

Antistress effect of Hydroxytyrosol, a component of olive oil, on gut microbiota, neurogenesis and behavior of aged mice

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Background:

The microbiota-gut-brain axis regulates many processes through bidirectional communication, including adult neurogenesis, i.e. the production of new neurons from stem cells. Neurogenesis is involved in memory and anxiety/stress response and declines with aging ¹. We have shown that hydroxytyrosol (HTyr), an olive oil phenolic compound synthesized in our laboratories ², stimulates dentate gyrus neurogenesis in aged mice ^{3,4}.

Methods and Results:

We asked whether the increase of neurogenesis induced by HTyr resulted into increased cognitive performances in aged mice by testing the associative memory and the response to anxiety/stress, and whether this was related to gut microbiota composition. We found that HTyr treatment did not improve associative memory (in contextual fear conditioning test) but reduced the stress anxiety response (measured by Plus Maze test). In parallel, we studied the gut microbial composition following HTyr administration by metabarcoding analysis. Notably, HTyr was able to counteract the stress-induced loss of biodiversity and could therefore play a role in the resilience of mice.

Conclusions and Significance:

These findings point to HTyr as a gut-brain axis regulator that increases resilience to stress via enhanced neurogenesis of the dentate gyrus and the regulation of gut microbiota biodiversity during aging.

Keywords:

Gut microbiota, neurogenesis, behavioral test, stress resilience, aging

References:

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Thematic Area:

- **Frontiers in microbiome research**
 - Microbiome: from Research to Clinics

Infrastructures:

Aging mice were stabulated in European Mouse Mutant Archive (Emma) mouse facility in the Buzzati Traverso Campus