

## Treadmill Exercise Ameliorates Purkinje Cell Loss Through Inhibition on Astrocyte Activation In Amyloid Beta23–35-Induced Rat Model of Alzheimer's Disease

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**Background:** Alzheimer's disease (AD) is the most common age-related neurodegenerative disease. AD is a progressive characterized by neuronal loss, extracellular senile plaques, and intracellular neurofibrillary tangles and accumulation of amyloid beta plaques ( $A\beta$ ) accumulation in various regions of the brain including cerebellum. Physical exercise is known to promote cell survival and functional recovery after brain injury. However, the functional alterations by exercise following an indirect cerebellum injury induced by AD are largely unknown. In the present study, we investigated the effects of treadmill exercise on the survival of Purkinje neurons and activation of reactive astrocytes in the cerebellar vermis of the  $A\beta_{25-35}$ -induced AD rats.

**Methods:** The animals were randomly divided into four groups ( $n = 10$  in each group): the control-operation group, the control-operation group and treadmill exercise group, the  $A\beta_{25-35}$ -induction group, the  $A\beta_{25-35}$ -induction and treadmill exercise group. The rats in the exercise groups were forced to run on a motorized treadmill for 30 min once a day for 4 weeks, starting postnatal day 22.

**Results:** In the present results, ICV injection of  $A\beta_{25-35}$  decreased motor coordination and the number of calbindin-positive cells, while GFAP expression in the cerebellar vermis were increased in the  $A\beta_{25-35}$ -injection group compared to the control group. Treadmill exercise increased the number of Purkinje neurons via down-regulation of reactive astrocytes after induction of ICV injection of  $A\beta_{25-35}$ .

**Conclusion:** Therefore, the present study provides the possibility that treadmill exercise may be an important mediator to enhance survival of Purkinje neurons in AD.

**Keywords:** Alzheimer's disease, Treadmill exercise, Cerebellum, Purkinje neurons, Reactive astrocytes