

Allergic contact dermatitis from grasses

D. KOH¹, C. L. GOH², H. T. W. TAN³, S. K. NG² AND W. K. WONG²

¹Department of Community, Occupational and Family Medicine, The National University of Singapore ²National Skin Centre, Singapore

³School of Biological Sciences, The National University of Singapore

This study attempts to demonstrate the existence of allergic contact dermatitis from grass, and to develop a patch test series to screen patients with grass intolerance. 6 common grass species from lawns and military training areas were collected. Solvent extracts of polar, non-polar and volatile fractions were prepared and used for patch testing in 20 control subjects and 46 patients with a history of grass intolerance. The 20 controls had negative responses to patch testing. 5 out of 46 patients had positive patch tests to *Axonopus compressus* (carpet grass), *Ischaemum muticum* (sea-shore centipede grass), *Imperata cylindrica* (alang), *Panicum maximum* (Guinea grass) and *Pennisetum purpureum* (elephant grass). Reactions to the non-polar fraction for all 5 species were noted. This study demonstrates the existence of allergic contact dermatitis from various common species of grass. In our series, this is seen in 11% of those with a history of grass intolerance.

Key words: grass; patch testing technique; allergic contact dermatitis; plant extracts; plants; occupational; military training; irritant contact dermatitis. © Munksgaard, 1997.

Accepted for publication 20 March 1997

In Singapore, about 150 patients complaining of rashes after contact with grass (grass intolerance) are seen annually at the National Skin Centre. These patients are usually young men who are about to begin, or who are already undergoing, military training. They typically complain of rashes on the limbs and uncovered areas of the body, after contact with grass several hours beforehand, which may persist for several days. Most report itchy, patchy or streaky, red non-bullous dermatoses. The assessment of such cases is fraught with difficulty (1), but it is important for a diagnosis to be made in order to determine suitability for military field training. Very little information on grass intolerance is currently available in the literature. No reference to grass dermatitis is made in the standard dermatological textbooks (2, 3), and only brief mention of the subject appears in specialized texts on botanical dermatology (4, 5).

In the testing of patients with grass intolerance, 2 fundamental questions need to be considered. Firstly, what is the exposure? Most patients cannot specify the type of grass with which they are in contact. There are numerous species of grasses, and grasses encountered in lawns differ from grasses present in military training areas. Secondly, what is the mechanism of action in grass intoler-

ance? Many skin reactions to grass are due to skin irritation, but a Type IV allergic reaction may also be the cause. A distinction between irritant and allergic mechanisms is necessary, as it has implications for patient management and fitness for work assessments.

This study attempts to demonstrate the existence of allergic contact dermatitis from grass, and to develop a standardized patch test series to screen patients with grass intolerance for this condition.

Materials and Methods

We identified the common and important species of grass in this region (Table 1) for inclusion in the patch test series. 3 were lawn species and 3 were military training area grasses (6). Samples of each species were identified and vouched for by the botanist (HTWT) in the group. Grasses were selected from areas that were as free as possible from pesticides, fertilizers or other chemicals. Only those parts of the grasses above ground, which have the potential to come into contact with human skin, were collected. The specimens collected were rigorously cleaned of other stray species and cross-contaminants.

Table 1. Grass species used for patch testing

Lawn species (and their geographic distribution)

1. *Axonopus compressus* (Sw.) P.Beauv. (carpet grass)
(Caribbean, tropical America and introduced to most tropical and subtropical countries as a lawn grass)
2. *Paspalum conjugatum* Berg. (cow grass)
(throughout old-world tropics)
3. *Ischaemum muticum* L. (seashore centipede grass)
(Sri Lanka, India, Myanmar, Thailand, Indonesia, Philippines to Polynesia)

Training area species (and their geographic distribution)

