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Ostracod valves provide efficient UV protection

Lynn Van den Broecke, Koen Martens, Valentina Pieri & Isa Schön

One of the major consequences of climate change is the increase of ultraviolet radiation, especially UVB (280–315 nm). Ultraviolet radiation reaching the Earth's surface has significantly increased since 1979 at all latitudes, except for the equatorial zone (Herman 2010). This has important consequences for organisms and ecosystems (Harley et al. 2006; Nelson et al. 2006). The effects of UVB on aquatic organisms are mainly dependent on the radiation dose reaching the organisms, which is influenced by the capacity of UV radiation to penetrate aquatic environments. The latter is mainly determined by water-column depth, dissolved organic carbon, and the quantity of organic and inorganic molecules (Häder 1998; 2007; Bancroft et al. 2007). In freshwater ecosystems with transparent water, UV can easily penetrate deeply (Nazari 2003).

In our study, we used three different experimental approaches to examine the response of non-marine ostracods and cladocerans to UVB radiation. Firstly, we estimated how much UVB could penetrate through crustacean valves. For this, single crustacean valves were arranged on a microscopic cover-glass until the UBB sensor was covered. Secondly, we determined the lethal dose by exposing individuals once to a high (lethal) UVB dose for several hours. Finally, the chemical composition of valves was determined for eight ostracod species and the cladoceran *Daphnia magna*.

For most investigated crustaceans, we found a strong correlation between the amount of UVB that is blocked by the valves and the lethal UVB doses. For examples, valves of the ostracods *Eucypris virens*, *Heterocypris incongruens* and *Tonnacypris lutaria* blocked 80 % of UVB radiation, thus providing effective UVB protection. These species also showed high lethal doses of 166 kJ/m^2, 110 kJ/m^2 and 214 kJ/m^2. *Cypridopsis vidua*, *Bradleystrandesia fuscata* and *Candona candida* valves block circa 70 % of UVB. In *Daphnia magna*, valves only stopped 35 % of UVB radiation, and also the lethal dose of 51 kJ/m^2 was much lower than our estimates for ostracods. We found only one exception to the observed correlation: the putative ancient asexual ostracod *Darwinula stevensoni* was only protected against about 60 % of UVB radiation by its valves, but the lethal doses of this species was with 130 kJ/m^2 as high as in the other investigated ostracods.

Since there were no significant differences in chemical composition between the investigated ostracod species, other factors must be responsible for the observed differences, which need to be identified in future research.

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Authors addresses:
Lynn Van den Broecke, Koen Martens, Valentina Pieri & Isa Schön
Royal Belgian Institute of Natural Sciences, Freshwater Biology, Vautierstraat 29, 1000 Brussels, Belgium
lynn.vandenbroecke@naturalsciences.be