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Neurochem Res. 2011 Feb;36(2):250-7. doi: 10.1007/s11064-010-0312-2. Epub 2010 Nov 13.

## Effects of Melissa Officinalis L. (Lemon Balm) Extract on Neurogenesis Associated With Serum Corticosterone and GABA in the Mouse Dentate Gyrus

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PMID: 21076869 DOI: [10.1007/s11064-010-0312-2](https://doi.org/10.1007/s11064-010-0312-2)

### Abstract

Lemon balm, leaves of *Melissa officinalis* L., has been used for anti-anxiety and spasmolytics. We observed the extract of *Melissa officinalis* L. (MOE) on cell proliferation and neuroblast differentiation in the hippocampal dentate gyrus (DG) of middle-aged mice (12 months of age) using Ki67 and doublecortin (DCX), respectively. We also observed changes in corticosterone, GAD67 and GABA-transaminase (GABA-T) to check their possible mechanisms related to neurogenesis. We administered 50 or 200 mg/kg MOE to the animals once a day for 3 weeks. For labeling of newly generated cells, we also administered 5-bromodeoxyuridine (BrdU) twice a day for 3 days from the day of the first MOE treatment. Administration of 50 or 200 mg/kg MOE dose-dependently increased Ki67 positive nuclei to 244.1 and 763.9% of the vehicle-treated group, respectively. In addition, 50 or 200 mg/kg MOE significantly increased DCX positive neuroblasts with well-developed (tertiary) dendrites. Furthermore, MOE administration significantly increased BrdU/calbindin D-28 k double labeled cells (integrated neurons into granule cells in the DG) to 245.2% of the vehicle-treated group. On the other hand, administration of MOE reduced corticosterone levels in serum and decreased GABA-T levels in the DG homogenates. These results suggest that MOE increases cell proliferation, neuroblast differentiation and integration into granule cells by decreasing serum corticosterone levels as well as by increasing GABA levels in the mouse DG.

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