*GLYCO*NPS AS NOVEL NON-VIRAL VECTORS: A DNA-INTERACTION STUDY

Andrea Ragusa,[a] *P. Eaton*,[a] *T. C. Rojas*,[b] *S. Penadés*[a]

[a] *Grupo de Carbohidratos, Laboratory of Glyconanotechnology, Instituto de Investigaciones Químicas, CSIC, C/Américo Vespucio 49, 41092 Sevilla, Spain*
[b] *Instituto de Ciencias de Materiales, CSIC, C/Américo Vespucio 49, 41092 Sevilla, Spain.*
ragusa@iiq.csic.es

One of the current "hot topics" in biotechnology is *gene therapy* [1]. Safe targeted delivery of any kind of *information* (e.g. DNA, RNA, PNA, etc.) to a desired cell nucleus could influence enormously the way several diseases are treated. However, the development of new vectors which could carry genes efficiently to the nucleus is still a challenging task.

The cell membrane represents a major barrier to the efficient delivery of plasmid DNA. In this regard, carbohydrates could help to solve the issue since they are involved in a variety of cell-recognition processes [2-4] and there are already examples in the literature where this characteristic has been exploited for targeted gene delivery [5-10].

Gold glyconanoparticles (GNPs) have already proved to be a versatile tool for many applications since they are relatively easy to synthesise and biocompatible [11,12]. Conveniently functionalised GNPs could represent a new type of synthetic vector with improved delivery ability.

A new class of GNPs with either just glucose or galactose monosaccharides or a mixture of these monosaccharides and amino-bearing PEG chains has been synthesized (Fig. 1a). Linearised pACC plasmid DNA was used to investigate, by means of atomic force microscopy (AFM) and transmission electron microscopy (TEM), the condensing properties of the NPs. These techniques jointly proved to be a useful tool for checking the formation of the complex, if any, between the GNPs and the plasmid.

A deeper investigation of the binding properties was accomplished using pEGFP-N1 plasmid DNA in electrophoretic experiments. With this technique the strength of the interaction could be directly measured by checking the minimum amount of GNPs required to retain the plasmid when applying an electric field.

Preliminary results have shown that mixed α-galacto/amino nanoparticles are highly efficient DNA-binders (Fig. 1b and 2). Furthermore, they are able to condense DNA into a compact globular shape, which is a desired property for gene transfection agents.

References:

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Figures:

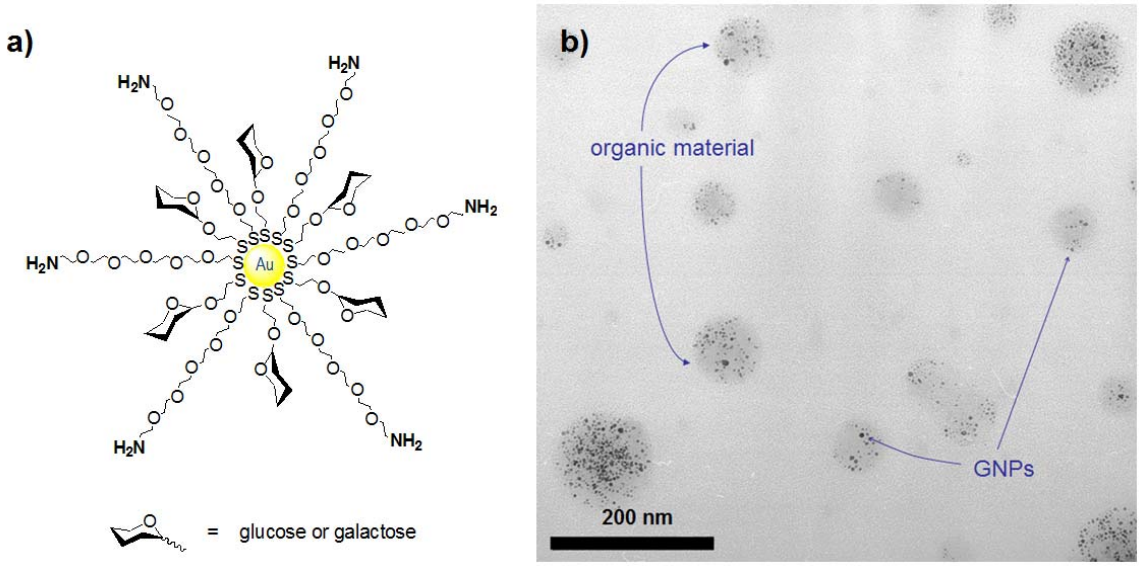

Figure 1. a) A new class of *Glyco*NPs, and b) TEM image of the complex between α-GalC_2S/H_2N-PEG_6-S@Au nanoparticles and linearised pACC plasmid DNA.

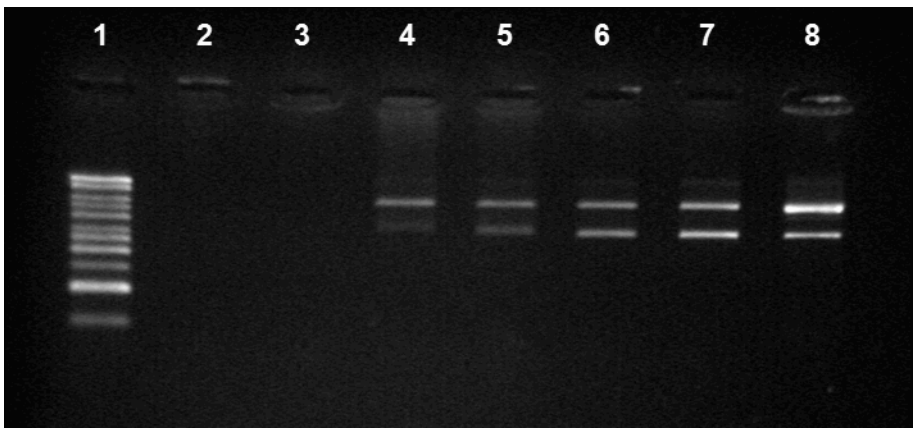

Figure 2. Agarose gel electrophoresis of the complex between the mixed α-GalC_2S/H_2N-PEG_6-S@Au nanoparticles and pEGFP-N1 plasmid DNA.