Workplace Training
CREOD Research Summary
April 2023

BACKGROUND

Preventing exposure to hazards that cause occupational disease is critical to workers' health and safety. Workplace prevention is usually approached using the hierarchy of controls. One control strategy is administrative or changing the way people work. Workplace training is considered an administrative control.

EXECUTIVE SUMMARY

1. A significant proportion of workers with occupational disease report that they have not received workplace training relevant to the specific hazards in their work that can cause OD.
2. Workers describe effective training as being multi-modal with some in-person and hands-on components and with content covering information about the specific exposures, their possible health effects and methods for prevention.

CREODD researchers have done a number of studies addressing workplace training. A table summarizing the key findings is included at the end of the narrative.

QUALITATIVE STUDIES FOCUSED ON OCCUPATIONAL SKIN DISEASE

CREOD researchers have done a number of studies focused on training to prevent occupational skin disease. Study participants include both workers being assessed for possible work-related skin disease in the St Michael's Hospital Occupational Medicine Clinic or workers in work settings where they have exposure to hazards that may cause occupational skin disease.

The results of workplace-based workers reporting having received workplace training to prevent exposures that could cause OSD are presented in the table below.

	Year	Group	Number of participants	% reporting training
Holness et al, 1995[1]	1993	Operating room workers	184	6%
Shin & Holness, 2014[2]	2002	Health care workers	100	28%
Lynde et al, Occ Med, 2009[3]	2000's	Cleaners in educational setting	549	20%
Nichol et al, 2008[4]	2006	Nurses	152	29%
Nichol et al, 2013[5]	2007	Nurses	1074	50%

The results of studies involving workers being assessed in an occupational health clinic those reporting having received training for prevention of the OSD are presented in the table below.

	Year	Group	Number of participants	% reporting training
Holness & Kudla, Occ Med, 2012[6]	2000-2001	Workers being assessed for OSD	100	28%
Arrandale et al, Occ Med, 2012[7]	2009-2010	Workers being assessed for OSD or occ resp disease	204	53%
Rowley et al, 2016[8]	2010	Workers being assessed for OSD	105	44% (just glove)

Gupta et al, 2018[9]	2014	Workers being assessed for OSD	140	49%
Zack et al, 2018[10]	2015-2016	Workers being assessed for OSD	122	39%
Holness et al, AWEH, 2021[11]	2012-2016	Workers being assessed for OSD	853	53%

Three of the studies in the above tables contain additional details about the training.[8,9,10] The studies collected more detailed information about the nature and content of the training programs and also workers' perceptions about what should be included.

Content Covered in Training Across Studies with Proportion of Participants Reporting Receiving Such Training

Content Covered	**Rowley et al., 2016[8] N=105**	**Gupta et al., 2018[9] N=64**	**Zack et al., 2018[10] N=47**
Glove use	74%	69%	92%
Style/type of glove to be used	55%	48%	
How to put on and take off gloves	55%	48%	
When to throw gloves away	48%	50%	
Skin care when using gloves	31%	27%	
Warning signs of skin problems	31%	34%	19%
Glove size	26%	28%	
Avoiding/minimizing exposure		87%	77%
Hand washing		92%	75%
Use of creams		52%	28%
Skin problems resulting from exposure			32%

Content Reported Being Most Useful Across Studies

Most Useful Content	**Rowley et al., 2016[8] N=105**	**Gupta et al., 2018[9] N=64**	**Zack et al., 2018[10] N=47**
Glove use	76%	50%	
Style/type of glove to be used	40%	34%	
How to put on and take off gloves		30%	
When to throw gloves away	24%	25%	
Skin care when using gloves		13%	
Warning signs of skin problems	21%	22%	
Glove size	19%	23%	
Avoiding/minimizing exposure		61%	
Hand washing		56%	
Use of creams		25%	
Overall proportion that agreed the training was useful			85%

There were similarities across studies concerning the training program content. For example, the training delivered included *avoiding exposure, handwashing*, *use of creams*, *warning signs of skin problems*, and *glove use*.

Training about *glove use* specifically tended to cover the following content:

- What tasks require glove use
- Appropriate type of glove
- How to put gloves on/take off
- When to throw gloves away
- Skincare when using gloves
- Glove size

Two of the studies also reported who delivered the training.[8,10] Most commonly, the employer provided it, including OHS staff, supervisors or managers. Participants also reported training delivered by co-workers, and, in some cases, by themselves. In a study by Zack et al. training was also occasionally provided by an external agency (13%), union school (6%), vocational school (4%) or other (21%).[10]

Several modes of training were also reported, including videos, seminars, classroom or workstation demonstrations, online modules, brochures and posters.