1. *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) C. E. Hubb. ex C. E. Hubb. & R. E. Vaughan (lalang)
(Asian tropics, Africa to Australia)
2. *Panicum maximum* Jacq. (Guinea grass)
(Africa, India and many tropical countries; introduced throughout the tropics because it is an excellent fodder grass)
3. *Pennisetum purpureum* Schumach. (elephant grass)
(Africa, Sri Lanka, Myanmar; introduced to many tropical countries for fodder)

Solvent extraction of non-volatile polar and non-polar fractions as well as volatile fractions of the dried (at 45°C) and ground plant material was performed according to the method described by Lovell (7). The extracts were then used for patch testing for 2 days using Finn Chambers. Patch test readings were performed by a dermatologist (SKN or WKW) with expertise in contact dermatitis, and graded according to the scale recommended by the International Contact Dermatitis Research Group (8). All patients were adults who gave their informed consent.

Initially, the grass extracts were patch tested at concentrations of 5%, 10% and 100% in control patients to rule out irritant reactions and to determine the optimal concentration for patch testing. All patch testing was subsequently done with the grass extracts as is. 3 groups of patients were tested. The 1st group comprised 20 persons with no history of grass intolerance, thus providing a control group to demonstrate that the patch test material was non-irritant to the skin. The 2nd and 3rd groups comprised 25 and 21 patients with a history of grass intolerance. Patch test readings were done at 2 and 4 days for group 2, and at 3 days for the 3rd group. The reason for this difference was that, while the conventional recommendation is for readings at 2 and 4 days (9), a single patch test reading is usually performed at 3 days for patients at the National Skin Centre.

Results*Group no. 1*

The 20 control patients had negative patch test readings at 2 and 4 days. 2 of the patients in this group had a history of bronchial asthma.

Group no. 2

Of the 25 patients with a history of grass intolerance in the 2nd group, 3 had positive patch test reactions at 2 and 4 days to *Axonopus compressus*, *Imperata cylindrica*, and *Ischaemum muticum*.

The patient details (case nos. 1–3) are listed in Table 2.

Group no. 3

21 patients with a history of grass intolerance had 3-day patch test readings. 1 had a positive patch test reaction to *Pennisetum purpureum*, and 1 reacted to *Imperata cylindrica*, *Panicum maximum* and *Pennisetum purpureum* (case nos. 4–5 in Table 2).

Table 2. Case details of patients with positive patch test reactions to grasses

Case no. 1. A 19-year-old male recruit with a past history of atopic dermatitis, undergoing basic military training. Referred by military doctor for grass intolerance. Complaint: rashes over back and lower limbs which appear 1 day after contact with grass during training. Rashes persist for several days.

Patch test (4 days): +reaction to *Axonopus compressus* (non-polar fraction).

Case no. 2. A 42-year-old non-atopic female clerical officer. Had a past history of skin rashes after contact with grasses, and thus avoided grass contact as far as possible. Referred by her dermatologist, who initially saw her for facial allergic contact dermatitis from fragrance mix and cosmetics.

Patch test (4 days): +reaction to *Imperata cylindrica* (volatile fraction).

Case no. 3. A 21-year-old male combat engineer with a past history of bronchial asthma, who had undergone 11 months of military training. Referred by camp medical officer. Complaint: itch and rashes in areas in contact with grass since the age of 14 years. Rashes appear as soon as 15 min after contact, and persist for several hours. He was found to have dermographism.

Patch test (4 days): +reaction to *Ischaemum muticum* (all fractions).

Case no. 4. A 17-year-old non-atopic male student. Self referred. Complaint: rashes on the limbs after contact with grass since the age of 12 years. Rashes appear a day after contact with grass, and last for several days. He had taken up rugby 10 months ago, but stopped 2 months ago because of the rashes.

Patch test (3 days): +reaction to *Pennisetum purpureum* (non-polar fraction).

Case no. 5. A 19-year-old male soldier with a past history of allergic rhinitis, who had completed his basic military training and was currently in an elite infantry unit. Referred by camp medical officer. Complaint: rashes of forearms and lower limbs after contact with grass. Rashes appear 12 h after contact with grass, and last up to 1 week.

