# APPLICATION RIDA ALLERGY SCREEN TO DETERMINE MULTI - E GLOBULIN IMMUNE DISTRIBUTION PATTERNS USING QUANTITATIVE SPECIAL IN SERUM VIETNAMESE PEOPLE

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### ABSTRACT

Introduction: RIDA qLine® Allergen Serum diagnostic and is individual treatment confirmatory test in patients with unknown etiology or multiple allergens. Research to find distribution patterns of multi- allergens in the population. Methods: Retrospective analysis 538 samples from 2022 to 2024 in adults (Table 1 Viet) and children (Table 4) at Medic Medical Center, HCMc. Automated s-IgE quantification using nitrocellulose membrane immunoblot method to explore the relationship between s-IgE and ten common inhalant allergens based on a maximum value of 6.0 and a minimum value of 1.0 with a reference range < 0.35 IU/mL similar to normal RAST < 1. **Results:** sIgE was positive with a rate of 44.6% (mean 2.96±1.49) Dermatophagoides pteronyssinus (Dp), 51.1% (mean 2.55±1.39) Dermatophagoides farina (Df), 50% (mean 2.73±1.38) Blomia tropicalis (Bt), 3.1% cat hair (mean 2.69±1.28), 3.5% dog hair (mean 2.13±1.41), 0% mouse hair, 10.9% cockroach (mean 1.85±0.77), 9.2% feathers mixture (mean 1.73 ±0.68), 15.5% grass mixture (mean 1.55±0.69). The population is divided into 3 groups: (A) 39.5% negative non-allergic, (B) positive sensitive 38.6% dominant house dust mite and (C) 28.4% positive for systemic. Samples are often positive simultaneously Dp. Df, Bt and good correlations r=0.8 between Dp and Df, r=0.7 between Dp and Bt, r=0.9 between Df and Bt. **Conclusions:** In most patients with multiple allergens, the incidence of low concentrations predominates and decreases at medium and high concentrations. House dust mites spp, mainly Dp, Df, Bt are one of the common complex respiratory allergens and have strong correlation.

Keywords: Multi-allergens, RAST, specific s-IgE

### I. INTRODUCTIONS

Allergy is an immune-mediated hypersensitivity to certain substances such as environmental factors, animals, insects, microorganisms, foods and drugs. Foreign substances that cause allergies are called allergens that is through inhalation, ingestion, injection or skin contact<sup>1</sup>. Sensitization is the initial or repeated exposure to allergens, an response by stimulating immune the production of immunoglobulin E antibodies. This IgE causes the release of mediators (usually from mast cells) such as histamine, leukotriene, prostaglandin, etc., leading to the allergic system. House dust-related respiratory allergies, as asthma, allergic rhinitis and dermatitis are commonly known, are a common health problem worldwide, affecting people's quality of life<sup>2</sup>. They are associated with patients' allergic reactions to pollen grains of certain trees, grasses, weeds, molds, cat and dog dander8. In this difficult diagnostic group, complex allergies cannot be diagnosed using standard methods such as skin prick testing and the patient's allergy history<sup>3</sup>. Many studies confirm that multiallergen testing can improve patient

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outcomes by avoiding inaccurate diagnoses and is beneficial for finding the cause of in patients with symptoms unknown allergens or allergic to multi-allegents<sup>4</sup>. Allergen-specific IgE measurements and clinical history along with epidemiology are the basis of allergy diagnosis. Nowadays, both the characterization and standardization of allergen extracts and testing technology have been improved and developed<sup>5</sup>. Many analytical methods with different techniques for simultaneous detection and measurement as RIDA Allergy Screen, MAST Optigen allergy system, Polycheck Allergy, ImmunoCAP(®), Fluorescence Enzyme Immunoassay, Immuno-Solid-phase Allergen Chip ALEX, ImmunoCAP ISAC or sIgE or rapid, chip DNA microarray, molecular, multiplex real-time PCR. Serological testing with allergen components may provide more clues for diagnosis and clinical management. The target of this study was important to find a common pattern of s-IgE sensitization for the airway in regions by RIDA Allergy Screen that testing confirmed clinical suspicion. Simultaneous multi-allergen testing is widely used as a screening tool for allergic diseases in population and has the advantage of providing s-IgE results for different allergens in the quantitative. The development of a protocol for the use of consensus testing evaluated multiple allergen tests using devices that can measure the presence of multiple immunoglobulin E antibodies in patient serum. are also represented by health-related issues, factors that influence treatment such as diet, immunotherapy drugs, pets, environmental sanitation. weather. and testing other potential experiments. The clinical

