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ACPI1 is associated with allergy

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Key words: ACPI1; allergy; cLMWPTP; cohort survey; LMPTP.

● THE CYTOSOLIC low molecular weight protein tyrosine phosphatase (LMPTP or cLMWPTP; also known as acid phosphatase locus 1-ACPI1), is a protein

tyrosine phosphatase involved in the modulation of signal transduction by insulin and platelet derived growth factor (PDGF) receptors and by the T cell receptor. LMPTP is present throughout human tissues in two different isoforms called A and B (also called ACPI1 F and

S) which show different physicochemical properties and probably have different physiological targets (1,2).

An association between LMPTP polymorphism and allergic atopic eczema/dermatitis syndrome (AEDS) has been described (2,3) in a small sample of Italian children, suggesting a greater susceptibility of *A allele carriers who show low enzymatic activity. More recently, it has been shown that total serum IgE levels are lower in subjects carrying the ACPI1 genotype who show the highest activity (CB genotype) (5).

We made a retrospective survey of a previously identified cohort, interviewing individuals studied at birth more than 20 years ago. In these newborns, ACPI1 phenotype had been determined by starch gel electrophoresis.

Out of 400 subjects studied at birth only 49 were still living at the addresses given on the clinical records. We asked these 49 if they had allergic disorders including asthma, rhinitis and AEDS. All subjects with allergic symptoms reported they had been evaluated at least once and had at least one positive prick test. No appreciable differences in socioeconomic status were detectable between responders and the remaining subjects.

Table 1 shows that the proportion of allergic subjects is much higher among carriers of *A allele than among other ACPI1 phenotypes. The positive association of allergy in the presence of *A allele appears to agree with previous independent observations (2). We also analyzed the relationship between the concentration of the F and S isoforms associated with each ACPI1 phenotype, and the presence of allergic disorders in individuals participating in the survey. The presence of allergic disorders was significantly associated with a lower F isoform concentration (13.58 (standard error (SE) 0.48) in nonallergic and 11.17 (SE 0.85) in allergic subjects; $P=0.027$);

no association was present with S isoform concentration.

Among the signal transduction pathways involved in allergic disorders, the IL-4 receptor signal transduction might be a good candidate for the ACPI1 regulatory role. Several tyrosine phosphorylation phenomena are activated following IL-4 stimulation, and many pathways activated by the IL-4 receptor are similar to those activated by insulin (4), whose signal transduction is modulated by ACPI1.

Recently (5) we have found a significant interaction between ACPI1 and the intracellular Glu/Arg polymorphism in position 551 of IL-4 RA concerning total IgE level, thus supporting the hypothesis that the association between ACPI1 and allergy may be partly related to interactions with IL-4 receptor signal transduction. It should be considered, however, that the fraction of variance in plasma IgE that can be accounted for by genetic differences in the IL-4 receptor, although statistically detectable, is very small.

As shown in Table 1 the value of eta-squared (η^2 : a measure of strength of association) is relatively high (0.126) considering that ACPI1 is a common "normal" polymorphism, thus pointing to ACPI1 as a major factor in the predisposition/resistance to allergic disorders.

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Table 1. Distribution of ACPI1 genotypes in relation to allergy

	Proportion of allergic subjects	Total number	Statistical value
Carriers of *A allele	33.3%	27	
Other types	4.5%	22	
Chi-squared test of independence			$\chi^2 = 6.185$ (1 degree freedom; $P = 0.013$)
Eta (with allergy dependent)			0.355
Eta-squared			0.126

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Allergy to eggplant flower pollen

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Key words: agricultural worker's disease; allergy; flower pollen; occupational asthma; rhinitis; Solanaceae.

• OCCUPATIONAL ALLERGY to flowers is commonly seen in patients working in the flower industry (1). Symptoms differ among patients, who can present with rhinoconjunctivitis, asthma, or urticaria. We describe a case of rhinoconjunctivitis and asthma to eggplant flower pollen in an agricultural worker.

A 43-year-old male smoker from Portugal presented with recent onset of rhinoconjunctivitis and a dry cough in the month of June when he was working in a greenhouse where eggplants (*Solanum melongena*) were cultivated. Physical

examination revealed decreased peak flow at 70% of the predicted value. Spirometry showed a moderate obstructive syndrome, partially reversible with inhaled β_2 -stimulants, hyperinflation, and static air trapping. Diffusion was in the normal range. Skin prick tests (SPT) with common inhalant allergens were positive to house-dust mites (*Dermatophagoides pteronyssinus*, *D. farinae*), storage mites (*Euroglyphus maynei*, *Glycyphagus domesticus*) and ash tree pollen. Mugwort was negative. SPT and a conjunctival challenge test with a saline extract from *Solanum melongena* flower petals and pollen were positive (wheal diameter 5 mm). SPT with eggplant fruit was negative. Three nonexposed control patients (one atopic) tested negative in the SPT and conjunctival challenge test to *S. melongena* extract. Avoiding the greenhouse containing the eggplant and the use of inhaled corticosteroids and bronchodilators was associated with a rapid improvement of symptoms and normalization of the peak flow.

Many different allergens of animal, vegetable or chemical origin can induce respiratory symptoms in an agricultural setting (2,3). The pathomechanisms are varied (IgE-mediated, nonspecific hyperactivity, and pharmacological mechanisms), making diagnosis of a specific allergy challenging. Moreover, many other respiratory diseases in farm workers must be ruled out (allergic alveolitis, organic toxic dust syndrome, chronic obstructive pulmonary disease) before diagnosis of an occupational allergy can be established (2,3). Exposure to flowers of the nightshade family (Solanaceae) such as paprika, tomatoes, potatoes, and eggplants has been described to lead to asthma, rhinoconjunctivitis and urticaria in gardeners by an IgE mediated mechanism (5,6). In artificial environments such as greenhouses the pollen density is enhanced and may lead to unusual pollen allergies (2). Cross-reactivity among members of the Solanaceae family and between Solanaceae and mugwort has been reported (5,7,8). Some authors suggest mugwort sensitization as a marker for sensitization to other Solanaceae pollens (1,5). Occupational allergy

to pollen of the Solanaceae family does not lead to food-induced allergy to the fruit of the incriminated plant (8). We found only two descriptions of sensitization to eggplant flower pollen in commercial gardeners with symptoms to tomatoes and paprika in the non-English language literature (5).

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