Letter to the Editor

TISSUE ENGINEERING: APPLICATIONS IN DENTISTRY

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Dear Editor,

Tissue engineering is an interdisciplinary field that applies the principles of engineering and life sciences toward the development of biological substitutes that restore, maintain or improve tissue function.[1] The principal objective behind tissue engineering is to replace and reconstruct the tissue so as to alleviate pain and to restore mechanical stability and function.[2] It employs the knowledge of tissue and molecular biology for the growth and development of new tissues, knowledge of biomaterials and engineering principles for engineering functional tissues, and is likely to revolutionize the ways we improve the health and quality of life of people by restoring, maintaining, or enhancing tissue and organ functions.[3]

The field of tissue engineering is highly multidisciplinary and is based on three fundamental principles, namely: (I) the cells, responsible for synthesis of the new tissue matrix; (II) growth factors that promote and facilitate cell function; (III) and scaffolds that act as an extracellular matrix, allowing cell differentiation, proliferation and biosynthesis.[4] One of the main determining components of tissue engineering are the cells, which can be stem cells, progenitors, or differentiated cells such as osteoblasts, fibroblasts, and cementoblasts. They can be autologous, allogeneic, xenogeneic, genetically-altered or phenotypically-altered cells. In the oral cavity, stem cells can be derived from dental pulp, periodontal ligament, exfoliated deciduous teeth, apical papilla, dental follicle and gingival.[3]

Growth factors are extracellular secreted proteins that bind to cell receptors and modulate cellular activity, by regulating the rate of proliferation, inducing differentiation into another cell type, or by stimulating cells to synthesize mineralizable matrices. They are critical to the development, maturation, maintenance and repair of oral tissues as they establish an extra-cellular environment that is conducive to cell and tissue growth. Different growth factors have been used in tissue engineering, among them are the bone morphogenetic proteins (BMP); fibroblast growth factor (FGF); epidermal growth factor; platelet derived growth factor (PDGF); transforming growth factor and vascular endothelial growth factor (VEGF).[5]

Tissues are organized as three-dimensional structures and appropriate scaffolding is necessary to provide a spatially correct position of cell location and to regulate differentiation, proliferation or metabolism. Extracellular matrix molecules control the differentiation of stem cells and an appropriate scaffold might selectively bind and localize cells, contain growth factors and undergo biodegradation over time. Scaffolds can be bone graft materials (allografts, xenografts or alloplasts), polymers (natural polymers such as collagen, fibrin and hyaluronic acid or synthetic polymers such as polylactic/poly glycolic acid or their copolymer), or a combination of both.[6]

In dentistry, tissue engineering can be applied in periodontal tissue engineering (guided tissue regeneration, guided bone regeneration), oral and maxillofacial reconstructive surgery and regenerative endodontics.[2] Tissue engineering will have considerable impacts on dental practice and is likely to revolutionize the ways we improve the health and quality of life of people by restoring, maintaining, or enhancing tissue and organ functions.[2,3]

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There are no conflicts of interest.

REFERENCES

1. Deepak BS, Nandini DB, Naik SN. Tissue engineering: Is it the future of endodontics? Peoples J Sci Res. 2011;4(1):76-82.
2. Anche S, Kakarla P, Avula SS, Akkala SG. Impact of tissue engineering in dentistry. Niger J Exp Clin Biosci. 2017;5(2):35-38.
3. Hiral J, Shelaan K. Tissue Engineering in Regenerative Dental Therapy. J. Healthcare Eng. 2011;2(4):405-426.
4. Rai R. Tissue engineering: step ahead in maxillofacial reconstruction. J Int Oral Health. 2015;9(7):138-142.
5. Moro JS, Barcelos RCS, Terra TG, Danesi CC. Tissue engineering perspectives in dentistry: review of the literature. RGO, Rev Gaúch Odontol. 2018;66(4):361-367.
6. Yang S, Leong KF, Du Z, Chua CK. The design of scaffolds for use in tissue engineering. Part I. Traditional factors. Tissue Eng. 2001;7(6):679-689.