

Background: Graphene-based nanoparticles have been widely used in industry and biomedical fields due to their unique physicochemical properties. Humans are continually exposed to nanoparticles mainly through skin while using everyday products.

Aim: Investigating the effects of graphene oxide nanoparticles complexed with titanium dioxide and copper or copper oxide (TiO₂/CuO/GO and TiO₂/Cu/TRGO) on A375 and HaCaT cell lines in the dark and exposed to visible light.

Methods: Human keratinocytes – HaCaT – and cancerous skin cells – A375 – were used in this study. Cells were cultured in DMEM media supplemented with 10% fetal bovine serum, 1% L-glutamine and 1% Penicillin-Streptomycin. At 80% confluence, nanoparticle treatments were applied for 24h in dark and under a 96-LED board that emits in three wavelengths (613.5nm, 515nm, 455nm). Finally, different assays were conducted to establish the toxic effect. MTT reduction assay was performed for determination of cell viability, extracellular lactate dehydrogenase release was performed for determination of membrane integrity and quantitative nitric oxide assay for determination of oxidative stress.

Results and Discussions

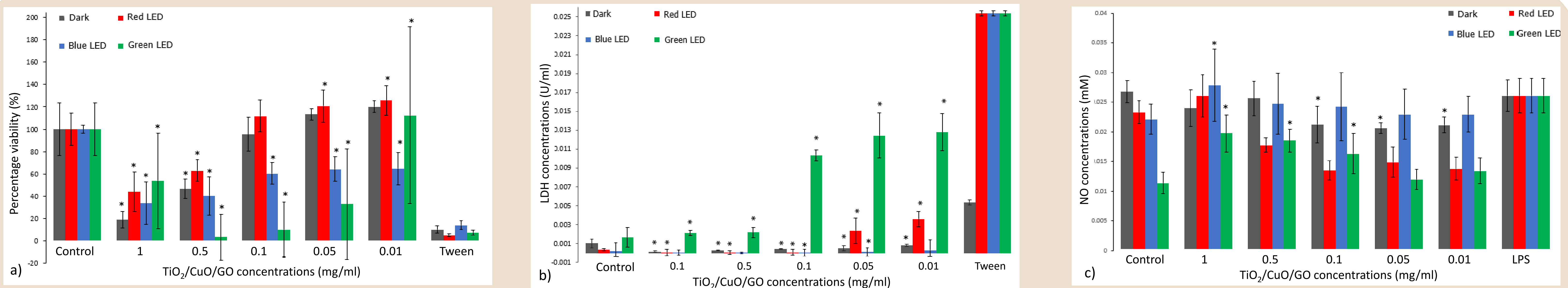


Figure 1. Results of MTT (a), LDH (b) and NO (c) assays after TiO₂/CuO/GO treatment on A375 cells

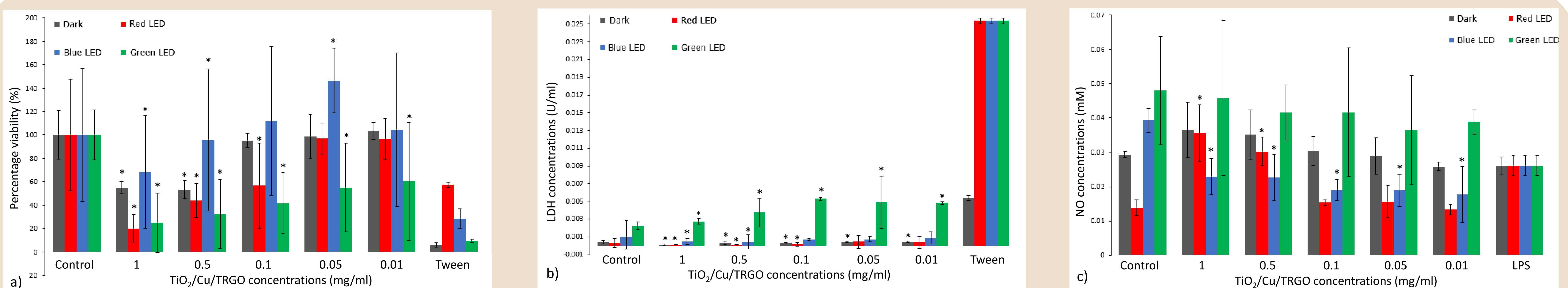


Figure 2. Results of MTT (a), LDH (b) and NO (c) assays after TiO₂/Cu/TRGO treatment on A375 cells

