

THE SERUM TRANSAMINASES IN EXPERIMENTAL LESIONS OF THE LIVER

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During recent years considerable research has been undertaken to determine the serum transaminase activity in various diseases. It has been found that the transaminase concentration rises especially high in myocardial infarction, in lesions of the liver parenchyma, in muscular dystrophies, and in other diseases associated with tissue necrosis. Particular interest is attached to the determination of the transaminase activity in liver diseases. By this means acute and chronic conditions can be distinguished, the trend of the disease can be judged, and so on.

In acute lesions of the liver, for example, in infectious hepatitis, a sharp increase is always seen in the activity of both glutamico-asparaginic (G-As) and glutamico-alanine (G-Al) transaminases, and moreover, the ratio between the activities of the G-As and G-Al transaminases, normally 1.33, falls to 0.6. In chronic liver diseases and in cirrhoses the increase in transaminase activity is relatively small. The increased serum transaminase activity is explained by cytolysis of the liver tissue and escape of transaminases from the liver into the blood stream [2, 4, 5, 9].

TABLE 1. Transaminase Activity of Rats' Sera at Various Intervals after Injection of CCl_4 (in μg Pyruvic Acid per 20 Minutes at 25°)

Indices	Control	After 3 h	After 6 h	After 12 h	After 24 h	On the 7th day (3 injections)	On the 30th day (15 injections)
n	13	6	3	4	5	10	5
G-As	48-100	60-150	116-136	138-176	158-462	80-154	230-320
$M \pm$	$71 \pm 3,7$	$89 \pm 16,9$	122	$152 \pm 8,4$	$246 \pm 55,6$	$122 \pm 9,6$	$276 \pm 20,0$
P		$0,2 < P < 0,3$		$< 0,001$	$< 0,01$	$< 0,001$	$< 0,001$
G-Al	28-68	36-70	76-92	74-104	95-396	54-212	144-256
$M \pm$	$42 \pm 2,9$	$57 \pm 5,5$	84	$86 \pm 6,5$	$255 \pm 63,0$	$100 \pm 15,0$	$192 \pm 25,0$
P		$0,02 < P < 0,05$		$< 0,001$	$< 0,01$	$< 0,01$	$< 0,001$
Activity G-As							
Activity G-Al	1,69	1,55			0,96	1,22	1,43

The transaminase activity has also been investigated in experimental liver disease and, in particular, in CCl_4 poisoning. It has been found that administration of CCl_4 leads to an increase in the activity of both serum transaminases, and that this increase in activity runs parallel to the pathological changes in the liver [6, 7, 8]. However, the trend of the changes in transaminase activity of the serum has not been investigated in the course of experimental liver lesions.

In the present research we attempted to study the relationship between the changes in the serum transaminase activity and the time elapsing from the injection of CCl_4 into the experimental animals.

EXPERIMENTAL METHOD

Experiments were conducted on rats and dogs. The rats received a subcutaneous injection of CCl_4 in a dose of 0.25 ml/100 g body weight; 3, 6, 12, or 24 hours later they were decapitated, their blood was collected, and the transaminase activity of the serum was determined colorimetrically by T. S. Paskhina's method [1].

In another series of experiments the rats received injections of CCl_4 in doses of 0.15 ml/100 g body weight on alternate days, and the activity of both transaminases in the serum was investigated after the third (on the 7th day from the beginning of injections) and after the 15th injections (30 days after the beginning of the experiment).

The transaminase activity in dogs was determined 6 and 24 hours after a single subcutaneous injection of CCl_4 in a dose of 0.5 ml/kg body weight.

EXPERIMENTAL RESULTS

The mean results of the experiments are shown in Tables 1 and 2.

It is clear from these results that the G-AI transaminase activity of the Rats' sera is slightly increased 3 hours after administration of CCl_4 , and the activity of both transaminases is increased after 6 hours.

We observed the maximum increase in transaminase activity 24 hours after a single injection of CCl_4 . The ratio between the activity of G-As transaminase and that of G-AI transaminase fell from 1.69 in the healthy rats to 0.96 ($P < 0.01$), which is characteristic of an acute lesion of the liver. The changes in the liver were evidently most pronounced after 24 hours. This assumption agrees with information in the literature that this is the time of the greatest accumulation of CCl_4 in the liver after a single injection [3]. When three injections of CCl_4 were given, each of 0.16 ml/100 g body weight, the increase in transaminase activity after 24 hours was much less marked than at the same time after a single injection of a dose of 0.25 ml/100 g body weight of the compound.

TABLE 2. Transaminase Activity of Dogs' Sera at Various Intervals after a Single Injection of CCl_4 (in μg Pyruvic Acid per 20 minutes at 25°)

Control		After 6 h		After 24 h	
G-As	G-AI	G-As	G-AI	G-As	G-AI
24	21	20	8	57	53
16	31	13	—	80	156
34	27	32	22	—	—
36	24	28	14	—	—
—	—	29	12	—	—

After administration of CCl_4 for one month in doses of 0.15 ml/100 g on alternate days, the picture was different: the activity of both G-As and G-AI transaminases was considerably increased. The activity of the former, however, rose more than that of the latter, and the ratio of G-As/G-AI = 1.43 ($P < 0.001$). The considerable

increase in the serum transaminase activity indicated a severe lesion of the liver, evidently following a different course from the acute lesion. Acute lesions of the liver are characterized by an increase in the G-AI transaminase activity, so that when an acute process changes to chronic, an increase in the ratio G-As/G-AI is observed.

In dogs after 6 hours we observed no change in the transaminase activity; after 24 hours the serum transaminase activity rose, but to a lesser degree than in the rats. This was probably due to the smaller dose of CCl_4 .

SUMMARY

An inquiry was made into the activity of the glutamico-asparagic and glutamico-alanine transaminase in the blood serum of rats and dogs at various periods after the administration of carbon tetrachloride. The maximal rise of the transaminases activity in the blood serum of rats was observed in 24 hours after a single administration of CCl_4 ; the ratio of the activities of glutamico-asparagic and glutamico-alanine transaminase was below 1. Considerable rise of the transaminase activity in the blood serum of rats was observed after 15 times administration of CCl_4 given every other day. However, the ratio of the glutamicoasparagic transaminase and glutamico-alanine transaminase ratio was over 1.

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.
