

The influence of early postnatal feeding of laboratory white rats with flavonoids from Georgian endemic grape species “Saperavi” on hippocampus related learning/memory processes

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Introduction: Flavonoids and other phenol compounds, which are mainly found in fruits, vegetables, in beverages such as wine, tea, cocoa and fruit juice play an important role in the human diet. Flavonoids are powerful antioxidants and are characterized by scavenging of wide range of reactive oxygen and nitrogen. Flavonoids can easily pass through the blood brain barrier and they have ability to accumulate in the brain structures, especially in the cortex and hippocampus, thus they can participate in the hippocampus-dependent memory functions. According to the recent literature, flavonoids in the brain show a wide range of neuroprotective activities. They effectively protect neurons from injuries induced by toxins, inhibit the inflammatory processes in the brain and positively affect learning/memory, general cognitive functions. The aim of our work was to determine the effects of flavonoids from Georgian endemic grape species Saperavi on aging-related changes in hippocampus-dependent spatial memory functions in laboratory white rats. In the previous biochemical experiments flavonoid rich fraction isolated from “Saperavi” revealed multicomponent phenol content and antioxidant capacity.

Methods: Behavioral experiments were planned on laboratory rats of 2 different ages (8-10 and 28-32 weeks old). To define the effects of flavonoids from Saperavi grape species on learning/memory ability and emotional state of rats, 2 different regime of 8 days administration of flavonoids were used – early postnatal (P7 - P15) or late supplementation of rats with 25mg/kg daily directly before testing them in a standardized behavioral paradigms. The open field, T-maze and passive avoidance tests were carried out to assess emotional state, fear level, defensive reactions and memory/learning ability of animals.

Results: The analysis of data showed that supplementation with flavonoids from Saperavi grapes during early postnatal period positively modulates hippocampal-related plastic processes in the 8-10 week old rats (a shift of the curve of learning dynamic to the left). No significant changes were observed when flavonoids from Saperavi grapes were orally administered in 8-10 week old rats. While the same doses of Saperavi flavonoids significantly improves age-related spatial memory decline in 28-32 week old rats. The effect of the flavonoid extract from Saperavi grapes compared to resveratrol (3,5,4'-trihydroxy-*trans*-stilbene – a type of natural phenol, 25mg/kg daily dose) was more pronounced. We suggest that the potency of flavonoids from “Saperavi” is related to the ontogeny of neuronal circuits underlying spatial memory and the status of neuronal mechanisms of plastic processes in rat brain.