Genotoxicity and DNA repair induced by a glyphosate-based herbicide in fish upon exposure and post-exposure periods

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The widespread use of herbicides, including the glyphosate-based formulation Roundup®, represents a risk to non-target organisms. These biocides, applied to both agricultural and non-agricultural purposes, can easily reach the water systems, endangering aquatic organisms, namely fish. Among the effects described on fish, genotoxicity has been pointed out as one of the most hazardous. However, the genotoxic mechanisms of Roundup® are not entirely understood as well as the involvement of the DNA damage repair system. Hence, this work aimed to improve the knowledge on the progression of DNA damage upon short-term exposure (3 days) and post-exposure (1 - 14 days) periods in association with DNA repair processes in *Anguilla anguilla* exposed to Roundup® (58 and 116 μgL^{-1}). DNA damage in hepatic cells was evaluated by the comet assay improved with the DNA-lesion specific endonucleases FPG and EndoIII. In order to evaluate the oxidative DNA damage repair ability, an *in vitro* base excision repair (BER) assay was performed, testing hepatic subcellular extracts. Besides the confirmation of the genotoxic potential of this herbicide, oxidative damage was implicit as an important mechanism of genetic damage, which showed to be transient, since DNA integrity returned to the control levels on the first day after cessation of exposure. An increased capacity to repair oxidative DNA damage emerging in the post-exposure period revealed to be a crucial pathway for the *A. anguilla* recovery; nevertheless, DNA repair machinery showed to be susceptible to inhibitory actions during the exposure period, disclosing another facet of the risk associated to the tested agrochemical.