IVD_04 - Evaluation of the type of stabilizer in the quantum yield of gold nanoparticles used in the *in vitro* diagnostics production

Thallis Martins Souza[1]; Gabriel Mustafá Misirli[1]; Ana Paula dos Santos[1]; Keila Gisele Azevedo Figueiredo dos Santos[1]; Cláudio Dutra Figueira[1]; Edimilson Domingos da Silva[1]; Simone Ferreira Rodrigues Fernandes[1].
[1]Fiocruz/Bio-Manguinhos

Introduction: Gold nanoparticles (AuNP) have a wide bond affinity to proteins, antibodies, and antigens. These bioconjugates show high stability and are applied as biological markers in the lateral flow immunochromatography to obtain the rapid diagnostic kits. Quantum yield (QY) is one of the parameters which characterizes the fluorescence process of a material. It is defined as the number of emitted photons relative to the number of absorbed photons, so that the greater the QY value, the greater emitted radiation. Determining the QY is very important to identify the most promising nanoparticles able to produce diagnostic kits with more sensibility, to secure faster and earlier diagnosis.

Objectives: This work aims to evaluate the effect of different stabilizers in the QY of AuNP applied on the *in vitro* diagnostic production.

Methodology: Three fluorescent AuNP were synthesized *in-house* (Laboratory of Diagnostic Technology, Bio- Manguinhos) using HAuCl4.3H2O, as precursor, and tryptophan (AuNP-T), bovine serum albumin (AuNP-B) and pepsin (AuNP-P) as stabilizers. QY values and fluorescence spectra were obtained using a spectrofluorophotometer (Shimadzu RF-6000) equipped with 150 W Xenon arc lamp and 1-cm quartz cell. Maximum excitation (λ_{EX}) and emission (λ_{EM}) wavelengths of each AuNP were obtained from spectra scan from 250 to 800 nm. Fluorescein 0.05 mol L^{-1} solution (FS), prepared in NaOH 0.1 mol L^{-1}, was used as fluorescence standard. absorbance at maximum λEX, refractive index and emission spectra areas were other parameters used in the QY calculation.

Results: AuNP solutions showed absorbance and refractive values of 0.07 and 1.333, respectively. AuNP-B, AuNP-P and AuNP-T showed maximum $\lambda_{EX}/\lambda_{EM}$ in 510/651 (QY: 1.0%), 315/405 (QY: 0.10%) and 300/360 nm (QY: 4.3%), respectively. The highest QY value observed to AuNP-T agree with the results described in the literature and can be attributed to the presence of the tryptophan in its structure, which is the amino acid whose luminescent process has been studied for many years.

Conclusion: Tryptophan was the stabilizer whose nanoparticle (AuNP-T) exhibited the highest QY value (4.3%), so that its fluorescence characteristic secures it as a potential nanoparticle to be applied on the *in vitro* diagnostic production.

Keywords: Fluorescence spectroscopy, Quantum yield, Gold Nanoparticles