

Hormonal activities of four UV filters measured by bioluminescent yeast bioreporters

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Organic UV filters are used in personal care products and technical materials for protection from skin cancer or deterioration of materials caused by UV radiation. UV filters were detected in lakes, rivers, sludge, animals and even in human milk at trace-level concentrations. It was found UV filters have more different hormonal activities *in vitro* and can induce the vitellogenin synthesis in fish, so it is important to develop and apply sensitive biological assays appropriate for detecting the hormonal effect of the UV filters.

The aim of this work was to adapt yeast bioreporters to measure the hormonal activities of four selected UV filters. In addition the effective concentrations (EC₅₀/IC₅₀) were also determined and were compared to effective concentrations from other *in vitro* experiments using the hER α or hAR.

In order to detect hormonal activities and cytotoxicity of the UV filters bioluminescent yeast strains of *Saccharomyces cerevisiae* (BLYES, BLYAS and BLYR) were applied. The BLYES/BLYAS strains serve to measure estrogenic/androgenic effects whereas BLYR strain to detect the cytotoxicity. The antiestrogenic/antiandrogenic activities could be measured indirectly by adding to each well 17 β -estradiol (E2) or 5 α -dihydrotestosterone (DHT) in concentration corresponds with EC₆₅ so the decreasing of bioluminescence could be followed up. For determining the dose-response curves of the UV filters serial dilutions were made in 3 parallels.

According to the dose-response curves all UV filters can be characterized by antiandrogenic activity whereas none of the UV filters had androgenic potential in spite of *in vitro* results in the literature. Benzophenone-3 (BP-3) and 4-methylbenzylidene camphor showed submaximal dose-response curve in the estrogen assay, however ethylhexyl methoxycinnamate and octocrylene were not estrogenic. Anti-estrogen activity could be observed at three UV filters. Only BP-3 was cytotoxic to the yeasts in the applied concentration interval measured by BLYR strain.

These results confirm that these UV filters have more and different types of hormonal activities. It may be hypothesized BP-3 can pose significant environmental and human health risk due to its high antiandrogenic and cytotoxic activity.

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