

Histology

Review – Dentalelle Tutoring

Basics

- The dental papilla is a condensation of ectomesenchymal cells called **odontoblasts**, seen in histologic sections of a developing tooth. It lies below a cellular aggregation known as the **enamel organ**. The dental papilla appears after **8-10 weeks** intra uteral life.
- **The dental papilla gives rise to the dentin and pulp of a tooth.**
- The enamel organ, dental papilla, and dental follicle together forms one unit, called the **tooth germ**. This is of importance because all the tissues of a tooth and its supporting structures form from these distinct cellular aggregations.

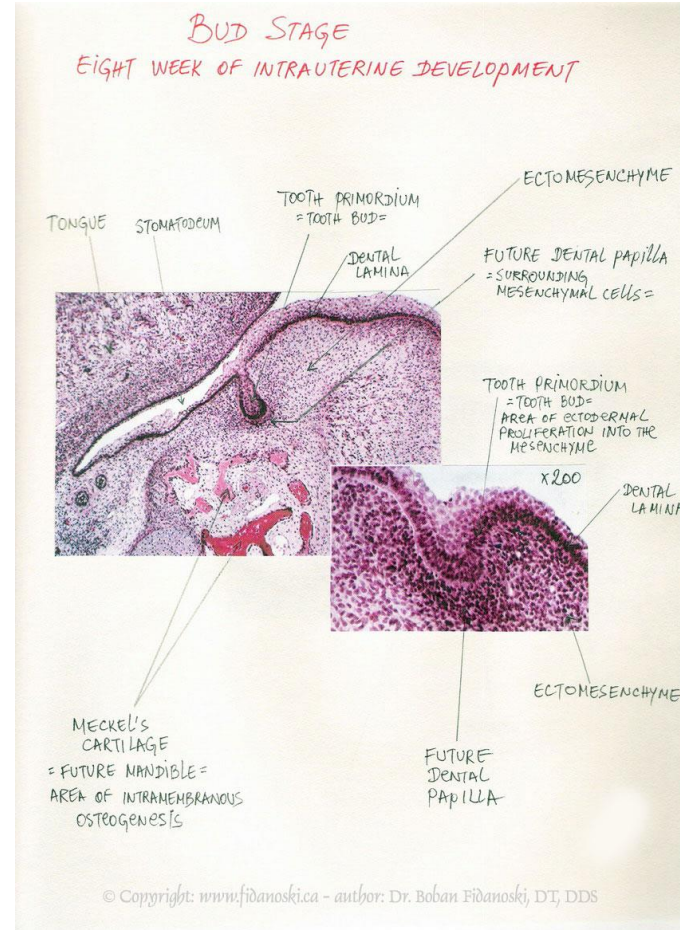
Teeth

- Tooth development or odontogenesis is the complex process by which teeth form from embryonic cells, grow, and erupt into the mouth.
- For human teeth to have a healthy oral environment, all parts of the tooth must develop during appropriate stages of fetal development. Primary (baby) teeth start to form between the sixth and eighth week of prenatal development, and permanent teeth begin to form in the twentieth week.

4 Stages

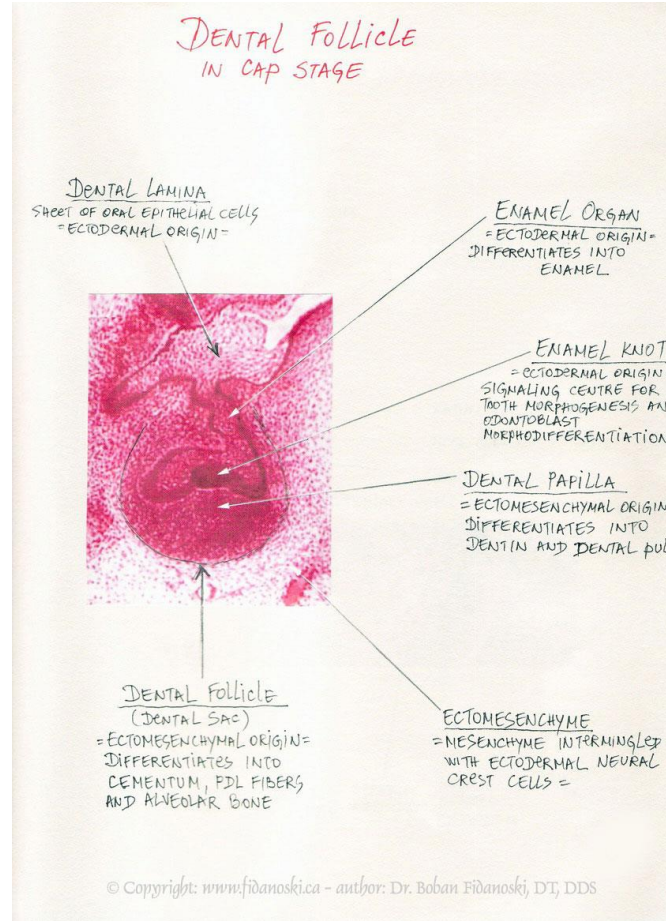
- What characterizes the 4 stages of tooth development
- 1) Ball of cells: **bud stage (initiation)**
- 2) **Cap**: the first time you can identify the three parts (DO, DP, DS)
- 3) **Early Bell**: IEE makes the shape of the future crown.
- 4) **Late Bell**: calcified tissue (young enamel, not fully mineralized)

