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Human Dental tissues derived Mesenchymal Stem cells in regenerative medicines

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Abstract

Human dental tissues provide an alternative autologous source of mesenchymal stem cells (MSCs) for future stem cell therapy. We derived MSCs from human dental follicle, papilla and pulp tissues after impacted third molar extraction of the same donor. All the three types tissue derived cells were investigated for expression of pluripotent markers and MSCs specific cell surface markers along with their ability to differentiate into osteocytes and adipocytes (mesodermal lineage). All the three types of dental MSCs had showed almost similar morphology, expressed pluripotent markers (Oct4, Sox2, Nanog) and were found positive for mesenchymal markers (CD 44, CD 90, CD 105) and negative for hematopoietic markers (CD 34, CD 45), and differentiated into osteocytes and adipocytes. After the initial characterization, MSCs from dental follicle, papilla and pulp were trans-differentiated into neuronal cells. It is speculated that dental stem cells have neural crest origin, so they have higher neurogenic capacity as compared to MSCs derived from other tissues. MSCs were exposed to neuronal induction media for 3 weeks and then were analyzed for the expression of neuronal specific markers at mRNA and protein level, which deciphered higher expression level in pulp differentiated neuronal cells as compared to follicle and papilla. Functional analysis were performed using whole patch clamp technique (electrophysiology) to record Na+ and K+ currents in all dental differentiated and non-differentiated MSCs. Electrophysiological data revealed higher conductance (Na+ and K+) in pulp derived neuronal cells than the follicle and papilla. In conclusion, three types of dental MSCs from a single donor broadly possessed similar cellular properties and can differentiate into neuronal cells, but pulp derived MSCs showed higher neurogenic potential than the follicle and papilla, suggesting their use in future stem cells therapy for the treatment of neurodegenerative disorders. We also further analyzed the in vivo regeneration capacity of dental pulp derived MSCs in rat neurotmesis model.

Biography

Imran Ullah has completed his/her PhD at the age of 30 from Gyeongsang National University, South Korea. He worked for two and half years as a post-doctoral fellow at National Institute of Animal Science (NIAS), South Korea. Currently, he is working as an Assistant Professor of Biochemistry, Quaid-i-Azam University, Islamabad, Pakistan. He has over 20 publications that have been cited over 700 times, and his/her publication H-index is 11.

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