

**Title: Antioxidant and oxidative stress responses in zebrafish brain after exposure to low doses of ionizing radiation**

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**Text:**

**Introduction:** The use of zebrafish – *Danio rerio* – has grown considerably, demonstrating the increasing interest to use this model in biomedical research. This is essentially due to the level of homology shared with the human genome, complemented by an easy and reasonably affordable practical side. Hence, this work investigated radiobiological effects of exposure to low doses of ionizing radiation in zebrafish.

**Methods:** A population of 120 adult zebrafishes has been used, with the animals divided in 4 groups of 30 each, with an equal number – 15 – of males and females in each group. “Control Group” was not submitted to irradiation, while remaining 3 groups were externally irradiated, respectively with 100, 500 and 1.000 mGy. Data was obtained from each group, with 5 males and 5 females sacrificed at 1, 4 and 7 days after the irradiation.

Catalase (CAT) is an antioxidant enzyme that catalyzes decomposition of H<sub>2</sub>O<sub>2</sub> to water and oxygen. An increase in CAT activity reflects an increase in reactive oxygen species that may cause oxidative stress. Lipid peroxidation was assessed through the quantification of ThioBarbituric Acid Reactive Substances (TBARS). Both parameters were measured by spectrophotometric methods.

**Results:** CAT activity varied between 0.84 to 9.00  $\mu\text{mol min}^{-1} \text{mg}^{-1}$  protein and LPO level varied between 37.45 to 194.75  $\mu\text{mol TBARS mg}^{-1}$  protein. The three-way ANOVA

revealed significant effects of the interaction irradiation  $\times$  sex  $\times$  time for CAT activity and LPO level. Differential responses to dose by males and females were found for anti-oxidant defences and oxidative damage, as indicated by significant dose  $\times$  sex interactions. Significant dose  $\times$  time interactions were found for both biomarkers too.

**Conclusions:** Results obtained suggest that females and males present distinct responses to radiation since there are differences in CAT activity as well as in lipid peroxidation level and further that these responses are different over time.



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