

## TOTAL SERUM IgE LEVELS AND EOSINOPHIL COUNTS IN TRICHIURIASIS

Nelson Augusto ROSARIO FILHO

### SUMMARY

Total serum IgE levels and eosinophil counts were determined in 21 boys with light *Trichuris trichiura* infection living in an institution. They were compared with a control-group matched for age and sex, and living under the same circumstances. A significant eosinophilia was found in trichiuriasis. Serum IgE values were greatly variable among cases with trichiuriasis. The geometric mean IgE (471.4 U/ml) was higher than in controls (192.3 U/ml) but not at a level of statistical significance. No correlation could be demonstrated between fecal egg counts, serum IgE levels and eosinophil counts. These findings expand the observations of serum IgE in human helminthiasis and is the first of its kind, relating intensity of *Trichuris trichiura* infection to this host response.

### INTRODUCTION

*Trichuris trichiura* is an helminth restricted to the colon and has no larval stage in tissues. The pathogenesis of such an infection is still debated<sup>5</sup>. It causes damage to the host only in heavily infected subjects<sup>3,19,30</sup>.

There have been several reports on total serum IgE levels in human helminthiasis<sup>11,12,17,22,28</sup>. Levels are elevated particularly in acute stages of infection or during tissue migration of larvae<sup>13,27</sup>.

Most cases of trichiuriasis reported in the literature regarding IgE levels are multiply infected with other agents known to stimulate IgE production. One study of single infections by *Trichuris trichiura* has not found elevation in serum IgE levels<sup>28</sup>.

The purpose of this work was to determine total serum IgE concentrations and total eosinophil counts, and correlate to intensity of *Trichuris trichiura* infection as assessed by fecal egg count.

### SUBJECTS

One hundred and three boys living in an institution were scrutinized for the presence of

parasites, either by the presence of cysts of protozoa or the presence of ova and larvae of helminths in feces.

We identified 21 cases of trichiuriasis (mean age 11.0 years) and compared to 15 cases that served as negative control group. In the last group (mean age 11.7 years) 10 cases were not infected at all, and five had giardiasis. They had at least three samples of feces examined to be certain they were not infected by helminths.

### METHODS

**Stool Parasites** — recently collected feces were examined by an experienced parasitologist. The method of FAUST et al.<sup>23</sup> of centrifugation and flotation in 33% Zinc sulfate solution and the method of HOFFMAN et al.<sup>23</sup> by spontaneous sedimentation in water were employed for detecting cysts and ova of parasites. The extraction of larvae of *Strongyloides stercoralis* was performed through the technique of RUGAI et al.<sup>23</sup>.

In addition, a quantitative method was used for determining the number of eggs per gram of feces (EGF). The method of Kato, as

modified by KATZ et al.<sup>20</sup> is commercially available in kits (A. K. Indústria e Comércio Ltda., Minas Gerais).

When results were positive by the other methods and eggs were not found by the quantitative method, we considered the sample as containing 24 EGF.

**Eosinophils** — venous blood was taken between 8 and 9 o'clock in the morning for total eosinophil counts (TEC). A selective staining method for eosinophils was utilized<sup>7</sup>. It gave highly reproducible counts, with a coefficient of variation between experiments of  $\pm 4.1\%$  and intraexperiment of  $\pm 7.8\%$ .

**Serum IgE** — serum samples of 1.0 ml were lyophilized and stored at  $-20^{\circ}\text{C}$ . Total serum IgE levels were determined by the Phadebas IgE PRIST (Paper Radio-immunosorbent Test). Kits were kindly donated by Pharmacia Diagnostics AB, Uppsala, Sweden. All sera were tested in duplicate. The average value was taken and results expressed in Units/ml.

**Statistics** — in order to normalize the non-Gaussian distribution, IgE values were converted into their natural log and results were reported as geometric means.

The data were analysed by the Student's *t* test and correlation coefficient test.

## RESULTS

Individual distribution of serum IgE values and eosinophil counts are shown in Tables I and II, respectively for the group with trichiuriasis and the control-group.

Eosinophil counts were significantly higher ( $p < 0.05$ ) in trichiuriasis than in the control-group.

There has been a tendency to find elevated serum IgE concentrations in trichiuriasis. However, it did not reach a significant level when compared with the values obtained in the control-group. In six cases, IgE levels were equal or greater than 880 U/ml, the highest value observed among non-infected cases.

