



# Workplace Survey: Guiding Principles from Occupational Dermatology

# 83

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### Abstract

A history of workplace exposures is essential for the diagnosis of allergic and irritant contact dermatitis. Information about the worker's occupational exposure may be obtained from an workplace exposure history or a workplace walkthrough. While safety data sheets provide useful information about potential exposures, there may be limitations with ingredient listing.

- A detailed occupational exposure history, using a structured format will assist in diagnosis and management of occupational contact dermatitis.
- While Safety Data Sheets are an important source of information about workplace exposures, they may have limitations in ingredient listing so it may be necessary to follow-up with the manufacturer about ingredients.

### Keywords

Occupational skin disease · Occupational contact dermatitis · Occupational allergic contact dermatitis · Occupational irritant contact dermatitis · Occupational history · Diagnosis · Workplace walk-through · SDSs · MSDSs · Prevention · Return-to-work · Guidelines · Occupational medicine · Hazardous substances · Chemical safety · Product labeling · Occupational exposures · Workplace exposures · Occupational health

## 2 Introduction

Occupational skin diseases (OSD), primarily, allergic and irritant contact dermatitis (CD), account for a significant burden of occupational disease. Often workplace parties are less aware of workers' exposure to chemical, biological, and physical causative agents of OSD, compared to more apparent occupational hazards like working at heights.

Understanding an individual's current and previous occupational and non-occupational exposures is essential in making an accurate diagnosis of OSD. Identifying and controlling risks of exposure in the workplace environment are pivotal not only for prevention but also for treatment and return-to-work (RTW).

The usual method of gathering information about the workplace and work exposures is by taking a history from the worker. While this may provide adequate information in some circumstances, it may not identify all the skin irritants and allergens to which the worker is exposed. Other methods to obtain more information about workplace conditions and exposures by the clinician or occupational health and safety professional (OHSP) (e.g., occupational hygienist) include collecting a detailed and focused workplace history or conducting a workplace visit.

## 1 Core Message

- A complete occupational history is essential to making a diagnosis of occupational contact dermatitis.
- A workplace walk-through may provide the best information about the workplace and workplace exposures if conducted by someone with knowledge of occupational health and safety.
- Although a workplace walk through may be ideal, it is generally impractical in most jurisdictions for the practicing dermatologist.
- If there is a company occupational physician or another occupational health and safety professional, they may be able to conduct a walk-through.

While these are often considered gold standard methods, there is limited information available in the literature. The use of Safety Data Sheets (SDSs, also called Material Safety Data Sheets (MSDSs)) is also of key importance as they contain information on the ingredients of various workplace products. There are, however, limitations to SDSs.

This chapter presents:

1. A workplace history outline that may be used to collect detailed information
2. A review of the workplace visit both for diagnostic and RTW purposes
3. A review of SDSs as a source of information regarding exposures

This discussion is informed by the literature and our practice in the Occupational Disease Specialty Program (ODSP) (Holness 2015). The ODSP is a specialized clinic that receives referrals from the Ontario Workplace Safety and Insurance Board, the provincial workers' compensation agency. The clinic is staffed by occupational medicine physicians and other subspecialists including dermatologists and allergists, a clinical occupational hygienist, a RTW coordinator, and specialized technicians.

### 3 Taking an Occupational History/Interview

As part of a routine clinical assessment a physician will take a patient's history. While there is a clear need to take a workplace exposure history, there is little information available in the literature about how commonly this occurs. When physicians are asked whether they take a workplace exposure history, they generally report that they do, particularly dermatologists, for the investigation of possible contact dermatitis (Holness et al. 2007). Most of those who do not report taking patients' history cite time constraints as the reason. However, the results are different when the worker reports on whether their physician asked about their work and workplace exposures. While about half of workers describe that their primary care physician or dermatologist ask about their job, virtually none

report being asked about their workplace exposures or to obtain SDSs (Holness 2004).

