



Dermatite de Contacto Alérgica em Profissionais de Saúde

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RESUMO – Introdução: A dermatite de contacto alérgica (DCA) constitui patologia profissional particularmente frequente em profissionais de saúde. Os alergénios responsáveis podem variar ao longo do tempo, com a exposição ocupacional e com o tipo de trabalho. **Objectivos e Métodos:** Com o objetivo de avaliar a realidade local, foi feita uma análise retrospectiva dos profissionais de saúde que realizaram testes epicutâneos no Serviço de Dermatologia do Centro Hospitalar e Universitário de Coimbra (CHUC), num período de 6 anos (2010-2015), por suspeita de dermatite de contacto alérgica. Os doentes foram todos testados com uma Série Básica e com séries complementares orientadas pela história clínica. **Resultados:** Dos 1858 doentes testados, 125 (6,7%) eram profissionais de saúde, 114 de género feminino/11 masculino, idade média de 39,26±12,5 anos, maioritariamente enfermeiras (56), assistentes técnicos (48) e médicos (21), 71 com dermatite das mãos (56,8%), 22 com dermatite atópica e/ou outros sinais de atopia (17,6%). Noventa (72%) revelaram pelo menos um *patch test* (PT) positivo, 47 dos quais (52,2%) com relevância profissional. Doentes com dermatite das mãos tiveram mais frequentemente PT positivo (76,1%). Os metais causaram maior número de PT positivos (total 51; Ni-41, maioritariamente com relevância passada, Co-8; Cr-2), seguidos das fragrâncias (total 30; mistura de fragrâncias (FM)-I-10; Myroxylon pereirae-8; liral-5; FM-II-4; citronellol-3), conservantes (total 29, dos quais 20 à metilisotiazolinona (MI) e/ou clorometilisotiazolinona/MI (MCI/MI)), borrachas (24; P-fenilenodiamina (PPD)/Isopropil-PPD-9) e medicamentos tópicos (total 14; iodopovidona 5). As principais causas da DCA profissional foram os desinfetantes/sabonetes líquidos e produtos de higiene dos doentes (15), borracha das luvas/calçado (12) e medicamentos sistémicos ou tópicos (8 antissépticos e 3 antibióticos parentéricos). Os principais alergénios com relevância profissional foram a MI e/ou MCI/MI (15), lanolina (9), formaldeído e/ou libertadores (7), iodopovidona (5), carbamatos (4), FM-I (3), cefalosporinas (3) e acrilatos (3 dentistas e/ou assistentes dentários). Em 37 dos 42 casos avaliados, houve uma melhoria franca ou resolução da DCA, após evicção do alergénio causal, nomeadamente o conservante MCI/MI contido num sabonete líquido sob a designação de "Acticide® MV". **Conclusões:** A dermatite das mãos, a principal apresentação da DCA em profissionais de saúde, não mostrou relação com atopia e foi mais frequentemente associada a PT positivos. PT positivos a isotiazolinonas e libertadores de formaldeído foram mais frequentes entre profissionais de saúde do que na população geral estudada, muito provavelmente devido à exposição cumulativa, pessoal e profissional, a estes conservantes em sabonetes líquidos de uso pessoal e hospitalar. O PT foi crucial para orientar individualmente os doentes e para alertar a comunidade hospitalar para a presença de alergénios no local de trabalho e estabelecer medidas preventivas mais adequadas.

