Functionalization of liposomes with glycolipids for targeted drug delivery to breast cancer cells

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The functionalization of liposomes with glycolipids might ascribe them specificity toward cancer cells overexpressing GLUT family members correlated with invasive potential, survival and uncontrolled proliferation.
Different liposomal formulations composed of 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) and the glycosylated lipids (GL) at different molar concentrations were synthesized (DMPC/GL2 95:5, DMPC/GL4 95:5, DMPC GL3 95:5 and DMPC/GL3 7:3).
Flow cytometry analysis, demonstrated that after 4 h of treatment DMPC/GL2 95:5, DMPC/GL4 95:5 and DMPC GL3 95:5 liposomes were no more efficient than DMPC liposomes in the three analyzed cell lines. On the contrary, DMPC/GL3 7:3 formulation proved to be more efficiently uptaked by all the tested cell lines.
Analysis performed after 18 h of treatment showed an increase in the mean fluorescence channel in cells treated with DMPC/GL2 95:5 and DMPC/GL4 95:5 formulations when compared to cells treated with unglycosilated liposomes. No significant differences in the uptake of DMPC/GL3 95:5 formulation and unglycosilated liposomes were observed in MCF7 and SKBR3 cells, whereas a slight increase was observed in MDA cells. DMPC/GL3 7:3 formulation proved to be most efficiently uptaked by all the three breast cancer cell lines
The observations performed by LSCM after 18h of treatment confirmed data obtained by flow cytometry and showed different intracellular localizations of different liposome formulations.
DMPC, DMPC/GL2 95:5 and DMPC/GL4 95:5 liposomes appeared to be internalized in cytoplasmic vesicles, mainly localized in perinuclear regions, whereas DMPC/GL3 7:3 liposomes appeared strongly clustered in the proximity of the plasma membrane.
In conclusion, the results obtained in this study demonstrated that the functionalization of liposomes with glycolipids improve their ability of interaction with breast tumor cells.