In the case of possible occupational skin disease, the work history is of key importance. There is general guidance available about occupational history taking in guidelines and standards (Adishes et al. 2013; Johnston et al. 2017). These tend to provide non-specific advice about taking an occupational history, for example, asking about practices and products handled at work, personal protective equipment (PPE) used, reviewing SDSs, and evaluating the relationship between symptoms and workplace exposure (Johnston et al. 2017).

Exposure information is needed to assist with diagnostic testing, most commonly patch testing as well as for making RTW recommendations. The occupational physician or dermatologist can obtain the history. If there is an OHSP in the clinical team, such as in the ODSP, they can be a valuable resource for obtaining this information. In the case of the ODSP, this information is obtained in advance of the patient's appointment via a telephone interview. The ODSP, the occupational hygienist has developed a questionnaire which is used as a tool to ensure consistent history taking for contact dermatitis patients and consists of the following headings:

- Job title
- Employer
- Industry sector (reflects sectors relevant to the provincial compensation board)
- Number of employees (small vs. large business)
- Workplace representation (unionized vs. non-unionized)
- Work status (full-time, part-time, casual/working, off work, on modified duties)
- Exposures (presented as a list of categories relevant for skin exposure for quick review)
- Dermal exposure routes (emission, transfer, deposition)
- Skin protection (i.e., use of PPE)
  - Type
  - Frequency of use
  - Care of PPE
- Skin care (use of moisturizers, cleansers, frequency of hand washing/sanitizing)

A significant amount of time in the interview is devoted to obtaining the details of the worker's job duties including:

- Details of tasks performed – both typical and atypical (e.g., occasional cleaning, maintenance, etc.)
- Identifying exposures and routes of exposure for each task performed (i.e., review of chemical products used directly by the worker and review of exposures to which the worker may be indirectly exposed such as from adjacent work processes) in order to obtain the relevant SDSs. The following information is noted:
  - Product trade name
  - Description (appearance, odor, chemical state)
  - Consumption (amounts used and frequency of use, the number of parts handled per shift, the frequency and duration of wet work, etc.)
- Review of “housekeeping” conditions (this can shed light on route of exposure particularly via transfer)
- Integrity and extent of control measures in the workplace
- Use and type of PPE for each task
- Perceived prevalence of skin problems among fellow co-workers

In the ODS, once all of the above information is gathered, the occupational hygienist prepares a report for the dermatologist to review during the patient's initial consultation. This report includes a detailed review of the worker's job, PPE used, summary of SDSs in table form (noting product name, chemical ingredients, pertinent details such as pH, volatility, route of exposure, and dermal effects), history of the worker's skin problem, and review of skin care management practices. Based on the exposure information collected during the telephone interview and the documentation provided, the occupational hygienist makes initial suggestions for patch testing from an occupational hygiene perspective.

The dermatologist may request additional information following their review of the report and assessment of the worker. This might include

clarification of workplace exposures or requests for the following: additional information regarding workplace exposures, to investigate issues regarding PPE and to obtain products for custom allergen testing.

Once a final diagnosis has been made, the worker is provided with advice about managing their workplace exposures. The ODS has developed a “workplace prescription” a template in which the dermatologist can highlight exposure modifications as well as providing skin care management suggestions (Fig. 1) (Kudla et al. 2017). The workplace prescription facilitates communication between the physician, worker, workplace, and insurer for workers with OSD. This standardized document, modeled after a conventional doctor's note, adds clarity and formality to the communication between the parties involved.

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## 4 Workplace Walk-Through

A workplace walk-through (also known as a workplace visit) is traditionally conducted by an OHSP such as an occupational hygienist with the purpose of identifying potentially causative substances, where they exist, and the remedial action that can be taken to limit or eliminate the worker's exposure. Workplace visits may be conducted by physicians, most commonly occupational physicians or dermatologists with expertise in OSD.