PALAVRAS-CHAVE – Alergénios; Dermatite de Contacto Alérgica; Exposição Ocupacional; Profissionais de Saúde; Saúde Ocupacional; Testes de Contacto

Occupational Allergic Contact Dermatitis in Healthcare Workers

ABSTRACT – Introduction: Occupational allergic contact dermatitis (ACD) is frequent among health care workers (HCW) and culprit allergens may vary with time, occupational setting and exposure hazards. **Objectives and Methods:** In order to

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characterize the main contact allergens in HCW with dermatitis and its occupational relevance, we performed a retrospective analysis of clinical data and patch test (PT) results from HCW who were studied in the Department of Dermatology of Coimbra Hospital and University Centre (CHUC) between 2010-2015. All patients were tested with a baseline and additional series, according to the tasks developed. **Results:** Among 1858 patch tested patients, 125 (6.7%) were HCW, 114 females/11 males, mean age $39,26 \pm 12,5$ years, mainly nurses (56), technical assistants (48) and doctors (21), 71 with hand dermatitis (56,8%), 22 with atopic dermatitis and/or other atopic symptoms (17,6%). Ninety patients (72%) had at least one positive PT, 47 (37,6%) with occupational relevance. Patients with hand dermatitis were significantly more likely to have positive PT (76.1%). We observed 51 positive PT to metals (Ni-41, most with past relevance, Co-8; Cr -2), 30 to fragrances (FM-I-10; Myroxylon pereirae-8; lylal-5; FM-II-4; citronellol-3), 29 to preservatives (mostly methylisothiazolinone (MI) and/or chloromethylisothiazolinone (MCI)-20), 24 to rubber chemicals (P-phenylenediamine (PPD)/Isopropyl-PPD-9), and 14 to topical medicaments (iodopovidone - 5; caine mix - 4). The main occupational causes of ACD were hand soaps/disinfectants and patients' hygiene products (15), protective gloves/shoes-9 and topical or systemic drugs (antiseptics-8 and parenteral antibiotics-3). Main allergens with occupational relevance were MI and/or MCI/MI (15), although isolated MI was tested only after mid 2012, lanolin and/or amerchol L101 (9), formaldehyde and/or formaldehyde releasers (7), iodopovidone (5), thiuram mix (5), carbamates (4), FM-I (3), cephalosporins (3) and (meth)acrylates (3 dentists/dental technicians). In 37 out of 42 evaluated cases there was marked improvement/resolution of the dermatitis, namely after eviction of the hospital hand soap which contains MCI/MI under the designation of Acticide® MV. **Conclusions:** Hand dermatitis was the main presentation of ACD in HCW with no apparent relation with atopy. Isothiazolinones and formaldehyde releasers induced more positive PT and were more frequent among HCW than in the whole population studied very probably due to the cumulative exposure to these preservatives in personal and occupational hand soaps and hygiene products. PT was important to orient eviction in each individual case but also for the hospital community to understand the presence of moderate or potent sensitizers in the work place and, therefore, establish the most adequate preventive measures.

KEYWORDS – Allergens; Dermatitis, Allergic Contact; Health Personnel; Occupational Exposure; Occupational Health; Patch Tests.

INTRODUCTION

Occupational skin diseases are very frequent representing up to 34% of the occupational diseases recorded in Europe.¹ The Portuguese reality is not well documented as occupational skin diseases are seldom reported to the national authorities.² Contact dermatitis represents one of the most common occupational disease³⁻⁶ and it is frequently responsible for sick-leave⁷, job loss and disability resulting in chronicity and high socio-economic impact.⁷⁻¹⁰ Moreover it can have a high impact on quality of life.^{9,10} Occupational allergic contact dermatitis (ACD) is particularly frequent among health care workers (HCW).^{1,5,6,11-14}

In the healthcare setting ACD can occur due both to delayed-type hypersensitivity mediated by allergen specific T lymphocytes that recognize low molecular weight chemicals, and immediate-type hypersensitivity, with IgE recognizing larger chemicals, like latex proteins.^{12,15,16} Clinical manifestations depend on the chemical properties of the allergens, local and form of exposure (acute or chronic)^{17,18} and may also be influenced by individual factors (atopy) or concomitant risk factors, like intensive exposure to wet work and skin irritants, namely with frequent and cumulative hand washing at work and at home.¹⁹ Occupational ACD in HCW affects mainly the hands, and particularly females, younger workers, individuals working in acute care settings, facility support services, and laboratory assistants and technicians, due to the tasks required.²⁰ ACD is reported to be mainly due to contact with rubber chemicals of protective gloves, surface and instrument disinfectants, drugs for systemic or topical use, or components of skin care products such as emollients,

