Structure and Stability of Proteins Interacting with Nanoparticles

L. Calzolai, S. Laera, G. Ceccone, and F. Rossi

European Commission, Joint Research Centre Institute for Health and Consumer Protection, Ispra, Italy

luigi.calzolai@jrc.ec.europa.eu

Abstract

The behavior and toxicological properties of nanoparticles (NP) in biological medium depends heavily on their interactions with proteins. In return, the structure, stability and biological properties of the proteins that interact with the nanoparticles are strongly affected by this interaction. Unfortunately, the mechanisms of interaction and their structural consequences are very difficult to analyse. Here we show how biophysical techniques used in structural biology can be adapted to study the changes in structure and stability of proteins upon interaction with nanoparticles. By using synchrotron radiation circular dichroism spectroscopy it is possible to detect changes in the secondary structure and stability of proteins upon interaction with nanoparticles [1]. In some cases it is also possible to identify the protein-nanoparticle interaction domain by using high resolution Nuclear Magnetic Resonance spectroscopy [2].

References

[1] Laera et al, Nano Lett., Nano Lett 2011, 11:4480

[2] Calzolai et al., Nano Lett. 2010, 10:3101

Figures

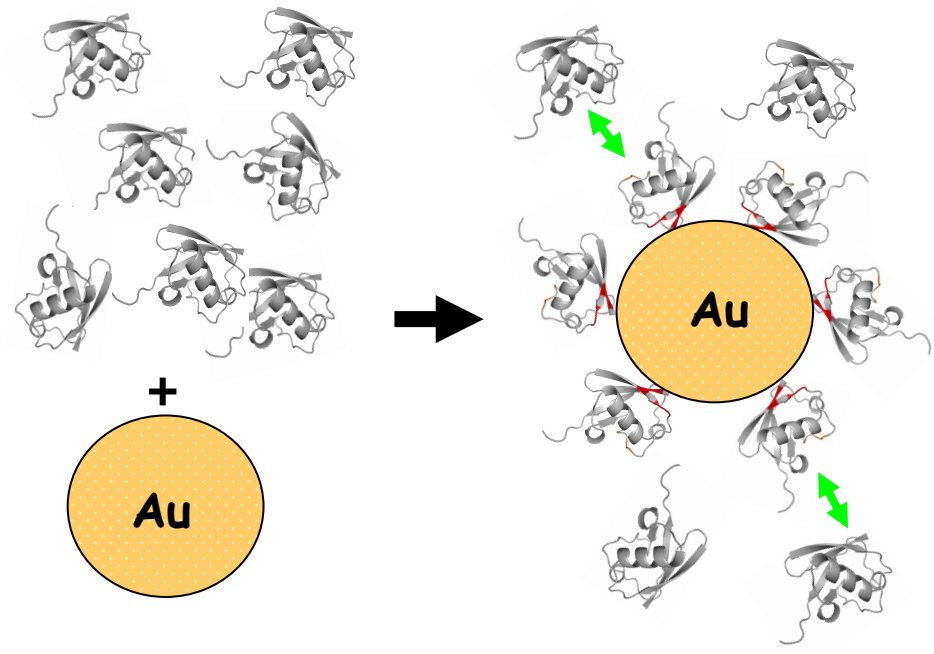

Figure 1. Ubiquitin proteins form a single layer around gold nanoparticles. By using NMR it is possible to identify a specific area of the protein that interacts preferentially with the nanoparticles.