# sciforum-103092: Involvement of bread melanoidins in cellular pathways against ischemia

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Ischemic hypoxia, a common condition that can cause neuronal damage, triggers multiple cellular pathways, including hypoxia-inducible factors and anti-apoptotic mechanisms. Using food industry by-products with antioxidant and anti-inflammatory properties, such as melanoidins, as functional ingredients allows their revalorization and may enhance neuronal survival. The scientific impact of this study also considered the bioaccessibility of these compounds to exert a beneficial effect. Therefore, this study evaluates the potential effect of bioaccessible bread melanoidins on ischemic hypoxia. Bread melanoidins were obtained from bread crust through enzymatic extraction and dead-ultrafiltration, then subjected to in vitro gastrointestinal digestion to obtain bioaccessible melanoidins. Differentiated SH-SY5Y cells were incubated with these bioaccessible melanoidins and subsequently subjected to hypoxia induced by CoCl2. Cell viability was analyzed by flow cytometry, and the gene expressions (qPCR) of hypoxia-related proteins (HIF-1α and tp53), apoptosis regulation (Bax/Bcl2), oxidative stress response (p62/keap1), and antioxidant defense (SOD1, Catalase) were evaluated. The results showed a modulatory effect of bioaccessible melanoidins on pathways involved in the cellular adaptive response to ischemic hypoxia. Treatment with melanoidins decreased HIF-1α and tp53 gene expression compared to the ischemic control. Additionally, increased cell viability was observed in ischemic cells treated with melanoidins, accompanied by a decrease in pro-apoptotic Bax mRNA levels and an increase in anti-apoptotic Bcl2. Melanoidins also enhanced antioxidant protection against ischemia by upregulating the p62/Keap1 pathway and increasing levels of antioxidant enzymes SOD1 and catalase. In conclusion, melanoidins from food by-products could have beneficial effects against neuronal damage, contributing to their revalorization. Furthermore, using bioaccessible fractions ensures a comprehensive understanding of how bread melanoidins exert their biological effects. However, since the structure of melanoidins is unknown, attributing the effect to a specific bioactive compound is challenging, and in vivo studies are needed.

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