

activation of caspase 3. Glycine also maintained phosphorylating ability of mitochondria after incubation of rats' brain cortex slices under anoxia for 30 min. Neuronal death during ischemic stroke mediated by glutamate excitotoxicity which results in elevation of intracellular calcium concentration. Elevated concentrations of calcium induce mitochondrial permeability transition pore, which dissipates mitochondrial electrochemical gradient and lead to energy collapse. Therefore we investigated the effect of glycine to influence directly on calcium capacity of isolated mitochondria in conditions close to brain tissue surviving during ischemic stroke. We studied the calcium capacity of isolated brain mitochondria after incubation under anoxia at different temperatures and the effect of glycine on this parameter. Concentration of calcium in the incubation medium and the mitochondrial membrane potential were measured. Incubation of the mitochondria at room temperature (22 °C) under 30 min of anoxia led to a decrease of the calcium capacity of mitochondria by 80–90% compared with intact mitochondria, also significantly decreased sensitivity to cyclosporin A. Calcium capacity at the same conditions and in the presence of glycine 5 mM was reduced only by 50–60%. There was a concentration dependence of this effect and it could be observed under not less than 2 mM glycine. Our data show that glycine prevents decrease of calcium capacity in isolated brain mitochondria during anoxic conditions. These findings suggest a novel mechanism for glycine as a potential stroke therapeutic.

doi:10.1016/j.bbabbio.2010.04.246

#### 9P.9 Evaluation of neuroprotective abilities of the novel mitochondria-targeted antioxidants

Mariya I. Danshina<sup>1</sup>, Denis N. Silachev<sup>1</sup>, Irina B. Pevzner<sup>1</sup>, Egor Y. Plotnikov<sup>1</sup>, Yuri B. Pirogov<sup>2</sup>, Nikolaj K. Isaev<sup>1</sup>, Vladimir P. Skulachev<sup>1</sup>, Dmitry B. Zorov<sup>1</sup>

<sup>1</sup>A.N.Belozersky Institute of Physico-Chemical Biology and Institute of Mitoengineering, Moscow State University, Russia

<sup>2</sup>Training and Research Interfaculty Center of Magnetic Tomography and Spectroscopy, Moscow State University, Russia

E-mail: [proteins@mail.ru](mailto:proteins@mail.ru)

Over the world, brain ischemia is one of the most common causes of death and adult disability. Oxidative stress is known to be highly associated with brain ischemia with an important role of mitochondria as a major source of reactive oxygen species. Therefore, therapeutic approaches targeting mitochondrial dysfunction and oxidative damage hold great promise in neurodegenerative diseases. We tested mitochondria-targeted chimeric compounds carrying antioxidant moiety as potential agents to efficiently alleviate the deleterious consequences of ischemic insult. Among all tested compounds the highest efficiency was displayed by SkQR1 consisting of a rhodamine moiety linked to a plastoquinone residue. Brain ischemia in rats was induced by insertion of a silicon-coated thread in the middle cerebral artery (MCA). The volume of brain infarct was determined on the first postoperative day by magnetic resonance imaging. Behavioral test was performed 1 day before the surgery and on the first day after the induction of ischemia. Measuring the proteins content in the brain homogenate tissue was determined by Western blotting. We found that a single intraperitoneal injection of SkQR1 at the concentration of 0.5, 1, 2 mM/kg before and after MCA occlusion significantly diminishes infarct volume and improves performance of a test characterizing neurological deficit of ischemic animals in a dose-dependent manner. An analog of SkQR1 without plastoquinone did not display apparent neuroprotective properties. We also revealed that SkQR1 activates signaling pathways involved in ischemic tolerance induction. We conclude that beneficial effect of rhodamine derivative of mitochondria-targeted compound SkQR1 causing significant improvement of neurological functions and decreased infarct volume may be explained by a direct antioxidative effect of the drug. However, we

cannot exclude some other mechanisms of SkQR1 action, in particular, through a mechanism of ischemic tolerance induction.

