

VIVINJECT : NUTRITIVE HYDROGELS ENHANCING STEM CELL SURVIVAL FOR TISSUE RECONSTRUCTION

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L'AVENIR EST FAIT D'AUDACE

An injectable, biocompatible and biodegradable hydrogel enabling the enhancement of stem cell survival and better cellular colonization for tissue reconstruction

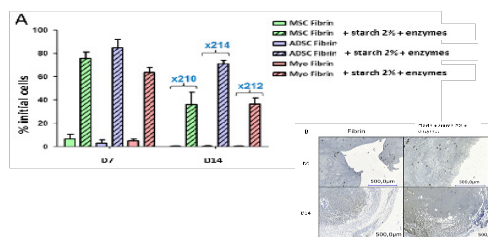
PRESENTATION

In the growing market of regenerative medicine, the graft of stem cells is a promising strategy but limited survival of cells post implantation reduces its efficacy. The main role of stem cells in tissue regeneration is to release paracrine factors and therefore stimulate the creation of new vessels, cells recruitment and tissue remodeling. Though to have a significant efficacy, stem cells have to stay alive long enough post-implantation in an ischemic environment.

The research team has demonstrated that mesenchymal stem cells (MSCs) can withstand exposure to severe, continuous hypoxia provided that they have access to glucose [2]. Therefore, they designed a biocompatible material which provides a release of glucose, with good mechanical properties making it easy to handle and injectable. The hydrogel is based on a co-polymer of fibrin and starch containing enzymes capable of producing glucose by consuming starch and therefore, inducing an enhancement of stem cell survival. The enzymes can be encapsulated or not in nanoparticles playing a role of reservoir.

The hydrogel presents interesting mechanical properties, better in vitro and in vivo stem cells survival (tested on three different cell lines), and in vivo cellular colonization. The hydrogel can be conditioned in a double-chamber syringe (injectable form) and has been tested under sterile and different storage conditions.

This technology is providing an environment suitable for stem cell survival even under hypoxic conditions.



A. Assessment of in vitro stem cell survival in hypoxic conditions by flow cytometric analysis at day 7 and 14. 2 experimental conditions have been tested : fibrin alone and Vivinject gel (fibrin/starch/enzymes) in 3 different stem cell lines : MSC, Adipocyte derived stem cells (ADCS) and myoblasts. n=3.

B. Representative images of Immuno HistoChemistry (IHC) tissue analysis (macroglobulin staining) after in vivo evaluation of MSC survival (quantification and more results available on demand).

INTELLECTUAL PROPERTY

International patent application filed on September 16, 2016 ; WO2017/046369

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Biomaterial - Hydrogel - Stem cells -
Regenerative medicine - Tissue engineering - Bone reconstruction

COMPETITIVE ADVANTAGES

- Maximize bioavailability of drugs at their site of action
- Sprayable or injectable via thin catheters
- Ease of production (liquid at room temperature)
- Made of approved components
- Possibility to adjust the thermosensitive hydrogel composition to modulate its mechanical properties

APPLICATIONS

Treatment of colorectal, gastric and gynaecologic cancer

DEVELOPMENT PHASE

- ✓ Performed optimization of thermosensitive hydrogel properties
- ✓ In vitro POC on gynaecologic and colorectal tumour cell lines
- ✓ In vivo POC in a mouse model of colorectal cancer: neo-adjuvant and adjuvant therapies
- ✓ In vivo POC on peritoneal carcinomatosis: neo-adjuvant therapy