

Occupational contact urticaria: Australian data

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Summary

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Conflicts of interest

None declared.

Background Over the last 30 years there has been increasing recognition of the clinical entity contact urticaria (CU) and the related diagnosis, protein contact dermatitis. However, there are relatively few reports of the occupational relevance of this condition.

Objectives To describe relevant characteristics of patients diagnosed with occupational CU (OCU) in a tertiary level specialist occupational dermatology clinic in Australia.

Methods We performed a retrospective analysis of all patients diagnosed with OCU at an occupational dermatology clinic in Melbourne between 1 January 1993 and 31 December 2004. We identified 151 cases of CU diagnosed over the 12-year period.

Results OCU was diagnosed in 8.3% (143 of 1720) of the total number of patients with occupational skin disease. Natural rubber latex accounted for the majority of all cases of OCU. Other common causes were foodstuffs and ammonium persulphate utilized as hairdressing bleach. The most commonly affected sites were the hands, followed by the arms and face. The most frequently affected occupations were healthcare workers, food handlers and hairdressers. All cases of CU in patients with hand symptoms were assessed to be work related. Atopy was a significant risk factor for both latex-related and nonlatex-related OCU.

Conclusions Radioallergosorbent tests and skin prick testing, including to patients' own food samples, should be part of the routine assessment of patients in high-risk occupations for OCU, particularly if the hands are affected, there is a history of atopy and there is exposure to urticants. We emphasize the importance of both determining the role of occupation in the causation of CU and recognizing all contributory factors in complex cases of occupational contact dermatitis of the hands.

The term 'contact urticaria' (CU) was introduced by Fisher in 1973 to describe a weal and flare reaction of the skin occurring after contact with a substance.¹ The reaction often occurs within 30 min, with total resolution usually occurring within 24 h. Repeated episodes of CU may result in the development of dermatitis, termed protein contact dermatitis (PCD).²

CU may be classified into nonimmunological or irritant CU (NICU) and immunological or allergic CU (ICU), according to the underlying mechanism. There is a third category to describe reactions with some features of both NICU and ICU. This group has been termed 'uncertain mechanism CU'.^{3,4}

There are distinct differences between ICU and NICU in their presentation, pathophysiology, investigation and treatment. The key differences are that NICU does not require prior sensitization, may occur on the first exposure and the reactions

are always localized. By contrast, ICU is a type 1 hypersensitivity reaction, mediated by allergen-specific IgE, requiring prior sensitization to the allergen. Furthermore, ICU may be complicated by systemic symptoms, known as 'CU syndrome', described by Maibach and Johnson.⁵ This can be divided into four stages: stage 1, localized urticaria, nonspecific symptoms (itch, tingling or burning) or dermatitis; stage 2, generalized urticaria; stage 3, extracutaneous involvement (rhinoconjunctivitis, bronchospasm, orolaryngeal or gastrointestinal); and stage 4, anaphylactic shock.³ Kligman has argued that CU is underdiagnosed, as more subtle clinical presentations, for example erythema or pruritus alone, may easily be misdiagnosed.⁶ These are termed suburticogenic forms of CU.⁶

The term PCD was first introduced by Hjorth and Roed-Petersen to describe an allergic or nonallergic eczematous

reaction to proteinaceous materials among food handlers.² Recurrent episodes of CU cause the development of PCD. The mechanisms by which proteins may penetrate the skin to cause CU and PCD have been described.⁷

Since CU was first defined, there has been a steady increase in the number of case reports describing new causes and these have been extensively reviewed.^{3,4,8} Despite individual case reports,^{9–19} there remains limited information on the epidemiology of occupational CU (OCU),^{20–23} with the exception of extensive literature on natural rubber latex (NRL) allergy.^{24,25}

We have undertaken a review of all of the cases of CU diagnosed at the Occupational Dermatology Clinic in Melbourne since 1993.

Subjects and methods

Patients

The study population consisted of all patients seen at the Occupational Dermatology Clinic in Melbourne, Australia between 1 January 1993 and 31 December 2004. This clinic is a tertiary referral clinic for the investigation of patients with suspected occupational dermatoses, predominantly contact dermatitis. Most referrals are from dermatologists, although referrals are also accepted from general practitioners, occupational physicians and clinical medical officers, other occupational health staff and allergists.

