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Soft-diet Feeding Inhibits Adult Neurogenesis in Hippocampus of Mice

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Abstract: Our previous study showed that mice fed on a soft diet after weaning had reduced levels of brain-derived neurotrophic factor (BDNF) protein in the hippocampus after 3 months of age compared with mice fed on a hard diet. BDNF is one of the most effective promoters of neurogenesis in the hippocampus, and enhancement of BDNF production has been shown to enhance neural precursor cell proliferation in the dentate gyrus. We hypothesized that soft-diet feeding during development would reduce the proliferation rate of precursor cells, resulting in lower production of new neurons in the hippocampus. Male C57BL/6 mice pups were fed either a solid (hard-diet group) or powdered (soft-diet group) diet starting at weaning. Three and six months after birth, mice of each group received intraperitoneal injections of bromodeoxyuridine (BrdU, 50 mg/kg body weight), twice a day for 3 consecutive days. After survival time of 1 day, 1 week, or 4 weeks, the mice were anesthetized and perfused transcardially. Newborn cells in the dentate gyrus were examined by immunohistochemistry using anti-BrdU antibody. In addition, phenotypically neuronal cells among the newborn cells were detected by immunofluorescent double labeling for BrdU and mature neuron-specific nuclear protein (NeuN) using anti-BrdU and anti-NeuN antibodies. Total number of BrdU-positive cells in the dentate gyrus was fewer in the 6-month-old mice than in the 3-month-old mice at any survival time investigated, and fewer in the soft-diet group than in the hard-diet group at 3 and 6 months of age. Neither soft-diet feeding nor aging affected ratio of phenotypically neuronal cells among newborn cells. These results indicate that insufficient mastication

activity during development as well as aging restrains hippocampal neurogenesis in adulthood.

Key words: Mastication, Neurogenesis, Neurotrophin

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