



## Zooplankton survival and reproduction responses to damaging UV radiation: A test of reciprocity and photoenzymatic repair

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**ABSTRACT:** As stratospheric ozone concentrations are reduced, exposure of organisms to damaging ultraviolet radiation (UVR) reaching the earth increases. Many organisms can repair DNA damaged by UVR through photoenzymatic repair (PER) using the enzyme photolyase, in the presence of photorepair radiation (UV-A and visible light [PRR]). Biological weighting functions have been used to model UVR damage in organisms in an attempt to predict the short-term effects of ozone depletion. One assumption of these studies is that reciprocity [satisfied when the effect of a dose is independent of the dose rate] must hold. Here we exposed organisms to damaging UV-B radiation in both the presence and absence of PRR. This study explicitly tests whether reciprocity holds in two zooplankters with differing PER abilities: *Daphnia pulicaria*, and *Asplanchna girodi*. We found significant PER and a failure of reciprocity when comparing *Daphnia* and *Asplanchna* survival at different dose rates. However, in a higher dose experiment with *Asplanchna*, we found no significant PER, and reciprocity held. These experiments show a link between PER and reciprocity. The ability of *Daphnia* and *Asplanchna* to produce viable offspring after UVR exposure did not vary with dose rate but did vary with PRR. Reciprocity held in all cases where PRR was provided, but in the absence of PRR all offspring died. This study shows that overall dose, dose rate, the ability to undergo PER, and the presence of PRR are important factors to consider when studying the effects of UVR on organisms.

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