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Role of transient receptor potential canonical 3 channel (TRPC3) and polyphenols on manganese-induced toxicity of hippocampal astrocytes

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Introduction & Aim: Polyphenols, Epigallocatechin (EGC), Epigallocatechin-3-Gallate (EGCG) and Myricetin (MRC) are involved in natural preventative care. However, in metal neurotoxicity, these mechanisms are not clearly identified. Manganese (Mn) is a trace element but is toxic at higher concentrations from occupational and/or environmental exposures. Astrocytes play a vital role in neuronal signaling. When exposed to toxins, astrocytes undergo astrogliosis, characterized by increased production of glial fibrillary acidic protein (GFAP). Transient Receptor Potential Canonical 3 channel (TRPC3) is known to influence Ca flux of cortical astrocytes, necessary for signaling. However, Mn has been shown to block Ca flux by TRPC3. In this study, we have revealed the presence of TRPC3 on hippocampal astrocytes and the effect of polyphenols on TRPC3 regulation, GFAP production and viability of Mn-induced astrocyte toxicity.

Methods: Astrocytes (E18) were isolated from hippocampal tissue and cultured for 12 days. Cells were plated with 1, 3 and 10 uM of EGC, EGCG and MRC, incubated for 24 hours. Mn (100 uM) was added to wells and incubated for 48 hours. WST-8 detected cell viability and immunofluorescence identified GFAP and TRPC3.

Results: Immunofluorescence indicated the presence of TRPC3 channel on hippocampal astrocytes. WST-8 showed consistent decreased viability when Mn was added to cells. Increased GFAP confirmed that Mn caused damage to astrocytes. EGC (3 uM), EGCG (1 uM), MRC (1 uM) appeared to decrease GFAP and TRPC3.

Conclusion: TRPC3 is present on hippocampal astrocytes. Certain concentrations of polyphenols may be astroprotective against Mn-induced damage.

Discussion: For the first time, TRPC3 channel was demonstrated on hippocampal astrocytes. The regulation of TRPC3 in Mn toxicity is not clear, though literature suggests that the channel is up-regulated because astrocytic Ca signals are needed to initiate astrogliosis. EGC (10 uM) and MRC (3 uM) may prevent damage produced by Mn.

Biography

Annie Phung is currently a Master's degree candidate at the Philadelphia College of Osteopathic Medicine - Georgia Campus, USA. She has completed her undergraduate degree in Biological Sciences at the University of California, Irvine in 2015 where her knowledge about neuroscience research started in the lab of Dr. Burton-Jones.

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