-19.53;  $P < .01$ ) and for those who used aromatherapy products in oils, lotions, or creams (OR, 2.60; 95% CI, 1.33-5.09;  $P = .01$ ) (Table 2). There was some evidence of increased risk for women (OR, 2.77; 95% CI, 0.82-9.38;  $P = .10$ ) and in those who frequently used massage oils, creams, or lotions (OR, 5.73; 95% CI, 0.76-43.23;  $P = .09$ ).

**Table 2. Risk Estimates for Self-reported Cases of Hand Dermatitis (Univariate Analysis)**

Variable	OR (95% CI)	P Value
Women compared with men	2.77 (0.82-9.38)	.10
Age for every additional 10 y	0.79 (0.58-1.07)	.13
History of atopy		
Any atopy	1.92 (0.92-4.02)	.08
Asthma	1.00 (0.39-2.55)	.99
Nasal allergy	1.67 (0.85-3.28)	.13
Atopic dermatitis	8.69 (3.87-19.53)	<.001
Frequent use of massage oils, creams, or lotions	5.73 (0.76-43.23)	.09
Hand washing for every additional 10 washes per day	1.15 (0.83-1.58)	.40
Use of aromatherapy products	1.99 (0.91-4.33)	.08
In oils, lotions, creams	2.60 (1.33-5.09)	.01
In candles, burners, incense	1.19 (0.62-2.26)	.60
Use of protective gloves sometimes or always vs no gloves	1.82 (0.90-3.70)	.10
Working for every additional 10 h/wk	1.28 (0.93-1.75)	.12
Working, for every additional 10 clients per week	1.13 (0.79-1.60)	.51

Abbreviations: CI, confidence interval; OR, odds ratio.

**Table 3. Risk Estimates for Self-reported Cases of Hand Dermatitis (Multivariate Analysis)**

Variable	OR (95% CI)	P Value
Women compared with men	2.91 (0.65-12.94)	.16
Age, for every additional 10 years	0.81 (0.57-1.16)	.25
Atopic dermatitis	8.06 (3.39-19.17)	<.001
Aromatherapy, in oils, lotions, creams	3.27 (1.53-7.02)	.002

Abbreviations: CI, confidence interval; OR, odds ratio.

In multivariate analysis, risk remained high for massage therapists who used aromatherapy products in massage oils, creams, or lotions (OR, 3.27; 95% CI, 1.53-7.02;  $P = .002$ ) and for those with histories of atopic dermatitis (OR, 8.06; 95% CI, 3.39-19.17;  $P < .001$ ). Sex (OR, 2.91; 95% CI, 0.65-12.94;  $P = .16$ ; for women compared with men) and age (OR, 0.81; 95% CI, 0.57-1.16;  $P = .25$ ; for every additional 10 years) of the massage therapists and the use of massage oils, creams, or lotions were not significantly associated with hand dermatitis in multivariate analysis. There were no significant interactions between atopic dermatitis and use of aromatherapy products (**Table 3**).

When asked about aggravators of skin symptoms in those with self-reported hand dermatitis, 87% reported at least 1 item, including frequent hand washing (23, or 51%); friction and physical trauma (10 or 22%); massage oils, creams, or lotions (11 or 24%); other chemicals (18 or 40%); other aggravating factors (20 or 44%); and work with wet hands (2 or 4%). Only 2 (4%) of these respondents reported that the addition of aromatherapy products to their oils, creams, or lotions aggravated their skin symptoms.

## IMPACT ON WORK ACTIVITIES

In those respondents who met criteria for self-reported hand dermatitis, impact on work activities were listed as follows: have to use protective gloves (13%), had to change work tasks (7%), experienced negative attitudes by employer(s) or coworker(s) (2%), had a decrease in income (4%), had to miss work (7%), and had to miss other activities (13%).

### COMMENT

In this study, the 12-month prevalence of hand dermatitis in massage therapists was found to be 15% by self-reported criteria and 22% by a symptom-based method. This may represent a marked increase from the general population, because prevalence rate determinations in prior studies<sup>30-32</sup> have been in the range of 2% to 10%. In multivariate analysis, statistically significant independent risk for hand dermatitis was found with having a history of atopic dermatitis and with having frequently used aromatherapy products in oils, creams, or lotions.

