UNIVERSITY OF LIVERPOOL

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Novel Bioengineered Substrates for Pluripotent Stem Cell Culture

A molecularly engineered protein-based PSC culture substrate that can be easily and cheaply produced

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IP Status

Patent application submitted

Seeking

Licensing, Commercial partner

About **University of Liverpool**

By facilitating access to our expertise, facilities and networks, the University of Liverpool offers the means to transform ideas into creative solutions, improved performance, new technologies, strategies, applications, products or skills.

Background

A current barrier to the translation of PSC-based therapeutics for such diseases is that it is difficult and very costly to produce sufficient numbers of cells under the necessary GMP and xeno-free culture conditions. There is a pressing need for improved culture conditions to facilitate the scale-up of PSCs for clinical use.

Tech Overview

Human pluripotent stem cells (PSCs) have enormous potential to treat various degenerative diseases and the first UK clinical trial “The London Project to Cure Blindness” involving these cells is now underway. This trial is focussing on age-related macular degeneration (ARMD) and involves transplanting PSC-derived retinal pigment epithelial (RPE) cells into the eye. There is now much optimism that similar PSC-based therapies could be used to treat other diseases, such as Parkinson’s Disease (PD).

To address this need, a team at the University of Liverpool has developed a molecularly engineered protein-based PSC culture substrate that can be easily and cheaply produced. The Liverpool substrate has a 100% protein composition of human origin and can be produced in high yield.

The potential healthcare impact of the PSC culture substrate is that it will enable the affordable scale-up of PSCs under GMP and xeno-free conditions so that therapeutic cell types such as PSC-derived dopaminergic neurons can be generated in sufficient quantities for clinical applications.

The substrate is produced recombinantly in *E. coli* and assembled spontaneously *in vitro* by incubation in aqueous buffer. The resulting protein substrate can be passively adsorbed onto polystyrene surfaces for attachment of human embryonic stem cells and supports their self-renewal. Further, the scaffold may be further modified at different sites to generate multi-functionalized scaffolds for custom applications.

The current production of the Liverpool substrate under academic, manual, laboratory conditions coats about 300 T75 flasks using the material obtained from 1L bacterial culture (approx. 10 pence per flask). Although commercial and in-house costs are not directly comparable, this indicates that the substrate could be commercialised at low prices using established industry protocols for large-scale protein production under GMP conditions.

There is also a safety concern that other substrates on the market can produce cross-links between peptides, generating covalent aggregates. Aggregates might stimulate undesirable immune reactions in patients, causing unwanted and unnecessary side effects. In contrast, the Liverpool substrate only contains biodegradable protein components of human origin that have not undergone any chemical treatment, reducing the presence of aggregates.

Benefits

The main competitive advantage of the novel recombinant substrate is that it can be produced cheaply and reproducibly in bacteria.

Opportunity

The University is currently seeking a licensing partner to provide expertise in the commercialisation of the technology.

Patents

- A patent was filed in August 2017.