effectiveness and cost-effectiveness of the treatment regimen were evaluated by comparing long-term recovery and favorable quality-of-life outcomes in patients managed using standard diagnostic procedures.

### **II. MATERIALS AND METHODS**

Retrospective analysis 538 cases from March 2022 to May 2024 in adults (panel 1 Viet) and children (panel 4) at Medic Medical Center HCMc. This study was performed only with sensitive files that anonymized test results and therefore did not include information on gender or age. Data from serum extracts of allergic patients showed s-IgE content using the RIDA qLine® Allergy test with 20 allergens on each strip (ten 10 panels for food and ten panels for inhalant panel of R-Biopharm). For in vitro diagnostics. This test is based on the principles of the immunoblot method. It is an enzyme immunoassay on nitrocellulose membrane for the quantitative detection of allergen-specific IgE antibodies in human serum and plasma (citrate). The sample is evaluated with RIDA gLine® Scan in combination with the software RIDA qLine® Soft. The color intensities of the allergen bands are quantitatively evaluated on the basis of a standard curve on the membrane to determine the corresponding IU/mL or RAST classes. The result was single 36 cases and 502 cases with multiallergens. Immuno (1-20 panels) probed with escalating IgE values (0.35 to >100 UI/mL) from allergic patients serum to explore the relationship between specific IgE with ten common allergens based on the maximum value 6.0 and the minimum value 1.0 with normal reference range <1 of RAST classes.

<i>Table 1.</i> Rate of positivity s-IgE within for ten different panels in 538 patients								
Allergens	Patients	(%) Positive	Mean±SD	CV(%)	Min-max			
Derm. Pteronyssinus (DP)	538	44.6	2.96±1.49	0.50	1.0-6.0			
Derm. Farinae	538	51.1	2.55±1.39	0.54	1.0-6.0			
(DF)								
Blomia Tropicalis (BT)	538	50	2.73±1.38	0.50	1.1-5.4			
Epithelia Cat dander	538	3.1	2.69±1.28	0.47	1.0-5.4			
Epithelia Dog hair	538	3.5	2.13±1.41	0.66	1.0-5.4			
Mouse hair	538	0.0						
Cockroach	538	10.9	1.85±0.77	0.41	1.0-4.1			
Feathers mixture	538	9.2	1.73 ±0.68	0.39	1.0-3.7			
Grass mixture	538	15.5	1.55±0.69	0.44	1.0-4.3			
Mould mixture	538	1.0			3.6			

# **III. RESULTS**

### Table 2. Frequency of multi-allegens devided into three type of clinical disease groups

Group	Type Allergic	Panels	Patients	(%)
(A)	Negative for non-allergic	from1 to10 panels	213	39.59
(B)	Positive for sensitive	dominant house dust mites from1 to 3 panels	208	38.6
(C)	Positive for systemic	From 4 to 7 panels	102	28.49

Each component of multi-allergens corresponds to one panel in numerical order from one to ten panels for inhalant with twenty allergens on each strip immunoblot.

