

DESENSITIZATION IN ASCARIASIS

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Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 51,

No. 1, pp. 70-73, January, 1961

Original article submitted February 11, 1960

Allergic reactions play a definite role in the pathogenesis of ascariasis. In pulmonary ascariasis, they are manifested in the form of Loeffler's syndrome — transitory eosinophilic infiltration [7,19], while in intestinal ascariasis they are manifested in the form of enterocolitis, urticarial rashes and, sometimes, anaphylactic shock.

In the first stages of the disease in a primary infection, and especially in reinvasion, these reactions provide protection for the organism, because, when ascarid antigen combines with anti-ascarid antibodies at the site of the cell, biologically active substances (histamine, acetylcholine) are given off which cause an acute inflammatory reaction around the ascarid larvae. As a result of this, the larvae are immobilized in the tissues and are then broken down by phagocytes [9,18]. However, if the allergy does not then become immunity, the beneficial factor then becomes a harmful one. Allergic inflammation may cause severe pathological changes in various organs and systems: pulmonary atelectasis [8], obturation of the bronchi with mucus [16], attacks of bronchial asthma [11,13], inflammation of the meningeal membranes [6], inflammation of the intestinal mucosa and distortion of the secretion of intestinal juice [17], disruption of the antitoxic function of the liver [2]. In this case, the problem arises of relieving the allergic condition by means of desensitization.

Since, in pulmonary ascariasis, desensitization may prove to be one of the important types of therapy, we conducted a number of experiments devoted to the study of desensitization with vitamin B₁ in pulmonary ascariasis.

We selected the given preparation because it promotes the production of intense immunity in experimental ascariasis [4]. At the same time, it is well known that vitamin B₁ shows a desensitizing effect in serum and bacterial allergy [3,12,14,20].

In the first series of experiments, we studied the effect of vitamin B₁ administered from without on the development of a strictly allergic reaction in response to ascarid antigen in guinea pigs suffering from ascariasis.

The experiments were carried out on guinea pigs having an initial weight of 200-225 g. Animals showing a daily increment in weight of less than 3 g were not included in the experiment. All experimental animals received 300 invasive ova of *Ascaris lumbricoides* each. One group of animals daily received vitamin B₁ subcutaneously in the amount of 570 µg per course during 21 days.

On the 21st day after infection, an extract of lyophilized ascarid tissues in the amount of 0.25 ml of a 1:200 dilution was injected into the animals intracardially.

Since, as per our findings, the injection of this amount of antigen caused fatal anaphylactic shock in 100% of guinea pigs sensitized by larval ascariasis, we were able to judge the degree of desensitization.

The Effect of B₁ -Hypervitaminosis on the Size of Edema During a Skin Test with Ascarid Antigen in Rabbits Infected with Invasive Ova of *Ascaris lumbricoides*

Animal No.	Amount of thiamine per course (mg)	Area of cutaneous edema (cm ²)
1	—	56
2	—	49
3	—	68
4	—	39 (average M = 53)
5	8.75	6
6	8.75	10
7	8.75	27.5
8	8.75	7.5
9	8.75	2.5
10	8.75	12 (average M = 9.25)

The experiments showed that the administration of excess vitamin B₁ during experimental ascariasis has a desensitizing effect. Control pigs which were on an ordinary diet gave anaphylactic shock with a fatal outcome in all cases. In the guinea pigs with B₁-hypervitaminosis, shock with fatal outcome was observed in one case out of eight.

However, when evaluating the materials presented by the method of variable statistics, it can be noted that the limit of probability of the result is about 0.3 for the experiment, according to A. Ya. Boyarskii's approximation scale [1], while for the control, the minimal probability is about 0.7. Therefore, in order to exclude the possibility of the elements of chance, a second series of observations was set up. In this series, the local manifestation of the anaphylactic reaction was studied. The experiments were carried out on rabbits weighing 2 to 2.5 kg, and infected with two doses of 6000 invasive ascarid ova each, with an interval of 21 days.

One group of animals daily received vitamin B₁ subcutaneously in the amount of 8.75 mg per course. On

the 29th day of invasion, 0.2 ml of extract of lyophilized ascarid tissues in a dilution of 1:100 was administered to all rabbits into the skin of the back, from which the fur had been removed. The results of the reaction were recorded after 24 hours, according to the size of the edematous area. The data of the experiment are given in the table.

The results obtained show that in rabbits to which vitamin B₁ had been administered, the area of cutaneous edema varied in the range of 2.5-27.5 cm². In rabbits which were kept under ordinary conditions, the area of cutaneous edema varied in the range of 39-56 cm². From this it follows that B₁-hypervitaminosis weakens the cutaneous allergic reactivity of rabbits suffering from larval ascariasis to the parenteral administration of ascarid antigen.

The results of the experiment are treated statistically.*

As seen from the table, the average area of edema in the B₁-hypervitaminosis group was 9.25 cm². The

average squared deviation for this group, calculated according to the formula $\sigma = \sqrt{\frac{\sum y^2 - \frac{(\sum y)^2}{n}}{n-1}}$, where \underline{n} is the number of variants, \underline{y} is the variants and Σ is the sum of variants or of their squares, was equal to 19.1.

In the control group, the average area of edema was 53 cm², while σ calculated by the method described above was 12.2. The error of the arithmetic mean in the group of animals which had received the vitamin was $m = \frac{\sigma}{\sqrt{n}} = 7.8$, while in the control group it was 6.1. The difference between the size of edema in the experiment and in the control (difference of averages) was 43.75 cm², while the error of the difference, $md = m_{on} - m_K$, was 13.9. In order to answer the question of the validity of the results obtained, we compare the difference with its own error according to the formula $t = d/md$, where \underline{t} is the criterion of reliability, d is the difference between size of edema in experiment and in control, and md is the error of difference. The difference is considered to be statistically reliable if $t \geq 3$. In our experiment, $t = 3.2$. Consequently, the results of the experiment are statistically reliable.

Thus, the experiments of both the first and second series which have been given enable us to conclude that the injection of vitamin B₁ into animals affected by ascariasis lead to the weakening of their allergic reactivity to the parenteral administration of ascarid antigen.

* All statistical indicators were computed for small samples.

In reviewing the causes underlying this phenomenon, it must be noted that, in animals affected by larval ascariasis, an excess of vitamin B₁ raises the titer of circulating antibodies against ascarid larvae. This fact was described by us, together with A. N. Mats and I. N. Markovich, in 1958. In the given experiment, we also observed an increase in the titers of circulating anti-ascarid antibodies in animals receiving an excess of vitamin B₁. Therefore, it is quite probable that, in animals with B₁-hypervitaminosis, antigen administered parenterally can be neutralized by circulating antibodies in the vascular system. This prevents the combination of antigen with the antibodies fixed in the cells. In this case, the antigen-antibody reaction at the site of the cell is weakened, and death of the animal does not occur.

It can also be assumed that disturbance in acetylcholine metabolism during ascarid invasion, under the influence of excess thiamine [5], lead to a decrease in the secretion of this mediator during the course of the strictly allergic reaction. The intensity of the reaction is therefore weakened.

SUMMARY

B₁-hypervitaminosis reduces allergic reactivity to ascarid antigen in guinea pigs and rabbits infected with *Ascaris lumbricoides* ova. The course of anaphylactic shock in animals with B₁ hypervitaminosis is milder, and the size of the skin edema, appearing in response to subcutaneous administration of ascarid antigen, is reduced.

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