Objective: We aimed to improve an ICG (Indocyanine Green) based nanoparticle, a light source and an application method that is centred to photodynamic therapy of MCF-7 cells.

Methods: MCF-7 cells were obtained from ATCC, expanded in DMEM, 10% FBS and subjected to tissue culture E-Plate that was used to generate dynamic real-time data by measuring electrical impedance across interdigitated micro-electrodes on the bottom of the plate. ICG (has a high absorption at 770-810 nm) embedded and functional folic acid groups covered magnetic mesoporous nanoparticles that can be directed by magnetic field was prepared at various (50, 25, 10, 5, 2.5 µg/ml) concentrations and applied to the E-plate. Light source (LEDs) was designed as a system that fit to 96 well-plate was irradiated 785 nm for 20 minute. To confirm the xCelligence system’s data, proliferation assay was performed according to the manufacture’s instructions (WST-1 reagent, ROCHE). Afterwards absorbance was measured at 450 nm using an ELISA reader. Phosphatidylserine accumulation was determined with the Apoptosis Detection Kit, Annexin-V-Alexa 568 (ROCHE).

Results: According to xCelligence system analysis, the effect of optimal dose of irradiated MNP-MS-ICG-PAMAM-Folic Acid molecule was more potent at reducing proliferation of MCF-7 cells than MNP-MS-ICG-PAMAM. Also these results were confirmed by WST-1 assay was used in dark and light conditions for MCF-7 cells. The irradiation light itself did not cause any cytotoxic effect in the absence of photosensitizers. Our results showed that in-vitro application of MNP-MS-ICG-PAMAM-Folic Acid –PDT cause apoptosis in the MCF-7 cell line. Apoptotic cells were observed after 24 hours treatment under the irradiation.

Conclusion: This study revealed that MNP-MS-ICG-PAMAM- Folic Acid –PDT is more cytotoxic and thereby lethal than the nanoparticle without Folic Acid integration. This indicates high efficiency for future in vivo studies aiming anti-cancer treatment strategies instead of using the latter.