REACTION OF THE ALBINO RAT LIVER TO CHOLAGOGUES AFTER RESECTION

M. A. Garbarets

UDC 616.36-089.873-092.9-036.8:612.357.4

During the first few hours after resection of the left lobe of the liver in rats the sensitivity of the resected organ to the choleretic action of dehydrocholic acid falls sharply while its sensitivity to that of oxaphenamide is preserved. From the second day after operation the reaction to dehydrocholic acid is restored and that to oxaphenamide is reduced. Toward the end of the first week after resection the reaction of the liver to cholagogues is restored approximately to the initial level.

* * *

Few results of the study of the bile-excretory and bile-forming function of the liver after resection of the organ are to be found in the literature [1-3, 5]. I have shown [1] that the intensity of bile formation in albino rats after resection of one-third and even two-thirds of the liver is restored to its initial level within the next 4-5 days.

The object of this investigation was to determine the reaction of the liver to cholagogues in the time immediately following resection of the left lobe.

EXPERIMENTAL METHOD

Experiments were carried out on 127 male albino rats weighing 120-180 g. In the control series the initial background of bile secretion was determined in intact animals and animals after resection of the left lobe of the liver [4] (about 38-39% of liver tissue) at the following times: immediately after, 24 h and 4-5 days after the operation. In the remaining experiments the response of the liver to dihydrocholic acid (10 mg/100 g body weight) and oxaphenamide (25 mg/100 g body weight) was determined under the same conditions and at the same times. On the day of the investigation laparotomy was performed on each animal under general anesthesia (amylobarbital, 1 ml of 1% solution/100 g body weight intramuscularly) and the common bile duct was cannulated. In all experiments the rate of bile secretion during each of the 8 h of observation (in mg/min/100 g body weight) and the total volume of bile obtained (in mg/100 g body weight) were determined and from the results of chemical analysis the content of water and of organic and inorganic substances (in mg/g), and the concentration (in mg %) and absolute contents (in mg/100 g) of bile salts and bilirubin were calculated.

EXPERIMENTAL RESULTS

The results given in Table 1 show that in intact animals dihydrocholic acid increases the intensity of bile secretion during the first 4-5 h on the average by 73.3-38%. The total volume of bile obtained in the course of 8 h increased by 31.2%. After administration of oxaphenamide the rate of bile secretion increased to approximately the same degree, but the total volume of bile increased by 29.1%. The choleretic reaction was accompanied by some increase in the content of organic substances at the expense of an equivalent decrease in water. The concentration of cholates and bilirubin fell, but because of an increase in the level of bile secretion, their total content increased in all hourly samples.

Immediately after resection of the left lobe of the liver the response to dihydrocholic acid fell, but that to oxaphenamide remained. The action of dihydrocholic acid was very short in duration and weak in intensity, while the choleretic response to oxaphenamide remained high and lasted for more than 8 h. Marked differences were also observed in the chemical composition of the bile. Oxaphenamide stimulated cholate formation, as a result of which the total content of bile salts was almost doubled and the excretion

Department of Pharmacology, Ternopol' Medical Institute (Presented by Active Member of the Academy of Medical Sciences of the USSR V. V. Zakusov). Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 66, No. 11, pp. 69-71, November, 1968. Original article submitted June 5, 1967.

TABLE 1. Effect of Cholagogues on Intensity of Bile Secretion in Albino Rats before and after Liver Resection

Experimental conditions	Level of bile secretion (in mg/100 g) hours								Total during 8 h
	1-st	2-nd	3-rd	4-th	5-th	6-th	7-th	8-th	
Before resection	270±18	270±12	270±12	252±12	252±12	240±6	252±12	252±12	2058±96
background	468±24	396±18	354±18	348±18	294±18	294±18	276±12	270±18	2700±150
dihydrocholic acid	480±18	408±18	354±12	300±18	294±18	288±12	282±12	252±12	2658±120
oxaphenamide									
Immediately after operation	192±24	180±24	168±18	162±12	162±12	150±12	132±12	138±12	1284±126
background	258±24	234±18	228±18	162±12	138±12	132±6	126±6	132±6	1510±102
dihydrocholic acid	402±30	294±18	270±6	270±6	222±6	192±6	198±12	192±6	2040±90
oxaphenamide									
24 h after operation	198±12	198±18	192±18	186±12	180±12	168±12	162±12	144±12	1428±102
background	504±24	426±30	402±18	378±18	348±18	312±18	294±12	270±6	2934±144
dihydrocholic acid	384±30	288±18	264±18	246±18	210±12	204±28	192±18	180±18	1968±150
oxaphenamide									
4-5 days after operation	288±18	282±18	276±18	276±12	264±18	258±18	252±12	210±6	2106±120
background	432±24	360±12	342±12	342±18	336±24	300±12	258±18	240±18	2590±138
dihydrocholic acid	468±18	390±18	378±12	342±18	306±12	270±12	240±6	216±6	2610±102
oxaphenamide									

of bilirubin was more than trebled. Administration of dihydrocholic acid was accompanied by inhibition of cholate formation: the total content of bile salts fell on the average by 27.2%. The mean increase in bilirubin excretion was 21.3%.

Twenty-four hours after the operation, when the background level of bile secretion was considerably lowered, dihydrocholic acid still exhibited its choleretic action. Stimulation of cholate formation also was observed. Oxaphenamide under these conditions had a very weak effect on this function of the liver. Nevertheless, an increase in bilirubin excretion was observed: by 43.3% due to oxaphenamide and by 47.5% due to dihydrocholic acid.

On the 4th-5th day after resection of the liver, when the background level of bile secretion had returned to its initial value, both substances gave a choleretic effect of the same magnitude and duration as in the control animals. Changes in the chemical composition of the bile also were similar.

The results thus demonstrate that in the period immediately after resection of the left lobe of the liver the reaction of the liver to dihydrocholic acid and oxaphenamide is preserved. However, it differs in degree depending on the nature of the preparation and the time elapsing after resection of the liver.

LITERATURE CITED

1. M. A. Garbarets, Abstracts of Proceedings of the 9th Jubilee Scientific Conference Celebrating the 10th Anniversary of Ternopol' Medical Institute [in Russian], Ternopol' (1967), p. 22.
2. A. S. Lokhatyuk, Vestn. Khir., No. 1, 61 (1957).
3. B. P. Solopaev, Relationship Between Repair Processes in the Liver and the Bile Secretory Function [in Russian], Author's Abstract of Candidate Dissertation, Moscow (1957).
4. G. Higgins and R. Anderson, Arch. Path., 12, 186 (1931).
5. J. Milcu and J. Simek, J. Physiol. (Paris), 56, 611 (1964).