# Lipid nanocapsules: a new platform for nanomedicine



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| Titre | Lipid nanocapsules: a new platform for nanomedicine |
| Type de publication | Article de revue |
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| Editeur | Elsevier |
| Type | Article scientifique dans une revue à comité de lecture |
| Année | 2009 |
| Langue | Anglais |
| Date | 11/09/2009 |
| Numéro | 2 |
| Pagination | 201-9 |
| Volume | 379 |
| Titre de la revue | International Journal of Pharmaceutics |
| ISSN | 1873-3476 |

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| Résumé en anglais | Nanomedicine, an emerging new field created by the fusion of nanotechnology and medicine, is one of the most promising pathways for the development of effective targeted therapies with oncology being the earlier and the most notable beneficiary to date. Indeed, drug-loaded nanoparticles provide an ideal solution to overcome the low selectivity of the anticancer drugs towards the cancer cells in regards to normal cells and the induced severe side-effects, thanks to their passive and/or active targeting to cancer tissues. Liposome-based systems encapsulating drugs are already used in some cancer therapies (e.g. Myocet, Daunoxome, Doxil). But liposomes have some important drawbacks: they have a low capacity to encapsulate lipophilic drugs (even though it exists), they are manufactured through processes involving organic solvents, and they are leaky, unstable in biological fluids and more generally in aqueous solutions for being commercialized as such. We have developed new nano-cargos, the lipid nanocapsules, with sizes below the endothelium fenestration (phi inférieur à 100 nm), that solve these disadvantages. They are prepared according to a solvent-free process and they are stable for at least one year in suspension ready for injection, which should reduce considerably the cost and convenience for treatment. Moreover, these new nano-cargos have the ability to encapsulate efficiently lipophilic drugs, offering a pharmaceutical solution for their intravenous administration. The lipid nanocapsules (LNCs) have been prepared according to an original method based on a phase-inversion temperature process recently developed and patented. Their structure is a hybrid between polymeric nanocapsules and liposomes because of their oily core which is surrounded by a tensioactive rigid membrane. They have a lipoprotein-like structure. Their size can be adjusted below 100 nm with a narrow distribution. Importantly, these properties confer great stability to the structure (physical stability >18 months). Blank or drug-loaded LNCs can be prepared, with or without PEG (polyethyleneglycol)ylation that is a key parameter that affects the vascular residence time of the nano-cargos. Other hydrophilic tails can also be grafted. Different anticancer drugs (paclitaxel, docetaxel, etoposide, hydroxytamoxifen, doxorubicin, etc.) have been encapsulated. They all are released according to a sustained pattern. Preclinical studies on cell cultures and animal models of tumors have been performed, showing promising results. |
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