

# Characterization of the influence of geometry and surface functionalization on bio-nano interaction in both physiological and pathological conditions

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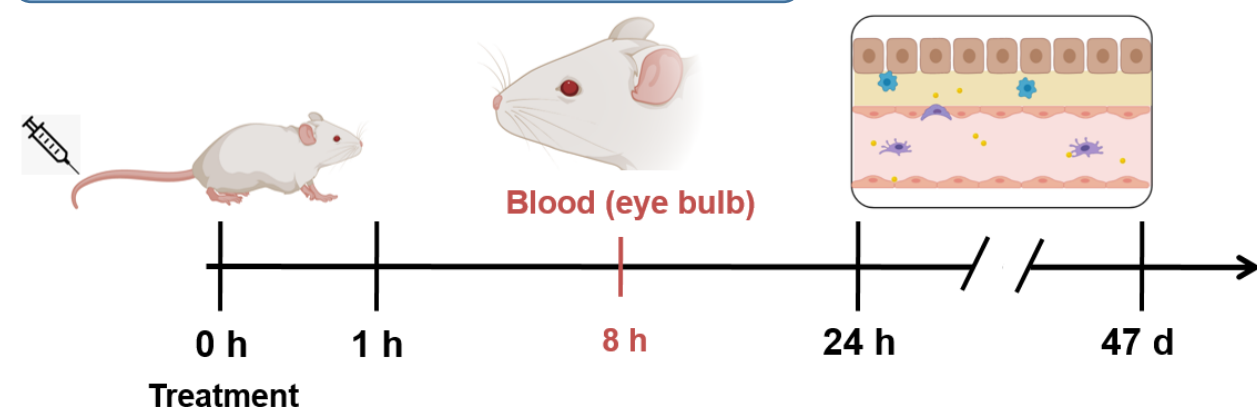
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## BACKGROUND

One of the main hurdles to the nanoparticle (NP)-dependent targeting is the filtering action played by the liver. Resident macrophages are indeed able to uptake a high percentage of circulating NPs<sup>[1]</sup>. In the last years, many studies have demonstrated that glycans may play a key-role to prolong the half-life of circulating NPs. Glycans are complex sugars that along with nucleic acids, proteins and lipids are fundamental in all living organisms. Their expression on the cell surface make them able to recognize extrinsic or intrinsic molecules, playing an important role in the immune system activation<sup>[2]</sup>. **This study aims at assessing the actual influence of size, shape and glycan coating on the hepatic distribution of AuNPs after intravenous administration in healthy immune-competent mice<sup>[3]</sup>.**

