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Complement C5a promotes odontogenic dental pulp stem cell differentiation

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Dental pulp stem cells (DPSCs) are multipotent/undifferentiated cells that are found in the soft living tissue within the dental pulp. Given their easy access compared to other stem cells, they have been given much attention in recent regenerative medicine. Odontoblasts are dentin-making cells in the pulp and have a significant role in dentin-pulp repair in injured teeth. Our team demonstrated for the first time that the complement system, a major component of innate immunity and inflammation, is activated at the injured site of human carious teeth and plays an important role in dental nerve regeneration. We extend this observation in DPSC differentiation. The role of complement fragment C5a in the differentiation of DPSCs is unknown. Human DPSCs were prepared from healthy molars at the 2/3 root formation stage by the explant outgrowth method. DPSCs were cultured in regular media and osteogenic media and treated with C5a antagonist and C5a exogenous protein for 72 hours in regular growth media, and then swapped with osteogenic media for 21 days. The C5a inhibitor and protein were treated every three days during the whole differentiation process. Immunohistochemistry, PCR and western analysis for various differentiation markers were performed. C5a plays a positive role in odontogenic differentiation of DPSCs. The odontogenic differentiation genes, BMP1, ON, RUNX2, DSPP, have all increased relative to the control. Our results demonstrate that C5a constitutes a positive regulator of the odontogenic DPSC differentiation and identified the C5a as a key initial signal to control odontogenic DPSC differentiation.

Biography

Amer Marachli is an undergraduate student at the University of Illinois at Urbana-Champaign with a bachelors in science in Molecular and Cellular Biology. He joined Dr. Seung Chung's lab as a Summer Research Intern in June 2017, and successfully completed his project regarding the role of C5a in DPSC odontogenic differentiation. He plans to apply to dental schools in the fall of 2017.

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