All patients were assessed in clinic by an experienced occupational dermatologist (J.D.L.W., A.Y.L.L. or R.L.N.) during the study period. Patients with CU were identified from this clinical assessment, and underwent appropriate investigations. Cases of CU and PCD are grouped together. Cases of CU to NRL are recorded separately. Patients are often diagnosed with more than one condition in the clinic, and where this is the case, the diagnoses are listed in order of importance, with the primary diagnosis being considered the most important.

Investigations

All patients who were thought clinically to have contact dermatitis or where it was important to exclude allergic contact dermatitis (ACD) were patch tested using allergens from either Chemotechnique Diagnostics® (Malmö, Sweden) or Trolab® Hermal (Reinbek, Germany). Patches were applied to the back using Finn Chambers® on Scanpor® (Epitest, Tuusula, Finland). They were removed and generally read at day 2 and day 5.

Where the diagnosis of CU was suspected, the patient was investigated using available radioallergosorbent tests (RASTs) initially. A RAST result of 0 was considered a negative test. Skin prick testing was subsequently undertaken with standard allergens when RASTs were negative, not available and also when testing patients to their own samples. Readings were taken at 15 and 30 min and the reaction compared with that

of histamine dihydrochloride (10 mg mL⁻¹) as control.²⁶ A weal of 3 mm diameter was considered a positive reaction. Atopy was diagnosed using the British Working Party Criteria questions.²⁷

Classification of occupation and industry groups

The occupation of patients was classified and recorded using the Australian Bureau of Statistics (ABS) Australian Standard Classification of Occupations.²⁸ The industry of employment of patients was classified and recorded using the ABS Australian and New Zealand Standard Industrial Classification.²⁹ Criteria for work relatedness were based on the Mathias criteria.³⁰

Results

In total, 1720 people were assessed and assigned a diagnosis in the clinic between 1 January 1993 and 31 December 2004. Of these patients, 1443 (83.9%) were diagnosed with a substantially or partially work-related dermatosis. CU was diagnosed in 143 (9.9%) of 1443 with a substantially or partially work-related dermatosis (Table 1).

NRL was by far the most common cause of OCU (75 of 143; 52%). Foods were the second most common cause of OCU (50 of 143; 35%). The next most common urticant was ammonium persulphate utilized in hairdressing.

There were five patients diagnosed with OCU resulting from both NRL and non-NRL causes. They have been included in the NRL group for the subgroup analysis.

Demographic characteristics

Sixty-three per cent of patients with OCU were women (90 of 143). Female predominance was less evident in the non-NRL OCU group: 38 of 68 (56%) compared with 52 of 75 (69%) in the NRL OCU group ($P = 0.31$).

Overall, 93 of 143 (65%) patients diagnosed with OCU had a history of atopy. The rates were similar for non-NRL OCU (43 of 68; 63%) and NRL OCU (50 of 75; 67%, $P = 0.73$). Overall, patients diagnosed with OCU were significantly more likely to be atopic ($P < 0.001$). Significance was also shown for the individual subgroups, non-NRL OCU ($P < 0.01$) and NRL OCU ($P < 0.01$).

Site of dermatitis

The exact location of the skin changes is outlined in Table 2 for patients with an occupationally related diagnosis. Hand involvement was present in 125 of 143 (87.4%) patients with OCU, which was a significantly higher proportion than for all other dermatoses (75.9%, $P = 0.002$). For NRL OCU, 70 of 75 (93%) patients had hand involvement ($P = 0.0001$ compared with all other dermatoses), while 55 of 68 (81%) patients with non-NRL OCU had hand involvement ($P = 0.34$).

Table 1 Demographic characteristics of patients with contact urticaria

	Total	All contact urticaria	Nonlatex	Latex
n	1720	151	75	76
Work relatedness				
Substantially	1106 (64.3%)	130 (86.0%)	62 (82.7%)	68 (89.5%)
Partially	337 (19.6%)	13 (8.6%)	6 (8.0%)	7 (9.2%)
Not work related	272 (15.8%) ^a	8 (5.3%)	7 (9.3%)	1 (1.3%)
Age (years)				
All (mean $\pm$ SD, range)	37.2 $\pm$ 12.4 (15–79)	31.2 $\pm$ 11.1 (16–65)	28.9 $\pm$ 8.9 (16–54)	33.4 $\pm$ 12.5 (16–65)
Work related ^b (mean $\pm$ SD, range)	36.5 $\pm$ 12.4 (15–76)	31.1 $\pm$ 11.2 (16–65)	28.5 $\pm$ 8.83 (16–54)	33.5 $\pm$ 12.5 (16–65)
Gender – female				
All	724 (42.1%)	96 (36.4%)	44 (58.7%)	52 (68.4%)
Work related ^b	615 (42.6%)	90 (62.9%)	38 (55.9%)	52 (69.3%)
Atopic				
All	707 (41.1%)	98 (65.0%)	48 (64.0%)	50 (65.8%)
Work related ^b	607 (42.1%)	93 (65.0%)	43 (63.2%)	50 (66.7%)

^an = 5 with unknown work relatedness. ^bSubstantially/partially work related.

