SCIENCE*SPRING*DAY

Nanodevices for Theranostic Lung Delivery

Group of Polymer Synthesis & Processing (GPS&P)
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Ana Sofia Silva

PhD student
MIT-Portugal Doctoral Program
Bioengineering Systems
Advisors:
Prof. Ilídio Correia and Prof. Ana Aguiar-Ricardo

Masters degree:
Biomedical Sciences – UBI

Objectives

The project herein presented proposes the development of theranostic aerosolized nanodevices comprising antitumoral drugs and fluorescent molecules grafted onto the particles' surface to be used in lung cancer conditions. Therefore, the main goals are:

- To develop nanodevices through colloidal and $scCO_2$ assisted methods for small lung cancer theragnosis;

- To characterize the produced nanocarriers;

- To optimize the production methods to meet the required specifications from FDA for cancer theragnosis with minimal toxicity for the healthy tissues/organs;

- To evaluate nanocarrier performance for biomedical applications.

Fig 1. High pressure reactor

Methodology

- Synthesis of biocompatible nanodevices loaded with bioactive molecules and their structural, morphological, physico-chemcail and mechanical characterization;

- Characterization of drug release profile;

- *In vitro* characterization of the antitumoral efficiency of nanodevices;

- *In vivo* evaluation of the antitumoral efficiency of nanodevices.

Fig 2. Theragnostic nanoparticles

Expected Results

The nanodevices herein produced are expected to:

- Have a mean hydrodynamic diameter between 5-34nm;

- Be able to load anticancer drugs;

- Recognize specifically cancer cells and target their nucleous;

- Be able to perform a controlled release of the anticancer drug and induce cellular apoptosis;

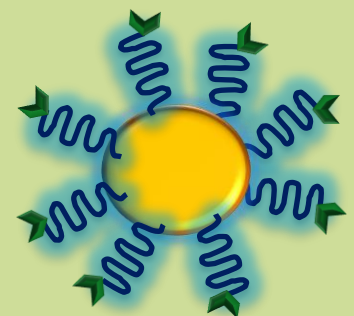- Be able to target lung alveolus after being delivered using a dry powder inhaler (DPI).
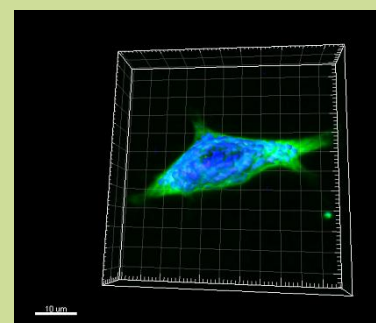

Fig 3. Cells (green) internalization of theragnostic nanoparticles (blue)