Special article

Contact dermatitis and workers' compensation: Criteria for establishing occupational causation and aggravation

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Contact dermatitis is the most common form of occupationally acquired skin disease. Eligibility for coverage under the workers' compensation laws of all states requires only reasonable probability that dermatitis directly resulted from, or was aggravated by, employment. The responsibility for this determination ultimately resides with the examining physician, who must critically evaluate the medical history and cutaneous findings. This article proposes seven objective criteria that may be used to assess the probability of a causal relationship with employment. (J AM ACAD DERMATOL 1989;20:842-8.)

Contact dermatitis is a reactive eczematous inflammation of the skin provoked by direct contact with an environmental chemical or substance. Contact dermatitis accounts for more than 90% of all workers' compensation claims for occupational skin diseases.[1] The majority are attributed to cutaneous irritation (at least 80%), and contact allergy accounts for the remainder.[2]

Workers' compensation laws in all states require only reasonable probability (more than 50% likelihood) that dermatitis directly resulted from, or was aggravated by, occupational exposure. Because no clinical[3] nor histologic[4] features uniquely characterize occupational contact dermatitis, a physician must deduce this probability by critically evaluating the medical history and cutaneous findings. This article reviews the basic considerations of this evaluation process and proposes seven objective criteria that may be used to assess this probability.

CAUSATION

Schwartz et al.[5] and Emmett[6] have previously outlined criteria for probable occupational causation of skin disease. The criteria that follow have been modeled after their criteria but adapted specifically for contact dermatitis. Because workers' compensation laws require only reasonable probability (more than 50% likelihood) that dermatitis is work-related, the answer to at least four of these seven criteria should be "yes" before the clinician concludes that dermatitis is probably occupational. Any "no" response should raise concern that dermatitis may not be occupationally related but does not necessarily invalidate this conclusion. These criteria are summarized in Table I.

Criterion 1: Is the clinical appearance consistent with contact dermatitis?

"Yes". The clinical appearance of contact dermatitis is most consistently characterized by eczematous inflammation. Although the terms *eczema* and *dermatitis* often are used interchangeably by dermatologists, dermatitis simply means "inflammation of the skin" and encompasses a wide spectrum of disorders. Eczema (derived from the Greek word *eczeo,* meaning "to boil over") is synonymous with eczematous dermatitis and refers to a "bubbling" of vesicles or serous exudate through the epidermis, which characterizes some inflammatory disorders, including contact dermatitis. In its acute stages eczematous dermatitis is clinically distinguished from other forms of dermatitis by the presence of vesiculation; subacute and chronic stages are characterized by scaling or lichenification accompanied by signs of serous exudate (e.g., serous discoloration of scales). If

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Table I. Contact dermatitis: Criteria for evaluating probable occupational causation

Criterion	Yes	No	Don't know
1. Is the clinical appearance consistent with contact dermatitis?	Eczematous morphologic or histologic findings *or* Adequate clinical description in history or medical records	Noneczematous morphologic or histologic findings	No dermatitis on clinical examination; inadequate clinical description in history or medical records *or* Noneczematous reaction sometimes mimicked by contact dermatitis (e.g., lichenoid eruptions)
2. Are there workplace exposures to potential cutaneous irritants or allergens?	Supported by toxicologic data or clinical experience	Not supported by toxicologic data or clinical experience	Toxicologic properties of the exposure not known
3. Is the anatomic distribution of dermatitis consistent with cutaneous exposure in relation to the job task?	Dermatitis is most severe on skin surfaces with maximal exposure (depends on physical form of irritant or allergen)	Dermatitis does not affect skin surfaces with greatest exposure	Dermatitis affects skin surfaces with maximal exposure but is more severe on other body areas (excluding eyelid, facial, genital skin) *or* Dermatitis spares skin surfaces with maximal exposure but affects eyelid, facial, or genital skin
4. Is the temporal relationship between exposure and onset consistent with contact dermatitis?	First or increased exposure preceded onset or aggravation *and* Onset or aggravation within 6 months of first or increased exposure	Onset or aggravation preceded the first exposure *or* Onset or aggravation occurred more than 3-4 days after last exposure (exception: initial allergic reaction)	Onset or aggravation occurred more than 6 months after first or increased exposure

continued

these changes are not apparent on clinical examination, a skin biopsy specimen should demonstrate epidermal microvesicles or spongiosis, accompanied by lymphocytosis. Since skin biopsy alone cannot distinguish contact dermatitis from other clinical types of eczema, findings must be correlated with the clinical history and examination. There are no clinical features that distinguish irritant from allergic contact dermatitis, although vesicles are more likely to occur with the latter.

