

HEMODYNAMIC RESPONSE TO COTTON ALLERGEN UNDER INDUSTRIAL CONDITIONS

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On the basis of experimental and clinical-laboratory investigations the writers showed that sensitization with cotton dust is possible [2, 4]. In women workers engaged in cotton processing, and suffering from chronic diseases of the upper respiratory tract, antibodies against cotton allergen were found in the blood at times of feeling unwell during work [3, 4].

The object of the present investigation was to study responses of the cardiovascular system and the craniocerebral circulation to inhalation of specific cotton allergen in subjects with different degrees of sensitization to cotton dust.

EXPERIMENTAL METHOD

Seventeen female workers (mean age 36.7 ± 2.6 years), who had previously undergone careful clinical-laboratory examination, were selected for the investigation. All had increased sensitivity to cotton dust. Depending on the severity of the skin reaction to the allergen they were divided into two groups. Group 1 consisted of seven women with skin reactions rated at ++ and +++, group 2 consisted of ten women with a skin reaction rated at +.

Parameters of the central hemodynamics were recorded in each patient by mechanocardiography. The systolic, diastolic, mean-dynamic, and lateral systolic arterial pressures were determined. The sphygmogram was recorded from the carotid, femoral, and radial arteries, after which the velocity of spread of the pulse wave along vessels of muscular and elastic types, the stroke volume (SV) of the heart and cardiac output (CO), the relative and total peripheral resistance (RPR and TPR, respectively), the mean rate of ejection of blood from the left ventricle, and certain other parameters relating to the phase structure of cardiac activity (ejection time, period of diastole) were calculated.

The heart rate was also calculated.

The craniocerebral circulation was studied by rheoencephalography (REG). The rheographic index (RI) and the pulse filling time of the cerebral vessels with blood were calculated. The parameters for each subject were recorded after adaptation for 20-25 min, after inhalation of vapor of physiological saline (by means of a manual inhaler) for 3 min, and again 10 and 20 min after inhalation of vapor of the cotton dust allergen (1.5 ml) with a content of 1000 PNU/ml.

EXPERIMENTAL RESULTS

The writers consider that changes in the parameters of the central and cranio-cerebral hemodynamics found in the initial state are connected with differences in the degree of allergologic susceptibility. Allergens are known to be stimuli for different parts of the nervous system, and for that reason the higher values of parameters of the central hemodynamics can evidently be explained on the grounds that the examination was carried out on textile workers under industrial conditions after the beginning of the shift, when the cotton dust allergen, present in the air of the factory premises, could already have had a reflex action and induced shifts in the hemodynamic reactions. On inhalation of vapor of physiological saline the parameters recorded remained virtually unchanged. Subsequent inhalation of the allergen induced different types of response (Table 1, Figs. 1-3). In workers with less marked sensitization

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TABLE 1. Changes in Hemodynamic Parameters in Response to Inhalation of Cotton Allergen in Subjects with Weaker (1) and Stronger (2) Sensitization to Allergen ($M \pm m$)

Parameter tested	Initial data		Inhalation of vapor of physiological saline		10 min after inhalation of allergen vapor		20 min after inhalation of allergen vapor	
	1	2	1	2	1	2	1	2
SV, cm^3	$52,50 \pm 3,90$	$92,70 \pm 7,32^*$	$57,59 \pm 4,20$	$81,04 \pm 3,68^*$	$57,56 \pm 4,01$	$73,06 \pm 8,02$	$72,44 \pm 5,13$	$73,94 \pm 7,85$
CO, cm^3/min	$4225,0 \pm 251,1$	$65580,0 \pm 715,7^*$	$4201,0 \pm 416,5$	$5472,0 \pm 416,4^*$	$4182,0 \pm 329,2$	$4870,0 \pm 725,3$	$5257,0 \pm 420,7$	$48270,0 \pm 476,3$
Mean blood ejection velocity, cm^3/sec	$214,2 \pm 12,8$	$350,0 \pm 22,3^*$	$220,0 \pm 15,5$	$294,0 \pm 16,2$	$208,6 \pm 16,9^*$	$258,6 \pm 30,5$	$272,6 \pm 18,5$	$255,0 \pm 55,6$
RPR, conventional units	$39,95 \pm 3,92$	$26,41 \pm 2,87^*$	$41,41 \pm 4,61$	$29,96 \pm 1,48^*$	$44,57 \pm 5,10$	$40,28 \pm 6,49$	$34,62 \pm 3,83$	$41,36 \pm 5,50$
TPR, dynes/sec • cm^{-5}	$1905,0 \pm 167,4$	$1253,0 \pm 135,2^*$	$1970,7 \pm 212,2$	$1415,7 \pm 82,5^*$	$2101,0 \pm 232,0$	$1904,0 \pm 288,8$	$1651,0 \pm 185,7$	$1888,0 \pm 268,2$

* $P < 0.005$.

