Group	:	Organic Surfaces
Project	:	**Surface modification of substrates for characterization of extracellular vesicles**
Supervisors	:	prof. Leon Terstappen (UTwente) and prof. Cees van Rijn (WUR)

Key words

Surface modification, Lab-on-a-chip, cancer, extracellular vesicles, smart sieves, personalized medicine

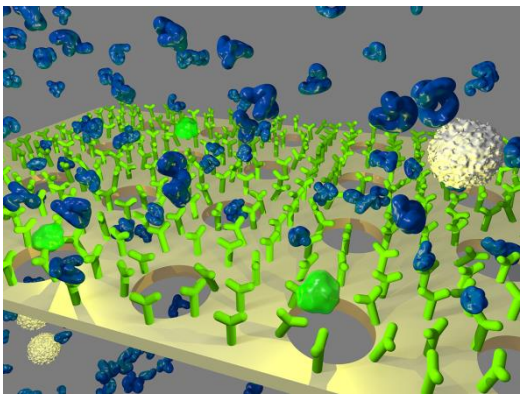
Introduction

Metastasis is the cause of death in 90% of cancer-related deaths. To colonize distant sites, cells detach from primary tumors and travel through the bloodstream during which time they are known as circulating tumor cells (CTC). The number of CTC present in the bloodstream is a measure for the probability of survival of the cancer patient. However, since CTC are very small in number (10^{-3}-10^{3} per ml of blood), the information density in patient samples is very low.

Extracellular vesicles (EVs) shed by CTC are more abundant. Extracellular vesicles are submicron bioparticles, of which the properties reflect those of the tissue of origin and as such can be used in diagnosis. Given their size, EVs are currently very difficult to detect and characterize, so methods are needed to maximize the information that can be extracted from blood samples.

Goal

A microfluidic chip is being developed for the filtration of whole blood, the capture of CTC-derived extracellular vesicles, and the enumeration and characterization of the captured vesicles. Nano-fabricated Microsieves®, developed by prof. van Rijn, are surface modified for the conjugation of antibodies to selectively capture CTC-derived EVs. The so-formed smart sieves are to allow passage of biomatter found in blood while retaining the particles of interest.



For the enumeration of EVs, a sensitive biosensor is required. Confocal fluorescence microscopy, Raman spectroscopy and impedance spectroscopy are promising characterization methods. In parallel, surface modification strategies and microfluidic sample handling systems are being developed to accommodate the requirements of these methods. Eliminating the need for extensive lab work will allow for quick adaptation of cytostatic therapy: real-time diagnostics for personalized medicine.

This project is part of the STW Perspectief project *Cancer-ID*:
New Technology for monitoring Cancer therapy
through extracellular vesicle Identity.