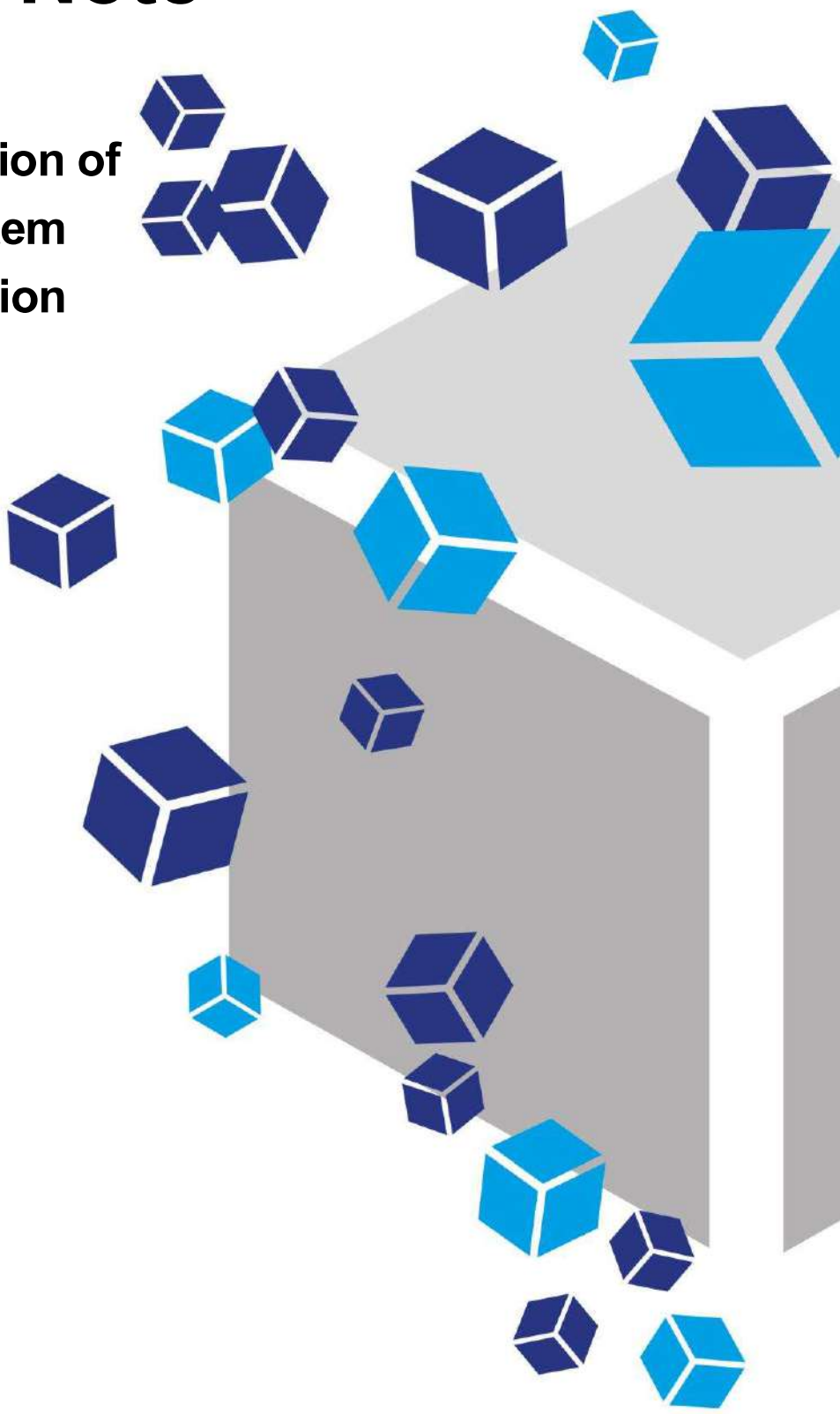
Application Note

PODS® Activin induction of mouse trophoblast stem cell aggregate cavitation



PODS® Activin induction of mouse trophoblast stem cell aggregate cavitation

Data Courtesy of Sarah Harrison and Magdalena Zernicka-Goetz, Cambridge University

Introduction to PODS®

The challenge for conventional growth factors

Many proteins, especially growth factors and cytokines, when used as a reagent, degrade quickly, rapidly losing their bioactivity. Additionally, they can also suffer from lot-to-lot product variation. This fragility and variability hampers research and significantly limits the therapeutic potential of proteins.

Protein Micro-depots

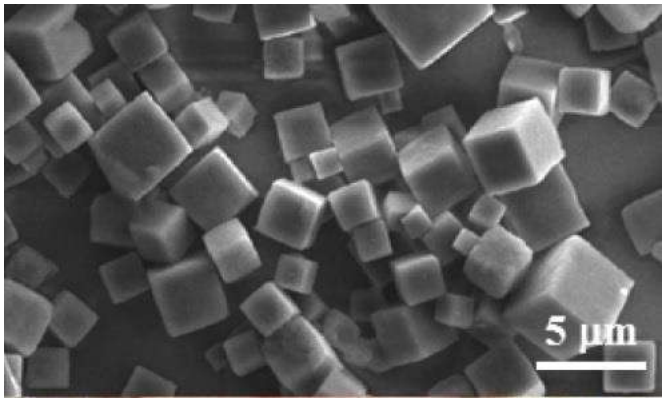
Development of a technology that can continuously replenish active protein from a local, microscopic store, has been a significant challenge, but one that could transform the fields of cell culture and medicine by allowing greater control and reproducibility of cell culture.

