ALLERGENIC MITES ON MINERAL WALLS AND IN TEXTILES

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Abstract—In the home environment allergenic mites are well known inhabitants of textiles and food. In humid dwellings mites and moulds are found on walls.

In autumn (1990) textiles and wall surfaces were sampled in eight rooms of four dwellings. The same was done in winter (1990–1991), in seven rooms. Sampling was done with an intensity of 1 minutes vacuuming per square meter surface area.

In autumn as well as in winter the total number of mites from textiles and walls were statistically correlated. Spearman rank correlation coefficient being 0.731 ($0.05 < p < 0.025$) in autumn, and 0.667 ($0.10 < p < 0.05$) in winter. In both periods a correlation between the number of house dust mites (HDM) from textiles and walls was also present (in autumn: $p < 0.05$, and in winter: $p < 0.025$). For both periods no association was found between the number of non-pyroglyphid mites from textiles and wall surfaces. The number of mites per square meter surface area was significantly lower on walls than in textiles.

The economical and health relevance of mites on walls is yet not clear. However, in the Netherlands about 20% of the housing stock has problems with dampness and moulds, which can lead to development of storage and fungal mites. Therefore, in humid dwellings control of allergenic domestic mites should include mites from walls.

INTRODUCTION

In the home-environment allergenic mites are well known inhabitants of home-textiles and food. In Europe the house dust mite, *Dermatophagoides pteronyssinus*, is the main allergen producer of allergens which may cause allergic inflictions, such as asthma (Platts-Mills and de Weck, 1989). Home-textiles, especially mattresses, show favourable conditions for mite development regarding humidity, temperature and food (van Bronswijk, 1981).

In the home-environment, damp walls are known as a susceptible substrate for mould growth (Grant, 1989), but are less known as a niche for mites. However, in 1934 it was already reported that the storage mite *Glycyphagus domesticus* occurred on mouldy wall paper (Hora, 1934). Recently, it has been found that in addition to storage mites, also house dust mites (Pyroglyphidae), fungal mites (tarsonemids) and predatory mites from the Cheyletidae family are present in wall dust (Kort, 1990). Other arthropods, like dust lice, were found next to a variety of mould species (Kort, 1989). All these organisms may also be present in house dust. They are known allergen producers, whose control may lead to a reduction in allergic symptoms (Colloff et al., 1992).

Therefore, we examined the interrelation between wall surfaces and home-textiles, in order to assess the importance of walls as a part of environmental control programmes.

MATERIAL AND METHODS

In autumn (1990), 17 home-textiles and 30 walls were sampled in eight spaces, of four different dwellings in the Netherlands. Sampling was done with an intensity of 1 minute vacuuming per square meter surface area with a Hoover S 2222 (550 Watts, Hayesgate, U.K.). In winter (1990–1991), the same sampling procedures were repeated in seven spaces of four dwellings (24 home-textiles and 26 walls), of which three were also sampled in autumn. Another dwelling was chosen, because one of the dwellers moved and did not want to participate any more in the study.

After sampling took place dust samples were stored at room temperature prior to analysis. Analyses for arthropods were done with the flotation technique according to van Bronswijk, 1981. Mites found were arranged in the following categories: house dust mites (Pyroglyphidae), storage mites (Acaridae & Glycyphagidae), Tarsonemoidea, Cheyletidae and other mites, which included oribatids, other Prostigmata and Mesostigmata. Arthropods found are expressed as arthropods per square meter. The maxima and medians are also given per 0.1 gram dust, because wall-dust samples were small ranging from 10 mg to 200 mg (median = 40 mg), and for comparison to other studies.

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Guanine amount was estimated semi-quantitatively in the samples by use of Acarex® (Werner & Mertz, Mainz, Germany).

Numbers of arthropods found on different walls in one single room were added to obtain the numbers of arthropods found on all walls in that particular room. The same was done with arthropods found in different home-textiles.

Statistical analysis was done by use of the Spearman rank correlation test for association of organisms in textile and on walls. The Mann Withney U-test was used to compute the difference between arthropods on walls and in textiles, and between arthropods found in autumn and in winter (Siegel, 1956). The confidence limit was set at 5%.

