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LY294002 small molecule promote motor neuron differentiation of human endometrial stem cells cultured on electrospun biocomposite Polycaprolactone/Collagen scaffolds

Small molecules as useful chemical tools can affect cell differentiation and even change cell fate. It is demonstrated that LY294002, a small molecule inhibitor of PI3K/Akt signal pathway, can inhibit proliferation and promote neuronal differentiation of mesenchymal stem cells (MSCs). The purpose of this study was to investigate the differentiation effect of Ly294002 small molecule on the human endometrial stem cells (hEnSCs) into motor neuron like cells on polycaprolactone (PCL)/Collagen scaffolds. hEnSCs were cultured in a neurogenic inductive medium contain 1μM LY294002 on the surface of PCL/Collagen electrospun fibrous scaffolds. Cell attachment and viability of cells on scaffolds were characterized by SEM and MTT assay. The expression of neuron-specific markers was assayed by real-time PCR and immunocytochemistry analysis after 15days post induction. Results showed that attachment and differentiation of hEnSCs into motor neuron-like cells on the scaffolds with Ly294002 small molecule were higher than that of the cells on tissue culture plates as control group. In conclusion, PCL/ collagen electrospun scaffolds with Ly294002 have potential for being used in neural tissue engineering because of its bioactive and three-dimensional structure which enhances viability and differentiation of hEnSCs into neurons through inhibition of the PI3K/Akt pathway that manipulation of this pathway by small molecules can enhance neural differentiation.

Key words: PI3K/Akt signaling, small molecule, differentiation, motor neuron cells, PCL/Collagen scaffol