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Omega-3 polyunsaturated fatty acid attenuates uremia-induced brain damage in mice.

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Objectives: Researchers have increasingly demonstrated the relationship between renal impairment and cognitive impairment. Omega-3 polyunsaturated fatty acid (ω3-PUFA) plays an important role in preserving nerve function. However, neuroprotective effects of ω3-PUFA against uremic condition remain unclear. We are to identify brain damage caused by uremic toxicity and determine the protective effects of ω-3 PUFA against uremic toxin.

Methods: We induced uremic condition with renal ischemia reperfusion (IR) injury. 10 weeks male C57BL/6 mice and Fat-1 mice were used for IR injury. 3 days after IR injury, blood, brain and kidney tissue were collected for analysis.

Results: The results showed that Ki67 and neuronal nuclei (NeuN) decreased in the brain of uremic mice as compared to wt mice brain, but increased in the ω-3 PUFA–treated uremic mice and the brain of uremic Fat -1 mice as compared to the brain of uremic mice. The pro-apoptotic protein expressions were increased, whereas anti-apoptotic protein expression decreased in the brain of uremic mice as compared to wt mice brain. However, apoptotic protein expression decreased in the ω-3 PUFA–treated uremic mice and the brain of uremic Fat -1 mice as compared to the brain of uremic mice. Furthermore, the ω-3 PUFA–treated uremic mice and brain of uremic Fat-1 mice protein expression of p-PI3K, p-PDK1, and p-Akt were increased as compared to the brain of uremic mice.

Conclusions: In conclusion, we confirm that uremic toxin damages the brain and causes cell death. ω-3 PUFA may play a role in reducing neuronal injuries through PI(3)K-Akt signaling.