The examining physician must rely on clinical descriptions provided by the patient or medical records if dermatitis is not present at the time of evaluation. Although such descriptions are sometimes adequate, they are frequently insufficient to characterize the dermatitis as probably eczematous.

"No". If the clinical appearance is not eczematous, the probability that dermatitis has been caused by contact irritants or allergens is substantially reduced. A skin biopsy is sometimes necessary before concluding that dermatitis is not eczematous.

"Don't know". Seborrheic dermatitis, dyshidrotic eczema, nummular eczema, stasis eczema, asteatotic eczema, atopic eczema, and neuroder-

Table I. Cont'd

Criterion	Yes	No	Don't know
5. Are nonoccupational exposures excluded as probable causes?	Not likely on the basis of a thorough history or patch tests	Likely on the basis of a thorough history or patch tests	Inadequate history *or* Exposure to irritants or allergens both within and outside the workplace
6. Does dermatitis improve away from work exposure to the suspected irritant or allergen?	Improvement not a result of concomitant medical treatment (e.g., intramuscular steroid) *and* Reexposure causes exacerbation	No improvement after more than 1 week away from work exposure *and* No concomitant exposure to other irritants or allergens	Improvement coincides with medical treatment *or* Failure to improve may be attributed to other irritants or allergens. *or* No improvement but away from work exposure less than 1 week
7. Do patch or provocation tests identify a probable causal agent?	Positive reaction, with tests performed according to established guidelines *and* Exposure has occurred in the workplace	Negative reaction, with tests performed according to established guidelines *and* All potential workplace allergens tested	Tests not performed according to established guidelines *or* All potential workplace allergens or irritants not tested

matitis represent cutaneous eczematous reaction patterns in which endogenous or poorly understood systemic factors are often the primary determinants. Because contact dermatitis may sometimes mimic similar reaction patterns,[3] these eczematous morphologies should not automatically exclude contact dermatitis from consideration. Occasionally, contact dermatitis may exhibit specific noneczematous reaction patterns (e.g., lichenoid eruptions and urticarial or erythema multiforme–like reactions).[7] Although these reactions are consistent with contact dermatitis, they more frequently are due to other causes such as viral infections or drug eruptions. The absence of clinical findings and inadequate clinical description in the history or medical records precludes reliable evaluation of this criterion.

Criterion 2: Are there workplace exposures to potential cutaneous irritants or allergens?

"Yes". The physician should inquire about all workplace exposures, including protective clothing, barrier creams, soaps, and first aid preparations before this criterion is evaluated. Comprehensive textbooks[8-12] provide valuable information on the irritancy or allergenicity of a large number of environmental and occupational exposures. In addition, the Hazardous Substance Communication Standard (29 CFR 1910.1200) requires employers to provide employees on request with Material Safety Data Sheets (MSDS) on all materials or substances to which they may be exposed at work. Brief statements on cutaneous irritancy or allergenicity found on MSDS may help to evaluate this criterion. If data on MSDS are inadequate, more specific information may be obtained by telephoning the manufacturer at the emergency number found on the first page of the MSDS. In the absence of definitive toxicologic information the physician may reason that a material or substance is a potential irritant or allergen on the basis of its industrial application or physical properties. For example, the chemical properties of a substance that made it a good industrial cleansing or degreasing agent also may make it a potential skin irritant. Likewise, a new industrial

chemical derived from paraphenylenediamine (a common skin sensitizer) may be a potential skin allergen, although specific toxicologic information cannot be found.

"No". Toxicologic data or clinical experience may suggest that a workplace exposure is neither irritating nor allergenic. Negative findings indicate only a low probability of cutaneous effects inasmuch as almost anything may irritate skin occasionally if conditions are favorable (e.g., high concentrations, occlusion against skin, and prolonged or repetitive exposure).[12]

"Don't know". If the physician cannot determine the irritant or allergenic properties of the workplace exposures, this criterion cannot be evaluated.

Criterion 3: Is the anatomic distribution of dermatitis consistent with the form of cutaneous exposure in relation to the job task?

"Yes". Contact dermatitis is usually most severe on skin surfaces with maximal exposure to the irritant or allergen. The physical form of the irritant or allergen determines the skin surfaces most likely to be exposed in relation to the job task. Contact dermatitis from fumes, gases, or vapors most often affects exposed skin of the face and eyelids; symptoms of ocular or upper airway irritation often occur simultaneously. Contact dermatitis from airborne particles, dusts, or mists may affect not only exposed skin surfaces but also covered areas adjacent to the margins of clothing, beneath which these particulates can become trapped and concentrated. Dermatitis from industrial liquids often occurs on exposed skin of the hands or arms where direct skin contact is frequent but may also occur beneath covered areas if overlying clothing becomes sufficiently saturated. Dermatitis from solid agents affects skin surfaces with prolonged or frequent contact (e.g., nickel-plated scissors causing contact allergy in seamstresses).

