

## Correlation of Changes of the Content of Microelements and Corresponding Enzyme Systems at Physiological and Abnormal Pregnancy

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### ABSTRACT

It had been studied the dynamics of the change of microelements' level, specifically of copper, manganese, zinc and the activity of corresponding enzymes - cupreoxidase (cerruloplasmin), cholinesterase (true and pseudo), catalase, carboanhydrase, and their relationship in organism at physiological and abnormal pregnancy. On the ground of investigations of women at the different stages of pregnancy had been revealed the certain regularities in abovementioned changes.

**KEYWORDS:** *cupreoxidase, cholinesterase, catalase, carboanhydrase*

**A**t pathologies of pregnancy and birth are observed the significant changes of the content of some microelements. However, the information about the role of microelements in enzyme processes at pregnancy and its complications are represented by sporadic investigations.

In this connection we decide to investigate more specifically the dynamics of change of the level of microelements - copper, manganese, zinc and enzymes - cupreoxidase, cholinesterase, catalase, carboanhydrase, their correlation in organism at physiological pregnancy and birth in age-aspect, and also at the threat of miscarriage.

In large, 240 expectant women were investigated. Microelements had been defined in whole blood, separately in form elements and plasma with the usage of modern methods.

By trimesters of physiological pregnancy we have revealed the regular increasing of the level of copper and enzymes depending on the term of pregnancy. The amount of manganese was authentically increased in the I and the II trimesters, but in the III - was decreased. At the threat of miscarriage the content of copper and cupreoxidase in blood increases, but the level of manganese and the activity of cholinesterase fall down.

Thereby, was established the direct dependence between the level of copper in blood and the activity of cupreoxidase and between of content of manganese and activity of cholinesterase.

It was studied by us the change of concentration of microelements and activity of enzymes for women at pregnancy and birth in the age-aspect. Under influence of pregnancy in optimal age (20-25year) the level of copper, manganese and zinc increases, both, in form elements and plasma in comparison with unpregnant women. For the young (16-19 years) and aged (30-45 years) para I women the amount of these microelements in comparison with woman of age 20-25 is decreased in form elements and is accumulated in plasma (Tab.1). At dilating labor for para I women of optimal age concentration of investigated elements is decreased, both, in plasma and form elements (in comparison with pregnant). For young and aged pregnant biotics are accumulated in form elements and plasma except for zinc, the level of which for aged para I women was decreased in form elements and increased in plasma. In period of

ejection, in comparison with dilating labor, for parturient women in optimal age microelements are accumulated in form elements and plasma. The content of zinc for young and aged parturient women was decreased in form elements and plasma and at the same time the level of zinc is increased in form elements and decreased in plasma.

The activity of catalase of young and aged pregnant decreases insignificantly in comparison with women of optimal age. From the birth activity to the end of the birth for parturient women of all ages the activity of catalase increases reaching the maximum at the period of ejection.

The change of activity of carboanhydrase depending on the age of para I women is not revealed, and the obtained indicators of activity of enzymes in dynamic for all age groups of unpregnant, pregnant and parturient women are analogical.

The activity of true cholinesterase for young and aged pregnant is higher, than for persons of optimal age.

With the beginning of the birth the activity of acetylcholinesterase was decreased for parturient of all age groups and at the end of the birth became somewhat lower than for unpregnant women.

The activity of false cholinesterase does not manifest such legibly expressed wave, as far as it does not influence on the process of hydrolysis of acetylcholine.

Thereby, at the comparison of the content of copper, manganese and zinc with the activity of true cholinesterase was noted inverse relation.

At the birth with intrauterine asphyxia was revealed the certain regularities of change of levels of microelements and enzymes depending on the stage of asphyxia. The activity of carbon anhydrase was increased depending on the severity of asphyxia, which can be appreciated as the manifestation of compensator reaction, directed on decreasing of acidosis at the expense of amplified exertion of carbon oxide from organism.

In venous blood of parturient at the light degree of asphyxia in comparison of control data the content of copper is increased, and at the heavy - decreased. The level of manganese and zinc in venous blood of parturient with the rise of severity of asphyxia was increased.

The analysis of the change of the level of microelements and enzyme activity at abnormal pregnancy indicates on

the meaning of the essentially important biotics for normal current of pregnancy and development of fetus.

The time of scanning	Components of blood	Statistical indicators	Copper			Manganese			Zinc		
			Young	Optimal age	Aged	Young	Optimal age	Aged	Young	Optimal age	Aged
Unpregnants	Form elements	M	7,7	4,9	8,4	1,3	1,5	1,2	31,7	24,2	32,2
		P	<0,01	<0,01		<0,5	<0,1		<0,005	<0,01	
	Plasma	M	15,3	9,9	15,1	1,5	0,9	1,0	20,7	15,0	21,8
		P	<0,01	<0,02		<0,001	>0,5		<0,02	<0,02	
Pregnants	Form elements	M	5,6	10,8	6,3	1,2	2,1	1,7	20,4	29,2	38,4
		P	<0,001	<0,001		<0,001	<0,05		<0,01	<0,05	
	Plasma	M	21,0	31,3	23,2	0,8	1,6	1,1	12,1	19,1	10,9
		P	<0,001	<0,01		<0,001	<0,01		<0,01	<0,001	
Dilating of labor	Form elements	M	10,0	7,8	9,7	1,7	1,5	1,8	34,2	22,1	29,0
		P	<0,02	<0,05		>0,2	<0,05		<0,001	<0,05	
	Plasma	M	27,5	20,3	29,5	1,5	1,1	1,3	21,4	10,7	16,4
		P	<0,01	<0,01		<0,01	<0,1		<0,001	<0,01	
Period of ejection	Form Elements	M	8,2	9,4	7,6	1,5	1,7	1,5	39,8	35,2	34,9
		P	>0,5	<0,1		>0,2	>0,2		>0,2	>0,5	
	Plasma	M	25,9	28,5	22,5	1,1	1,6	1,0	13,0	9,5	12,9
		P	>0,5	<0,02		<0,001	<0,001		<0,05	<0,05	

**Tab.1** The level of microelements in blood of para I women depending on age, mg% on incineration residue.

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## Взаимосвязь между содержанием микроэлементов и соответствующих ферментных систем при физиологической и осложненной беременности

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### РЕЗЮМЕ

Изучена динамика изменения уровня микроэлементов, в частности, меди, марганца, цинка и активности соответствующих ферментов - медьоксидазы (церуллоплазмина), холинэстеразы (истинной и ложной), каталазы, карбоангидразы, их взаимосвязь в организме при физиологической беременности и родах в возрастном аспекте, а также при угрозе невынашивания. На основе обследования женщин в разные периоды беременности выявлены определенные закономерности вышеуказанных изменений.

**Ключевые слова:** медьоксидаза, холинэстераза, каталаза, карбоангидраза