

Results of a controlled trial of the acaricide Paragerm on *Dermatophagoides* spp. in dwelling houses

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Summary

The effect of Paragerm spray from either a hand pressurized can or from a general room mist device (MCR device) on mattress mite populations was compared with the effect of a control spray. After 1 month a reduction in mite population due to the cleaning procedures was evident in the control treated mattresses; Paragerm treated mattresses had significantly fewer mites, notably those treated with the aerosol can spray, nine out of fifteen of which were mite free. Dissection of the mattresses showed that some mites survive and they could form the nucleus from which reinfestation could occur.

Introduction

The predominant role played by pyroglyphid mites in house dust allergy has led to a search for an effective means of killing these animals in bedding and to prevent their growth.

Hitherto patients have been advised to change, as far as possible, the ecological conditions of their bedrooms, but although it is true that exposure at 60°C (140°F) for 10 min, and to –18°C (about 0°F) for 24 hr will kill the mites, for most people this does not offer a practical means to reduce the domestic mite population.

The most commonly used method which is really effective, as was shown by Cunnington & Gregory (1968), and Hughes & Maunsell (1973), is the cleaning of the mattress with a vacuum cleaner which, if regularly performed, twice a week for instance, effectively reduces the number of mites.

Recently it has been shown (Penaud *et al.* 1973a, b) that Paragerm AK, a non-toxic bactericidal and fungicidal spray, commonly used in French hospitals, killed cultures of *Dermatophagoides* spp. at an acceptable and easily produced concentration, and in 1975 (Penaud *et al.*, 1975) the preliminary results of its clinical use in the bedrooms of patients was reported.

This paper reports the results of a controlled study of Paragerm.

Materials and methods

Paragerm AK is a complex solution composed of ten constituents, mainly balsamic essences associated with various chemical antiseptics (benzoic acid, salol, thymol, terpineol, citrus fruit natural essence, natural essences from *Syringa* and *nardus*, two halogenized phenyl alcohols and light liquid paraffin). It is anhydrous, very volatile and has bactericidal and fungicidal properties. It is used in hospitals by spraying with a special portable device called MCR (average emission output 10 ml/min; dish content: 1.5 l; with meter-bell from 0 to 30 min; height: 42 cm; width: 30 cm; load: 2–8 kg). The duration of the spray process depends upon the volume of the room since the flow of the device is fixed (10 ml/min).

It is also presented in aerosol pressurized cans for use in private dwellings.

Bedrooms, from which mattress sampling had been shown to be positive, were treated on two consecutive days in the following manner: the bed was stripped and after careful cleaning of the closed room with a vacuum cleaner, including the two sides of the mattress, Paragerm or control aerosol was applied either with the MCR (6 sec per m³ of room) or with an aerosol applicator pointed toward the mattress from a distance of about 20 cm. The room was kept closed for 3 hr. The following day, the procedure was repeated with the mattress turned on its opposite surface. Three hours after each treatment the room was opened and the mattress vacuum cleaned again. One month later, further samples of house dust were obtained by brushing the mattress for a quantitative study of the remaining house dust mite population.

The control material was made by the Paragerm laboratory and applied with the active agent in a random double blind fashion.

Patient tolerance

Vital capacity and FEV₁ were measured with a vitalograph in a group of thirty asthmatic adults before the patients entered a small room, 40 m³, which had been filled with an aerosol of Paragerm. On twenty-five occasions the MCR apparatus working for 4 min (the output of MCR being of 10 ml/min) was used to generate the spray and on five the hand Paragerm spray was used (three 0.5 min sprays). Each patient was exposed for 8 min in the closed chamber. Immediately after the exposure, the patient was auscultated and the functional measurements were made again. In five patients they were repeated twice an hour, for 4 hr, to assess the absence of delayed effect of the aerosol on the bronchi.

Results

The results obtained using Paragerm and control solution in thirty bedrooms are summarized in Tables 1 and 2.

Table 1 refers to treatment with spray cases. It will be noted that there was a noticeable reduction of the mite population, following treatment by control; but after Paragerm treatment nine out of fifteen mattresses were rendered mite free; striking reductions were observed in a further four and reductions similar to those seen in the control group were noted in two cases.

Table 2 refers to treatment with the MCR device. Falls in the mite population in the control group also occurred, suggesting once more an effect of the cleaning procedures. The results of treatments, although showing a significant improvement over control were not so striking as the aerosol can treatment shown Table 1. Nevertheless three of the fifteen beds were mite free and reductions of more than 80% were noted in a further seven.

