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Workshop 2018

EVO-NANO

Evolvable platform for programmable nanoparticle-based cancer therapies

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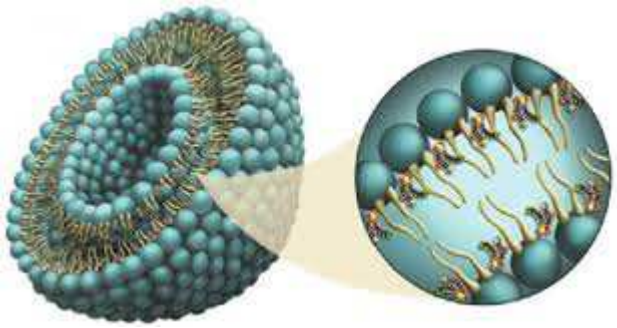
Overview

- FET Open “supports the early-stages [. . .] research and innovation around new ideas towards radically new future technologies.”
- FET Open success rate: 6%
- **EVO-NANO long term vision:** to create an integrated platform for the artificial evolution and validation of novel drug delivery systems for cancer treatment using nanoparticles (NP).

Nanoparticles – from large to small-scale chemistry



Size 1-100 nm

Liposomes, dendrimers

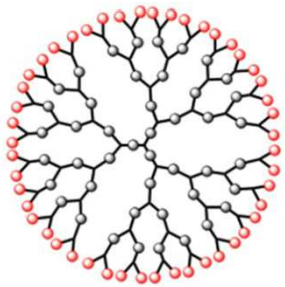
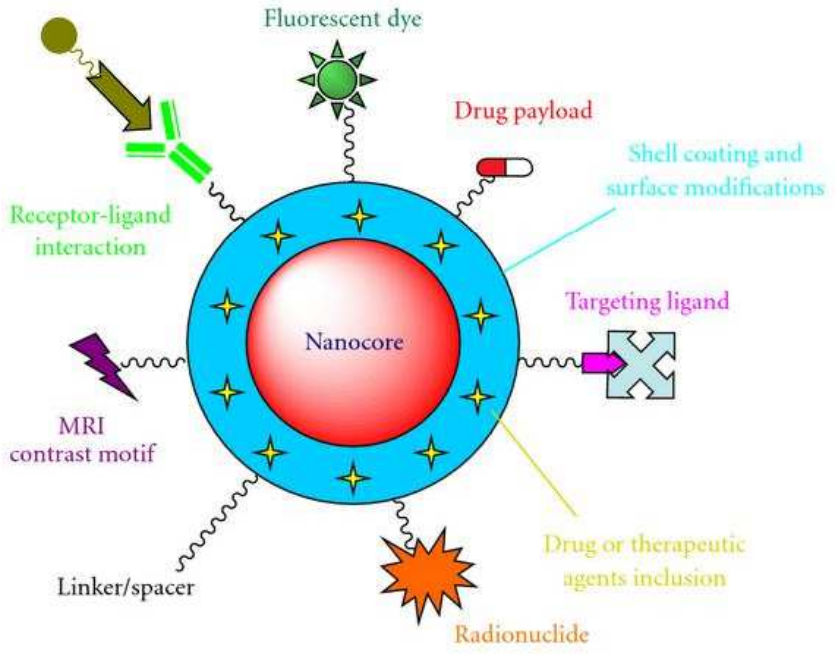


