

Clinical significance of total serum IgE determination in screening of Iranian Russian thistle pollen hypersensitive individuals

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Summary

Total serum IgE concentrations of normal and Russian thistle (*Salsola pestifer*) pollen hypersensitive individuals were determined in an Iranian population, using the solid phase radioimmunoassay technique. The mean values were 963.7 and 885.3 ng/ml, respectively, which are much higher than normal values given for non-Iranian populations. In addition, no significant differences were found between observed values ($P=0.1$) for normal and allergic individuals. The effect of common parasitic infestation in the Iranian population in causing high serum IgE levels is discussed.

Introduction

Since the demonstration of immunoglobulin E (IgE) in the serum by Ishizaka, Ishizaka & Hornbrook (1966) and the discovery of myeloma protein (IgND), which was later proved to be identical to IgE (Johansson & Bennich, 1967; Bennich *et al.*, 1969), various *in vitro* tests have been introduced to measure total (Johansson, 1968) and allergen-specific IgE in the serum (Wide, Bennich & Johansson, 1967; Gleich & Yunginger, 1975).

The serum concentrations of IgE in normal adults have been shown to vary widely and a range of 20 to 1830 ng/ml, with mean values of 150 to 248 ng/ml, is reported when using the solid phase (Phadebas IgE test) radioimmunoassay technique (Lynn Nye, Merrett & White, 1975). However, these values are significantly increased in various allergic diseases (Johansson, 1967; Johansson, Bennich & Berg, 1972; Gleich, Averbek & Swedlund, 1971), and it has been suggested that quantification of the total serum IgE in patients free from parasitic infestation is indicative of the state of atopy (Johansson, 1975).

Because of the fact that parasitic infestation is very common in the Iranian population during much of their life, it was expected that the total serum IgE concentrations would be high, even in the normal individuals. It was, therefore, the purpose of the present investigation to obtain the total serum IgE concentrations, both in

normal and in Russian thistle (*Salsola pestifer*) pollen hypersensitive individuals. In addition, to find out if the mean values given for the serum level of this antibody for the non-Iranian would hold true in the Iranian population.

Materials and methods

Subjects

Nine allergic patients, seven males and two females, with ages ranging from 10 to 48 years, who showed positive skin reaction to Russian thistle pollen crude extract and had typical symptoms during pollination of this weed in Tehran, Iran, were selected. Sera of these patients were collected during May, 1977, long before the pollination of Russian thistle in Tehran (Shafiee, 1976). Sera from eighteen normal volunteers, who were randomly chosen from the students and staff of the University of Tehran, with ages ranging from 19 to 40 years, were also obtained during the same period. All normal subjects were free from parasitic infestation at this time and had no history of allergic diseases in themselves and their families.

Russian thistle pollen crude extract preparation

Russian thistle pollen was collected during the 1975 pollen season in Tehran. Ten g pollen was defatted and depigmented by anhydrous diethyl ether and dried under vacuum. Dried pollen was extracted with 0.05 M phosphate-buffered saline at pH 7.4, and the extract was sterilized by filtration with a 0.22 Millipore filter. Concentration of the extract was adjusted to 2000 protein nitrogen units (PNU) per ml. All allergic patients gave a positive skin reaction (+2, 6 × 16 mm weal) when tested by the prick method.

Total serum IgE determination

The total serum IgE concentrations of the subjects were determined by the Phadebas IgE test (Pharmacia AB, Uppsala, Sweden) according to the procedures supplied with the kit. One unit was approximately equal to 2.0 ng and serum containing an IgE total higher than 400 ng was diluted so that the concentration would fall in the range of 50 to 100 ng/ml of the standard curve. According to the procedure given with the kit, factors 0.96 and 0.91 were used for samples diluted ten and five times, respectively.

Treatment of data

Student's *t*-test was used to measure statistically the significance of differences at $\alpha=0.1$.

Results

The total serum IgE concentration in randomly selected normal and Russian thistle (*Salsola pestifer*) pollen hypersensitive individuals is shown in Table 1. The mean level for total serum IgE in the normal subjects was 963.7 ng/ml, with a standard error of 164.5 ng/ml. The allergic patients had a mean total serum IgE level and standard error of 885.3 and 266.1 ng/ml respectively. Student's *t*-test revealed no significant difference between normal and Russian thistle pollen hypersensitive individuals at $\alpha=0.1$.

Table 1. Immunoglobulin levels (IgE) in serum of Iranian normal and Russian thistle pollen hypersensitive individuals

Normal subjects				Allergic patients			
Subject	Sex*	Age (years)	IgE (ng/ml)	Subject	Sex*	Age (years)	IgE (ng/ml)
P.K.	M	19	40	H.A.	M	29	440
A.S.	M	36	1040	P.P.	M	26	1600
R.A.	M	19	600	H.R.	M	30	300
S.K.	M	20	160	A.M.	M	48	460
A.M.	M	20	800	G.A.	F	23	48
P.K.	M	40	1000	H.S.	M	36	800
K.M.	M	22	1800	U.G.	F	28	580
B.B.	M	24	680	A.A.	M	25	2620
G.N.	M	22	840	P.A.	M	10	1120
M.H.	M	25	250				
H.K.	M	23	2000				
H.S.	M	23	420				
G.G.	M	23	336				
D.N.	M	21	1320				
S.A.	M	25	2700				
M.N.	M	21	760				
A.M.	M	23	1560				
M.S.	M	26	1040				
Mean			963.7				885.3
Standard error			164.5				266.1
Coefficient of variation (%)			72.4				90.2
Statistical difference							n.s.

