

# Skin test hypersensitivity for childhood asthma in Istanbul during a period of 16 years

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## ABSTRACT

**Background:** For diagnosis of allergic disorders, besides history and physical examination, many *in vivo* and *in vitro* laboratory tests are used. Skin prick test (SPT) is an easily performed and valuable test in children. Our aim was to evaluate the SPT results of asthmatic children according to age and gender, in Istanbul and its neighborhood, followed for a period of 16 years.

**Material and methods:** Consecutive 5080 asthmatic children, aged 1 to 18 years, admitted to Pediatric Allergy Polyclinics of Istanbul University Cerrahpasa Medicine Faculty from 1987 to 2003, were screened retrospectively for 10 frequently exposed allergens.

**Results:** 3086 cases (61 %) had SPT reactivity for one and/or for multiple allergens; the SPT reactivity percentages of the exposed allergens was 50 % (2554 cases) for house dust mites DP, 49 % (2462 cases) for house dust mites DF, 15 % (784 cases) for cat dander, 10 % (525 cases) for dog dander, 4 % (228 cases) for lamb wool, 10 % (504 cases) for wheat, 3 % (162 cases) for egg white, 6 % (345 cases)

for hazelnut pollen, 6 % (318 cases) for *Candida Albicans*, 6 % (326 cases) for *Aspergillus Fumigatus*.

**Conclusion:** While house dust mites were determined as the predominant allergen for each age groups in this study, allergy against cat dander was the third important allergen in sequence, as cat is a domestic pet which is frequently kept at home in Turkey.

**Key words:** Childhood. Asthma. Skin Prick Test.

## RESUMEN

**Antecedentes:** Para el diagnóstico de los trastornos alérgicos, además de la exploración física y de la historia clínica se emplean muchas pruebas de laboratorio *in vivo* e *in vitro*. La prueba por punción cutánea (*prick test*) (PC) es una prueba fácil de realizar y valiosa en niños. Nuestro objetivo era evaluar los resultados de las PC en niños asmáticos de Estambul y su periferia según su edad y sexo, con un seguimiento de 16 años.

**Material y métodos:** Se efectuó un estudio retrospectivo mediante PC con 10 alérgenos de exposición frecuente a 5.080 niños asmáticos, de 1 a 18 años de edad, consecutivamente tratados en la Policlínica de Alergología Pediátrica de la Facultad de Medicina Cerrahpasa de la Universidad de Estambul entre 1987 y 2003.

**Resultados:** 3.086 casos (el 61 %) mostraron reactividad a la PC con uno o más alérgenos; los porcentajes de reactividad a la PC con los alérgenos frecuentes fueron: el 50 % (2.554 casos) para los ácaros del polvo doméstico de la especie D.p., el 49 % (2.462 casos) para los ácaros del polvo doméstico de la especie D.f., el 15 % (784 casos) para epitelio

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de gato, el 10 % (525 casos) para epitelio de perro, el 4 % (228 casos) para la lana de cordero, el 10 % (504 casos) para el trigo, el 3 % (162 casos) para la clara de huevo, el 6 % (345 casos) para el polen de avellano, el 6 % (318 casos) para la *Candida albicans*, y el 6 % (326 casos) para el *Aspergillus fumigatus*.

**Conclusión:** Aunque los ácaros del polvo domésticos se establecieron como el alérgeno predominante en todos los grupos de edad del estudio, la alergia a epitelio de gato fue el tercer alérgeno en importancia, ya que el gato es un animal doméstico presente en muchos hogares turcos.

**Key words:** Childhood. Asthma. Skin Prick Test.

## INTRODUCTION

Asthma is a leading cause of chronic illness in childhood. Epidemiological studies report an increasing prevalence especially for childhood asthma in recent years<sup>1-3</sup>. This is the result of many in and out household factors.