Patch test (3 days): +reaction to *Imperata cylindrica* (non-polar fraction), *Panicum maximum* and *Pennisetum purpureum* (non-polar and polar fractions).

Discussion

Because of compulsory military service, when enforced contact with plants and grasses occurs during field training, the number of cases of grass intolerance referred for assessment has been rising in Singapore. Previously, the assessment of such cases was difficult, as a reliable means of assessment had yet to be developed in order to identify persons truly allergic to grass, and who thus should be excused from further grass contact. The results of this study demonstrate the existence of true allergic contact dermatitis from at least 5 common species of grass. Patients reacted to the non-polar extract of all 5 species, and the polar and volatile extracts of 3 and 2 species respectively. 1 patient was allergic to 3 grass species.

While 5 out of 46 patients with a history of grass intolerance showed allergic contact responses to grass, the true proportion is likely to be higher. This is because only 6 common species were used in the test series. Some patients might have been allergic to grass species that were not tested. Furthermore, contact allergy to non-grass plants needs to also be considered in the patients who did not react to grass. Plants such as Compositae (Asteraceae), for example *Vernonia cinerea*, *Emilia sonchifolia*, *Mikania cordata* and *Mikania micrantha*, are also found in this region. Other phytophotodermatoses and Type I reactions to pollens could also cause symptoms^(4,5).

This study has demonstrated that contact reactions to grass are not only irritant but can also be allergic. In our series of 46 patients, allergic contact dermatitis occurred from various species of grasses and was seen in 5 (11%) of those with a history of grass intolerance. The diagnosis of allergic contact dermatitis from grass can be made with standardized patch test materials. For convenience, the screening patch test series should consist of grass extracts of the common species found in the relevant geographic area. Patients with grass intolerance, as well as military authorities in charge of such persons, would benefit from a more objective and standardized method of as-

essment. As a follow-up, we intend to identify the specific causative allergens in the grass extracts by various chromatographic methods. This will enable dermatologists to test for contact allergy to grass more accurately.

Acknowledgements

This project was funded by a National University of Singapore grant (RP 3930349). We thank Ms B. Tan, Ms J. Wee, Mr K. S. Chua, Dr. S. C. Foo, and Dr. Y. H. Leow for their assistance in the project.

References

1. Wong, W K, Ng S K, Goh C L. Grass allergy amongst national servicemen in Singapore. *Contact Dermatitis* 1994; 30: 108-10.
2. Burton J L, Ebling F J G. (eds). Champion R H, Rook, Wilkinson, Ebling textbook of dermatology 5th edition. Blackwell Scientific Publications, 1992.
3. Fitzpatrick T B, Eisen A Z, Wolff L, Freedberg I M, Austen K F, (eds). *Dermatology in general medicine* 2nd edition. McGraw Hill Book Co 1979.
4. Mitchell J, Rook A. *Botanical dermatology. Plants and plant products injurious to the skin*. Vancouver Greengrass, 1979: 319-322.
5. Benezra C, Ducombs G, Sell Y, Foussereau J. *Plant contact dermatitis*. BC Decker Inc, 1985: 301-304.
6. Gilliland H B. A revised flora of Malaya: an illustrated systematic account of the Malayan flora, including commonly cultivated plants, vol III. Grasses of Malaya. Botanic Gardens, Singapore, 1971: 132-134, 162-164, 180-182, 187-188. 220-222, 255-257, plates 17a, 20c-d, 24d, 32a-b.
7. Lovell C R. *Plants and the skin*. Oxford Blackwell Scientific Publications, 1993: 101-105.
8. Fregert S. *Manual of contact dermatitis* 2nd edition. Copenhagen: Munksgaard, 1981.
9. Rycroft R J G, Menné T, Frosch P J (eds): *Textbook of contact dermatitis*, 2nd edition. Berlin: Springer Verlag, 1995: 250.

Address:

David Koh
Department of Community,
Occupational and Family Medicine
The National University of Singapore
Lower Kent Ridge Road
Singapore 0511
Republic of Singapore

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.