A method using specific small-molecule inhibitors and growth factors to derive skeletal muscle precursor cells from hPSCs. These cells provide a valuable in vitro and in vivo research tool for studying early human development and disease, and could support cell-based therapies to treat muscle diseases such as dystrophies.

**THE CHALLENGE**

Human pluripotent stem cells (PSCs) such as embryonic stem cells (ESCs) and induced PSCs (iPSCs) provide an extraordinary research tool. In vitro, these cells display extensive proliferation and the ability to differentiate into derivatives of all three germ layers. Such characteristics give these cells a remarkable potential for use as an in vitro model of early human development and in cell-based therapies.

PSC differentiation protocols are currently available for a vast number of cell types. However, little progress has been made regarding differentiation of PSCs into derivatives of paraxial mesoderm, such as skeletal muscle, in the absence of forced transgene expression.

Appropriate combination of markers for efficient isolation of skeletal muscle precursors also remains to be determined.

There is a clear need for transgene free methods of differentiating and isolating pure populations of skeletal muscle precursors from PSCs.

**THE TECHNOLOGY**

Researchers from the Australian Institute of Regenerative Medicine have developed a simple two-step differentiation protocol to create skeletal muscle precursors, by treating hPSCs with a glycogen synthase kinase-3 inhibitor and then addition of fibroblast growth factor 21.

To isolate skeletal muscle cells generated in the system, the team also established a stringent cell sorting strategy using the muscle-specific markers known for embryonic hypaxial migratory precursors and mature myocytes.

The protocol has been successfully tested on several PSC lines and provides an invaluable standardised tool for directed differentiation of transgene-free myogenic cells for in vivo preclinical studies and in vitro functional and drug screening assays. Future applications of this method to patient-specific iPSC lines will also aid in the study of muscle diseases.

The transplantation of highly purified skeletal muscle precursors has been considered a possible option for the treatment of degenerative muscle disorders, such as muscular dystrophy.

**THE OPPORTUNITY**

Monash seeks a licensee or partner to develop this technology for research or clinical use.


Reference