

Management of Occupational Dermatitis

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KEYWORDS

- Contact dermatitis • Occupational contact dermatitis
- Occupational skin disease • Management
- Allergic contact dermatitis

Contact dermatitis is the most common occupational skin disorder, responsible for up to 30% of all cases of occupational disease in industrialized nations.¹ Epidemiologic data suggest that contact dermatitis accounts for 90% to 95% of all cases of occupational skin disease,^{2–4} imposing considerable social and economic implications. Occupational contact dermatitis (OCD) is broadly classified into allergic and irritant subtypes. Irritant contact dermatitis (ICD) is widely quoted in the literature to account for 80% of OCD cases, with allergic cases held responsible for the remaining 20%.^{5,6} However, as reviewed by Holness,⁷ numerous studies have shown wide variation in the distribution of cases of ICD versus ACD. As discussed by Belsito⁸ ICD accounts for 71% to 32% of OCD cases, whereas ACD is responsible for 60% to 34%.^{9–14} The incidence rate of OCD is suggested by epidemiologic studies to be approximately 0.5 to 1.9 cases per 1000 full-time workers per year¹ with a 1-year prevalence estimate of 10% and lifetime prevalence of approximately 20%.^{15,16} Mild cases of OCD are rarely registered, leading to underestimation of incidence by perhaps 20 to 50 times.¹⁷ In the occupational setting, the hands are the most commonly affected area, with involvement in 80% to 90% of cases.¹⁸ However, true epidemiologic data regarding OCD are lacking, secondary to a lack of standardization of case definitions and methods.

The economic, social, and psychologic repercussions of OCD defy understatement. The Bureau of Labor Statistics estimated 41,800 cases of OCD in the United States in 2000.¹⁹ However, as a result of underreporting of mild cases, Lushniak has suggested the true number could approach

400,000 to 2 million cases per year.²⁰ Mathias had estimated the total annual costs in 1985 to be between \$222 million and \$1 billion in the United States alone.²¹ A survey of reported cases of occupational hand eczema (HE) established that in 1 year, 19.9% to 23% of cases experienced prolonged sick leave and job loss respectively.²² Showing the socioeconomic toll of OCD, in a 12-year Swedish questionnaire and phone interview study following 517 patients who reported OCD to the Social Insurance Office, 82% of HE patients reported having changed their work situation and 48% declared taking sick leave for at least 1 period of 7 days secondary to HE. In culmination, 15% of HE patients were excluded from the occupational workforce through unemployment or disability pension.²³

One of the often overlooked burdens of occupational dermatitis, like any visible skin disease, is the concomitant social stigmata. As discussed by Diepgen and colleagues,²⁴ the importance of the hands as tools for communication and expression is manifested by the major psychosocial problems (eg, anxiety, depression, social phobia) affected individuals suffer. A lower quality of life, comparable to generalized eczema or psoriasis is reported in severely affected cases.^{25,26}

CLINICAL FEATURES

Traditionally, the mechanisms underlying ICD and ACD were divided into nonimmunologic and immunologic pathways respectively. However, recent studies suggest significant pathophysiologic overlap between the entities. Likewise

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Dermatol Clin 27 (2009) 365–383

doi:10.1016/j.det.2009.05.002

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many, if not most, substances do not exclusively induce irritant or allergic reactions; instead being able to induce both.

Irritant Contact Dermatitis

Overview

ICD results from failure of the barrier function of the stratum corneum with the consequential release of inflammatory mediators from keratinocytes. In contrast to ACD, ICD is not a singular entity, but rather encompasses a spectrum of abnormal skin changes.²⁷ The lack of a standard definition of ICD results commonly in the misclassification of ICD and hence attendant over or underestimation of the disease frequency. Irritants are physical or chemical agents exerting a cytotoxic effect, which after single or repeated exposure elicits a non-allergic inflammatory host response. Irritants do not require sensitization (unlike ACD) and highly irritating substances such as alkalis, acids, and strong oxidizing and reducing agents may cause dermatitis with the first exposure.²⁸ Most cases, however, result from chronic cumulative exposure to 1 or multiple low grade irritants. ICD requires a threshold concentration (which may vary from person to person) above which the responsible chemicals cause dermatitis and below which they do not.

Risk factors

The development of ICD is dependent on exogenous and endogenous risk factors. Repeated exposure with nearly any chemical can result in ICD. The irritating potential of a substance is dependent on its physical properties, concentration, duration of exposure, and vehicle. Molecular size, ionization state, and fat solubility affect penetration through the skin.²⁹ As reviewed by Slodownik and colleagues,²⁹ physical, mechanical, and environmental factors significantly contribute to the onset of ICD; a fact which is unfortunately often overlooked.³⁰ Low humidity enhances irritability by decreasing ceramide levels in the stratum corneum³¹ which can lead to cracking or fissuring. Heat or occlusion with gloves may precipitate ICD through increased exposure to sweat which is more irritating than water.³² Common skin irritants include water, detergents, solvents, rubber, fiberglass, cutting fluids, and food products. Identifying a single substance causing ICD is inefficient at best, and often impossible, as ICD is usually multifactorial.²⁹ The most commonly implicated exogenous factor in ICD is "wet work".³³ Wet work includes wearing occlusive gloves for more than 2 hours per day, exposure of the skin to liquid for more than 2 hours per day, or frequent hand washing.³⁴

Endogenous factors including sex, age, atopy and other skin disease, and anatomic site influence vulnerability to ICD.³⁵ Occupational ICD affects women nearly twice as often as men, in contrast to other occupational disorders which more frequently affect men. Although the picture remains cloudy, it has been suggested that the increased incidence in females is secondary to the disproportionate role women occupy in housecleaning, hair styling, and childcare. An atopic diathesis increases the susceptibility to skin irritants³⁶ and atopics should therefore be cautioned regarding professions with significant irritant exposure. Anatomic site further influences the propensity to develop ICD. The thickness of the protective stratum corneum varies considerably depending on location. It is thickest on the palms of the hands. Consequently, hand dermatitis often occurs on the dorsal hand and finger web spaces where the stratum corneum is thinner.

Presentation

Classically the dermatitis affects the dorsum of the hand and the finger webs where the protective stratum corneum is thinnest. Patients typically complain of pain, irritation, burning, and/or itching. Itching is typically less intense than what is seen in ACD. Two major forms of ICD are recognized: acute and cumulative. Cumulative ICD is more common than acute. Acute ICD can develop rapidly, within minutes after exposure to highly irritating substances, especially powerful acids and alkalis, and strong oxidizing and reducing agents. Typically, such exposure produces rapid development of burning and pruritus with coincident erythema, blistering, and swelling. The rash does not extend beyond the area of contact and typically resolves within a few weeks with removal of further insult. In contrast, weak irritants produce cumulative ICD, which may require months of continual exposure before the repair capacity of the skin is overwhelmed and ICD clinically manifests. Repeated exposure to mild irritants such as soap, water, greases, and solvents causes chronic cumulative irritant dermatitis. The chronic lesions of cumulative ICD appear lichenified with fissuring, hyperkeratosis, excoriations, and scaling and can take considerably longer to resolve than acute irritant dermatitis.