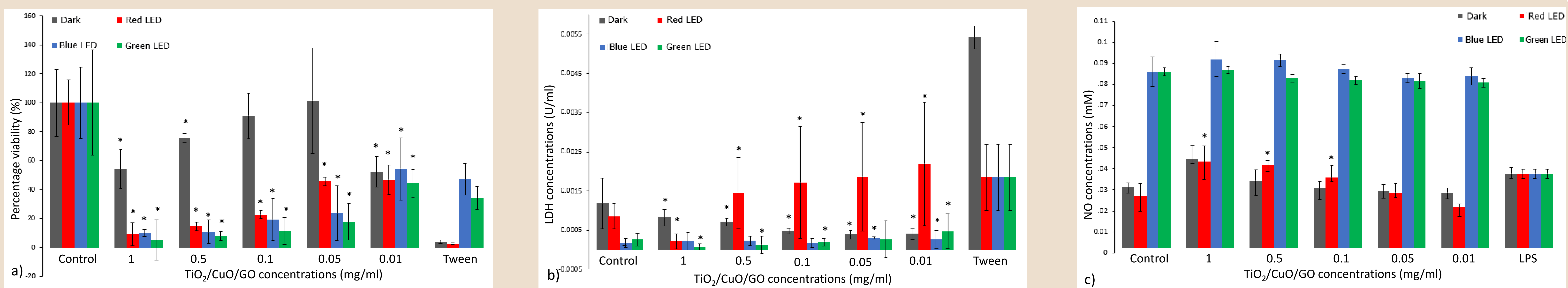


Figure 3. Results of MTT (a), LDH (b) and NO (c) assays after TiO₂/Cu/TRGO treatment on A375 cells

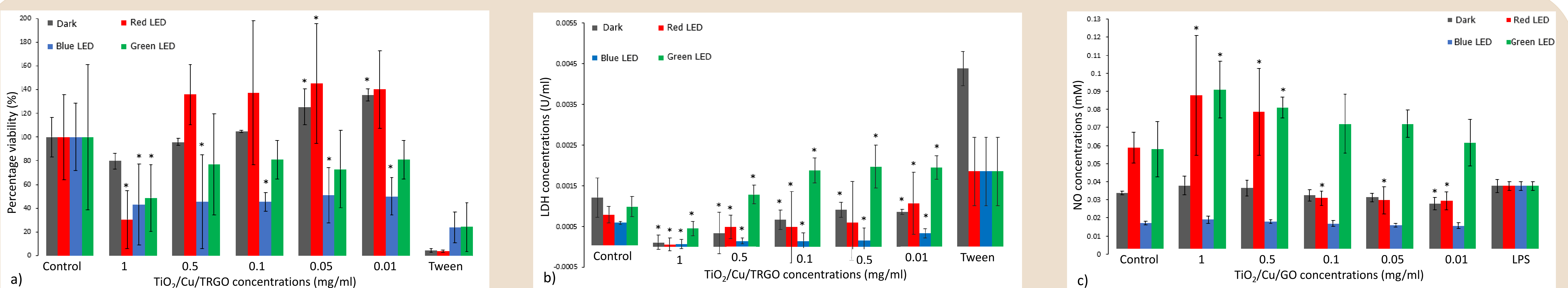


Figure 4. Results of MTT (a), LDH (b) and NO (c) assays after TiO₂/Cu/TRGO treatment on A375 cells

Conclusions: Nanoparticles under light irradiation reduced cell viability, induced nitric oxide generation and impaired cell membrane integrity of A375 and HaCaT in a dose-dependent manner. It is valuable to inform that HaCaT cells appeared to be slightly more susceptible to TiO₂/CuO/GO treatment than A375 cells. On the other hand TiO₂/Cu/TRGO nanocomposite has the potential for antitumor treatment by photooxidation, as green and blue lights intensify the toxicity.

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