



International Standards for Prevention of Occupational Dermatoses

8

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Introduction

Work-related and occupational dermatoses lead to frequent use of health care services, high occurrence of sick leave, job loss, job change, and mental distress [1]. Both occupational dermatoses and its consequences are highly preventable by eliminating and reducing exposure to occupational hazards.

Scope of Preventive Measures

Prevention can be defined as:

“measures adopted by or practiced on persons not currently feeling the effects of a disease, intended to decrease the risk that disease will afflict them in the future” [2].

The ultimate goal for prevention in occupational dermatology is to maintain a healthy skin in a safe work environment. Thus, prevention focuses on human, organizational, and technical and organizational measures for avoidance and limitation of exposure to skin irritants, urticariogens, allergens, and carcinogens at the work-

place according to legislation and the provision of regular training in the use of personal protective measures adapted to the needs of the employees [3].

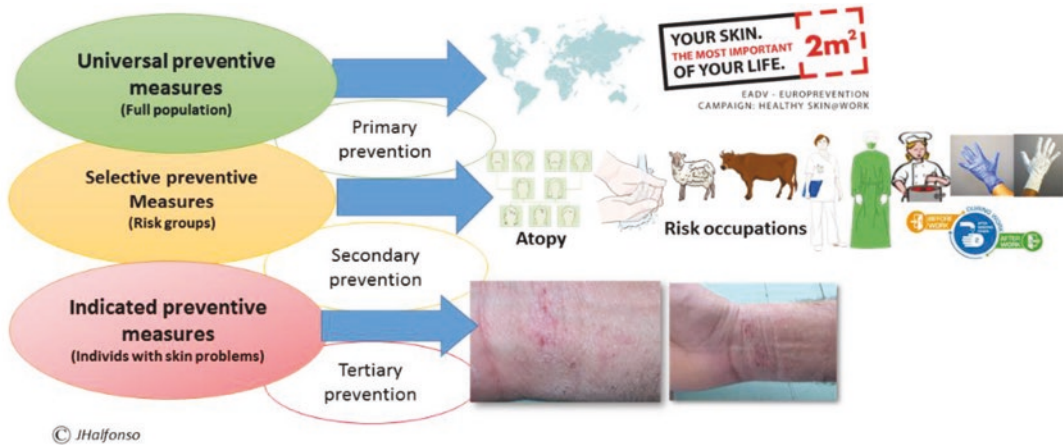
Thus, from a public health perspective preventive measures comprise:

1. **Universal measures:** include strategies for health promotion to benefit the full population. Legislation regulating the availability of skin irritants, allergens, and urticariogens is the best example of universal measures. For instance, a significant decline of occupational contact urticaria attributed to latex in gloves was observed in Germany, France, and the United Kingdom after legislation to reduce occupational exposure [4–6]. Preservatives such as methylchloroisothiazolinone/methylisothiazolinone (CMIT/MIT, also known as MCI/MI, Kathon CG®), methyl dibromo glutaronitrile (MDBGN), and several formaldehyde releasers are substances which have caused a rapid and alarming increase in contact allergy and dermatitis [7]. Liquid soaps, industrial hand cleansers, detergents, skin care products, paints, metal-working fluids, and their biocides, as well as fountain solution additives in printing work, are the most common sources of exposure to MIT or MCIT/MIT. Julander and a group of experts from the Nordic countries summarize important dates concerning legislation, classification, and

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Fig. 8.1 Preventive measures according to population groups. Servier Medical Art kindly provided graphic images for the design of this figure

restriction of sensitizing preservatives in Europe [8].

2. **Selective measures:** include specific preventive actions focusing on specific risk factors and risk groups. Examples include education about risk factors for developing work-related skin problems, training on skin protection such as proper use of protective equipment, provision and training on use of moisturizers, and periodical health surveillance in risk occupations. The effectiveness of these measures to prevent work-related and occupational dermatoses depends on the knowledge, awareness, and motivation of both employers and employees. Firstly, employers should be aware about the risks at work to develop immediate contact reactions and provide the workers with proper skin education and protective elements. Secondly, workers should be motivated to carry out or seek out specific preventive measure. Occupational health professionals and health educators have an essential role to facilitate the effective design and implementation of these actions.
3. **Indicated measures:** comprise the application of specific diagnostic procedures in workers with already established skin problems. Indicated prevention is most commonly

applied in the clinical setting, as indication is ordinarily one discovered through medical examination or laboratory testing, and many of the preventive measures require professional advice or assistance for optimal results [2]. The German “Dermatologist’s procedure” serves as a model on how to identify early work-related skin problems by mandatory reporting and prevent its social, psychological, and economic consequences [9].

