VII. DISCUSSION

The present investigations were conducted to find out the effect of CCl₄ on the biochemical composition of some blood constituents, viz., (the blood sugar, cholesterol, phospholipid, plasma protein, albumin and globulin) and liver constituents, viz., (the glycogen, cholesterol and phospholipid) in the two tropical rats viz., the Indian gerbil (Tatera indica) and the House rat (Rattus rattus).

In the first place the purpose was to find out whether CCl₄ poisoning brings about any quantitative alternations on the biochemical composition of these important metabolites. Having found out such differences if any, it was also thought desirable to see whether such differences in the blood composition have any bearing on similar contents of the liver, which plays a very important role in the metabolic activities of vertebrate animals.

The blood sugar contents showed a steep rise by 42.04% at the end of 24 hrs in CCl₄ treated Indian gerbil and rose further by 61.96% 120 hrs after the CCl₄ treatment. In the House rat on the other hand a decline was registered initially
i.e., by 9.26% in 24 hrs treated rat. Thereafter a slight increase was no doubt registered, but it was still below the normal level by about 4%.

From the above mentioned results it can be surmised that the effect of CCl₄ on blood sugar is not uniform in both the animals. It results in a steep rise in one species viz., the Indian gerbil, whereas in the other, there is a decline. Thereafter an increase is observed in the blood sugar contents of both the animals as high as by 61% of the normal value in the Indian gerbil. In the House rat however, the increase was quite negligible.

Due to the toxicity of CCl₄, the liver glycogen contents declined initially in both the animals to the extent of 54.60% of the normal value in the Indian gerbil and 77.77% in the House rat. This decline was very high in the Indian gerbil than in the House rat. Thereafter an increase was observed in the liver glycogen contents in both of them. Presumably the recovery had started by this time but at the end of 120 hrs the level was still 78.89% of the normal level in the Indian gerbil while in the House rat hardly any quantitative change had taken place in the glycogen contents during the next ninety six hrs of the treatment.
Experiments conducted by Wilson et al., 1969; Adam and Thrope 1970; Hickenbottom and Hornbrook 1971 and several others have also shown that CCl₄ produces a rapid and prolonged depletion in the liver glycogen during the first 24 hrs of treatment. The results obtained during the present investigations are thus in conformity with those obtained by the earlier workers.

Unlike an increase in the blood sugar level in the Indian gerbil, there was actually a decrease in the liver glycogen contents in the initial stage i.e., after 24 hrs of the treatment in this animal. In the House rat on the other hand both the blood sugar level and the level of glycogen had decreased at the end of 24 hrs after the treatment. It appears therefore, there is no direct correlation as such between the carbohydrate contents of the blood and the liver.

Investigations have been conducted by Heinberg et al., 1962; Haling et al., 1962; Poggi and Paoletti 1964; Schotz et al., 1964, and others to see whether a correlation exists between a quantitative change in the neutral fat contents of the blood and the liver. Based on the results obtained by them, they have suggested that in CCl₄ treated rats that there is an accumulation of triglycerides in the liver with
a corresponding decrease in the concentration of blood plasma triglycerides.

The concentration of blood cholesterol showed a decrease in the Indian gerbil after CCl₄ treatment at the end of 24 hrs. It was by 30.27%. But this decrease which was by 2.99% was practically negligible in the House rat.

Thereafter a rapid increase in the concentration of this substance was observed in both the animals. The increase registered being by 20.57% in the Indian gerbil and 52.44% in the House rat of the normal value at the end of 120 hrs after CCl₄ treatment.

The level of liver cholesterol showed on the other hand a gradual increase in both the CCl₄ treated species after 24 hrs. It was by 36.19% in the Indian gerbil and 6.92% in the House rat. The rise was continued at the end of 120 hrs in these CCl₄ treated rats. The increase registered was by 187.67% in the Indian gerbil and 71.52% in the House rat.

The results obtained here are in variance from those of Gane (1973) who observed a prolonged depletion of mice liver cholesterol synthesis 17-19 hrs after the administration of CCl₄.
During the present investigations a rise in the level of liver cholesterol was marked right from the time of the administration of the drug. Ganj (1973) experiments however, did reveal a rise only after the completion of 17-19 hrs.

The results of experimental work conducted by Tomokuni (1970) on the blood phospholipid contents, show a decrease in its level at the end of 24 hrs of CCl₄ treatment. Similar results were obtained during the present investigation also as far as the concentration of blood phospholipid is concerned in the House rat. On the other hand, a marginal (but insignificant) increase was observed in the Indian gerbil by 2.64% at the end of this period. A decrease was however, has been registered in the blood phospholipid contents thereafter, unlike the results obtained by Tomokuni (1970) where an increase was observed in the level of this constituent after 24 hrs treatment.

A quantitative estimation of liver phospholipid contents in the two animals did not show a uniform result. No doubt in both the animals a slight increase was registered at the end of 24 hrs. But in the Indian gerbil it continued to show a rise thereafter. On the other hand in the House rat there was a considerable loss in the liver phospholipid contents at the end of 120 hrs.
In view of the fact that the effect is not uniform it is not possible to predict a correlation between the phospholipid contents of the blood and that of the liver as a consequence of CCl₄ induced toxicity in rats.

It is known for quite sometime that the administration of CCl₄ brings about inhibition of protein contents. The probable cause for such reduction is already discussed in detail in the chapter dealing with the effect of CCl₄ poisoning on plasma protein contents. Several factors are involved. The inhibition of nucleic acid is perhaps of the major factions. A slight increase in γ-globulin contents is however, noticed and it is suggested that this increase is consequence of the operation of a different mechanism, culminating in the formation of antibodies which combat with the foreign material, which is CCl₄ as far as the present investigations are concerned. The results obtained during the present work are in general no doubt in agreement with those obtained by the earlier workers as far as protein contents are concerned, these results do not conform to any specific uniform pattern as such. This is evident from the fact that A/G ratio showed an increase in 24 hra CCl₄ treated gerbil. On the contrary a decrease has been registered in the A/G ratio during this period in the House rat.
From the studies of earlier investigators it has been noted that accumulation of triglycerides in the liver results in a corresponding decrease in the concentration of blood plasma triglycerides. As far as the blood cholesterol, phospholipid and liver cholesterol, phospholipid are concerned no such correlation was observed between the concentrations of these constituents in the blood and the liver.