Table 2 Site of occupational dermatosis

Site of dermatitis	Total all dermatoses (work related n = 1443), n (%)	Total OCU (work related n = 143), n (%)	Nonlatex OCU (work related n = 68), n (%)	Latex OCU (work related n = 75), n (%)
Hands	1111 (77.0)	125 (87.4)	55 (80.9)	70 (93.3)
Arms	291 (20.2)	35 (24.5)	20 (29.4)	15 (20.0)
Face	237 (16.4)	30 (21.0)	17 (25.0)	13 (17.3)
Eyelids	66 (4.6)	5 (3.5)	3 (4.4)	2 (2.7)
Lips	13 (0.9)	4 (2.8)	3 (4.4)	1 (1.3)
Legs	91 (6.3)	7 (4.9)	5 (7.4)	2 (2.7)
Abdomen	29 (2.0)	3 (2.1)	3 (4.4)	0 (0.0)
Feet	84 (5.8)	3 (2.1)	2 (2.9)	1 (1.3)
General	10 (0.7)	3 (2.1)	2 (2.9)	1 (1.3)
Back	20 (1.4)	2 (1.4)	1 (1.5)	1 (1.3)

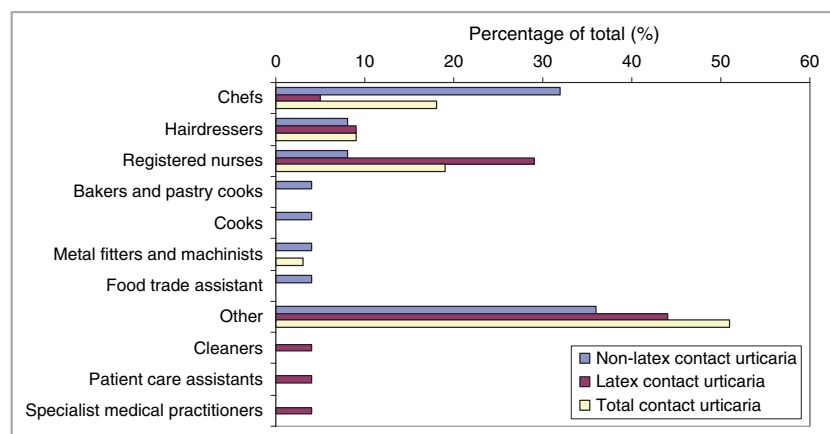
OCU, occupational contact urticaria.

Occupation

The most common occupations where a diagnosis of CU was made are shown in Figure 1. Non-NRL OCU was most commonly seen in chefs (23 of 68; 34%). NRL OCU was most

commonly seen in registered nurses (22 of 75; 29%). Overall, OCU was most commonly seen in registered nurses (27 of 143; 19%) followed by chefs (26 of 143; 18%). One hundred and sixty-nine registered nurses were diagnosed with occupational skin disease (OSD) during the study period, with OCU

Fig 1. Most common occupations associated with diagnosis of occupational contact urticaria.



Nonlatex contact urticaria	Latex contact urticaria
Carpentry and joinery tradespersons	Aircraft maintenance engineers
Checkout operators and cashiers	Ambulance officers and paramedics
Chemical production machine operators	Concreters
Child care coordinators	Cooks
Dental assistants	Dental assistants
Engine and boiler operators	Dental practitioners
Fast food cooks	Floor finishers
Farm hands	Food trade assistants
Food trade assistants	Manufacturers
General mechanical engineering tradespersons	Medical scientists
Meat tradespersons	Metal casting tradespersons
Other agricultural and horticultural labourers	Metal fitters and machinists
Other food tradespersons	Motor mechanics
Other intermediate machine operators	Other intermediate stationary plant operators
Other miscellaneous tradespersons and related workers	Other miscellaneous tradespersons and related workers
Packagers and container fillers	Packagers and container fillers
Photographic developers and printers	Panel beaters
Product assemblers	Rubber production machine operators
Sales assistants	Textile and footwear production machine operators
Science technical officers	Pharmacists
Veterinary nurse	Podiatrists
	Sales assistants
	Science technical officers
	Ushers, porters and related workers
	Waiters