Figure 8.1 summarizes the scope of prevention based on a population approach for whom the measure is advisable according to scientific evidence and cost-benefit analysis.

International Standards for Prevention

Scientific evidence-based criteria and standards are necessary to assess workers at risk for developing work-related and occupational dermatoses and patients with these conditions in order to prevent and treat occupational dermatoses.

Evidence-based recommendations for the prevention, identification, and management of occupational contact dermatitis and urticaria were

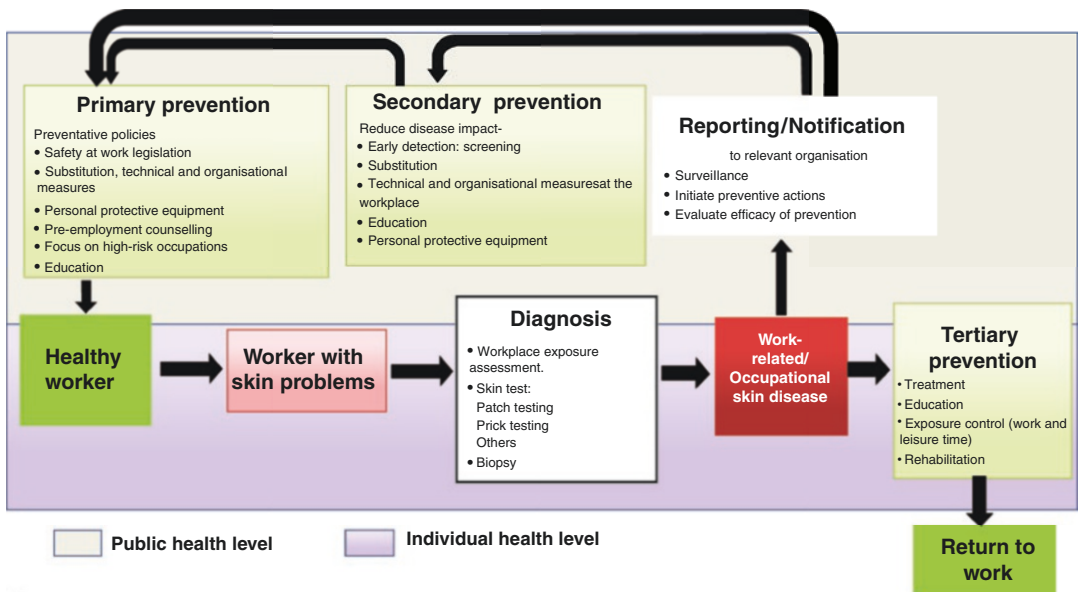
first developed by Nicholson et al. after a systematic review of the literature (Table 8.1) [10].

Minimum standards for effective prevention, diagnosis, and treatment of work-related and

occupational skin diseases (Fig. 8.2 and Table 8.2) have been established by a consensus-based approach by means of the Delphi method with over 80 experts (dermatologists, occupational

Table 8.1 Evidence-based recommendations for the prevention of occupational contact dermatitis and urticaria. Adapted from [10]

<i>Recommendations to health and safety personnel</i>	
1.	Implement programs to remove or reduce exposure to agents that cause occupational contact dermatitis or occupational contact urticaria.
2.	Provide appropriate gloves and cotton liners where the risk of developing occupational contact dermatitis or occupational contact urticaria cannot be eliminated by removing exposure to its causes.
3.	Make after-work creams readily available in the workplace and encourage workers to use them regularly.
4.	Not promote the use of pre-work (barrier) creams as a protective measure.
5.	Provide workers with appropriate health and safety information and training.
6.	Ensure that workers who develop occupational contact dermatitis or occupational contact urticaria are properly assessed by a physician who has expertise in occupational skin disease for recommendations regarding appropriate workplace adjustments.
<i>Recommendations to health practitioners</i>	
1.	Ask a worker who has been offered a job that will expose them to causes of occupational contact dermatitis whether they have a personal history of dermatitis, particularly in adulthood, and advise them of their increased risk, and to care for and protect their skin.
2.	Ask the worker who has been offered a job that will expose them to causes of occupational contact urticaria whether they have a personal history of atopy and advise them of their increased risk, and to care for and protect their skin.
3.	Take a full occupational history whenever someone of working age presents with dermatitis or urticaria, asking about their job, the materials with which they work, the location of the rash, and any temporal relationship with work (chap. 10).
4.	Arrange for a diagnosis of occupational contact dermatitis or occupational contact urticaria to be confirmed objectively (patch tests and/or prick tests); not on the basis of a compatible history alone, because of the implications for future employment.