Fig. 1 Basic structure of dendrimer

Gold, silver, mesoporous silica

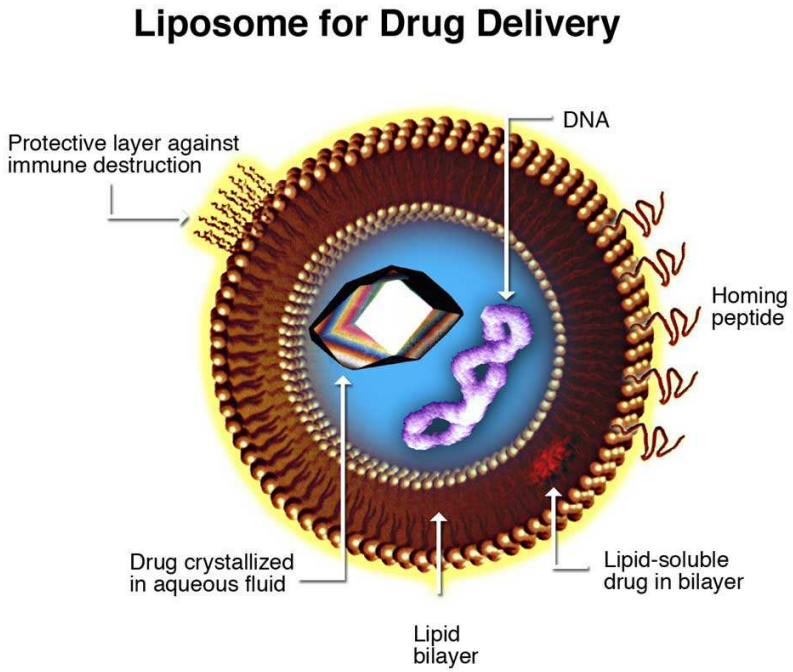
Nanoparticles – from large to small-scale chemistry



Liu et al (2010). Journal of Nanomaterials http://dx.doi.org/10.1155/2010/894303

Drug delivery

- transporting a **pharmaceutical** compound in the body to safely achieve its desired therapeutic effect

