



AB023. Ultrastable gold nanoparticles as a drug delivery system for ocular therapy

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Background: Ocular therapy administrated by ophthalmic drops is advantageous thanks to its simplicity. However, efficiency of active molecules is limited when administered by this method. Indeed, more than 99.9 % is discarded due to multiple factors including lacrimal drainage. Low retention time of drugs at the cornea leads to their poor penetration. Our hypothesis is that a drug delivery system based on gold nanoparticles should enhance the efficiency of the drugs. The main objective is to develop new methods to improve active molecules biodisponibility in ocular therapy thanks to a new drug delivery system implying gold nanoparticles. The specific objectives are: (I) to synthesize and characterize ultrastable gold nanoparticles, (II) to establish the drug encapsulation protocol, (III) to develop a separation method of free and encapsulated drugs to allow their quantification, (IV) to study the cytotoxicity of our gold nanoparticles.

Methods: Ultrastable gold nanoparticles were synthesized by a new method and their ultrastability toward several

harsh conditions was characterized. An encapsulation protocol was settled for several drugs. The separation of free and encapsulated drugs was performed with magnetic beads. The quantification of the encapsulated drugs was performed by HPLC. A MTS assay was performed on 3 corneal epithelial cell populations, exposed or unexposed to gold nanoparticles. Reconstructed corneas were prepared using the self-assembly method. A wound healing experience was performed on those corneas with or without nanoparticles.

Results: Gold nanoparticles were synthesized and purified according to our new experimental conditions. They support harsh conditions as several cycles of freeze-drying, heating, salt exposition and ultracentrifugation. For the first time in literature, gold nanoparticle support autoclave sterilisation. The separation method involving magnetic beads was optimized to get rid of non-specific interactions. The encapsulation efficiency varies according to the active molecule. The MTS assay did not show diminution of the cellular viability when in presence of gold nanoparticles. Furthermore, gold nanoparticle exposition did not slow the wound healing of reconstructed corneas.

Conclusions: Our new ultrastable gold nanoparticles can have a major impact in nanomedicine. They can support harsh conditions, as autoclave treatment, allowing their sterilisation for *in vivo* use. We showed that active molecules can be encapsulated in gold nanoparticles. In addition, they do not seem to cause any diminution of cellular viability. These data suggest the possible improvements in ocular therapy thanks to gold nanoparticles

Keywords: Gold nanoparticles; ultrastability; drug delivery; MTS assay; wound healing assay.

doi: 10.21037/aes.2019.AB023

Cite this abstract as: Masse F, Desjardins P, Ouellette M, Couture C, Omar MM, Pernet V, Guérin S, Boisselier E. Ultrastable gold nanoparticles as a drug delivery system for ocular therapy. *Ann Eye Sci* 2019;4:AB023.