Pathogenesis

Historically, ICD was considered to be a nonimmunologic process. Conversely, current theories suggest that the immune system plays a central role in the pathogenesis of ICD. Irritants may be physical or chemical in nature. Either can initiate ICD if skin is subjected to exposure for a sufficient

duration at an adequate concentration and/or force. Repeated exposure with nearly any chemical may elicit ICD. Irritants may damage the skin by way of a multitude of effects, including, but not limited to: direct cytotoxicity, lipid-barrier removal, cell membrane damage, and denaturation of keratins.³⁷ Despite varying mechanisms, the final common pathway is executed with the release of inflammatory mediators from damaged and viable keratinocytes. Keratinocytes are essential in the propagation of ICD, releasing cytokines upon penetration of irritants through the stratum corneum, up-regulating cell adhesion molecules, and up-regulating MHC class II antigens.³⁸ A plethora of cytokines are liberated during propagation of ICD, but perhaps the most important is TNF- α . Research suggests that TNF- α may be the major mediator of inflammation, notably shown by a study in which mice administered anti-TNF- α antibodies failed to develop ICD.³⁹

As reviewed by Slodownik and colleagues,²⁹ the chronicity of ICD which is observed in some patients has 2 probable explanations. First, prolonged inflammation exposes the immune system to immunogenic skin peptides resulting in persistent recruitment of inflammatory mediators. Second, TNF- α is regulated in an autocrine manner and thus engaged in the maintenance of inflammation.⁴⁰

Allergic Contact Dermatitis

Overview

ACD is a classic, type IV, delayed, T-cell mediated, hypersensitivity reaction, the pathophysiology of which has been extensively reviewed in standard texts and articles; to which the interested reader is referred. The trademark of an allergy is its specificity; a discrete, predictable, and reproducible inflammatory reaction occurring exclusively in sensitized individuals only after rechallenge with a specific allergen. Hypersensitivity to an allergen usually lasts indefinitely.

Risk factors

Environmental factors such as friction, heat exposure, humidity, and pressure⁴¹ have been implicated in ACD likely through embarrassment of the skin's barrier function; and have previously and succinctly been reviewed by Belsito.⁸ Specifically, maceration effected by wet work and repetitive cycles of wetting and drying (ie, hand washing) provoke fissuring and cracking, enhancing cutaneous penetrance of allergens and irritants. Similarly, decreased ambient humidity results in desiccation and epidermal barrier disruption. In contrast, humid and/or hot environments promote perspiration, into which

soluble contactants are dissolved, enhancing cutaneous penetration.⁸ Finally, persistent friction likewise incites barrier disruption with an attendant increased risk for sensitization.⁴²

Beyond host and environmental factors, specific occupations are associated with relatively greater rates of ACD including hairdressers, printers, cement workers, painters, mechanics, animal handlers, food processors, florists, chefs, builders, pharmaceutical factory workers, and laundry workers.^{43–45} As a collective, the features shared by the majority of the above occupations are an excessive exposure to water, solvents, and/or micro trauma. More extensive allergen lists and occupational exposures are available in reference books.^{6,46}

Presentation

Reexposure to an allergen after sensitization evokes the elicitation phase, which normally presents between 12 and 48 hours after exposure; this is the obligatory time for allergen to be processed, presented, and for lymphocytes to be recruited. However, clinically evident ACD may require months to years of exposure to low levels of an allergen (eg, chromate dermatitis in cement workers) before manifesting. After contact, sensitized individuals develop an eczematous rash with significant pruritus, erythema, and edema, thereafter accompanied by vesicles, papules, bullae, and scaling. Subsequently, lesions evolve with crusting and weeping with associated risk for infection. Chronic ACD appears lichenified with scaling and often fissured. The lesions of ACD are initially sharply demarcated; occurring only at the site of contact, but with time can potentially become more generalized and less strikingly delineated. The lesions of ACD after a singular encounter with an allergen typically resolve in 7 to 21 days but continual exposure inducing chronic ACD may persist for weeks or months after antigen removal.²⁷

DIAGNOSIS OF OCCUPATIONAL CONTACT DERMATITIS

The diagnosis of OCD is dependent on patient history, exposure history, dermatitis pattern, and patch testing (if indicated). Differentiation between ICD and ACD requires a methodical and fastidious approach and hence an attendant time obligation. If OCD is suspected as the cause of dermatitis, criteria proposed by Mathias⁴⁷ or the operational definition propounded by Marrakchi and colleagues^{48,49} will assist in both the diagnosis of OCD as well as subsequent workers' compensation (WC) claims.⁴⁸ The 7 criteria (**Table 1**)

Table 1
Summary of the Mathias criteria for assessing occupational causation and/or aggravation of contact dermatitis

Criterion 1:	Is the clinical appearance consistent with contact dermatitis?
Criterion 2:	Are there workplace exposures to potential cutaneous irritants or allergens?
Criterion 3:	Is the anatomic distribution of dermatitis consistent with cutaneous exposure in relation to the job task?
Criterion 4:	Is the temporal relationship between exposure and onset consistent with contact dermatitis?
Criterion 5:	Are non-occupational exposures excluded as probable causes?
Criterion 6:	Does dermatitis improve away from work exposure to the suspected irritant or allergen?
Criterion 7:	Do patch or provocation tests identify a probable causal agent?

Data from Mathias CG. Contact dermatitis and workers' compensation: criteria for establishing occupational causation and aggravation. J Am Acad Dermatol 1989;20(5 Pt 1):842–8.

proposed by Mathias should be used to assess probability for workplace causality. Answering “yes” to at least 4 of the questions leads to a presumption of a greater than 50% probability of occupational causation, which implies a “reasonable degree of medical certainty” that the dermatitis is the result of occupational activities. The diagnosis of ACD rests on proper diagnostic patch testing and determination of relevance. The diagnosis of ICD unfortunately remains one of exclusion. A maxim which must be appreciated is that contact dermatitis, especially of the hand is often the collective consequence of irritant, allergic, endogenous, and climactic factors; and therefore may be nonoccupational, partially occupational, or wholly occupational.⁵⁰

History of the Dermatitis

A detailed history of the dermatitis by the patient remains paramount to the workup of OCD. The date of onset, site of onset, description, evolution of the dermatitis, and accompanying symptoms may suggest ACD or ICD or even a causative factor. For example, erythema, burning, and stinging immediately after contact implies an irritant reaction whereas the abrupt appearance of hives suggests contact urticaria. Moreover, intense pruritus may support ACD. A previous history of atopic eczema, psoriasis, or other dermatitis should be elicited, as many cases of possible OCD are complicated by secondary diagnoses and the disease course of atopic individuals may be protracted.⁵¹ The time course of the dermatitis, one of the Mathias criteria, is often highly relevant. ACD may be precipitated by as few as 2 exposures or require years of persistent contact. The rapidity of developing OCD after

exposure varies greatly between professions and even among individuals with similar exposures. For example, apprentice hairdressers have a propensity to develop irritant OCD within the first year. ACD to chromates in cement is not influenced by exposure time and may take years before induction. In stark contrast, a delayed type IV sensitivity to epoxy may be elicited by a single contact. Furthermore, observations of improvement away from work, (or lack thereof) and response to therapy are noteworthy. Patients must be questioned specifically regarding the topical application of all medicaments (eg, topical antibiotics, topical steroids) and home remedies, as any may contain ingredients capable of provoking a superimposed irritant and/or allergic dermatitis which may perpetuate or mask the underlying etiology.