barrier creams, or liquid soaps^{12-14,19} but culprit allergens may vary with time, occupational setting and exposure hazards. A correct diagnosis of occupational ACD is critical once the timeline of the diagnosis affects the outcome of the disease.²¹ The diagnostic work-up of ACD includes a complete physical examination, a detailed occupational history (exposure at work, use of personal protective equipment, work and skin care practices, relationship of the symptoms with work and whether other workers are also affected), and a fundamental step, patch testing, the most important investigative and diagnostic method available for studying the aetiology of delayed contact hypersensitivity.^{16,22}

There is lack of data in Portuguese healthcare centres,^{2,28} but we have reasons to believe, according to findings in literature,^{1,6,19,23-29} that targeted interventions based on well documented risk factors and allergens may provide a particularly beneficial cost-benefit effect in HCW, particularly in hand eczema.^{7,9} In order to manage properly the occupational ACD, detailed information on the incidence and causes of occupational ACD is needed.

AIMS

The aim of the present study was to evaluate the prevalence of delayed-type hypersensitivity reactions in HCW with dermatitis, focusing on characterization of the main contact allergens and its occupational relevance, in comparison with the whole population tested.

A secondary aim was evaluate the subsequent results of the measures taken after the correct etiologic diagnosis on the outcome of the dermatitis.

Table 1 - Comparative characteristics of healthcare workers and the whole patch tested population between 2010 and 2015.

TOTAL PATIENTS TESTED		HCW	DIFFERENCES
Total studied	1858	125	
Sex	503 M/ 1356 F	11 M / 114 F	73.0%F vs 91.2%F
PT positive	1295 (69.85%)	90 (72.00%)	↔
PT positive in females	987 (72.95%)	85 (74.56%)	↔
PT positive in males	308 (61.52%)	5 (45.45%)	↓
MOHALFA Index			
Male	479 (25.82%)	11 (8.80%)	↓
Occupational	298 (16.04%)	47 (37.6%)	↑
Hand dermatitis	466 (25.12%)	71 56.8%)	↑
Atopy/atopic dermatitis	543 (29.24%)	22 (17.6%)	↓
Leg ulcer/dermatitis	121 (6.54%)	0 (0.00%)	↓
Face dermatitis	506 (27.28%)	29 (23.2%)	↔
Age > 40	953 (51.34%)	54 (43.2%)	↓

METHODS

We performed a retrospective analysis of clinical data and patch test (PT) results from HCW studied in the allergology section of the Department of Dermatology of Coimbra University Hospital (CHUC) between 2010-2015. All patients were tested with the European baseline³⁰ and additional series, according to the tasks they developed. Allergens from Chemotechnique (Chemotechnique Diagnostics®, Vellinge, Sweden) or Trolab allergens® (Almirall GmbH, Germany) were applied for 48h on the back using Finn Chambers® (Epitest Ld, Almirall) or IQ Chambers® (Chemotechnique Diagnostics®, Vellinge, Sweden) and readings were performed at day (D)2-3 and D4-7, according to ESCD guidelines.³⁰⁻³² Only 1+ or more intense reactions were considered. Occasionally, semi-open testing was performed with rinse-off products from the workplace. MOHAL-FA index of the HCW population was evaluated and compared with the whole population tested.

PATIENTS

Between 2010 and 2015, among a total of 1858 patients that were patch tested in the Department, we studied 125 (6.7%) HCW, 114 females (91.2%) and 11 (8.8%) males, with a maximum age of 68 and a minimum of 21 years (average 39.26 years ± 12.54), 56 nurses, 48 technical assistants and 21 physicians (Table 1). Comparing with the whole population, there was a female predominance in HCW and hands were more frequently affected (56.8%) in this group of patients.

