May the contamination history and gender influence the genotoxic responses of the crayfish *Procambarus clarkia* to the herbicide Viper®?

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Several species can inhabit aquatic environments impacted by high levels of multiple anthropogenic pollutants or/and natural toxins. Despite being well known that populations' success is related to the development of adjustment strategies, the way non-target organisms cope with the presence of pesticides is still poorly understood. These organisms' strategies are frequently related with the local contamination history as well as gender specification, which appear as factors determining physiological responses. These factors are not commonly studied, despite they are argued highly important when performing a population study. DNA integrity assumes a key role, since genetic damage may escalate into severe problems from intracellular to individual (and populational) levels. Genotoxicity can be modulated by mentioned factors, either independently or jointly. Bearing this in mind, and owing to the vital role of DNA integrity, the major aims of the present study were: (i) to understand the influence of contamination history and gender in the genotoxic responses of the crayfish *Procambarus clarkii* following exposure to a widely used penoxsulam-based herbicide - Viper® and (ii) to investigate the mechanisms involved in putative adjustments shown by *P. clarkii*. In this way, male and female specimens of two populations, one from a reference site and the other from an historically contaminated site, were exposed to environmentally relevant Viper® concentrations and standard (alkaline) comet assay was adopted to assess the genetic damage in gill cells. The results proved the genotoxicity of the penoxsulam-based herbicide to the non-target crayfish, and males from the historically exposed population displayed a higher susceptibly towards the non-specific genotoxic pressure posed by Viper®. In contrast, DNA oxidation patterns suggested an increased ability of males to deal with this particular type of damage. It is worth remarking that the influence of the exposure history on the protection/vulnerability to Viper® was only evident in males. Overall, the influence of contamination history and gender was demonstrated, highlighting the importance of considering differential physiological background in ecogenotoxicological analysis, hence favouring the elaboration of more plausible and holistic approaches integrating the environmental risk assessment of pesticides.