

Serum YKL-40 levels are correlated with symptom severity in patients with allergic rhinitis

J.-W. Kwon, T.-W. Kim, S.-H. Cho,
K.-U. Min & H.-W. Park*

Keywords: allergic rhinitis; asthma; chitinase-like proteins; severity; YKL-40.

Chitin is the second most abundant polysaccharide in nature. Though mammals and plants do not produce chitin, they do express chitinases and chitinase-like proteins, which are potent regulators of innate immune responses, which interact with and degrade chitin

Serum YKL-40 levels were elevated in patients with allergic rhinitis and correlated with symptom severity.

(1). In humans, it is known that chitinase and chitinase-like protein levels are elevated in various diseases, chronic inflammation, wound healing, and allergies (2, 3). YKL-40, one of the human chitinase-like proteins, is related to allergic inflammation and tissue remodeling (2). Serum YKL-40 levels are positively correlated with the severity of asthma and inversely correlated with lung function (4). Besides asthma, little is known about the relationship between YKL-40 and other allergic diseases. We conducted this study in order to evaluate the relationship between serum YKL-40 expression and allergic rhinitis.

A total of 51 patients with allergic rhinitis, 21 asthmatics, and nine healthy

controls were enrolled. For patients with allergic rhinitis, allergic rhinitis was diagnosed by allergy specialists based on perennial rhinitis symptoms, which lasted for more than 1 year, and ≥ 1 positive result (mean wheal diameter ≥ 3 mm) in skin prick tests for common aeroallergens. The patients who had asthmatic symptoms or a history of other allergic diseases, such as asthma, atopic dermatitis, or food allergy, were excluded. Symptom severity of allergic rhinitis was evaluated with a questionnaire about nasal symptoms including nasal obstruction, itching, sneezing, and rhinorrhea, which were each scored separately on a severity scale between 0 and 3 (0 = absent, 1 = mild, 2 = moderate, and 3 = severe). These four symptom scores were combined to produce a total nasal symptom score (TNSS) with a maximum score of 12 (5). For asthmatics, asthma was diagnosed by allergy specialists based on symptoms and positive methacholine bronchial provocation tests [25 mg/ml or less of methacholine concentration at

a $\geq 20\%$ decrease in the forced expiratory volume in 1 s (FEV₁)]. The severity of asthma was assessed by the Global Initiative for Asthma guidelines (6). Healthy controls who had no history of smoking or allergic diseases including asthma, rhinitis, or food allergy, were enrolled. Serum YKL-40 levels were measured in duplicate with enzyme-linked immunosorbent assay kits (Quidel Corporation, San Diego, CA, USA), and median values are presented.

Serum YKL-40 levels in patients with allergic rhinitis were significantly higher than those in controls [median (range), 53.0 (16.0–276.3) vs 33.3 (15.7–49.0) ng/mL; $P = 0.014$] but were significantly lower compared to those in asthmatics [53.0 (16.0–276.3) vs 85.5 (28.5–413.0) ng/mL; $P = 0.002$; Fig. 1]. Data were analyzed after log-transformations of YKL-40 values. Serum YKL-40 levels showed a positive correlation with symptom severity in patients with allergic rhinitis measured by TNSS ($r = 0.287$, $P = 0.041$). Among the four nasal symptoms of TNSS, itching and nasal

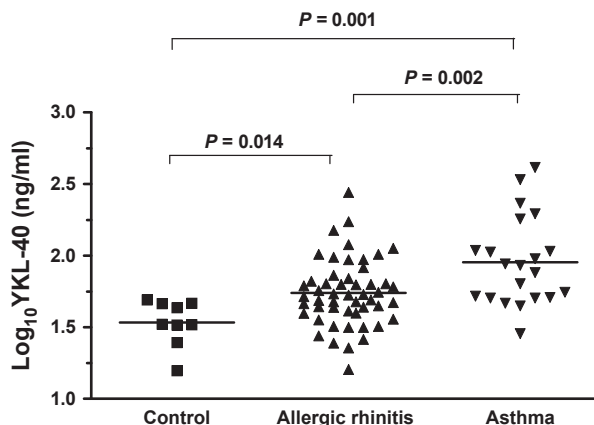


Figure 1 Comparison of the serum YKL-40 levels in the three study groups. Statistically significant differences between the groups were assessed by ANOVA ($P < 0.0001$) and T -tests. The line indicates the mean value for each group.

obstruction were positively correlated with the expression level of serum YKL-40 ($r = 0.428$, $P = 0.002$ and $r = 0.303$, $P = 0.031$, respectively).

Although allergic rhinitis is regarded as a local disease within the nasal cavity, serum YKL-40 levels in patients with allergic rhinitis were significantly elevated compared to controls and lower than those of asthmatics. This finding might be explained by the extent of the area involved in disease or tissue remodeling. Then serum YKL-40 levels are positively correlated to the severity of allergic rhinitis and the degree of itching, which is caused by the hypersensitivity of the peripheral nervous system to mucosa.

Although exact function and biologic characteristics of YKL-40 are not elucidated, this study suggests that serum YKL-40 may play a potential role in the pathogenesis of allergic rhinitis. The further studies are needed to understand the pathophysiologic mechanisms of YKL-40.

Conflict of interest

All of the authors have no conflicts of interest to disclose.

*Department of Internal Medicine
Seoul National University
28 Yongondong
Chongno-gu
Seoul 110-744
Korea
Tel.: 82-2-2072-0699
Fax: 82-2-742-2912
E-mail: guinea71@snu.ac.kr

Accepted for publication 21 March 2011
Allergy 2011
© 2011 John Wiley & Sons A/S
DOI: 10.1111/j.1398-9995.2011.02596.x

References

1. Ober C, Chupp GL. The chitinase and chitinase-like proteins: a review of genetic and functional studies in asthma and immune-mediated diseases. *Curr Opin Allergy Clin Immunol* 2009;**9**:401–408.
2. Lee CG, Elias JA. Role of breast regression protein-39/YKL-40 in asthma and allergic responses. *Allergy Asthma Immunol Res* 2010;**2**:20–27.
3. Sutherland TE, Maizels RM, Allen JE. Chitinases and chitinase-like proteins: potential therapeutic targets for the treatment of T-helper type 2 allergies. *Clin Exp Allergy* 2009;**39**:943–955.
4. Chupp GL, Lee CG, Jarjour N, Shim YM, Holm CT, He S et al. A chitinase-like protein in the lung and circulation of patients with severe asthma. *N Engl J Med* 2007;**357**:2016–2027.
5. Juniper EF, Stahl E, Doty RL, Simons FE, Allen DB, Howarth PH. Clinical outcomes and adverse effect monitoring in allergic rhinitis. *J Allergy Clin Immunol* 2005;**115**(3 Suppl. 1):S390–S413.
6. Bateman ED, Hurd SS, Barnes PJ, Bousquet J, Drazen JM, FitzGerald M et al. Global strategy for asthma management and prevention: GINA executive summary. *Eur Respir J* 2008;**31**:143–178.