(Fig. 3) and glutathione peroxidase [11] activity with age may be one factor which explains why, although the concentration of the myocardial homogenate from rats aged 12 and 24 months was higher, the intensity of LPO in the membranes was reduced more than in young rats aged 1 and 3 months (Fig. 1).

The results of this investigation show that the intensity of free-radical lipid peroxidation in rat myocardial membranes decreases with age. Since free radicals are among the leading factors of aging, the results suggest that the process of aging of the myocardium may follow a more rapid course in youth than in old age.

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REDISTRIBUTION OF REGIONAL BLOOD FLOWS AND VOLUMES DUE TO OBTURATION OF THE BILIARY TRACT

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Obturation of the biliary tract causes changes in the systemic hemodynamics and the blood volume in individual organs [6]. However, the general structure of the regional distributions of the cardiac ejection — the circulatory minute volume (CMV) and circulating blood volume (CBV) — has not been studied. The aim of the present investigation was an experimental study of this problem.

EXPERIMENTAL METHOD

Experiments were carried out on noninbred male albino rats weighting 180-230 g. The common bile duct was ligated and divided under hexobarbital anesthesia under sterile condi-

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TABLE 1. Principal Parameters of Systemic Hemodynamics 6 Days after Ligation of Common Bile Ducts in Rats (M ± m)

Parameter	Control	Experiment	P
BP, mm Hg	120±3,13	82±4,05	<0,001
HR, beats/min	526±9,4	375±16	<0,001
CMV, ml/min/100 g	31,3±1,96	36,7±3,10	>0,1
SV, ml/100 g	0,059±0,00365	0,101±0,0123	<0,01
TPR, dynes · sec cm^{-5}/100 g	10^5·(3,3±0,195)	10^5·(1,59±0,164)	<0,001
CBV, ml/100 g	7,45±0,388	6,34±0,235	<0,05
MTCT, min	0,250±0,022	0,180±0,0147	<0,02
MCCT (min/100 g)	0,026±0,0016	0,034±0,0038	>0,05
CeBV, ml/100 g	1,74±0,133	2,01±0,327	>0,25
Work of heart, g · cm	92±5,87	96±13,7	>0,5
CI, ml/min/cm^2	0,159±0,0095	0,192±0,0165	>0,5
Body weight, g	215±9,0	198±17,59	>0,25

Legend. BP) Pressure in common carotid artery, HR) heart rate, SV) stroke volume of heart, MTCT) mean total circulation time, CBV) circulating blood volume,(CeBV) central blood volume, CI) cardiac index, MCCT) mean central circulation time.

tions. Changes in the circulation were studied every 6 days in animals fixed to a frame for 1 h, and in control rats. The technique used was as follows. The main parameters of the systemic hemodynamics (Table 1) were recorded by the usual methods, including by the thermodilution method [7]. These parameters and, in particular, the total peripheral resistance (TPR), CMV, and CBV were essential when analyzing relative changes in the regional circulation. The regional redistributions of CBV were used as a parameter reflecting overall changes in the capacitive, resistive, and capillary sections [1]. Redistributions of CMV [16], reflecting regional fluctuations in tone of the resistive vessels, were recorded under the same conditions. Macroaggregates of albumins-^{131}I (MAA), which were injected into the left ventricle to the number of 600,000-800,000 in a volume of 0.2 ml (radioactivity about 10 mCi), were used as indicator microparticles. The diameter of 90% of the MAA particles was 10-30 μ, and only 1.5% of their total number entered the venus blood [9]. To characterize overall changes in the regional blood flow and transcapillary permeability, regional redistributions of intravenously injected ^{86}Rb were determined. Comparison of redistributions of CMV and ^{86}Rb enabled changes in transcapillary permeability to be assessed, and comparison of the redistributions of CBV, CMV, and ^{86}Rb enabled the capacitive component of the regional muscular response to be determined. In each of the four principal and four control series of experiments 14 animals were used. For statistical analysis differences between arithmetic means were evaluated by the t(P) test, and a special modification of factor analysis was used to separate the integral assessment (P) into factors [3]. The load structure of the first two factors was interpreted.

