

# Some Molecular Mechanisms of Different Stress Factors Influence on Process of Physiological Pregnancy

*David Gagua, Jaba Gamrekelashvili, Nikoloz Kintraia*

Department of Obstetric and Gynecology, Tbilisi State Medical University, Georgia

## **Abstract**

As it is known in case of complications at pregnancy, homeostasis is disturbed, takes place hypoxia, intensification of oxidative process, changes in NO metabolism, often having undesirable effect as on mother organism as well as on fetus. Due to the above-mentioned the aim of our study is the investigation of free radical oxidation and NO metabolism processes during the influence of different stress factors on body at the experiment. It can be concluded that antioxidative system of blood is very sensible to the changes of metabolism, taking place at pregnancy. At the physiology of pregnancy activities of SOD and catalase responses are higher while at gestosis activity is increased sharply and activity of glutathionreductase is reduced. The revealed regularities indicate reduction of blood antioxidant enzymes ability to response on intensification of free radical oxidation at pathological pregnancy.

**Keywords:** *pregnancy, glucose-6-phosphatdehydrogenase, superoxiddismutase, catalase, glutathionreductase*

## **Introduction**

Contemporary epoch is characterized by growing of ecological cataclysms, physiological stresses, non-rational feeding and adynamic life-style. All the mentioned has its results, leading us to the permanent stress conditions in which human organisms are under, especially of women, revealing into development of chronic diseases such as: cardiovascular, endocrine, digestive system and etc.

Worsening of ecological and socio-economical situation in Georgia has the significant influence on the frequency of perinatal mortality and diseases. Mainly this is caused by the fact that stress factors disturb molecular processes running in uterus. It must be taken notice of premature caused by psychological stress in refuges from Abkhasia (Kintraia N., 2002). According to the data obtained in Georgia psychological stress has great influence on pregnancy and delivery process.

As it is known in case of complications at pregnancy, homeostasis is disturbed, takes place hypoxia, intensification of oxidative process, changes in NO metabolism, often having undesirable effect as on mother organism as well as on fetus (Kintraia et al. 2001). Due to the above-mentioned the aim of our study is the invitation of free radical oxidation and NO metabolism processes during the influence of different stress factors on body at the experiment.

## **Materials and Methods**

The experiments have been conducted on mature guinea pigs (females), weight - 350gr. Have been studied 3 groups of animals: 1 - control (non-pregnant 6 animals); 2-animals with physiological pregnancy (6 animals); 3 pregnant animals during 3-7 weeks of pregnancy have been undergone the influence of vibration and noise (6 animals).

Animals were killed at the late stages of pregnancy (7-8 weeks) by the method of decapitation. Right away after

decapitation were taken blood samples from animals for biochemical studies. Have been determined the following indexes: activities of glucose-6-phosphatdehydrogenase, superoxiddismutase, catalase and glutationreductase.

The activity of glucose-6-phosphatdehydrogenaza has been defined by the method of Kornbery, Horecker, G-6-PDH (Method Nr.345. UV) (SIGMA). Activity of glutationreductase has been defined by the method described by L.B. Usupov. Activity of superoxiddismutase (SOD) has been determined by the method of Fried (1975) with modification of Koroluk.

### **Results and Discussion**

The data about changes of antioxidant blood enzymes' activities (superoxiddismutase, catalase, glucose-6-phosphatdehydrogenase) of guinea pigs at physiologic and pathologic pregnancy are shown in the table followed below.

According to the table at late period of physiological pregnancy SOD activity increases by 83% in comparison with control data. At the same time activity of catalase increases by 75%, while activity of glutationreductase doesn't change practically in comparison with the control findings. Due to the data given in the table, activity of glucoso-6-phosphate-dehydrogenase reduces as well at physiologic pregnancy and is 61% of the control data. Activity of antioxidative enzymes of guinea-pigs with pathological pregnancy, change sharply in comparison with the data corresponding to physiologic pregnancy. Regarding to the data showed in the table, SOD activity is lower and exceeds the control data only by 51%, activity of glutationreductase is decreased by 35% in comparison with the findings characterized for no pregnant guinea pigs, while the activity of catalase are not changed practically comparing with indexes,

characterizing for guinea pigs with physiologic pregnancy. Activity of glucoso-6-phosphate-dehydrogenase is not changed comparing with the findings characterizing for physiologic pregnancy.

