Abstract

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Title of diploma thesis: Study of the cytostatic effects of sulfur mustard

Sulfur mustard (HD) belongs to blistering agents used in chemical warfare. It is a bifunctional alkylating agent that covalently modifies DNA. The cytostatic effect of HD is characterized by halting cell division without cell death. The duration for which a cell can remain in this state depends on the extent of DNA damage, which can subsequently be converted into a cytotoxic effect leading to cell death.

The aim of the study was to determine the concentration range of HD gas that exhibits cytostatic effects and to investigate the sensitivity of HaCaT skin keratinocyte cells synchronized in the G1, S, and G2/M phases of the cell cycle to alkylating damage induction following release from cell cycle blockage.

The cytostatic effect was observed only at very low concentrations, in the range of units of $\mu mol.l^{-1}$. In our experiments, a concentration of 2 $\mu mol.l^{-1}$ of HD prevented cell proliferation for 2 days. Lower, submicromolar concentrations, had a stimulatory effect on cell proliferation, while higher concentrations of HD acted cytotoxically.

When damage was induced in the G1 phase, there was a decrease in cell viability after 48 hours, accompanied by a decrease in the percentage of cells in the G1 phase. Surprisingly, we found no significant effect of alkylating damage on synchronized cells in the S phase, neither in terms of viability nor cell cycle. The most pronounced impact on the viability of HD-affected cells was observed in the G2/M phase, although there was no significant difference at the level of the cell cycle. The response of synchronized cells to alkylating damage was not statistically significant in terms of cell cycle and DNA synthesis in our experiments.