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Ageing changes in cerebellar acetylcholine-mediated blood pressure response

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Statement of the Problem: The cerebellum is innervated by abundant cholinergic fibers and found with several subtypes of cholinergic receptors (AChRs), through which the cholinergic action plays a subtle role in blood pressure (BP) regulation. The cerebellum undergoes significant morphologic and functional alterations with age, and this study was designed to determine how aging affects cerebellar acetylcholine (ACh)-mediated BP regulation.

Methodology & Theoretical Orientation: The carotid arterial pressure was measured in young (2 mo) and old (16–20 mo) rats after ACh (10, 30 or 100 mM) was microinjected (0.3 μl/5s) into the vermian lobule VI under anesthetization. In some young animals, nonselective nAChR or mAChR agonist, ACh mixed with the nonselective nAChR or mAChR antagonist, the selective M2R agonist, mAChR agonist mixed with the selective M2R antagonist, was used to examine the specific receptor phenotype that participates in the ACh-mediated BP modulation. Finally, the cortical M2R proteins in young and old rats were extracted for western blot analysis. The mean arterial pressure (MAP) and the reaction time (RT) in BP responses, and the relative chemiluminescent intensity in western blot results were analyzed.

Findings: Cerebellar ACh induces a marked depressor effect on systemic BP regulation, and the depressor responses in the old animals are significantly attenuated compared with the young ones. The mAChRs, further the M2R subtypes, rather than the nAChRs, in the cortex are involved in such response. Moreover, the M2R protein expression deceases greatly in the old vs the young rats.

Conclusion & Significance: Cerebellar cholinergic tone exerts depressor effect on BP regulation, and such effect undergoes retrogression with aging, which may be contributed by the decreased M2R expression during aging.

Biography

Changzheng Zhang has his expertise in brain aging research, especially in the cerebellum. He has made some investigations on the morphologic and functional alterations in aging cerebellum, such as cell number, neuronal structures, neurotransmitter content, neuronal activities and the behavioral correlates. In recent years, he and his team focus on cholinergic role in cerebellum and other brain regions, and explore the age-related alterations based on the molecular, cellular, neural circuit and behavioral relationships.

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