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Effects of haloperidol, clozapine and olanzapine on the survival of human neuronal and immune cells in vitro

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Cytotoxic effects on neuronal as well as on immune cells have been reported for both, typical and atypical antipsychotic drugs. We here evaluated the effects of different concentrations of a typical (haloperidol) and two atypical (clozapine, olanzapine) antipsychotics on the survival of human neuronal (SH-SY5Y cells) and immune cells (U937 cells) by determining the metabolic activity after 24 hours of incubation by the modified tetrazolium method. The dopaminergic neuroblastoma SH-SY5Y and the lymphoma U-937 cell line are well established models for in vitro investigations. To further elucidate possible mechanisms of action we also determined the ATP content in the cultured cells. After experimental treatment, significant effects were detected by Kruskal Wallis test for all treatment conditions. Post-hoc tests (Dunn's method) showed that haloperidol and clozapine at their two highest concentrations (25 and 50 µg/ml) caused a significant decrease of metabolic activity in both cell systems, which was also detectable after treatment with clozapine at a concentration of 12.5 µg/ml in U937 cells.
In contrast, olanzapine induced a significant increase in metabolic activity of SH-SY5Y cells at all concentrations except for the concentration of 3.1 µg/ml, whereas the metabolic activity in U937 cells was increased at concentrations of 1.6 and 6.25 µg/ml. For the determination of ATP content, the LD50 values of the metabolic activity were used, except for olanzapine for which no distinct LD50 value was available. Significant changes were detected for all treatments and post-hoc tests revealed that haloperidol caused a significant decrease compared to the control condition in both cell systems.
These findings suggest that antipsychotic substances of different classes exert differential metabolic effects in both, neuronal und immune cell systems.