عنوان مقاله:

3D composite scaffold incorporating osteogenic phytomolecule for bone tissue engineering: with an emphasis on multi-functional properties of resveratrol

محل انتشار:

اولین کنگره بین المللی مهندسی بافت و پزشکی بازساختی ایران (سال: 1397)

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خلاصه مقاله:

Bone is the second most commonly transplanted tissue worldwide, with over four million operations using bone grafts or bone substitute materials annually to treat bone defects. Bone grafts have been predominated used to treat bone defects, delayed union or non-union, and spinal fusion in orthopaedic clinically for a period of time, despite the emergency of synthetic bone graft substitutes. However, significant limitations affect current treatment options and clinical demand for bone grafts continues to rise due to conditions such as trauma, cancer, infection and arthritis. The replacement of conventional autografts and allografts by bone fragments constructed from alternate materials, cells, and molecules (growth factors, drugs, etc.) is an exciting prospect in the field of bone tissue engineering.A variety of materials and manufacturing methods including 3D printing have been used to create novel alternatives to traditional bone grafts. However, individual groups of materials including polymers, ceramics and hydrogels have been unable to fully replicate the properties of bone when used alone. Favourable material properties can be combined and bioactivity improved when groups of materials are used together in composite 3D scaffolds. Natural compounds represent an emerging class of therapeutics for skeletal diseases. Among these therapeutics natural product, resveratrol, represents one of the most promising candidates owing to its multifaceted effect on bone tissues. Resveratrol (3,5,4′-trihydroxy-trans-stilbene) belong to stilbenes family, an important subclass of polyphenols, and can be found in grapes, raspberries, and mulberries. Resveratrol is produced by plants in response to attack by pathogens. Resveratrol demonstrated anti-carcinogenic activity and was found to be able to induce endothelial production of nitric oxide, reduce oxidative stress and inhibit vascular inflammation. Resveratrol can enhance the ALP activity and mineralization of the cell-scaffold composites, and significantly increase osteogenesis. Resveratrol possessed biphasic effect on self-renewal and differentiation of stem cells, also can protects pluripotent stem cells from apoptosis, and promotes osteogenesis and inhibits adipogenesis in mesenchymal stem cells.Overall, through the aforementioned reports, resveratrol can be considered as a suitable candidate for prevention of postmenopausal

osteoporosis and development of bone tissue engineering.

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