

INKJET PRINTING: A NOVEL TECHNOLOGY FOR GOLD NANOPARTICLE MICROENCAPSULATION

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Inkjet printing is a versatile high-throughput technology for ejecting microdroplets of different fluids. Such continuous microencapsulation methodologies are particularly relevant to industrial encapsulation due to their high rate of production (>16000 micro-droplets per second and per nozzle), excellent control of the micro-droplets formed, high encapsulation efficiency and ease of scale-up. We have adapted this technology for microencapsulation of multifunctional gold nanoparticles (AuNPs) encapsulated in a monodisperse polymeric chitosan hydrogel matrix. Chitosan is a biocompatible and biodegradable polymer of special interest for delivery of pharmaceuticals, making this production procedure particularly appropriate to the medical field. In addition, pre-functionalization of the AuNPs with a large number of biomolecules converts the inkjet encapsulation of AuNPs into a highly modular and innovative encapsulation methodology for a number of health applications. This new methodology has been utilised to produce highly reproducible and monodisperse microcapsules (ChMC@AuNP) and we are optimizing this system to encapsulate AuNPs functionalized with small interfering RNA (siRNA) against Granzyme A, a key serine protease related with colorectal cancer and ulcerous colitis.

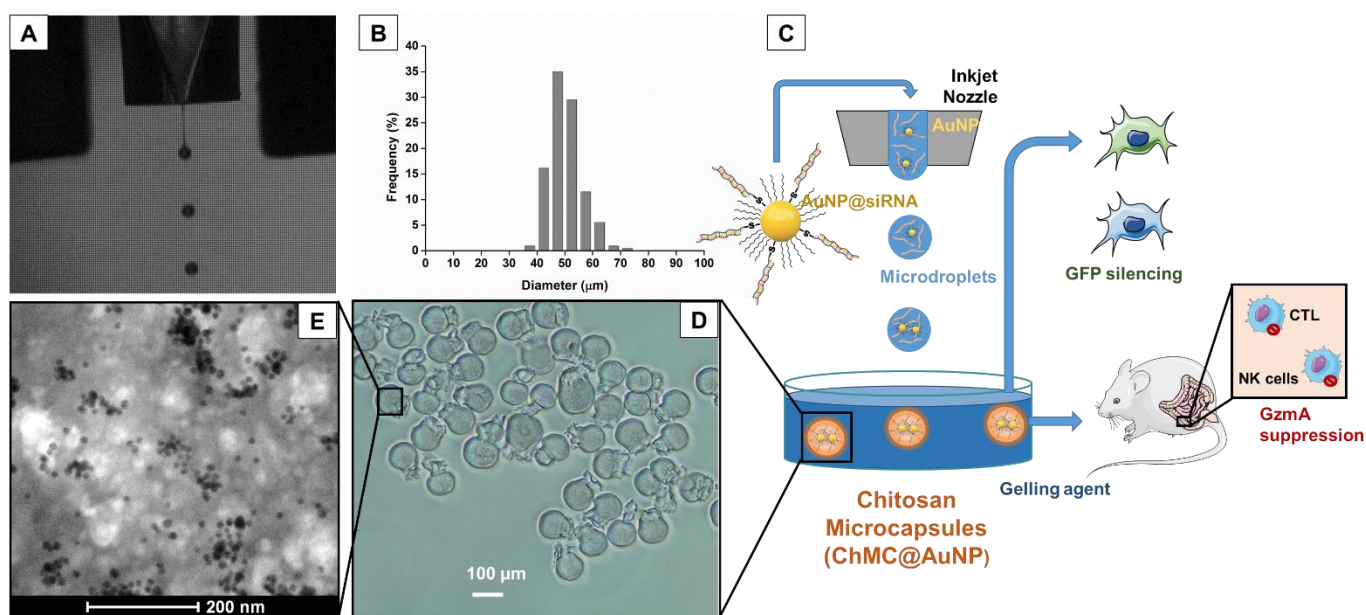


Figure 1. A) Inkjet printing of chitosan solution; B) Microcapsule size histogram; C) Illustrative scheme of AuNP functionalized with siRNA encapsulated by inkjet printing and the applications being explored; D) Optical microscopy image of microcapsules ChMC@AuNP; E) TEM image of AuNP inside the chitosan microcapsule.

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