

# CHANGES IN THE BILE-FORMING FUNCTION OF THE LIVER IN ALBINO RATS AFTER CASTRATION

G. K. Skakun

UDC 612.357.3-06:612.616.11

Castration of albino rats of both sexes gives rise to prolonged hypersecretion of bile. Disturbances in the secretion and chemical composition of the bile after castration disappear completely in the course of the next 2-3 months. Replacement therapy (with folliculin or methyltestosterone, respectively) prevents the onset of biliary hypersecretion after castration.

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Investigations have shown that after loss of gonad function in dogs marked and prolonged disturbances of bile formation develop [1, 4-7]. In my own experiments [2, 3], hypersecretion of bile appeared in some dogs, while in others (and also in guinea pigs) bile secretion was inhibited. The sensitivity of the bile-secreting apparatus of the liver to cholagogues and its reactivity to them were also reduced.

The object of the present investigation was to examine the response of the liver to castration in albino rats and to determine to what extent these changes are dependent on loss of the internal secretory function of the gonads.

## EXPERIMENTAL METHOD

Experiments were carried out on 85 female and 39 male albino rats previously undergoing a mock castration operation (controls) or the unilateral or bilateral removal of the gonads. Ovariectomy was performed on 14 animals and the ovaries left inside the abdomen (autotransplantation operation), while 21 animals received folliculin or methyltestosterone as replacement therapy one month after castration.

In all the experiments the intensity of bile secretion was determined and expressed in mg/h/100 g body weight and also in mg/100 g body weight/5 h of the experiment. The content of water, total organic substances, and mineral substances in the bile was also determined (in mg/g). The concentrations (in mg%) and total content (in mg/100 g) of bile salts (cholates) and bilirubin in the bile were also determined.

## EXPERIMENTAL RESULTS

After castration the rats developed marked hypersecretion of bile. For instance, 2 weeks after the operation on the females the bile secretion increased from between  $194 \pm 18$  and  $180 \pm 16$  to between  $272 \pm 13$  and  $210 \pm 12$  mg/h/100 g, and one month after the operation it was increased still further to between  $295 \pm 13$  and  $211 \pm 17$  mg/h/100 g. As a result the total volume of bile secreted during the 5 h of the experiment increased on the average from  $921 \pm 53$  to  $1239 \pm 56$  and  $1215 \pm 47$  mg/100 g, respectively. The content of water in the bile and also of the total organic and mineral substances remained unchanged. The concentration of cholates fell from 685-320 to 550-312 mg %, and that of bilirubin from 10-13.8 to 8.2-9.9 mg %. However, the total content of these substances excreted with the bile during 5 h of the experiment remained within the original limits.

This character of the change in the chemical composition of the bile indicates that hypersecretion after castration is the result of an increase in filtration rather than in true secretion in the process of bile formation.

At the later period of observation (2 months after castration) the intensity of bile secretion was mainly back to normal. However, the content of cholates and bilirubin in the bile remained slightly low, namely

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Department of Pharmacology, Ternopol' Medical Institute (Presented by Academician V. V. Parin).  
Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 67, No. 1, pp. 33-35, January, 1969.  
Original article submitted January 17, 1968.

3.2747 (compared with 4.3043 mg/100 g in the control) and 0.0805 mg/100 g (control 0.1129 mg/100 g) respectively, i.e., 28.7 and 24% lower than in the control. In the experiments carried out 3 months after castration the intensity of secretion and the chemical composition of the bile were indistinguishable from the controls, indicating that the process was completely back to normal.

Similar results were obtained in the experiments on males.

Removal of one ovary from the females caused no significant changes, whereas replacement therapy with folliculin restored normal bile formation. In particular, injection of folliculin in a dose of 200-300 units/100 g body weight 24 h before the experiment into animals with marked hypersecretion of bile after castration led to a decrease in the total volume of bile from  $1215 \pm 47$  to  $946 \pm 55$  mg/100 g, i.e., to the initial value. Similar results were obtained in the experiments on males, in which injection of methyltestosterone (0.5 mg/100 g body weight 24 h before the experiment) reduced the intensity of bile secretion on the average from  $1265 \pm 22$  to  $1062 \pm 52$  mg/100 g (control value  $1011 \pm 36$  mg/100 g). Hypersecretion of bile also developed in the animals undergoing autotransplantation of the ovaries into the abdominal cavity, but it was rather less in degree.

Hence, albino rats after castration developed prolonged hypersecretion of bile lasting for more than 2 months.

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