EFFECTS OF THE RECOVERY PERIOD AFTER EXPOSURE TO INDUSTRIAL EFFLUENT AND GRAPHENE OXIDE/MAGNETITE NANOMATERIALS ON THE BLOOD OF FEMALE *Poecilia reticulata*

Walter de Souza Rodrigues[1]; Victoria Costa da Silva[1]; Débora dos Santos Pereira[1]; João Marcos de Lima Faria[1,2]; Ana Luiza Torres Soares[1]; Isabela Cristina Louza Goulart[1]; Ryan Marques Rezende[1]; Simone Maria Teixeira de Sabóia Morais[1]

Laboratory of Cellular Behavior, Institute of Biological Sciences, Federal University of Goias, Goiânia, Goiás[1], Brazilian Nanotechnology National Laboratory (LNNano), Brazilian Center for Research in Energy and Materials (CNPEM), Campinas, São Paulo[2]

INTRODUCTION: The use of nanomaterials for the remediation of polluted water sources demonstrates excellent potential applications in ecotoxicology. Among them, graphene oxide (GO), a carbon allotrope, possesses high surface area, chemical stability, and oxygenated functional groups, providing ideal interaction with water pollutants. Similarly, magnetite, an iron oxide nanoparticle (IONP), enables magnetic removal of contaminants. Hence, it is imperative to determine an appropriate safety threshold for their concurrent application in aquatic organisms. OBJECTIVES: This study aimed to evaluate the mutagenic effects of GO, IONP, and magnetic graphene oxide (GOmag) nanoparticles on the nuclei of blood cells in *Poecilia reticulata* fish, comparing them with the effects of a cosmetic industry effluent (EFL). Additionally, it aimed to understand how fish blood recovers after exposure in reconstituted water devoid of the tested substances. MATERIALS AND METHODS: The nanomaterials were synthesized and characterized at Brazilian Nanotechnology National Laboratory (LNNano) of the Brazilian Center for Research in Energy and Materials (CNPEM). The industrial effluent was obtained from a cosmetics factory in Aparecida de Goiânia, and female guppies were acquired from a local fish farm. For the test, 140 female fish were exposed to seven groups: control, GO (0.3 mg/L), IONP (0.3 mg/L), EFL (4.2 mg/L), GO+EFL, IONP+EFL, and GOmag+EFL (each at 0.3 mg/L + 4.2 mg/L) for seven days, followed by a seven-day post-exposure period. Fish were gathered after each period, and blood samples were taken from the caudal vein. Prepared blood smears were stained with Panótico for subsequent erythrocyte nuclear analysis under light microscopy to assess nuclear abnormalities. Data were analyzed using ANOVA. RESULTS AND CONCLUSION: Significant morphonuclear alterations were observed, particularly in the GO, IONP and GOmag groups, with a notable presence of lobed ($F=8.884$, $Df=69$, $p<0.0001$), segmented ($F=2.933$, $Df=69$, $p=0.0138$), and kidney-shaped ($F=2.586$, $Df=69$, $p=0.0265$) nuclei. However, these changes decreased significantly after exposure. We conclude that fish blood shows high cellular plasticity and graphene oxide and iron oxide nanomaterials have potential for environmental remediation.

Keywords: fish; graphene; effluent; blood