

## Dermatology in the military field: What physicians should know?

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### Abstract

In the civilian dermatological setting, the top 5 skin diseases usually seen are eczema/dermatitis, acne, benign skin tumors, viral infections and pigmentary disorders. In comparison, the top 5 skin conditions encountered in the military sector are usually fungal infections, eczema/dermatitis, insect bite reactions, bacterial infections and acne. This is not surprising as military personnel, due to the special environment and vocations they are in, are prone to getting eczema as heat, sweating and wearing of the military uniform aggravate the condition. Fungal infections are common in those who wear the army boots. Insect bite reactions are not an uncommon sight among those who have to go to the jungle regularly for outfield training. Grass allergy or intolerance, contact dermatitis or acneiform eruption due to the application of military camouflage cream on the face, contact dermatitis to insect repellents, and military uniform allergy and intolerance are amongst the commonest dermatological problems encountered in the military field, and physicians should recognize them, investigate and manage these problems accordingly. Lastly, a diagnosis not to be missed in the military field is cutaneous melioidosis, especially when a military personnel presents with a non-healing ulcer.

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**Key words:** Dermatology; Skin diseases; Military

**Core tip:** In the civilian dermatological setting, the top 5 skin diseases usually seen are eczema/dermatitis, acne, benign skin tumors, viral infections and pigmentary disorders. In comparison, the top 5 skin conditions encountered in the military sector are usually fungal infections, eczema/dermatitis, insect bite reactions, bacterial infections and acne. This is not surprising as military personnel, due to the special environment and vocations they are in, are prone to getting eczema as heat, sweating and wearing of the military uniform aggravate the condition. Fungal infections are common in those who wear the army boots. Insect bite reactions are not an uncommon sight among those who have to go to the jungle regularly for outfield training. Grass allergy or intolerance, contact dermatitis or acneiform eruption due to the application of military camouflage cream on the face, contact dermatitis to insect repellents, and military uniform allergy and intolerance are amongst the commonest dermatological problems encountered in the military field, and physicians should recognize them, investigate and manage these problems accordingly. Lastly, a diagnosis not to be missed in the military field is cutaneous melioidosis, especially when a military personnel presents with a non-healing ulcer.

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### INTRODUCTION

In the year 2012, the most common top 5 dermatoses seen at the tertiary dermatological center, the department of dermatology, National Skin Center (NSC), Singapore were eczema/dermatitis, acne, benign skin tumors, viral

**Table 1 Top 5 skin diseases seen in the civilian and military dermatology patients**

Skin disease	Civilian <sup>1</sup>	Skin disease	Military <sup>1</sup>
Eczema/dermatitis	24%	Fungal infections	28%
Acne	12%	Eczema/dermatitis	20%
Benign skin tumors	8%	Insect bite reactions	7%
Viral infections	7%	Bacterial infections	6%
Pigmentary disorders	6%	Acne	5%
Total	57%	Total	66%

<sup>1</sup>NOTE: % refers to proportion of all skin diseases seen in each category of patients.

infections and pigmentary disorders. In contrast, the top 5 skin conditions encountered in the military sector, the Singapore Armed Forces (SAF) during the same period were fungal infections, eczema/dermatitis, insect bite reactions, bacterial infections and acne. The proportions of civilian and military top 5 skin diseases are illustrated in Table 1. This is not surprising as military personnel, due to the special environment and vocations they are in, are prone to getting eczema as heat, sweating and wearing of the military uniform aggravate the condition. Fungal infections are common in those who wear the army boots. Insect bite reactions are not an uncommon sight among those who have to go to the jungle regularly for outfield training.

In one study analyzing medical conditions that affected the Australian troops deployed for peacekeeping missions in East Timor from 1999-2000, it was found that as high as 25% of all medical conditions seen were dermatologically related<sup>[1]</sup>. Infections (bacterial, viral and fungal) alone accounted for more than 50% of all skin conditions seen during that time.

## OCCUPATIONAL DERMATOSES IN THE MILITARY

There was a study done looking at the occupational skin diseases in national servicemen and military personnel in Singapore from 1989 to 1999<sup>[2]</sup>. A total of 1059 patients were diagnosed to have occupational skin diseases at NSC, out of which 77 (7.3%) were national servicemen and regulars. Personnel included 44 from the Army (57%), 16 from Air Force (21%), 7 from Navy (9%), 6 from Civil Defense (8%) and 4 from Police Force (5%). The most common vocations associated with occupational skin diseases were vehicle repairs/maintenance (48%) and food handling (19%).

Irritant contact dermatitis accounted for 61 (80%) cases, allergic contact dermatitis 10 (13%) cases and contact urticaria 4 (5%) cases. The most common irritants were oil/grease (66%), wet work (23%) and solvents (18%). Other irritants found included acids/alkalis (lime burns in a Civil Defense serviceman), cement (in a Civil Defense serviceman), coolant (in an Army mechanic), uniform dye, fiber glass (in an Army technician), food (papaya in an Army cook), friction, pesticide (in an Army hygiene as-

sistant) and resin (in an Air Force aircraft technician).