Introducing PODS®

PODS® is a sustained release system which continuously replenishes proteins from millions of local microscopic stores which can be placed next to (or at a distance from) cells, either randomly or in precise locations. Just like cells, these micro-depots release a steady stream of bioactive protein. This protein can be limited to local surroundings or dispersed more widely, or made to form a gradient.

How does it work?

At the heart of PODS® is an extraordinary polyhedrin protein. This specific polyhedrin protein has the unique ability to encase cargo proteins within perfect, transparent, cubic, micro-sized crystals, much smaller than the cells. These protein crystals form admixtures of the polyhedrin and cargo proteins which slowly degrade, releasing the biologically active cargo protein.



How can PODS® help my research?

PODS® are tough and will withstand physical and chemical stress, so you can handle them with ease. PODS® typically release intact cargo protein over several weeks and months. Using PODS® you can readily create a steady-state protein environment in microscopic detail wherever you want, tailored exactly to your requirements. This is the power of PODS®. PODS® proteins are now available for many growth factors and cytokines and are already being used in many leading world-class research labs. PODS® protein applications include:

- Micropatterning
- Physiological, stable gradient formation
- Bioinks for 3D printing
- Microcarriers
- Functionalizing scaffolds
- Microfluidics (lab on a chip)
- Improved and simplified stem cell culture
- Therapeutic protein delivery

Overview

Trophoblast stem cell (TSC) aggregates cavitate in the presence of Activin. The data presented here demonstrate the utility of PODS® Activin A to induce cavity formation in TSC aggregates.

Methods

Aggregate formation

TSC aggregates were generated as described[1] using Matrigel®. Single aggregates were transferred into each well in a 96 well plate containing 150 µl ETS Embryo media.

Cavitation

A single dose of 10^5 PODS® Activin A crystals were added to each well. No further media changes were required. Controls were set up which included no PODS® crystals or empty PODS® crystals (no cargo protein).

Immunocytochemistry

Cells were DAPI stained and with an antibody against F-Actin.

Results

PODS® Activin A treatment supports cavity formation in TSC aggregates.

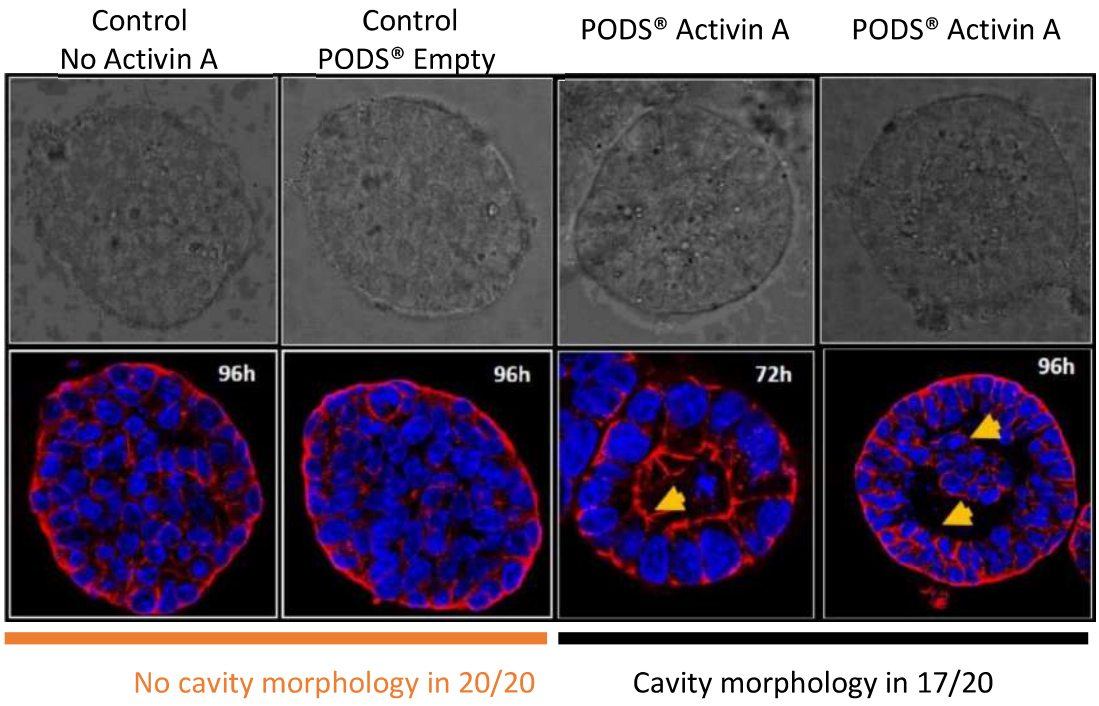


Figure 1. PODS® Activin A generates clear cavity formation in a high proportion of TSC aggregates. Aggregates were examined after 72- and/or 96-hours under fluorescence microscopy for cavity formation. This was observed in 17/20 aggregates treated with PODS® Activin A. Cavitation was not detected in any of the aggregates in either of the control groups.

Conclusions

- PODS® Activin A efficiently induces cavitation in mouse TSC aggregates
- Experimental protocols were simplified by the use of PODS®

Reference

Sarah Ellys Harrison, Berna Sozen, Neophytos Christodoulou, Christos Kyprianou and Magdalena Zernicka-Goetz. Assembly of embryonic and extra-embryonic stem cells to mimic embryogenesis in vitro (2017) Science Vol. 356, Issue 6334

Cell Guidance Systems' reagents and services enable control, manipulation and monitoring of the cell, both *in vitro* and *in vivo*

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- Instant Exosomes™ - purified and characterized
- NTA Service
- Freeze drying service

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- Tunable self-assembling peptide hydrogels

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