

Evaluation of House Dust Mite (*Dermatophagoides farinae* and *D. pteronyssinus*) Reduction Techniques for Stuffed Animals

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ABSTRACT

We studied 54 stuffed animals for the prevalence of house dust mites (*Dermatophagoides farinae* and *D. pteronyssinus*). Potential dust mite reduction techniques of vacuuming and freezing were also evaluated. We determined that the baseline dust mite levels of stuffed animals were insignificant, especially when compared with the bedroom floors.

INTRODUCTION

HOUSE DUST MITES (*D. farinae* and *D. pteronyssinus*) produce allergens that can exacerbate allergic conditions. The second international workshop on dust mite allergens and asthma concluded that 100 mites/g dust can increase allergic sensitization while 500 mites/g dust can increase the risk of acute asthma attacks.⁽¹⁾ Since house dust mites subsist chiefly on human dander and the absorption of atmospheric moisture, stuffed animals (or "teddy bears") are one potential, largely uninvestigated, reservoir for these mites.

In our study we evaluated two potential uncomplicated methods of dust mite reduction techniques that could be used by a family member to lessen the effect of dust mites in the pediatric population. One group of toys was frozen in a household refrigerator freezer for 24 h. A second group was vacuumed with a vacuum cleaner for 2 min. In addition, a control group was obtained in which neither intervention was utilized.

MATERIALS AND METHODS

Fifty-four animals were removed from nine Nashville, TN area homes for 36 h during February 1995. The toys were randomly placed into two intervention groups or one control group. Each home had at least one toy in each of the three groups. Bedroom floor dust samples were also obtained from five of the nine homes.

In the first group, the stuffed animals were placed in the freezer component of a household refrigerator (−20°C) for 24 h. The second group was vacuumed with a household vacuum cleaner (without a dust mite

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trap) for 2 min. In the control group, no intervention was performed after the toys were removed from the homes. Each of the two intervention groups and the control group contained 18 stuffed animals.

After reintroduction into their environment for 4 to 6 days, the stuffed animals were swept with a vacuum equipped with a special dust trap. After collection, the individual dust traps were frozen at -20°C until transfer to Wright State University (L.G.A.) for analysis using standard procedures employed in previous studies.^(2,3) In a subset of the samples, species and sex determination of the mites was undertaken by visual inspection.

RESULTS

In the five bedroom samples, a mean of 496 mites/g dust (range 100 to 1540 mites/g dust) was obtained. The mean mite count of the toys was appreciably lower than the mean mite counts of the control group (13 mites/g dust), frozen group (24 mites/g dust), and vacuumed group (16 mites/g dust). The range for the bears was 0 to 92 mites/g dust. There was no significant difference ($p > 0.05$) between the control group and either of the intervention groups.

Of the mites in which species identification was attempted, immature forms, *D. pteronyssinus*, and *D. farinae* represented 49, 40, and 10% of the population, respectively. No other species of house dust mite such as *Blomia tropicalis* or *Euroglyphus maynei* were collected. Twenty-nine percent of the mites were female and 22% of the mites were male (and the remaining 49% were immature forms).

DISCUSSION

In a study conducted in 30 French daycare nurseries, de Andrade et al.⁽⁴⁾ found that 94% of the soft toys and 100% of the floors had dust mite allergen levels $< 2 \mu\text{g/g}$ dust (corresponding to 100 mites/g dust). However, our toys were obtained from private homes that generally did not implement the dust mite reduction techniques such as noncarpeted floors, synthetic mattress covers, or weekly washing of linens uniformly employed in the French daycare study. Thus the toys were obtained from settings having substantial dust mite levels (mean of 496 mites/g dust). Despite this environment conducive to dust mite populations, the levels of dust mites obtained from the control group of stuffed animals (13 mites/g dust) and intervention groups (20 mites/g dust) were substantially below the concentration of dust mites needed for allergic sensitization (100 mites/g dust) or induction of asthma exacerbations (500 mites/g dust).⁽¹⁾

Species identification revealed that of the mature mites only *D. pteronyssinus* and *D. farinae* were found on the stuffed animals or in Nashville, TN bedrooms. In our sampling, *D. pteronyssinus* was four times more prevalent than *D. farinae*. *D. pteronyssinus* is generally more prevalent than *D. farinae* in the warm, humid climates of the United States southeast.⁽³⁾ *D. pteronyssinus* natural development is directly dependent on temperature. Arlian et al.⁽⁵⁾ demonstrated that at 16°C , maturation of *D. pteronyssinus* from egg to adult averaged 122.8 days compared to 34.0 days at 23°C .

Due to insignificant baseline levels of dust mites on the stuffed animals, our study did not support the presumption that after 4 to 6 days, the limited mite levels on these toys could be significantly lowered by 24 h of freezing or 2 min of sweeping. With the low levels of mites found on these toys, the application of dust mite reduction techniques to stuffed animals may be of minor importance.

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HOUSE DUST MITE REDUCTION

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