

Master Degree Project in Applied Physics, SCI School for HT19/VT20

Title: Nanoscale vesicle profiling for cancer diagnosis

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Background: Exosomes are nanometer-sized vesicles which are released from almost all types of cells, see Fig. 1 (left). These biological nanoparticles have shown potential for cancer diagnostics/therapeutics because they transport molecular contents (proteins, RNA) of the cells from which they originate. By travelling in body fluids (blood, saliva) exosomes carry “biological information” between cells located far away from each other, hence they are responsible for intercellular communication. How can we detect the information carried by exosomes which is important for diagnosis/therapy 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, see Fig. 1 (right).

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 Associate Professor Dr. Ilya Sychugov, ilyas@kth.se ; project starting in August 2019.

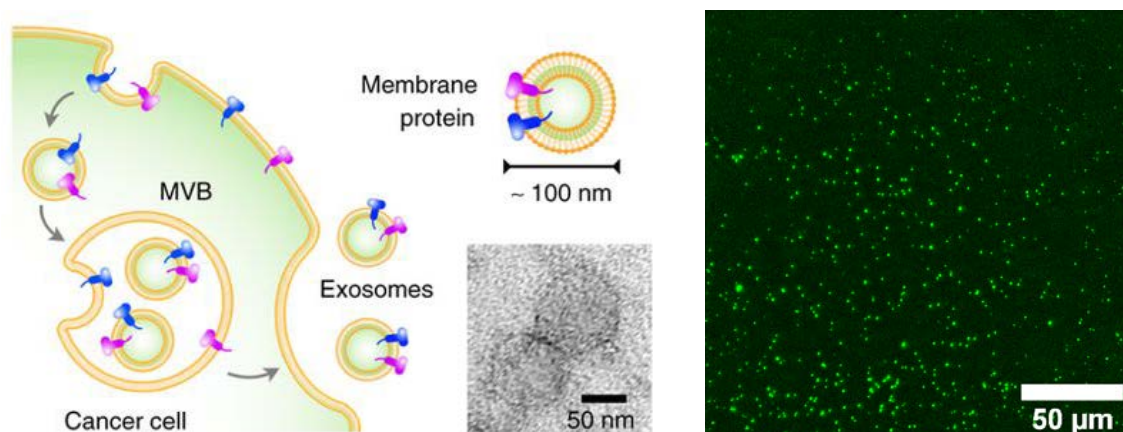


Figure 1. (left) Cancer cells secrete exosomes of sizes ~ 100 nm through fusion of a multivesicular body (MVB) with the cellular membrane. Inset shows a typical transmission electron microscope image of exosomes. Taken from [1]. **(right)** Fluorescent image of isolated exosomes labelled by green fluorescent protein. The image was recently taken with our fluorescence microscopy setup.