RESULTS

Among the 125 HCW that were patch tested, the main clinical presentation that motivated the allergological study was hand eczema (71-56.8%), followed by facial lesions (29-23.2%).

Out of the 125 HCW, ninety patients (72%) had at least one positive PT. Considering the European baseline series, the most frequent allergens identified were metals (51 – mostly nickel sulphate), fragrances (30, fragrance mix I - 10 and *Myroxylon pereirae* - 8), preservatives (29, namely isothiazolinones - 20 and formaldehyde and/or formaldehyde releasers - 9), and rubber chemicals (28, namely paraphenylenediamine(PPD)/IsopropylPPD in 13 cases; thiuram mix and carba mix 5 cases each) and topical medicaments (14, namely iodopovidone 5 cases and caine mix - 4) (Table 2). Nickel sulphate was the most frequent allergen (41-45.6%), with most cases related to past relevance, followed by methylisothiazolinone (MI) and/or chloromethylisothiazolinone/methylisothiazolinone (MCI/MI) that together had 20 cases (22.2%), and thimerosal (19-21.1%).

In the 90 reactive patients we found 179 total positive PT within the baseline series, 57 (31.8%) with occupational relevance, and 150 more positive PT in additional series, 72 (48.0%) with occupational relevance.

A positive PT with occupational relevance was observed in 47 of the 90 reactive patients (52.2%), in 54 out of

Table 2 - Most common positive PT within the baseline series in HCW and its occupational relevance.

Positive PT patients Baseline series	Allergens	Positive allergens	Occupational relevance
Metals 51	Nickel sulfate hexahydrate (5% pet)	41	1
	Cobalt chloride hexahydrate (1% pet)	8	1
	Potassium dichromate (0,5% pet)	2	1
Fragrances 30	Fragrance mix – I (8% pet)	10	3
	Myroxylon pereirae resin (25% pet)	8	0
	HICC-Lyral (5% pet)	5	1
	Fragrance mix – II (14% pet)	4	0
	Citronellol (1% pet)	3	0
Preservatives 29	MI (500-2000 ppm)* and/or MCI/MI (100 ppm)	20	15
	Formaldehyde (1%w) and/or form. releasers (imidazolidinylurea, diazolidinylurea, quaternium 15, DMDM hydantoin)	9	7
Rubber chemicals 24	PPD (1% pet) and/or I-PPD (0.1% pet)	9	3
	Thiuram mix (1% pet)	5	5
	Carba mix (3% pet)	5	4
	Disperse orange 3 (1%pet)	3	1
	Disperse blue mix 106/124 (1% pet)	2	1
Topical medicaments 14	Iodopovidone (10% w)	5	5
	Caine mix (10% pet)	4	0
	Tixocortol-21-pivalate (1% pet)	3	1
	Neomycin sulphate (20% pet)	2	2
Others 31	Thiomersal (0.1% pet)**	19	0
	Lanolin(30%pet)/Amerchol L101 (50%pet)	9	9
	Colophony (20% pet)	3	0
Total		179	57

DMDM hydantoin – Dimethylol dimethyldyantoin; I-PPD – Isopropyl-paraphenyldiamine; HICC - Hydroxyisohexyl 3-cyclohexene carboxaldehyde; MCI – mehtylchloroiso-thiazolinone; MI – mehtylisothiazolinone; PPD – paraphenyldiamine.

*tested only after mid 2012 and untill 2014 only at 500 ppm

** thiomersal tested in the baseline séries only until 2014.

71 (76.1%) patients with hand dermatitis and 16 out of 25 (64%) with atopy and atopic dermatitis.

The main occupational causes of ACD were hand soaps/disinfectants and patients' hygiene products (15), protective gloves/shoes (9) and topical or systemic drugs (antiseptics-7 and parenteral antibiotics-3). The main allergens with occupational relevance are described on Table 2 and Table 3.

