alloxan and in animals infected with the virus only. The isolation rate of Coxsackie A13 virus in animals of this group was rather higher than in the case of Coxsackie B4 virus. The character and localization of fluorescence were the same as in DBA/2 males. The results of IF assay and virological investigation correlated with each other.

The study of the diabetogenic properties of Coxsackie P′ and A13 viruses in mice of sensitive and resistant strains, with the use of subdiabetogenic doses of alloxan in the latter case thus revealed definite biochemical changes, expressed as lowered glucose tolerance and disturbance of IRI synthesis. The most marked biochemical changes were observed in male DBA/2 mice infected with Coxsackie B4 virus, in (CBA × C57B1/6)F_1 mice, and in DBA/2 females infected with Coxsackie A13 virus.

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PROTECTIVE PROPERTIES OF MICROCRYSTALLINE CELLULOSE IN RATS WITH EXPERIMENTAL DIABETES

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Among the many factors which influence the mechanism of function of the digestive organs, one of particular importance, as has recently been shown, is the class of natural regulators, which includes dietary fibers [9]. Microcrystalline cellulose (MCC) a refined preparation of native cellulose [4], has been used as one such fiber. In previous investigations [3] the writers showed that MCC, administered in large doses and for long periods of time, does not disturb homeostasis and does not cause injury to organs of the gastrointestinal tract.

The known protective properties of the various dietary fibers in relation to disorders of carbohydrate and lipid metabolism in diabetic patients, and the use of MCC as a food additive in several countries, provided the motivation for this investigation.

EXPERIMENTAL METHOD

MCC — the purest cellulose preparation, obtained by hydrolysis of native cotton fiber to the "limiting" degree of polymerization — was used as the test object. According to mean viscosity calculations, this is equivalent to about 170 glucose residues to each cellulose macromolecule [4]. Experimental diabetes (ED) was produced in 45 noninbred albino rats weighing 150-170 g by injection of alloxan (Fluka, Switzerland) by the method in [10]. After 2 weeks, when the hyperglycemia stabilized (glucose concentration in blood from the caudal vein 9.03-11.77 mmoles/liter) and on elevation of the glycosylated hemoglobin (Gly-Hb) level, in addition to the standard animal house diet, balanced with respect to the principal parameters, animals of the experimental groups were fed with MCC in a dose of 3 g daily, equivalent to 10%

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TABLE 1. Effect of MCC on Parameters of Carbohydrate and Lipid Metabolism in Rats with Alloxan Diabetes

Stage of determination	Number of animals	Body weight, g	Glucose, mmoles/liter	Gly-Hb, mmoles 5-GP/mole Hb	FChS (mmoles/liter)	TChS (mmoles/liter)	TG (mmoles/liter)	PL, mg P/liter	EChS/FChS
Before administration of alloxan I	11	166,2±7,5	5,78±1,00	35,17±1,7(3)					
	13	162,4±9,4	6,04±0,72	34,89±0,9					
II	10	170,5±7,0	5,24±0,90	36,01±1,2(3)					
	11	173,8±10,1	5,24±0,89	35,41±1,0					
14 Days after administration of alloxan I	11	162,0±9,8	11,55±0,40						
	13	165,0±7,3	11,73±0,80						
	10	169,0±7,8	9,86±0,80						
	11	170,2±8,3	9,56±0,63						
42 Days after administration of alloxan (experiment—28 days after injection of MCC)	11	187,3±5,3*	12,72±1,29*	49,89±1,9**	1,80±0,09*	3,01±0,20	1,01±0,04	19,7±1,73	0,65±0,03**
	13	170,0±6,4	9,25±0,09	39,71±2,0	1,46±0,10	2,62±0,14	0,84±0,03	22,5±1,64	0,80±0,03
	10	190,1±5,5*	9,42±0,40**	41,54±0,9**	1,69±0,09***	2,85±0,15**	0,92±0,04**	17,9±1,56*	0,67±0.03***
	11	171,1±6,7	8,18±0,13	38,75±0,8	1,17±0,08	2,29±0,06	0,76±0,04	22,7±1,20	0,67±0,03

Legend. I) Males, II) females; numerator — control, denominator — experiment (five intact animals served as the control). Significance of differences between experimental groups: *P < 0.05, **P < 0.01, ***P < 0.001.

of the weight of the solid part of the daily ration. On the 28th day after the beginning of MCC feeding, the rats were anesthetized by intraperitoneal injection of amobarbital (100 mg/kg) and blood was taken by puncture of the right ventricle. Control rats with ED did not receive MCC.