Despite the importance of thorough elicitation of history, a Canadian survey of dermatologists revealed that occupational history taking was poor, as only 5% of dermatologists queried about exposures and only 3% asked patients to bring material safety data sheets (MSDSs) from their workplace.⁵²

Occupational History and Workplace Surveys

Investigation of the possibility of OCD requires that the physician gain extensive knowledge of a patient’s occupational activities. It is not sufficient to know what their job title is; the physician must know what they actually do. Relevant information includes past and previous jobs, (including length of employment in that job) chemical exposures, and workplace environment. The patient should be queried regarding dermatitis at any previous jobs and if any WC was received. The duration and frequency of contact with chemicals,

both irritants and potential allergens, should be documented. The patient should be questioned regarding exposure to and duration of wet work, which itself can cause ICD or predispose to ICD or ACD from other sources. Likewise, the physical environment of the workplace including humidity, temperature, airflow, and control measures (if any, such as encapsulation), cleansing agents, frequency of hand washing, and use of barrier creams may elucidate precipitating factors which predispose the skin to dermatitis. MSDSs may reveal significant exposures, but they have shortcomings, which are discussed later. The physician should request information regarding the use of personal protective equipment such as gloves (including the material, thickness, frequency with which they are exchanged for new pairs, donning technique, duration of daily wear, presence of cuffs), and safety training received (if any). ACD is typically sporadic whereas ICD may affect groups of workers; therefore inquire if any other employees have dermatitis. Knowledge of the patient's hobbies and exposures away from work may reveal competing etiologies of dermatitis such as gardening, painting, or woodwork.

Physicians must be aware that the identification of the offending agent is principally dependent on the history and thus the patient's interpretation of details. Therefore, if clinical history, physical examination, and patch test results remain inconclusive, a workplace survey may be required. Such visits by a physician may reveal inadvertent or previously unrecognized exposures, the degree and duration of exposures to irritants, possible allergens, and environmental factors such as humidity, heat, and cold. If ACD is suspected, the relevance (or irrelevance) of positive patch test/s may (possibly) be established. The reader is referred to **Box 1** for a summary of important questions critical to the diagnosis and management of OCD.

Physical Examination

The examination should focus on the areas of suspected OCD, but inspection of the entire integument should follow with an emphasis on evidence of competing diagnoses such as extensive psoriasis, flexural eczema, or dermatophyte infection. The cause of dermatitis can only rarely be determined by anatomical location or morphology of lesions alone, but specific patterns may narrow the possibilities, suggest an exposure, or aid in ruling out competing diagnoses such as tinea or psoriasis. There are no pathognomonic features that distinguish irritant from allergic contact dermatitis, although vesicles are more

Box 1

Integral components in the initial evaluation of suspected OCD

History of the dermatitis

- Date and initial anatomic location of onset, progression of lesion/s, and description (including rapidity of evolution)
- Relative severity of symptoms (especially itch versus pain/stinging/burning)
- Course of the dermatitis as related to work exposures, vacations, and weekends
- Response to and/or use of prescribed medications, over-the-counters, and home remedies

Medical History

- Previous history of skin disease especially contact dermatitis, atopic dermatitis, psoriasis

Occupational history and exposures

- List of previous and present occupations with dates of employment
- Potential exposures to irritants and allergens, including duration and frequency
- Duration and exposure to wet work
- Previous history of OCD, receipt of previous WC benefits
- Job title and description of work (be specific and detailed) including length of time in current position, recent job change/s, and time spent on specific work activities
- General work conditions including ambient humidity, temperature, airflow; and control measures (if any) including ventilation and encapsulation
- Occupational hygiene including number of times hands are washed/day, cleanser used, and water temperature; use of moisturizers and barrier creams
- Use of personal protective equipment including glove material, thickness, changing schedule, donning and removal technique, and safety training received (if any)
- Coworker – are any other workers affected?

Hobbies and extracurricular activities

- Hobbies, including their relation to the dermatitis, duration of exposures, recent changes
- House work, including all personal care products, detergents and soaps, and personal protective equipment used; and any recent changes in the aforementioned products

likely in ACD. Historically, involvement of the dorsal skin of the hands was suggestive of contact dermatitis according to some investigators, whereas palmar or lateral digit dermatitis connotes atopic eczema or dyshidrotic eczema.⁵³ Studies refute this theory, proposing that there is no correlation between location of dermatitis and the etiological diagnosis of ACD or ICD^{54,55} with the exception that central palmar dermatitis is correlated with endogenous etiology, that is, atopic dermatitis.^{54,56} Therefore, any attempt to distinguish ACD from ICD solely on the basis of appearance is perilous and fraught with pitfalls. It is important to keep in mind, though, that distinguishing between ACD and ICD is irrelevant to determining occupational causation, as both are commonly caused by occupational exposures, but distinguishing between the 2 can be vital for determining proper management.

Diagnostic Testing

Patch testing is essential to the workup of skin disease and remains the foundation of the diagnosis of ACD. As reviewed by Slodownik and colleagues,²⁹ follow-up studies have shown beneficial effects in the long-term outcomes for patients even when results are negative.^{57–59} Further, the absence of patch testing correlates with a concomitant increase in morbidity as well as adverse financial implications for patients, health services providers, and the state.⁵⁰ The patch test attempts to reproduce a contact dermatitis under uniform conditions but remains imperfect, for it is incapable of replicating the exact conditions (ie, friction, sweating, humidity, duration or concentration of exposure) which precipitated the dermatitis. With a sensitivity and specificity of 70% to 80%⁶⁰ patch testing is cost-effective if patients meet 2 conditions:⁶¹

1. There is a strong clinical suspicion of allergy.
2. Patients are tested with chemicals relevant to exposures.

Post-patch test probabilities do not justify testing with random selections of chemicals, as noted by Bruze.⁶²

The patch testing process used to investigate potential OCD is identical to the standard patch testing procedure which has been reviewed extensively in many manuscripts and textbooks⁶ to which the interested reader is referred. The only significant difference when investigating potential OCD as compared with non-OCD is in the allergens selected for testing. In addition to the standard panel that is applied to all patients being investigated for contact dermatitis, additional

allergens must be specially selected based on the occupational exposures of the patient. Several occupations with a high risk for contact dermatitis, such as hairdressing, metalworking, and dentistry, have standard patch tests series which are commercially available. Testing with additional allergens depending on exposure and specific occupation of each individual patient significantly increases the probability of detecting relevant allergens.⁶³ As discussed by Slodownik and colleagues,²⁹ patch testing that is performed in a dedicated patch-test clinic enhances the identification of relevant allergens,^{64,65} which is attributable to the increased number of patch tests applied, the testing of patient's own products, and to the interpretation of results.⁶⁶

Job Interruption

Prescribing a leave of absence from the workplace can be diagnostic and therapeutic. However, a number of practical issues, unrelated to the potential occupational dermatitis demand consideration.

