Antiproliferative activity of PDE5 inhibitors vehicled by nanovesicles in thyroid cancer cells

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Alternative novel therapeutic approaches are currently tested for the less differentiated thyroid cancers which are non-responsive to the ordinary therapies. In this study we evaluated an innovative formulation of nanoliposomes containing sildenafil citrate or tadalafil, inhibitors of phosphodiesterase-5 (PDE5), on two human thyroid cancer cell lines (TPC-1 and BCPAP). Nanoliposomes were prepared by evaporation and extrusion methods, sildenafil citrate was solubilized in the aqueous phase and tadalafil was dissolved in the organic phase. Nanoliposomes were characterized by a mean diameter of ~100 nm, a low polydispersity index (~0.1) and made up of DPPC, cholesterol and DSPE-mPEG2000 (6:3:1 molar ratio). The drugs were efficiently retained in the colloidal structure and did not influence the physicochemical properties of the systems. Effects of encapsulated drugs, sildenafil (sil-nlip) and tadalafil (tad-nlip) were tested by cell count and MTT assay. We found a significant reduction of the viability in both cell lines following 24 h of treatment. In particular, in TPC-1 we observed a growth inhibition of 40% and 60% at concentration 10 μM for sil-nlip and 0.1 μM tad-nlip compared to control and free drug, while in BCPAP was found a viability reduction of 40% and 70% at concentration 10 μM for sil-nlip and tad-nlip respect to control and free drug. These results demonstrate that encapsulation into nanoliposomes improve the antiproliferative activity of PDE5 inhibitors, so that this drug formulation may represent a novel tool for the treatment of thyroid cancer.