"No". If dermatitis spares areas with maximal exposure to a suspected irritant or allergen (based on consideration of physical form in relation to job task) but affects other surfaces, it probably has not been caused by that exposure.

"Don't know". Although contact dermatitis is usually most severe where exposure has been maximal, there are important exceptions to this generalization. Eyelid, facial, and genital skin is relatively more susceptible to irritation than other skin areas, presumably because cutaneous permeability is greater.[12] These may sometimes be the only affected areas, despite greater exposure on other body surfaces.

Criterion 4: Is the temporal relationship between exposure and onset consistent with contact dermatitis?

"Yes". Exposure must have preceded the onset of contact dermatitis before a causal relationship is plausible. Irritant contact dermatitis usually begins within the first few weeks or months[13] after either first exposure or an increase in the amount of an ongoing exposure (e.g., exposure to a cutting fluid increasing from ½ hour per day to 6 hours per day). Although allergic contact dermatitis often occurs within the first few months as well, the latent period is more variable; weeks or years may elapse before onset. A useful rule of thumb for a consistent temporal relationship is a latent period of no more than 6 months after either the first or an increased exposure.

"No". A causal relationship is not plausible if the onset of dermatitis preceded the first exposure. Furthermore, contact dermatitis usually begins within a few hours or days after any exposure sufficient enough to provoke it. A lag time of more than 3 to 4 days between the last exposure and onset usually is not consistent with a causal relationship. The only exception to this generalization is the first occurrence of allergic contact dermatitis, which sometimes begins 1 to 3 weeks after the last exposure.

"Don't know". If the latent period between either the first or an increased exposure has been more than 6 months, a causal relationship becomes uncertain. Work histories that accurately document increases in ongoing exposures are difficult to elicit. The skin of older workers may become more susceptible to irritation with aging, although exposures have not changed or increased. Anecdotal experience suggests this most often occurs between the ages of 50 to 60 years.

Criterion 5: Are nonoccupational exposures excluded as likely causes?

"Yes". Other potential causes of irritant or allergic contact dermatitis from nonoccupational exposures (e.g., cosmetics and hobby glues) must

be excluded by a thorough history and, occasionally, by patch testing.

"No". Nonoccupational exposures may be more likely causes on the basis of a thorough history or patch testing.

"Don't know". Without a thorough nonoccupational exposure history the examining physician cannot reliably exclude exposures outside the work environment from consideration. Occasionally the affected worker has had substantial skin exposure to irritants or allergens both within and outside the work environment.

Criterion 6: Does removal from exposure lead to improvement of dermatitis?

"Yes". Improvement "off work" or on "modified work" suggests a probable causal relationship only when concurrent medical treatment (e.g., intramuscular steroid) cannot account for improvement. Exacerbation after reexposure suggests that improvement was probably not "spontaneous."

"No". Dermatitis that does not begin to improve within 1 week after the worker's removal from workplace exposure probably is not occupational, provided that concomitant exposure to other irritants or allergens did not occur during this interval. Failure to improve does not automatically invalidate a causal relationship, and chronic dermatitis occasionally may require 3 to 4 weeks away from work exposures before noticeable improvement occurs. Several published studies on occupational contact dermatitis have demonstrated that a substantial number of affected workers (up to 25%) may not improve despite job changes or modifications.[14-16]

"Don't know". Improvement "off work" or on "modified work" sometimes may be caused by concurrent medical treatment. Conversely, failure to improve may sometimes be explained by too short a period of observation (less than 1 week away from work) or concurrent exposure to other irritants or allergens. This criterion cannot be evaluated whenever these alternative explanations exist.

Criterion 7: Do patch tests or provocation tests implicate a specific workplace exposure?

"Yes". Patch tests should be performed whenever a diagnosis of allergic contact dermatitis is considered. The procedure should employ nonirritating concentrations of test substances and follow recommended guidelines to avoid false-positive or false-negative reactions.[17] A positive reaction to a patch test does not indicate the source of exposure to an allergen and supports a causal relationship only if exposure actually occurred in the workplace.

