CHROMOSOMAL ABERRATIONS IN LEUKOCYTES OF ALLERGIC PATIENTS

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The karyotypes of 20 patients with allergy were studied by the usual method at the 70th-72nd hour of incubation of the leukocytes. The mean frequency of cells with chromosomal aberrations in these patients was 10.7 ± 0.9% (differences from control significant; $P < 0.01$), with variations in individual persons from 4 to 22%. It is postulated that the state arising in the patient with various forms of allergy may significantly increase the frequency of chromosomal and also, perhaps, of gene mutations.

The basis for this investigation was the views expressed by one of the authors [4] regarding disturbances of intracellular homeostasis as the cause of spontaneous or natural mutation and experimental evidence of the onset of mutations in mouse bone marrow cells under the influence of immunological stress [5].

Allergic reactions to foreign substances are special manifestations of immunological stresses, and they are very widespread among persons of all age groups.

The object of this investigation was to study the influence of such immunological conflicts on the genetic apparatus of the cell.

EXPERIMENTAL METHOD

The karyotypes of 20 patients with allergy, either attending or admitted to hospital for treatment, were studied by the usual method [12]. Patients with no history of virus diseases and never having received x-ray therapy, radiotherapy, or specific chemotherapy, were specially chosen for the investigation. Blood was taken in the acute stage of the illness (from 15 patients), before medicinal treatment began. In 5 patients the tests were carried out during remissions. The allergic states were caused by the following allergens: antibiotics (streptomycin, penicillin, tetracycline), sodium thiosulfate, sulfathiazole, antitetanus serum, pollen, berries, house dust, and cold. To obtain control data the frequency of detection of leukocytes with chromosomal aberrations in five healthy persons was studied. Fifty metaphase plates were analyzed for each subject. All aberrations of chromosomal and chromatid types were recorded.

EXPERIMENTAL RESULTS

The frequency of aberrant cells discovered in the control group varied from 0 to 2% (mean 1.2%). This frequency agrees with figures given by Soviet and other workers who compared the frequency of chromosomal aberrations appearing spontaneously and in response to the action of various mutagens [1, 3, 6, 8-11] and also with the results of investigations carried out specially to study the level of spontaneous chromosomal aberrations in a culture of human leukocytes [2].

The mean frequency of cells with chromosomal aberrations in patients with allergy was 10.7 ± 0.9% (differences from the control significant; $P < 0.01$), with variations in different individuals from 4 to 22%

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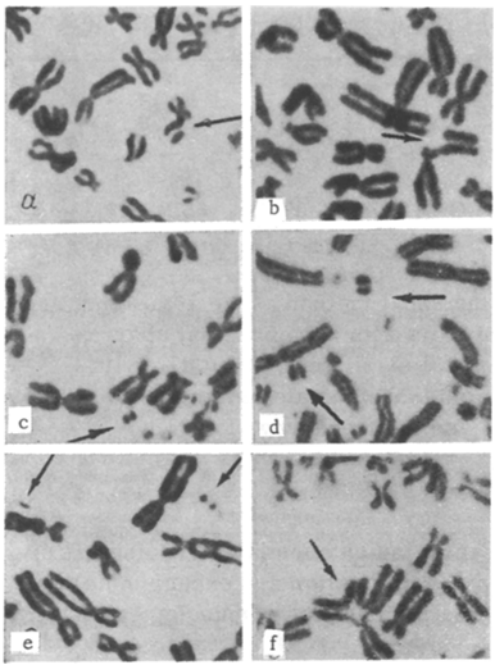

Fig. 1. Chromosomal aberrations in leukocytes of patients with allergy (stained with aceto-orcein; objective 90, ocular 15): a, b) chromatid breaks, c, d, e) paired acentric fragments, f) chromatic translocation.

(Fig. 1). The structural aberrations consisted of single and paired fragments; one chromatic translocation was found in only one patient, or an average of 1:1000 cells (almost twice the frequency in healthy persons). The highest frequency of cells with chromosomal aberrations (16-22%) was observed in patients in the acute stage of the disease caused by various allergies, the lowest in the patients during a remission.

No conclusion regarding correlation between the severity of the manifestation of allergy and the frequency of appearance of cells with chromosomal aberrations can be drawn from these results. However, chromosomal aberrations were found with the highest frequency in patients in a state of anaphylactic shock.

No relationship was found between the frequency of discovery of aberrant cells and the action of particular allergens. Some scatter was found in the degree of the mutagenic effect of the same allergens in different individuals; this is evidently explained by individual differences between patients and differences in the doses of allergens producing the effects. According to the literature [7], penicillin, streptomycin, and tetracycline themselves do not produce a mutagenic effect and, for that reason, the facts described can be explained by the mutagenicity of these substances.

There are thus good grounds for considering that the state arising in man in various allergies may significantly increase the frequency of chromosomal and also, perhaps, of gene mutations. The facts described above merit attention in connection with the explanation of the possible biological factors leading to genetic contamination of the pool of germ and somatic cells.

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