EXPERIMENTAL RESULTS

Changes in the principal parameters of the systemic hemodynamics are given in Table 1. A significant decrease was observed in arterial blood pressure (BP), heart rate (HR), and TPR, and an increase in stroke volume (SV). Similar results were obtained in obturation of the biliary tract produced experimentally [17] and observed clinically [6].

The changes in the regional circulation (Table 2) point to significant differences in the main trend of regional redistributions of CBV, CMV, and ^{86}Rb. This means that redistributions of CBV are definitely connected with changes in the lumen of regional capacitive vessels [8]. Comparison of fractionation of CMV and ^{86}Rb indicates an increase in transcapillary permeability in most of the abdominal viscera and in the lungs.

TABLE 2. Percentage Changes in Regional Blood Volume (% of CBV), Blood Flow (% of MAA), and Rubidium Uptake (% of ^{86}Rb) 6 Days after Ligation of Common Bile Duct in Rats

Test object	Assessment of changes from control to experiment								
	% CBV			% MAA			% ^{86}Rb		
	P	f_1	f_2	P	f_1	f_2	P	i_1	i_2
Head									
skin	>0,5+	+443	—303	>0,1—	—421	+311	<0,05—	—646	—051
muscles and bones	>0,5+	+403	—486	>0,05—	—777	—066	>0,05—	—397	—237
brain	>0,1+	+685	—275	>0,25	—513	+289	>0,05+	+234	+257
Neck									
skin	<0,01+	+318	+582	>0,25+	—212—	—+309	<0,05+	+297	+249
muscles and bones	>0,1+	+642	—200	<0,25—	—537	+422	>0,5+	—323	+516
Chest									
skin	<0,05+	+546	—022	>0,5—	—261	+223	>0,5—	—228	+118
muscles and bones	>0,25+	+534	—234	<0,05+	—290	+642	>0,1+	—237	+797
myocardium	>0,1—	—089	—410	>0,5+	+330	—066	>0,5+	+306	+086
lungs	>0,5—	—406	+047	>0,5+	+563	+144	<0,01+	+330	+629
Abdomen and pelvis									
skin	>0,05+	+737	—044	<0,05—	—742	—183	<0,01	—427	—574
muscles and bones	<0,05—	—106	—607	>0,25+	+016	+066	>0,05—	—509	—163
liver	>0,25+	—467	+603	>0,5—	+207	—491	>0,5+	+514	—500
small intestine	<0,05+	+608	+306	<0,02—	—577	—582	>0,5+	+438	—370
large intestine	>0,5—	—090	—087	>0,05—	—632	—410	>0,25+	+376	—321
stomach	>0,1+	—030	+227	<0,01—	—212	—561	>0,25+	+119	+187
kidneys	>0,25+	+462	+056	>0,25—	—257	—602	>0,25+	+077	—232
adrenals	>0,5+	+368	+072	—	+470	—224	<0,01+	+419	+268
spleen	<0,01+	+001	+688	<0,02—	—509	—430	>0,25+	+414	—237
pancreas	>0,05+	+402	+010	<0,02—	—432	—450	>0,5+	+057	—154
urinary bladder	<0,01—	—305	—291	>0,5+	+312	—053	>0,05+	366	+230
testes	>0,05+	+821	—134	<0,02—	—693	—249	>0,1—	—397	—521
Forelimbs									
skin	>0,25+	+588	+054	0,1—	—478	—218	<0,02—	—418	—457
muscles and bones	>0,25+	+754	—201	>0,5+	—481	+427	>0,5—	—012	—342
Hind limbs									
skin	<0,02+	+580	+220	—	—336	+087	<0,01—	—657	—490
muscles and bones	<0,01+	+571	+475	>0,5+	+266	—151	>0,05—	—659	—295
tail	>0,5+	+362	—087	>0,5+	+013	—150	<0,01—	—589	—500
Weight of factor, %	—	12,16	5,4	—	25,4	14,2	—	22,6	18,0

