Liver failure

The current treatment for liver failure is restricted to surgical liver transplantation, which is technically complicated, limited by the shortage of available organs and presents major risks to the patient. Bone marrow mesenchymal stem cells (BMSCs) represent promising sources of hepatocyte-like cells for cell transplantation treatment. However, a safe and efficient induction method for their differentiation remains to be defined. Here we further optimized an effective technique by combining high-dose treatment with hepatocyte growth factor (HGF) and ultrasound stimulation. The optimized ultrasound parameter (1.0 W/cm2 intensity, 1 MHz frequency, 20% duty cycle, 100 Hz pulse repetition frequency, 60-s irradiation duration, triple times in three days) combined with different HGF doses (10, 20 and 50 ng/ml) was used to treat BMSCs. The results showed that the specific hepatic markers, including α fetoprotein (αFP/AFP), cytokeratin 18 (CK18), albumin (ALB) and glycogen, were increased in a dosedependent manner. Their concentration was then further increased when ultrasound irradiation was administered (P < 0.05), as indicated by PCR, Western blot and immunofluorescence staining as well as a glycogen synthesis test. Furthermore, analysis of the hepatocyte-derived chemokines showed elevated stromal cell-derived factor 1alpha (SDF-1 α) and C-X-C chemokine receptor type 4 (CXCR4) after HGF treatment. Again, concentrations of those chemokines were further increased by ultrasound radiation (P < 0.05). The observed increased effect was sustained for 21 days. To summarize, we further defined the optimal combination of HGF and ultrasound treatment to increase the differentiation and chemotaxis of BMSCs in a safe, sustained and efficient manner. These findings provide a new perspective for stem cell orientation in the field of tissue engineering $^{1)}$

1)

Song L, Constanthin PE, Sun T, Li X, Xia Z, An L, Li F. Long-term Production of Glycogen and Hepatic-Derived, Cell-Invasion-Promoting Chemokines by Ultrasound-Driven Hepatic-Differentiated Human Bone Marrow Mesenchymal Stem Cells. Radiat Res. 2020 Mar 3. doi: 10.1667/RR15421.1. [Epub ahead of print] PubMed PMID: 32126187.

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