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Fig. 8.2 Minimum European standards for primary, secondary, and tertiary prevention of work-related and occupational skin diseases [3]

Table 8.2 Standards for prevention, diagnosis, and treatment of work-related and occupational skin diseases [3]

<i>Definition and classification</i>
1. Work-related as well as occupational diseases comprise entities/conditions with an occupational contribution. However, occupational diseases are additionally defined by diverging national legal definitions. These definitions have an impact on prevention, management, and compensation.
2. The implementation of the proposed ICD-11 classification of WRSD/OSD is recommended. It will enable comprehensive identification of WRSD/OSD and thereby valid surveillance.
<i>Diagnosis</i>
1. Comprehensive and early diagnosis is key for prevention and management.
2. The diagnosis of WRSD/OSD should be based on existing guidelines and should include a multidisciplinary approach.
3. Patch testing is essential if contact dermatitis persists longer than 3 months or relapses.
<i>Work exposure assessment</i>
1. Workplace exposure assessment is an essential part of the assessment and management of patients with WRSD/OSD.
2. Minimum requirements for workplace exposure assessment in diagnosis of WRSD/OSD include worker's medical and occupational history, physical examination, and product labels/material safety data sheets assessment.
3. Full labeling of product ingredients should be made mandatory on MSDS in Europe.
<i>Reporting</i>
1. Current registries are usually incomplete. Accurate and complete reporting is important for monitoring and effective allocation of resources.
2. Reporting procedures should be transparent, simple, and easily accessible to provide optimal care for affected workers. They contribute to preventing chronic and relapsing disease courses.
3. The investment in reporting systems offers a substantial reduction of cost related to medical care, retraining, and compensation.
<i>Treatment</i>
1. The therapeutic treatment of work-related chronic hand dermatitis and skin cancers does not differ from the corresponding non-work-related dermatosis. In addition, avoidance of the trigger factors, e.g., skin contact with irritants and allergens or sun exposure at the workplace, by technical and/or organizational measures is essential.
2. The use of available guidelines for treatment of chronic hand dermatitis [11] and non-melanoma skin cancers is recommended.
<i>Prevention</i>
3. The aim of primary prevention is maintaining a healthy worker by by creating safe workplaces. This includes risk assessment and early intervention.
4. The aim of secondary prevention is to avoid disease chronicity and/or progression through early diagnosis and intervention.
5. The aim of tertiary prevention is medical and occupational rehabilitation of workers with an established disease.
6. Minimum requirements for the prevention of work-related/occupational hand dermatitis and occupational skin cancer include regular use of personal protective equipment and regular provision of health and safety information in vocational schools and workplaces.

physicians, health educators, epidemiologists) from 31 European countries (COST Action TD 1206, STANDERM) [3].

Primary Prevention

Primary prevention measures aim to avoid the development of work-related dermatoses in healthy workers [3]. The implementation of risk management processes involving risk

analysis, risk assessment, and risk control practices constitute a basis for primary prevention [12].

Table 8.3 presents the **STOP** concept (Substitution, Technical measures, Organizational measures, and Personal protection), which is practically orientated for prevention at the workplace [13].

If substitution, technical and organizational prevention measures are not available or are insufficient, personal protective equipment (e.g.,



Fig. 8.3 Nitrile accelerator-free gloves. Photo: National Institute of Occupational Health, STAMI



Fig. 8.4 Gloves made of bamboo viscose fiber. Photo: National Institute of Occupational Health, STAMI

Table 8.3 Preventive measures for work-related/occupational dermatoses Adapted from [3]

<i>Preventive measure</i>	
Substitution and replacement	Regulation of exposure by legislation on threshold values. Replacement, modification, or inactivation of hazardous substances [4, 5, 6, 16].
Technical measures	Proper labeling and storage of chemicals and regular maintenance of tools. Industrial measures to avoid direct skin contact with skin irritants, urticariogens, allergens, and carcinogens [13, 14]. Technical measures such as ventilation and automatization in work practices will reduce if not eliminate the risk of skin irritations, sensitization, and carcinogenesis.
Organizational measures	Reduce wet work to less than 2 h. Work tasks rotation and variation to reduce wet work. Skin protection programs providing information on healthy and diseased skin and skin care to facilitate a behavioral change regarding skin protection and decrease the occurrence of work-related skin problems. Such recommendations should be evidence-based [17]. They should be implemented in the curriculum of vocational schools and provided regularly at workplaces. These programs have been shown to be effective in primary, secondary, and tertiary prevention, but also in secondary and tertiary prevention [[18].
Personal protection	<p>Good hand hygiene regimes should include:</p> <ul style="list-style-type: none"> – Alcohol hand rubs. – Hand washing with lukewarm water, rinsing the liquid soap thoroughly, and drying hands carefully with single-use paper towels. <p><i>Protective gloves (powder and accelerator-free):</i></p> <ul style="list-style-type: none"> – Should be worn on dry and clean hands for wet work and work with hazardous substances for as short a time as possible. – Cotton glove liners should be used if gloves have to be worn longer than 10 min. – Single-use gloves should be worn only once. – Defect gloves must be removed immediately. <p><i>Moisturizers:</i></p> <ul style="list-style-type: none"> – Should be used to prevent and support the treatment of irritant hand dermatitis. – Should be applied all over the hands including the fingerwebs, fingertips, and back of the hand. – Should not contain fragrances, coloring agents, and preservatives [19–21].