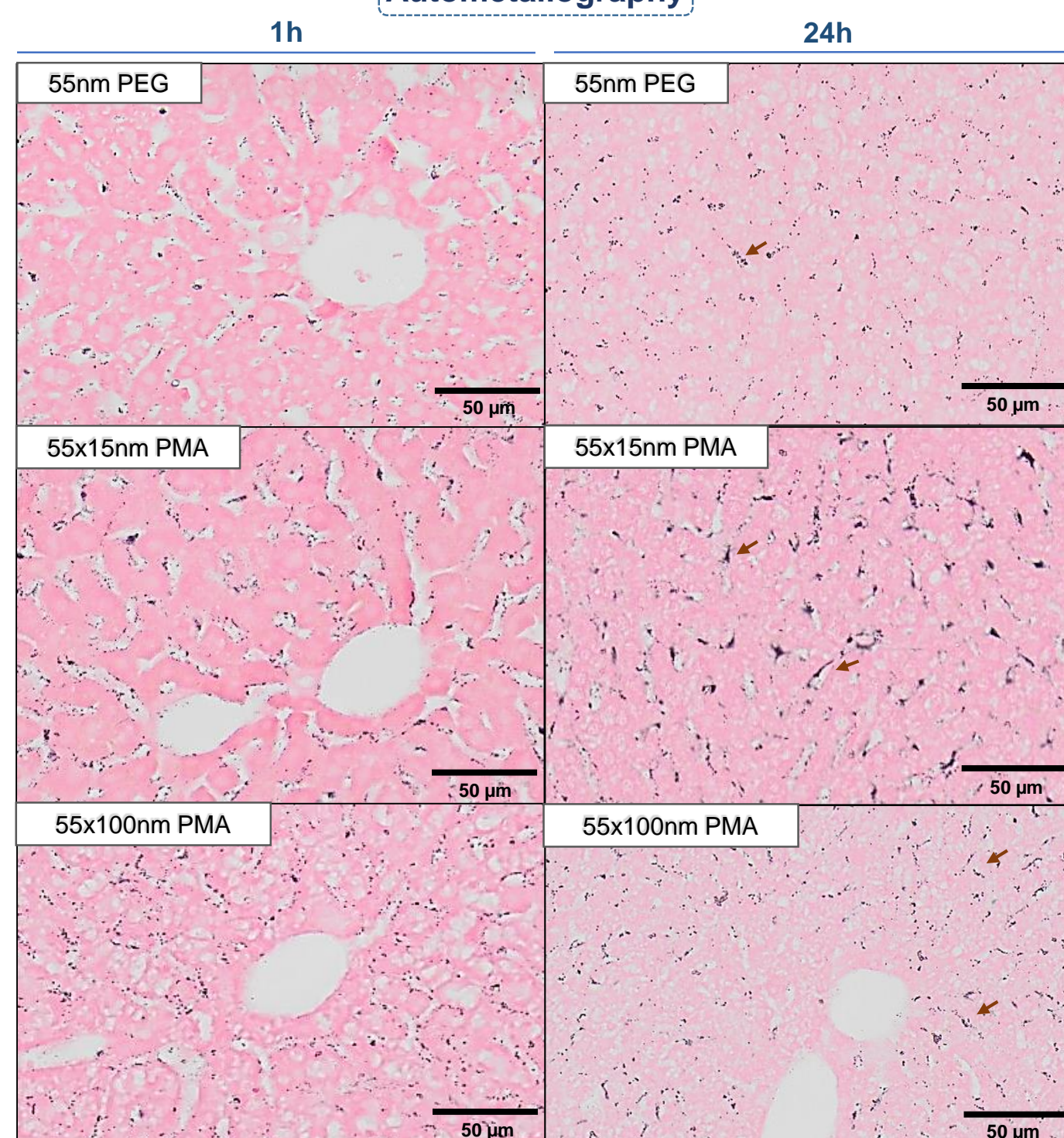
## EXPERIMENTAL PLAN



Mice (n=5) were treated with  $2 \times 10^{11}$  NPs/mice suspended in water. They were sacrificed after 1h, 24h and 47d, blood and organs were collected.