Table 3 Uncommon occupations associated with contact urticaria

diagnosed in 27 of 169 (16%). Fifty-four chefs were diagnosed with OSD during the study period, and 26 of 54 (48%) were diagnosed with OCU. OCU also plays an important role in hairdressers, involving 13 of 106 (12%) hairdressers diagnosed with OSD. Table 3 lists the uncommon occupations where we have diagnosed OCU.

Industry

Table 4 details the most common industries affected by OCU. The food service industry was most commonly affected by non-NRL OCU (32 of 68; 47%). Healthcare was the most common industry affected by NRL OCU (37 of 75; 49%).

Overall, healthcare was the most common industry affected by OCU (43 of 143; 30%).

Hierarchy of diagnosis

Table 5 lists the diagnostic classification of OCU. Overall, when the diagnosis of OCU was made, it was the only diagnosis in only 15 of 143 (10%) cases, the primary diagnosis in 69 of 143 (48%) cases and the secondary diagnosis in 50 of 143 (35%) cases of OCU. Non-NRL OCU was the only diagnosis in nine of 73 (12%) cases and the primary diagnosis in 33 of 73 (45%) cases. NRL OCU was the only diagnosis in six of 75 (8%) and the primary diagnosis in 36 of 75 (48%) cases.

Table 4 Most common industries associated with occupational contact urticaria

Nonlatex contact urticaria (n = 68)			Latex contact urticaria (n = 75)			Total contact urticaria (n = 143)		
	n	(%)		n	(%)		n	(%)
Food services	32	47	Healthcare	37	49	Healthcare	43	30
Healthcare	6	9	Food services	8	11	Food services	24	17
Hairdressing and beauty salons	6	9	Hairdressing and beauty salons	7	9	Hairdressing and beauty salons	13	9
			Tradespersons and labourers	5	7	Tradespersons and labourers	11	8
Other	24	35	Other	18	24	Other	52	36

Food services include the catering and hospitality sectors.

Table 5 Hierarchy of diagnosis

Diagnostic order	Nonlatex OCU (n = 73)		Latex OCU (n = 75)		Total OCU (n = 143)	
	n	%	n	%	n	%
Sole diagnosis	9	12	6	8	15	10
Primary diagnosis	33	45	36	48	69	48
Secondary diagnosis	25	34	27	36	50	35
Tertiary diagnosis	10	14	11	15	19	13
Quaternary diagnosis	5	7	1	1	5	3

OCU, occupational contact urticaria. Workers were often assigned multiple diagnoses where more than one factor was thought to be contributing to their occupational contact dermatitis. Patients with more than one diagnosis have these placed in order of importance, with the most important being the first/primary diagnosis and so on. Patients with both latex OCU and nonlatex OCU have been included in both groups.

Discussion

In this article, we report on 143 cases of OCU over a 12-year period. Skin prick testing or RASTs were used to diagnose CU, together with a history of relevant exposure to the urticant. Where there was a history of a strong type 1 hypersensitivity reaction with systemic symptoms, RAST testing was preferred because of the risk of anaphylaxis with skin prick testing.³¹

A previous epidemiological study from Finland included OCU and PCD together under the umbrella term of CU.²¹ In the 5 years from 1990 to 1994, 815 cases were reported to the Finnish Register of Occupational Diseases. These represented 29.5% (815 of 2759) of the total number of occupational allergic contact dermatoses. OCU was more common in women (70%), and the six most common causes among the 815 reported cases were cow dander (362), NRL (193), flour, grains and feed (92), foods (25), industrial enzymes (14) and decorative plants (13). The most common occupations with OCU per 100 000 employed workers were as follows: bakers (140.5); preparers of processed food (101.8); dental assistants (95.5); veterinary surgeons (72.5), domestic animal attendants (69.1) and farmers (57.7). Kanerva *et al.* reported an increase in the number of cases diagnosed over time.²¹

