

# THE EFFECT OF PREGNANCY ON THE CONTENT OF SILICON, ALUMINUM AND TITANIUM IN THE LIVER AND IN THE BLOOD FLOWING FROM THE LIVER OF ANGIOSTOMIZED DOGS

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According to the literature, pregnancy is accompanied by an increase of many microelements in the blood, especially elements like manganese, silicon, aluminum, titanium, copper and zinc [2,3,4,5,7,9,11]. The question of the degree to which the liver participates in the redistribution of the microelements in the organism during pregnancy has received very little study. A number of authors have reported their research on the deposition, and also secretion of microelements by the liver in various organic conditions. Zakrzhevskii, Kul'berg and Lirtsman [4] found that the amount of copper in dog liver decreases during painful stimulation. V. R. Soroka [9], in experiments on angiotomized dogs, showed that the liver secretes manganese, silicon, aluminum, titanium and copper under conditions of excitation and inhibition, induced by medicinal substances (ether, caffeine). M. G. Mirzakarimov [6,7] reports that an increase in the amount of copper in the blood of pregnant women arises principally at the expense of a decrease in its content in the liver tissue. Our studies in chronic tests on angiotomized dogs have established that during pregnancy, manganese and copper are secreted into the outflowing blood by the liver.

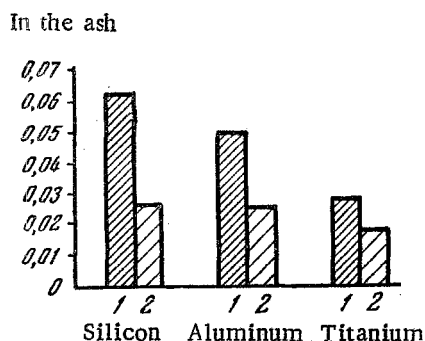


Fig. 1. Average content of silicon, aluminum and titanium in the liver tissues of non-pregnant and pregnant dogs (in percent in the ash) 1) Liver tissue of non-pregnant dogs; 2) liver tissue of pregnant dogs.

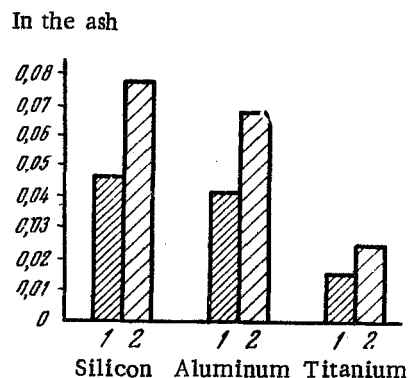


Fig. 2. Average content of silicon, aluminum and titanium in blood flowing from the liver of non-pregnant and pregnant dogs (in percent in the ash). 1) Blood flowing from the liver of non-pregnant dogs 2) blood flowing from the liver of pregnant dogs.

In our present research we tried to shed some light on the changes in content of silicon, aluminum and titanium which are noted in liver tissue and in blood flowing from the liver of pregnant dogs.

## METHOD

We carried out studies in 24 chronic experiments on 6 female dogs (three pregnant and three non-pregnant controls) in which we applied a metallic cannula in the hepatic vein (according to the method of E. S. London). We used a long needle to take blood flowing from the liver on the sixth day after the operation. Liver tissue for the study was taken from 10 pregnant and 10 non-pregnant sacrificed dogs. Quantitative analysis of the content of microelements in the ashes of the test samples was carried out by the method of emission spectral analysis.

## RESULTS

Results of the investigation of the content of silicon, aluminum and titanium in the tissues of the liver of pregnant and non-pregnant dogs are presented in Fig. 1.

As seen in Fig. 1, in the pregnant dogs, the average quantity of the specified microelements in liver tissue is significantly lower than in the non-pregnant dogs: silicon -  $2\frac{1}{2}$  times, aluminum - 2 times, and titanium -  $\frac{1}{3}$  more. Literature reports, and also a report of the research findings of one of the present authors, [2] show that an increase in the amount of manganese, silicon, aluminum, titanium and copper, is observed in the blood during pregnancy. Consequently, such a distinct decrease in the amount of microelements in the liver tissue of pregnant dogs in comparison to non-pregnant dogs, which our tests showed, permits the assumption of a secretion, into the blood, of microelements in the liver of pregnant dogs. This is entirely logical, since the liver is the principal depot of microelements in the animal and human organism. [1]

However, research performed up to the present time has dealt either with liver tissues only, or with the general blood supply only, taken from the large blood vessel circulation; determination of the content of the microelements in the general blood supply has not been adequately studied. To clarify the role of the liver in the metabolism of microelements during pregnancy, the material used in our experiment was blood flowing from the liver which we sampled directly from the v. hepatica by the angiostomy method.

As seen in Fig. 2, the average content of silicon, aluminum and titanium in the blood flowing from the liver of pregnant dogs is significantly higher than in non-pregnant dogs: silicon - by 67%, aluminum - by 51%, titanium - by 71%.

The decrease in the amount of silicon, aluminum and titanium in the liver tissue of dogs in connection with pregnancy, and the simultaneous increase in the content of these microelements in the blood flowing from the liver, agree with results obtained by us in previous experiments in connection with copper and manganese, and testify to the secretion of the liver microelements into the outflowing blood. The appearance of a secretion of liver microelements into the outflowing blood during pregnancy, which we noted, is apparently connected with supplying the requirement of the growing fetus, because - according to the findings of one of our laboratory staff, A. S. Mikosha [8], - during the period of embryonic development, marked storage of manganese, nickel, silver, aluminum, titanium, chromium, lead and copper occurs in the fetal liver.

The results obtained, in consonance with the findings of M. G. Mirzakarimov [6,7] who showed an increase in the amount of copper in the blood of pregnant women, while it decreased in the liver tissue, allow the conclusion to be drawn that during pregnancy the liver has a much higher requirement than does the liver of non-pregnant women. In view of the transfer of a significant quantity of microelements from the organism of the mother to the fetal organism, we must assume that a deficit of microelements must arise in women during pregnancy. On this account, it is entirely natural to recommend for pregnant women a diet enriched with salts of the microelements.

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