doi:10.1016/j.bbabbio.2010.04.247

#### 9P.10 Oxidative inactivation of mitochondrial creatine kinase: Differential sensitivity of isoforms

Malgorzata Tokarska-Schlattner, Uwe Schlattner

Laboratory of Fundamental and Applied Bioenergetics (LBFA), Inserm U884, University Joseph Fourier - Grenoble 1, Grenoble, France

E-mail: [malgorzata.tokarska@ujfrenoble.fr](mailto:malgorzata.tokarska@ujfrenoble.fr)

Isoforms of creatine kinase (CK) are key players in energy metabolism of many cells with high and/or fluctuating energy demands by providing energy buffer and energy transfer functions. They are easily inactivated in situations of oxidative stress, which makes them a critical factor for energy failure occurring in many related pathologies. Reactive oxygen and nitrogen species (ROS, RNS) not only induce enzymatic inactivation, which occurs with all CK isoenzymes, but also specific damage to the mitochondrial CK isoforms (MtCKs). This includes impairment of critical MtCK properties like destabilization of the native octameric state or decreased membrane binding capacity [1]. Using purified recombinant proteins, cell homogenates and mitochondria isolated from rat heart and brain, we have compared sarcomeric sMtCK (expressed in heart and skeletal muscle) and ubiquitous uMtCK (expressed in many other tissues) with respect to their sensitivity to oxidative inactivation induced by the drug doxorubicin or occurring spontaneously after extraction under non-reducing condition. Sarcomeric sMtCK showed significantly higher sensitivity to oxidation and was the isoform responsible for the loss of CK activity in heart extracts upon storage under non-reducing conditions. The sMtCK dimer was more easily inactivated as compared to the octamer, and solubilization of sMtCK from membrane (promoting dimerization) made the protein an especially vulnerable substrate for inactivation. This differential susceptibility of the two MtCK isoenzymes has been related to some differences in their molecular structures (e.g. number and surface exposure of cysteine residues). It may contribute to energy deficits that occur in oxidatively stressed heart expressing the sMtCK isoform [2,3].

#### References

- [1] Schlattner U, Tokarska-Schlattner M, Wallimann T (2006) *Biochem. Biophys. Acta* **1762**: 164-180.
- [2] Tokarska-Schlattner M, Zaugg M, Zuppinger C, Wallimann T, Schlattner U (2006) *J. Mol. Cell. Cardiol.* **41**: 389-405.
- [3] Tokarska-Schlattner M, Dolder M, Gerber I, Speer O, Wallimann T, Schlattner U (2007) *Biochim. Biophys. Acta* **1767**: 1276-1284.

doi:10.1016/j.bbabbio.2010.04.248

#### 9P.11 Liver mitochondria and insulin resistance

Guillaume Vial<sup>1</sup>, Hervé Dubouchaud<sup>1</sup>, Karine Couturier<sup>1</sup>, Cécile Cottet-Rousselle<sup>1</sup>, Nellie Taleux<sup>1</sup>, Anne Athias<sup>2</sup>, Anne Galinier<sup>3</sup>, Louis Casteilla<sup>3</sup>, Xavier M. Leverve<sup>1</sup>

<sup>1</sup>Inserm, U884, Grenoble, F-38041 France, Université J. Fourier Grenoble-1, Bioénergétique Fondamentale et Appliquée, Grenoble, F-38041 France

<sup>2</sup>Inserm, UMR866, Dijon, F-21079 France, Université de Bourgogne, Faculté de Médecine, Institut Fédératif de Recherche Santé-STIC, Dijon, F-21079 France

<sup>3</sup>CNRS, UMR5241, Toulouse, F-31432 France; Université Paul Sabatier Toulouse, Toulouse, F-31432 France

E-mail: [Guillaume.vial@ujfrenoble.fr](mailto:Guillaume.vial@ujfrenoble.fr)