Bud Stage



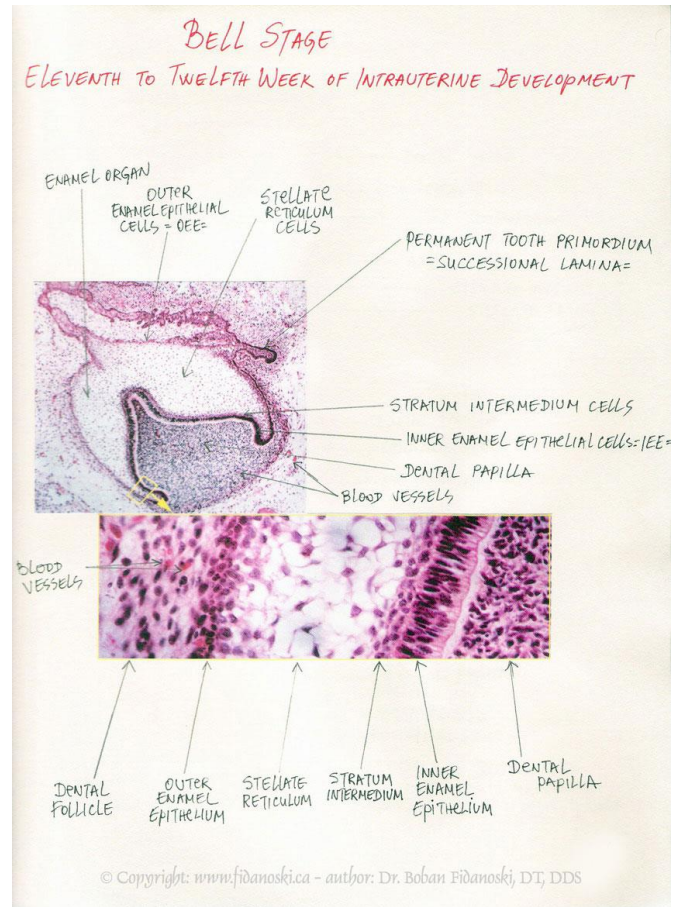
<http://www.fidanoski.ca/dentalhygiene/oralhistology/19-bell-stage.jpg>

