

# DIFFERENCE OF SURFACE DERMATOFAGOID ALLERGEN CONCENTRATION ON 0-2 YEARS AGE GROUP AND BABY AND CHILDREN CLOTHES MANUFACTURED FROM VARIOUS FABRICS

## ÇEŞİTLİ KUMAŞLARDAN ÜRETİLEN 0-2 YAŞ GRUBU BEBEK ve ÇOCUK İÇ GİYSİLERİNİN YÜZEY DERMATOFAGOİD ALERJEN YOĞUNLUĞUNUN FARKLILIĞI

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### ABSTRACT

Allergic illness based on home dust affects not only the life style of the adults as well as the life quality of the children. Mites are found in all kinds of home textile products and clothing. The main reason that triggers the asthma illness in babies and children is these bugs called mites which cannot be seen with naked eye.

In this study, the factors that cause allergic effects due to textile clothing are aimed to be investigated in the most used baby underwear. With this purpose, underwears produced from six different kinds of knitted fabrics worn to each child for three days were investigated. Under the light of this study, the most appropriate fabric types were determined in order to prevent asthma in children based on mites.

**Key Words:** Mite, Allergy, Combed Yarn, Carded Yarn, Rib, Interlock, Single Jersey.

### ÖZET

Ev tozlarından kaynaklanan alerjik rahatsızlıklar yalnız yetişkinlerin değil, çocukların da yaşam kalitelerini etkilemektedir. Evdeki tüm tekstil ürünlerinde ve giysilerde akarlar bulunmaktadır. Bebek ve çocuklarda astım rahatsızlığını tetikleyen temel neden çıplak gözle görülemeyen akar deneni böceklerdir.

Bu çalışmada bebek iç giyiminde en çok kullanılan kumaşlarda giysiden kaynaklanan alerjen etkiye en çok neden olan faktörlerin araştırılması amaçlanmıştır. Bu amaçla altı farklı tipte kumaştan üretilen iç giysiler her çocuğa üç gün giydirilerek incelenmiştir.

Yapılan çalışmalar ışığında çocuklarda akardan kaynaklanan astım rahatsızlığını önlemek açısından en uygun kumaş türleri ortaya konmuştur.

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Received: 31.09.2009

Accepted: 01.03.2010

### 1. INTRODUCTION

Indoor dusts contain several materials that are fiber particles, sand particles, pollens, bacteria, human and animal skin-hair exuviations, and food residue only detectable by microscope and house dust mites. House dust mite is the most widespread allergen. In coastal regions of our country, sensitivity of house dust mite is more

frequently determined than inner and higher regions. House dust mites are detectable by microscope and they live embedded themselves inside the textile fibers of furniture covered by fabrics, carpet, bed, quilt and blankets. Ideal environment necessary for dust mites' life is 22-26°C temperature and humidity over 55%. These conditions required for the living of mite is present almost in every house especially in

bedrooms which provide the best conditions of warmth, humidity, and food for their growth. They are present in mattresses, pillows, blankets, carpets, upholstered furniture, curtains, and similar fabrics. The average bedroom can be infested by millions of microscopic dust mites. They feed themselves by fungus spores, bacteria and contaminated human exuviations (1).

Researches show that during one night sleep most people toss and turn up to 60 or 70 times meaning the dust mite droppings are frequently expelled into the air from bedding. Researchers have also discovered that the allergens can then stay in the air for up to 2 hours. Once airborne, dried dust mite droppings are easily inhaled into our airways thus causing allergic reactions in asthmatics. These allergens can cause wheezing, coughs, itchy eyes, sniffles and, in more serious cases, asthma, eczema, and allergic rhinitis. Allergic illnesses and allergic asthma bronchitis increase paralel to the development of the societies (2). These allergic disturbances especially increase more and more for the little children (3).

Allergic asthma bronchitis is the most frequent chronic disease of the children in the developed societies (4-9). For this reason, asthma has become an important health and social problem for the children and their families. The frequency of asthma and importance of the problem evolved grow more and more. The reason for this is the increase of air pollution, construction and indoors pollution and living in humid rooms with furniture, or in other words changes in living style (6). The most frequently seen allergic asthma is mite (dermatofagoids) sensitivity. Mites live at home dust originating from fiber covered furniture such as rug and carpets. However with the change of living style, properties of the changing interior and outdoor wearing clothes play important role in the increase of allergic sensitivity of dermatafagoids as the house dust mite. Dermatafagoids live more in every place where textiles exist (3). For this reason, besides the delivery of anti-mite drug delivery, correct wearing style material and indoors arrangement, cause less damage from these disturbances (10).

Floor covers like carpets, furnitures, beds, plush toys, are the ideal environment that mites live most (11, 12). Mites that have many legs can hold the flossy textiles tightly and they cannot leave these places easily, they cause distribution of excrete left on textile products to the air inhaled (13).

The frequently seen risk of meeting with mite allergy occurs in bed room while sleeping. With the changing of life style, the features of the room (closed structure, high temperature, humidity, etc.) can be an environment where mites are produced more. Therefore, underwear which is another textile product that child use during night at the same environment can increase those encounters more (14,15).