RESULTS

In autumn, the total number of mites/m^2 ranged from 0–6, median = 2 for walls (maximum = 40 per 0.1 g, median = 5 per 0.1 g) to 0.1–311 for textiles, median = 38 (maximum = 183 per 0.1 g, median = 12 per 0.1 g) (Figure 1). In winter, total mite numbers/m^2 from textiles ranged from 18 to 104, median = 39 (maximum = 50 per 0.1 g, median = 26 per 0.1 g). On walls however, 0–4 mite numbers/m^2, median = 0.2 were found (maximum = 40 per 0.1 g, median = 5 per 0.1 g) (Figure 1). For both walls and textiles no significant difference is found between mites collected in autumn and in winter ($p > 0.05$), with the exception of the group of 'other mites' found on walls. Also no significant difference is found between mites collected in autumn and in winter, when only those spaces were compared, which were vacuumed both in autumn and winter. In winter significant less 'other mites' were found in wall dust. This was also the case for dust lice.

In autumn, in six of the eight spaces, textile-dust samples were above the proposed risk value of 0.6 mg guanine per gram (Acarex $1 \geq$) for sensitization (Platts-Mills and de Weck, 1989). In winter, in five of the seven vacuumed spaces, home-textile samples were above the risk value. In both seasons none of the wall dust samples were above the proposed risk value.

In autumn as well as in winter the total number of mites from textiles and walls, were statistically correlated. Spearman rank correlation coefficient being 0.731 ($0.05 < p < 0.025$) in autumn, and 0.667 ($0.10 < p < 0.05$) in winter. However, the number of mites per square meter of surface area was significantly lower on walls than in textiles ($p < 0.05$) (Figure 1). In both periods a correlation between the number of house dust mites (HDM) from textiles and walls was also present (in autumn: $p < 0.05$ and, in winter: $p < 0.025$). In autumn, storage mites (SM) were found in textile as well as wall dust samples in two rooms only. During winter no SM could be collected from the wall dust. For both periods no association was found between the number of non-pyroglyphid mites from textiles and walls.

DISCUSSION

Within mite categories, the number of mites on walls are not related to those in textiles, with the exception of pyroglyphid mites. However, total mite numbers/m^2 are correlated for walls and textiles, this is probably contributable to the numbers in the category house dust mites only. The mite species found on walls are a reflection of those found in textiles.

In this study mite numbers found on walls are significantly lower than mites found in textiles as expressed in mite numbers/m^2. This is as to be expected, since walls cannot be considered a mite allergen reservoir, as are home-textiles. Although, inner walls may be considered as a potential allergen accumulating surface, at sites with high infestation of mites and fungi. This is comparable to the hot spots known from stored grain (Sinha, 1961). It has been reported that the mite allergen Der f I has been detected in wall wipe samples at a concentration of 6.8 ng per filter (Wood, 1992).

Non-pyroglyphids from walls and textiles were not associated. The presence of non-pyroglyphids and fungi on walls may start as a local problem, when on the wall a moist spot turns into a favourable micro-habitat. Non-pyroglyphids such as storage and fungus eating mites, have been found in adhesive tape samples taken from walls, together with heads and conidia of *Aspergillus* (Kort, 1989). The relationship of pyroglyphid numbers in textiles and those found on walls, is probably due to aerogenic dust and mite transport, caused by domestic activities. It has been reported before, that house dust mites are the most abundant species on walls without visible mould