The most common allergens were food (40%) and chromate in cement (20%). One Army cook was patch tested positive to garlic, and 3 other cooks had positive prick tests to prawns, chicken, fish, squid and salted vegetables. Other allergens observed included nickel (in a Police Force personnel's uniform buttons), epoxy (in an Air Force flying instructor's mask), grease and kerosene. In conclusion, irritant contact dermatitis was found to be much more common than allergic contact dermatitis and contact urticaria in military personnel, outnumbering by 4.4:1.

## GRASS ALLERGY

It is not uncommon to see military personnel who regularly go for outfield training complaining of itch and rash appearing after contact with grass. The difficulty on the physician's part is to determine whether this is truly grass allergy or malingering. There are 2 studies done locally which attempted to address this issue.

The first is a study looking at 23 military personnel referred to the contact clinic at NSC for the investigation of grass allergy from 1989-1990<sup>[3]</sup>. As *Axonopus compressus* (cow grass) is the most common grass species found locally in the training field, patch test was done to standard series and *Axonopus compressus* as whole plant (leaves, flowers and stem) and prick test to the crushed grass was also performed. Twenty controls were also prick and patch tested to grass as well.

It was found that only 8 (35%) were atopic and the majority 19 (83%) did not present with any skin rash in the clinic. Prick test was positive to the grass in only 2 (9%) patients and patch test was positive in 3 (13%), making a total of 5 (22%) who were tested positive to prick/patch tests. All controls were tested negative to prick and patch tests.

Grasses, grains (maize, oats, rice), sugar cane and bamboo belong to the *Gramineae* family. Contact dermatitis to grasses is mainly due to mechanical irritation. However, the importance of grass testing in military personnel is really 2-fold. Firstly, it is potentially medico-legal as dermatologists need to certify a patient fitness for field training. Secondly, it is vital to determine whether the reaction is truly allergic, or just irritant, or the personnel is malingering. It is really not possible to predict which patient would give a positive reaction to prick or patch test based on history and physical examination. This study also shows that a history of atopy does not increase the chance of positive prick or patch test.

In conclusion, grass allergy is mostly an irritant contact dermatitis and atopic patients are not more likely to get it. Only a minority of patients are truly allergic to grass. But as only 1 grass species was utilized in testing, a "grass mix" would be more appropriate.

Subsequently, another study analyzing grass allergy was published, this time utilizing a total of 6 common local grass species (found in lawn and training field) instead

of just 1 for patch test<sup>[4]</sup>. Out of 46 patients who were investigated for grass allergy, 5 were tested positive (11%) to the various grass species in different combinations.

However, the real problem with grass testing is that a negative test reaction does not totally exclude a true allergy to grass as some patients might have been allergic to grass species that were not tested. Besides, contact allergy to non-grass plants should be considered in patients who did not react to grass. Plants such as Compositae (Asteraceae), for instance *Vernonia cinerea*, *Emilia sonchifolia*, *Mikania cordata* and *Mikania micrantha* are also found in this region. Other phytophotodermatoses and Type I reaction to pollens could also cause symptoms as well.

Patients who are grass-tested negative should probably be more appropriately labeled as having grass intolerance than allergy.

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## MILITARY CAMOUFLAGE

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A 20-year-old Chinese army recruit was referred in 1999 for rashes on 2 occasions after applying camouflage with camouflage stick<sup>[5]</sup>. Pruritic vesicular eruption over the neck, chin, face and hands appeared 1 d after applying the camouflage, associated with eyelid swelling. The rash lasted 3 to 4 d. Diagnosis of an allergic contact dermatitis to the military camouflage was made and patch test was performed to the standard series, camouflage stick and suspected substances in it, including ricinoleic acid.

A 2+ reaction was observed for both the camouflage stick and ricinoleic acid (30% in petrolatum). The main component of the camouflage stick was found to be castor oil (47.1% w/w). Other ingredients were iron oxide (black, red, yellow, green pigments), chromium oxide (green), beeswax, distilled oleyl alcohol, ozokerite wax, carnauba wax and 2-bromo-2-nitropropane-1,3-diol. Ricinoleic acid is the main constituent of castor oil, extracted from seeds of the castor oil plant *Ricinus communis*. It is also commonly found in lipsticks and make-up remover.

However, the current camouflage cream has totally different ingredients, including water, mineral oil, talc, propylene glycol, glyceryl stearate, magnesium aluminium silicate, stearic acid, cetyl alcohol, triethanolamine, kaolin, methylparaben, propylparaben, iron oxide, chromium oxide and titanium dioxide. It appears to be less sensitizing and less likely to cause an allergic contact dermatitis.

