

*June 2022*

## **Development of Self-Assembled Nanoparticles and the interaction with Biomolecular corona**

In the field of nanomedicine, it is important to understand how to target a specific site in the body, combating the disease without the side effects for the patients.

One of the main goals is to use Nanoparticles to arrive in the specific site using carriers as a vehicle to carry and guide the bioactive agents to their desired site of action (TEKADE et al, 2017). It is very important to understand how the biomolecular corona is formed around the nanoparticle to avoid that the nanoparticle be captured by our immune system before arriving at the desired site to execute it's role.

The biomolecular corona is made of proteins that will interact with the nanoparticle when they enter in the body, and that can trigger an immune system response. With that, the focus of this project is to develop a library of nanoparticles to try to “dribble” these proteins so that the nanoparticles can achieve their goal. Nanoparticles are increasingly considered as novel, promising tools with improved therapeutic efficacy, biodistribution, and pharmacokinetics.

(FELIU et al,2016).

### ***What are Nanoparticles?***

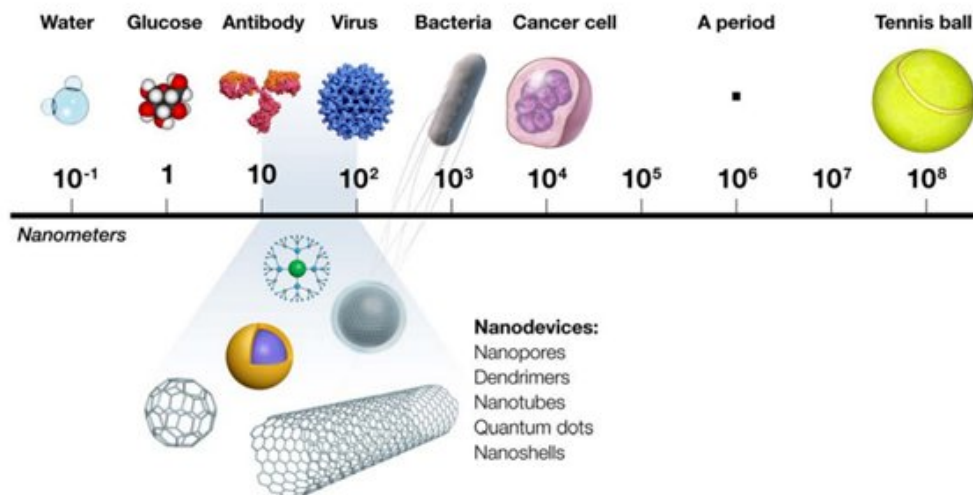
Nanoparticles are little spheres, cylinders or rods in the scale of nanometers which means their size is between an antibody and a virus.

They can have different sizes, shapes, compositions and surface properties, and all of these are fundamental issues that influence in the therapeutic effect to deliver a drug or act as a drug. Their small size permits them to circulate more freely in the human body. It confers some unique chemical, magnetic, mechanical and

biological properties that can increase biocompatibility and cellular uptake.

The possibility to engineer their surface permits multifunctional applications, especially in the clinical environment for diagnosis and therapies.

(CAMPORA; GHERSI, 2021).



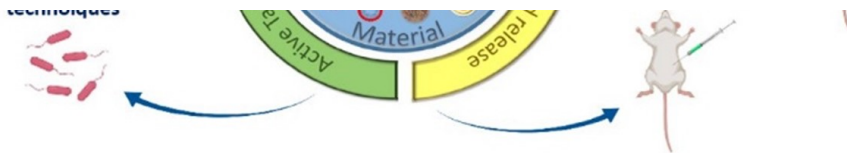
### ***How do they work?***

The Nanoparticles can enter the body by different pathways but it is necessary to remember that each pathway needs a different approach due to the different environments and tissues that are present in the body. After the nanoparticle is inside the body they act as a carrier to deliver the drug, but before they need to pass through the immune system without being captured (which is why it is really important to modify the surface of the nanoparticle) and then the nanoparticle can arrive in the different parts of the body through the blood vessels and using the permeation through the micro vessels.

In the DIRNANO project our focus is to work with 3 different types of Nanoparticles: Gold, Silica as a polymer that could degrade in the biologic system. All of these 3 nanoparticles can be modulated in size, porosity and surface, but all of them are spheres.

Our goal is to modify the surface to arrive in the best option to avoid the capture of the nanoparticles. Modify the surface means synthesize different molecules to attach in the surface of the nanoparticles, in this way is possible to attach a small or big molecule, a fluorescent probe to monitor the NP in the body, could be a protein or an antibody.





In the DIRNANO team we have some collaborations and mobility between the different host organizations and some members are visiting different institutions as a part of the project.

Upcoming events that will benefit from the participation/organization of DIRNANO ESRs are included in a list below.

For regular information on the Network's activities visit our LinkedIn page!

Haritha (UOL) is visiting UNEW – University of New Castle with the supervision of Prof Moghimi.

Michele (UNIPD) is visiting UOL – University of Lincoln with the supervision of Prof Hunter.

VIII JORNADAS DOCTORALES DE CAMPUS IBERUS. 27-29/06/2022, Jaca, Universidad Zaragoza

Michele do Nascimento Tomaz  
ESR Università degli Studi di Padova

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