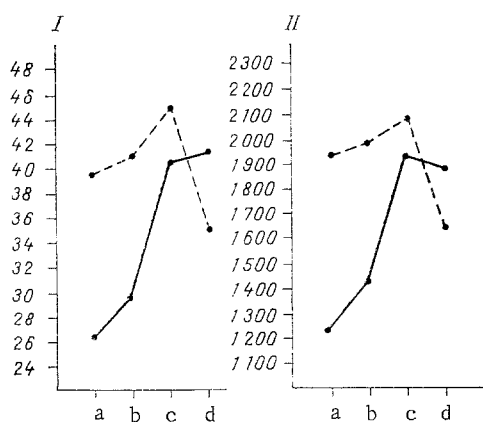


Fig. 1. Parameters of peripheral resistance. I) RPR (in conventional units), II) TPR (in dynes/cm·sec⁻⁵). Broken line — subjects with weaker sensitization to cotton allergen, continuous line — subjects with stronger sensitization to cotton allergen. a) Background; b) after inhalation of physiological saline; c) 10 min, d) 20 min after inhalation of allergen.

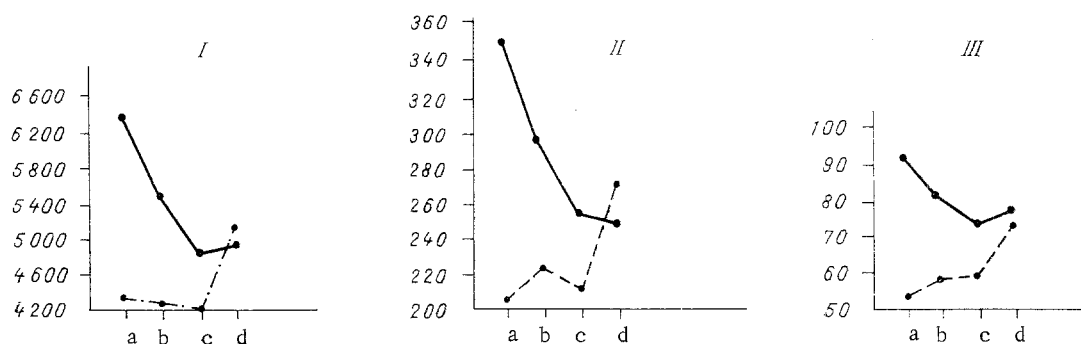


Fig. 2. Parameters of cardiac function. I) CO (in cm³/min), II) blood ejection velocity from left ventricle (in cm³/sec), III) SV (in cm³). Remainder of legend as to Fig. 1.

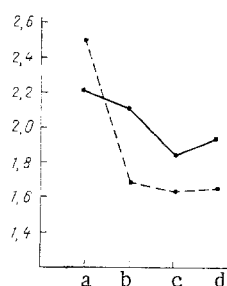


Fig. 3. Parameters of craniocerebral circulation (RI). Legend as to Fig. 1.

to cotton allergen the hemodynamic responses were of the rising type, increasing until the 10th minute and reaching a maximum by the 20th minute after inhalation of the allergen. This type of response, in our opinion, is positive and is regarded as an adaptive response of the body to the specific allergen.

The response to the allergen in the group of subjects with marked sensitization to cotton allergen was completely different in character. Their response to the allergen was of the descending type. Either it had no maximum or it was very short and ill-defined. The maximum of the response was reached at the 10th minute, and had disappeared by the 20th minute. This response can be regarded as one of resolution in the sensitized subject to administration of the reacting dose of allergen.

Different initial background and, more important still, the different type of response to inhalation of the allergen during tests of function of the cardiovascular system and craniocerebral circulation thus shed light on the character of allergic susceptibility of the subject and the path of the subsequent changes affecting the cardiovascular system depending on the action of the specific stimulus. In the writers' view, if the results are interpreted in this way the state of the central and craniocerebral hemodynamics can be predicted and appropriate measures taken to correct them.

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