### RESPONSE AND BIAS

A total of 350 therapists (57%) returned completed questionnaires. An overestimation of prevalence might be possible given that individuals with hand dermatitis may be more inclined to respond to a skin health survey.

### PREVALENCE OF HAND DERMATITIS

Of the massage therapists surveyed in this study, the 12-month prevalence of hand dermatitis was 23% by the symptom-based method and 15% by self-report. Whereas symptom-based methods tend to overestimate, self-reported rates tend to underestimate true population prevalence rates. Therefore, the true 12-month prevalence rate in this population of massage therapists is likely within this range. The differences in rates by these 2 methods can be explained by their disparate sensitivities and specificities as determined in prior studies<sup>25,31,33,34</sup> that included methodologic validations. High negative predictive values make standard symptom-based methods better tools for screening purposes.<sup>25,31,33,34</sup> The high specificity of the self-reported method (in the range of 96.2%-98.9%) makes this a better tool for the identification of potential cases for further evaluation.<sup>33</sup>

The prevalence rates found in this study for massage therapists are within the range of prevalence rates previously found in other high-risk populations, such as nurses,<sup>25,31,35-37</sup> farmers,<sup>34</sup> veterinarians,<sup>38,39</sup> flower industry workers,<sup>5,30,40</sup> car mechanics,<sup>33</sup> and several other occupational subgroups.<sup>32,41-45</sup> Unfortunately, the investigative methods used to assess hand dermatitis produce inconsistent results based on differences in both the study methods and the criteria used to define hand dermatitis.<sup>5,7,23-25,33,34,42,46,47</sup> Consequently, meaningful comparisons among different study populations are difficult.

To help rectify some of these problems, the Nordic Council of Ministers recently released a standard set of occupational skin disease questions to be used in epi-

miologic studies (NOSQ-2002/LONG; available at <http://www.ami.dk/english/redskaber/2.html>).<sup>22</sup> This instrument will greatly facilitate work in the field of occupational dermatology. In the next phase of this study, we will conduct personal interviews and physical examinations to confirm credible prevalence rates for hand dermatitis in this population of massage therapists. In addition, patch testing may prove useful in identifying specific chemicals in aromatherapy or other types of products that cause or aggravate hand dermatitis in this population. In this study, we clearly outlined our case definitions for hand dermatitis by both self-reported and symptom-based methods to provide a standardized approach to investigate hand dermatitis in future questionnaire studies.

### PATTERN OF HAND DERMATITIS

The pattern of involvement of hand dermatitis can sometimes be a clue to causality. In this study, more respondents reported dorsal hand symptoms (49%) than palmar hand symptoms (33%). It is known that substantially greater involvement of the dorsa of the hands as opposed to the palms suggests allergic contact dermatitis if the allergen contacts all areas of the hand equally.<sup>48,49</sup> One study<sup>50</sup> demonstrated that patients with predominantly dorsal hand involvement are more likely to have significant contact with irritants and are more often atopic than those with palmar predominance. In another study<sup>51</sup> conducted with 5700 individuals in Sweden suspected of having allergic contact dermatitis, statistical associations were found between certain chemicals and dermatitis localized to different sites on the hands. Additionally, eruptions on the palms and sides of the fingers are often the result of dyshidrotic eczema rather than exposure to external contactants.<sup>52</sup> Mechanical factors have also been shown to influence the pattern of hand dermatitis, resulting in so-called frictional contact dermatitis.<sup>53,54</sup> One might expect trauma or friction to more often manifest on the fingertips or palms in massage therapists. It is obvious that the pattern of dermatitis on the hands is the result of a complex interplay between host susceptibility and environmental or occupational exposures. An explanation for the patterns of involvement in this population of massage therapists will have to await the future phases of this study, which will involve in-depth occupational histories, physical examinations, and patch testing.

