

в ядре и цитоплазме также сравнимы — по крайней мере в течение первых 10 мин после индукции стресса.

В целом вывод из этой работы таков: активная детоксификация  $H_2O_2$  в цитоплазматическом компартменте вносит основной вклад в экранирование клеточного ядра от повреждающего действия  $H_2O_2$  при резком повышении окислительной нагрузки на клетки. Насколько можно распространить этот вывод на клетки других фенотипов и на клетки других организмов, покажут будущие эксперименты.

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## H<sub>2</sub>O<sub>2</sub> LEVEL IN THE NUCLEUS AND CYTOPLASM OF K-562 CELLS UNDER CONDITIONS OF EXTERNAL H<sub>2</sub>O<sub>2</sub>-INDUCED OXIDATIVE STRESS

N. A. Guriev, Ju. S. Ivanova, O. G. Lyublinskaya\*

*Institute of Cytology, Russian Academy of Sciences, St. Petersburg, 194064, Russia*

\* e-mail: o.lyublinskaya@mail.ru

**Objective:** Disturbance of redox homeostasis in cells induced by excessive accumulation of extracellular hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) is a stressful situation that cells in the human body may encounter during the development of various pathologies, as well as under the influence of external adverse factors (tobacco smoke, xenobiotics, radiation). It is known that under stress conditions, the intracellular concentration of H<sub>2</sub>O<sub>2</sub> is significantly lower than the extracellular concentration, due to the activity of peroxidases localized in various cell compartments. In this study, we aimed to determine to what extent the cellular antioxidant defense systems are able to prevent excessive accumulation of H<sub>2</sub>O<sub>2</sub> in the nuclear compartment under conditions of external H<sub>2</sub>O<sub>2</sub>-induced stress of various intensity. **Methods:** The studies were performed using K-562 cell lines expressing HyPer, a genetically encoded H<sub>2</sub>O<sub>2</sub> biosensor, in the nucleus or cytoplasm. The kinetics of HyPer oxidation in the cell nucleus or cytoplasm were assessed using flow cytometry. Analysis performed allowed us to compare the H<sub>2</sub>O<sub>2</sub> level established in the cell nucleus and cytoplasm 10 minutes after H<sub>2</sub>O<sub>2</sub> addition to cells. The disulfide reductase activity of the thioredoxin-dependent enzymatic system of the nucleus and cytoplasm was compared as well. **Results:** The data indicate that under conditions of external, toxic and non-toxic, oxidative stress, the nuclear concentration of H<sub>2</sub>O<sub>2</sub> in K-562 cells increases and is close to the cytoplasmic one. The thioredoxin-dependent disulfide reductase activity in the nucleus and cytoplasm also turned out to be comparable. Overall, we came to **the conclusion** that in case of abrupt increase in extracellular H<sub>2</sub>O<sub>2</sub> concentration, the nuclear apparatus of K-562 cells is protected from excessive accumulation of H<sub>2</sub>O<sub>2</sub> no more than the cytoplasmic structures.

**Keywords:** hydrogen peroxide, antioxidant defense, peroxidase activity, disulfide reductase activity, cytoplasm, nucleus, genetically encoded biosensor, HyPer