"Tooth formation & repair with stem cells or other cells"

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INTRODUCTION: A big effort has been done during the last 20 years to understand the molecular events leading in tooth formation. The understanding of the genetic code controlling tooth development and repair will permit us to imagine and generate new products and replacement tissues for injured and unhealthy teeth. The potential of stem cells is also enormous for the creation of new teeth. For this purpose, stem cells may originate from both the bone marrow and tooth, as they share many of the same markers (type I collagene, DSP etc).

DISCUSSION & CONCLUSIONS: The reparative mechanisms that operate following carious lesion and traumatic dental injury are critical for dental pulp survival. Severe injuries are lethal to the odontoblasts and their replacement requires the presence of stem cells. Stem cells have been identified recently in adult human teeth. These cells are able to differentiate in vivo and in culture to odontoblasts, chondrocytes, adipocytes and neuronal cells. In dental injury, damaged odontoblasts are replaced by the pulp-derived stem cells, which are differentiating into odontoblasts and produce a reparative dentin. This is a complex process requiring the collaborative efforts of different cell lineages. The close association of mesenchymal cells and neovessels in dental diseases and the relation to Notch signalling pathway may be important in the regulation of stem cells to form odontoblasts. During the tooth repair process, pulp-derived stem cells proliferate and express Notch molecules. Other stem cell markers such as P75 and Nestin have proved useful in identifying stem cells and the newly formed odontoblasts. Tooth repair can be greatly improved by the supplementation of growth factors, cell adhesion molecules and supportive extracellular matrix components. Growth factors (i.e. TGFßs, BMPs), dentin matrix and enamel matrix proteins have been evaluated for their potential contributions to dental tissue repair. However, it is difficult to deliver active growth factors over the entire duration of tooth repair. Scaffolds and cell aggregates are effective and appropriate vehicles for supplying bioactive factors. Furthermore, aggregates of stem cells could be used for local transplantation in the wounding dental tissue. These experimental approaches show that the requirements for functional tooth formation/repair are complex. Yet, a single approach has not allowed an effective clinical therapy. However, these new techniques and information will be used for developing more biological approaches for dental repair in the future.

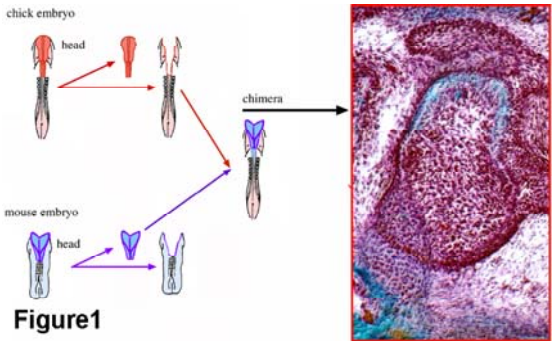

Fig.1: Neural crest cells from mouse have contributed to formation of tooth structures in chick

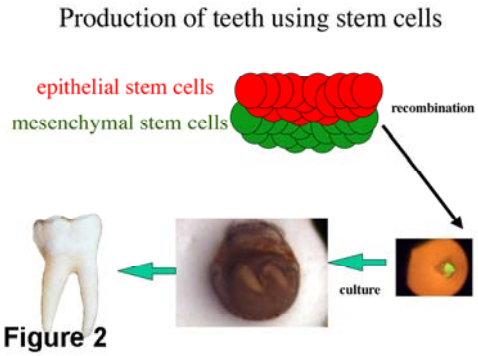

Fig. 2: Schematic representation showing the production of a tooth using stem cells

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