Skin prick test (SPT) which is an *in vivo* laboratory test used to diagnose asthma and allergic disorders, is a type I hypersensitivity reaction, mediated by IgE, which occurs when small amounts of extracts of test antigen is introduced into the skin of sensitive people by scratch, puncture or intra dermal techniques. In this series of biochemical reactions, many pharmacologically active substances (such as histamine), known as chemical mediators, are released when the test allergen bridges adjacent IgE molecules, which is reversibly bound or "fixed" to surface receptors of mast cells and basophiles and leads to the known initial wheal and flare reaction (induration plus surrounding edema and erythematous swelling, occurring at the injection site 15 minutes later), which is replaced by an inflammatory lesion 6-12 hours later. Skin prick test is an easy test to apply, inexpensive and sensitive and is also little traumatic. Nowadays SPT has a widespread usage, as it has besides some benefits like

avoiding exposure with the known allergen and also preventing from exposure to environmental factors in childhood asthma, it provides immunotherapy for selected cases. In this study we retrospectively screened the age and gender prevalence of our cases, as 10 frequently exposed allergens were introduced to each of our patients, for a period of 16 years, in Istanbul and their changes within these years.

## MATERIALS AND METHODS

All consecutive 5080 asthmatic children, aged 1 to 18 years, admitted to Pediatric Allergy Policlinics of Istanbul University Cerrahpasa Medicine Faculty from 1987 January to 2003 April, were screened retrospectively. After cleaning the interior faces of the forearms of all cases, 10 frequently exposed allergenic solutions (*Dermatophagoides pteronyssinus* [DP], *Dermatophagoides farinea* [DF], cat dander, dog dander, lamb wool, wheat, egg white, hazelnut pollen, *Candida albicans* and *Aspergillus fumigatus*), histamine for positive control and serum physiologic for negative control were introduced into the skin by prick method in the mornings by the same health personnel.

Patients were warned not to use antihistamines at least 20 days before the test and an asymptomatic period is chosen. For our study if the radius of the en-duration formed 15 minutes after the injection was 3 mm and over 3mm, it was accepted as a positive respond<sup>4,5</sup>.

## RESULTS

A total of 5080 cases, 2152 girls (42 %) and 2928 boys (58 %), with documented childhood asthma, aged 1 to 18 years (mean 6.3 years), admitted to Pediatric Allergy Policlinics of Istanbul University Cerrahpasa Medicine Faculty, were screened for skin test hypersensitivity against 10 allergenic extracts introduced epidermal with prick method.

There wasn't any reactivity against skin test in 1994 cases (39 %) retrospectively screened (table I).

Table I

Age and gender distribution of our cases without having positive reactivity to the skin tests

	n	1-3 years	4-6 years	7-9 years	10-12 years	13-15 years	16-18 years
Female	887 (17 %)	113 (66 %)	343 (45 %)	274 (40 %)	104 (30 %)	36 (21 %)	17 (40 %)
Male	1107 (22 %)	199 (65 %)	481 (45 %)	221 (25 %)	148 (31 %)	50 (23 %)	8 (23 %)
Total	1994 (39 %)	312 (66 %)	824 (45 %)	495 (32 %)	252 (30 %)	86 (22 %)	25 (32 %)

In the SPT negative group 887 of the cases (17 %) were female and 1107 (22 %) were male. When the cases without sensitization to SPT were screened according to age ranges, 312 cases (66 %) were 1 to 3 years of age, 824 cases (45 %) were 4 to 6 years of age, 495 cases (32 %) were 7 to 9 years of age, 252 cases (30 %) were 10 to 12 years of age, 86 cases (22 %) were 13 to 15 years of age, 25 cases (32 %) were 16 to 18 years of age (fig. 1). When 10 allergenic extracts introduced were screened according to the age ranges of boys and girls; the least sensitivity to all of the 10 allergens was in the 1 to 3 years of age range (for girls 66 % and for boys 65 %, in sequence) and sensitivity increased with increasing age for childhood asthma (fig. 1) (table I).

When we screened the age and years of 3086 cases (61 %) having reactivity to at least one antigenic extract, house dust mites were reported as the mostly encountered positive allergen in comparison with other allergens, during a period of 16 years (fig. 2) (table II). Also house dust mites were frequently positive for all age groups (table III).

When the allergen exposure distribution of our cases were screened, DP (50 %, 2554 cases) and DF (49 %, 2492 cases) were the mostly exposed antigens (table III). As cat dander was 15 % (784 cases) positive, it was the frequently exposed 3<sup>rd</sup> allergen. The positive hypersensitivity percentages to other allergens were; dog dander 10 % (525 cases), lamb wool 4 % (228 cases), wheat 10 % (504 cases), egg white 3 % (162 cases), hazelnut pollen 6 % (345 cases), C. Albicans 6 % (318 cases), A. Fumigatus 6 % (336 cases) (table II).