Nevertheless, it is not uncommon to see military personnel who already suffer from moderate to severe acne vulgaris complaining of a flare of acne when such camouflage cream is being applied to the face during outfield training. This can be due to the irritating and comedogenic effects of the ingredients such as mineral oil in the camouflage cream. But more likely, the flare of acne is a manifestation of an occlusion folliculitis, resulting from thick application of the camouflage cream, which has to be left on the face for a long time throughout the outfield exercise. It is analogous to acne cosmetica when comedogenic cosmetics are being applied to the face; when camouflage cream causes acne, the condition is probably

more appropriately called “acne camouflageca”.

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## INSECT REPELLENT

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The military insect repellent contains DEET (N,N-diethyl-M-toluamide, 75% w/w) in an inert gel base. It commonly gives a hot, burning sensation when applied to the skin. An irritant contact dermatitis is most often associated with the use of such insect repellent, but contact urticaria has been reported as well. Other adverse effects are erythema, blistering and skin necrosis. Neurotoxicity and cardiotoxicity have been reported as well when a large amount is applied.

A survey carried out on soldiers in SAF studying the perception, use and acceptability of the insect repellent showed that although over 80% of the servicemen knew the proper use of the insect repellent and brought along the army-issued repellent in the field, less than half used this repellent frequently while on exercise<sup>[6]</sup>. Eighty three percent felt that the army repellent was only effective sometimes and that it lasted 4 h or less. Skin irritation was a common side effect when using the repellent. Thus the army-issued insect repellent currently used is not totally acceptable to the servicemen.

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## UNIFORM ALLERGY

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Many military personnel complain of itch and rash on the body after wearing the Army uniform, which is made of thick, non-porous material. This is most often due to irritation rather than a true allergy—a more appropriate term is probably uniform intolerance. However, the potential allergens include the textile dyes, azo dyes, formaldehyde resins and chromate. Purpuric contact dermatitis to the Navy blue uniform has been reported as well.

Two cases with allergic contact dermatitis from chromate in green military uniform sweater and pants have been reported<sup>[7]</sup>. Chemical analysis showed that water-soluble chromate was released from the uniform even after repeated washings.

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## FUNGAL FOOT INFECTIONS

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In a study carried out among Algerian military personnel, it was found that 18.3% of the patients who attended the department of dermatology of the Army Central Hospital had fungal foot infections, with tinea pedis and *Candida* intertrigo being the most common forms (68%)<sup>[8]</sup>. *Trichophyton rubrum* (20.9%) and *Candida parapsilosis* (18.7%) were shown to be the major causal agents isolated.

When subjects were grouped according to military rank, fungal foot infections were prevalent in troop soldiers; when grouped according to years of service in the army, the infections were frequent in military recruits.

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## CUTANEOUS MELIOIDOSIS

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Melioidosis is a rare tropical disease caused by infec-

tion with the bacterium *Burkholderia pseudomallei*, which is widely distributed in water and soil of the tropics, especially in rice paddies<sup>[9]</sup>. Humans become infected by contact (*via* direct or cutaneous inoculation) with contaminated water or soil, presenting with a non-healing ulcer or ulcerated plaque, also known as cutaneous melioidosis. Inhalation or ingestion of contaminated materials occurs less frequently. Melioidosis occurs endemically in parts of Southeast Asia, such as Malaysia, Thailand, Vietnam and Myanmar, Northern Australia, Africa, Central and South America.

The disease may be localized or disseminated with multi-organ involvement. Any organ may be affected especially the lungs (causing acute fulminant pneumonia or an indolent cavitary disease), skin and subcutaneous tissues, bones and joints, liver, spleen, kidneys and brain. Subacute disease can potentially progress to cause severe systemic multi-organ involvement, leading to severe morbidity and mortality.

Between 1987 and 1994, 23 cases of melioidosis were diagnosed in persons serving in the SAF<sup>[10]</sup>. There were 4 deaths resulting from complications of the infection. Unlike the situation in the general population, where the affected are mainly the elderly with underlying illness, the majority of cases in the SAF were otherwise fit and healthy young servicemen. Serological surveys have shown the prevalence of the infection in Singapore to be 0.2% in the military as well as civilian population. As physical contact with soil is an unavoidable part of military training, military personnel continue to be at risk of exposure to this soil-related disease.

Therefore, in any military personnel who has gone for outfield training and complains of a non-healing ulcer or ulcerated plaque, cutaneous melioidosis must be borne in mind as a differential diagnosis.

## CONCLUSION

This paper aims to offer readers insights to aid understanding of the development and impact of dermatological diseases in a military population in a tropical environment. Compliance to treatment can be a practical

issue to deal with as many military personnel are too busy involved in various military exercises and outfield training, resulting in suboptimal response to treatment. This is certainly an important point to be borne in mind whenever a clinician encounters military personnel seeking treatment. Understanding differences between the civilian and military populations of patients would allow clinicians to better recognize them, investigate and manage these problems accordingly and appropriately with due empathy.

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