TABLE I  
Total eosinophil counts, serum IgE levels and fecal EGG counts in patients with trichiuriasis

Case	Eosinophils/ $\mu\text{l}$	IgE (U/ml)	EGF	G. lamblia
1	566	300	2,160	
2	1,580	540	120	++
3	676	580	216	
4	335	2,000	96	
5	969	820	168	
6	273	84	72	++
7	714	3,000	48	
8	657	36	432	++
9	218	188	48	+
10	189	180	24	
11	487	660	216	
12	579	780	888	
13	1,141	1,740	96	
14	182	700	24	
15	865	1,720	24	+
16	208	230	72	++++
17	280	80	456	+++
18	579	880	384	
19	139	680	72	+
20	166	280	48	
21	1,330	880	100	+
	577.8 $\pm$ 89.2 * (139-1,580)	471.4 ** (36-3,000)	274.5 $\pm$ 104.7 * (24-2,160)	

\*  $\bar{x} \pm \text{SEM}$

\*\* geometric mean

( ) range

EGF = eggs per gram of feces

As can be seen, there were nine patients with giardiasis in the test-group and five in the control-group. A possible effect of *Giardia lamblia* infection of IgE levels was checked on, by dividing patients according to the presence or the absence of concomitant giardiasis. The geometric mean of IgE concentrations in cases with giardiasis was 262.0 U/ml and in cases without giardiasis was 732.3 U/ml. The difference between these two means was statistically significant ( $p < 0.05$ ) indicating that the presence of concomitant *Giardia lamblia* infection was associated with a decrease in IgE levels among patients with trichiuriasis.

T A B L E II  
Total eosinophil counts and serum IgE levels in the control-group

Case	Eosinophils/ $\mu$ l	IgE (U/ml)
1	624	150
2	286	500
3	442	880
4	2	140
5	468	530
6	189	210
7	345	33
8	221	41
9	263	43
10	143	290
Giardiasis		
11	371	280
12	348	150
13	88	80
14	127	398
15	416	880
Mean	288.9 $\pm$ 42.7 *	192.3 **
Range	(2-624)	(33-880)

\*  $\bar{x} \pm$  SEM

\*\* geometric mean

There was no correlation at all between fecal egg counts and IgE concentrations ( $r = 0.21$ ) or eosinophil counts ( $r = 0.01$ ). Furthermore, serum IgE was not correlated with eosinophilia ( $r = 0.32$ ).

## DISCUSSION

Intensity of some helminthic infections can be reasonably estimated by fecal egg counts, permitting a correlation with clinical manifestations and in evaluating treatment<sup>29</sup>. Symptoms are reported to be characteristic in trichiuriasis when egg counts are grater than 5,000<sup>3</sup> and parasitism considered massive when counts are over 30,000 EGF<sup>19</sup>.

Based on these clinical observations as correlated to the quantitative determination of egg output, we assume that patients included in our study represent light *Trichuris trichiura* infections.

The mean eosinophil count and range observed in the control-group are similar to what is accepted to be normal for boys at this age<sup>6,24</sup>. In spite of not being an invasive parasite, *Trichuris trichiura* may cause eosinophilia<sup>30</sup>.

Our results confirm the observations of a slight eosinophilia in children infected with *Trichuris trichiura*<sup>4,19</sup>. However, we could not establish a correlation between egg counts and total eosinophil counts, contrary to the findings of JUNG & BEAVER<sup>19</sup>.

The mean IgE levels of 192.3 U/ml found among children with no helminthic infection is close to the values reported for normal caucasians<sup>1</sup> but yet higher than in other studies<sup>2,9, 16,24</sup>. This discrepancy could be attributed to ethnic differences<sup>26</sup> or to the exposure to parasites in highly endemic areas, as demonstrated in other studies<sup>10,14,15</sup>.

Nevertheless, the fact of living in the same institution made them suitable as a negative control-group for the study of trichiuriasis.

We also included cases of giardiasis in both groups. Protozoal infections do not stimulate IgE production neither cause eosinophilia<sup>8, 18,22</sup>. Interesting was the finding of lower IgE levels in patients with giardiasis. We have no explanation for this finding, considering that *Trichuris trichiura* and *Giardia lamblia* colonize different intestinal sites.

RADERMECKER et al.<sup>28</sup> found normal IgE levels in six cases of trichiuriasis (geometric mean of 362 U/ml). This is the only report in the literature regarding IgE levels in trichiuriasis.

We observed in 21 cases a geometric mean of 471.4 U/ml, not significantly different from the values in the control-group. A great variability in IgE levels was observed among infected individuals. In addition, there was no correlation between egg counts and IgE levels, and between eosinophilia and egg counts.

Some cases of trichiuriasis may exhibit an increase in total serum IgE. The significance

of this finding is based on the fact that the incidence of trichiuriasis is high among Brazilian children and this could interfere with the interpretation of IgE determination as a laboratory aid in the diagnosis of atopic diseases<sup>25</sup>.

## RESUMO

### Níveis de IgE sérica total e eosinófilos na tricocefalose

Níveis séricos de IgE total e contagens de eosinófilos foram estudados em 21 casos de tricuriase pouco intensa e comparados aos valores obtidos em um grupo-controle do mesmo sexo e idade, vivendo sob as mesmas condições.

Eosinofilia significativa foi observada nos casos com tricuriase. Os valores de IgE variaram amplamente com uma média geométrica (471.4 U/ml) mais elevada do que a média para o grupo-controle (192.3 U/ml), embora não atingindo nível de significância estatística. Não houve correlação entre as contagens de ovos nas fezes, níveis séricos de IgE e contagens de eosinófilos.

Os achados expandem as observações existentes sobre IgE em helmintíases e é o primeiro a correlacionar a intensidade da infecção pelo *Trichuris trichiura* às respostas do hospedeiro.

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