Reduced mastication results in the impairment of memory and learning function

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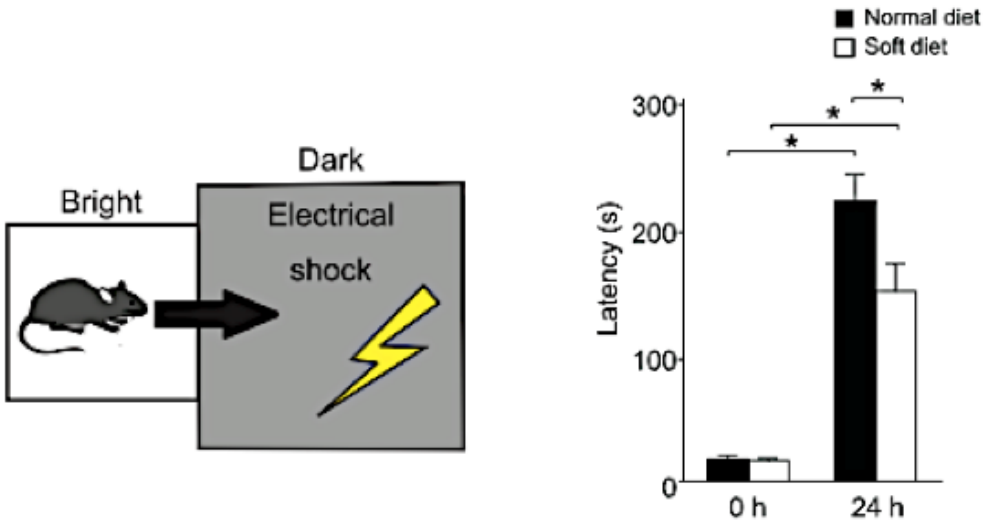


The evaluation of memory and learning function by Passive avoidance test.The passive avoidance apparatus consists of a light and a dark compartment with a hole, across which mice can pass. Mice ware placed in the light compartment, and the latency to entry into the dark compartment as a conditioning procedure. After 24 hour, the latency of the conditioned mice was measured. Long-term memory, depicted by the latency to enter the dark compartment after electric shock conditioning, was lower in the mice fed with soft diet(SD) than nomal diet(ND). Credit: Department of Cell Signaling,Department of Orthodontic Science TMDU)

Recently, frequency of mastication has dramatically decreased along with changes in dietary habits. Masticatory stimulation has particular

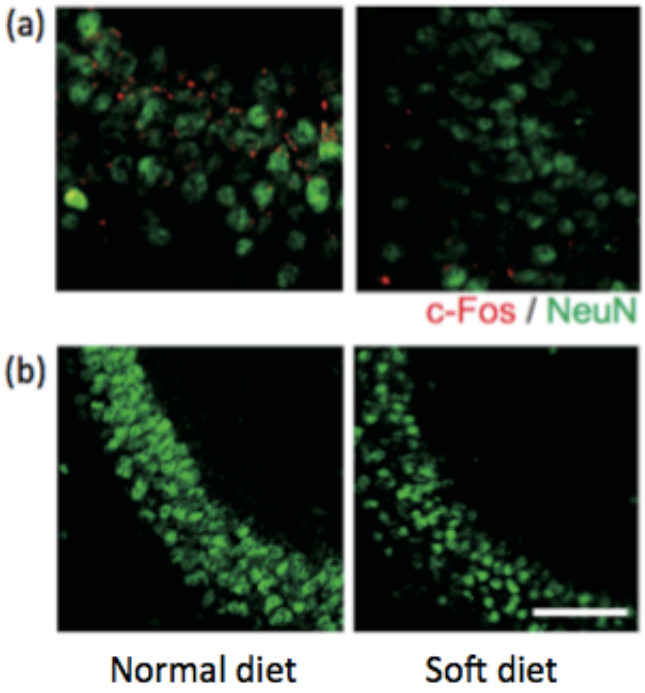
influence on the development of the central nervous system as well as the growth of maxillofacial tissue in children. Recently, deterioration of masticatory function due to aging and the consequent reduction of brain function have become major problems. Although the relationship between mastication and brain function is potentially important, the mechanism underlying is not fully understood.

In order to prevent disorders of brain functions including those related to memory and learning, it is imperative to define the linkage between masticatory function and brain function.

Researchers found that growth of the maxillofacial bone and muscle were suppressed in mice by reducing masticatory stimuli via feeding with powdered food. In addition, behavioral experiments revealed that reduced mastication impaired memory and learning functions (Image 1). In the hippocampus, a major component responsible for memory, neural activity, synapse formation and expression of brain-derived neurotrophic factor (BDNF) were reduced in these mice (Image 2).

Thus, the authors demonstrated that the changes in masticatory stimuli can modulate neurogenesis and neuronal activity in the hippocampus, functionally contributing to cognitive function.

This research suggests that maintaining or strengthening of masticatory function would be effective in preventing dementia and memory/learning dysfunction. It is also suggested that further elucidation of the mechanism linking mastication and brain function can lead to novel treatments and preventive measures for memory/learning dysfunction in the future.



(a) This is meuron activity (C-Fos-positive neurons) in the hippocampus. The number of c-Fos-positive neurons was significantly lower in the hippocampus in mice fed with SD than ND.(b)The number of the neuronal cells(NeuN-positive cells) in the hippocampus. NeuN-positive neuronal progenitor cells in the hippocampus was lower in mice fed with SD than ND. Credit: Department of Cell Signaling,Department of Orthodontic Science(TMDU)

More information: Y. Fukushima-Nakayama et al, Reduced Mastication Impairs Memory Function, *Journal of Dental Research* (2017). DOI: 10.1177/0022034517708771

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