When we screened according to age ranges, for all age ranges hypersensitivity to house dust mites was the most (fig. 3). The allergen hypersensitivity percentages for boys and girls were reported to be almost similar (table III).

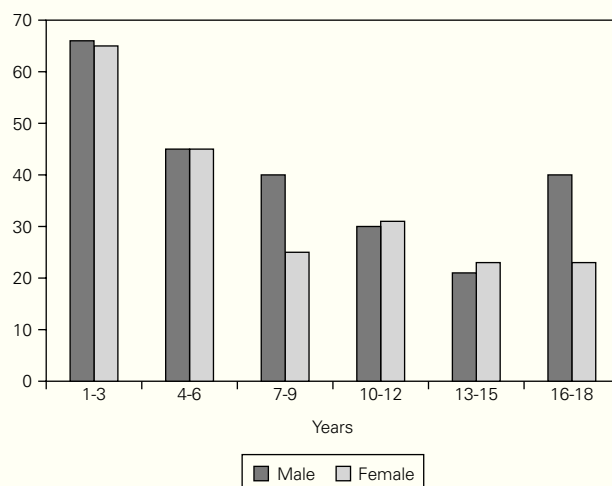


Figure 1.—The age distribution of our cases without having positive reactivity to the skin tests (%).

## DISCUSSION

Allergy has an important role for asthma development and allergic factors are responsible for 80 % of childhood asthma. Aeroallergens trigger asthma and asthma attacks frequently than the ingested allergens.

Skin prick test helps to define the etiology of one of the chronic inflammatory diseases, asthma, that has an increasing prevalence for childhood and helps both in preventive therapy and in immunotherapy, so it is one of the important *in vivo* laboratory tests.

Although most suitable SPT application time is not known exactly, positive reactivity can be in early childhood, at 1 year of age<sup>6</sup>. In our study, skin reactivity couldn't be observed in 66 % of asthmatic children aged  $\leq 3$  years. However, 34 % positive reactivity has a diagnostic importance, thus SPT is useful in childhood allergic disorders.

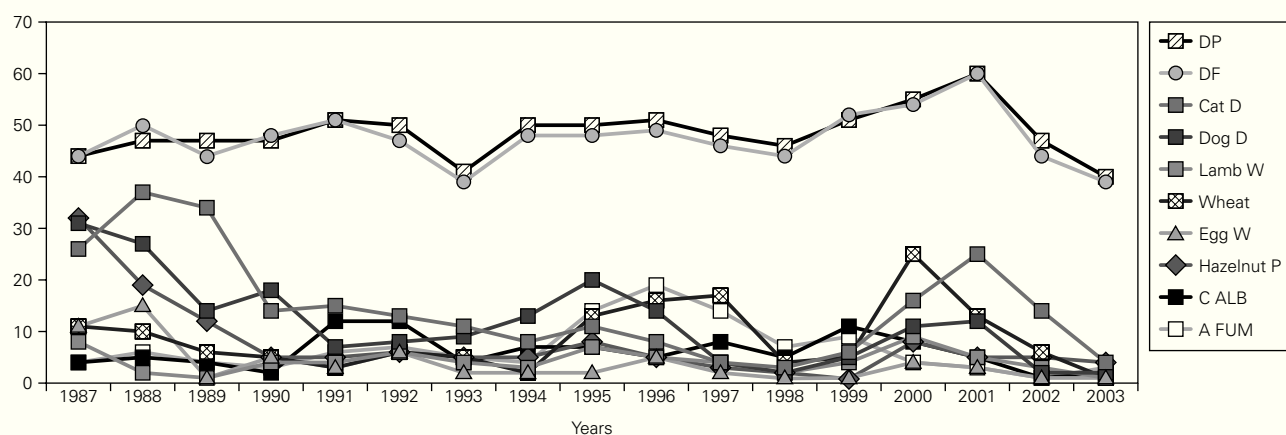


Figure 2.—The distribution of the allergens according to the years (%).

