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The impacts of Environmental Chemicals on telomere length and adverse effects in A549 Cells

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Human exposure to environmental chemicals is associated with cardiovascular disease, lung cancer, chronic respiratory disease and mortality. In this study, we investigated the exposure of one group of chemicals (oxidizing agents) can lead to adverse effects and change the telomere length as a mechanism of health effects in lung epithelial cells in cell cultures. We selected four oxidizing agents such as Potassium Bromate (KBrO₃), Hydrogen peroxide (H₂O₂), Sodium dichromate (Na₂Cr₂O₇) and 4Nitroquinoline 1-oxide (4NQO) that can cause DNA damage. The compounds are suggested to be used as positive controls for the generation of DNA strand breaks and/or oxidatively damaged DNA. We measured cytotoxicity effects of cell metabolic activity, cell membrane damage and cell proliferation after 24 hours exposure to all chemicals and oxidative stress levels (ROS generation and antioxidant defense) were measured in short term and long-term exposures after 3 hours exposure to all chemicals and the effect of long-term exposure on the telomere length. The results can be summarized as (1) the short-term exposure for KBrO₃ leads to low cytotoxicity and oxidative stress effect; (2) the H₂O₂ causes no cytotoxicity effects and moderate oxidative stress effect; (3) the Na₂Cr₂O₇ leads to high cytotoxicity and moderate oxidative stress effect and (4) the 4Nitroquinoline 1-oxide (4NQO) leads to high cytotoxicity and oxidative stress effects. The long-term exposure for all the chemicals induces moderate oxidative stress effect in the cells. Long term exposure to all chemicals are associated with no significant change on the telomere length was observed in A549 cells.

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