Regarding the diagnostic value of prescribing work leave, several issues must be considered. First, when a patient is given a medical work excuse, but continues to report to perform alternative "light duty," the patient may still be exposed to workplace irritants or allergens; the most common example being the soap in the bathroom. In this situation, if a patient's dermatitis does not clear, it does not necessarily indicate that factors outside of work are causing persistence. Second, when a patient is medically proscribed completely for diagnostic purposes, it should be for a sufficient period of time to see clear improvement in the dermatitis, typically at least 2 weeks. Care must be taken to make sure that aggressive therapy does not lead to a mistaken assumption of improvement while off work, for example if a patient is put on a 2 week prednisone taper for the concurrent 2 weeks of work leave, because of the prednisone the dermatitis will improve during the leave and flare upon the return to work as the prednisone is tapered.

For removal from work to have a significant therapeutic effect, 2 points should be considered. First, the exposure or activity that caused the dermatitis cannot be resumed upon return to work, or the dermatitis will quickly recur. Second, the barrier function of the skin recovers more slowly than the clinical appearance of the skin, so to allow the barrier function to recover, the patient should be kept off work for additional time after the dermatitis has resolved, although

exactly how long it takes for the barrier function to recover will vary from patient to patient.

Practical considerations regarding options for removing the patient from the work environment must be taken into account. The patient may be able to take paid sick time off from work, they may be able to take paid Family Medical Leave Act (FMLA) time off from work, or they may be able to take paid vacation time off from work. However, depending on the policies of their employer they may not be paid while taking time off by any of these routes (sick time, FMLA time, or vacation time), and many patients are unable to afford the loss of income associated with a prolonged (2 week) period of lost wages. Another possible option is that they may be able to take time off by short term disability if it is offered as a benefit by their employer. Short term disability usually applies to the first 6 weeks to 90 days of time off of work, if it is offered by their employer. With any of these methods of getting a worker time off from work, the physician who recommends the time off should be prepared to complete significant amounts of paperwork on the patient's behalf to justify the leave.

By law, all workers can use the FMLA if they need time off of work as a result of illness or injury, and the law states that they cannot lose their job for taking time off for this purpose. However, employers do not have to pay employees while they are off work under the FMLA. Although it is unethical to do so, employers can often find creative reasons to justify discharging the employee if the employee takes time off from work.

Material Safety Data Sheets: Functions and Limitations

MSDSs play a fundamental role in the evaluation of suspected occupational dermatitis. Regulations protecting workers were first established in 1970 through passing of the Occupational Safety and Health Act by Congress. Subsequent legislation founded the Occupational Safety and Health Administration (OSHA). In 1986 OSHA instituted the Hazard Communication Standard (HCS) which included the origination of MSDSs. MSDSs must include at least the minimum following requirements:

1. Chemical and common (trade) names of all hazardous ingredients
2. Physical and chemical characteristics of the agent or agents
3. Physical hazards such as flammability or explosive reactivity
4. Medical symptoms, signs, or known diseases that can be caused or aggravated by exposure
5. Primary route or routes of entry
6. Legal time-weighted exposure limits and toxicity information established by OSHA
7. Carcinogenicity
8. Precautions for safe handling and use, including appropriate hygienic practices, personal protective equipment, and procedures for clean up of spills and leaks
9. Engineering control requirements
10. Emergency and first-aid measures
11. Dates of MSDS preparation, edits, and updates
12. Manufacturer contact information

Use of MSDSs in the workup of occupational dermatitis is crippled by serious handicaps. According to Bernstein⁶⁷ there are 4 major limitations to MSDSs. First, vital information is often omitted regarding generic names and formulas of hazardous chemicals because OSHA permits exclusion of such information if the manufacturer deems said information a trade secret or the chemical not hazardous. Second, potential respiratory or skin sensitizing chemicals (ie, known contact allergens) are generally not considered toxic or hazardous. Third is a deficiency to update the most current permissible exposure levels.^{68,69} The fourth limitation stems from neglect to require documented clinical information with respect to specific occupational cutaneous diseases which have been correlated with a particular agent. In addition, it should be noted that the definition of a hazardous chemical is relatively vague in the OSHA guidelines, meaning that manufacturers and importers have significant leeway in deciding which chemicals to list on an MSDS.

If MSDSs are not readily accessible, the internet provides several major MSDS sites (eg, the Cornell MSDS web site).⁶⁷ When reviewing MSDSs, a summation of constituents totaling less than 100% should forewarn that a manufacturer may have omitted agents they deemed nonhazardous or a trade secret. A suspected omission should prompt a telephone conversation by way of the required contact information provided on the MSDS. Furthermore, an emergency obligates the release of proprietary information by the manufacturer per OSHA.

In summary, under current OSHA guidelines, most known contact allergens do not need to be listed on MSDSs, which relegates the utility of MSDSs to nearly useless as an aid in the evaluation of the patient with suspected OCD. MSDSs do typically contain information regarding the skin irritancy potential of a substance, and this information can be used to help determine if it is possible or advisable to patch test the patient

with the substance. In most situations, the most important, and possibly the only useful, information on an MSDS is the name and contact information of the manufacturer of the substance.

WORKERS' COMPENSATION AND DISABILITY

Workers' compensation and disability insurance are explicit entities and must be considered separately. WC is a form of insurance that all employers must carry. When an injury or illness occurs to an employee when at work, this insurance pays for the medical care of the injured worker and, if the worker is unable to work, the insurance will also pay the worker a fraction of their normal wages. It does not matter if the worker caused the injury or disease through personal negligence, if the injury or disease was caused by employer negligence, or if the injury or disease was purely accidental and unforeseeable. The only requirement for coverage by WC is that the injury or illness occurs when the person is working.

Workers who receive WC are required to continue working if a job is available which they are able to perform, given the restrictions imposed upon their activities by the disease or illness. Physicians are often asked to list what tasks a worker with an occupational injury or illness is able to perform and what tasks they are not able to perform. A "Work Abilities Form" is frequently used to report these limitations. The physician should be aware that the more restrictions they place on the worker, the less likely the worker will be able to return to work, but if inadequate restrictions are instituted, the worker may continue to suffer from the illness or injury because of repeated exacerbations.