In this study, the factors that cause allergic effects due to textile clothing are aimed to be investigated in the most used baby underwear. With this purpose, underwear produced from six different kinds of knitted fabrics worn to each child for three days were investigated. Under the light of this study, the most appropriate fabric types were determined in order to prevent asthma in children based on mites.

## 2. MATERIAL AND METHODS

### 2.1. Material

30 healthy children with the age range of 0-2 years were taken for using the undershirts which surface dermatofagoid allergen concentration test should be applied. 50 % of the cases were male and 50 % of them were females. At first, suitable families were selected after arranging a contact and meeting with them. In selection of families, same or similar features of the bedroom arrangement of the child and the type of bed, quilt, and pillow type were considered. Furthermore, families were selected with the same social and economic statue since the home may affect the indoor environmental features.

Fabric types used for underwear production were obtained from cotton of same origin with the same methods. Totally, six kinds of fabric were prepared from supreme, interlock and 1x1 rib knittings with combed and carded yarns and they were subjected to same finishing processes for removing dye effect, all of the fabrics were bleached directly. Baby undershirts were seamed from prepared fabrics in order to use for research.

### 2.2. Method

After production of the baby underwear, surface dermatofagoid allergen densities were determined quantitatively in order to find the mite quantity on them after washing and drying of the underwear before putting on. Then all undershirts were washed with cleaning material suitable for babies which does not create any allergic problem at 60°C, were rinsed and dried. After mothers bath their babies, these undershirts were worn for three days and were delivered to researchers with clean pochettes. Worn undershirts were brought to the unit for counting mites.

At the unit for counting mites, undershirts were put into sterilized bags with each bag containing a group of five undershirts with respect to the kind of fabric. Then dusts of underwear were collected inside a single use consumable plastic tube that is an element of a kit of a high suction power. This process was repeated for each type of fabric. Then, undershirts were subjected to surface dermatofagoid allergen concentration test in order to determine the relation between the fabric textile type and the mite formed on the wear.

For determination of concentration of allergen, a quantitative method (Acarex Test) was used. Collected dust was poured into the test trench of the kit and was waited for 1 minute after the Acarex-Test solution was added. Stick for obtaining quantitative result was immersed in the solution and was removed after 5 seconds. Dust quantity on fabric mass was determined by comparing the scala on the kit with respect to the color taken by the stick (Table 1). Results were evaluated by numeric scoring subjectively with respect to the following colors (Table 1).

**Table 1.** Quantative evaluation of allergen concentration of Dermatofagoid

Score	Color	Result
0	Yellow	No Dermatofagoid Allerg
1	Light rose	Low Dermatofagoid Allerg
2	Light oran	Medium Dermatofagoid Allergen
3	Orange	High Dermatofagoid Allergen

**Table 2.** Dust scores on fabrics before wearing them

Types of Combed Knitting	Dust Scores	Types of Carded Knitting	Dust Scores	p*
Combed Single Jersey	0	Carded Single Jersey	0.8±0.4	<0.05
Combed Interlock	0	Carded Interlock	0.8±0.3	<0.05
Combed Rib	0	Carded Rib	0.9±0.4	<0.05
P	>0.05		>0.05	

**Table 3.** Dust levels that fabrics host

(Score/meter <sup>2</sup> ) → Fabrickinds ↓	Allergen quantity on fabrics before wearing (Score/meter <sup>2</sup> )	Allergen quantity on fabrics after wearing (Score/meter <sup>2</sup> )	p*
Combed Single Jersey	0	0,59 ± 0.57	<0.05
Carded Single Jersey	0.81 ± 0.44	0,94 ± 0.32	>0.05
Combed Interlock	0	0,14 ± 0.08	>0.05
Carded Interlock	0.89 ± 0.36	0,99 ± 0.56	>0.05
Combed Rib	0	0,64 ± 0.38	<0.05
Carded Rib	0.92 ± 0.44	1,29 ± 0.55	<0.05
P	> 0.05	< 0.05	

Obtained results were evaluated as unit result for 5 underwears. In this evaluation the result obtained from each measurement was standardized with dividing it by the surface as in the following formula;

$$\text{Result} = \frac{\sum \text{Dust containing Score}}{\text{Undershirt number in the group} \times \text{Unit metrage of the undershirt}}$$

Results were given as score /m<sup>2</sup>.

Allergen concentration before and after use were determined as arithmetical average from result of each unit for that type of fabric group. Obtained results were tested with ANOVA with respect to statistical meaning of the differences between the fabric groups. As a Post-hoc test, paired Student-t test was used. P value was accepted as meaningful with respect to statistical meaning.

