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Nanometric and vectorized gold as a potential strategy for the treatment of rheumatoid arthritis

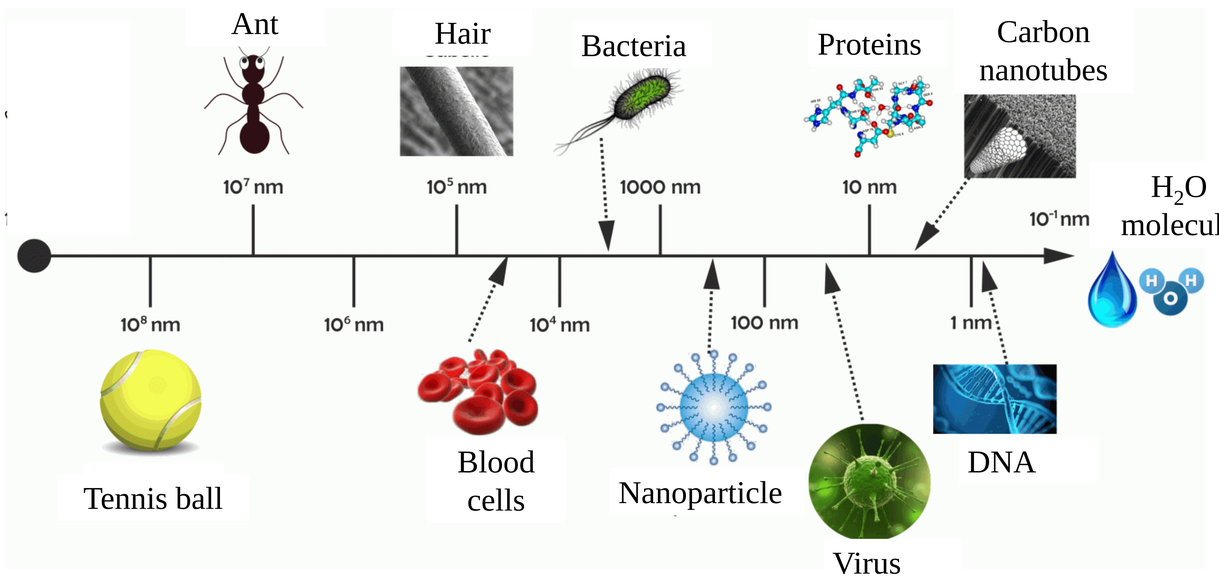
I. Ortega Torres, C. Alonso-Moreno, J.A. Castro-Osma

Universidad de Castilla-La Mancha, Departamento de Química Inorgánica, Orgánica y Bioquímica-Centro de Innovación en Química Avanzada (ORFEO-CINQA), Facultad de Farmacia, 02006-Albacete, Spain.

