House dust mites known to be an allergen source for 50 years: Der p 1 still detectable in the original sample

Key words
house dust mites – stability of the mite allergen – history of house dust allergy

To the Editors:

A German-language publication that appeared 50 years ago (October 1964) can be considered a milestone in the history of allergology: Reindert Voorhorst and the married couple Frits T. Spieksma and Marise I. Spieksma-Boezemanin – both biologists in Voorhorst's laboratory –reported in the Leipzig journal Allergie und Asthma for the first time that house dust mites are the actual source of „house dust allergens" [1]. They documented the presence of house dust mites in dust samples taken from homes in the Juliana-Straße in Leiden, Germany, which was responsible for causing asthma symptoms. At the same time, Frau Spieksma-Boezemanin was able to prove that the number of mites in damp houses was greater than in dry houses.

House dust had been suspected as an asthma trigger for 300 years. As early as in 1698, Sir John Floyer (1649–1734) made a detailed description of bronchial asthma, which could be caused „by the smallest amount of dust while sweeping a room or making beds" [2]. However, it took another 125 years before anyone started to understand this „house dust asthma."

It was a well-known diagnostic problem that skin tests with house dust extracts were often negative, whilst the dust samples themselves could cause asthma attacks. Was it really the house dust that was causing asthma or were other, possibly climatic factors responsible?

This question was answered in 1923 by van Willem Storm van Leeuwen (1882–1933) in an experiment that was as simple as it was clinically impressive. Within only a few days of arriving in St. Moritz, Switzerland, three Dutch house dust mite allergy sufferers were free of their asthma symptoms. However, upon inhaling dust from a tin containing house dust from their homes, their asthma symptoms reappeared even in St. Moritz. Thus, the cause of their asthma lay in the dust from their own homes [3], not in the dust at the hotel in St. Moritz.

In 1931, although Peipers suspected the presence of numerous allergens in house dust [4], he was unable to identify the actual allergen source.

The former Allergy Documentation Center (Allergie-Dokumentations-Zentrum, ADIZ) received a very special gift from Mr. and Mrs. Spieksma in 1992: a small glass bottle with the inscription Julianastraat 48. The bottle contained some of the original house dust from 1964 in which the house dust mites were seen, identified, and their significance as an allergen source recognized.

In a letter to Karl-Christian Bergmann Spieksma writes about the goal of the study at that time and about sample collection: „The aim of this study was twofold: A) To document the seasonal fluctuation in mite numbers supposedly related with the seasonal fluctuation of the "house dust allergen." B) To document the differences in house dust mite numbers between damp and dry houses. Conservation of dust sample: After collecting the dust samples, they were heated at 70 degrees Celsius in order to stop further mite growth, and stored in a sealed tin with the addition of silica gel to keep the dust dry. After some years (1970?) a selected number of portions were taken from the original samples, and put into little bottles (one of which was donated to ADIZ in 1992). Origin of dust: The content of the little bottle is a small portion from a mixture of two 5 gram samples of floor dust collected with a vacuum cleaner, from the ground floor of a small house in Leiden, on October 13, 1964. It was part of a series of samplings from three houses with different grades of dampness. The address was Julianastraat 48. It was the dampest of the three. Samples were taken every three weeks.

The house does not exist anymore, as it had been demolished because of poor quality. Mite content: From the two original 5 gram samples mites were isolated and counted as described in two published articles [1. Spieksma F Th M and Spieksma-Boezeman M I A: The mite fauna of house dust with particular reference to the house-dust mite *Dermatophagoides pteronyssinus* (Trouessart, 1897). Acarologia 1967;9:226–41 / 2. Voorhorst R, Spieksma F T M, Varekamp H, Leupen M J and Lyklema A W: The house-dust mite (*Dermatophagoides pteronyssinus*) and the allergens it produces. Identity with the house-dust allergen. J Allergy 1967; 39:325–39]. In the sample of October 13, 1964 appr. 1600 mites of the genus Dermatophagoides were found, almost exclusively of the species *D. pteronyssinus* (see the graphical presentation, also published in [1, 2]). The complete scale of mite species observed over the whole year of sampling 1964–1965 is shown in the table (as published in [1])."

We were interested to discover whether mites and mite allergens could still be detected in the 1964 dust sample, which had been kept at room temperature since 1992. We opened the bottle and ... indeed! Jörg-Thomas Franz found preserved samples of *D. pteronyssinus* (**Fig. 2**) and, in the laboratory (M. R.), it was possible to detect allergens in these samples, though not the major allergen Der f 1 from the

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Dermatophagoides farinae mite) (**Tab. 1**): evidence of Der p 1's remarkable stability.

De Boer [5] found there to be no effects on the concentrations of Der p 1, Der p 2, and Der f 2 in mite-containing dust after 18 months of storage at 25° Celsius and 75 % humidity.

In the case of stored mattress dust containing dead mites, Der f 1 has been documented as having a median half-life of 10 years in households and 18 years in store rooms [6], whilst another source reports virtually unaltered concentrations of Der p 1 after 4 years under domestic conditions [7].

The detection of Der p 1 [8] in dust after 50 years demonstrates once again the extraordinary robustness of the mite allergen.

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Conflict of interest
The authors state that there are no conflicts of interest.

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Fig. 1: Bottle containing the dust sample from Juliana Straße 48 in Leiden, Germany (from 13th October, 1964).

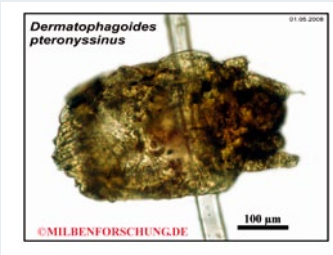

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Fig. 2: *Dermatophagoides pteronyssinus* in the dust sample from 1964. Image dated May 1, 2008 taken by Jörg-Thomas Franz.

Table 1

Quantification of mite allergens in the historical house dust sample from 1964

Mite allergen	µg/g Dust
Dermatophagoides pteronyssinus antigen1	52.50
Dermatophagoides pteronyssinus Der p 12	11.50
Domestic mite antigen1	8.02
Dermatophagoides farinae Der f 12	BDL
Tyrophagus putrescentiae antigen1	1.63
Lepidoglyphus destructor1	0.46
Acarus siro antigen1	0.07

BDL below the detection limit

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