Comparing the effect of ultraviolet radiation (UVR) on photosynthetic pigments and oxidative stress responses of Antarctic and tropical *Chlorella*

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Increasing levels of ultraviolet radiation (UVR), as a result of anthropogenic ozone depletion, have been reported in many parts of the world including the Antarctic and tropical regions. As microalgae form the basis of the food chain in many ecosystems, any adverse impacts of UVR on microalgae will also affect organisms at higher trophic levels. The cosmopolitan small coccoid chlorophyte genus, *Chlorella*, is one of the best-studied phototrophic eukaryotes. An Antarctic (*Chlorella* UMACC 237) and a tropical (*Chlorella* UMACC 001) strain of *Chlorella* were exposed to three light treatments: PAR+UVA+UVB, PAR+UVA, and PAR alone, under a 12h:12h light-dark cycle for 8 days. The Antarctic and tropical strains were grown at temperatures representative of their typical ambient conditions, 4 and 28 ºC respectively. Growth response, photosynthetic pigment content (chl-a, chl-b and carotenoids), reactive oxygen species (ROS), lipid peroxidation levels and superoxide dismutase (SOD) enzyme activity of the isolates were assessed. The tropical *Chlorella* grew best under UVB+UVA+PAR treatment, followed by UVA+PAR treatment and PAR alone. In contrast, the Antarctic *Chlorella* did not show any significant difference in terms of growth response under the different UVR treatments. Photosynthetic pigment contents per cell (chl-a and chl-b) were lower under UVB stress as compared to PAR alone for both *Chlorella* strains, while the reverse trend was apparent in carotenoid content per cell. Oxidative stress responses based on ROS, lipid peroxidation and SOD enzyme activity were slightly lower under UVB treatment compared to PAR alone in both strains. Overall, the Antarctic and tropical strains showed similar responses to UVR in terms of photosynthetic pigments and oxidative stress. Increased cellular content of carotenoids could be an important defence mechanism for these microalgae to counter UVB stress.