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Omega-3 polyunsaturated fatty acids enhance cerebral angiogenesis and provide long-term protection after stroke

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Stroke is a devastating neurological disorder and one of the leading causes of death and serious disability. After cerebral ischemia, revascularization in the ischemic boundary zone provides nutritive blood flow as well as various growth factors to promote the survival and activity of neurons and neural progenitor cells. Enhancement of angiogenesis and the resulting improvement of cerebral microcirculation are key restorative mechanisms and represent an important therapeutic strategy for ischemic stroke. In the present study, the hypothesis that post-stroke angiogenesis would be enhanced by omega-3 polyunsaturated fatty acids (n-3 PUFAs), a major component of dietary fish oil was tested. To this end, found that transgenic fat-1 mice that overproduce n-3 PUFAs exhibited long-term behavioral and histological protection against transient focal cerebral ischemia (tFCI). Importantly, fat-1 transgenic mice also exhibited robust improvements in revascularization and angiogenesis compared to wild type littermates, suggesting a potential role for n-3 fatty acids in post-stroke cerebrovascular remodeling. Mechanistically, n-3 PUFAs induced upregulation of angiopoietin 2 (Ang 2) in astrocytes after tFCI and stimulated extracellular Ang 2 release from cultured astrocytes after oxygen and glucose deprivation. Ang 2 facilitated endothelial proliferation and barrier formation in vitro by potentiating the effects of VEGF on phospholipase C γ 1 and Src signaling. Consistent with these findings, blockade of Src activity in post-stroke fat-1 mice impaired n-3 PUFA-induced angiogenesis and exacerbated long-term neurological outcomes. Taken together, findings strongly suggest that n-3 PUFA supplementation is a potential angiogenic treatment capable of augmenting brain repair and improving long-term functional recovery after cerebral ischemia.

Biography

Ling Chen has completed his M D and Ph D at the age of 28 years from Xiang-Yale Hospital of Hunan Medical University and postdoctoral studies from Xuanwu Hospital of Capital Medical University. He studied as a visiting scholar in INI-Hannover Germany and learnt from professor Madjid Samii who has been the president and now honorary president of the WFNS The World Federation of Neurosurgical Societies. He has published more than 70 papers in reputed journals and serving as an editorial board member of the Journal of Current Signal Transduction Therapy.

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