IBEC-VHIR INTERNATIONAL PhD PROGRAMME

Position

1. Project Title/ Job Position title:
   Hydrogels for Sustained Delivery of Therapeutics in Ovarian Cancer

2. Research project/ Research Group description

Our group 'Microenvironments for Medicine' at IBEC engineer biomaterials with controlled properties for applications in cell engineering, to support in vitro models and as tools for mechanobiology. Here, in collaboration with Simo Schwartz Jr (Clinical Biochemistry - Drug Delivery and Therapy group, CB-DDT, Vall d'Hebron Institut Recerca) we will engineer hydrogels that enable to sustained, local, release of therapeutics to address unmet clinical needs in ovarian cancer.

3. Job position description

Ovarian Cancer (OC) is usually diagnosed in advanced stages when metastasis into the intra-abdominal (i.a.) cavity already occurred and prognosis is poor. The OC standard-of-care (SoC) efficacy is hampered by drugs' high systemic toxicity and the early appearance of resistance. Thus, advanced OC remains an **unmet clinical need**, forcing the need for alternative therapies based on drugs' local slow-release at the i.a. cavity. Hydrogels (HG) have been proposed as *in situ* drug sustained release systems (DDS). Their application **avoids off-target effects** caused by drugs' systemic administration and **improves** their **therapeutic efficacy**, particularly to prevent intraperitoneal metastasis as co-adjuvant chemotherapy to SoC treatments. In addition, the use of other DDS such as Extracellular vesicles to delivery anticancer treatments (e.g., protein inhibitors of undruggable intracellular targets; i.e., KRAS) and/or polymer micelles delivering Docetaxel targeting metastatic sites (using proprietary cell penetrating peptides)(D-PM), have yield very promising data in in vitro and in vivo models of OC (CB-DDT group). Moreover, CB-DDT group has also designed cells able to deliver specific targeted-EVs with antitumoral activity. Furthermore IBEC's group has strong expertise in designing functional HGs with controlled biochemical and biomechanical properties. Here, we propose the design of advanced HGs to support living cells producing targeted antitumoral EVs in combination with targeted-D-PMs delivery for intra-abdominal implantation, as a depot slow release targeted DDS to treat OC. We will use **eco-friendly, sustainable, and low-cost EMA-approved polymers** that comply to "Green Chemistry" rules. Moreover, HGs design will be supported by *in silico* prediction tools to allow **easy formulation scale-up** process and **translatability to the clinic setting**.

Lastly, efficacy will be performed using complex *in vitro* (co-cultures and spheroids) and *in vivo* OC models. The project's success is guaranteed by the teams multidisciplinary character and the perfect match of knowledge. Also, the on-demand character of HG design could bring new alternatives to other clinical situations with limited therapeutic options and pave the way towards more personalized therapies.

Group Leader IBEC

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