

EFFECT OF AFLATOXIN ON DYNAMICS
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In experiments on mice immunized with typhoid vaccine, if aflatoxin is administered before, along with, or after vaccination it depresses the plasma-cell response of the lymph glands and spleen and sharply inhibits antibody formation.

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In recent years a special group of toxic substances secreted by the fungi Aspergillus flavus and Penicillium puberum and called aflatoxins has been described [4]. They possess high toxicity toward many species of animals and birds and man. Aflatoxin has been shown to be present in many agricultural products and also in the milk of animals receiving food containing these toxins. Aflatoxin B₁ possesses the greatest biological activity. In chronic aflatoxin poisoning pathological changes develop in the liver and other organs rich in reticulo-endothelial tissue [1]. The host organism shows increased susceptibility to secondary bacterial infection.

The aim of this investigation was to study the effect of aflatoxin on the dynamics of antibody formation.

EXPERIMENTAL METHOD

Aflatoxin was isolated from a culture of the fungus A. flavus by the method described previously [2].

In the experiments of series I the antibody titer was determined in the blood serum of albino mice receiving various combinations of aflatoxin and typhoid vaccine. The experimental animals were divided into four groups. The mice of group 1 received typhoid vaccine only, by subcutaneous injection, in a volume of 0.1, 0.2, and 0.3 ml, the mice of group 2 received typhoid vaccine followed 3 days later by aflatoxin in doses of 0.3, 0.4, and 0.5 ml, while the animals of group 3 received aflatoxin followed by typhoid vaccine in the same volumes. The mice of group 4 received subcutaneous injection of aflatoxin and typhoid vaccine simultaneously. In all experiments, blood was taken 24 and 72 h and 10 days after the last injection for use in the agglutination reaction with homologous antigen. To study the effect of aflatoxin on the plasma-cell response of the lymph glands and spleen, the experiments of series I were performed on albino mice. The animals were subdivided into five groups. In all cases 24 h after the last injection of the preparation the mice were decapitated, impression films were made from the lymph glands and spleen and stained by the usual method, and the plasma cells were counted in 50 fields of vision in each film. The results were subjected to statistical analysis.

EXPERIMENTAL RESULTS

Aflatoxin was found to influence the dynamics of antibody formation in animals immunized with typhoid vaccine (Table 1). After immunization of mice with typhoid vaccine alone the antibody titer reached 1:60-1:320. Administration of typhoid vaccine followed by aflatoxin to the mice resulted in antibody formation to a titer of 1:40 by the 10th day. Aflatoxin injected into animals after the beginning of antibody synthesis evidently depresses this process considerably.

When the animals were injected with aflatoxin followed by typhoid vaccine, or when these preparations were injected at the same time, no antibodies were formed or their titers were minimal and did not exceed 1:5.

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TABLE 1. Results of Agglutination Reaction with Blood Serum of Experimental Mice

Substance injected	No. of animals	Results of agglutination reaction															
		After 24 h								After 72 h							
		1:5	1:10	1:20	1:40	1:80	1:160	1:320	1:5	1:10	1:20	1:40	1:80	1:160	1:320	1:5	1:10
Typhoid vaccine	30	+														+	
Typhoid vaccine followed by aflatoxin	30	+														+	
Aflatoxin followed by typhoid vaccine	30																
Aflatoxin and typhoid vaccine simultaneously	30																

TABLE 2. Number of Plasma Cells in Lymph Glands and Spleen of Mice after Receiving Injections of Aflatoxin and Typhoid Vaccine in Different Combinations

Substance injected	Volume of pre- paration in- jected	No. of animals	No. of plas- ma cells per 50 fields of vision
Aflatoxin	0.3 0.4 0.5	20	9
Vaccine	0.1, 0.1, 0.1		
followed 3 days later by aflatoxin	0.3, 0.4, 0.5	20	25
Aflatoxin	0.3, 0.4, 0.5		
followed 3 days later by vaccine	0.1, 0.1, 0.1,	20	17
Aflatoxin and vac- cine simultaneously	0.3, 0.4, 0.5	20	23
Typhoid vaccine only	0.1, 0.1, 0.1	20	56

Aflatoxin thus inhibits immunogenesis, presumably because of the toxic action of these substances on antibody-producing cells.

The results of the experiments of series II showed that aflatoxin reduces the number of plasma cells in the lymph glands and spleen of the experimental animals (Table 2).

The number of plasma cells in the lymph glands and spleen of normal mice is 14-16 cells per 50 fields of vision, while in animals immunized with typhoid vaccine this number rises to 56 per 50 fields of vision. After injection of aflatoxin followed by typhoid vaccine into the mice the number of plasma cells only reached 17, indicating marked depression of the plasma-cell response of the lymph glands and spleen of the immunized animals. In mice receiving aflatoxin followed by typhoid vaccine or receiving them at the same time, the number of plasma cells also was considerably reduced.

A direct relationship was thus established between the number of plasma cells in the lymph glands and spleen of the mice and the titer of specific antibodies. Aflatoxin inhibits the plasma-cell response of the lymphatic system of immunized animals, so that the antibody titer is lowered or antibodies are absent altogether.

LITERATURE CITED

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