

# Investigating the protein corona formation on nanoparticles

An internship position for Bachelor or Master students (life-sciences, biomedical sciences, analytical chemistry) is available at the **Amsterdam Vesicle Center** of the Amsterdam University Medical Center. In our group, new treatment and diagnostic procedures based on innovative physics techniques are developed. Our group is part of the department of Biomedical Engineering and Physics and the Laboratory of Clinical Chemistry in the AMC.

## Background

In recent years, nanoparticles have become widely used in biology and medicine, playing crucial roles in drug delivery, diagnostics, biosensing, and other areas.<sup>1-5</sup> The reason for their extensive use is attributed to their versatile and modifiable properties, including their size, material composition, core/shell structure, and surface charge. For example, during the COVID-19 pandemic, gold nanoparticles were used in widely available lateral flow tests for rapid testing.

Another application of nanoparticles is calibration. In our lab we use nanoparticles to calibrate flow cytometry measurements of extracellular vesicles. Using nanoparticles for calibration enables us to convert signals measured in arbitrary units to parameters like particle size or fluorescence intensity.

We are currently developing a nanoparticle-based internal standard to standardize vesicle flow cytometry measurements.

## Problem

One of the biggest disadvantages and obstacles when using nanoparticles is non-specific protein adsorption. When nanoparticles are added to a biological sample such as blood plasma, a so-called protein corona forms around the nanoparticle (Figure 1). The composition of the formed protein corona depends on the various properties of the nanoparticle as well as their environment.<sup>6-9</sup>

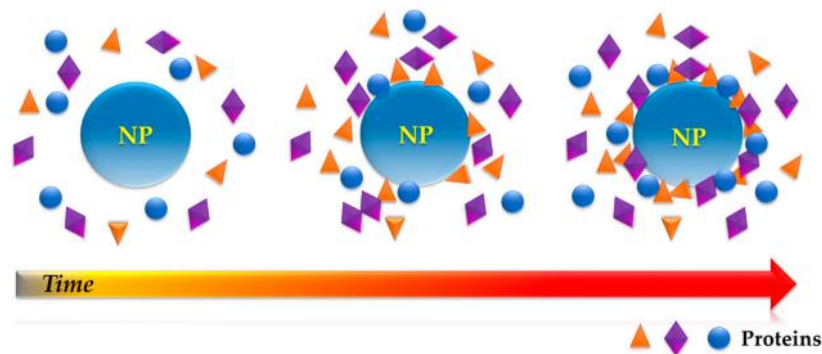


Figure 1: Formation of protein corona on nanoparticles over time.<sup>8</sup>

## Solution

Investigating and understanding the protein corona on various types of nanoparticles provides insight into the formation and contents of the protein corona. This knowledge can then be used to either prevent the formation of the protein corona or utilize it for further research.

## Proposed project

The first step in this project will be a literature review to investigate the current knowledge on the formation and contents of protein corona. The aim of the second part of the project will be to investigate non-specific and specific interaction between the protein corona and different types of nanoparticles. Therefore, experiments with different nanoparticles using new methods and protocols found in literature will be performed. Techniques such as ELISA, SDS/PAGE, LC/MS, and flow-cytometry will be used.

## Preferred qualifications

- Experience working with ELISA, SDS/PAGE, LC/MS.
- Internship duration of at least 4-6 months.

## Contact

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