Glucose delivery system based-hydrogel composite scaffold for improving mesenchymal stromal cell survival and functionalities

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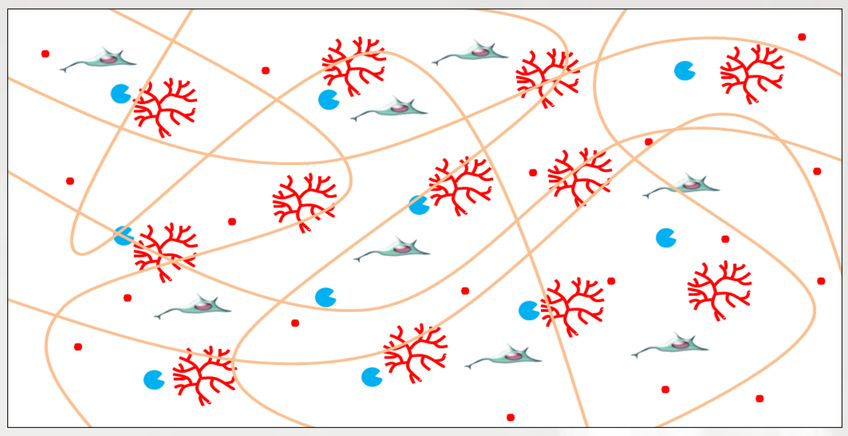
BACKGROUND

Mesenchymal stem cells (MSCs) are appealing candidates for regenerative medicine due to their paracrine abilities and their capacity to differentiate into bone, cartilage and adipose tissue.

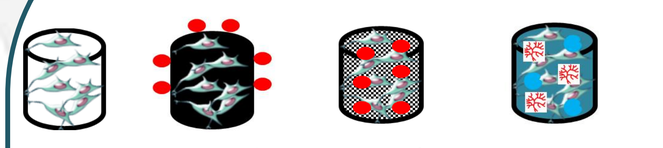
However, a major limitation in the use of MSCs is their massive death post-transplantation. This issue can be overcome by supplying glucose to MSCs post-implantation (Deschepper *et al.*2011 and 2013).

OBJECTIVE: To engineer a composite scaffold providing glucose to MSCs when transplanted *in vivo.*



MATERIALS & METHODS

Hydrogels + hMSCs

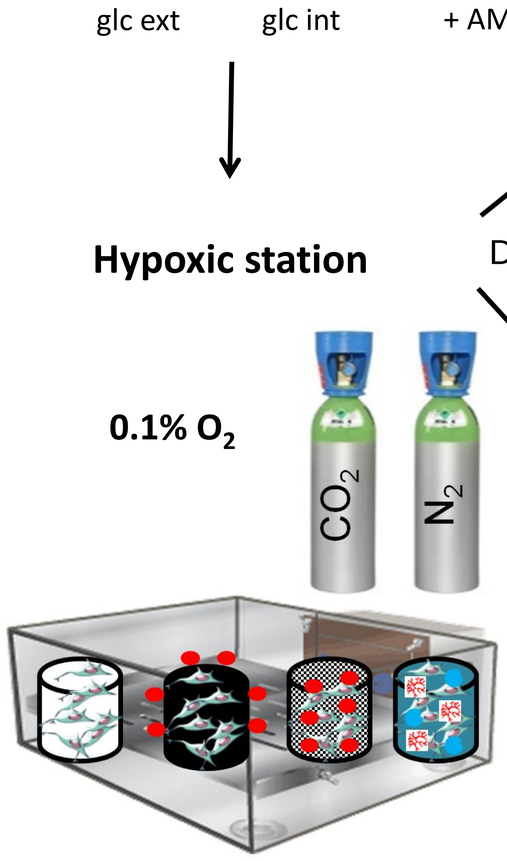


Cell survival
(H33342, PI)

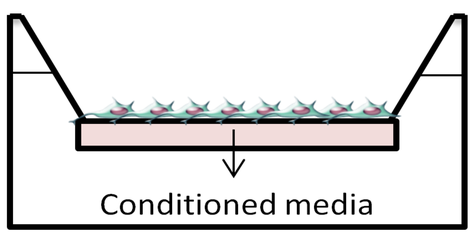
Hypoxic station

D7, D14

0.1% O_2

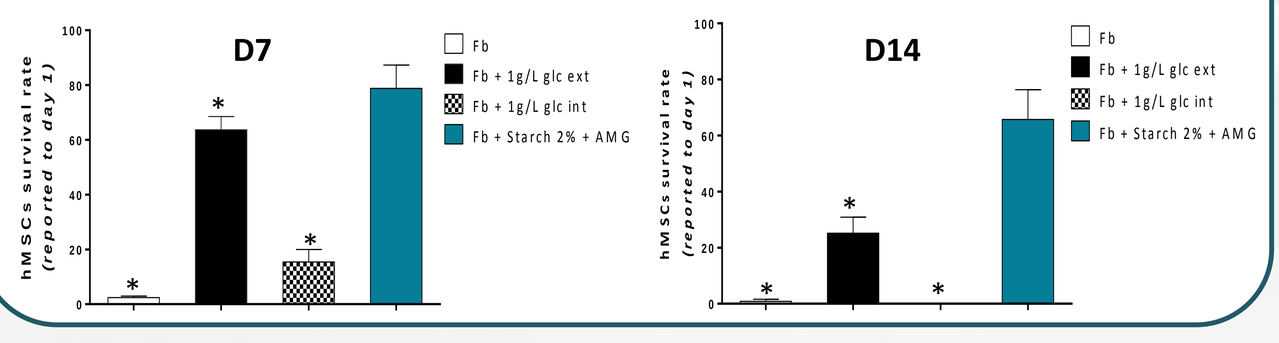


Chemotactic potential of cell secretome
(Boyden Chamber)

