

Controllable System for Generating Mature Blood Vessels In Vitro for Drug Discovery and Screening Applications

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Technology description

A leading cardiovascular scientist at Robarts has created a cardiovascular culture system comprising; proprietary vascular smooth muscle cells; endothelial cells; a proprietary combination of growth factors, and the necessary substratum for the self assembly of complex multiwalled vessels with features associated with true vasculature. Further, the formation of complex blood vessels has been demonstrated in 2D models. This culture system may provide a foundation for the generation of simple or complex tissue equivalent models for the screening of angiogenic compounds or potential side effects of compounds on blood vessel structure and activity.

Background

Early concept stage screening of compounds for potential therapeutic application is a critical stage in drug development and represents a market of over USD\$1.2B/yr. It is estimated that cell-based and HCS assays represented approximately \$560 million in sales in 2007. Cell based assays are emerging as an alternative to HTS as they provide a closer representation of actual tissues, provide the flexibility of being able to evaluate a number of diverse cellular outcomes simultaneously, and allow one to examine specificity and functionality. To be effective, these assays must be relatively simple, reproducible, and relevant to the system to be evaluated. Similarly, while social pressure in Europe and Asia call to reduce the application of animals for biomedical research purposes, it has been estimated that 80% of the animals used for toxicology testing could potentially be replaced by tissue engineered products.

The difficulty in generating complex blood vessels in vitro has been an important limitation to the adoption and application of complex cell based models for studies of angiogenesis and vasculogenesis. While the formation of endothelial tubes is well known within the academic literature, the ability to generate integrated vessels that contain vascular endothelial cells with associated smooth muscle cells has been elusive. Similarly, the generation of stable, secure and invested blood vessels has been a challenge for tissue engineers, 2D and 3D cell based assay developers, and those considering regenerative medicine strategies employing stem and progenitor cells seeding within biomaterials. The ability to develop a system for self-assembling relevant cell types into stable, reactive blood vessels in

vitro would allow for the discovery of factors affecting vasculogenesis and subsequent angiogenesis as well as screen compounds for their ability to affect such processes.

Advantages

- Fully characterized in vitro model of vasculogenesis and angiogenesis
- Application as cell based tool for discovering factors critical for angiogenesis
- May serve as in vitro assay for screening the impact of cosmetic, ophthalmic, and therapeutic factors upon angiogenesis and vessel stability
- May serve as in vitro assay for screening of potential therapies of vascular disease
- Only in vitro cardiovascular culture system whereby cells will self assemble into microvasculature accurately reflecting angiogenesis/vasculogenesis
- Only in vitro cardiovascular culture system whereby the microvasculature is fully functional and vasoreactive
- System comprises cell lines, substratum, cell culture reagents and supplements.

Institution

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