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Graphene oxide incorporated silicate doped nano-hydroxyapatite novel composite for bone tissue engineering

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Hydroxyapatite, as the natural inorganic phase of the bone tissue has been widely used as the main structure of bone tissue scaffolds. In studies, ion substitution into hydroxyapatite structure enhanced the osteogenic properties. Silicon is an ion that was used to produce silicate doped hydroxyapatite (SiHA). SiHA is reported to promote proliferation and osteogenic activity of osteoblasts. Graphene oxide (GO) is formed by functionalization of graphene with oxygen-containing groups, reported to enhance adhesion and growth of cells while inducing calcium phosphate deposition. In this study, we aimed to combine osteogenic properties of SiHA and GO in order to produce a novel composite to be incorporated into bone scaffolds as osteogenic component. Therefore, composite groups with different ratios of SiHA and GO were compared to identify the most effective composite composition. Composite groups were evaluated in a fibrous scaffold structure formed by electrospinning within PCL solution. Scaffolds were characterized in terms of protein adsorption-desorption, calcium deposition and tensile strength properties. *In vitro* studies were conducted with human osteosarcoma (Saos-2) cell line as cell adhesion, spreading, proliferation and ALP activity. Scaffold groups bearing GO showed increased protein adsorption and improved initial cell attachment. Cell spreading and proliferation were highest in the group with effective concentrations of SiHA and GO (PCL-10%SiHA-4%GO). The group also showed higher calcium phosphate deposition and alkaline phosphatase activity. Results showed that the novel GO incorporated SiHA composite has high potential to be used as a bone tissue engineering material.

Biography

Ali Deniz Dalgic completed his undergraduate study from the Department of Biological Sciences and MSc from the Department of Engineering Sciences at Middle East Technical University. During his MSc, he studied on liposomes as controlled drug delivery system for cancer therapy. He is a PhD candidate in Middle East Technical University, Department of Engineering Sciences. In his PhD studies, besides liposomal drug delivery, he has also specialized on tissue engineering and regenerative medicine. He has 6 years of working experience as a Research and Teaching Assistant. He has 2 published and 1 accepted journal articles and has ongoing projects on drug delivery systems, tendon and bone tissue engineering.

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