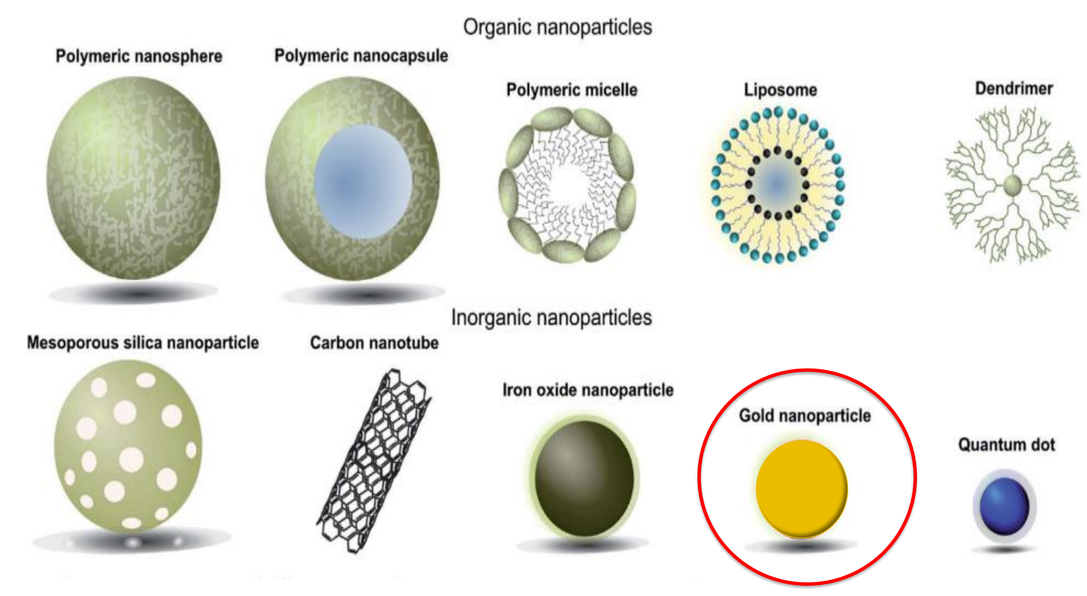
E-mail: inesilla_11@Hotmail.com

INTRODUCTION

Nanoparticles are colloidal systems of synthetic, natural organic or inorganic compounds with amorphous or crystalline structure[1].



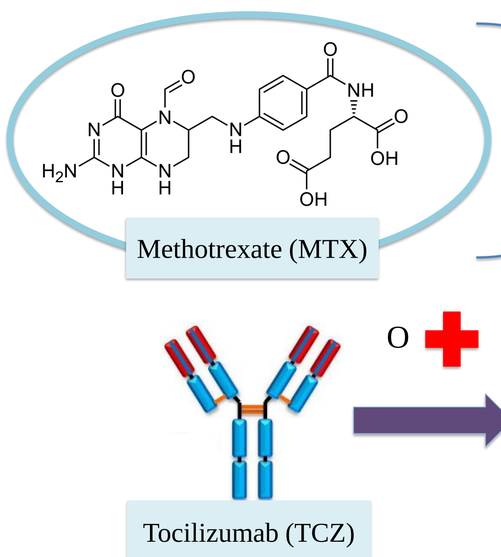
Without knowing its nanometric structure, ancient civilizations began to use them for their medicinal, optical and decorative properties. The first biomedical nanoparticles were proposed to direct the drugs to areas of interest, increasing the selectivity of the treatment, and reducing doses and side effects. Synthetic nanoparticles can be classified into many categories but the most used one refers to their nature[1].



Gold nanoparticles (AuNPs) are amongst the most important metal nanoparticles. These nanoparticles possess a gold core, optical and chemical properties and applications which depend on their size, shape and functionalization. The control of these properties[1] has allowed to obtain AuNP for diverse biomedical applications. Regarding its application as drug delivery systems, the AuNPs take advantage of their chemical and physical properties, improving drug solubility, *in vivo* stability and biodistribution.

TREATMENT OF RHEUMATOID ARTHRITIS

Rheumatoid arthritis (RA) is a chronic inflammatory disease with an unknown etiology and a complex multifactorial pathology. Disease-modifying antirheumatic drugs (DMARDs) are the main strategy, being slow-acting medications that prevent or reduce joint damage[2].