Provocation tests are sometimes useful to confirm a probable source of exposure to an allergen identified on patch testing, especially when the source contains very low levels of allergen. Undiluted material may be applied to intact skin (e.g., the forearm or antecubital fossa) and left "open"; applications may be repeated twice daily to the same skin site for 5 days.[17] Positive results of provocation testing provide evidence for contact allergy provided that the test material is not irritating (i.e., control subjects after the same provocative procedure show negative results); however, false-negative reactions are common.

Most authorities strongly discourage patch or provocation tests to identify potential irritants and prefer critical evaluation of toxicologic data, inasmuch as false-positive reactions and misinterpretation occur frequently when these tests are performed by inexperienced physicians. In skilled hands these tests sometimes may be used as a last resort when cutaneous irritants cannot otherwise be identified. The procedure must be designed to reproduce the actual conditions of exposure in the workplace as closely as possible. Patch or provocation tests with irritants that involve a greater degree of exposure than the workplace will most likely produce false-positive, meaningless reactions.

"No". If properly performed patch or provocation tests to *all* potential workplace allergens or irritants have shown negative findings, a causal relationship is not probable.

"Don't know". If *all* potential workplace allergens or irritants have not been tested, this criterion cannot be reliably evaluated. Any possibility of false-positive or false-negative test results also precludes evaluation. Common causes of false-positive reactions include irritating test concentrations, overinterpretation of weak positive reaction test results, tests performed on eczematous skin, and widespread eczema or multiple strong positive patch test reactions (excited skin syndrome). Common causes of false-negative patch test results include deviations from established test guidelines,

failure to perform delayed readings, and suppression of positive reactions from concomitant corticosteroid administration.[17]

AGGRAVATION

At the time of hire an employer accepts an employee "as is," including his or her medical status. Workers' compensation laws generally permit compensation of a worker who experiences *substantial* aggravation of preexistent dermatitis, provided there is reasonable probability that it was aggravated by work exposures. The term *preexistent* sometimes causes confusion. It usually is applied to diseases that already show clinical symptoms, not to asymptomatic predispositions. Thus a job applicant with atopic dermatitis of the hands has preexistent dermatitis, whereas an applicant without clinical dermatitis but with a history of seasonal rhinitis or childhood eczema (a predisposition to irritant contact dermatitis) does not. In the latter case "new" dermatitis is evaluated from the standpoint of primary causation (see preceding section), and the underlying predisposition is ignored.

The following two criteria may be used to evaluate whether *substantial* aggravation probably has occurred. If the answer is "yes" to either, the evaluating physician should then determine, on the basis of the seven criteria for primary causation, whether this aggravation probably was due to superimposed occupational contact dermatitis. Preexistent dermatitis aggravated by occupational contact dermatitis remains compensable until it has completely reverted to its clinical status before aggravation. Difficulties with interpretation of these general guidelines sometimes arise when preexistent dermatitis does not revert to its baseline status or continues to worsen despite removal from aggravating work exposures. In such instances the physician must decide on an individual case basis whether persistence or worsening was triggered primarily by occupational or endogenous factors.

Criterion 1: Has new dermatitis occurred on skin surfaces not previously affected by preexistent dermatitis?

"Yes". The spread of preexistent dermatitis to previously uninvolved cutaneous surfaces forms one objective basis for deciding if aggravation probably has occurred. New areas of involvement should be carefully documented by history, physical examination, or review of appropriate medical records.

"No". Unless new areas of involvement can be documented objectively, substantial aggravation is not probable.

Criterion 2: Has dermatitis become more severe on skin surfaces already affected by preexistent dermatitis although new surface areas are not involved?

"Yes". Objective verification is difficult and requires repeated physical examinations. If an increase in severity cannot be verified objectively (e.g., if the evaluating physician has never examined the worker before), subjective criteria must be used, including more frequent or protracted exacerbations, more frequent need for medical treatment, or need for stronger topical or systemic therapies.

"No". Unless subjective or objective evidence is convincing, substantial aggravation probably has not occurred.

CONCLUSION

Considered separately, no single criterion provides sufficient evidence for probable occupational causation of contact dermatitis. Together, however, these criteria form a logical, uniform basis for assessing the probability of causation from workplace exposures. Because workers' compensation laws require only reasonable probability (more than 50% likelihood) of causation, the answer to at least four criteria should be "yes" before the clinician concludes that dermatitis probably was caused by a workplace exposure. Any "no" answer should raise suspicion that dermatitis may not have been work-related but does not automatically invalidate this conclusion.

If four or more criteria cannot be answered affirmatively, a conclusion of probable occupational causation may be difficult to justify without further investigation.

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