Although isolated MI was tested only after mid 2012 and initially at 500 ppm in water it was the most common allergen, very often with occupational relevance related with the use of a hand soap containing MCI/MI, under the designation of Acticide MV®. Occupational ACD to cephalosporins was observed in 3 nurses that manipulated the antibiotics during its preparation, and 3 cases of ACD to (meth)acrylates were

Table 3 - Most common positive PT allergens in HCW and its occupational relevance within additional series.

Additional Series	Allergens	Positive allergens	Occupational relevance
Cosmetics 29	Propolis (10% pet)	5	1
	Cocamidopropyl betaine (1% w)	3	1
	Benzophenone-3 (10% pet)	3	1
	DMDM Hydantoin (2% w)	2	0
	Ethylenediamine dihydrochloride (1% pet)	2	1
	Chlorhexidine digluconate (0.5% pet)	1	1
	Dimethylamino-propylamine (1% w)	2	1
	2-bromo,2-nitropropanodiol (bronopol) (0.5% pet)	1	1
	Sodium metabisulfite (1% pet)	1	1
	Hydroabietyl alcohol (10% pet)	1	0
	Toluenesulfonamide formaldehyde resin (10% pet)	1	0
	Sorbitan oleate (5% w)	1	0
	Chloroacetamide (0.2% pet)	1	0
	Hexahydro-1,3,5-tris-(2-hydroxyethyl)triazine-Grotan Bk (1% w)	1	0
	Oleamidopropyl dimethylamine (0.1% w)	1	0
	Trietalonamine (2.5% pet)	1	0
	Benzoic acid (5% pet)	1	0
Triclosan (2% pet)	1	0	
Acrylates and Methacrylates - 26	2-OH-ethyl metacrylate HEMA (1% pet)	7	2
	2-OH-propylmetacrylate HPMA (2% pet)	7	2
	Ethylene glycol dimethacrylate EGDMA (2% pet)	3	1
	Triethylene glycol dimethacrylate (2% pet)	3	1
	Tetra Ethylene glycol dimethacrylate (2% pet)	2	0
	Ethyl acrylate (0.1 pet)	2	0
	Dimethylaminoethyl metacrylate (0.2% pet)	2	0
Hand soaps - 25	Hand cleansers (as is in semi-open testing)	9	6
	Dishwashing detergents (as is in semi-open testing)	9	5
	Softaskin®	4	4
	Lifoscrub®	2	2
	Promanun®	1	1
Rubber chemicals and other glove allergens - 16	1,3-Diphenylguanidine (1% pet)	3	3
	Bensoisothiazolinone (0.1% pet)	2	2
	Tetramethylthiuram monosulf. (0.25% pet)	2	2
	Tetramethylthiuram dissulf. (0.25% pet)	2	2
	N,N-Diphenyl-p-phenylenediamine (0.25% pet)	2	2
	Dipentamethylenethiuram dissulf. (0.25% pet)	1	1
	Disperse Red 1 (1% pet)	1	1
	Acid yellow 36 (1% pet)	1	1
	4,4-Diaminophenylmethane (0.5% pet)	1	0
	Latex (1% pet)	1	1

Table 3 (Cont.) - Most common positive PT allergens in HCW and its occupational relevance within additional series.