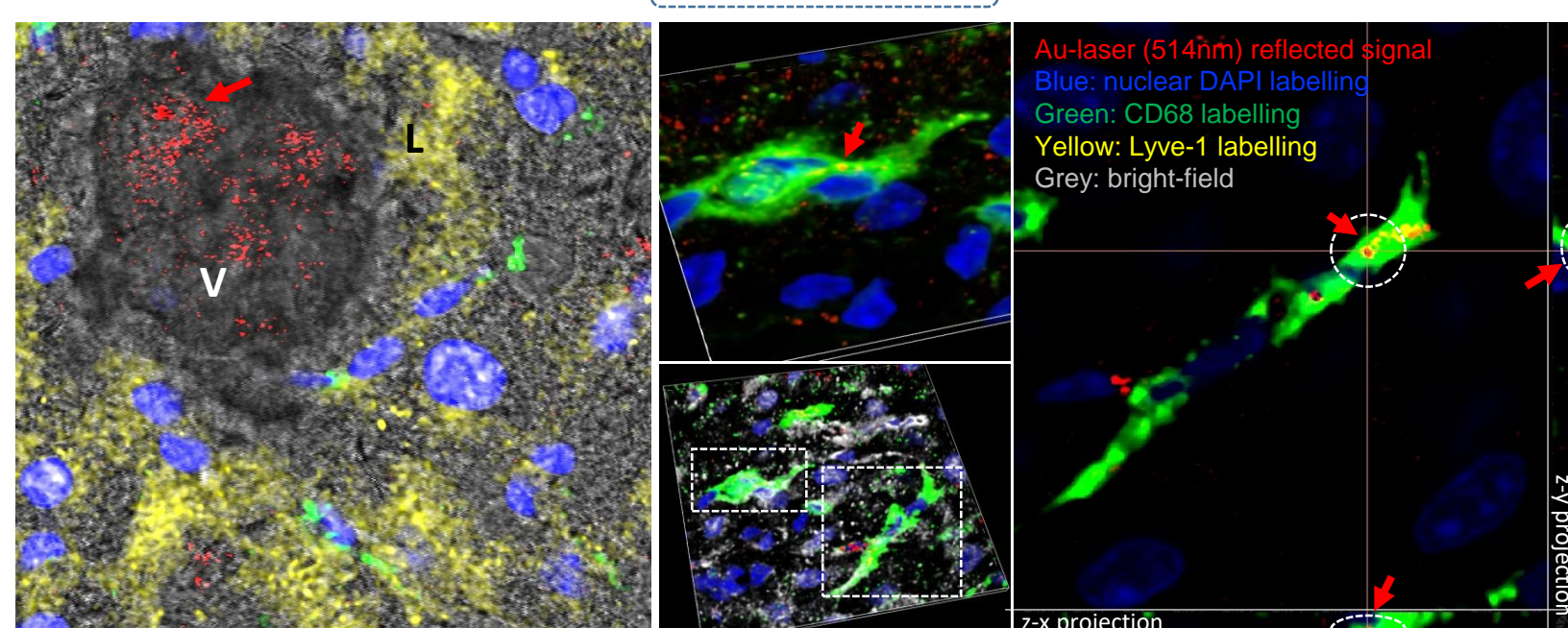
## BIODISTRIBUTION

### Autometallography



Au signal (black spots) detected in the sinusoidal space after 1h exposure meanwhile after 24h, it is detected inside cells.

### Reflective SIM



At 1h most Au reflected signal is visualized within vessels, nevertheless some reflecting objects are already visible in liver parenchyma. After 24h, there is intracellular localization of Au-laser reflecting spots in CD68+ and Lyve1+ cells.

## CONCLUSIONS

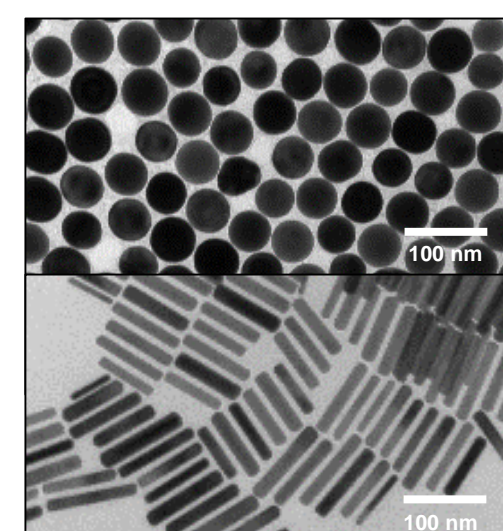
- AuNPs coated with PMA have a higher internalization inside the liver.
- AuNPs are found in the sinusoid after 1h of exposure and internalized inside CD68+ and Lyve1+ cells after 24h.

## FUTURE PLANS

- ALT and AST blood tests.
- AuNPs synthesis and functionalization with different glycans for a second study of the biodistribution.
- Select a possible candidate for therapeutical purposes in liver disorders.