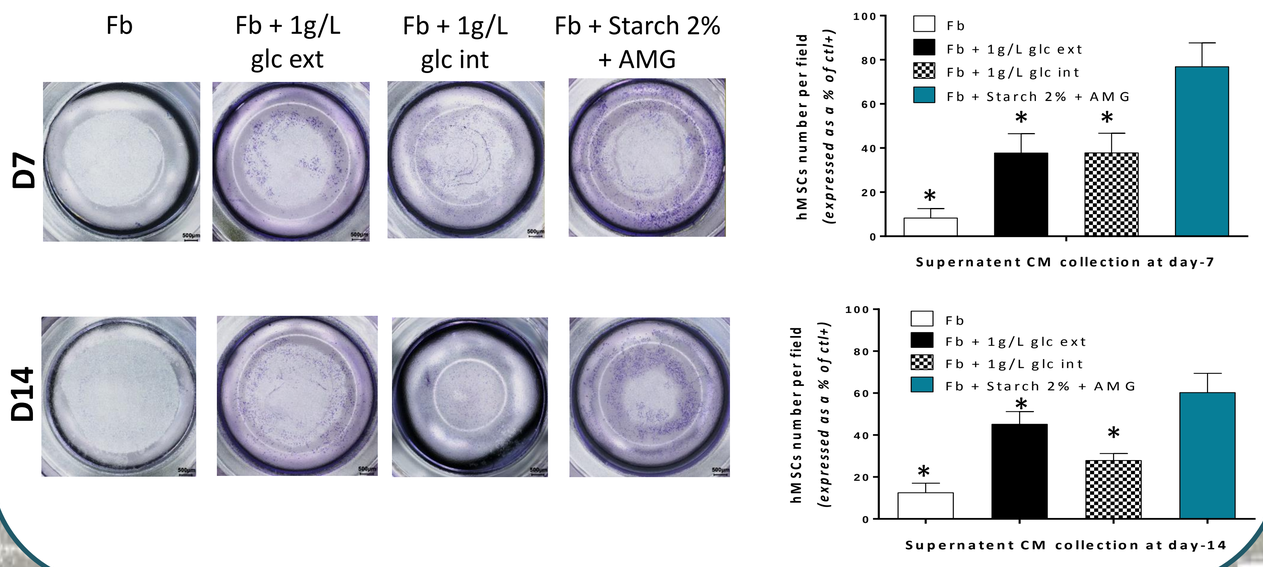


RESULTS

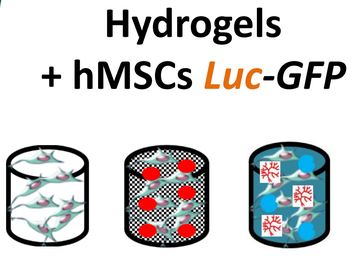
"Starch + AMG" system improves hMSCs survival inside hydrogels near anoxia



"Starch + AMG" system promotes the chemotactic potential of hMSCs secretome inside hydrogels near anoxia



Hydrogels + hMSCs *Luc-GFP*



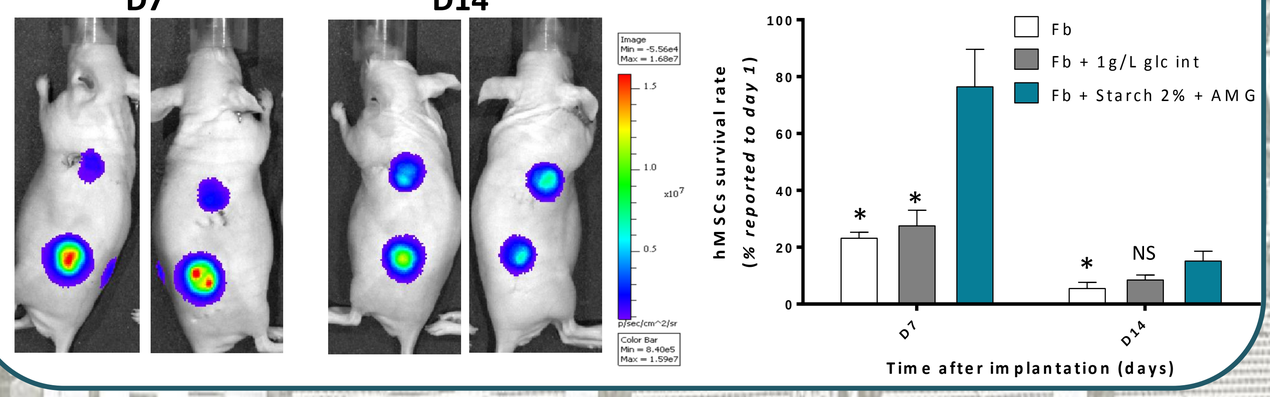
Ectopic implantation

D7
D14

Luciferin

Cell survival
(BLI)

"Starch + AMG" system improves hMSCs survival inside hydrogels after subcutaneous implantation



These findings suggest that glucose delivery system based on « Starch + AMG » inside hydrogel scaffold is a promising strategy in tissue engineering applications to improve hMSCs survival and functionalities in *in-vivo* ischemic environment.

Deschepper *et al.*, Journal of Cellular and Molecular Medecine, 2011
Deschepper *et al.*, STEM CELLS, 2013
CNRS, 2014. Deschepper *et al.*, European Patent Office, EP14306700