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ECIS to assess the effects of drugs on RGC-5 cell behavior under light stimulation

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A light radiation causes dysfunction and death of retinal ganglion cells (RGC-5) and leads to retinal degeneration. In the present study, we investigated light-induced dysfunction, and addressed the cell viability using an unprecedented, simple and real-time *in vitro* analytical tool. Hence an unprecedented light setup was established using a bioimpedance system to generate artificial light that damage retinal RGC-5, and the corresponding impedance was recorded. Along with the effects of agmatine and resveratrol on light-induced damage and this underlying photo-oxidative and protective mechanisms were monitored by bio-impedance system. The real-time measurement was used to assess cell behavior on light induced response to therapeutic agents. After exposure to light from 4 to 24 hrs, 5-10% to 20-25% of the RGC-5 cells underwent death. During light exposure the RGC-5 cells elevate free radicals and Ca^{2+}, followed by other noxious factors such as the nitric oxide (NO) and tumor necrosis factor-αα (TNF-α) in the culture media, which can be facilitated to arrest cell cycle and cell demise. Drugs treated cells show some decrease in free radicals, Ca^{2+}, NO, and TNF-α compared to the untreated cells. The results revealed that agmatine and resveratrol can control the elevation of free radical, calcium gating, nitric oxide level, and increased TNF-α, which could diminish RGC-5 cell photo-damage. In summary, resveratrol helps more to rescue damaged cells compared to agmatine and this system provides an enough potential to study photo-protective drugs. Also the proposed system identifies the photo-toxic effects in RGC-5 and provides high throughput drug screening for photo-oxidative damage during early stages of drug discovery. This study is convenient and potential enough for the direct measurements of the photo-protective effect *in vitro* and would be of broad interest in the field of radiation-induced melanoma and eye cell-damaging studies.

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