

Allergic contact dermatitis among maintenance and clerical workers in a military population

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Contact dermatitis is one of the leading causes of occupational morbidity and absenteeism and has become an intolerable cause of missed workdays and health problems in the Israeli military. The aim of this study was to determine the rate of contact dermatitis in maintenance and clerical workers, the common allergens causing it, and the background of atopy in the subjects in order to design preventive measures. Medical records of all recruits to the Israel Defense Forces from 2000 to 2003 were reviewed for contact dermatitis. The 102 cases found were further assessed for job assignment, atopic background, and allergens. Of the 102 cases, 60 had irritant contact dermatitis and 42 had allergic contact dermatitis, of which 33 (78.6%) were maintenance workers, mainly mechanics. 13 soldiers in the maintenance job category (39%) and 2 soldiers in the clerical group (22.2%) had atopic background. There were 55 positive reactions in patch tests, 25 of them to oil and cooling fluids, with 14.5% attributed to methylchloroisothiazolinone/methylisothiazolinone (Kathon CG). Atopy was found to be a risk factor for allergic contact dermatitis in our study and should be screened for in job assignment procedures in the military. Oil and greases contain significant allergens, especially their preservatives.

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Occupational contact dermatitis (OCD) is common and costly, accounting for a high rate of absenteeism (1). The problem is especially acute in the military setting where missed workdays and dropouts from the workforce are at intolerable levels. In view of the poor prognosis of OCD (2) and the importance of primary prevention (3), we set out to identify the contribution of atopy and of certain hazardous materials to the distribution of OCD in clerical and maintenance workers.

Patients and Methods

A review of the medical records of 57 511 recruits to the Israel Defense Forces between the years 2000 and 2003 turned up a total of 102 18- to 21-year-old soldiers, 70 men and 32 women, in clerical and maintenance assignments, with contact dermatitis. Record was made of job assignment, atopic background (e.g. previous or present atopic dermatitis, allergic rhinitis, allergic conjunctivitis, and allergic asthma), and allergens identified in

patch testing. All recruits with suspected allergic contact dermatitis were tested during their service. Patch tests were performed with the European Standard series and additional case sensitive series (Chemotechnique Diagnostics, Sweden) and also own suspected material. Readings were done on D2 and D4. Diagnostic criteria included positive patch tests or fulfilling 4 out of 7 criteria of Mathias (4). Relevance of a positive patch test was also considered. Data were analysed by the Statistical Analysis System (version 9.2, SAS Institute Inc., Cary, NC, USA). The chi-square test was used to compare between the groups. The exact binomial test was also used to compare between the groups. A *P* value of 0.05 or less was considered significant.

Results

Of the 102 subjects, 60 (58.8%) had irritant contact dermatitis and 42 (41.2%) had allergic contact dermatitis. Of the 60 recruits with irritant

contact dermatitis, 41 were on maintenance assignments. Approximately 85% had only hand involvement. The median exposure before hand eczema had occurred was 6.8 ± 0.35 months. As shown in Table 1, of the 42 subjects with allergic contact dermatitis, 33 (78.6%) were maintenance workers and 9 (21.4%) were clerical workers. This finding was significant with a very small probability of type 1 error ($P < 0.05$).

We also show a significant difference in the atopic background between maintenance and clerical workers with allergic contact dermatitis: 13 (39%) and 2 (22.2%), respectively, and between the maintenance group and the rate of atopy in the general military population (13%).

There were 55 positive reactions in patch testing among the 102 recruits. 41 (75.4%) of the positive reactions were relevant according to the scoring system of Suneja and Belsito (5). 25 of the positive reactions (45.5%) were attributed to oil and cooling fluids allergens (Table 2). Most of the soldiers (57.1%) reacted to only 1 allergen. Table 2 summarizes the most prevalent allergens.

Discussion

The high rate of allergic contact dermatitis among maintenance vocations is expected. Dirty work, extreme environmental conditions, exposure to irritants, mechanical insult to the skin barrier, and insufficient skin recovery time (6, 7) all foster eczema. This intense exposure of soldiers to irritant and allergenic products, often in polluted work environments, poses a major challenge to the military health system to protect the health of soldiers while the system as a whole strives to maximize manpower utilization.

