

APPLICATIONS

- Hydrogel implant for tissue engineering: i.e. bone graft and cartilage defect
- Can also be developed for other applications in regenerative medicine

DEVELOPMENT PHASE

- *In vitro* and *in vivo* efficacy for stem cell survival and safety studies on relevant mice models
- On-going *in vivo* studies for bone reconstruction

INTELLECTUAL PROPERTY

International patent application filed on Oct. 2015

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VIVINJECT : NUTRITIVE HYDROGELS ENHANCING STEM CELL SURVIVAL FOR TISSUE RECONSTRUCTION

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

Biomaterial ■ Hydrogel ■ Stem cells ■

Regenerative medicine ■ Tissue engineering ■ Bone reconstruction

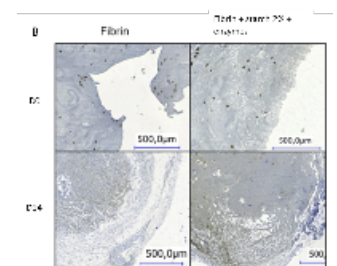
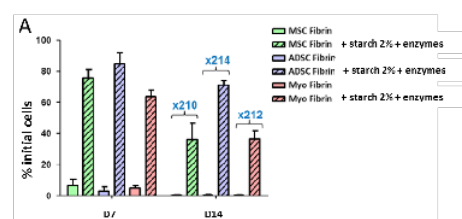
PRESENTATION

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].

COMPETITIVE ADVANTAGES

- Enhancement of stem cell survival
- Easy to manufacture
- Easy handling and storage
- Injectable