## CHARACTERIZATION OF AuNPs

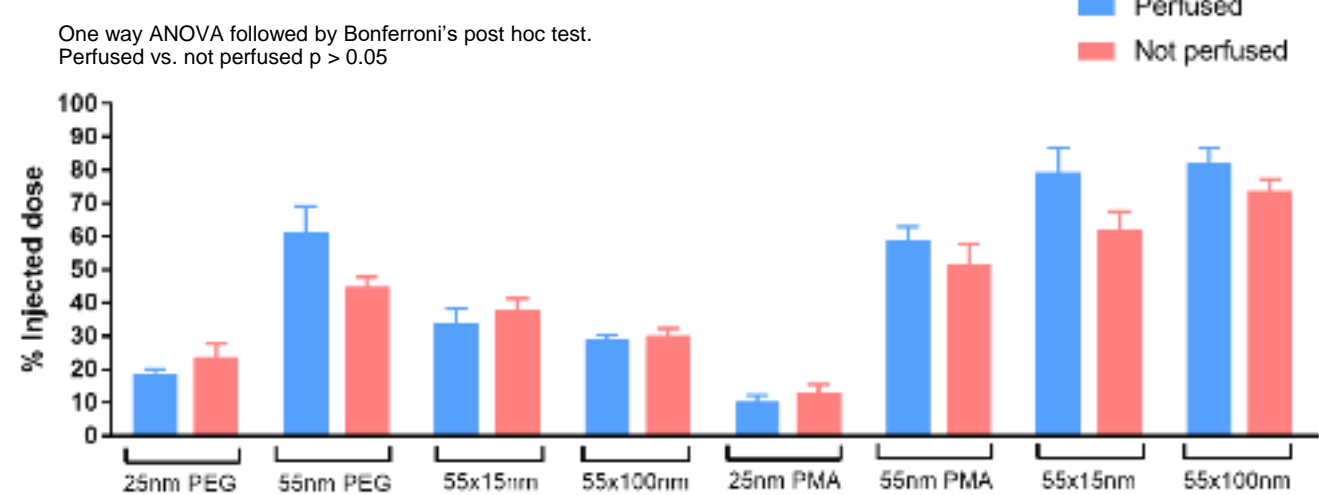
AuNPs were dissolved in water. A representative image obtained by TEM for the largest spheres and rods NPs are shown on the right. The sample is formed of particles with a regular size.



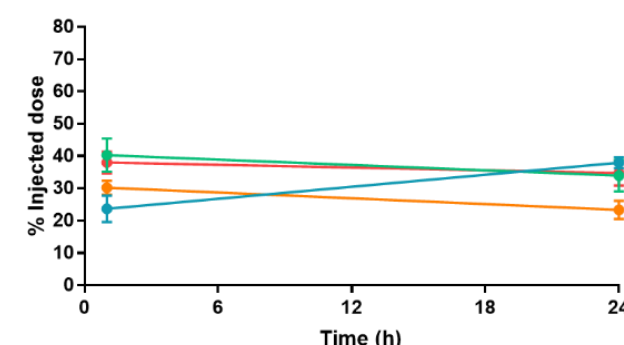
Charge index NPs coated with PEG = -20mV and coated with PMA = -25mV.