gloves and moisturizers) must be available as well as regular training on correct application/use. Several studies have shown that protective

strategies are applied insufficiently; therefore regular instructions on use and application are necessary [14, 15].

Recommendations for the Use of Protective Gloves

Accelerators-Free Gloves

Protective gloves can lead to skin irritation and allergy due to skin occlusion and the presence of allergens. For instance, while an effective reduction in the occurrence of occupational contact urticaria due to natural rubber latex has been registered [4–6], rubber additives are still causing occupational contact dermatitis and urticaria [22]. Low-protein rubber gloves, vulcanization accelerator-free, or gloves containing antimicro-

bial agents or moisturizers new technologies are now available [22]. These gloves are useful for primary prevention among healthy workers in risk occupations, and among workers with already established skin problems in terms of secondary prevention. Unfortunately, these gloves may be more expensive than regular non-accelerator-free gloves as cheaper options gloves are usually not tested for allergy and may still contain both allergens and urticariogens. Table 8.4 shows an overview of some available accelerator-free gloves.

It is highly recommended that food handlers do not use natural rubber latex gloves, as latex

Table 8.4 Accelerator-free gloves to prevent gloves-related skin allergies

Occupational group	Material	Manufacturer
Health workers Veterinarians	Low-protein latex gloves: Use of deproteinized and purified natural rubber latex is obtained by adding proteolytic enzymes and/or surfactants, chlorination, and high-temperature post-washing [22].	Ansell https://www.ansell.com/
	Non-latex surgical gloves. MEDI-GRIP® Made from synthetic neoprene and free from latex proteins and chemical accelerators.	
	GAMMEX® non-latex PI. Made of 100% synthetic polyisoprene. Safe for latex-sensitive (type I).	
	MICRO-TOUCH nitrile accelerator-free	
Surgical personnel (surgical gloves)	Biogel® NeoDerm® made of polychloroprene, without accelerators.	Mölnlycke http://www.molnlycke.us/
	Sempermed® Syntegra UV Polyisoprene photocross-linked (powder free, natural latex free, accelerator free)	Sempermed https://www.sempermed.com/en/
	Finnessis corium® Styrene elastomer (SEBS) (powder free, natural latex free, accelerator free)	Finnessis http://finnessis.com/
Food handlers, catering, cleaners, hairdressers	Accelerators-free, powder-free, nitrile gloves	Granberg http://www.granberg.no/

proteins can be transferred to food [23, 24]. Subjects with known latex allergies can develop severe allergic reactions to foods handled by latex gloves [25]. The website of the American Latex Allergy Association provides an extensive list of alternative latex-free products at <http://latexallergyresources.org/latex-free-products>.

Practical Recommendations for Proper Glove Use

Table 8.5 summarizes practical recommendations for proper glove use to prevent the effects of glove occlusion on the skin barrier disruption and further development of work-related and occupational dermatoses [25, 26].

Table 8.5 Tips on proper glove use

1. Use the recommended gloves on the data safety material sheet of the chemical products you are handling. In case of doubt, contact the producer or ask for advice from occupational hygienists or safety engineers.
2. Use accelerator-free gloves.
3. Always choose gloves that are CE marked.
4. Protective gloves should be used when necessary, but for as short a time as possible.
5. Protective gloves should be intact and clean and dry inside.
6. Use gloves with long cuffs to avoid that water and chemical products coming inside the glove.
7. Hands must be washed after glove removal. Gloves have an imperfect barrier to infectious material.
8. Avoid finger rings and long nails inside when using gloves.
9. Use gloves made of cotton or bamboo viscose fiber under the protective glove, which will absorb moisture and sweat (Fig. 8.5). Gloves made of bamboo viscose fiber are softer and more comfortable. The fingertips of the glove can be cut in order to keep a good finger sensation.
10. Disposable gloves are gloves for single use. They should not be cleaned and reused.
11. Choose the right glove size.
12. Remove the gloves without touching the outer surface of the glove to avoid contact with substances that may cause allergy or irritation on the skin.
13. Use protective gloves when performing wet work during domestic or free time activities.



