

# Development of magnetic nanocarriers for enhanced anticancer potential of lactoferrin

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Nowadays, the conventional drug administration faces several limitations that can be overcome by the development of multifunctional nanocarriers, such as the magnetoliposomes. These nanocarriers are composed of an aqueous core of magnetic nanoparticles (aqueous magnetoliposomes) or a magnetic core covered by a lipid layer (solid magnetoliposomes) [1]. These systems were chosen as carriers for lactoferrin, a protein that has been associated with anticancer activity [2]. In this work, both lactoferrin-loaded aqueous and solid magnetoliposomes were developed and characterized. Their biological activity, as well as the cellular uptake, were assessed in non-tumorigenic and in breast cancer cell lines. It was demonstrated that these nanosystems are cytocompatible for the non-tumorigenic cell line and cellular internalization occurs in both cell lines. The results show that magnetoliposomes are promising nanocarriers for proteins like lactoferrin, allowing its selective targeting and opening the possibility of a synergistic effect between this protein and antitumor drugs, together with enhanced cancer cell death by magnetic hyperthermia.

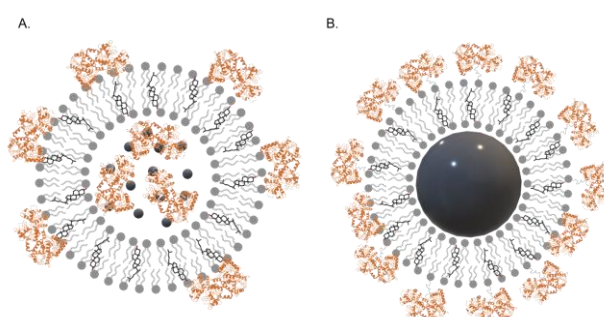
## References

[1] D. Pereira, B. Cardoso, A.R.O. Rodrigues, C. O. Amorim, V. S. Amaral, B. G. Almeida, M.J.R.P. Queiroz, O. Martinho, F. Baltazar, R. Calhelha, I.C.F.R. Ferreira, P.J.G. Coutinho

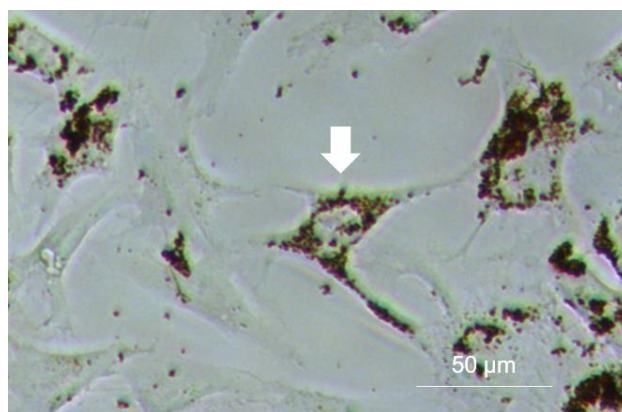
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[2] C. Pereira, J. Guedes, M. Gonçalves, L. Loureiro, L. Castro, H. Gerós, L. Rodrigues, and M. Côrte-Real, *Oncotarget*, 38 (2016) 1-15.

## Figures



**Figure 1:** Schematic representation of lactoferrin-loaded aqueous (A) and solid magnetoliposomes (B). Magnetoliposomes contain manganese ferrite nanoparticles entrapped or covered by a lipid bilayer of egg phosphatidylcholine and cholesterol (7:3).



**Figure 2:** Bright-field photomicrography of cellular uptake of unloaded AMLs using *in vitro* breast cancer cells (Hs 578T). The white arrow evidences the presence of manganese ferrite nanoparticles inside the cells cytoplasm.