

The Protective Effect of Omega-3 in Mitochondria Submitted to Neurodegenerative Processes

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Introduction: The ingestion of vegetables grown even at low concentrations of herbicides has been related to neurodegeneration, such as promoted by Paraquat in Parkinson's disease. Diet supplementation with omega-3 polyunsaturated fatty acids may improve or prevent neurotrophic processes in the brain. **Objectives:** Investigate the effects of Paraquat and omega-3, alone or in combination, in the thoracic muscle metabolism of *Drosophila melanogaster*, an organ directly affected in neurodegeneration diseases. **Material and Methods:** *Drosophila melanogaster* (Mito/Cy; Mef2) insects (N=400) were separated into one of four feeding groups: standard diet (control), diet supplemented with 1 mg/mL eicosapentaenoic (EPA)/docosahexaenoic (DHA) acids (1:1), 2 µg/mL Paraquat, or EPA/DHA and Paraquat. After 3 days, the insects were anesthetized by CO₂ and thorax was removed to measure oxygen consumption (high resolution respirometry, Oxygraph Oroboros) and the citrate synthase activity (spectrophotometrically at 412 nm, by the oxidation of 5,5' dithiobis-2-nitrobenzoic acid (DNTB)). **Results and Discussion:** *Drosophila* group feeding Paraquat presented reduced thorax mass, indicating muscular atrophy. This tissue presented lower mitochondrial respiratory capacity, as shown by reduced oxygen consumption in States of Phosphorylation, Leak and Uncoupled as well as low citrate synthase activity, indicating lower mitochondrial content. When respiratory rates were analyzed per mitochondria, the thorax mitochondria from *Drosophila* feeding Paraquat presented strong respiratory capacity, indicating a mechanism to compensate the reduced mitochondrial number. Instead, *Drosophila* group feeding EPA/DHA alone, or Paraquat and EPA/DHA presented no changes in thoracic and mitochondrial parameters, indicating that EPA/DHA protects the muscles of the wing from *Drosophila melanogaster* from loss of muscle mass and mitochondrial content promoted by Paraquat. **Conclusions:** Paraquat ingestion decreases muscular mass and metabolism whose are prevented by dietary EPA/DHA, suggesting a potential therapeutic way against the neurodegenerative mechanisms triggered by Paraquat.

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Keywords: mitochondria, neurodegeneration, herbicide, omega-3.