The advantages to obtaining exposure information from the worksite directly as opposed to inferring exposure information from a worker's self-report include the opportunity to consider the effects of the production process, organization of the workspace, as well as use of PPE and other control measures. Obtaining this information from the workplace directly is invaluable to establishing a diagnosis of OSD seeing as job-exposure matrixes fail to account for exposure variation inherent to each work environment.

While a worker may be aware of products integral to their job tasks and provide the OHSP with the relevant SDSs, it cannot be assumed that SDSs are sufficient to identify all potentially hazardous dermal exposures. Processes such as

Patient's Name: \_\_\_\_\_ Physician: \_\_\_\_\_ Date: \_\_\_\_\_

EXPOSURE MODIFICATIONS		SKIN CARE MANAGEMENT SUGGESTIONS		
<b>NO Exposure</b> <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____		<b>Hand Washing</b>	<b>What to Use</b> <input type="checkbox"/> alcohol hand rubs <input type="checkbox"/> non-foaming cleanser <input type="checkbox"/> lukewarm water <input type="checkbox"/> Other (specify): _____	<b>Additional Information</b> <input type="checkbox"/> Cetaphil Cleanser <input type="checkbox"/> CeraVe Cleanser <input type="checkbox"/> rinse /dry thoroughly (including spaces between fingers) <input type="checkbox"/> avoid wearing rings <input type="checkbox"/> refer to allergen information sheets
			<b>Treatment</b> <input type="checkbox"/> moisturizer <input type="checkbox"/> skin diary <input type="checkbox"/> follow up with physician if worsens  <input type="checkbox"/> prescribed medication	<input type="checkbox"/> apply before work <input type="checkbox"/> apply after each break <input type="checkbox"/> apply after work <input type="checkbox"/> apply after each hand washing <input type="checkbox"/> CeraVe Moisturizing Cream <input type="checkbox"/> CeraVe Moisturizing Lotion <input type="checkbox"/> Cetaphil _____ <input type="checkbox"/> Prevox <input type="checkbox"/> Other (specify): _____
<b>REDUCE as much as possible</b> <input type="checkbox"/> wet work <input type="checkbox"/> prolonged glove use (>20 minutes) <input type="checkbox"/> fragranced products <input type="checkbox"/> harsh products for hand washing (gritty soaps, solvents, etc.) <input type="checkbox"/> mechanical irritation (friction, trauma, heavy use of hands, etc.) <input type="checkbox"/> extreme heat or cold <input type="checkbox"/> Other (specify): _____		<b>Gloves</b>	<input type="checkbox"/> single-use (disposable) <input type="checkbox"/> multi-use (re-useable) <input type="checkbox"/> cotton liner <input type="checkbox"/> nitrile <input type="checkbox"/> natural rubber/latex <input type="checkbox"/> vinyl <input type="checkbox"/> accelerator-free <input type="checkbox"/> anti-impact <input type="checkbox"/> other (specify): _____	<input type="checkbox"/> hands should be clean prior to donning gloves <input type="checkbox"/> discard after each use <input type="checkbox"/> discard at first sign of damage <input type="checkbox"/> discard at first sign of sweating <input type="checkbox"/> discard after 20 minutes <input type="checkbox"/> review donning/doffing techniques <input type="checkbox"/> N-Dex Free <input type="checkbox"/> Other: _____
			<b>Workplace Modifications</b> <input type="checkbox"/> return-to-work/stay-at-work with no changes <input type="checkbox"/> return-to- work /stay-at-work with modifications <input type="checkbox"/> return-to-work with graduated # of hours: _____ <input type="checkbox"/> maximum # of back-to-back shifts: _____ Other strategies: <input type="checkbox"/> reduce duration of exposure (eg., job rotation) <input type="checkbox"/> use of long-handled tools (eg., brush, sponge, scoops etc.) <input type="checkbox"/> Other: _____	<b>Other Personal Protective Equipment</b> <input type="checkbox"/> protective arm sleeves <input type="checkbox"/> disposable gown/coveralls <input type="checkbox"/> face shield

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**Fig. 1** Workplace Prescription

frequent handwashing or improper removal of protective equipment are examples of skin hazards that are often overlooked. While they can induce or aggravate OSD, because they are not chemicals their risks are not captured by SDSs. Furthermore, workers may also be affected by specific agents that are not integral to their job task such as a product used or produced in close proximity to their workstation or a component of the hand cleaner in the washroom.