С	lass	Reference range	Multi-Allegents Percentage (%)							
N <sup>0</sup>	RAST	IU/mL	Derm.	Derm.	Blomia.	Cat	Dog	Cockroach	Feathers	Grass
			Ptero	Farinae	Tropicalis	dander	hair		mixture	mixture
	0.0-	0.0-0.34	55.4	48.9	50	96.9	96.5	89.1	90.8	84.5
0	0.9									
	1.0-	0.35-0.69	32.08	31.3	34.2	35.3	57.9	55.93	64	77.8
1	1.9									
	2.0-	0.7-3.49	23.8	25.81	24.54	23.52	15.8	32.2	26	14.81
2	2.9									
	3.0-	3.5-17.49	16.25	17.1	20.44	23.52	15.7	8.47	10	6.17
3	3.9						8			
	4.0-	17.5-49.99	12.08	15.27	13.01	11.76	5.26	3.4		1.23
4	4.9									
	5.0-	50-100	15	9.81	6.7	5.9	5.26			
5	5.9									
6	6	>100	0.83	0.72	1.11					
		Patients	538	538	538	538	538	538	538	538

### Table 3. Percentage s-IgE of multiple allergens classified according to RAST

The seven s-IgE classes (0-6) of the RAST classification are equivalent to the concentration (UI/mL) of the reference range.

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*Figure 1.* Classification sIgE of Multi-Allegents according to RAST Organizes the percentage of seven classes of each allergen in ten panels group we ana *Table 4.* Pearson correlation coefficients between two allergy panels in the ten panels

Allergens 1 <sup>st</sup>	Allergens 2 <sup>nd</sup>	r(-1,	,+1)
Derm. Pteronyssinus	Derm. Farinae	0.	.8
Derm. Farinae	Blomia tropicalis	0.	.9
Blomia tropicalis	Derm. Pteronyssinus	0.	.7
Epithelia Cat dander	Epithelia Dog hair	0.	.5
Cockroach	Feathers mixture	0.	.6
Cockroach	Derm. Pteronyssinus or Derm. Farinae or B. tropicalis	0.	.5

r(-1,+1) Pearson: Perfect -1, +1. Strong -0.7, -0.8, -0.9, +0.7, +0.8, +0.9. Moderate -0.5, -0.6, +0.5+0.6. Weak -0.2, 0.3, -0.4, +0.2, +0.3+0.4. None -0.1, +0.1, 0

The remaining panels have low or no correlations that are insignificant to list (table 4)

Table 5. The percentage multi-Allergens and single Allergy in 538 patients

Multi-Allergens	Panel	n	(%)
D.Pteronyssinus+D.Farinae+B.Tropical	3	208	38.66
D.Pteronyssinus+D.Farinae+B.Tropical+Cat dander+Dog hair	5	8	1.48
D.Pteronyssinus+D.Farinae+B.Tropical+Cat dander	4	15	2.78
Cockroach+Feathers mix+Grass mix	3	17	3.15
DP+DF+BT+ Cockroach+Feathers mix +Grass mix	6	16	2.97
DP+DF+BT+Dog+ Cockro+Feathers mix +Grass mix	7	6	1.11
Cockroach+Feathers mix +Grass mix	3	17	3.15
DP+DF+BT+Feathers mix	4	16	2.97
Single Allergy	Panel	n	(%)
Derm. Pteronyssinus (DP)	1	2	0.37
Derm. Farinae (DF)	1	2	0.37
Blomia Tropicalis (BT)	1	14	2.6
Cockroach	1	1	0.18
Grass mixture	1	17	3.16
Total		36	

Multi-allenggens is on two sensitizers simultaneously in one sample.

Single allegy is a positive reaction in only one panel per sample.01.

### **IV. DISCUSSION**

The 538 patients with s-IgE levels for any allergen in the ten panels, assessed by immunoblot RIDA qLine® Allergy. From the selected patients with multi-allergens are 240 patients 44.6% (mean 2.96±1.49) Derm. Pteronyssinus, 51.1% (mean  $2.55 \pm 1.39$ ), Derm. farinae, 50% (mean  $2.73 \pm 1.38$ ), Blomia tropicalis, 3.1% epithelia cat hair (mean 2.69±1.28), 3.5% epithelia dog hair (mean 2.13±1.41), 0% mouse hair, 10.9% cockroach (mean 1.85±0.77), 9.2% feathers mixture (mean 1.73 ±0.68), 15.5% grass mixture (mean 1.55±0.69). The average value is divided into two groups with equivalent values, the group of house dust mite and cats (mean=2.55-2.96) is higher than the group of dog, cockroach, feathers and grass dust (mean 1.55-2.13), with a low standard deviation (0.68 -1.49) usually indicating high consistency and reliability of experimental results. The variation of the data series is almost equivalent and has little fluctuation (0.39-0.66) (table 1).