The details of WC laws vary significantly from state to state in several ways. Examples of interstate differences include the percentage of the employee's salary which is covered by WC and the duration the worker is entitled to WC benefits. It must be noted that in many cases the employer will dispute whether or not the worker's illness or injury truly was the result of workplace activities. The method of resolution of these disputes also shows interstate variance. As a result of these issues, it is often advisable to recommend that a worker pursuing WC retain an attorney. In most cases there is no upfront cost to the worker and the attorney is compensated through the receipt of a percentage of any WC benefits awarded.

Conversely, disability insurance, similar to health insurance, is purchased by individuals for themselves, is provided to individuals by the government Social Security Disability Insurance (SSDI), or is purchased for an individual by their employer.

Unlike WC, disability is independent of where, when, or how an individual is injured or acquires an illness. All that matters is how severely the function of the individual is affected. If the individual is deemed unable to partake in gainful employment of any type, they are considered totally disabled. If they are deemed to be able to partake in at least some type of gainful employment, then they are considered partially disabled. In the case of SSDI, a judge makes the decision if the individual is totally, partially, or not disabled. In the case of disability insurance, the insurance company responsible for the policy determines if the worker is disabled based on the details of the policy.

To summarize, the key question of WC regards if the injury or illness was caused by the individual's job – the type or severity of injury is irrelevant until after occupational causality is established. In the case of disability, the key question is if the injury or illness is severe enough to limit the individual's ability to be gainfully employed – independent of how or where the injury occurred. Several examples to illustrate these points are in **Box 2**.

The concept of impairment should be understood by physicians dealing with potential OCD. According to the fifth edition of the *AMA Guides to the Evaluation of Permanent Impairment*,⁷⁰ impairment is defined as "a loss, loss of use, or derangement of any body part, organ system, or organ function." In disability cases, the physician evaluates the degree of impairment (judged by anatomical or functional loss) and provides an assessment of impairment to disability raters, judges, hearing officers, or commissioners.⁴⁶ Subsequently, these non-medical personnel judge an individual's disability. Again, impairment is a medical assessment determined by health care personnel whereas disability is a non-medical pronouncement concluded by WC boards or by way of litigation.⁸

Unlike impairment, disability is dependent on a specific job and the ability to compete in the open market. Impairment does not necessarily imply disability and the two must be considered separately. For instance, an individual with loss of the distal phalanx of the second digit results in the same impairment rating in a roofer and concert violinist, yet the rated disability is much greater for the musician.⁴⁶ A physician requested to perform an evaluation of impairment should employ the most current edition of *AMA Guides to the Evaluation of Permanent Impairment*.⁷¹

Preparing a Letter and/or Report

Subsequent to patient evaluation and initiation of treatment, a letter should be prepared and

Box 2**Examples of the differences between WC and disability coverage**

Example 1: An individual who works as a dishwasher develops irritant hand dermatitis because of chronic exposure to soap and water at work. He is able to keep working but requires physician visits and prescription steroids. He would qualify for WC compensation which would pay for the physician visits and prescriptions. He would not qualify for disability since he is able to work.

Example 2: An individual develops severe palmo-plantar psoriasis that is recalcitrant to therapy. It is so severe that it is intensely painful to walk and she cannot use her hands. She is no longer able to perform her job as a janitor, nor is she able to perform any other jobs. She would qualify for disability but not for WC.

Example 3: An individual develops severe vesicular hand dermatitis when working as a machinist. She is found to be allergic to nickel. The hand dermatitis is sufficiently severe that she is unable to work. She stops working, but the hand dermatitis develops into an endogenous chronic vesicular hand dermatitis which is sufficiently severe to prevent her from engaging in gainful employment. She qualifies for WC because the nickel allergy and hand dermatitis developed while she was working as a machinist. Because the condition persists permanently and prevents gainful employment, she would also qualify for disability.

formatted. In general, the report should be formatted as a letter to a referring physician, but is distinguished by the necessity to include language which is comprehensible by non-physicians. This letter will need to be intelligible by the worker, worker's employer, and/or professional disability rating personnel. Beyond inclusion of the patient's occupational history, patch test results, and physical examination, the report should also contain the following: (1) a brief overview of the Mathias criteria for establishing occupational causation or aggravation; (2) a declaration of which of the 7 Mathias criteria are satisfied and attendant justification for each criterion; (3) acknowledgment that since 4 or more of the 7 criteria have been fulfilled, occupational causation is established to "a reasonable degree of medical certainty"; (4) if needed, the letter should include specific instructions regarding treatment, future prevention (eg, workplace hygiene), and rehabilitation, as well as projected length of illness and prognosis.

Preparing a report that maximizes the chances for a good medical and occupational outcome for the patient can be exceptionally difficult. Appropriate accuracy (or vagueness) and detail are paramount. Although it is often medically appropriate to indicate that a certain degree of uncertainty remains in opinions regarding diagnosis, prognosis, and causality, noting this uncertainty in the report can lead to significant misinterpretation and misrepresentation by biased attorneys and biased disability insurance reviewers. Alternatively, if opinions regarding diagnosis, prognosis, future course, or activity restrictions are presented with excessive certainty, it can present difficulties if any additional information comes to light that in any way refutes these opinions. Sensitivity to the patient's occupational status may require communication with the employee and/or their employer before any final conclusions are drawn to diminish unintended consequences.⁶

MANAGEMENT: PREVENTION AND THERAPY

The initial treatment of OCD focuses on the avoidance of possible sources of antigens and/or irritants and control of the disease process. The symptoms of OCD can be acute or chronic, allergic or irritant; each of which requires a modified approach. In any case, implementation of lifestyle changes is often necessary but difficult, resulting in reduced patient compliance. An acute allergic reaction involving a limited amount of skin should respond well to potent topical steroids applied 2 to 3 times daily. Widespread involvement and/or severe symptoms may necessitate a systemic steroid taper. Typically, a starting dose of 40 to 80 mg/day of prednisone tapered over 3 weeks is adequate to control acute symptoms, but unless exposure ceases, a severe flare of dermatitis will almost certainly follow the taper.

The cornerstones of symptomatic, short term management of occupational hand dermatitis are avoidance of potential irritants and allergens, frequent moisturization, and proper hand cleansing (ie, avoid harsh/abrasive soaps, solvents). All patients should receive instruction to suspend the application of all topical medications and personal care products to the affected areas except those products with little-to-no potential for irritancy or allergy, such as petrolatum or desoximetasone ointment.

Acute lesions of OCD may benefit from soaks with cool water or Burrows solution. Topical steroids can provide symptomatic relief. Note, though, that applying a steroid which contains an ingredient to which the individual is allergic is

akin to “tossing gasoline on the fire.” Suspicion of steroid allergy should precipitate the use of hypo-allergenic products, such as desoximetasone ointment or tacrolimus ointment. As stated previously, severe cases may require systemic steroids, but said therapy will necessarily delay patch testing.