One study reported the duration of training.[10] Most skin-specific training lasted between 15–30 minutes (48%), followed by less than 15 minutes (41%). A small number of respondents reported training that lasted more than one hour (11%).

Another study reported the timing of when the training was received.[8] Half of the respondents reported receiving the training before starting work, 10% within one week, 20% one week to 1 year, and 20% more than 1 year after starting work.

Finally, another study examined reporting of training across sectors.[11.] The service sector had the lowest reporting of general OHS training, WHMIS training and skin specific training followed by the construction sector.

Several studies examined factors associated with the likelihood of training being reported by workers. Unionized and large workplaces were associated with more workers reporting.[6,8,9]

QUANTITATIVE STUDIES FOCUSED ON OCCUPATIONAL SKIN DISEASE

In addition to the quantitative studies, four studies used qualitative methods. Two involved workers with OSD who were being assessed in the St Michael's Hospital Occupational Medicine Clinic.[12,13] The other two involved primarily occupational health nurses working in the Greater Toronto Hamilton area and involved their perspectives on training related to OSD.[14,15]

The first qualitative study involved interviews with 14 workers with suspected occupational contact dermatitis being assessed in the Occupational Medicine Clinic at St Michael's Hosptial.[12] 71% reported receiving general OHS training and 86% reported receiving WHMIS training.

The method of training varied with many reporting videos and online training. The training was characterized by passivity. Reinforcement was rare and a minority reported supervisors leading by example or having refresher training. The effectiveness of the training was questioned and was often either too much content or forgettable. Preferred training formats were visual and hands-on rather than oral presentations or written materials.

Training was provided by a variety of people including supervisors, health and safety professionals, vocational schools, union schools, and employment agencies. Duration of training varied from a very brief (few minutes) to much long (several hours to days). Trust in sources was important. Supervisors who had experience in the same job and co-workers were more trusted sources of information. Others trusted their healthcare provider more than workplace sources. Health and safety professionals in the organization were less trustworthy, based in part on the fact they had no experience with the job.

Interestingly, participants believed the skin-specific training was not provided in their workplace because OCD was uncommon and very few of their coworkers had skin problems. Other factors affecting whether training was provided included cost and workplace health and safety culture.
Participants also felt that the employer did not prioritize training because they believed that this training was received outside of work through vocational training or educational background. Training was not a high priority for employers and participants felt that employers were only motivated by fear of penalty or fines/insurance premiums.

When asked about their attitudes towards training, participants expressed a desire to learn about prevention strategies, workplace hazards and occupational disease in addition to hand-on training specific to job tasks. Participants felt that training that was vague or irrelevant to their daily job tasks made them lose interest or become overwhelmed with irrelevant information. Training formats preferred by participants included those that were visual in manner and hands-on as opposed to oral presentations or written materials.

In a second qualitative study, 24 workers with occupational contact dermatitis were recruited from the Occupational Medicine Clinic at St Michael's Hospital.[13] Just over half of the participants had received some OHS training (58%), and almost all had received WHMIS (88%) but none reported receiving skin-specific training.

Study participants were asked about effective training programs considering the following components: the content, the format, the trainer, and the barriers to success:

Characteristics of effective training programs included:

- Cardiopulmonary resuscitation (CPR) and First Aid training
- Promoted active learning
- Had depth in content
- Delivered by a trusted/respected trainer
- Providing information useful outside of the work environment
- Use of personal stories of skin disease to enable workers to see the consequences
- Use of statistics/costs of skin disease to facilitate engagement

Effective Training: Content

- Provide information that is useful outside of the work environment
- Use of personal skin disease stories that highlight the consequences
- Information on chemicals used in the workplace and how they can be harmful
- Ingredients of materials that they may encounter
- Short and long-term health consequences associated with products
- Provide methods of skin protection, such as appropriate glove use, creams and cleansers
- Justification for the use of PPE
- Prevalence of skin diseases and effectiveness of protection measures to reduce incidence, symptoms, severity, etc.

