

# The Changes of Paramagnetic Centers of Blood in Critical State Patients

*Ilia Nakashidze, Nestan Abdushelishvili*

Tbilisi State Medical University, Georgia

## **Abstract**

Critical state of any genesis is accompanied with activation of free radical processes in tissues and organs of patient. The aim of the study was investigation of the pathogenesis of critical states on subcellular, molecular level. We've decided to investigate state of adrenoreceptors of blood cells and metabolism of free nitric oxide. In the blood EPR spectrum has been revealed decrease of signal, characteristic for activated form of adrenoreceptors and increase for their inactivated form. During the critical state the content of nitric oxide (NO) in blood increases sharply as well. It can be concluded that oxidative stress is very important pathogenetic factor of critical state development. Over-intensification of free radical processes causes suppression of compensatory reactions in body, causing adrenergic structures and nitrogen oxide.

**Keywords:** *chronic hepatitis C, cytokines, predictive factors*

## **Introduction**

Critical state of any genesis is accompanied with activation of free radical processes in tissues and organs of patient. All the functionally significant free radicals, producing in body, contain oxygen in their composition. They are characterized by chemical instability and high reactivity. Influencing on cellular components - lipids, proteins, and nucleonic acids - they cause inactivation of various hormones and enzymes, losing of receptors' sensibility of plasmatic membranes, tissue injury and cells' death.

With the aim to study the pathogenesis of critical states on subcellular, molecular level we've decided to investigate state of adrenoreceptors of blood cells and metabolism of free nitric oxide.

## **Materials and Methods**

There has been carried out a clinical-laboratory investigation of 40 diseased patients in critical states. A control group has constituted 15 volunteers. The state of blood' red cells adrenoreceptors and content of free Nitric Oxide in patients blood was assessed by the method of electron paramagnetic resonance (EPR), the basis of which is absorption of electromagnetic energy by the substance of high rate (blood), allocated in the magnetic field of the definite voltage. We have studied the intensity of EPR signals of adrenoreceptors and nitric oxide. The Electromagnetic spectrum of blood has

been registered on the radio spectrometer RE 1307 in quartz flat at the temperature of liquid nitrogen.

## **Results and Discussion**

The Table shows the changes of signal intensity of spin-trapped nitric oxide EPR signal and the signals of red cells adrenoreceptors state. In the spectrum of blood EPR spectrum a signal has been revealed decrease characteristic for activated form of adrenoreceptors and increase for their inactivated form. As a consequence of data brought in the table, during the critical state the content of nitric oxide (NO) in blood increases sharply. As it is known at overintensive and continuing stress-reaction in cells takes place activation of free radical oxidative processes, accompanied with intensification of peroxidation processes, disturbance of membrane structures integrity with entrance into intracellular area of  $Mn^{2+}$  and  $Fe^{2+}$  free ions, proved to be powerful promoters of free radical oxidative processes (Greengard P., 1981)

In process of stress-reaction progress in organism the great role is given to NO (Russe R, et al, 1993). It is considered that increase in NO production at over stress-reaction corresponds to the exhaustion stage. At the same time strengthening of NO synthesis can take place as at the expense of already existed enzyme NO synthetase activation (Busse R., et al, 1995) as increase of NO synthetase synthesis de novo (Calza L., et al, 1993). Activation of NO synthetase is connected with enhancement of intercellular Calcium, activation of free

radical oxidation and increase of free fatty acids concentration (Ignarro L., 1989). Stress induction of genes, coding NO synthetase, can be conducted as a result of NFkB transcription factor together with free radicals of calcium, cytokines, interleukins and TNF-a (Busse R., et al, 1995). Content of factors, activating NO production are unspecifically increased at any stress-influence. It is known, that NO modulates main hypophysic stress-hormones secretion (Kato N., 1992), allowing us to suppose that nitric oxide plays very important role in regulation of hypophysis function and

warning of overactivation of central link of stress system. NO can block peripheral ejection of stress-hormones and protect cells and organs from stress injuries and enhance its content in blood being in critical state of patients can be observed as the revelation organism compensatory reaction. However, at the state of oxidative stress there exists the great probability of NO interaction with reactive forms of oxygen (superoxidradicals), producing cytotoxic peroxinitrit.

GROUP	NUMBER OF PATIENTS	INACTIVE FORM OF ADRENORECEPTORS	ACTIVE FORM ADRENORECEPTORS	NO
		g=2,01	g=2,003	g=2,035
Control	15	6,20±0,6	7,80±0,8	16,0±0,8
Critical states	20	13,6±1,6 p<0,001	1,43±0,5 p<0,001	22,1±1,0 p<0,001

**Tab.1** *Change of paramagnetic centers of blood during acute insufficiency in children.*

### References

1. Busse R., Mulsch A., Fleming I., Hecker M., 1993, *Circulation*, 87, V18-V25.
2. Busse R., Fleming I., 1995, *Ann. Med.*, 27, 331-340.
3. Calza L, Giardino L., Ceccatelli S., 1993, *Neuroreport* 4, 672-630.
4. Ignarro L.J., 1993, *Biochem. Biophys. Res. Commun.*, 193, 126-132.
5. Kato N., 1992 *Endocrinology*, 131, 2133-2138.

## **Изменения парамагнитных центров в крови пациентов, находящихся в критическом состоянии**

*Илья Накашидзе, Нестан Абдушелишвили*

Тбилисский государственный медицинский университет, Грузия

### **Р Е З Ю М Е**

Критические состояния различного генеза характеризуются активацией свободнорадикальных процессов в тканях пациентов. Целью исследования являлось изучение патогенетических изменений, характерных для критических состояний на субклеточном молекулярном уровне. Исследовано состояние адренорецепторов форменных элементов крови и метаболизм оксида азота. В спектре ЭПР крови выявлено уменьшение интенсивности сигнала ЭПР, характерного для активного увеличения сигнала, характерного для инактивированного состояния адренорецепторов. Установлено также увеличение содержания свободного оксида в крови. На основании полученных результатов выявлена важная роль окислительного стресса в патогенезе критических состояний, способствующего подавлению компенсаторной реакции организма, обусловленного адренергическими структурами и оксидом азота.

**Ключевые слова:** *адренорецепторы, пероксидное окисление липидов, оксид натрия, кислородный стресс*