Fig. 8.5 Customized gloves made of bamboo viscose fiber to keep good sensation in the fingertips. Photo: National Institute of Occupational Health, STAMI

Moisturizers

A healthy skin assures protection against physical agents, chemicals, mechanical injuries, impact, light, UV radiation, cold, and heat. Extrinsic factors such as occupational exposure to chemical, physical, and mechanical exposures may threaten skin integrity and proper restoration leading to skin barrier disruption.

Skin barrier disruption leads to irritant contact dermatitis, facilitates the penetration of skin urticariogens and allergens with further sensitization. Proper use of moisturizers promotes regeneration and reparation of a disrupted skin barrier [27, 28] and contributes to keeping a healthy skin. A lipid-rich moisturizer free from fragrances and with preservatives and the lowest allergen potential is highly recommended [29].

Moderate evidence is available on preventive effect of the regular application of moisturizers to avoid the development of occupational contact dermatitis [10, 30]. Moreover, strong evidence, from high-quality independent studies, supports that the use of moisturizers before work (“pre-moisturizers”) may help to prevent the development of occupational contact dermatitis. However, the denomination “barrier cream” is highly discouraged as it may provide with a false feeling of full skin protection.

After a literature review focusing on primary prevention through the use of skin creams in healthy populations, an expert panel suggested three moments, for skin cream application to prevent irritant contact dermatitis in the workplace: before work; during work after hand washing; and after work [31]. This suggestion can be applied to all industrial sectors, with evidence drawn from different workplace scenarios such as hairdressers, food handlers, timber, building trade, machinists, and metalworkers.

More randomized controlled trials including long-term controlled observations as well as intervention studies in risk occupations are needed to confirm the effectiveness of this suggestion.

It has to be emphasized that proper use of gloves and moisturizers should not be a substitute

elimination, substitution, and reduction of hazardous skin exposures through legislation, risk assessment, and training on health and safety at the workplace.

Secondary Prevention

The aim of secondary prevention is to provide workers with accessible facilities for early diagnosis and intervention to avoid disease progression. Thus, secondary prevention measures are implemented to detect and treat early stages of the disease, to prevent relapses or chronicity by improvement of hazardous workplace situations, behavioral change, and proper skin protection at both work and free time.

Unfortunately, a significant delay between the onset of work-related skin problems and seeking health care varying from 9 months [32] to more than 30 months [33] often leads to a poorer prognosis [34].

Chapter 10 presents the basics of a proper diagnosis of work-related and occupational dermatoses and will not be repeated here. An individual approach to the worker with occupational dermatosis should ensure timely and accurate diagnosis as well as a better prognosis if early diagnosis and interventions are possible [35].

As Fig. 8.2 shows notification and surveillance systems for work-related and occupational dermatoses are necessary for early intervention, to initiate diagnostic, treatment, and interventions at the workplace.

Tertiary Prevention Measures

The aim of tertiary prevention is medical, occupational, and psychosocial rehabilitation of workers with an established disease. These measures aim to facilitate social rehabilitation and quality of life of workers who are at risk of losing their jobs or even had already suffered job loss because of their occupational dermatoses. Experiences from Germany suggest that tertiary individual programs including psychological interventions contribute to improving mental

health in patients with severe occupational hand eczema [36].

Knowledge dissemination by Interdisciplinary teams composed of dermatologists, occupational physicians, allergists, safety engineers, and health educators are necessary for effective measures in all levels of prevention [37].

Conclusion

The most effective preventive measures to prevent occupational dermatoses include legislation, elimination, substitution, and reduction of exposure to skin hazardous substances. When substitution, technical, and organizational measures are not feasible, skin protection by the terms of proper use of protective gloves and moisturizers is highly encouraged.

Continuous training and education will contribute not only to keeping a healthy skin in safe workplaces, but also to recognizing early signs of skin disease and facilitate rehabilitation. Hence, early diagnosis and intervention will prevent a relapse and chronic disease course. When an occupational disease is already established, measures aim to facilitate medical, occupational, social, economic compensation and psychological rehabilitation should be available.

The practical implementation of the already developed standards for the prevention of work-related and occupational skin diseases is essential for effective prevention.

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