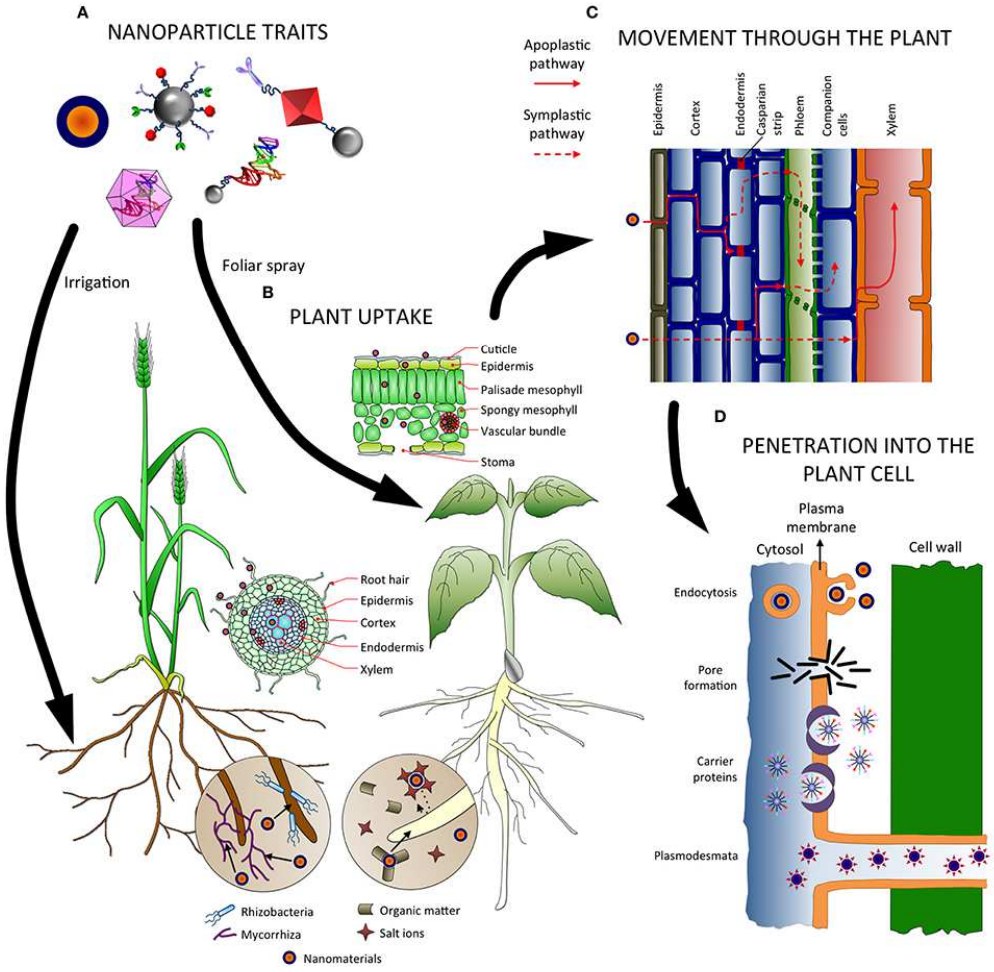


Torchilin, VP "Multifunctional Nanocarriers." Adv Drug Deliv Rev 2006 Dec; 58 (14): 1532-55 doi: 10.1016/j.addr.2006.09.009

Summary of possibilities:

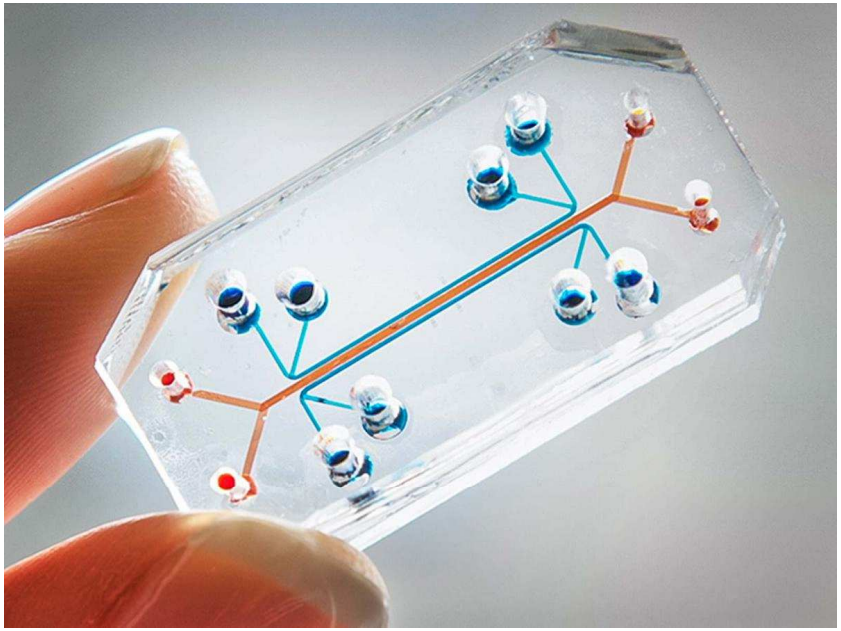
- Target specific tissues/cells in organism
- Modify cellular metabolism and/or response to stimulus
- Deliver drugs/imaging agents to specific regions
- Programmable trough multifunctionalization (algorithm like)

