CHANGES IN HISTAMINE CONCENTRATION IN BLOOD AND ORGANS OF RATS WITH EXPERIMENTAL PNEUMOCOCCAL INFECTION

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During development of experimental pneumococcal infection changes take place in the histamine concentration in the blood and certain organs of rats in phases which correspond to changes in serotonin concentration. As the infectious disease develops, this histamine concentration rises.

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Previous investigation demonstrated the participation of serotonin in the pathogenesis of bacterial infection and poisoning. There is a close link between the manifestations of the biological activity of serotonin and histamine.

The object of the present investigation was to study the dynamics of changes in the histamine concentration in the blood and organs during development of experimental pneumococcal infection.

EXPERIMENTAL METHOD

Experiments were carried out on 216 male rats weighing 170-200 g. Type I pneumococci were injected intradermally in the middle of the animal's right side in a dose of 0.2 ml of an 18 h culture diluted 1:100. The rats were decapitated 0.5,1, 3, 5, 12, 24, 48, and 72 h after injection and the organs were removed. The histamine concentration was determined in the blood, the brain except the hypothalamus, the hypothalamus, lungs, small intestine, liver, and skin. The blood and corresponding organs on intact rats served as controls. Histamine was determined by a spectrofluorometric method [3]. Histamine fluorescence was measured on a reconstructed ISP-53 apparatus with an FÉP-1 attachment. Histamine hydrochloride was used as standard. The results were analyzed by statistical methods [1].

EXPERIMENTAL RESULTS

The histamine concentration in the blood and organs of the intact rats was as follows: blood 0.027 ± 0.007 μg/ml, lungs 0.192 ± 0.034 μg/g, liver 0.225 ± 0.027 μg/g, small intestine 0.403 ± 0.043 μg/g, kidneys 0.088 ± 0.010 μg/g, skin 1.115 ± 0.076 μg/g, hypothalamus 0.180 ± 0.045 μg/g, brain except hypothalamus 0.058 ± 0.006 μg/g.

During the first 3 h, the blood histamine level in the rats infected with pneumococci fluctuated within normal limits. After 5 h, the histamine concentration was more than twice its initial value and remained at about the same level for 48 h. Three days after infection, its concentration was more than four times the initial value. In this period the animals' condition was serious (temperature raised by 1.5-2°, loss of appetite, adynamia, bilateral pneumonia, inflammatory edema affecting the right side of the trunk, the inguinal region, and the right lower limb).

The dynamics of the histamine concentration in the hypothalamus was similar. On the 2nd-3rd day of the disease the histamine concentration in the hypothalamus was between 4 and 6 times higher than the control value.

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In the lungs, liver, small intestine, skin, kidneys, and brain except the hypothalamus, a clear decrease in this histamine concentration was observed soon after infection of the animals with pneumococci. Between 30 min and 1 h after infection with pneumococci the histamine concentration fell to between half and one-fifth the control level. The decrease in histamine concentration in all the organs was statistically significant. The phase of decrease in histamine concentration was comparatively short in the small intestine, kidneys, and brain minus hypothalamus (the histamine level returned to normal after 3 h). In the liver and lungs, the histamine concentration reached normal values 12 h after infection of the animals and remained within normal limits for 24 h. During this period the histamine concentration in the small intestine, skin, and kidneys was between twice and four times higher than in the controls. Subsequent (48-72 h) development of the disease was accompanied by elevation of the histamine level in the investigated organs to between twice and nine times the control value. Statistical analysis confirmed that the increase in the concentration in the blood and organs was significant.

Changes in the histamine concentration is the blood and organs of rats with pneumococcal infection thus take place in phases corresponding to changes in serotonin concentration [2]. Two phases were found in the blood and hypothalamus: phase I is associated with absence of significant changes in the histamine concentration, phase II with an increased histamine concentration. In the liver, lungs, small intestine, brain minus hypothalamus, and skin three phases were found: in phase I (longer and more marked in the liver and lungs) the histamine concentration was lowered, in phase II it was within normal limits, and in phase III it was raised. The histamine concentration rose, like the serotonin concentration, during development of the infectious disease and bacterial poisoning.

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