Editorial

A Review of Tooth Tissue Engineering Studies

Tarek EL-Bialy*

Division of Orthodontics, University of Alberta School of Dentistry, Canada

I would like to congratulate the vision of the editorial board of The Open Dentistry Journal, and the Editorial Manager Ms. Ajum Ara at Bentham Science Publishers, for realizing a special issue on tissue engineering teeth.

It was an important moment in 2006, media interpreted the possibility of enhancing tooth eruption and formation in rabbits and the possibility of preventing or repairing orthodontically induced root resorption in human, as a potential of regrowing teeth in human. There has been growing evidence in the literature that tissue engineering teeth may be a possibility in the near future. Reaching moon and other planets by human was a dream in late 1980s, but it became a reality in the 1900s [1].

Tissue engineering teeth may be interpreted by laypersons as (regrowing teeth); however the enhancement of eruption of rabbits' teeth by ultrasound was the information that was interpreted by media as teeth regrowing [2].

Since 2006, it is appropriate to recall, the public is still waiting for a tool or technique to regrow human teeth. Also, since the first publication about the effect of ultrasound on lower incisor eruption and formation, many research interests appear worldwide to uncover the molecular basis of the potential use of therapeutic ultrasound in tissue engineering teeth [3].

The undertaking of research to understand the underpinning of low intensity pulsed ultrasound in dental tissue regeneration and possibly tissue engineering teeth has increased since 2003 [3]. However, teeth tissue engineering requires also specific scaffolds and cell characteristics to be able to differentiate into odontoblasts or odontoblasts-like cells that are capable of producing dentine or dentine like structures in order to engineer teeth or root.

The National Institute for Dental and Craniofacial Research (NIDCR) has dedicated a special program to tissue engineer teeth, known as (Building A Tooth: Bridging Biology and Material Sciences) which requires integration between biotechnology, biomaterials and cell biology. This research program pointed out the importance of seven main pillars which include: 1) understand cell-protein, protein-protein and protein-crystal interactions associated with the creation of hydroxyapatite composite tissues; 2) understand the cell-to-cell interactions and cell-to-extracellular matrix interactions required for dental tissue formation and biomineralization; 3) understand how interfaces between one mineralized tissue and another (from enamel to dentine to cementum to bone) are formed and how biology mediates their association and the dynamic, but firm anchorage of teeth to the jaw; 4) acquire an understanding of how mineral formation is initiated and shaped to achieve the esthetic, mechanical and scale properties of the original tissue; 5) understand and ultimately control the organization of extracellular matrix by cell surface nano-mechanisms; 6) develop stem cell technologies for tooth and supporting connective tissue regeneration; and 7) finally, be able to recreate functional teeth using biological principles. Although these seven pillars cover most of the aspects that are needed to move forwards towards teeth tissue engineering, another aspect that probably would add a new dimension is the application of a bioreactor or an enhancer to promote dental tissue formation [4].

This special issue of the Open Dentistry Journal addresses the current state-of-the-art scientific basis of teeth tissue engineering. Also, it addresses the potential use of low intensity pulsed ultrasound as a promoter or a clinically acceptable bioreactor to teeth tissue engineering.

The articles in this special issue of The Open Dentistry Journal represent different aspects of this special topic with regard to scaffolds, cells and mechanical stimulations for tissue engineeringteeth.This special issue of The Open Dentistry Journal presents a number of original research and review papers that cover teeth tissue engineering. The essential sections of this special issue include the important review by Arefin et al. about the current state-of-the-art or all contemporary scaffolds for teeth tissue engineering. It covers wide range of scaffold that was tested for the potential use in teeth tissue engineering. The interaction between different stem cells and scaffolds is presented and discussed. This provided the readers and researchers with an idea for the future research in this area and how this would be a part of the clinical practice in the future.

The second paper by Braga Rego, *et al.*, about the potential use of Low Intensity Pulsed Ultrasound (LIPUS) in teeth tissue engineering presents an important aspect of in-vitro and in-vivo use of LIPUS in teeth tissue engineering. It also uncovers the molecular biology about the use of LIPUS in enhancing gene expression of dental tissue forming cells and the future research to utilize LIPUS in teeth tissue engineering.

*Address correspondence to this author at the Orthodontics and Biomedical Engineering, University of Alberta, Edmonton, Canada; Tel: 780-492-2751; Fax: 780-492-1624;
E-mails: telbialy@ualberta.ca, telbialy@hotmail.com

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The third paper by El-Bialy, T and Lam, B. presents new data about the effect of LIPUS on periodontal ligament cells for potential use in dental and periodontal tissue engineering.

The last paper entitled (Dental Tissue Repair: Novel Models for Tissue Regeneration Strategies) by Sloan, A.J. and Lynch, C.D. presents novel research in teeth tissue engineering. The *ex-vivo* model of studying scaffold-cell interaction presents a novel method of studying dental and periodontal tissue engineering.

Collectively, this special issue sheds the light on the state-of-the-art of the contemporary techniques that showed promise in their potential utilization in teeth tissue engineering. Also, this special issue by being provided free access online will provide the public with the difference in what has been called by media "regrowing teeth" and the science behind the potential tissue engineering teeth through this editorial.

I would like to extend my thanks to the Editor in Chief, The Open Dentistry journal for sponsoring this important special issue to uncover the current state-of-the-art scientific literatures and future direction in teeth tissue engineering.

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