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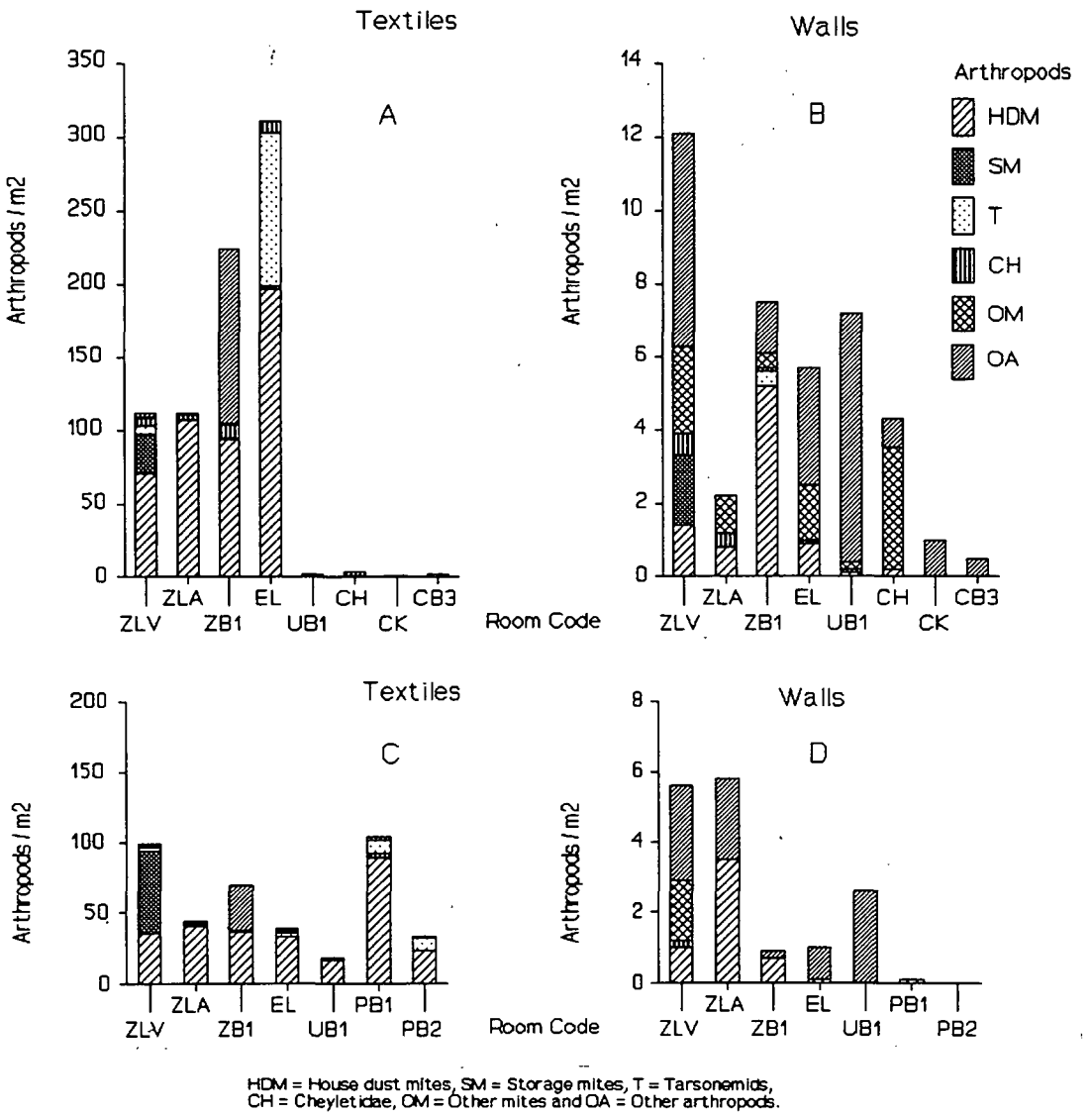

Fig. 1. Mites and other arthropods isolated from textile- and wall dust samples taken in autumn 1990 (A & B) and in winter 1990–1991 (C & D).

growth, in contrast to fungal ridden wall surfaces, on which tarsonemids were the most abundant (Kort, 1990). It appears that on walls house dust mites are allochthonous organisms, whereas non-pyroglyphids are not.

The importance of mites in textile, in the sense of health care, has been acknowledged (Platts-Mills et al., 1992), though the economical and health relevance of mites on walls is yet not clear. However, in the Netherlands about 20% of the housing stock has problems with dampness and moulds (Tammes et al., 1985), and therefore, with storage and fungal mites. It is desirable to include walls in environmental control programs, not only because of the occurrence of moulds, but also because of the occurrence of allergenic domestic mites.

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