



**Università di Roma “Tor Vergata”**

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Dipartimento di Scienze e Tecnologie Chimiche

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## **AVVISO DI SEMINARIO**

*il giorno 5 aprile alle ore 15:00  
nell'Aula Seminari del Dipartimento di  
Scienze e Tecnologie Chimiche, il  
Prof.ssa Debora Berti  
Università di Firenze*

**Terrà un seminario dal titolo:**

**Nanostructured materials meet lipid bilayer membranes: a  
colloidal perspective**

Proponente: Prof. Gaio Paradossi

### ***Abstract:***

*Debora Berti, University of Florence and CSGI*

Biomembrane activity of inorganic or polymeric nanoparticles (NP), defined as the tendency to structurally modify and/or permeate natural membranes, requires full elucidation to optimize biomedical properties or minimize health risks in consumer products. To get fundamental insight into these aspects, we used different model membrane systems, giant unilamellar vesicles (GUVs), supported lipid bilayers (SLB) and liposomes.

The application of this approach was demonstrated in two case studies, where biomimetic membranes were challenged with:

a) A nanostructured antibiotic drug, composed of a bolaamphiphile and a transcription factor decoy, TFD, that self-assemble in solution to form NP (70 nm). The investigation with model bacterial membranes provided a sketch for a hypothetical mechanism of action: first they destabilize bacterial membranes and then, once internalized, the TFD is released and, in bacteria, it interferes with RNA transcription, inhibiting sporulation.

b) Gold NPs, of different size, shape and surface coating. Their effect on bilayer morphology, permeability and fluidity present strong differences or similarities, depending on the length scale, from the colloidal to the molecular domains. After a surface-energy driven adsorption, the NPs stiffen the region of contact and “freeze” the lipids in raft-like nanoscale domains.

In vitro experiments performed on *E. Coli* (a) and rat macrophages (b) challenged with the same NPs, indicate a close analogy with the observations in mimetic models, providing validation of our experimental approach.

#### Recent bibliography

1. C. Montis, D. Maiolo, I. Alessandri, P., Bergese, D. Berti, Interaction of nanoparticles with lipid membranes: A multiscale perspective, *Nanoscale*, 6, 12, 2014, 6452-6457.
2. C. Montis, P. Baglioni and D. Berti, Monitoring the Interaction of Nucleolipoplexes with Model Membranes, *Soft Matter*, 2014, **10**, 39-43
3. Gold Nanoparticles vs mammalian cells: a lipid-membrane mediated process, C. Montis, V. Generini, G. Boccalini, . Bani, D. Berti (in preparation)
4. M. Mamusa, C. Resta, F. Barbero, D. Carta, D. Codoni, K. Hatzixanthis, M. McArthur, D. Berti, Interaction between a cationic bolaamphiphile and DNA: the route towards nanovectors for oligonucleotide antimicrobials, 2016, *Colloids And Surfaces B-Biointerfaces*, 2016, in press.
5. A. Marin-Menéndez, C. Montis, T. Diaz-Calvo, K. Hatzixanthis, C.J. Morris, M. McArthur and D. Berti, Antimicrobial Nanoplexes meet Model Bacterial Membranes: the key role of Cardiolipin, 2016, submitted to *ACS Nano*.