

## **Exploration of Nanomedicine Formulation containing Biodegradable Polymers Using Microfluidic Platforms**

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Nano-sized particles attract the interest in drug delivery systems because its advantages in its variability in surface function, transfection properties and the capability of easily controlling its characterisations. The involvement of biodegradable polymers widens the possibility of nanomedicine formulations since it's been found in enhancing drug encapsulation and release kinetics. A number of different techniques of producing of polymer-involved nano-formulations have been reported such as nanoprecipitation and emulsification solvent evaporation. The introduction of microfluidics in the production of polymeric nanoparticles brings improved reproducibility and provides more control over various particle characterisations.

Here we are presenting three pieces of work involving the study of polymer-based drug loaded nanoparticles using microfluidic technologies. Paclitaxel and Docetaxel are the drugs used in these studies and the microfluidic system from Syrris was used. Two types of microfluidic chips were applied and parameters such as polymer concentration, fluid ratio between phases, total flow rate were investigated. Polymer used including PLGA, PLA and the PEGylated version of them. PLCL and PEG-PLCL were synthesized to study the effects of polymer structure and molecular weight. The formulations of core-shell type lipid-polymer hybrid nanoparticles were also presented towards the end. It was found that by using microfluidics the production of nanoparticles can be highly reproducible and controllable in terms of the size and polydispersity. However the drug loading performance was found to be not as high as some other polymeric formulations reported in literature using emulsification/solvent displacement method.