MASTER THESIS PROJECT

Title: Nanoscale vesicle profiling for cancer diagnosis

Research group: Biosensing group, Applied Physics Department, KTH (Kista campus)

Background: Almost all type of cells, healthy as well as cancer cells, release nanometer-size vesicles which are called exosomes. Recently, exosomes have been shown to transport molecular contents (proteins, RNA, *etc.*) of the cells from which they originate (parent cells). By travelling in body fluids (blood, saliva, *etc.*) these nanoscale vesicles carry biological information between cells located far away from each other, hence they are responsible for intercellular communication. For these reasons, they have shown potential for non-invasive cancer diagnostics/therapeutics, especially for some types of cancer (*e.g.* brain cancer) where biopsies are difficult to perform. How can we detect the molecular fingerprint carried by exosomes which is important for diagnosis of many diseases?

The goal of our project is to profile cultures-derived and clinical exosomes derived from healthy as well as cancer cells. We can do that by (i) measuring the size of exosomes via atomic-force microscopy (AFM) both in air and in liquid environments and by (ii) studying the surface expression of proteins and other biomarkers via fluorescence microscopy.

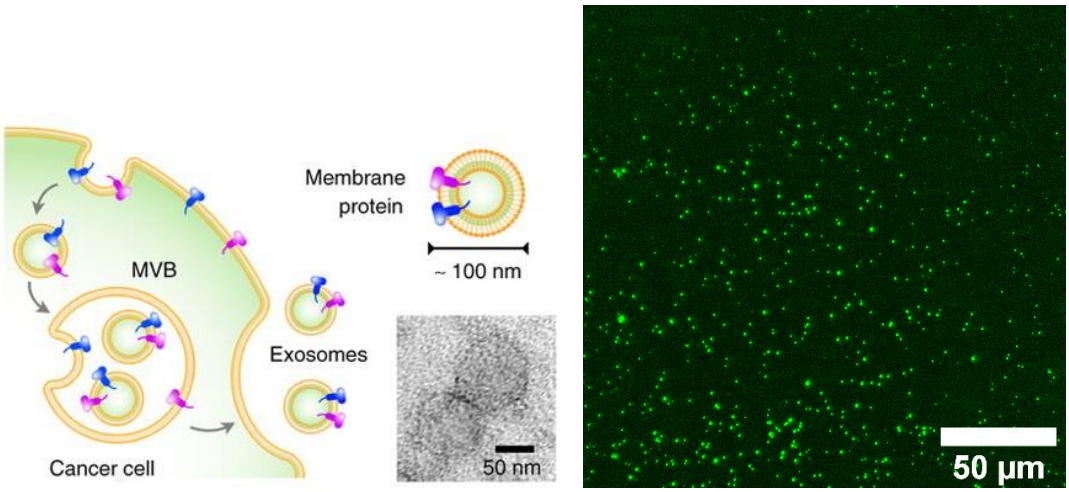

Figure 1. (left) Cancer cells secrete exosomes through fusion of a multivesicular body (MVB) with the cellular membrane. Inset shows a typical TEM image of exosomes. Taken from [1]. (right) Fluorescent image of isolated exosomes labelled by green fluorescent protein take in our lab.

Task and expected results: This master project deals with profiling of nanoscale vesicles for cancer diagnosis applications. Atomic-force and fluorescence measurements will be carried out in our biosensing lab located in KTH Kista.

Plan for project: Key activities for this full time master project include:

- Atomic-force microscopy and fluorescence microscopy of exosomes
- Data processing and analysis using ImageJ, Gwyddion and MATLAB)

Applications: Please contact Dr. Federico Pevere, pevere@kth.se or Dr. Apurba Dev apurbad@kth.se ; project starting in August 2019.

References:

[1] Im *et al.* Nature Biotechnology 32 (2014)