**Table II**  
**The patient distribution of the allergens according to the years**

	n	DP	DF	Cat Dander	Dog Dander	Lamb Wool	Wheat	Egg White	Hazelnut Pollen	C. ALB	A. FUM
1987	67	30 (44 %)	30 (44 %)	18 (26 %)	21 (31 %)	6 (8 %)	8 (11 %)	8 (11 %)	22 (32 %)	3 (4 %)	3 (4 %)
1988	180	85 (47 %)	91 (50 %)	67 (37 %)	49 (27 %)	2 (1 %)	18 (10 %)	28 (15 %)	35 (19 %)	10 (5 %)	12 (6 %)
1989	404	190 (47 %)	180 (44 %)	140 (34 %)	58 (14 %)	2 (1 %)	28 (6 %)	8 (1 %)	51 (12 %)	16 (4 %)	20 (4 %)
1990	339	162 (47 %)	163 (48 %)	49 (14 %)	30 (8 %)	15 (4 %)	18 (5 %)	19 (5 %)	17 (5 %)	8 (2 %)	10 (3 %)
1991	329	170 (51 %)	168 (51 %)	50 (15 %)	32 (7 %)	14 (4 %)	13 (3 %)	11 (3 %)	19 (5 %)	35 (10 %)	26 (7 %)
1992	325	164 (50 %)	155 (47 %)	45 (13 %)	26 (8 %)	22 (6 %)	21 (6 %)	20 (6 %)	21 (6 %)	30 (9 %)	30 (9 %)
1993	291	122 (41 %)	114 (39 %)	33 (11 %)	28 (9 %)	13 (4 %)	17 (5 %)	7 (2 %)	17 (5 %)	12 (4 %)	16 (5 %)
1994	243	123 (50 %)	118 (48 %)	29 (12 %)	32 (13 %)	8 (3 %)	7 (2 %)	7 (2 %)	14 (5 %)	18 (7 %)	11 (4 %)
1995	263	134 (50 %)	127 (48 %)	29 (11 %)	53 (20 %)	15 (5 %)	36 (13 %)	11 (2 %)	23 (8 %)	21 (7 %)	38 (14 %)
1996	284	145 (51 %)	141 (49 %)	25 (8 %)	42 (14 %)	14 (5 %)	47 (16 %)	15 (5 %)	21 (5 %)	16 (5 %)	30 (10 %)
1997	370	179 (48 %)	172 (46 %)	18 (4 %)	16 (4 %)	15 (4 %)	66 (17 %)	11 (2 %)	14 (3 %)	30 (8 %)	31 (8 %)
1998	328	151 (46 %)	147 (44 %)	10 (3 %)	7 (2 %)	9 (2 %)	16 (4 %)	3 (0,9 %)	8 (2 %)	17 (5 %)	26 (7 %)
1999	384	200 (51 %)	202 (52 %)	25 (6 %)	21 (5 %)	17 (4 %)	21 (5 %)	7 (1 %)	3 (0,7 %)	36 (11 %)	38 (9 %)
2000	383	214 (55 %)	207 (54 %)	65 (16 %)	43 (11 %)	36 (9 %)	97 (25 %)	4 (1 %)	33 (8 %)	32 (8 %)	19 (4 %)
2001	548	330 (60 %)	329 (60 %)	139 (25 %)	68 (12 %)	31 (5 %)	73 (13 %)	17 (3 %)	30 (5 %)	29 (5 %)	19 (3 %)
2002	258	122 (47 %)	116 (44 %)	38 (14 %)	6 (2 %)	8 (3 %)	17 (6 %)	3 (1 %)	13 (5 %)	3 (1 %)	4 (1 %)
2003	81	33 (40 %)	32 (39 %)	4 (4 %)	2 (2 %)	1 (1 %)	1 (1 %)	1 (1 %)	4 (4 %)	2 (2 %)	3 (3 %)
Total	5080	2554 (50 %)	2492 (49 %)	784 (15 %)	525 (10 %)	228 (4 %)	504 (10 %)	162 (3 %)	345 (6 %)	318 (6 %)	336 (6 %)