Additional Series	Allergens	Positive allergens	Occupational relevance
Fragrances - 12	Tree moss absolute (1% pet)	2	1
	Balsam of Tolu (20% pet)	2	1
	Geraniol (1% pet)	2	2
	Oak moss absolute (1% pet)	1	1
	Alfa-amylcinamal (1% pet)	1	1
	Propionic acid (3% pet)	1	0
	Sorbitan sesquioleate (20% pet)	1	0
	Trans-anethole (5% pet)	1	0
	Hydroxycitronellal (1% pet)	1	0
Metals - 11	Palladium chloride (2% pet)	10	0
	Vanadium (5% pet)	1	1
Topical drugs - 10	Polyninylpirrolidone iodade (2% w)	4	4
	Nonoxynol 9 (2% pet)	1	1
	Polyninylpirrolidone iodade (10% pet)	2	2
	Cloridrate benzalconio (0.1% pet)	1	1
	Sulphate Gentamicyn (20% pet)	1	1
	Hydrogen peroxide (3% w)	1	1
Systemic antibiotics - 9	Cefotaxim sodium salt (10% pet)	2	2
	Ceftriaxone (10% pet)	2	2
	Cefazolin (10% pet)	1	1
	Ampiciline (10% pet)	1	1
	Cefoxitin (10% pet)	1	1
	Omeprazole (10% pet)	1	0
	Pantoprazole (10% pet)	1	0
Hairdressers - 6	Tuolene-2.5-diamine sulphate (1% pet)	2	0
	Pirogalol (1% pet)	1	0
	Wood tar mix (12% pet)	1	0
	Aminophenol (1% pet)	1	0
	2-nitro-p-phenylenediamine (1% pet)	1	0
Anaesthetics - 3	Tetracaine hydrochloride (5% pet)	2	1
	Lidocaine (5% pet)	1	0
Personal systemic drugs - 3	Cloropromazina®; Fenofibrato®; Pravafenix®	3	0
Total		150	72

found among dentists/dental technicians (Fig. 1 and 2).

Thimerosal, patch tested only until 2014, had a high prevalence in our patients, but its occupational relevance is difficult to consider as its use as a skin disinfectant was discontinued long ago in healthcare centres in our country.

After the identification of the causal allergens, personal measures to reduce/avoid exposure were taught to the

patients who were later observed in consultation or contacted by phone in order to know the outcome of their dermatitis. Marked improvement or resolution of the dermatitis was observed in 37 out of 42 (88%) cases that were evaluated, namely after eviction of the hospital hand soap which contains MCl/MI. Nevertheless, although efforts were conducted to replace this soap, these measures were not yet fully accomplished.

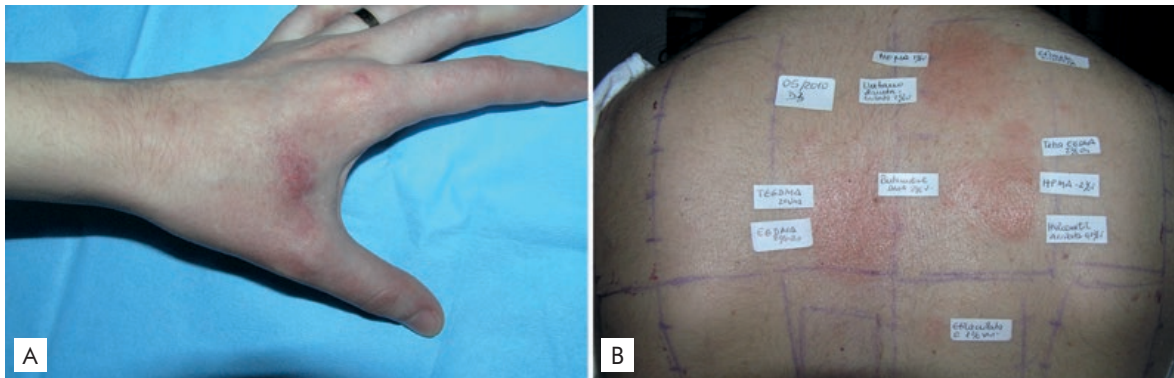


Figure 1 - Hand dermatitis involving the dorsum of the hand in a dentist who inadvertently applied the acrylate sealant on the glove before performing the treatment (A) and the relevant reaction to multiple acrylates and methacrylates (B).