Effective Training: Method

Multi-modal with multiple teaching methods to address different learning styles

- In-person, hands-on training with a demonstration component
- Use of visuals
- Use of personal narratives
- Negative framing or use of potential worst-case scenarios to highlight the importance of prevention
- Online or hard-copy resources accessible after the training

Effective Training: Trainer

Delivered by a trusted/respected trainer

- An expert in the field and experienced with access to evidence-based information
- Trainer could be internal or external with different advantages or disadvantages for each
    - An external trainer should be well informed and up to date on current evidence, impartial to workplace politics or dynamics, and an expert in the topic
    - An internal trainer should understand the work environment intimately, has performed job tasks before, possesses specialized training, and is both trusted and respected
- Usefulness of training outside of the work environment would promote training uptake

Effective Training: Barriers to Success

Trying to get workers to appreciate the importance of the training when they were healthy and had never experienced skin disease

- Using plain language versus technical jargon
- Offering training in languages other than English
- Workplace culture of “having always done it this way” or generational differences
- OCD is not seen as a priority in the organization, and skin training is therefore not prioritized/seen as important
- Lack of understanding of the cost of OCD
- Employers where OHS culture is seen as an obligation vs. genuine
- Not enough time to attend training and process new information due to a fast-paced work environment
- Not having a supportive supervisor
- Those in smaller organizations believing training was unnecessary due to their familiarity with the small work environment and close relationships with co-workers or because of the difficulty in making changes due to interpersonal dynamics in a small setting
- Regulatory environment and the fact that skin training is not mandatory does not favour engagement or attendance/compliance
- Lack of specificity to the individual’s work environment

Healthcare Sector
Two studies examined a number of occupational health and safety topics from the perspective of occupational health nurses working in the healthcare sector.

Nichol et al. conducted an e-survey and received responses from occupational health and safety leaders at 17 hospitals (response rate 74%).[14] When asked about training resources, 77% reported using printed materials, and 6% reported using web-based materials. None reported using workshops for training. The training was most often delivered as part of new employee orientation (59%) and included as part of hand hygiene for which the Infection Prevention and Control (IPAC) staff delivered.

The researchers also interviewed 12 occupational health nurses (response rate 52%). The interviews highlighted the lack of collaboration between occupational health (responsible for identification and management of contact dermatitis) and IPAC (responsible for hand hygiene education/training). Nurses reported not knowing what education or training was being provided by IPAC regarding contact dermatitis.

A second study of this group interviewed 15 OHNs working at 11 hospitals.[15] Many respondents noted that hand dermatitis-related resources were sparse and, if available, focused primarily on hand hygiene. In addition, nurses in this study also reported a lack of collaboration between occupational health and IPAC. Recommendations for education delivery included the use of printed materials and online or in-person training. In addition to targeting front-line workers, supervisors should be educated to support staff as needed. Recommendations to facilitate the early identification and management of hand dermatitis included offering more education and training to healthcare workers. Specifically, the education should highlight clinical signs and symptoms, wet work as a common occupational risk factor, and encourage workers to access occupational health services at their institutions.

Service sector
A study of service sector health and safety association workers and members of a health and safety association advisory committees was conducted.[1x] Although focused on awareness of occupational skin disease, it provided some insights into training. Barriers to prevention including training were cost, reported low incidence of OSD, lack of time, lack of management support, workplace culture, lack of prevention standards and practices and lack of knowledge. Specific to training, a lack of materials and methods was cited as a barrier

Reviews
There were two review studies. The first was focused on prevention programs for occupational skin disease.[17.] Twelve studies were identified. Effective programs had many similarities in content, delivery methods and timing. They were characterized by industry specificity, and multimodal learning style with participatory components. Other characteristics included repeated sessions and management engagement. A second was a scoping review examining prevention strategies for common occupational diseases including contact dermatitis. The review found evidence supporting the use of training in the prevention of occupational contact dermatitis.

Intervention studies.

Two studies have implemented and evaluated an intervention.

The first study focused on respiratory and skin diseases among farmers and took place at a health fair.[19] Clinicians, safety consultants and safety equipment suppliers educated participants on work-related asthma, spirometry testing, respirator/FIT testing, barriers to PPE use, and prevention practices. Participants completed a pre-intervention survey regarding symptoms, OHS knowledge and exposure prevention practices and a follow-up survey six months after the intervention. Those in the intervention group (56% of the 68 participants) reported significant changes in the following post-intervention:

<u>OHS Knowledge</u>

- Reporting completion of safety training (+21.4% change)
- Familiarity with material safety data sheets (MSDDs) (+27.4% change)
- Knowledge of OHS legislation (+32.3% change)

<u>Prevention Practices: PPE</u>

- Reporting mask use (+6.0% change)
- Use of N95 mask (+18.7% change)
- Fit tested for N95 (+2.1% change)
- Use of respirator (PAPR) (+5.6% change)

<u>Prevention Practices: Dust & Mould</u>

- No dry sweeping of spills (-11.7% change)
- Wet sweeping of spills (+15.0% change)
- HEPA filter use (+7.1% change)
- Spraying feed or bedding (+6.7% change)
- Anti-mould spray use (+3.1% change)

