

Abstract

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Chronic omega-3 supplementation in seizure-prone versus seizure-resistant rat strains: a cautionary tale.

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BACKGROUND: Several studies have shown fatty acid supplementation to be efficacious in the treatment of attention deficit hyperactivity disorder/autism spectrum disorder (ADHD/ASD) and epilepsy. Interestingly, rats bred to be seizure-prone (Fast), unlike those bred for seizure-resistance (Slow), naturally exhibit behaviors and physiology reminiscent of ADHD/ASD in humans, suggesting a fundamental link between seizure disposition and these developmental disorders.

OBJECTIVE AND METHODS: To determine whether chronic omega-3 supplementation might ameliorate ADHD-like behaviors in the seizure-prone rat strain and/or alter natural predispositions for or against seizure in either strain, Fast and Slow weanlings were maintained on a control or omega-3-supplemented diet. As adults, rats were tested in paradigms known to elicit ADHD-like behaviors from Fast rats and then kindled from the amygdala to assess relative seizure disposition.

RESULTS: While omega-3 supplementation did not significantly alter the relative hyperactivity, learning deficits or heightened seizure sensitivity naturally exhibited by Fast rats, it dramatically reduced their impulsivity to Slow-like levels. In contrast, typical behavioral patterns in Slow rats were largely unaffected by omega-3 supplementation yet their proclivity for seizure was greatly increased. This heightened vulnerability to seizure in Slow rats was paralleled by a drop in circulating plasma non-esterified fatty acids (NEFA) to match levels normally observed in Fast rats.

CONCLUSIONS: These findings suggest a delicate balance between seizure predisposition and ADHD-like behaviors that can be influenced by omega-3 treatment. Further, a relationship between circulating NEFA levels and seizure susceptibility has surfaced that advocates caution when treating different genetic backgrounds with omega-3 fatty acids.

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