### ICP-MS

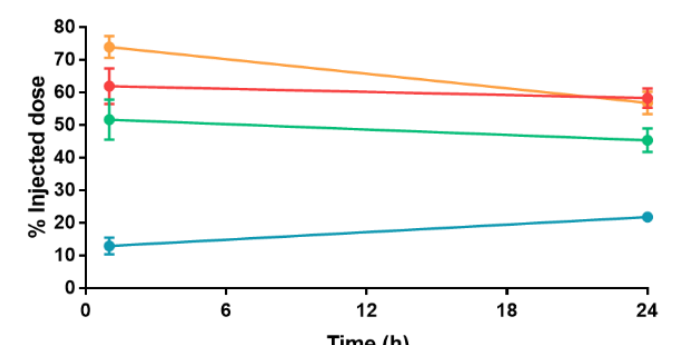
#### Liver perfused



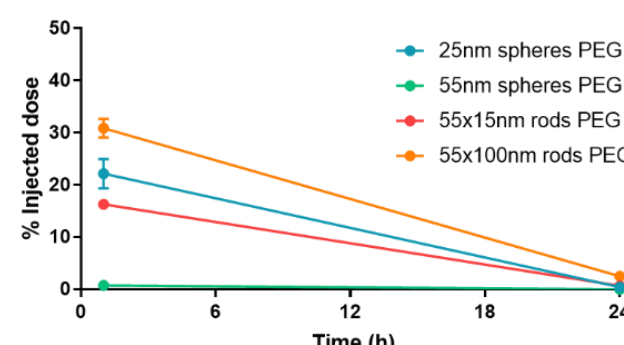
#### Liver PEG NPs



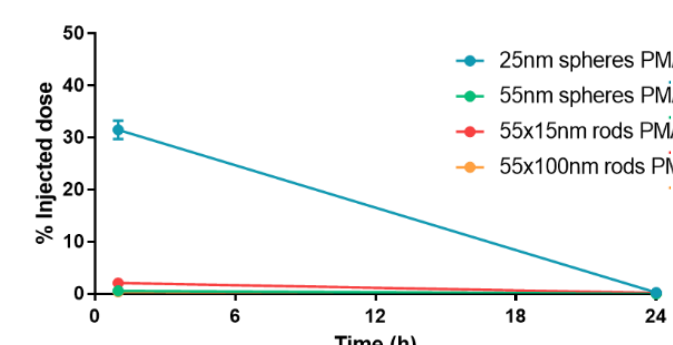
#### Liver PMA NPs



#### Blood PEG NPs

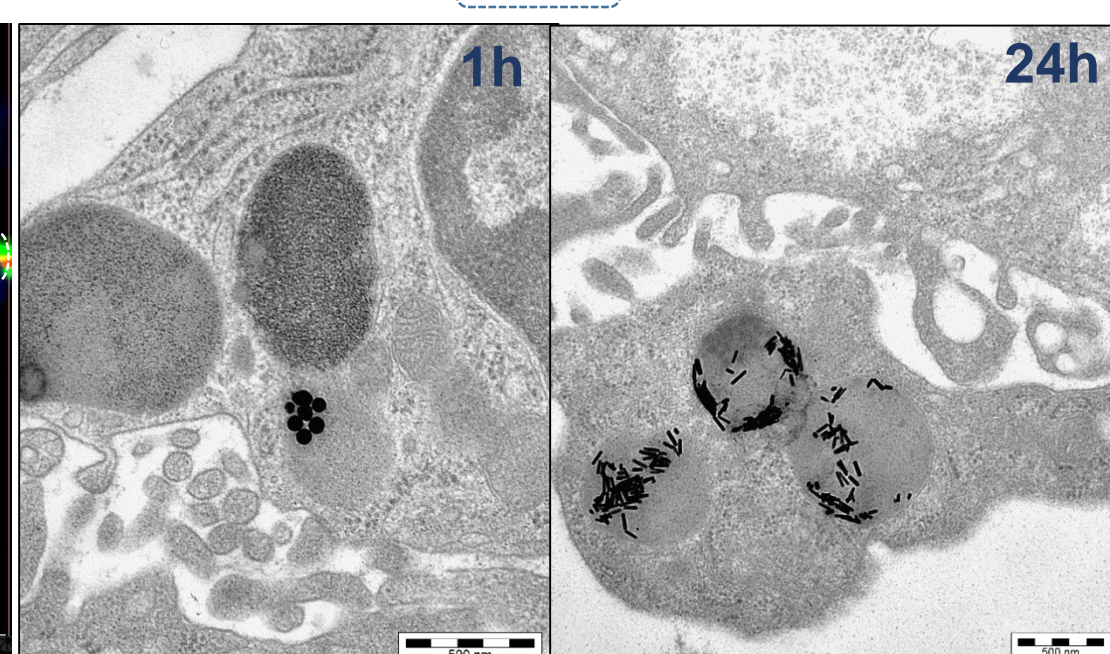


#### Blood PMA NPs



No significant difference in Au quantification between perfused and not perfused liver after 1h. Highest levels found in AuNPs coated with PMA.

### TEM



## REFERENCES

1. Yi-Nan Zhang, *et al.* (2016). Journal of Controlled Release, 240, 332-348.
2. Emanuel Maverakis, *et al.* 57, 1-13.
3. Laura Talamini, *et al.* (2017). ACS Nano, 11, 5519-5529.