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## EDITORIAL

# Evolving Concepts in Odontogenesis

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Tooth replacement has always been a biggest challenge for the dentists. There is no single material which can replace the properties of the natural tooth. Tooth loss due to trauma, disease or congenital abnormalities is a major health care problem worldwide and can also cause serious physiological and psychological consequences on patients. Hence numerous researches are being out, with main focus to replace the damaged tissue with cells and/or biological molecules that can create a functional replacement tissue in a diseased or damaged site.

Tissue Engineering (TE) is one such field of study that represents the most promising approach toward organ replacement. In fact, the use of a biological substitute for restoring functional balance may be more compatible with the body than the available therapies. The principles behind TE are the existence of stem cells, tridimensional structure (scaffolds) and growth factors, resulting in the construction of a functional organ. Scaffolds can be used as support as they have macro- and micro-geometry similar to the original tissue mimicking its anatomical, functional and mechanical proprieties thereby facilitating the migration and binding of transported cells or biomolecules used to replace, repair and regenerate newly formed tissue.

Orofacial structures are very unique in their development and function and have limited and variable capacity for regeneration. As far as regeneration of tooth is concerned there have been tremendous researches in the field of tissue engineering. The first attempt involved the application of calcium hydroxide for regeneration of dentine and pulp in traumatically exposed teeth. Since then there has been tremendous advancements in the field of tissue engineering, which has resulted in the development of fully functional bioengineered tooth. Dental tissues such as pulp, mucosa, gingiva, periodontium, exfoliated deciduous teeth, human retained teeth are a very rich source of stem cells which can induce the regeneration of dentin-pulp complex[4].

Odontogenesis, is a complex process that involve a series of reciprocal epithelial–mesenchymal interactions and coordination between the crown and the root with its associated periodontium. Thus cells dissociated from epithelium and mesenchymal tissues of prenatal or postnatal tooth germ can be used to reconstitute ‘‘bioengineered tooth germ’’ in vitro. This bioengineered tooth germ can then be transplanted into the oral environment to form a fully functional tooth. Synthetic scaffolds like biodegradable polyglycolic / polylactide having the shape of tooth have also been used in rats to produce bioengineered tooth.

There are numerous challenges in tissue engineering which must be addressed before achieving a fully formed tooth such as optimizing the number and quality of dissociated tooth bud cells, incorporating growth factors and cytokines or even transplantation of a regenerated tooth rather than regenerated tooth bud, knowledge of the sequence of events that are involved in engineering a specific type of teeth. After the required type of tooth is formed, controlling the anatomy and colour of bioengineered tooth is another area of investigation. Also it is very essential to maintain the continuity of the engineered tooth with the jaw bone by fully functional periodontium and highly vascularized

pulp for the success of regeneration. Thus tissue engineering is a major breakthrough in the regenerative field that has a potential to replace a variety of lost tissues and organs. Till date a lot of progress is happening in this field which aims to overcome the challenges posed and to develop novel scaffolds or fabrication methods which can help in successful regeneration of irreversibly damaged tissue. The future of these therapies involving more biological approaches and the use of dental tissue stem cells is promising and advancing.