**Table III**  
**The distribution of the allergens according to age and gender**

	n	DP	DF	Cat Dander	Dog Dander	Lamb Wool	Wheat	Egg White	Hazelnut Pollen	C. ALB	A. FUM
<b>Female</b>											
1-3 years	170	39 (22 %)	43 (25 %)	5 (2 %)	5 (2 %)	4 (2 %)	4 (2 %)	5 (3 %)	9 (5 %)	1 (0,5 %)	1 (0,5 %)
4-6 years	760	318 (41 %)	330 (43 %)	103 (13 %)	73 (9 %)	29 (3 %)	61 (8 %)	9 (1 %)	39 (5 %)	46 (6 %)	48 (6 %)
7-9 years	671	328 (48 %)	321 (47 %)	107 (15 %)	75 (11 %)	33 (5 %)	73 (11 %)	24 (3 %)	51 (7 %)	33 (5 %)	52 (7 %)
10-12 years	342	202 (59 %)	195 (57 %)	79 (23 %)	53 (15 %)	15 (4 %)	45 (13 %)	22 (6 %)	38 (11 %)	38 (11 %)	35 (10 %)
13-15 years	167	120 (71 %)	119 (71 %)	46 (27 %)	26 (15 %)	11 (6 %)	22 (12 %)	6 (3 %)	11 (6 %)	26 (15 %)	21 (12 %)
16-18 years	42	24 (57 %)	24 (57 %)	11 (26 %)	5 (11 %)	2 (4 %)	5 (11 %)	2 (4 %)	5 (11 %)	4 (19 %)	2 (4 %)
All	2152	1031 (47 %)	1032 (47 %)	351 (16 %)	237 (11 %)	94 (4 %)	210 (9 %)	68 (3 %)	153 (7 %)	148 (6 %)	159 (7 %)
<b>Male</b>											
1-3 years	302	72 (23 %)	66 (21 %)	10 (3 %)	4 (1 %)	3 (1 %)	6 (2 %)	8 (2 %)	20 (6 %)	1 (0,3 %)	1 (0,3 %)
4-6 years	1048	491 (46 %)	473 (45 %)	133 (12 %)	100 (9 %)	57 (5 %)	88 (8 %)	28 (2 %)	49 (4 %)	38 (3 %)	54 (5 %)
7-9 years	857	471 (54 %)	448 (52 %)	119 (13 %)	73 (8 %)	37 (4 %)	89 (10 %)	30 (3 %)	51 (5 %)	64 (7 %)	56 (6 %)
10-12 years	473	310 (65 %)	298 (63 %)	95 (20 %)	62 (13 %)	27 (5 %)	68 (14 %)	15 (3 %)	47 (10 %)	39 (8 %)	42 (9 %)
13-15 years	214	156 (72 %)	151 (70 %)	62 (28 %)	43 (20 %)	16 (7 %)	38 (17 %)	12 (5 %)	22 (10 %)	23 (10 %)	20 (9 %)
16-18 years	34	23 (67 %)	24 (11 %)	14 (41 %)	6 (17 %)	4 (11 %)	5 (14 %)	1 (2 %)	3 (8 %)	5 (14 %)	4 (11 %)
All	2928	1523 (52 %)	1460 (49 %)	433 (14 %)	288 (9 %)	144 (5 %)	294 (10 %)	94 (3 %)	192 (6 %)	170 (5 %)	177 (6 %)
<b>Total</b>											
1-3 years	472	111 (23 %)	109 (23 %)	15 (3 %)	9 (1 %)	7 (1 %)	10 (2 %)	13 (2 %)	29 (6 %)	2 (0,4 %)	2 (0,4 %)
4-6 years	1808	809 (44 %)	803 (44 %)	236 (13 %)	173 (9 %)	86 (4 %)	149 (8 %)	37 (2 %)	88 (4 %)	84 (4 %)	102 (5 %)
7-9 years	1528	799 (52 %)	769 (50 %)	226 (14 %)	48 (9 %)	60 (3 %)	162 (10 %)	54 (3 %)	102 (6 %)	97 (6 %)	108 (7 %)
10-12 years	815	512 (62 %)	493 (60 %)	274 (21 %)	115 (14 %)	42 (5 %)	113 (13 %)	37 (4 %)	85 (10 %)	77 (9 %)	77 (9 %)
13-15 years	381	276 (72 %)	270 (70 %)	108 (28 %)	69 (18 %)	27 (7 %)	60 (15 %)	18 (4 %)	33 (8 %)	49 (12 %)	41 (10 %)
16-18 years	76	47 (61 %)	48 (63 %)	25 (32 %)	11 (14 %)	6 (7 %)	10 (13 %)	3 (3 %)	8 (10 %)	9 (11 %)	6 (6 %)
All	5080	2554 (50 %)	2492 (49 %)	784 (15 %)	525 (10 %)	228 (4 %)	504 (10 %)	162 (3 %)	345 (6 %)	318 (6 %)	336 (6 %)