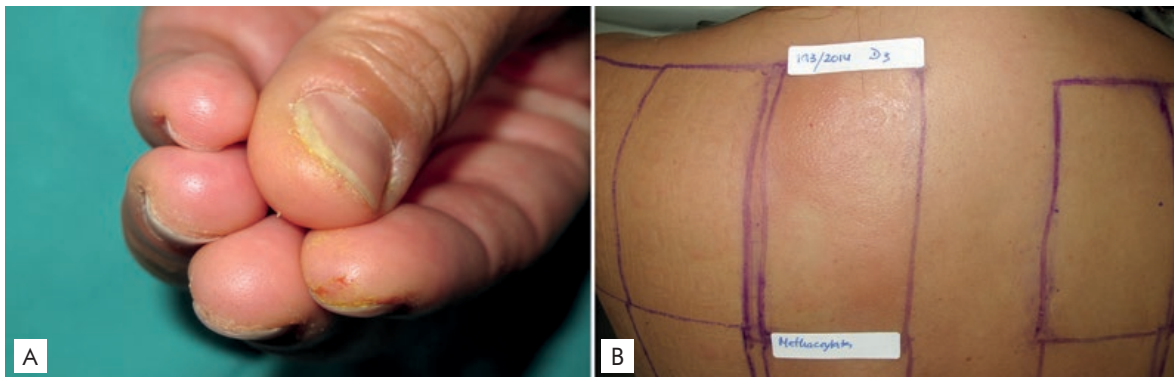


Figure 2 - Pulpitis with fissures in a dentist (A), the most frequent pattern of ACD among dental workers and reactivity to several (meth)acrylates (B).

DISCUSSION

As previously reported, positive PT and ACD were frequently observed in HCW.^{1,11-13} Actually, more than 70% of the studied HCW had a positive PT, which is not significantly different from the whole population tested. Although, only about half of the reactive patients had an occupationally relevant positive PT, occupational ACD was documented in 38% of the HCW that searched a dermatology testing, much higher than the percentage of occupational cases in the whole population tested (16%).

The majority of the study group were women (91.2%), which is due to the large proportion of nurses where women constitute the majority of the staff. This may also explain the high frequency of PT reactions to nickel and the slightly higher PT reactivity in the whole group.

Hand dermatitis was the main presentation of ACD in HCW, consistent with other studies.^{12,19} Although hand dermatitis is a multifactorial disease, often combining also atopic dermatitis, chronic irritant contact dermatitis, immediate symptoms, like contact urticaria and protein contact dermatitis,³³ the high frequency of ACD in this subgroup is certainly explained by the tasks done mainly by hand, like frequent washing and use of hand soaps/disinfectants and protective gloves.¹⁹ Moreover, wet work and the irritant effect of some of

these substances, also favours sensitization in hand dermatitis.³⁴ Interestingly, in our study there was no apparent relation between positive PT and atopy.

There are few published data on the prevalence of sensitized HCW and respective culprit allergens in Portuguese hospitals.^{2,35} Patch testing based in European baseline series, is widely used in European dermatology units for patch testing, and includes contact allergens found in occupational and non-occupational or both settings. Here we found 179 positive PT in European baseline series, 57 (31.8%) of them with occupational relevance, but we also found 150 positive PT, still with a higher percentage (48.0%) of occupationally relevant reactions when aimed testing with additional series. This finding highlights the importance of patch testing with additional series when ACD is suspected in HCW, namely when considering dental technicians and specific exposures as topical and systemic drugs which are not included in the baseline series.

Nickel was the most common allergen, as previously reported³⁶, with sensitization rates in women similar to the whole Portuguese population, probably explained by the poor implementation of the nickel Directive in Portugal³⁷, but it was not considered of occupational relevance, as this metal allergy is seldom related to this occupational setting.^{38,39}

