Fibre-based 3D Implants from Regenerated Silk Fibroin for Intervertebral Disc Regeneration

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INTRODUCTION

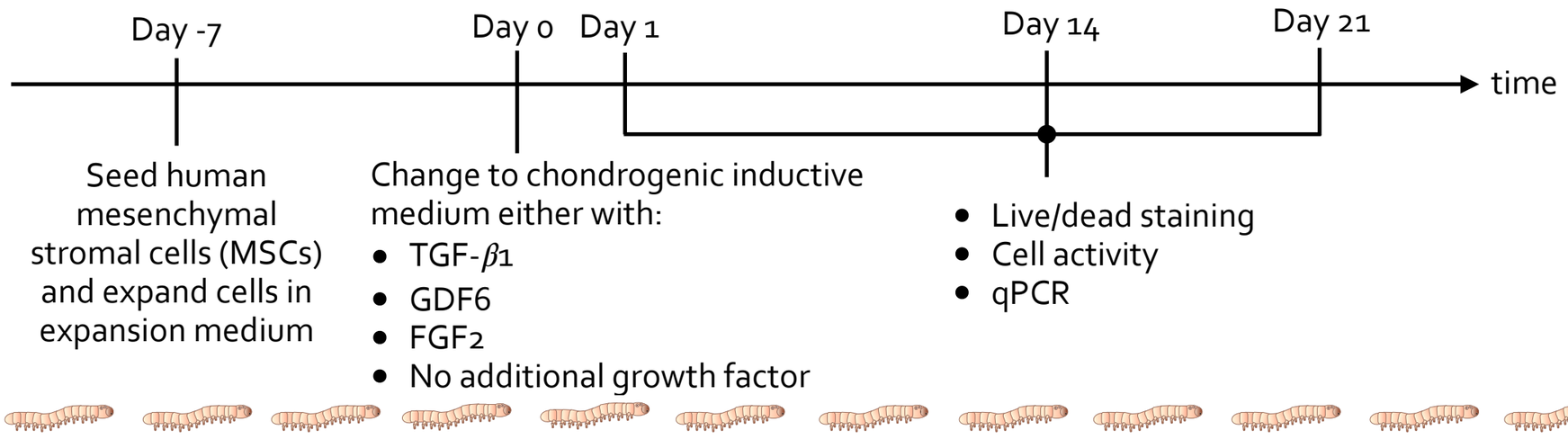
- Intervertebral discs (IVD) allow for six Degree-of-Freedom motion. However, they only have a very limited ability to self-repair in the event of degeneration or trauma.[1,2,3]
- A promising approach to solve this problem could be the application of silk fibroin derived from the silk worm *Bombyx mori*.
- In the past, numerous studies have shown the remarkable biocompatibility and bio-mechanical properties of silk.[4,5]

STUDY AIM

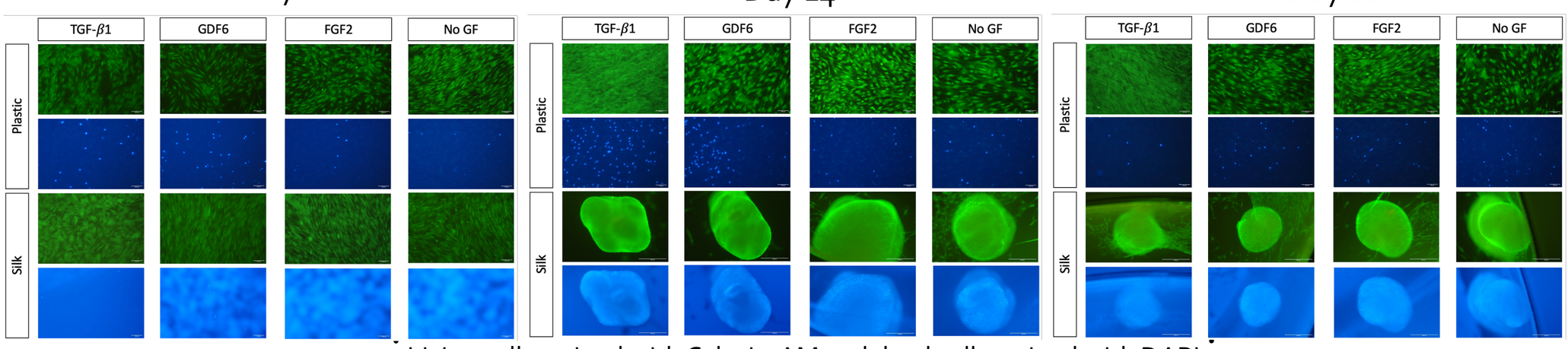
- Study the cyto-compatible properties of silk fibroin on human mesenchymal stromal cells with or without the addition of exogenously added growth factors.
- Investigate whether a 3D structure made of regenerated silk fibroin can potentially regenerate degenerated IVDs and ideally could be used for transplantation in patients suffering from damaged or degenerated IVDs.