Direct comparisons with the Finnish data cannot be made as they record only the primary diagnosis. Our figures include data on cases where OCU was one of multiple diagnoses, although not necessarily the primary diagnosis. We have recently performed a review of all cases of OSD diagnosed over a similar 12-year period. OCU represented 12.2% (68 of 553) of cases where the primary diagnosis was allergy (OCU and ACD) (Williams JDL, Matheson MC, Frowen KE, Noonan AM, Dharmage SC, Nixon RL. Occupational skin disease: a review of 12 years of data from an occupational dermatology clinic. Submitted for publication). This compares with 29.5% in the Finnish study. The higher rates of OCU as a cause of allergic occupational dermatoses in Finland than Australia may reflect the fact that in the cattle and dairy farming industry in Finland, cows are kept inside during autumn and winter, resulting in Finnish farmers being exposed to more cow dander.³² Cow dander is also the most common cause of

occupational rhinitis and asthma in Finland.³³ However, our Australia data reinforce the literature on NRL as a major cause of OCU.^{24,25,34} Furthermore, our data are based on patients assessed at a tertiary referral clinic, as opposed to the Finnish data, which were based on reports submitted to the Finnish Register.

Over a 6-year period in the U.K. there were 909 cases of CU reported by dermatologists and occupational physicians in a total number of 22 710 cases of OSD.³⁵ In the U.K. reporting scheme EPIDERM it is possible to record more than one diagnosis in a single patient, so these data are more comparable with ours. OCU was relevant in 4.0% of reported cases, although it is possible that occupational physicians do not have as much awareness of OCU as dermatologists.

Our figures show that women are more likely to have OCU, both from NRL and non-NRL causes. This is most likely explained by the preponderance of women in the most affected occupations of food handling, nursing and hairdressing. It could also reflect the fact that women are more likely to seek medical care. Similar findings were recently reported by the EPIDERM group in the U.K.³⁶ Dermatologists and occupational physicians both reported rates of OCU twice as high in women as in men. The most common reported urticants were rubber chemicals and then foods including flours. The most commonly affected industry was health and social services. We are unaware of any studies describing prevalence or incidence rates of OCU in the general population.

The high rate of atopy found in those patients diagnosed with OCU suggests that it is a significant risk factor for developing OCU, supporting the findings of Freeman and Rosen.³⁷ In a study of 14 food handlers with OCU, they found that half of them had an atopic diathesis. Physicians should have a lower threshold for performing RASTs and skin prick testing when assessing patients with an atopic diathesis. The occupations where skin prick testing and performing RASTs should be part of a routine assessment include nursing/healthcare workers, food handlers and hairdressers.

In our patients, the most common sites for OCU were the hands and arms, which are most likely to be affected by local

spread of the allergen from the hands. CU affecting the hands was found to be work related in all cases. While this is in the setting of an occupational clinic where referral occurs because occupational disease is suspected, it emphasizes the important role of CU in OSD.

Food handlers, hairdressers and nurses are at highest risk for NRL and non-NRL OCU. It is not surprising that nurses are the most common occupation affected by NRL OCU because of the widespread use of NRL gloves in the healthcare industry. However, with an increase in the use of powder-free NRL examination gloves, we expect rates of NRL OCU to fall in the future. The frequency of NRL OCU in chefs may be explained by the use of rubber gloves for cleaning and also that latex disposable gloves are still used in this industry. We recommend use of vinyl gloves for food handling, but it is important that healthcare workers who are allergic to NRL use nitrile gloves and not vinyl gloves.

There are a number of other occupations where OCU has been diagnosed. This emphasizes the importance of considering this diagnosis in all cases where people are exposed to urticants. In particular, 50% of chefs with OSD were diagnosed with OCU, stressing the importance of skin prick testing all workers with hand dermatitis who handle foods routinely in the workplace. This is especially important in those who describe a history of rapid onset of symptoms or a history of recurrent urticaria on the hands prior to developing hand dermatitis.

Our results show that in most cases OCU coexists with other OSD. In the food handling and healthcare industries, wet work is a significant factor.³⁸ One might postulate that wet work contributes to the development of irritant contact dermatitis, which is also predisposed to by atopy. This leads to disruption of the skin barrier and facilitates sensitization to proteins in the same way as contact allergens. This again highlights the importance of considering multiple causes contributing to the clinical presentation.

In summary, in our series CU was almost always work related and needs to be considered in atopic patients presenting with hand dermatitis working in high-risk occupations, such as food handling and healthcare. It is important to perform RAST and skin prick testing in addition to routine patch testing, as many cases may otherwise remain undiagnosed.

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