### DETERMINANTS OF HAND DERMATITIS

Massage therapists face multiple exposures that have been shown to increase the risk of hand dermatitis in other populations, such as water, perfumes, dyes, solvents, latex,<sup>6</sup> and frequent hand washing.<sup>5</sup> Constitutional factors, such as history of atopic dermatitis,<sup>7,36,37,55-57</sup> and female sex,<sup>35,57-59</sup> have also been demonstrated to influence hand dermatitis in previous studies.<sup>7</sup>

In this study, multivariate analysis demonstrated 2 statistically significant independent risk factors for hand dermatitis in massage therapists. These factors include the use of aromatherapy products in oils, lotions, or creams (OR, 3.27; 95% CI, 1.53-7.02;  $P = .002$ ) and a personal history of atopic dermatitis (OR, 8.06; 95% CI, 3.39-19.17;  $P < .001$ ).

There was also some evidence to suggest an increased risk for women compared with men (OR, 2.91; 95% CI, 0.65-12.94;  $P = .16$ ). However, this study may have had limited power to detect differences in rates between men and women. Statistical significance was likely not reached due to the low number of men in this population (15%).

## AROMATHERAPY PRODUCTS AND ESSENTIAL OILS

Massage therapists in this study who met criteria for hand dermatitis believed that frequent hand washing (51%) and the use of massage oils (24%) were the most important aggravators of their skin symptoms. Many reports have implicated aromatherapy products in the production of contact allergy.<sup>8-17</sup> However, only 2 (4%) of these same respondents listed aromatherapy products as potential aggravators of their hand dermatitis.

Allergic contact dermatitis from essential oils has been documented in several occupational subgroups, including bar workers,<sup>60</sup> citrus fruit pickers,<sup>61</sup> hairdressers,<sup>62</sup> beauticians,<sup>63</sup> aromatherapists,<sup>9,11,14</sup> and massage therapists.<sup>13</sup> The most commonly cited specific oils include tea-tree oil (*Melaleuca alternifolia*),<sup>64-67</sup> lavender,<sup>12,62,68</sup> jasmine,<sup>12</sup> rosewood,<sup>12</sup> lemon oils,<sup>61</sup> orange oils (including oil of bergamot),<sup>60,69,70</sup> citronella, cassia oil,<sup>71</sup> ylang-ylang oil,<sup>63</sup> and clove oil.<sup>72</sup>

The evaluation of potential essential oil allergy is extremely complicated. Chemical constituents are diverse, with as many as 100 distinct substances in any one oil, and extracts from the same plant species can result in varying ingredients and concentrations of chemicals. The most common substances found are monoterpene and sesquiterpene hydrocarbons, monoterpene and sesquiterpene alcohols, esters, ethers, aldehydes, ketones, and oxides. Additionally, it may be degradation byproducts within the skin that actually cause sensitization rather than the chemicals in the bottled oils. Conversely, due to the quenching effect, individual substances in an oil mixture often interact in a way to reduce the sensitizing potential of the individual component.<sup>20</sup> The consulting physician indeed has to be truly knowledgeable and diligent in the evaluation of potential essential oil allergy.

## CONCLUSIONS

The use of therapeutic massage is rapidly gaining popularity. Additionally, there has been a growing trend in the use of natural remedies and aromatherapy products. Massage therapists face multiple exposures known to influence hand dermatitis, such as wet work, fragrance, dyes, detergents, latex, and other irritants and allergens found in massage oils, creams, and lotions. This study demonstrated a 12-month prevalence of hand dermatitis in massage therapists of 15% by a self-reported method and 23% by a symptom-based method. This is a marked increase from the results of most studies on prevalence rates in the general population. In addition, statistically significant independent associations were found between the reporting of hand dermatitis and the use of aromatherapy products in massage oils, creams, or lotions (OR,

3.27; 95% CI, 1.53-7.02;  $P = .002$ ) and having a history of atopic dermatitis (OR, 8.06; 95% CI, 3.39-19.17;  $P < .001$ ). The risk of allergic contact dermatitis from essential oils in the occupational setting has been well established. Massage therapists should be aware of the sensitizing potential of their oils and the possibility of personal and client adverse skin reactions. To lower this high prevalence of hand dermatitis in massage therapists, it may be useful to conduct an educational campaign regarding the potential hazards of aromatherapy products, the identification of individuals with atopic background for vocational guidance, and the implementation of proper hand care practices, such as reduced frequency of hand washing, avoidance of detergents, and use of protective barrier gloves.

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