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A Study of the Areas and Frequency of House Dust Mites Dermatophagiodes in Illinois Homes

by Ashley Aller

(Honors Biology 1152)

ABSTRACT

The purpose of the study was to measure the commonness of dust mites *Dermatophagiodes* in households in the Chicagoland area, Illinois, and the types of microhabitats they occupy. Samples were collected during January from various places in 18 homes. Out of the 36 samples taken, only 2 bedrooms of a common home had mites present, and only one mite was found in each sample. The study concluded that dust mites appear not to be widely dispersed throughout homes during winter in northeastern Illinois.

INTRODUCTION

Due to the discovery of the link between house dust mites and allergies, many studies conducted over the past few years have been focused on better understanding house dust mites and their environment. The most common house dust mite (HDM) species found in homes of temperate zones worldwide are *Dermatophagiodes farinae* and *D. pteronyssinus* (Arlian and Platts-Mill 2001, Nadchatram 2005). Most studies on HDMs are motivated by examining the effects they have on allergies and how to reduce HDM populations in homes.

The species life cycle consists of the egg, larva, protonymph, tritonymph and adult stages, but *D. farinae* usually does not complete a full lifecycle unless the environment is ideally between 23°C and 30°C (Arlian and Platts-Mills 2001). Development and population growth of the *D. farinae* and *D. pteronyssinus* are also affected by relative humidity. Relative humidity levels between 55% to 85% relative humidity function to extend their range (Arlian and Platts-Mills 2001, Korsgaard and Harving 2005).

HDM prefer areas in homes where human activity is frequent. Dust mites feed on human skin scales and most skin cells are found in the bed (Nadchatram 2005). Each human sheds about 1g of human skin each day and one human skin scale as small as 250 mg can support thousands of dust mites for long periods of time (Korsgraad and Harving 2005). Mites can also be found in carpets, corners of rooms and the floor borders, bedding, mattresses and hard to get to areas of beds and rooms (Cristafulli et al. 2007, Nadchatram 2005, Korsgaad and Harving 2005, Maas et al. 2003).

House dust mites have been found to cause respiratory allergies, and this has led to studies focused on reducing human exposure to dust mites and ways to relieve allergy sufferers. Dead and live house dust mites and mite material, including fecal matter, can cause allergies when inhaled by a human (Nadhatram 2005, Arlian and Platts-Mills 2001). Methods proven to reduce mite populations in homes include vacuuming, washing bedding and clothes weekly in hot water and tumble drying a clothes dryer or hanging to dry in direct sunlight, replacing carpets with hardwood floors, replacing regular bed sheets with specialized protective bed coverings, replacing furniture with vinyl or leather covered furniture, cleaning air ducts and installing air filtration systems in homes (Narchatram 2005, Sheikh and Hurwitz 2003, Mahakittikun et al. 2001, Albertini et al. 2000, Arlian and Platts-Mills 2001). Though some chemical treatments have been shown to be beneficial, other chemical treatments may not be effective on reducing dust mite exposure and may even contribute to resistant strains of mites (Nadchatram 2005). Lastly, though these treatments have been shown to reduce the

numbers of dust mites in homes, the benefits to clinical patient symptoms are still unclear, and nasal corticosteroids and systemic antihistamines are recommended treatments (Sheikh and Hurwitz 2003).

In view of the allergic responses to house dust mites, the study sampled how common they are in homes of suburban Chicagoland, Illinois.

METHODS

For this experiment, samples of accumulated dust were collected during January 2009 from various locations of 18 homes, recording the location in the house and temperature where the sample was taken. Samples were examined under 100x magnification for the presence of mites.

RESULTS

Results of sampling are provided in Table 1. Of the 36 samples taken in the various areas of the homes, only two contained a single dust mite each and both were found in bedrooms of a common house.

DISCUSSION

The results from the experiment provide evidence that dust mites are rare during winter in temperate Illinois and are most likely to inhabit the bedroom of a house. Temperatures and lower humidities throughout homes could contribute to rarity of mites (Brunekreef et al. 2005, Gehring et al. 2003). The temperature range of the samples taken from the bedrooms is between 33°C and 44°C, which is at or beyond the high end of their preferred range (Arlian and Platts-Mills 2001). High temperatures and dry conditions inhibit HDM growth and likely unintentionally function to control their populations as described by Mahakittikun et al. (2001).

The finding of HDMs in a bedroom was not surprising, although most of the bedroom samples tested failed to show HDM. Dust in areas of other locations of the house, such as dust on electronics and wall decorations, would likely not have the concentration of human skin scales and other HDM food items.

The study needs to be continued throughout the year as the low number of dust mites could be attributed to the indoor conditions imposed by winter weather. A study by Crisafulli et al. (2007) saw a change in dust populations with the changing seasons. Humidity and temperature may be more conducive for HDM growth during summer.

This study is important in developing a greater understanding of house dust mites because it presents support for an argument about how the typical methods for controlling HDMs in homes may not be so essential to pursue during winter. Korsgaard and Harving (2005) estimated that 100 mites/g of dust are needed to elicit allergies. Findings here suggest HDMs are unlikely to contribute to most allergies experienced during winter. Regular sanitation may offer to control what HDMs are present.

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Table 1. The location, temperature range, and dust mite count per sample of samples taken from various locations in 18 houses.

Location	Temperature range	Sample size	Count of dust mites/sample
Kitchen	22°C to 27 °C	3	0
Electronics (TV, entertainment center, lamp)	18°C to 37°C	7	0
Bedroom	18°C to 22°C	15	Two samples each with 1 dust mite, remainder 0
Basement floor	21°C to 22°C	4	0
Laundry room	18°C to 22°C	2	0
Staircase	22°C	2	0
Furniture	21°C	2	0
Wall decoration	18°C to 21°C	1	0