<u>Prevention Practices: Engineering & Procedural Controls</u>

- Ventilation in grain storage areas (+4.2% change)
- Ventilation in barn (-2.3% change)
- Non-manual feeding system (-4.8% change)

The second study focused on hand-arm vibration syndrome (HAVS) among construction workers.[20] One hundred construction workers referred to the Occupational Medicine Clinic at St Michael's Hospital participated in the study. A one-page, double-sided laminated educational document (based on current best practices) was created. The material covered *types of damage*, *symptoms* that may occur in workers with HAVS, *prevalence*, *treatment options*, and *prevention strategies,* including anti-vibration tool purchasing policy, maintenance of tools and additional online resources. Each participant was given three copies of the educational document and asked to distribute them at their respective workplaces.

Participants were most likely to share the resource with their co-workers, followed by health and safety representatives, supervisors, and employers.

AV glove use was 4.1% (n=2) pre-intervention and statistically increased to 52.2% (n=25) post-intervention. A participant was more likely to use AV gloves if they had shared the educational materials with their supervisor (OR 6.42; 95% CI 1.51-27.38) or if their workplace had 20 or more employees (OR 5.46; 95% CI 1.19-25.05) though the confidence intervals were quite wide and thus not necessarily stable.

TABLE: Studies That Have Information About Workplace Training

Author	Year of study	Exposure/ System	Group	#	General	WHMIS	Specific to system	Detail of training	Union and/or Size of workforce
Holness et al, CD, 1995[1]	1993	Skin	OR staff (nursing, physicians, housestaff)	184			29% (professional training) 5.5% (employer)	Contact dermatitis and its prevention	
Holness & Kudla, Occ Med, 2012[6]	2000-2001	Skin	Occupational health clinic pop	100	52%	61%	28% Glove training: 38% Hand washing: 30%	Use of gloves, barrier creams, hand washing (when to wash & frequency) and skin cleansers Glove 38% Handwash 30%	36% unionized 400 avg # employees
	2000-2001		Sub population of those with confirmed OCD	78	58%	68%	34%	Glove 45% Handwash 35%	33% unionized 363 avg # employees
Shin & Holness, Derm, 2014[2]	2002	Skin	Hosp workers visiting employee health unit (EHU)	139			35%	Skin hazards and prevention methods such as hand washing and use of gloves	1,020 visitors to the EHU
Lynde et al, Occ Med, 2009[3]	2004	Lung-skin	Professional indoor cleaners within educational school board	549			20%	Skin protection	1,396 size of workforce (professional cleaners)
Nichol et al, AJIC, 2008[4]	2006	Lung	Nurses in acute care units	152			29%	Trained and fit tested within last 12 months	500 nurses employed at 9 units
Nichol et al, AJIC, 2013[5]	2007	Lung	Nurses in acute care units	1074			50%	Trained and fit tested within last 2 years	2,127 nurses employed at 46 units
Kim et al, Occ Med, 2012[19]	2009	Lung-skin	Farmers	68	59%		56% (attended intervention)	Work-related asthma, spirometry testing, respirator/FIT testing, barriers to PPE use, prevention practices	300 size of workforce (farm operators)
Arrandale et al, Occ Med, 2012[7]	2009-2010	Lung-skin	Clinic pop (allergy/ asthma and derm clinic)	204			53% Skin/respiratory PPE 14% Work-related disease-	Skin/respiratory PPE Work-related disease	48% unionized 25% (<20 empl) 28% (20-99 empl) 25% (100-499 emp) 21% (>499 empl)
Rowley et al, Derm 2016[8]	2010	Skin	Occupational health clinic pop	105	77%	84%	44% (glove training)	Glove training – when to dispose gloves, skin care when using	44% unionized 36% (<20 empl) 25% (20-110 empl) 39% (>100 empl)

								gloves, warning signs of skin problems, proper glove size and style of glove	
Gupta et al, AWEH, 2018[9]	2014	Skin	Occupational health clinic pop	140	81%	80%	49%	Skin-protection training - how to avoid exposure, hand washing, glove use Avoid exp 87% Handwash 92% Use creams 52% Signs 34% Glove 78%	48% unionized 29% (<20 empl) 46% (>100 empl)
Zack et al, Occ Med, 2018[10]	2015-2016	Skin	Occupational health clinic pop	122	80%	76%	39%	Avoid exp 77% Handwash 75% Use creams 28% Signs 19% Gloves 92% Skin problems 32%	43% unionized 175 visitors to clinic 30% (<20 empl) 30% (20-100 empl) 40% (>100 empl)
Holness et al, AWEH, 2021[11]	2012-2016	Skin	Occupational health clinic pop (patch testing)	853	78%	78%	53%	Skin-specific training by industry 62% auto 49% construction 65% health 56% manufacture 33% services 60% other	41% unionized 2,716 patch-tested at clinic 27% (<20 empl) 13% (20-50 empl) 8% (50-100 empl) 52% (>100 empl)
Leduc et al, Occ Ergo, 2016[20]	??	HAVS	Construction workers referred to occ health clinic	100	85%	96%	5%	Gloves 49% Anti-vibration gloves 8%	