Long-term management of occupational hand dermatitis revolves around first establishing an accurate diagnosis, then individualizing the appropriate recommendations.

Education of Worker

Roughly half of all cases of OCD was reported to occur in the first 2 years of employment⁷² perhaps accounted for by a lack of awareness of any probable health hazards, leading to complacency and poor occupational skin hygiene. As reviewed by Brown,⁷³ multiple studies have investigated the effect of education on the prevalence of OCD in various industries and proved them effective. These studies included wet work employees,⁷⁴ bakers’ apprentices,^{75,76} caterers,⁷⁷ hairdressers,^{78,79} student auxiliary nurses,⁸⁰ manufacturers of fine chemicals,⁸¹ and individuals in the metal working industry.⁸² Ideally, job training should be instituted before placement and resultant exposure to sensitizing and irritant chemicals, and employees should receive periodic retraining. Education during training or apprenticeship is likely most important.^{83,84} As stated by Brown,⁷³ studies have shown education to be cost-effective,⁸² as well as efficacious in primary (trainee), secondary (worker), and tertiary (afflicted individual) prevention. Educational initiatives should stress the proper use of personal protective equipment, personal and environmental hygiene, and recognition of early signs and symptoms of OCD.⁷³

Public Health Interventions

Recognition, elimination, substitution, and/or avoidance of hazardous materials are paramount to the prevention of OCD. Ideally, contactants with inherent strong sensitizing or irritating capacity will be identified before introduction to the workplace and every effort should be made to find a suitable substitute or to use engineering measures to eliminate the possibility of worker exposure. Passive methods to eliminate exposure (ie, methods that do not require any action or effort on the part of the worker) are much more effective than are methods involving use of personal protective equipment or other actions to be taken by workers. Examples of successful interventions include the addition of ferrous sulfate to cement in Scandinavian countries to inhibit chromate

sensitization^{85–87} and the substitution of ethylene glycol with zinc borate in cooling towers.⁸⁸ Likewise, recognizing that protracted wet work contributes to the vast majority of OCD cases, Germany conceived legislation regulating wet work.

Barrier Creams and Moisturizers

Barrier creams are intended to operate as a protective layer, shielding the skin from hazardous chemicals. They are typically oil-based creams formulated to repel oils, paints, grease or solvents, or silicone-based creams intended to be efficacious against water-based products such as acids, alkalis, and metalworking fluids.⁷³ Barrier creams should only be applied to normal skin as they may potentiate secondary aggravation of dermatitis with application to inflamed skin. Substances to which barrier creams have proven effective are beyond the scope of this article but have been succinctly reviewed by Brown.⁷³ Barrier creams have been shown to aid in the prevention of hand irritation in occupations which includes health care workers,⁸⁹ textile-dyeing and printing plant workers, hairdressers, and workers in the food processing industry. Despite experimental evidence supporting the use of barrier creams, experts remain skeptical. In a survey of international experts in OCD, 98% believed barrier creams to be no more effective than bland emollients in the prevention of hand dermatitis.⁹⁰ There is also doubt concerning the translation of experimental efficacy to clinical benefits as barrier creams must be applied frequently, and in adequate amounts to be effective to all skin areas needing protection. Barrier creams may give workers a false sense of security, leading to laxity in adherence to other methods to reduce cutaneous exposure.

Beyond barrier creams, emollients are purported to prevent OCD of the irritant type, despite a scarcity of evidence.¹ The water content of the stratum corneum in healthy skin is 10% to 20%.⁹¹ If the water content falls below 10%, the barrier capacity of the skin is impaired with concomitant increased susceptibility to irritants. As reviewed by Chew and Maibach,⁹¹ moisturizers hydrate the stratum corneum (eg, humectants such as glycerin or urea) or reduce transepidermal water loss (eg, lipids such as petrolatum); consequently preserving barrier function and reducing the risk of irritation. Therefore, therapeutic moisturizers are of relatively greater importance in the treatment and/or prevention of ICD versus ACD. Moisturizers can prevent the development of experimentally-induced ICD and enhance the

rate of healing of damaged skin.⁹² Habitual application of moisturizers may prove to be an integral component in the secondary prevention of OCD.⁹³ Ointments or creams with the fewest possible sensitizing agents possible are recommended, including plain petrolatum, Eucerin Plus Intensive Repair Hand Cream (Beiersdorf AG, Hamburg, Germany), and Neutrogena Norwegian Formula Hand Cream (Neutrogena Corp., Los Angeles, CA).⁹⁴ Patients should avoid moisturizers with fragrances or other potential sensitizers as well as lotions which are primarily water and ineffective because of their low lipid content.

The efficacy of barrier creams versus moisturizers is controversial and remains hotly debated. As discussed by Chew and Maibach,⁹¹ trials with repetitive hand washing and repetitive irritation have shown contradictory conclusions, with studies concluding barrier creams to be more effective,⁹⁵ equally effective,^{96,97} or less effective than moisturizers.⁹⁵ Further clouding the debate, specific barrier creams may prove efficacious against only a restricted range of irritants.⁹⁸ Notably, no known barrier cream is effective against a wide spectrum of irritants. Consequently, only barrier creams with proven efficacy against the specific exposures relevant to the patient should be recommended to prevent irritation by the agent in question. It is important to recognize that barrier creams themselves can induce ACD or ICD.⁹⁹

Hygiene and Cleansers

Cleanliness is an important consideration in the prevention of OCD and should always be addressed. There are several fundamental requirements for an efficient skin cleanser in the prevention of OCD. As reviewed by English,¹⁰⁰ the cleanser should be soluble in hard, soft, cold, or hot water; it should remove foreign matter with minimal damage to the skin; should avoid defatting the skin; should be stable during storage, be easily dispensable, and not clog plumbing. Punctual rinsing of the skin or washing with a mild soap is often adequate to remove most allergens and irritants but more abrasive soaps may be required in specific situations. Wet work including frequent hand washing especially with hot water and harsh soaps contributes to the pathogenesis of ICD or causes ICD directly. Therefore, patients with active ICD of the hands should wash the hands as infrequently as possible using a mild soap and warm, not hot water, followed by application of a moisturizer. Moisturizing non-lathering cleansers such as Cetaphil Cleanser (Galderma Laboratories, Fort

Worth, TX) or CeraVe Cleanser (Coria Laboratories, Dallas, TX) provide viable alternative if the hands are not extremely soiled. Workers should also maintain hygiene by regularly washing contaminated clothing, as excessive soiling often results in inadvertent skin contact when clothing is donned or removed.¹⁰¹ Alcohol-based waterless hand sanitizers have been repeatedly shown to cause less irritation than washing with soap and water, even though they often sting when applied to hands with ongoing irritant dermatitis. These products should be recommended as a replacement for hand washing in appropriate occupations, especially in the health care field, as recommended by the Centers for Disease Control and Prevention. Ideally, products with an added emollient are preferred.