MATERIALS AND METHODS

12-well plates covered with silk films

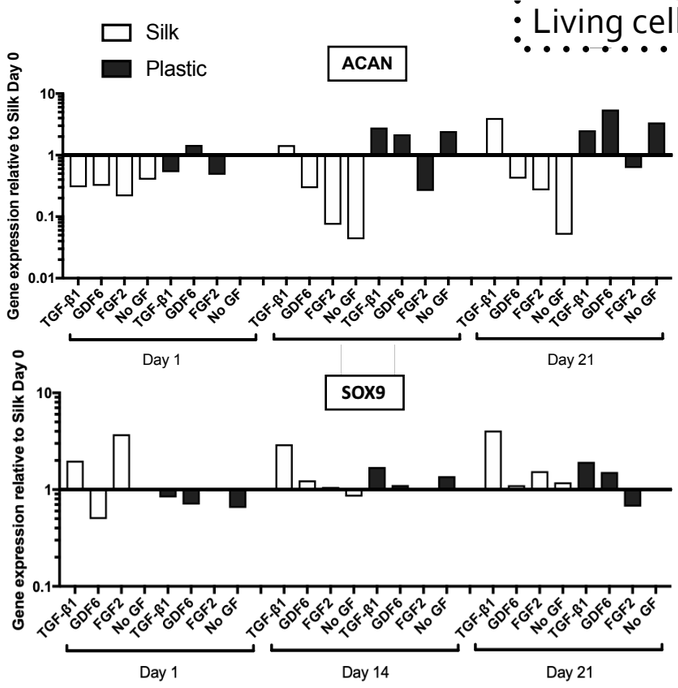


RESULTS



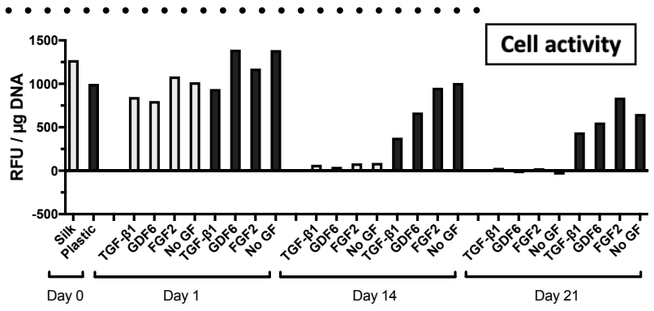
Living cells stained with Calcein-AM and dead cells stained with DAPI

High cell viability at day 1. However, after 14 days, MSCs formed pellets on the silk films.



Relative gene expression profile of Aggrecan core protein, Sra-Box transcription factor, and Matrix metalloproteinase 13.

Cell activity measured with resazurin sodium salt assay.



NEXT STEPS ...

Investigate how 3D silk scaffolds, which mimic an IVD, influence the behavior of MSCs and IVD cells.

CONCLUSION

- Silk fibroin films promote pellet formation in MSCs and consequently decreases the cells' activity.
- All tested growth factors lead to a comparable chondrogenic differentiation of MSCs.

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