So, from the obtained results we can conclude that the pregnancy at the end of the third term is accompanied with intensification of metabolic changes, promoting increased generation and utilization of oxygen active forms. At the first time this is concerned to O<sub>2</sub> and H<sub>2</sub>O<sub>2</sub>, which according to the other authors (Storozhuk P.G. 2000) play the important role in hemoglobin oxygenation processes. Strengthened generation of O<sub>2</sub> and H<sub>2</sub>O<sub>2</sub> at the conditions of physiologic pregnancy promotes activation of enzymes of antiradical prevention - SOD and catalase.

Recovered NADP and FAD forms, producing in these reactions together with recovered glutation by using of glutationreductase are the donors of H<sup>+</sup>. In its term, the abundance content of O<sub>2</sub> promotes reduction of glucoso-6-phosphate-dehydrogen activity (Storozhuk P.G., 2001).

At the conditions of pathologic pregnancy deoxihemoglobin is accumulated, developed hypoxia, generated abundant amount of oxygen reactive forms. In these conditions sharper inactivation of antioxidant enzymes (SOD, glutationreductase, glucoso-6-phosphate-dehydrogenas) has been observed.

So, it can be concluded that antioxidative system of blood is very sensible to the changes of metabolism, taking place at pregnancy. At the physiology of pregnancy activities of SOD and catalase responses are higher while at gestosis activity is increased sharply and activity of glutationreductase is reduced. The revealed regularities indicate to the reduction of blood antioxidant enzymes ability to response on intensification of free radical oxidation at pathological pregnancy.

<i>Groups</i>	<i>N</i>	<i>GLc-6-PDH</i> <i>(U/gHb)</i>	<i>SOD</i> <i>(U/mler)</i>	<i>Catalase</i> <i>(mkat/L)</i>	<i>Glutationreductase</i> <i>(U/ml er)</i>
1 Control	6	7,5±1,3	143,6±10,1	16,6±1,0	92,4±3,3
2 Physiologic pregnancy	6	4,6±1,1 p <sub>12</sub> <0,01	264,4±13,4 p <sub>12</sub> <0,01	29,4±1,3 p <sub>12</sub> <0,01	80,5±5,8 p <sub>12</sub> <0,1
3 Pregnancy with gestosis	6	3,6±1,8 p <sub>13</sub> <0,01	238,89±10,2 p <sub>13</sub> <0,01 p <sub>23</sub> <0,05	30,32±1,6 p <sub>13</sub> <0,01	59,0±4,3 p <sub>13</sub> <0,01

**Tab.1** *Changes of antioxidative blood enzymes activities at physiologic and toxic (with gestosis) pregnancy.*

## References

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## Изменения активности антиоксидантной системы крови при экспериментальном гестозе

*Давид Гагуа, Джаба Гамрекелашвили, Николоз Кинтрая*

Кафедра акушерства и гинекологии Тбилисского государственного медицинского университета, Грузия

### РЕЗЮМЕ

Известно, что беременность сопровождается глубокими метаболическими изменениями, которые усугубляются в третьем триместре и, особенно, в предродовом периоде. Осложнения беременности гестозом и гипоксией, как правило, способствуют генерации реактивных форм кислорода, которые на организм человека оказывают различного рода негативное или позитивное действие. Целью работы являлось выявление изменений активности ряда антиоксидантных ферментов в эритроцитах и сыворотке крови в условиях позднего экспериментального гестоза. На основании полученных результатов можно заключить, что антиоксидантная система крови весьма чувствительна к метаболическим процессам, протекающим при беременности. При физиологической беременности особенно активно реагируют СОД и каталаза, тогда как при гестозе резко повышается активность глюкозо-6-фосфатдегидрогеназы, снижается активность глутатионредуктазы. Выявленные нами закономерности указывают на снижение способности антиоксидантных ферментов крови реагировать на интенсификацию свободнорадикального окисления при патологической беременности.

**Ключевые слова:** беременность, глюкозо-6-фосфатдегидрогеназа, супероксиддисмутаза, каталаза, глутатионредуктаза