Table 1. Effects on *Dermatophagoides* of Paragerm AK (pressurized) and of a control with placebo

Before Paragerm	One month after Paragerm	Variation (%)	Before placebo	One month after placebo	Variation (%)
15	0	-100	90	60	-33
58	0	-100	120	142	+18
25	0	-100	53	32	-40
7	5	-28	8	6	-25
10	2	-80	87	62	-29
60	10	-83	54	39	-28
116	80	-31	106	77	-27
120	0	-100	28	21	-25
180	0	-100	145	96	-34
70	0	-100	97	65	-33
124	36	-70	14	9	-36
11	0	-100	70	49	-30
32	0	-100	42	28	-33
60	6	-90	120	126	+5
35	0	-100	84	58	-31

The data give the number of acari per 100 mg of mattress dust.

Table 2. Effects on *Dermatophagoides* of Paragerm AK (MCR) and of a control with placebo

Before Paragerm	One month after Paragerm	Variation (%)	Before placebo	One month after placebo	Variation (%)
85	26	-69	145	103	-29
25	1	-96	53	30	-43
150	20	-87	88	61	-31
90	30	-67	119	73	-39
75	53	-29	95	78	-18
30	0	-100	60	75	+25
154	27	-82	36	22	-39
92	35	-62	19	12	-37
100	30	-70	138	96	-30
81	0	-100	27	15	-44
76	6	-92	175	110	-37
40	26	-35	8	5	-38
5	0	-100	100	81	-19
16	4	-75	77	49	-36
96	80	-17	48	30	-38

The data give the number of acari per 100 mg of mattress dust.

Patient tolerance

The results obtained appear in Table 3. No significant changes appeared after an 8-min exposure to the aerosol.

Discussion

Leysen *et al.* (1974), who studied thirty pesticides against *Dermatophagoides pteronyss-*

Table 3. Mean values in twenty-five asthmatic patients exposed for 8 min to Paragerm aerosol

	CV before	CV after	FEV ₁ before	FEV ₁ after
$\bar{x}$	3.616	3.606	2.490	2.456
s.d.	1.007	0.990	0.727	0.747
s.e.	0.200	0.198	0.145	0.149

sinus, obtained complete satisfaction only with Lindane (0.5–1%) but its toxicity prohibits its use in the patients' houses.

The mixture Paragerm is not toxic (Broussy, 1972) and has been used for years as a disinfectant against parasites, bacteria and moulds in French hospital wards and rooms without any adverse effect other than a strong odour. As we have shown it is not harmful in asthma.

Our results confirm that cleaning the room and mattress with a vacuum cleaner causes a fall in mite population, even a month after treatment, although Hughes & Maunsell (1973) obtained even better results. They noticed, as did the author, that vacuum cleaning is not effective in removing eggs.

The results obtained with the pressurized hand spray were better than with the MCR which may be due to the fact that the MCR causes a general diffusion of the aerosol into the room, whereas the spray can be pointed directly at the mattress, the main refuge of the mites. These results are better than those reported by the authors in 1975, but in the present study the operation was conducted over 2 days.

The authors often found living mites in the samples before treatment, but after treatment of the mattress with the active product reexamination showed only dead mites. Occasionally we found live octopod nymphs which may be due to the fact that Paragerm is not an ovicide. As the eggs hatch 6–10 days after being laid a third disinfection would probably be worthwhile 10 days or 2 weeks after the second.

The authors have investigated this possibility by studying an old woollen mattress, the surface of which was rich in mites (180/100 mg of dust). It was treated by the method indicated above. Eight days after treatment there were no adults but young octopod nymphs were present. Eight days following a second treatment neither adults nor nymphs were found, and the mattress remained mite free a month later.

The authors believe that these results are due to the Paragerm even though this particular mattress was not in use, as Hughes & Maunsell have shown that intermittent use of the mattress does not harm the mite population. This mattress, the surface of which was mite free, was then sectioned. Living mites were still found in the outer wall of the mattress, and in the superficial part of the woollen stuffing, which could act as a nucleus for extensive reinfestation. A rubber mattress would probably harbour fewer residual mites.

The results suggest that vacuum cleaning of room and mattress, combined with spraying with Paragerm is effective in reducing the mite population of infected mattress and does not have any adverse effect on asthmatic patients.

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