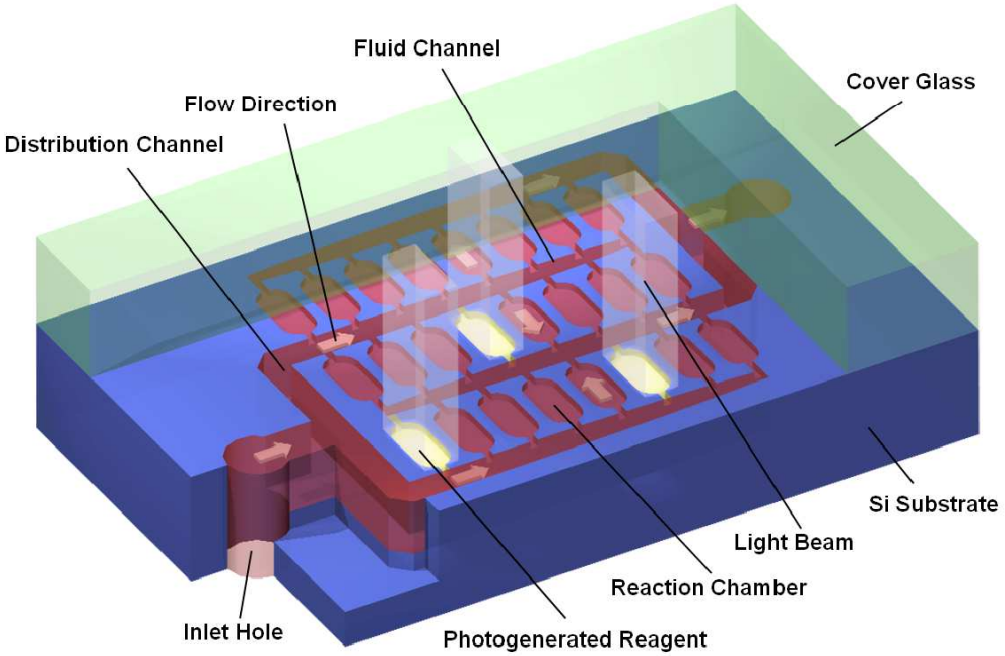
Usage of nanoparticles in Agriculture



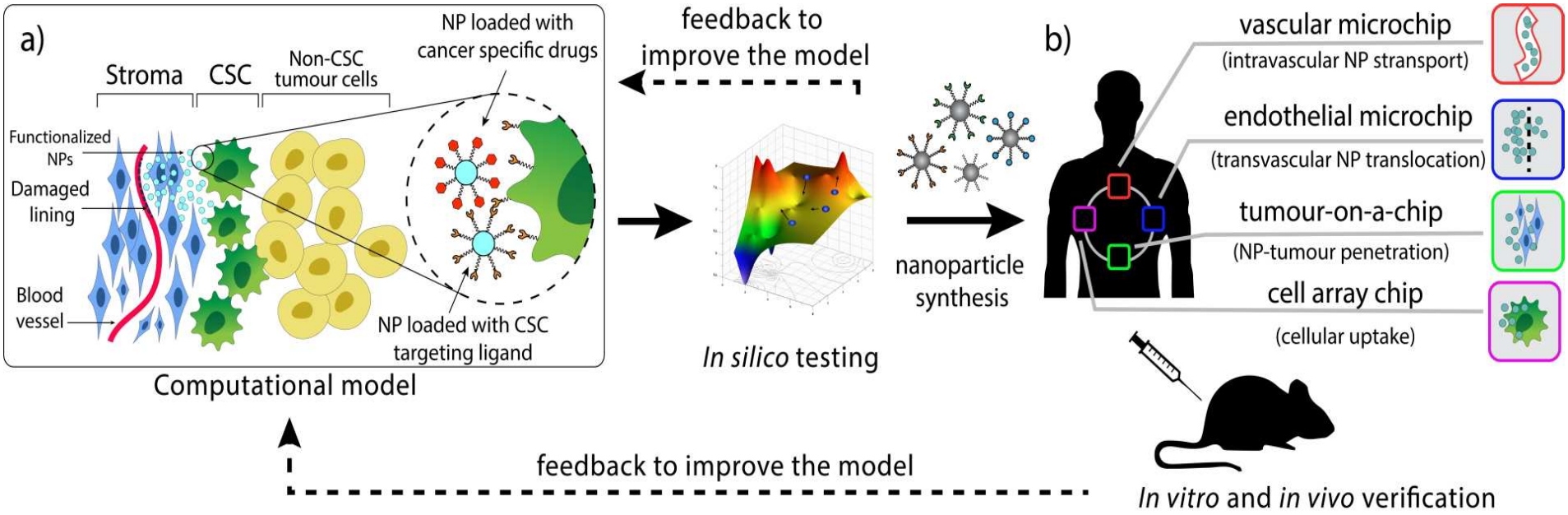
EVO-NANO work plan overview

- EVO-NANO is a hybrid platform
  1) Artificial intelligence autonomously create and optimize a set of functionalized NP and their collective behaviour;
  2) SME company synthesize most promising NP
  3) Synthesized NP are tested *in vitro* using microfluidic lab-on-a-chip techniques and *in vivo* using mouse cancer xenografts




Fluid Channel
Cover Glass
Flow Direction
Distribution Channel
Si Substrate
Light Beam
Reaction Chamber
Inlet Hole
Photogenerated Reagent

EVO-NANO work plan overview



At each stage, test results will be used to improve the computational model

Towards personalized medicine