**4.1 The Approach**

A workplace walk-through is conducted in order to identify the existence of a potential irritant or sensitizing agent and to establish whether it is a cause or aggravating factor for a suspected

case of OSD. This may be conducted at two points in the diagnostic and management process: before and after a diagnosis is made.

In the initial visit, the clinician or OHSP will identify all probable sources of exposure in the worker’s environment. This includes job tasks or processes in which the worker is directly exposed to potential irritants or allergens, as well as potential indirect exposures in the work environment (n.b. this may not be required where the exposures are well characterized). In addition to potentially hazardous chemical exposures, physical exposures including extreme temperatures, humidity, vibration, radiation, and mechanical trauma should also be considered.

Diagnostic testing (i.e., patch testing) will be done in order to implicate a particular exposure as a potential causative agent. While patch testing

is the gold standard diagnostic test for allergic contact dermatitis (ACD), a diagnosis of irritant contact dermatitis (ICD) is dependent on the exclusion of ACD.

The other time a workplace visit may often be done is during the RTW process. In this case, the causative agent(s) has been identified and the visit is to investigate where exposures to the agent may occur, possible mitigation strategies to reduce or eliminate exposure and in some cases, consider alternate jobs. A visit may also be necessary during the RTW process if there is no progress being made to identify workplace barriers preventing a successful RTW.

In the ODSP, workplace walk-throughs are often conducted by the occupational hygienist and RTW coordinator together, to inform RTW recommendations such as exposure modifications (which may include determining the suitability of other jobs within the company) and what PPE is required. They may also make a workplace visit in cases where a worker has experienced a recurrence of symptoms following their RTW to assist with problem-solving regarding concerns that have arisen since the worker's RTW and, where possible, minimize future causative exposures.

#### 4.2 Steps to Conduct a Workplace Walk-Through for OSD

1. Obtain a detailed description of the worker's job tasks and processes.
2. Obtain a detailed description of all chemicals used in the worker's environment.
3. Assess the work environment (i.e., temperature, humidity, radiation).
4. Collect SDSs for all chemicals used by the worker (including chemicals unrelated to their job task such as hand cleansers).
5. Assess job tasks performed (and chemicals used) in close proximity to the worker's area.
6. Determine areas of the skin exposed.
7. Observe the protective measures used (i.e., moisturizer, technique used for donning and doffing gloves).
8. Observe the engineering and administrative control methods used.

#### 4.3 What Do We Know About Workplace Visits

Though workplace visits are often reported as a gold standard practice, in reality, there is a lack of information about their actual use. While there are papers that outline reasons to conduct a workplace visit including to assess suspect dermatological hazards, bring awareness of the exposure to management, and evaluate the adequacy of control measures in the workplace, as well as the responsibilities of the health and safety professionals performing the visit, they are outdated (Tong 1995; Zugerma 1982) and, as a result, may lack relevance to site visits conducted today.

More recently, workplace visits have garnered attention at dermatology conferences, where English (2016) and Hobson (2016) have presented on the usefulness of conducting a workplace visit including the opportunity to identify allergens not previously considered, in response to a negative patch test result and persisting symptoms following the avoidance of a suspected causative agent, as well as logistics such as ensuring a site visit is performed when the workplace is active and the work processes in question are being carried out.

There are case reports that highlight the importance of conducting a workplace visit to identify a work process or causative agent not yet reported in the literature for that working population (Noiles et al. 2010). Workplace visits have also been recognized for serving as an opportunity to identify other workers who may be affected or be at risk of developing OSD has also been recognized (Engfeldt et al. 2013; Tong 1995).

