**Lec.17**

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**Development of Teeth**

In humans two sets of teeth develop at different times of life. First set called **deciduous teeth (primary dentition)** which are temporary. Second set called **permanent teeth (secondary dentition)** which are permanent.

The teeth develop from **ectodermal oral epithelium** and underlying **neural crest mesenchyme**. Enamel of the tooth is derived from ectoderm whereas all other tissues of tooth (dentine, pulp, cementum, and periodontal ligaments) are derived from neural crest mesenchyme.

The teeth develop in relation to alveolar process involving reciprocal induction between neural crest mesenchyme and overlying ectodermal oral epithelium.

**Stages of Development of Tooth**

For descriptive purposes, the development of tooth is divided into five stages: (a) dental lamina stage, (b) bud stage, (c) cap stage, (d) bell stage, and (e) apposition stage.

The following text deals with the development of the lower incisor teeth.

**Dental Lamina Stage**

The ectodermal epithelium overlying the upper convex border of the 3alveolar process becomes thickened and projects into underlying mesoderm to form the **dental** **lamina**. Since the alveolar process is U shaped, the dental lamina is also U shaped.

**Bud Stage**

The dental lamina now proliferates at ten sites to produce local swellings called **tooth buds** (**enamel organs**) that grow into the underlying mesenchyme. Thus, there are ten such enamel organs (five on each side) in each alveolar process. **These ten enamel organs first form** **20 deciduous teeth and later form permanent teeth** **when the deciduous teeth are shed off**.

**Cap Stage**

The mass of underlying neural crest mesenchyme invaginates the tooth bud/enamel organ. As a result, the enamel organ becomes cap shaped. This mass of mesenchyme that invaginates the tooth bud is called **dental papilla**.

**Bell Stage**

The enamel organs differentiate into three layers: **1.** Outer cell layer called **outer enamel epithelium** **2.** Inner cell layer called **inner enamel epithelium** **3.** Central core of loosely arranged cells called **enamel reticulum**.

As the enamel organ differentiates, the developing tooth assumes the shape of a bell, hence it is called bell stage. The cells of the enamel organ that line the dental papilla (cells of the inner layer enamel epithelium) become columnar and are now called **ameloblasts**.

The mesodermal cells of dental papilla adjacent to ameloblasts arrange themselves as a continuous epithelial layer. The cells of this layer are called **odontoblasts**.

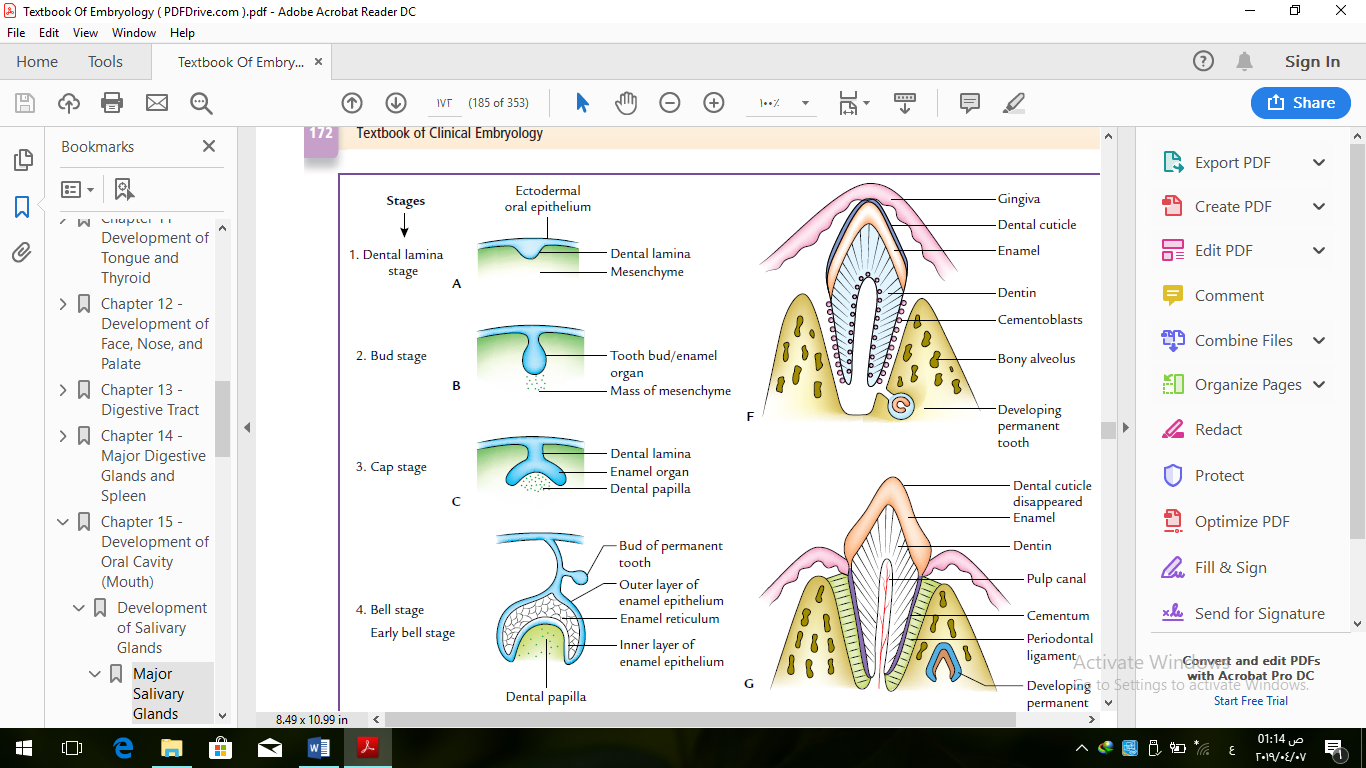
The ameloblasts derived from inner enamel epithelium of the **enamel organ** form the **enamel** and the odontoblasts derived from **dental papilla** form the **dentine** and **dental pulp**.

As the enamel organ and dental papilla develop, the mesenchyme surrounding the tooth condenses to form **dental sac**. The **dental sac** is primordium of **cementum** and **periodontal ligament**. Figure 15.9 shows the Photo micrographs of bell stage of developing lower incisor teeth.

**Apposition Stage**

Formation of the enamel and dentin occurs in this stage. The ameloblasts (enamel frame) form enamel in the form of long prisms over the dentin. As the amount of enamel increases, the ameloblasts move towards the outer enamel epithelium. As a result, enamel reticulum and outer enamel epithelium disappear.

After the enamel is fully formed ameloblasts also regress, leaving only a thin membrane—the **dental** **cuticle**. After the eruption of tooth, this membrane is gradually sloughed off.



Odontoblasts produce **predentin** deep to the enamel. Later predentine calcifies and forms second hardest tissue of body—**the dentine**. As the dentine thickens cell bodies of odontoblasts regress, but their cytoplasmic processes called **odontoblastic processes** (**Tomes** **processes**) remain embedded in the dentine.