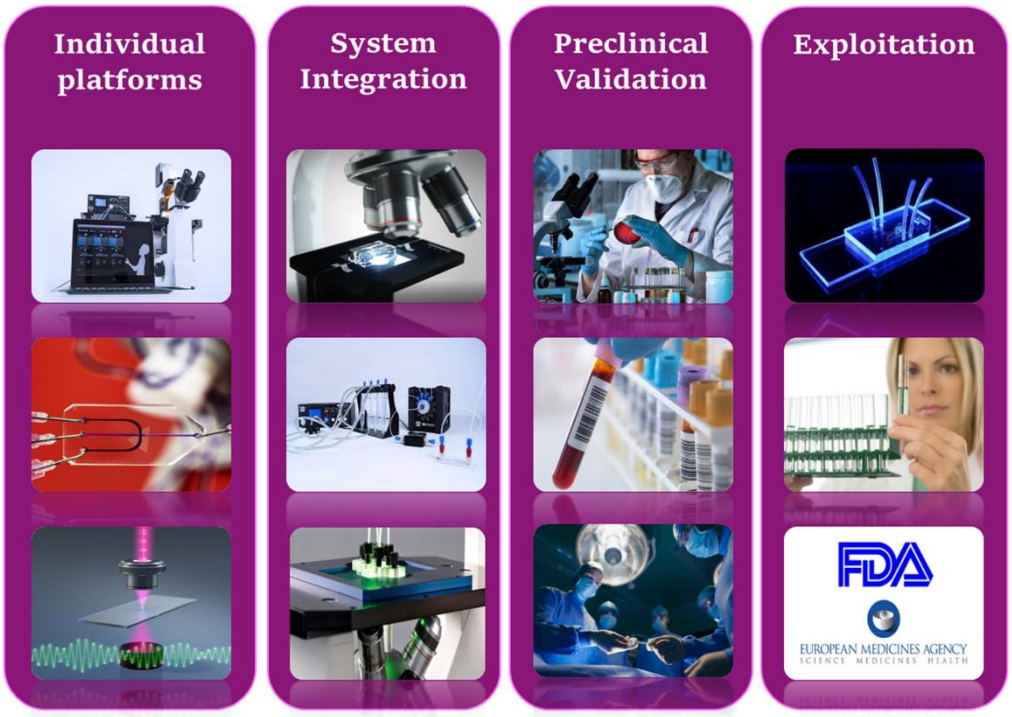
Press release

Tumor-LN-oC: Tumor and Lymph Node on Chip for cancer studies

Athens, September 2nd, 2021: Lung cancer is the leading cause of death (1.8 million worldwide, 267K in Europe) and accounts for 1/5 of total cancer deaths. It is believed that up to 70% of metastases occurs through the lymphatic system with lymphatic vessels and lymph nodes (LN) mediating the process, while the rest of them are of hematogenous origin and occur through the blood stream. LN metastasis is an independent indicator of poor prognosis. LNs are responsible for the immune response against external threats as well as the elimination of tumor cells which are considered foreign entities. Tumor cells however, have found ways to escape the immune system and even colonize LNs, which would be considered an otherwise "hostile" environment. Initially, this is achieved through secreted signals that travel to the lymph node and prepare the field, while later cancer cells migrating and homing the LN actively suppress the local immune response. Nowadays, immune response reactivation is the basis of immunotherapy success in cancer treatment. Understanding how tumors shape the LN environment and how tumor cells metastasizing to the LNs are able to suppress the immune response locally is a breakthrough, and it will help us identify novel biomarkers, and possibly targeted therapies which could be combined with existing anticancer therapies. Studying the metastatic process in real time, and doing so for individual cancer patients in a personalized manner that would also enable parallel preclinical drug testing of multiple drugs and combinations, is not possible with current methodologies.

Tumor-LN-oC thus proposes the development and validation of a TRL 5 tumor-lymph node-on-chip (Tumor-LN-oC) platform composed of 3D tissue models and microfluidic chips which will connect surgically removed human primary tumors and LN tissue from the same lung cancer patient. This will serve as a "biological twin" of the patient and will allow us to study the interaction of primary tumors with LNs for individual patients. Using sensitive off-chip proteomic and molecular approaches to subsequently analyze the soluble factors present between LN and the tumor the chip will enable characterization of the soluble signals that neutralize the immune response and allow tumor cells to metastasize to the LNs and to use them as spring boards for further dissemination. This will enable the use of existing drugs, or the development of new ones that could reverse this process and inhibit tumor growth and dissemination. It will also allow the identification of novel biomarkers characterizing metastatic cells which could also be exploited therapeutically. Moreover, by employing novel imaging approaches, Tumor-LN-oC will generate a spectral "fingerprint" of migrating/metastasizing cells which could be used for diagnostic purposes in tumor and lymph node biopsies.

"We are thrilled to undertake this fascinating but also challenging project which we hope will further substantiate the OoC technology to understand the basic biological questions and ultimately have a considerable impact in the healthcare" says the Tumor-LN-oC Coordinator, Prof. Ioanna Zergioti from Institute of Communication and Computer Systems in Greece.



The proposed technologies will provide added value to the EU cancer diagnostics and pharmaceutical industries and lower the barriers associated with the application of OoC technology in disease diagnosis and therapy.

Expected impact

- Verifiable progress in the application of Organ-on-Chip technologies for in-vitro research
- Reduction of the need for animal and clinical testing
- Lowering of barriers for application of Organ-on-Chip technology
- Improved competitiveness and attractiveness of the European biomedical and healthcare sector
- Increased awareness and knowledge about medical regulatory policies and requirements, especially by academics and SMEs

Project consortium:

Project duration: 1st of May 2021 – 30th of April 2025

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