REFERENCES

1. Holness DL, Tarlo SM, Sussman G, Nethercott JR. Exposure characteristics and cutaneous findings in operating suite personnel. Contact Dermatitis 1995;32:352-358.

2. Shin S, Holness DL. Screening for hand dermatitis in health care workers. Dermatitis 2014;25:281-282.

3. Lynde C, Obadia M, Liss G, Ribeiro M, Holness DL, Tarlo SM. Investigating the relationship between occupational cutaneous symptoms, exposures and respiratory symptoms among professional cleaners. Occup Med 2009;59:249-254.

4. Nichol K, Bigelow P, McGeer A, O'Brien-Pallas L, Manno M, Holness DL. The individual, environmental and organizational factors that influence nurses' use of facial protection to prevent occupational transmission of communicable respiratory illness in acute care hospitals, Am J of Inf Cont 2008;36:481-487.

5. Nichol K, McGeer A, Bigelow P, O'Brien-Pallas L, Scott J, Holness DL. Behind the mask: Determinants of nurse's adherence to facial protective equipment. Am J Inf Cont, 2013;41:8-13.

6. Holness DL, Kudla I. Workers with occupational contact dermatitis: Workplace characteristics and prevention activities. Occup Med 2012;62:455-457.

7. Arrandale VH, Kudla I, Kraut AG, Scott JA, Tarlo SM, Redlich C, Holness DL. Skin and respiratory symptoms among workers with suspected work-related disease. Occup Med 2012;62:420-426.

8. Rowley K, Ajami D, Gervais D, Mooney L, Solheim A, Kudla I, Holness DL, Switzer-McIntyre S. Glove use and education in workers with hand-arm vibration syndrome (HAVS). Can Acoustics 2011;39:116-117.

9. Gupta T, Arrandale VH, Kudla I, Holness DL. Gaps in workplace education practices for prevention of occupational skin disease. Ann Work Expo Health. 2018;62:243-247.

10. Zack B, Arrandale VH, Holness DL. Skin specific training experience of workers being assessed for contact dermatitis. Occ Med 2018;68:203-206.

11. Holness DL, Kudla I, DeKoven J, Skotnicki S. The utility of an occupational contact dermatitis patch test database in the analysis off workplace prevention activities in Toronto, Canada. Ann Work Expos Health 2021;65:196-200.

12. Zack B, Arrandale V, Holness DL. Workers with hand dermatitis and workplace training experiences: a qualitative study. Am J Ind Med 2017;60:69-76.

13. Zack B, Arrandale VH, Holness DL. A qualitative study to identify characteristics of a desirable training program for prevention of work-related skin disease. Ann Work Expos Health 2021;65:230-238.

14. Nichol K, Holness DL, Kersey K, Kendall A, Eriksson J, Copes R. Hospital screening and management practices related to occupational skin disease: Toronto experience. Ont Occup Health Nurses Assoc J 2015;34:3-6.

15. Ku R, Nichol K, Holness DL. Mild hand dermatitis: identification and management. Ont Occup Health Nurses Assoc J 2018;Spring/summer:42-45.

16. Holness DL, Kudla I, Brown J, Miller S. Awareness of occupational skin disease in the service sector. Occ Med 2017;67:256-259.

17. Zack B, Arrandale V, Holness DL. Preventing occupational skin disease: a review of training programs. Dermatitis 2017;28:169-182.

18. O'Keefe AR, Demers PA, Neis B, et al. A scoping review to identify strategies that work to prevent four important occupational diseases. Am J Ind Med 2020;63:490-516.

19. Kim J, Arrandale VH, Kudla I, Mardell K, Lougheed MD, Holness DL. Educational intervention among farmers in a community health setting. Occup Med, 2012;62:458-461.

20. Leduc M, House R, Eger T, Thompson A, Holness L. Health and safety training and prevention of hand-arm vibration syndrome through education in the construction industry. Occup Ergon 2016;13:45-51.