EFFECT OF TRYPTOPHAN, SEROTONIN, KYNURENIN, CORTICOSTEROIDS, AND PEROXIDASE ON ACTIVITY OF TRYPTOPHAN-PYRROLASE, 5-HYDROXYTRYPTOPHAN DECARBOXYLASE, AND CATALASE IN THE RAT LIVER

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Injection of tryptophan, serotonin, kynurenin, prednisolone, hydrocortisone, and peroxidase intraperitoneally into rats activates tryptophan-pyrrolase and inhibits liver catalase activity. Activity of 5-hydroxytryptophan decarboxylase is increased after injection of tryptophan, and unchanged or decreased after injection of prednisolone, hydrocortisone, serotonin, kynurenin, and peroxidase. The increase in activity of 5-hydroxytryptophan decarboxylase produced by tryptophan does not coincide in time with the activation of tryptophan-pyrrolase.

Since no information is to be found in the literature on simultaneous investigation of activity of tryptophan-pyrrolase (TP), 5-hydroxytryptophan decarboxylase (5-HTD), and catalase, in the present investigation parallel studies were made of changes in activity of these three enzymes in the liver under the influence of tryptophan, serotonin, kynurenin, corticosteroids, and peroxidase.

EXPERIMENTAL METHOD

Experiments were carried out on albino rats. Altogether 329 female rats weighing 150-200 g were used, of which 21 were controls, 87 received a single intraperitoneal injection of 5 ml physiological saline, 53 a similar injection of 5 mg DL-tryptophan, 30 received 5 mg serotonin-creatinine sulfate, 33 received 5 mg kynurenin sulfate, 37 5 mg prednisolone, 38 5 mg hydrocortisone, and 30 5 mg of horseradish peroxidase, dissolved in 5 ml physiological saline. Control animals received no injections. Analyses were made once in the control rats and in the experimental animals of the 2nd, 3rd, 6th, 10th, and 24th h after injection.

TP activity was studied by the method of Knox [7], and 5-HTD activity by a modified method of Gaddum and Gearman [3], serotonin being determined by a spectrofluorometric method as described by Udenfriend, Weisbach, and Brodie [10]. Catalase was determined by a modified method of Saito, described by Kidson [5]. The numerical results were analyzed by statistical methods. Changes in activity of the above enzymes were regarded as significant if their probability exceeded 95% ($P < 0.05$) [11].

EXPERIMENTAL RESULTS AND DISCUSSION

It is clear from Fig. 1, which gives the results of the investigation, that liver TP is activated by tryptophan ($P < 0.001$), and also by serotonin ($P < 0.001$), kynurenin ($P < 0.001$), prednisolone ($P < 0.001$), hydrocortisone ($P < 0.001$), and peroxidase ($P < 0.001$). This is in agreement with published data [1,2,6-8]. The activity of 5-HTD was increased only in rats receiving tryptophan, also in agreement with published data [4]. The increase was observed at 6 h and 10 h of the experiment ($P < 0.05$; $P = 0.05$), with a subsequent decrease at 24 h ($P < 0.01$). According to some data, corticosteroids slightly increase 5-HTD activity in the brain of animals [9], while according to others they decrease the serotonin concentration in various tissues [12]. According to the results of the present experiments, the increase in 5-HTD activity found 2 h and 3 h after injection of hydrocortisone and 24 h after injection of prednisolone was not statistically significant ($P > 0.1$). In the experiments with hydrocortisone, the activity of the enzyme was reduced by a statistically significant amount 10 h and 24 h after injection ($P < 0.02$). A decrease in activity of 5-HTD in the

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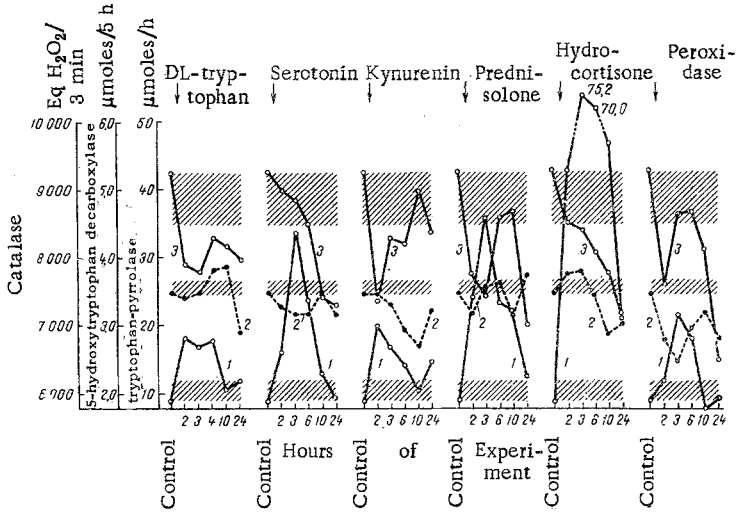

Fig. 1. Effect of tryptophan, serotonin, kynurenin, prednisolone, hydrocortisone, and peroxidase on activity of TP (1), 5-HTD (2), and liver catalase (3) in rats. Limits of changes in activity of all three enzymes observed after injection of physiological saline are marked by oblique shading.

liver was also observed after injection of serotonin, kynurenin,and, in particular, peroxidase ($P < 0.05$, $P < 0.02$, and $P < 0.001$, respectively). In all the experiments, liver catalase activity was reduced. A decrease, although not linear, always accompanied the increased TP activity. This observation is in agreement with data in the literature on the antagonistic action of TP and catalase in vitro [6,7].

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