Table 1. Dermatologic and atopy data in maintenance and clerical workers

	Maintenance workers	Clerical workers	<i>P</i> value
Gender (male/female)	27/6	2/7	
Presence of allergic contact dermatitis (<i>n</i> = 42)	33/42 (78.6%)	9/42 (21.4%)	$P < 0.05$
Presence of atopic background among allergic contact dermatitis affected (<i>n</i> = 42)	13/33 (39%)	2/9 (22.2%)	$P < 0.05$

Of the 42 subjects with allergic contact dermatitis, 33 (78.6%) were maintenance workers and 9 (21.4%) were clerical workers. This finding was significant with a very small probability of type 1 error ($P < 0.05$).

There is a significant difference in the atopic background between our cohort and between the rate of atopy in the general military population (13%). $P < 0.05$.

Table 2. Prevalence of the most common allergens among the 102 recruits

Allergen	No. (%) of tested recruits
Methylchloroisothiazolinone/ Methylisothiazolinone (Kathon CG)	8 (7.8)
Nickel	8 (7.8)
Thimerosal	5 (4.9)
Textile dyes	3 (2.9)
Potassium dichromate	3 (2.9)
Cobalt	3 (2.9)
Euxyl K-400	3 (2.9)

The most prevalent allergens causing allergic contact dermatitis among the recruits (Table 2) were found to be methylchloroisothiazolinone/methylisothiazolinone (MCI/MI), nickel, and thimerosal. Although highly prevalent, nickel allergy was not significantly higher among the recruits than among the general Israeli population (8). The detection of thimerosal as one of the leading allergens did not surprise us because this agent is a common preservative in Israeli's army fuels and oils. Its high relevance is further discussed in a former study (9), but sensitization due to immunization is a possibility that cannot be completely neglected.

The high prevalence of MCI/MI allergy was alarming: the rate of MCI/MI allergy was reported to be declining since the 1980s and stable in the past decade (10), thanks to legislation restricting the upper limit of the substance concentration to 15 p.p.m. (11). According to the literature, MCI/MI is an allergen in cosmetics and industry and not in mechanics (10, 12). We found the MCI/MI concentration to be very high (300 p.p.m.) in military fuel where it is used as a preservative for long-term storage in fuel depots. This high concentration together with intensive exposure and lack of appropriate preventive measures underlies the unexpected high prevalence of allergic contact dermatitis in our cohort. Our findings show that fuels and oils are considerable allergens and not mainly irritants as suggested in previous military reports (13, 14). Clearly, the elimination or substitution of harmful substances by less noxious materials suitable for the task (15) could help reduce the high rate of OCD among maintenance workers.

Until recently, atopics were considered to be at lower risk for allergic contact dermatitis. Recent studies (16, 17) indicate that there is an equal prevalence of allergic contact dermatitis in atopic dermatitis patients and nonatopics. Our study shows that atopy is a significant risk factor for developing occupational allergic contact dermatitis. Few studies (18, 19) show higher prevalence of contact

sensitization to preservatives in topical products among atopic dermatitis patients. Damaged barrier further harmed by intensive manual work along with former sensitization to ingredients of skin care medications may increase the risk for allergic contact dermatitis, especially hand eczema.

The high atopy rate among conscripts in both the maintenance and clerical groups underscores the need to identify subjects at risk for developing dermatitis upon contact with allergens. Atopy is a well-established risk factor for irritant contact dermatitis (20, 21), and screening for this factor during the assignment of new recruits to jobs they will perform for 2–3 years of compulsory military service could conceivably lower the incidence of the condition. Such screening, together with the elimination of potentially hazardous materials, should reduce the high rate of contact dermatitis. The consequences for efficient operation of the military and preservation of the health of the individual are obvious. Further research is required to determine whether lowering MCI/MI concentration will lead to lower rates of contact dermatitis in this population.

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