### 3. RESULTS

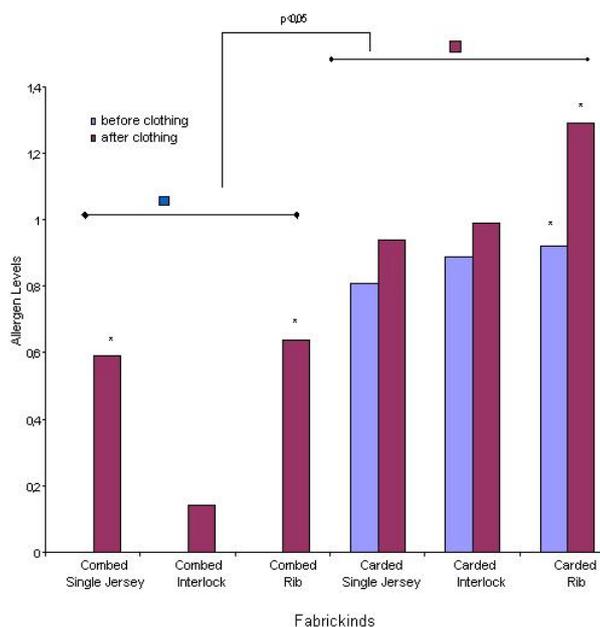
Results from tests applied on randomly chosen 5 undershirts in order to determine mite quantity before wearing the washed undershirts were shown in Table 2.

Allergen levels of dermatofagoid in the clothes knitted by carded cotton yarns were determined before wearing (Table 1). Allergen level of dermatofagoid in the clothes knitted by combed cotton yarn could not be determined before wearing

(Table 1). Difference between two fabric types is statistically meaningful (p<0.05) (Table 1). After the undershirts were worn to babies for three days, they were tested as groups and allergen level data obtained from tested dermatofagoid groups were evaluated with respect to formula stated above.

When post-wearing Allergen Levels were compared to pre-wearing allergen levels, it was detected that increase of allergen levels are statistically meaningful on some fabric types

(Table 2) (p<0.05). It was observed that this increase is combed supreme, combed ribana and carded ribana (p<0.05) (Figure 1). However carded supreme and carded interlock already have high prewearing allergen level so there is an increase in allergen concentration. However, no meaningful difference was detected with respect to pre-wearing (p>0.05). It was found that the maximum pre-wearing and post-wearing dermatofagoid allergen levels among all fabrics were carded ribana (Table 3). The only



**Figure 1.** Comparison of dust levels that fabrics host

fabric that has negative pre-wearing allergen concentration and non-detectable meaningful increase was combed cotton interlock. ( $p>0.05$ , Table 3).

#### 4. DISCUSSION

Instead of dry cleaning, textile products should be washed at the highest possible temperature that they should be washed. For instance, generally bed sheaths have property of being washed at temperatures more than 60°C. Thus they should be regularly washed minimum at 60°C. Mites become only ineffective at temperatures between 55-60°C (16). Under normal bed sheaths special sheaths preventing inside dust going outside and outside dust coming inside should be used.

Allergy to house dust is an illness not observed for adults, but it also directly affects the life quality of little children, even the babies. Mites live in all kinds of textiles used in house from house articles to clothing. With this study six different types of fabrics were investigated. Undershirts produced from these fabrics were put on the children for three days and house dust quantities were determined after three days.

When the obtained results are reviewed, it is observed that carded clothes contain maximum dust amount. The most important reason is the fact that it is considered that short fibers are used in manufacturing of carded cotton yarn. At the end of yarn manufacturing, fiber tips go out and dust holding probability increases.

Among the carded fabrics, carded ribana was the fabric that contained maximum dust. Minimum dust containing fabric was the combed interlock. Carded ribana has feature of being a very elastic construction, furthermore its yarn has fuzzy character. Thus if it is stretched, its surface area increases. For this reason, dust holding ratio became higher than others. Clothes from carded yarn during drying before wearing, has taken dust and dermatophagoids present in environment to inside its structure (Table 2). The reason is that fiber tips go out and give opportunity to hold mites living in the dust. After undershirts were worn to babies for three days, test was done by groups and data obtained was evaluated by calculation (Table 3).

Results of undershirts with combed supreme and combed ribana fabrics were found approximately same. Although results of undershirts with carded supreme and carded interlock fabrics were nearly same; carded supreme with respect to carded interlock contained less house dust. This originates from that supreme has less volume, and it is a thin fabric not so elastic. As a result, when the fabrics used in the research are compared, combed interlock contained minimum house dust after wearing for three days.

At the end of this study, fabric properties were determined suitable for minimizing the house dust allergens in order that babies should grow healthily. Thus, precaution to the illness can be taken by selecting clothes having directly determined for the babies with known or having suspected of allergic condition.

Results obtained shall be used widely by sharing with institutions doing research on increasing health standards and with companies manufacturing baby clothes nationally and internationally.

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*Bu araştırma, Bilim Kurulumuz tarafından incelendikten sonra, oylama ile saptanan iki hakemin görüşüne sunulmuştur. Her iki hakem yaptıkları incelemeler sonucunda araştırmanın bilimselliği ve sunumu olarak "Hakem Onaylı Araştırma" vasfıyla yayımlanabileceğine karar vermişlerdir.*