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Neural differentiation of mesenchymal stem cells influences their chemotactic responses to hepatocyte growth factor

Huanxiang Zhang
Medical College of Soochow University, China

Although much effort has been devoted to the delineation of factors involved in the migration of MSCs, the relationship between the chemotactic responses and the differentiation status of these cells remains elusive. Here, we report that MSCs in varying neural differentiation states display different chemotactic responses to hepatocyte growth factor (HGF): first, the number of chemotaxing MSCs and the optimal concentrations of HGF that induced the peak migration varied greatly; second, time-lapse video analysis showed that MSCs in certain differentiation state migrated more efficiently toward HGF; third, the phosphorylation levels of Akt, ERK1/2, SAPK/JNK, and p38MAPK were closely related to the differentiation levels of MSCs subjected to HGF; and finally, although inhibition of ERK1/2 signaling significantly attenuated HGF-stimulated transfilter migration of both undifferentiated and differentiating MSCs, abolishment of PI3K/Akt, p38MAPK or SAPK/JNK signaling only decreased the number of migrated cells in certain differentiation state(s). Blocking of PI3K/Akt or MAPK signaling impaired the migration efficiency and/or speed, the extent of which depends on the cell differentiation states. Meanwhile, F-actin rearrangement, which is essential for MSCs chemotaxis, was induced by HGF, and the time points of cytoskeletal reorganization were different among these cells. Collectively, these results demonstrate that neural differentiation of MSCs influences their chemotactic responses to HGF: MSCs in varying differentiation states possess different migratory capacities, thereby shedding light on optimization of the therapeutic potential of MSCs to be employed for neural regeneration after injury.

Biography

Huanxiang Zhang has completed his Ph.D at the age of 28 years from Beijing Normal University, China and postdoctoral studies from Geneva University School of Medicine, Switzerland. He is now working in the Department of Cell Biology, Medical College of Soochow University, China. His research focuses on the control of the directed migration and differentiation of stem cells, including neural stem cells, mesenchymal stem cells and embryonic stem cells, and tissue engineering, especially the interaction between stem cells and the silk fibroin scaffolds with a variety of physical and chemical properties. He has published more than 50 papers in reputed journals. Recently, his group demonstrated the close relationship between the chemoattractant-stimulated chemotaxis of stem cells and their differentiation states and the underlying mechanisms.

hzhang@suda.edu.cn