

EFFECT OF XYLITE ON INTENSITY OF BILE SECRETION AND SYNTHESIS OF BILE ACIDS

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UDC 615.874.2:547.427.3].015.4:[612.357+612.357.15.015.36

When administered to dogs, xylite increases bile secretion, cholate formation, and the excretion of cholesterol with the bile. The increase in the concentration of cholates in the bile takes place mainly on account of taurocholic and desoxycholic acids. In albino rats, bile excretion was not increased by the action of xylite, but cholate formation was stimulated, principally on account of taurocholic glycocholic, and desoxycholic acids.

Polyalcohols have recently begun to be used on a wide scale in medical practice. Xylite, in particular, is used for the therapeutic feeding of patients with diabetes mellitus, and in the diagnosis and treatment of some diseases [1, 4-6, 8]. It has a positive effect on choline deficiency in growing animals, reduces the degree of hypoglycemia produced by insulin [7, 10], stimulates intestinal movements [9], and exerts a choleretic and cholekinetic action.

In the investigation described below the effect of xylite on synthesis of bile acids and excretion of cholesterol and bilirubin by the liver was studied.

EXPERIMENTAL METHOD

Experiments were carried out on 30 male albino rats weighing 120-180 g and on 3 dogs with a permanent fistula of the gall bladder of the Schwann - Dastre type. Bile was collected from each animal in hourly portions (for 6 h from the rats and for 4 h from the dogs). The criteria of the intensity of bile secretion were the rate of bile secretion during each hour, expressed in mg/min/100 g body weight in the rats and in mg/min/kg body weight in the dogs, and the total volume of secretion obtained per hour of the experiment and in total during the whole period of observation, in mg/100 g and in mg/kg body weight, respectively. The concentration (in mg%) and total content (in mg/100 g and mg/kg body weight) of cholates, bilirubin, and cholesterol excreted with the bile were determined in the hourly portions of bile from the rats and dogs. The bile acids were fractionated by ascending paper chromatography [2, 3].

In the experiments of series I the initial background of bile secretion was determined, and in the remaining experiments the effect of xylite on this process was studied (xylite was administered to the rats through a duodenal tube at the rate of 200 and 400 mg/100 g body weight, and to the dogs by mouth in doses of 200 and 400 mg/kg body weight).

EXPERIMENTAL RESULTS

Xylite causes marked changes in dogs affecting both the intensity of bile secretion and the chemical composition of bile. Under the influence of xylite in a dose of 200 mg/kg the rate of bile secretion was increased for 1-2 h (in the dogs Bobik and Zhuk), and for more than 4 h (in the dog Belyanka). As a result, the total volume of bile obtained during the 4 h of the experiment increased in the case of Bobik from 2166 to 2508 mg/kg, and of Zhuk from 3498 to 3906 mg/kg and for Belyanka from 582 to 978 mg/kg, or by 16, 12,

Department of Pharmacology, Ternopol' Medical Institute. (Presented by Academician of the Academy of Medical Sciences of the USSR V. V. Zakusov.) Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 69, No. 5, pp. 69-71, May, 1970. Original article submitted December 1, 1969.

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and 68%, respectively. If the dose of the compound was doubled, the stimulation of bile secretion continued for longer and reached a higher degree, so that the total volume of bile produced was increased by 28, 29, and 130%, respectively.

The increase in the intensity of bile secretion due to xylite was accompanied by dissimilar changes in the chemical composition of the bile. In a dose of 200 mg/kg the compound reduced the concentration of cholates in the dog Bobik (from 2003-1997 to 1542-1222 mg%) and in Belyanka (from 8462-7961 to 7569-5869 mg%), but increased it in the dog Zhuk (from 1034-1569 to 2058-1896 mg%). Nevertheless, the total quantity of cholates excreted with the bile in the 4 h of the experiment was reduced only in Bobik (on the average from 44.18 to 34.583 mg/kg), whereas in Zhuk and Belyanka, on the other hand, it was increased - from 43.68 to 77.799 and from 49.687 to 72.61 mg/kg, respectively. With an increase in the dose of xylite to 400 mg/kg, the total content of cholates excreted with the bile was increased in all tests.

The changes described in the content of cholates took place on account both of conjugated and of free bile acids. The increase in the total content of cholates in the dog Zhuk took place mainly on account of taurocholic and desoxycholic acids (by 93 and 118%, respectively), and to a lesser degree of cholic acid. In Belyanka it was increased only on account of taurocholic acid, while the concentration of the free acids fell slightly. The action of xylite on the dog Bobik, on the other hand, was to reduce the content of taurocholic and desoxycholic acids and to increase the content of cholic acid. After administration of xylite in a dose of 400 mg/kg, cholate synthesis and excretion in the bile by the dogs Bobik and Zhuk were increased still more on account of taurocholic, cholic, and desoxycholic acids. In Belyanka, the content of taurocholic acid was increased, that of desoxycholic acid slightly reduced, while that of cholic acid was almost unchanged.

Under the influence of xylite the concentration of bilirubin in the bile of all the dogs as a rule fell, and the more marked the choleretic response the greater the fall. Nevertheless, the total quantity of pigment excreted with the bile either remained within normal limits or was slightly increased, particularly in the dog Belyanka.

So far as cholesterol is concerned, its concentration was increased in most experiments, but not very much. However, because of the increased intensity of bile secretion, the total quantity of cholesterol excreted during the 4 h of the experiment was increased: in Belyanka after administration of xylite in doses of 200 and 400 mg/kg from 0.235 to 0.353 and 0.336 mg/100 g, respectively, in Zhuk from 0.919 to 1.448 and 1.105 mg/100 g, and in Belyanka from 0.425 to 0.667 and 0.898 mg/100 g, respectively.

Less marked changes were observed in the acute experiments in rats, particularly as regards the intensity of bile secretion. Xylite, in a dose of 200 mg/100 g, had no significant effect on the rate of bile secretion, while in a dose of 400 mg/100 g it actually reduced the rate - on the average from 3.9 ± 0.3 to 2.6 ± 0.2 mg/min/100 g. The total volume of bile obtained during the 6 h of the experiment under these conditions was reduced from 1452 to 1212 mg/100 g body weight, or by 17%. Even so, however, the concentration of cholates in the bile was increased: after administration of xylite in a dose of 200 mg/100 g from 1239-650 to 2117-540 mg%, and in a dose of 400 mg/100 g body weight to 2450-867 mg%. Accordingly, the total quantity of cholates excreted during the experiment was increased: from 13.611 to 20.127 mg/100 g in the first case and to 22.207 mg/100 g of the second case. These changes took place on account of taurocholic, glycocholic, and desoxycholic acids. Their total content was increased after administration of xylite in a dose of 200 mg/kg by 1.2, 4.0, and 4.4 times, and in a dose of 400 mg/100 g by 1.3, 6.6, and 3.8 times, respectively.

At the same time, the concentration and total content of bilirubin in the bile of the rats increased slightly, especially in the 5th and 6th hourly portions. In turn, the concentration and total content of cholesterol were increased in the first three hourly portions, followed by a slight decrease. However, the total content of cholesterol excreted during the experiment was not reduced.

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