Apart from nickel, overall, occupational relevance of PT

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in HCW was high (52.2%) and eviction measures were important to improve or clear the dermatitis, as shown with the good outcome of our patients where relevant allergens were found. Like in other studies, main occupational relevant allergens were the preservatives,^{1,6,12,13,40} rubber chemicals,^{12,13} topical drugs and lanolin.^{1,12} High reactivity to preservatives, with 20 cases from isothiazolinones and 7 from formaldehyde and/or formaldehyde releasers, is very probably due to the cumulative personal and occupational exposure, as preservatives as well as fragrance allergens are common to hospital hand soaps, patient hygiene products and personal hygiene products. Accordingly, isothiazolinones have gained notoriety in the last years as an emerging contact allergen⁴¹⁻⁴⁴, present in wet wipes, skin cleansers, liquid soaps, lotions, shampoos and conditioners.^{1,42,43,45-49} Together with rubber chemical accelerators, MI and or MCI/MI are associated with at least doubled risk of occupational ACD.¹ Moreover, we found 2 positive PT to benzisothiazolinone very probably related to gloves, as this preservative is increasingly used in PVC and other gloves for medical use.⁵⁰

Rubber chemicals in gloves and/or shoes are still one of the most common allergens in HCW,^{1,6,11,12,19,51,52} however the paradigm is changing in the last decade by the introduction of new allergens⁵³ and new types of gloves. Vinyl gloves do not usually contain these rubber additive, so this is the usual alternative for HCW with ACD caused by vulcanization accelerators in rubber gloves material.

PT reactivity to topical medicaments with occupational relevance was also high, according to the previous findings in literature,¹¹ and it is justified by its frequent use in workplace particularly the antiseptics polivinylpirrolidone and chlorhexidine. Thimerosal, once used frequently as an antiseptic in most healthcare centres is still frequently responsible for positive PT, but relevance could not be traced, which justified its removal from the baseline series in 2014. Reactivity to thimerosal reflects either a high level of prior sensitization to this allergen or sensitization by vaccinations against infectious diseases such as influenza and hepatitis.^{13,36} Lanolin, present both in topical drugs and protective hand creams was also a frequent allergen in HCW, as previously reported.^{1,12}

Apart from topical drugs, we also identified a rare cause of occupational ACD to systemic drugs,⁵⁴⁻⁵⁶ in 3 cases of nurses sensitized to cephalosporins. Contact sensitivity to systemically administered drugs in HCW is mostly caused by antibiotics such as penicillins, cephalosporins and aminoglycosides^{54,55} and can be due to inadvertent contact with drug solutions for parenteral administration or, occasionally, by allergens in aerosols preparations or from the powder of pills crushed to administer to patients with swallowing problems.^{54,55}

In dental HCW we found, as expected, sensitization to (meth)acrylates used in dental procedures, as prosthodontic restorations,⁵⁷ but most cases of (meth)acrylate allergy were related with the use of artificial nails or long lasting acrylate nail varnish,^{2,58} a procedure still allowed in our HCW.

Our study emphasizes the importance of patch testing in

HCW, to identify the allergens and orient eviction in each individual case, which, as previously reported was associated with a relatively good outcome.²¹ Moreover, it was also important for the hospital community to understand the presence of moderate or potent sensitizers in the work place and, therefore, establish the most adequate preventive measures.^{21,22,59} It is particularly noteworthy that patch testing allowed us to discover the MCI/MI under the designation of Acticide MV[®], in the hospital hand soap.

The occupational health team has a critical role in managing the exposure to hazardous allergens in workplace and identifying potential incidents. This work reinforces that HCW with dermatitis should follow skin care programmes, as the use alcohol-based hand gel for hand decontamination, which is less probable to induce ACD than commercial hand cleansers.^{12,21} Also, when hands are not visibly dirty, they should be disinfected instead of repeated washing.¹⁹ And finally, skin conditioning creams without sensitizers, like fragrances or lanolin, should be available at hand washing areas.

Also, occupational physicians should check for HCW with symptoms in order to perform the correct diagnosis, treat the allergy, keep the worker away from the source of exposure, if possible eliminate the source or keep an eye on other exposed workers and therefore reduce occupational ACD. This may be important also because recently there is some evidence that dermatitis is more likely to be colonised with microorganisms than normal skin, although the higher risk of contamination to patients remains uncertain.²¹ Even though it is still questionable, caution is advised and prevention policies should be implemented in order to reduce hazards present in workplace and promote safer work practices.

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