Gloves

Considering hand dermatitis constitutes 80% of cases of OCD, proper glove use is paramount for sufficient hand protection. Industry provides a large number of permutations of glove materials, thicknesses, and designs. The physician should have a knowledge of the basic physical and chemical properties of the glove materials available and of the job that is to be performed, including which chemical, physical, and biologic exposures are present and must be protected against. Leather and textile gloves can be used to prevent irritation from mechanical friction, as well as environmental hazards such as cold and heat.⁶ Plastic and rubber gloves are used for protection from most chemical and biologic substances. As reviewed by Chew and Maibach,⁹¹ the selection of an appropriate glove is dependent on the nature and extent of the dermal hazards,¹⁰² as well as impermeability to chemicals, resistance to cuts, tears, abrasions, and tensile strength.¹⁰³ Further considerations include ergonomics⁹¹ (eg, pliability, tactile sense, and gripping qualities), and cost.^{102,103} Finally, the worker's individual characteristics need be examined including allergy (eg, sensitivity to latex, natural rubber, glove powder, or rubber additives), irritability, and magnitude of perspiration.¹⁰³ Excellent resources assisting in proper glove selection for the chemical in question include the "Quick Selection Guide to Chemical Protective Clothing"¹⁰⁴ and World Wide Web sites of glove manufacturers that provide technical support, including search engines which provide glove recommendations after a chemical exposure is entered (www.ansellpro.com, www.bestglove.com/site/chemrest/, www.northsafety.com). Finally, proper glove use, including donning and removal techniques, frequency of glove replacement and

glove storage are crucially important, as the perfect glove is worthless if not used correctly.

To extend all glove materials are permeable to some chemicals; there is no universal material affording protection from all chemicals. **Table 2** lists the general characteristics and chemical resistance of various glove materials. For some jobs and certain chemicals, there is no glove capable of furnishing a significant barrier.⁶ If sweating and maceration are a significant problem, light textile gloves should be worn beneath polymer gloves.⁶ Although effective in the prevention of OCD,^{101,105,106} gloves can increase the risk for OCD¹ if not used properly. Mechanisms include: irritation from sweat entrapment and/or friction, accidental occlusion of irritants and allergens beneath the glove enhancing cutaneous absorption, and contact sensitivity to glove additives (especially accelerators).⁷³ Glove failure may occur secondary to improper selection and/or inappropriate use. Kwon and colleagues¹⁰⁷ reviewed 3 primary mechanisms by which gloved hands can be exposed to chemicals: permeation (ie, substance diffuses through glove at molecular level), penetration (ie, substance passes through physical hole in glove), and contamination (ie, hands are contaminated before glove donning and substance is transferred to interior glove surface).

It is exceedingly important that the selected gloves be changed at appropriate intervals to minimize permeation. Likewise, the longer a given pair of gloves is used, the more likely they undergo degradation. Degradation is defined as a change in the physical properties of a glove as a result of exposure to chemicals and it begins as soon as the glove is first exposed to a causative chemical. The most common chemicals causing degradation of rubber gloves (latex, nitrile, and neoprene) are organic solvents and petrochemicals. Gloves that have undergone degradation are much more susceptible to permeation and physical damage, leading to severely compromised gloves. The sign of advanced degradation is a loss of elasticity or an increase in the stiffness of the glove material. Finally, employee education should emphasize proper donning and removal technique to minimize contamination.¹⁰⁷ The employee must be instructed to never don a glove when their hands are contaminated with any irritants or allergens.

Although proper selection and use of gloves is absolutely necessary to prevent OCD, practitioners should not rely excessively on gloves as a solution for occupational hand dermatitis, especially occupational ACD. It was the senior author's experience that even with selection of the correct glove and training on proper use; it is distinctly

uncommon for workers to be able to completely eliminate exposure to a chemical by using gloves. This is usually because of an inability to complete their work in a timely fashion when wearing gloves or because of other practical issues in the workplace.

Steroids

Topical corticosteroids remain the keystone in the first-line intervention of acute OCD. Corticosteroids exhibit broad mechanisms of action including suppression of the production and effects of humoral factors involved in the inflammatory response; inhibition of leukocyte migration to areas of inflammation; and interference with the functions of endothelial cells, granulocytes, mast cells, and fibroblasts.¹⁰⁸ The effectiveness of topical corticosteroids in the symptomatic treatment of ACD is well documented in the literature. In a double-blinded study of female volunteers ($n = 20$) with documented nickel allergy, 0.05% fluticasone propionate was effective in reducing nickel-induced contact dermatitis.¹⁰⁹ Other studies have upheld the benefits of topical steroids in ACD,¹¹⁰ however their efficacy in ICD remains disputable. Treatment of ICD with steroids can offer rapid relief of symptoms, but has yielded conflicting results when considering overall effects. Recent studies support the traditional use of topical steroids to treat the inflammation of ICD.^{111–113} Contradictorily, Levin and colleagues¹¹⁴ concluded corticosteroids to be ineffective in the therapy of surfactant-induced irritant dermatitis when compared with the vehicle and the untreated control. Evidence suggests that repeated use of steroids impairs skin barrier function by decreasing the production of intercellular stratum corneum lipids and through a decrease in thickness of the epidermis; and these effects would be expected to delay recovery from ICD and to increase susceptibility to repeated exposures. In summary, corticosteroids appear clearly beneficial in ACD and to be effective for acute control of the symptoms of ICD. Conflicting conclusions in the chronic therapy of ICD warrant further investigation.

In choosing a steroid, the physician should consider: the site and frequency of application, the vehicle and associated advantages and disadvantages of ointment, cream, gel, lotion, solution, or foam, and amount to be dispensed.¹¹⁵ In general, steroid ointments are preferred to other vehicles secondary to fewer preservatives and additives and greater lipid content. This is especially true considering that patients with ICD and ACD have an elevated risk for developing

Table 2
Summary of general characteristics of glove materials

Material	Chemical Protection		Biologic Protection	Puncture and Tear Resistance	Dexterity	Price	Allergy
	Good	Poor					
Latex	Water	Most chemicals	Excellent	Good	Excellent	Low	Type I Type IV
Nitrile	Water, most organic solvents, most hydrocarbons, oils, greases, selected acids and bases	Ketones, aromatics, chlorinated hydrocarbons, esters, some acids	Good	Good	Good	Low	Type IV
Vinyl	Acids, bases, oils, greases, peroxides, amines	Organic or petroleum based solvents, aldehydes	Poor	Poor	Poor	Low	Rare
Neoprene	Alcohols, phenols, peroxides, acids, hydrocarbons, bases	Halogenated and aromatic hydrocarbons	Good	Good	Good	Med	Type IV
Multilayer laminates	All classes	Isolated small molecule solvents	N/A	Medium	Very poor	High	Rare
	Chemical Protection	Biologic Protection	Dexterity	Durability	Price	Allergy	
Latex	Poor	Best	Best	Good	Low	Type I Type IV	
Nitrile	Good	Good	Good	Good	Low	Type IV	
Vinyl	Fair	Poor	Poor	Poor	Low	None	
Neoprene	Good	Good	Good	Good	High	Uncommon	

sensitivity to any potential allergens that are applied to the inflamed skin. Caution is necessary in the prescription of protracted therapy with topical steroids as long-term use can result in well known local effects including permanent skin atrophy, striae, and telangiectasia.¹⁰⁸

