Abstract


Improved outcome after peripheral nerve injury in mice with increased levels of endogenous ω-3 polyunsaturated fatty acids.


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BACKGROUND: Functional recovery after a peripheral nerve injury (PNI) is often poor. There is a need for therapies that protect neurons against injury and enhance regeneration. ω-3 polyunsaturated fatty acids (PUFAs) have been shown to have therapeutic potential in a variety of neurological disorders, including acute traumatic injury.

OBJECTIVE: The objective of this study was to assess the neuroprotective and pro-regenerative potential of ω-3 PUFAs in PNI.

METHODS: We investigated this in mice that express the fat-1 gene encoding for ω-3 fatty acid desaturase, which leads to an increase in endogenous ω-3 PUFAs and a concomitant decrease in ω-6 PUFAs. Dorsal root ganglion (DRG) neurons from wild-type or fat-1 mice were subjected to a mechanical strain or hypoxic injury, and cell death was assessed using ethidium homodimer-1 labeling. The fat-1 background appears to confer robust neuroprotection against both injuries. We then examined the early functional and morphological changes in wild-type and fat-1 mice after a sciatic nerve crush.

RESULTS: An accelerated functional recovery 7 d after injury was seen in fat-1 mice when assessed using von Frey filaments and the sciatic nerve functional index. These observations were also mapped to changes in injury-related markers. The injury-induced expression of ATF-3 was decreased in the DRG of fat-1 mice, whereas the axons detected 6 mm distal to the crush were increased. Fat-1 animals also had some protection against muscle atrophy after injury.

CONCLUSION: In conclusion, both in vitro and in vivo experiments support the idea that a higher endogenous ω-3 PUFA could lead to beneficial effects after a PNI.

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