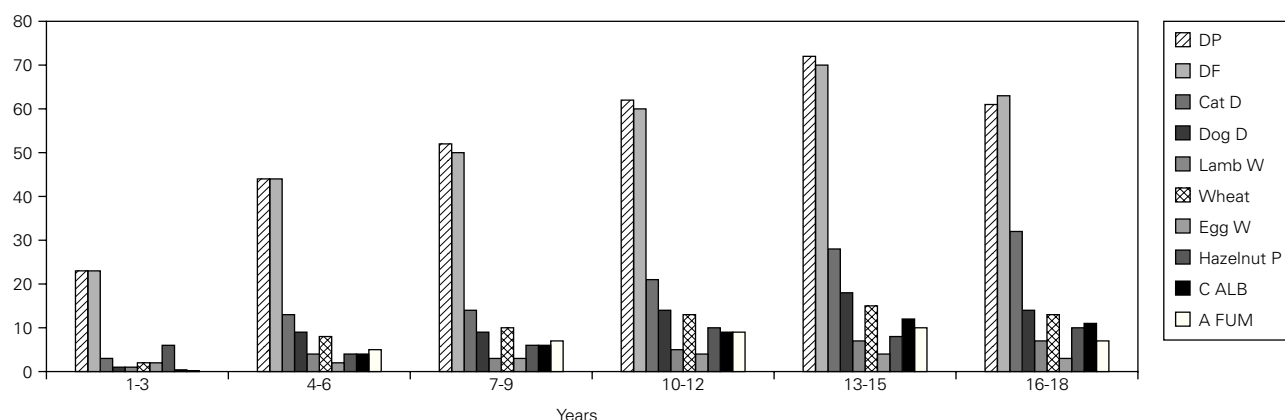


Figure 3.—The distribution of the allergens according to the ages of our cases (%).

Skin prick test negativity in the earlier ages was higher than the other age groups of our patients. Skin prick test negativity of our cases was in 1994 patients (39 %) and was both in girls and boys (66 % and 65 %, in sequence), and was mostly in children aged 1 to 3 years. In girls in the age ranges of 7 to 9 years and 16 to 18 years allergy test negativity was found to be higher than the boys (table I).

Prevalence of asthma and allergens detected by SPT, change from country to country and also from region to region. Thus house dust mites are the allergens mostly detected in asthmatic patients<sup>7-10</sup>.

In our study, positive reaction to at least one allergen was detected in our 3086 patients (60 %). We have introduced five groups of allergenic extracts; these are house dust mites, animal allergens, food, pollen and fungus and from these the predominant reaction was against to house dust mites.

In Istanbul, which is one of the greatest metropolitan cities, positive reaction to house dust mites has reached to the highest level during 2001. Nowadays, decrease in hypersensitivity since 2001, can be attributed to the periodic instruction provided to the society by educating about the preventive measures against house dust mites with the help of written and visual media like newspapers, radio and television and also by education institutes.

Cats are domestic animals frequently kept in our homes since old years. Positive SPT reaction to cat dander has incrementally decreased when compared with the earlier years, but have reached a peak level during 2001 and also have been at this same level during the earlier years. As lamb is a domestic animal that is kept at rural regions, the low detection rate of allergic hypersensitivity to lamb wool is attributed to the low probability of exposure.

When we screened wheat and egg white that are the frequently ingested foods during childhood, although wheat had different positive reaction rates in

different years, the positive reaction against the white part of the egg had decreased as child grow up. Thus, wheat and the egg white aren't important allergens for childhood asthma. Although there haven't been different positive reaction rates against fungus in different years, by improved living styles their rates have been decreasing with years.

Istanbul and its neighborhood provide the most suitable conditions for the house dust mites to live and to multiply. In our study, in parallel to this, we detected that the sensitivity to the house dust mites had been at the highest level.

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