Legend. P) Integral assessment of differences, f_1 and f_2) loads of 1st and 2nd factors respectively in the form of three characters after the decimal point. +) Probability of increase in experiment compared with control, —) decrease. Factor load statistically significant ($P < 0.05$) if its absolute value is greater than or equal to 0.360.

The changes in the regional circulation (Table 2) point to significant differences in the main trend of regional redistributions of CBV, CMV, and ^{86}Rb. This means that redistributions of CBV are definitely connected with changes in the lumen of the regional capacitive vessels [8]. Comparison of fractionation of CMV and ^{86}Rb indicates an increase in transcapillary permeability in most of the abdominal viscera and in the lungs.

The fractions of CMV accounted for by the small and large intestines, stomach, pancreas, spleen, testes, and abdominal skin were reduced. An increase in the CMV fraction was found in muscular and bony tissues of the chest. Two main groups of influences were discovered: those due to a relative rise in arterial tone in many parts of the skin-muscle region and in some abdominal organs with redistribution of blood flows into the lungs (bronchial blood flow), adrenals, and myocardium (f_1) and those due to relative constriction of resistive vessels of most abdominal organs with redistribution of CMV into skeletal muscles of the chest, neck and forelimbs (f_2). The results are in agreement with the scanty information available in the literature. During obturation of the biliary tract in experiments on monkeys no changes were found in the blood flow in the brain [12] and in the leg muscles [13]. In experiments on rats [10, 14] and dogs [15] a reduction in the hepatic and renal blood flow was found. However, according to data of other workers, the hepatic blood flow in dogs [17] and the renal blood flow in monkeys [11] was unchanged 1 week after obturation. All these results correspond to an absence of significant changes in the hepatic and renal blood flow on integral assessment (P) and to evidence of their decrease, manifested as loading of factor 2 (f_2).

In the regional redistributions of CBV, signs of extensive venodilatation were particularly marked, and affected the liver and lungs least of all (f_1). Experimental data showing changes in the regional blood value during obturations of the biliary tract are not to be found in the accessible literature.

Fixation stress in intact rats, incidentally, was accompanied by extensive venoconstriction [4], whereas the same stress 6 days after ligation of the bile duct was characterized by signs of extensive venodilatation. Obturation of the biliary tract thus qualitatively changed the response of the capacitive function of the circulation to fixation stress. Instead of a stage of its intensification, with extensive venoconstriction, in response to fixation of intact animals, a stage of its exhaustion was observed, with signs of extensive venodilatation [2] in rats fixed after obturation of the biliary tract for 6 days. Under the same conditions regional changes in tone of the resistive vessels did not undergo qualitative changes. Predominant constriction of the arteries of the descending aorta during fixation of intact rats [5] under conditions of obturation of the biliary tract was supplemented by a relative decrease in the lumen of the resistive vessels in some other parts of the skin-muscle region and in some abdominal organs.

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CHANGES IN THE GASTRIC MUCOSA OF RATS AFTER INTRAGASTRIC INJECTION OF GASTRIC JUICE FROM HEALTHY SUBJECTS AND PATIENTS WITH DUODENAL ULCER

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An important role in the development of lesions of the gastric and duodenal mucosa during ulcer formation is played by the gastric juice, which exhibits increased aggressiveness toward the gastric mucosa in patients with peptic ulcer [1, 4, 5]. Ulceration of the gastric mucosa may be facilitated by the lowering of its resistance possibly on account of diminished production of components forming a protective covering for the stomach [10, 11] and also with a disturbance of the structure of the protective gel [10].

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