

Functionalization of Gold Nanoparticles for the instrument-free detection of Adenosine in a bio-assay

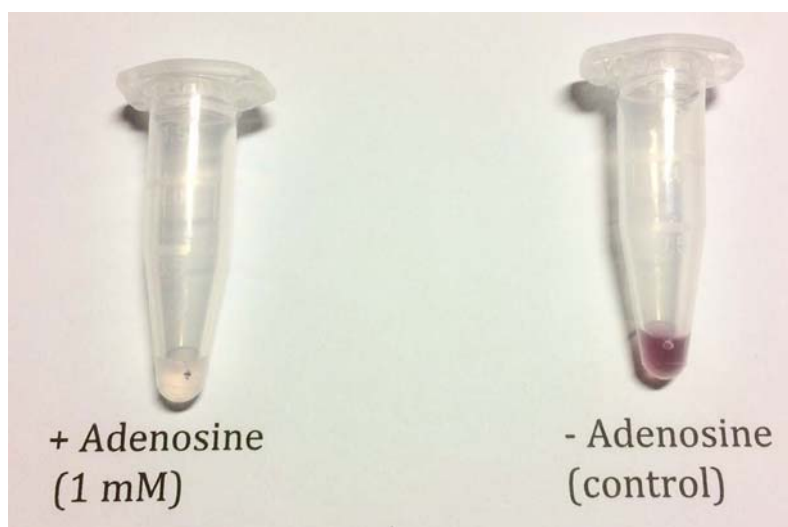
Yoann ROUPIOZ, yoann.roupioz@cea.fr
SyMMES, UMR 5819 (CNRS-CEA-Univ. Grenoble Alpes)

Gold nanoparticles are fascinating and have been used for centuries due to their characteristic optical properties. Even nowadays, gold nanoparticle solutions are sold for their putative curative properties.

One interesting feature is the colour change of colloidal solutions induced by the reversible aggregation of nanoparticles. This property has inspired many research groups for the development of biosensing reagents that could be used in solution. The development of biosensors requires the use of a molecular element highly specific to a pre-set target and whose binding to the target will fire a signal. In the case of colloidal gold nanoparticles, the multivalent binding of targets may induce the aggregation of the nanoparticles and eventually a change in the optical properties of the reacting solution.

Regarding the development of efficient bio-assays, the search of selective and sensitive probes is still an highly challenging issue. Maybe the most important commercial success in biosensing is the use of antibodies for the detection of human chorionic gonadotropin in pregnancy tests. Indeed, immuno-assays (assays involving the use of antibodies as a probing element) turned out to be interesting solutions for the detection of proteins or other "large" molecules. But in the case of small compounds detection (MW < 1,000 Da), things become way more challenging to produce -and use- efficient antibodies recognizing such light targets. One promising alternative is the use of aptamers. Aptamers are short oligonucleotides (less than 100 bases long), either in DNA or RNA series, which adopt 3D shapes enabling the binding, and thus the recognition, of a pre-determined target¹.

This practical aims at functionalizing gold nanoparticles with engineered aptamers to propose a bio-assay for the Adenosine detection. This approach enables the direct detection of the target and thus might be used in open field situations. The major principles for the design and operation of a biosensor will be discussed and explored during this practical session, where students will be asked to prepare their own assay.



¹ Li, F.; Zhang, J.; Cao, X.; Wang, L.; Li, D.; Song, S.; Ye, B.; Fan, C. Adenosine detection by using gold nanoparticles and designed aptamer sequences. *The Analyst* 2009, 134, 1355-60.