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Determining Cellular Biomarkers Sensitive to Low Damaging Exposure

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Abstract : At present, translational medicine is a rapidly developing branch of biomedicine. The main idea of translational medicine is a practical application of fundamental research. One of the possible applications for translational medicine is researching therapies that improve human age-related organism condition. To fill the gap between experiments and clinical practice, it is necessary to create the standardized system for the investigation of different effects on cellular aging models. In this study, primary human fibroblasts derived from patients of different ages were used as a cellular aging model. The senescence-associated β-galactosidase activity, lipofuscin, γ-H2AX, the reactive oxygen species level, and cell death markers (annexin V/propidium iodide) were used as biomarkers of the cell functional state. The effects of damaging exposures (oxidative stress and heat shock), potential positive factors (metformin and acetaminophen), and their combinations were investigated using the described biomarkers. Oxidative stress and heat shock caused the increase in the levels of all biomarkers, and only the cells from young patients partly coped with stress 3 days after the exposures. Metformin improved the state of pretreatment cells from young and old patients. The acetaminophen did not show significant changes in the biomarker levels compare to the action of metformin. This study proved the opportunity to develop a standardized screening system based on biomarkers of the cell functional state to identify potential positive or negative effects of some physical and chemical exposures. Moreover, such a system can be useful for the aims of regenerative medicine to determine the effect of cell pretreatment before transplantation.

Keywords : biomarkers, primary fibroblasts, regenerative medicine, senescence, test system, translational medicine
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