Benzophenone-3 and its proapoptotic activity in the rat brain

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Background. Benzophenone-3 (BP-3) is a compound used in sunscreens, cosmetics to absorb UV radiation. Due to low molecular weight, high lipophilicity is well absorbed through the skin, digestive tract, and reaches ten times higher concentration in the human serum than other UV filters. So far little is known about the influence of BP-3 on the brain as well as the concentration of this compound in the central nervous system (CNS). It is now known that xenobiotics which, though do not show acute toxic effects on the CNS cells, but acting for a long time, during development, may increase the susceptibility to neurodegenerative or mental diseases. In this study, the possible pro-apoptotic activity of BP-3 was evaluated in the selected rat brain structures.

Methods. Pregnant Sprague-Dawley rats were treated dermally with BP-3 and next their male offspring received this compound at 7 and 8 weeks of age. At 57th day of age animals were killed and the analysis of protein expression (western blot) was performed for: active-caspase-3, -8, -9, pro- and anti-apoptotic proteins. For immunofluorescent study, and TUNEL assay prior to animal being sacrificed, the whole-body perfusion was performed. Brain slices were double-stained for active-caspase-3 together with neuronal, astrocyte or microglial marker. Using slices the TUNEL reaction was performed.

Results. We observed significant increase in the expression of active forms of caspase-3 and caspase-9 in frontal cortex and in hippocampus of rats exposed to BP-3. In addition, in frontal cortex of the same group expressions of pro-apoptotic Bax and Bak protein were raised. In turn, in hippocampus anti-apoptotic Bcl-2 and Bcl-xL were reduced in BP-3 group. Results of TUNEL assay, and caspase-3 immunofluorescent staining corresponded with protein expression experiments.

Conclusion. Obtained results suggest that exposure to BP-3 in the prenatal and adult period may initiate intrinsic pathway of apoptosis in the cells of brain and possibly may be one of the factors initiating neurodegenerative or mental diseases. The mechanism of these events is still unknown and demands more detailed studies in this area.

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