* M and F indicate male and female, respectively.

† Determined by Student's *t*-test (two-tailed); $\alpha=0.1$; n.s.=not significant.

Discussion

Iranian clinicians use total serum IgE levels for screening their allergic patients, using normal values given in the literature for non-Iranian population. It was, therefore, essential to establish the total serum IgE concentrations in Iranian non-allergic individuals. In addition, it was interesting to compare normal serum IgE values with those of Russian thistle pollen hypersensitive patients and to find out whether the suggestion made concerning the screening of atopic patients on the basis of total serum IgE concentration holds true in this population.

The results of this investigation indicate that the mean values for total serum IgE concentrations in normal and Russian thistle pollen hypersensitive Iranian individuals are 963.7 and 885.3 ng/ml, with the coefficients of variation (c.v.) being 72.4 and 90.2% respectively. High coefficients of variation observed in both normal (c.v.=72.4%) and allergic (c.v.=90.2%) subjects confirm the results of other investigators (Gleich *et al.*, 1971; Leonardy & Peacock, 1972) that there exists large variation in total serum IgE concentration in different individuals. Furthermore, there is no significant difference (at $\alpha=0.1$) between total serum IgE levels of normal and Russian thistle pollen hypersensitive individuals. Very recently, Volyai (1978) also made similar studies in a large number of normal individuals in order to determine the total

serum IgE levels in the Iranian population. The mean value obtained in her investigation confirms the value reported in this paper.

The high values obtained might be partly attributed to the history of parasitic infestation which is very common in the Iranian population. Johansson, Mellbin & Vahlquist (1968) have noticed very high IgE concentrations in the sera of Ethiopian pre-school children. They attributed their high values mainly to the parasitic infestation and suggested that early parasitic infestation might be important in stimulation of IgE production. Furthermore, they proposed that the high IgE levels might persist even after the parasites have been cleared from the infested individuals. More recently, Ishizaka *et al.* (1976) have shown that IgE synthesis is enhanced when rats are infected with *Nippostrongylus brasiliensis* larvae and the total serum IgE titre did not correlate with the specific IgE antibody against this antigen. A similar situation may occur in the Iranian population.

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References

- BENNICH, H., ISHIZAKA, K., ISHIZAKA, T. & JOHANSSON, S.G.O. (1969) A comparative antigenic study of γ E globulin and myeloma IgND. *Journal of Immunology*, **102**, 826.
- GLEICH, G.J., AVERBECK, A.K. & SWEDLUND, H.A. (1971) Measurement of IgE in normal and allergic serum by radioimmunoassay. *Journal of Laboratory and Clinical Medicine*, **77**, 690.
- GLEICH, G.J. & YUNGINGER, J.W. (1975) The radioallergosorbent test: its present place and likely future in the practice of allergy. *Advances in Asthma and Allergy*, **2**, 1.
- ISHIZAKA, K., ISHIZAKA, T. & HORN BROOK, M.M. (1966) Physicochemical properties of human reaginic antibodies. IV. Presence of a unique immunoglobulin as a carrier of reaginic activity. *Journal of Immunology*, **97**, 75.
- ISHIZAKA, T., URBAN, J., JR., TAKUTSU, K. & ISHIZAKA, K. (1976) Immunoglobulin E synthesis in parasite infection. *Journal of Allergy and Clinical Immunology*, **58**, 523.
- JOHANSSON, S.G.O. (1967) Raised levels of a new immunoglobulin class (IgND) in asthma. *Lancet*, **ii**, 951.
- JOHANSSON, S.G.O. (1968) Serum IgND levels in children and adults. *International Archives of Allergy and Applied Immunology*, **34**, 1.
- JOHANSSON, S.G.O. (1975) Comparison of *in vivo* and *in vitro* tests for diagnosis of immediate hypersensitivity. *Laboratory Diagnosis of Immunological Disorders* (eds N. V. Girish, D. P. Stites and G. Brecher), p. 225. Grune and Stratton Inc., New York.
- JOHANSSON, S.G.O. & BENNICH, H. (1967) Immunological studies of an atypical (myeloma) immunoglobulin. *Immunology*, **13**, 381.
- JOHANSSON, S.G.O., BENNICH, H.H. & BERG, T. (1972) The clinical significance of IgE. *Progress in Clinical Immunology* (ed. R. S. Schwartz), Vol. 1, p. 192. Grune and Stratton Inc., New York.
- JOHANSSON, S.G.O., MELLBIN, T. & VAHLQUIST, B. (1968) Immunoglobulin levels in Ethiopian pre-school children with special reference to high concentrations of immunoglobulin E (IgND). *Lancet*, **i**, 1118.
- LYNN NYE, T.G., MERRETT, J.L. & WHITE, R.J. (1975) A detailed investigation of circulating IgE levels in a normal population. *Clinical Allergy*, **1**, 13.
- LEONARDY, J.G. & PEACOCK, L.B. (1972) An evaluation of quantitative serum immunoglobulin determination in clinical practice. *Annals of Allergy*, **30**, 378.
- SHAFIEE, A. (1976) Studies of atmospheric pollen in Tehran, Iran, 1974-5. *Annals of Allergy*, **37**, 133.
- VOLYAI, S.H. (1978) *Biochemical studies and IgE determination of blood in Schistosomiasis patients*. M.Sc. Thesis. School of Public Health, University of Tehran.
- WIDE, L., BENNICH, H. & JOHANSSON, S.G.O. (1967) Diagnosis of allergy by an *in vitro* test for allergen antibodies. *Lancet*, **ii**, 1105.

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