The population is divided into 3 groups: (A) 39.5% negative for non-allergic type, (B) positive for sensitive type 38.6% of dominant house dust types and (C) 28.49% positive for systemic type. Compared to the author Xiaoxu Sun<sup>6</sup> and <u>Zhibang Hu</u><sup>7</sup>, there is a small difference in the prevalence rate of house dust mites groups and mold. Dp, Df and BT are considered one of the most relevant respiratory allergens in the HCMc area. There was no difference in the proportion of s-IgE results between major components from house dust mite species, o some cases of cross-reactivity occur, which is difficult to control (table 2).

All data of negative rate for each phenotypic group were analyzed for significant proportions. Different allergic phenotypes related the positive allergens to the properties of the allergen constituents. The involvement of multi-allergens in allergic rhinitis and asthma has been well described. It is also linked to other allergic diseases. Nowadays, cross-reactivity has been described but recombinant allergens discovered by molecular biology techniques have not yet explained this mechanism<sup>8</sup>(figure 1).

Among six sIgE levels, class one accounts for the highest rate and gradually decreases at the next levels, low positive concentrations fluctuate in the range of (31.3-77.8)%, the rate is double of class two elevated positive concentrations (14.81-32.2%). Class 3 positive concentrations are signicanttly elevated in the range (8.47-23.52%). Class four and five have similar rates of high and very high positive concentrations in the range (15.8-26%). Class six has extremely high positivity, accounting for at least a few cases (table 3). sIgE profile in sensitized between two regions with great geographic and climatic differences Other factors, such as level of exposure, environment, genetic or epigenetic characteristics, skin barrier defects that facilitate sensitization. other comorbidities, and possible sensitization to Other allergen molecules have not been explored in the current study. Pearson correlation coefficients between two allergy panels Samples are often positive simultaneously Dp, Df, Bt and good correlations r=0.9 between Dp and Df, r=0.7 between Dp and Bt, r=0.9 between Df and Bt, dominant house dust 3 panels good and strong linear correlation. average correlation between dog hair and cat dander (r=0.5), cockroaches and feathers 9r=0.6) or cockroaches và house dust mites (r=0.5) (table 4).

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Among these, susceptibility showed 14 cases of Blomia tropicalis (2.6%) and 18 cases Grass mixture (3.16%) predominance. The remaining ingredients are in very low quantities such cases Derm. as 2 pteronyssinus, 2 cases of Derm. farinae, 1 case of Cockroach in 36 patients. RIDA may be useful for discriminating allergens that are structurally similar and are recognised by the same IgE antibody (cross-immunoreactive)<sup>9</sup>. A recent study has described sensitization models in which IgE production is typically from the initial monomeric protein pool or expands to the oligomeric or multimeric phase. Recombinant molecules for diagnostics have opened new avenues for studying individual sensitivities and new opportunities for more effective allergy prevention and treatment<sup>10</sup> (table 5).