Topical Calcineurin Inhibitors

In the therapy of contact dermatitis, topical steroids have long been a cornerstone in the dermatologists' armamentarium. Recent studies suggest that topical calcineurin inhibitors (TCIs) may provide an appropriate therapeutic alternative. TCIs are often prescribed as a component of a rotational regimen with both topical steroids and moisturizers. In a double-blind, intraindividual (both medications were compared in the same patient) study of 28 individuals, topical 0.1% tacrolimus under occlusion proved as effective as 0.1% mometasone in petrolatum in the suppression of ACD elicited by nickel.¹¹⁶ The most common side effects reported with TCIs are transient skin burning or sensation of warmth.^{117,118} TCIs do not induce skin atrophy, telangiectasia, or tachyphylaxis.^{119,120} Such characteristics of TCIs are particularly appealing for use in sensitive skin areas such as the neck, face, and groin. As a result of its increased efficacy and lower allergenicity of its vehicle, the author's strong preference in TCIs is to use only tacrolimus 0.1% ointment in the treatment of OCD.

As reviewed in the third edition of *Contact and Occupational Dermatology*,⁶ when therapeutic intervention and preventative measures fail, chronic skin impairment and disability may ensue. Such scenarios demand the institution of rehabilitation to restore vocational abilities and economic success for the patient. Often, such restoration can be realized by changing jobs within the workplace. Recalcitrant cases may require temporary removal from the workplace environment and subsequent vocational retraining in a different occupation. Such rehabilitation interventions can be coordinated through insurance carriers or by way of WC agencies. Comparatively speaking, rehabilitation, although expensive, remains much more fiscally responsible than disability benefits.

PROGNOSIS

As reviewed by Cahill and colleagues¹²¹ the prognosis of OCD remains difficult to quantify and compare between studies secondary to a lack of standardization. With these limitations the prognosis of OCD is generally considered to be poor but highly variable; some patients exhibit a self-limited disease with no or infrequent

exacerbations, others evolve a chronic disabling process. Recent studies show the recalcitrance of HE. An 8-year follow-up study reported that 67.6% of patients were still experiencing episodes of HE 8 years after diagnosis.¹²² Likewise, a 12-year follow-up on farmers showed that 12 years after diagnosis 40% had persistent disease in the last 12 months.¹²³ A 12-year follow-up study on OCD showed 70% with symptoms in the last year;²³ and a 15-year population-based study estimated that 44% had symptoms in the last year.¹²⁴ Recent studies show that 78% to 84% of patients with OCD improve when appropriately treated.^{14,125} In marked contrast, as reviewed by Hogan, Dannaker, and Maibach,¹²⁶ studies before 1990 noted improvement in only 30% to 50% of patients. Goh¹²⁷ proposes that the improved prognosis of OCD may be secondary to superior diagnostic procedures, increased education and preventative efforts, and enhanced accuracy in identification of contactants.

Studies comparing the prognosis of ACD versus ICD have failed to reach a consensus with outcomes suggesting that ACD has a better, equal, or worse prognosis than ICD.¹²⁶ Future comparisons will face similar formidable pitfalls secondary to the difficulty of definitively distinguishing cases of ACD and ICD and the widely varying prevalence of the offending agents. The corollary is that pervasive and difficult to avoid contact allergens such as formaldehyde, nickel, and chromate have a poor prognosis; their ubiquity often leads to a chronic and protracted course.¹²⁶ In contrast, epoxy resin is easily avoided outside of specific occupational settings and carries a more favorable disease course.¹²⁷ The prognosis of ICD is similarly varied. Dermatitis secondary to acids or alkalis typically clears after withdrawal from exposure, whereas chronic cumulative ICD to cutting fluids, solvents, or wet work routinely incites recalcitrant disease. Regarding both ICD and ACD, the duration of exposure is positively correlated with chronicity, meaning that the longer the patient has active ACD or ICD before the etiology is removed, the more likely they are to have protracted disease even after the etiology is removed.¹²⁵ Chronic cumulative ICD is associated with a worse prognosis than ACD or acute ICD.^{14,90,128}

A variety of predictive factors for persistent dermatitis have been proposed in the literature including duration of disease, sex, inability to avoid causative agent, age, patient knowledge, job change, morphology, area or extent of disease, and history of positive patch test. The duration of symptoms before diagnosis is correlated with a poor prognosis and recalcitrant disease.^{9,125,129-131}

Increased patient knowledge was associated with improved prognosis in studies by Holness and Nethercott¹³² and Kalimo and colleagues.¹³³ The extent of the disease correlates with a negative prognosis^{124,134,135} as can the morphology¹³⁶ and an inability to avoid the causative agent.¹³⁷ Atopic patients are more susceptible to irritant factors, are more likely to develop OCD and have a worse prognosis⁵¹ and are more likely to have persistent dermatitis.¹³⁵ A history of childhood eczema contributed to a less favorable prognosis as did a history of a positive patch test.¹³⁵ The influence of sex has yielded inconclusive and mixed results.^{14,123} Likewise, the literature regarding the effect of age on prognosis is varied,^{14,125,138–141} but Meding and colleagues¹³⁵ observed that a younger age at onset correlated with a poorer prognosis. Literature examining occupation change on OCD prognosis yields dissenting results. As reviewed by Cahill and colleagues the majority of studies advance that a change does not significantly alter prognosis.^{2,138,140–144} In contrast some authors purport prognosis is improved by a change in occupation.^{123,145–147} Notably, a study by Halbert and colleagues¹³⁰ compared chromate sensitive individuals whose dermatitis resolved after a change in occupation to a group lacking any post-occupational amelioration; the only significant difference that predicted post-job change course was the duration of the disease before job change.

Occupation changes are not always associated with improvement in OCD, and the dermatologic community lacks a consensus opinion. As discussed by Meding and colleagues,¹²⁴ there is no literature supporting a guarantee to clear the dermatitis with occupation change but an improvement may be expected. Therefore, before a job change is recommended, every attempt should be made to continue the current job by taking all practical steps to limit exposure and improve patient and employer education. Furthermore, the decision to change jobs can have unforeseen consequences. For example, older workers may experience difficulty finding employment^{125,126,148} or suffer a reduction in income.

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