However, in spite of the general view that worksite visits are an asset to the investigation and management of OSD, there is essentially no information available on how often they are conducted and if so, who does them. While it is often recommended that physicians be the ones to conduct workplace visits, unless one is the workplace physician who is on-site and, thereby, has easy access to the workplace, the impracticalities of a workplace visit may result in most physicians rarely, if ever, performing them. Factors that lead to this include a lack of time due to a physicians' busy clinical schedules, no method of

remuneration for the considerable amount of time invested in the worksite visit and challenges with gaining access during work hours. In some instances, where there may be an occupational hygienist or OHSP on staff, it may be more realistic for them to conduct the workplace visits. However, the same question of remuneration may lead this to be an unlikely occurrence.

The multidisciplinary ODSP model at St. Michael's Hospital includes a clinical occupational hygienist. Even though there is remuneration for workplace visits, given the occupational hygienist's workload, workplace visits to identify possible causative agents cannot be performed as frequently as desired. They are however, conducted more often in collaboration with the RTW coordinator, to assist with the RTW process.

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## 5 Safety Data Sheets

### 5.1 Introduction

SDSs are prepared by chemical manufacturers and are an important source of information about workplace exposures. They are required in many jurisdictions, and under the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), there is further standardization. SDSs are required to contain specific information related to workplace products. The key components of a SDS include product and supplier identification, chemical composition, first-aid, firefighting and accidental release measures, handling and storage precautions, exposure controls (e.g., personal protective equipment), and toxicological information (Canadian Centre for Occupational Health and Safety (CCOHS) 2018). Only ingredients present in the product at levels greater than or equal to 1% (0.1% for carcinogenic ingredients) need to be disclosed on the SDS (CCOHS 2016). *For this reason, it may be necessary to follow up with the manufacturer directly for more information on a product's chemical composition.* Hence SDSs should be recognized as an important source of information about exposures that may need to be considered in the causation of OCD.

### 5.2 Limitations of SDSs

A common assumption made by workplace parties is that reviewing chemical SDSs is a sufficient means to identify and assess existing and potential skin hazards and risks. However, in spite of the benefits of SDSs, there are also concerns raised about their shortcomings. SDSs are only prepared for materials deemed hazardous according to regional legislation. Furthermore, only health and safety risks associated with the supplied/intended use of the chemicals is considered. In normal working conditions, materials can be mixed, diluted, and subject to temperature changes or other means of processing, that would render the information proposed in the SDSs, obsolete. Material evaluations should not be restricted to their intended use, but rather how they are used in actual working conditions. Dependence on SDSs would exclude exposures to nonchemical hazards such as wet work that contribute to a high prevalence of OSD.

The literature contains a number of studies related to SDS. From a dermatological perspective, the usefulness of SDSs is limited by the tenet that ingredients deemed not hazardous by the manufacturer/supplier, or protected as proprietary, may be omitted (Bernstein 2002). Because determination of nonhazardous status is at the discretion of the manufacturer, dermal irritation and sensitization potential are inadequately disclosed.

Chemical analyses of workplace products including acrylics, metals, and solvents have found several products contained ingredients not disclosed in their SDS as well as ingredients present at higher concentrations than what was disclosed (Henriks-Eckerman and Kanerva 1997; Kanerva et al. 1997; Paul and Kurtz 1994; Tsai et al. 2016; Welsh et al. 2000). Other studies have highlighted the incompleteness of SDS content, particularly sections relating to potential health hazards, safe handling, as well as exposure controls and protection (Bonardi et al. 2014; Dalvie and Ehrlich 1999; Frazier et al. 2001; Kolp et al. 1995; Nicol et al. 2008). Furthermore, the utility of the information presented in SDSs is limited by the lack of standardization such as with the expression of ingredient content as ranges, rather

than specific proportions and subjectivity to the chemical manufacturer's perception of hazard classification and status (Di Mare et al. 2017; Suleiman and Svendsen 2014; Winder and Ng 1995) as well as the permissible omission of ingredients present at low concentrations, even for those with irritant or allergenic properties (Kanerva et al. 1997).