### **V. CONCLUSION**

Co-sensitization with other house dust mites Derm. Pteronyssinus, such as Derm.farinae and Blomia Tropicalis (Bt) is very common. This is considered one of the complex and dangerous respiratory allergens in HCMc area, with high cross-reactivity and no difference in prevalence was detected for with s-IgE between three groups of ingredients. Overall good correlation between airway allergen concentrations of house dust mites spp and clinical and in vitro immune responses showed equivalent positive and negative parameters. Extremely similar s-IgE affinity at 6 RAST values (>100 UI/mL) was achieved only in patients sensitized to house dust mite. The proportion of multi-allergens at low concentrations predominates and decreases at medium and high levels. Most patients are allergic to multi-allergens, as many as seven out of ten

panels screened, predominating over single substances with cockroaches and grass mixtures as active allergens independently due to differences in the sensitivity profiles of allergen molecules. In fact, no cases of sensitivity to mouse hair were detected. Allergy cases with negative results but no allergens were found account for а significant proportion, indicating the future expectation of using more panels to have a higher probability of detecting allergens. The percentage of sIgE sensitization varies by cut-off level between other analyser, regions, and seasons. Causes include lifestyle factors, socioeconomic and educational impacts, tendencies, change, genetic climate environmental pollution, and cross-reactivity according to many authors and should be studied further into allergies of the clinical utility and cost-effectiveness.

### REFERENCES

- 1. Wei Zhang, Biao Xie, Meina Liu et al. Associations between sensitisation to allergens and allergic diseases: a hospitalbased case–control study in China. Original research. Immunology (including allergy). doi.org/10.1136/bmjopen-2021-050047.
- 2. Yi Liu, Lan Zhao, Jiaofeng Wang et al. Serological analysis of allergic components of house dust mite provides more insight in epidemiological characteristics and clinical symptom development in North China. Front Immunol.. 2023 Apr 27:14:1083755.

doi: 10.3389/fimmu.2023.1083755. eCollection 2023.

- 3. Wenting Luo, Dandan Wang, Teng Zhang et al. Prevalence patterns of allergen sensitization by region, gender, age, and season among patients with allergic symptoms in mainland China: A four-year multicenter study. Allergy. 2021 Feb; 76(2): 589–593. PMC7984441. doi: 10.1111/all.14597.
- 4. Jaume Martí-Garrido, Jon R Konradsen, Gunilla Hedlin et al. Specific

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immunoglobulin E profiles in sensitized Swedish and Spanish children with severe asthma. Original Article. Explor Asthma Allergy. 2023;1:186–197. Nov 2023. doi:10.37349/eaa.2023.00019.

- Hao Chen, Ping Ji, Lin Yang, Nan Huang et al. Characteristics of allergen component in dust mite-induced allergic rhinitis patients. Lin Chuang Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2023 Jun;37(6):442-447. doi: 10.13201/j.issn.2096-7993.2023.06.007.
- 6. Xiaoxu Sun, Jun-Wei Zhao, Qiuya Wang et al. Prevalence of allergen sensitization among 15,534 patients with suspected allergic diseases in Henan Province, China. Environmental Science, Medicine. Asian Pacific Journal of Allergy and Immunology. APJAI 2019. Corpus ID: 4493344. doi:10.12932/AP-160817-0137.
- 7. Zhibang Hu, Jianrong Xue, Min Pan, Yongzheng Bao et al. Prevalence of allergen sensitization among children with allergic rhinitis in Changzhou, China: a

retrospective observational study. Observational Study. BMC Pediatr. 2023 Sep 16;23(1):466. doi: 10.1186/s12887-023-04291-9.

- 8. L Guilleminault, C Viala-Gastan. Blomia tropicalis: A house dust mite in the tropics. Review. Rev Mal Respir. 2017 Oct;34(8):791-801. doi: 10.1016/j.rmr.2016.10.877. Article in French.
- **9.** Limin Zhao, Yuling Zhang, Shujian Zhang et al. The effect of immunotherapy on cross-reactivity between house dust mite and other allergens in house dust mite -sensitized patients with allergic rhinitis. Review. Expert Rev Clin Immunol. 2021 Sep;17(9):969-975. doi: 10.1080/1744666X.2021.1968834.
- 10. DanielaPosa, StephanieHofmaier, StefaniaArasi et al.Evolution of IgEResponses to MiteAllergens and Relationship to Progression ofAllergicDisease: a Review. Review. CurrAllergyAsthmaRep. 2017May;17(5):28.doi: 10.1007/s11882-017-0697-y.