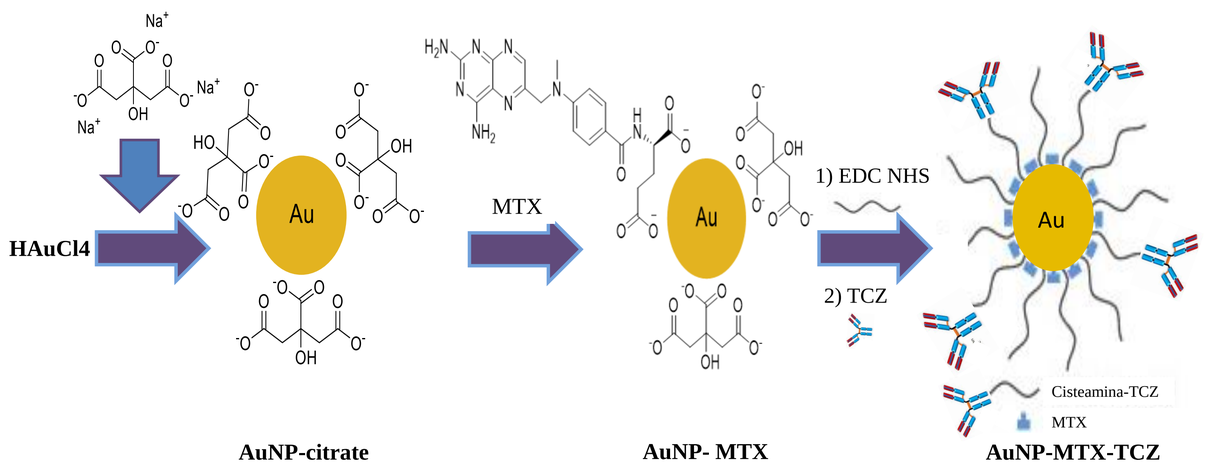


OBJECTIVE

The purpose of this study is the encapsulation of MTX in AuNPs and its subsequent vectorization through the conjugation of TCZ, as an alternative treatment of RA.

MATERIALS AND METHODS

AuNPs synthesis, MTX encapsulation and TCZ vectorization



Characterization[3]

DLS | **SEM** | **UV-Vis** | **LE** | **EE** | **Indirect ELISA**

In vitro studies

Previous formulations would be tested by the MTT-test on RAW 264.7 cell lines to evaluate the anti-inflammatory effect[2].

In vivo studies

It would be carried out by intra-articular injection formulations into the knee of RA rat. The control of changes in the tarsal, ankle joints, and knee of the animals would be performed through photography[2].

EXPECTED RESULTS

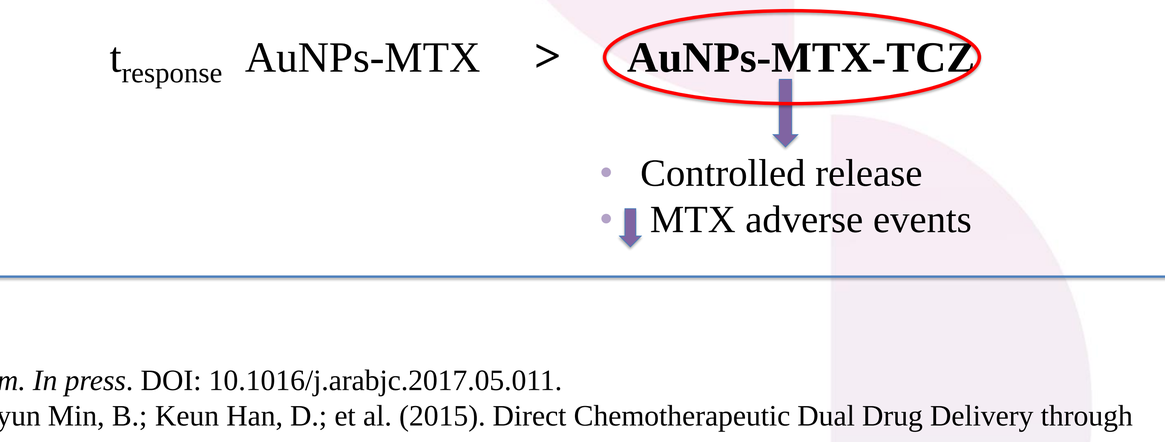
Once the compounds have been synthesized, ***IN VITRO*** studies of cell viability could be carried out, giving:

1º possibility:

MTX_{free} more effective than AuNPs-MTX → In RAW 264.7 cells → **MTX_{free}**

2º possibility:

AuNPs-MTX → In RAW 264.7 cells → **Cell viability** → **AuNPs-MTX-TCZ** → ***IN VIVO***



ADMINISTRATION
1º **AuNPs-MTX**
2º **AuNPs-MTX-TCZ**
→ Monitoring of photographs

No improvement → **MTX_{free}**

Better results AuNPs-MTX → **AuNPs-MTX-TCZ**

$t_{response}$ AuNPs-MTX > **AuNPs-MTX-TCZ**

- Controlled release
- ↓ MTX adverse events

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