The following parameters of the animals' state were determined: body weight (throughout the experiment), blood glucose level (by the orthotoluidine method), Gly-Hb (by the method in [12]), free, esterified, and total cholesterol (FChS, EChS, TChS) [8], phospholipids (PL) [5], total lipids and triglycerides (TG), with the aid of standard kits from Lachema, Czechoslovakia) and the thromboelastogram (TEG) of platelet-enriched plasma (on the Thromboelastograph-2 apparatus), with calculation of the "large" TEG [1]. Parameters of free-radical lipid oxidation (FRLO) were determined in the liver tissue: peroxide formation [13], diene conjugation (DC) of unsaturated fatty acids [7], malonic dialdehyde [6], and Schiff bases [11]. The experimental results were analyzed by Élektronika MK-54 microcomputer.

EXPERIMENTAL RESULTS

Significant changes ($P < 0.05$) in parameters of carbohydrate and lipid metabolism of the rats with ED are indicated in Table 1. Injection of alloxan caused changes in weight of all the animals by the 14th day of the experiment, though these were not significant ($P>0.05$). Addition of MCC to the diet of the experimental animals for 28 days stabilized the body weight of the rats of both sexes. Differences in hyperglycemia on the 14th day of the experiment between the control and experimental groups were not significant, but toward the end of the experiment the level of hyperglycemia in the experimental animals was significantly lower than in the controls. Similar relations were observed at these same times for Gly-Hb, an integral retrospective index of the blood sugar level.

Differences in the parameters of lipid metabolism between the control and experiment were observed more often and were greater (more significant) in females: addition of MCC to the diet of rats of the experimental group not only caused the TG, TChS, and PL levels in the blood to rise, but also caused an increase in the EChS/FChS ratio. The changes observed in lipid metabolism in animals of the experimental groups can be regarded as "antiatherogenic."

A significant hypocoagulation shift was observed in the system controlling the state of aggregation of the blood in the experimental animals compared with the controlling the state of aggregation of the blood in the experimental animals compared with the controls ($P < 0.05$) with respect to the following parameters: K) the clot formation time (1.94 ± 0.43 min in the experiment and 0.98 ± 0.2 min in the control), t) the coagulation constant (7.86 ± 1.37/3.48 ± 0.83 min), C) the syneresis constant (10.5 ± 1.6/4.8 ± 0.83 min), T) the total coagulation constant 12.6 ± 1.75/6.28 ± 0.9 min). A_{max}) the maximal amplitude (31.0 ± 2.55/40.05 ± 2.06 mm), E) the elasticity of the clot (47.02 ± 5.85/69.53 ± 5.88 units), and Ci) the hypercoagulation index (10.3 ± 1.63/17.2 ± 1.54). The hypocoagulation shift thus discovered was not pronounced — the parameters of the TEG in rats receiving MCC did not reach normal values (the principal parame-

ters of the TEG under normal conditions were: K = 2.89 ± 0.1 min, t = 10.73-0.3 min, A_{max} = 28.9 ± 1.6 mm, Ci = 7.0 ± 0.86).

Toward the end of the experiment activation of FRLO was observed in the liver tissues of animals of the experimental groups: the level of DC rose to 0.51 ± 0.01 compared with 0.48 ± 0.01 mmole/g in the control. The remaining parameters, determined in liver tissue, did not change significantly.

The protective effect of MCC thus revealed depends on many factors [2]: inhibition of absorption of glucose and lipids, absorption of bile acids, changes in secretion of interstitial hormones, changes in the bacterial flora of the digestive tract, and hence, in the entry of nutrients modified by this microflora and so-called ballast substances, and also of the metabolic products of the bacteria themselves, into the internal medium [9].

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