A review of the literature on whether SDSs fulfill their mandate to inform workers about all potential risks associated with their chemical interaction in the workplace, further substantiated the limitations of SDSs as a hazard communication tool, due to the pervasiveness of inaccuracies in ingredient disclosure (Nicol et al. 2008).

### 5.3 Clinical Uses of SDS

While SDSs play an important role in the investigation, diagnosis, and consideration of the occupational relevance for CD cases, uncertainties in the accuracy and adequacy of their content limit their use clinically. While the omission of information pertaining to ingredients present at low concentrations may be compliant with legislation, full labeling of product ingredients would be advantageous, seeing as the presence of substances with allergenic properties may elicit a skin reaction, even at concentrations below the limits for declaration/mandatory labeling (Alfonso et al. 2017; Dahlin 2016).

SDSs are clinically relevant by helping to inform clinicians about a product's suitability for patch testing as well as the appropriate patch test concentration and vehicle (Dahlin 2016). The audits conducted of SDSs identified frequent underreporting of skin sensitizers and allergens, as well as inconsistencies in the inclusion of both required risk hazard statements (i.e., "May cause an allergic skin reaction") and allergen content (Friis et al. 2015; Keegel et al. 2007). This is further evidenced in case reports of workers diagnosed with a contact allergy to a preservative and epoxy resin omitted in their respective SDSs (Bruze et al. 2005; Nixon 1997).

The SDSs may also be of assistance when performing patch testing with workplace materials.

Testing with the actual workplace materials may be needed if the results of patch testing with commercially available allergens is negative, but there is a strong suspicion of workplace causation. Again, the accuracy of the SDS is important in planning for testing with workplace materials.

The potential exists for better regulated SDSs to be a useful tool in the diagnosis and management of ACD. However, their role in the investigation of irritant CD is inherently limited given it is a diagnosis of exclusion, assigned when the patch testing result is negative, and significant exposure to the causative irritant in question is demonstrated (Friis et al. 2014).

While SDSs are predominantly used for diagnostic and exposure assessment purposes, in the context of OCD, their content is integral to informing worker compensation decisions. An analysis of Quebec workers' compensation appeals revealed overdependence on and misuse of SDSs in the decision-making process for claims associated with exposure to neurotoxic chemicals (Baldwin et al. 2003). SDS content was found to be used as evidence both to support and reject: occupational relevance, appropriate use of protective measures, and causal linkage between exposures and health effects. While it seems appropriate that they be used as a means to establish exposure or work-relatedness, the inaccuracies, incompleteness, and subjectivity of SDSs threaten their use in proving absence of exposure or causality between exposure and illness.

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## 6 Prevention

OSDs are some of the most common occupational diseases; fortunately they are preventable with appropriate health and safety measures. Accurate ingredient listing is fundamental to OSD prevention, in order for workplaces to implement appropriate safe work systems and protective equipment. Ingredient disclosure is required for concentrations above the legislation's level of elicitation. However, research shows that this concentration is too high to prevent sensitization and triggering of a reaction in previously sensitized workers (Friis 2014). Moreover, omissions in



toxicological data may compromise OSD prevention as workers may be less inclined to use the recommended protective measures.

## 7 Summary

A complete understanding of the worker's occupational exposures is essential in the diagnosis of OSD. Although a workplace visit is a useful way for clinicians or OHSPs to assess a worker's unknowing exposure to sensitizers or irritants, the benefits of practicing this resource intensive model are often outweighed by the high personnel and productivity costs. Collecting a detailed occupational history is however invaluable in establishing a diagnosis of CD, since its consideration for both past and current exposures can both elucidate a previous sensitization event and verify the source of exposure needed to manage clinical treatment and RTW and support a compensation claim. While the ubiquitous nature of SDSs has likely contributed their reputation as a central source of exposure information, their value in the context of diagnosing and managing OSD is limited by incomplete and inconsistent chemical profiles and inadequate disclosure of substances with allergenic properties.

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