Cap



<http://www.fidanoski.ca/dentalhygiene/oralhistology/19-bell-stage.jpg>

Bell



<http://www.fidanoski.ca/dentalhygiene/oralhistology/19-bell-stage.jpg>

Another form
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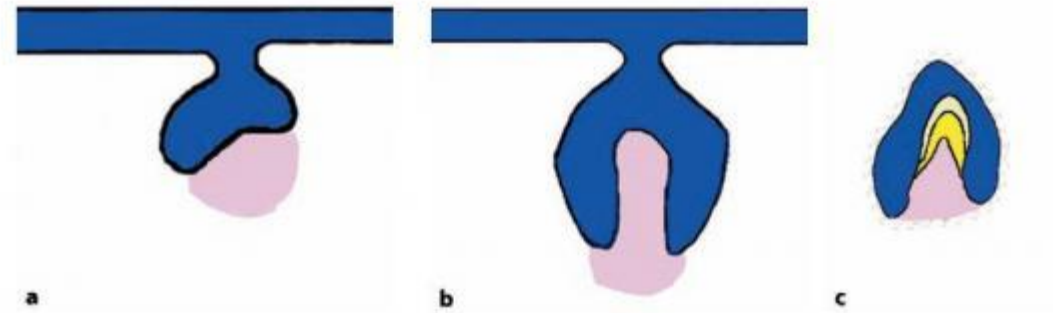
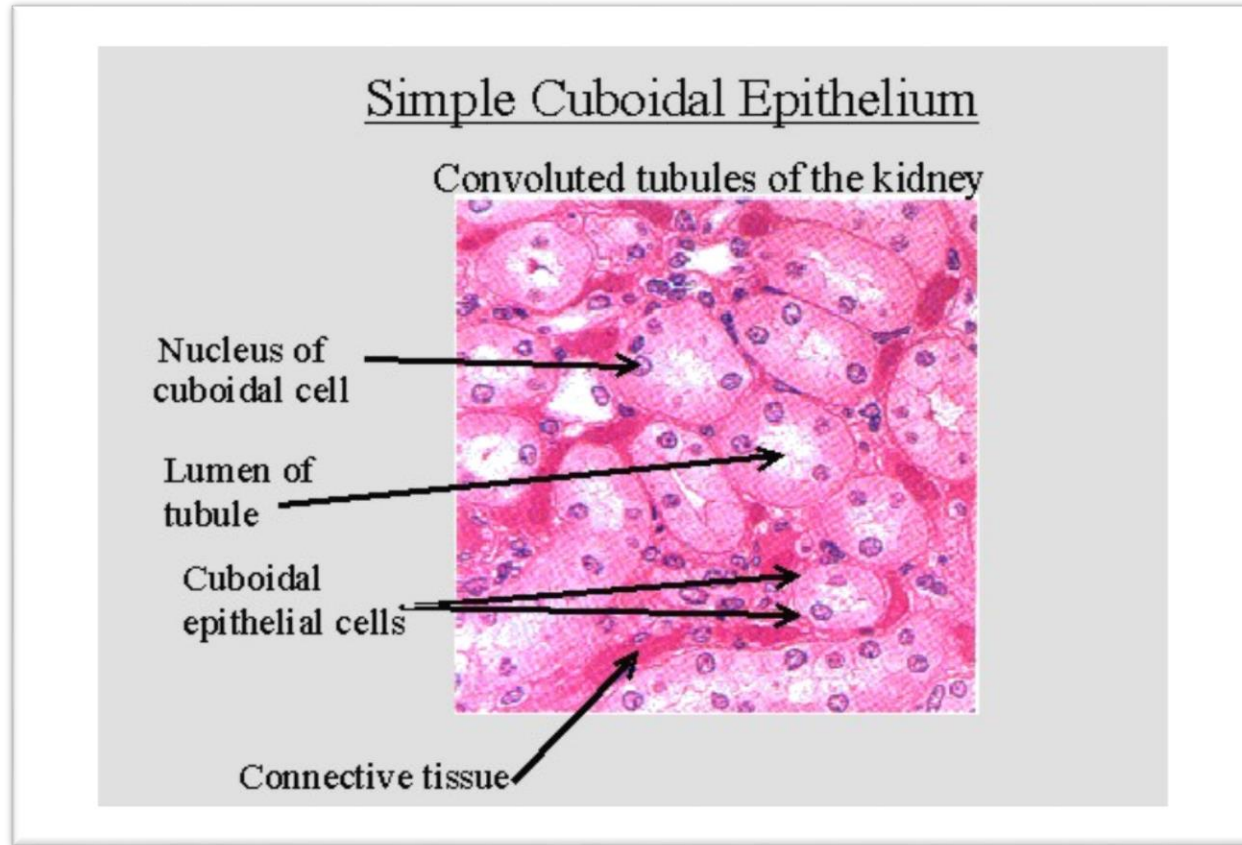


Fig. 1.1a-c Diagram showing consecutive stages of early tooth formation. a Bud stage, b Cap stage, and c Bell stage. Epithelium shown in *blue*, ectomesenchyme in *pink*, dentin in *yellow*, and enamel in *grey*

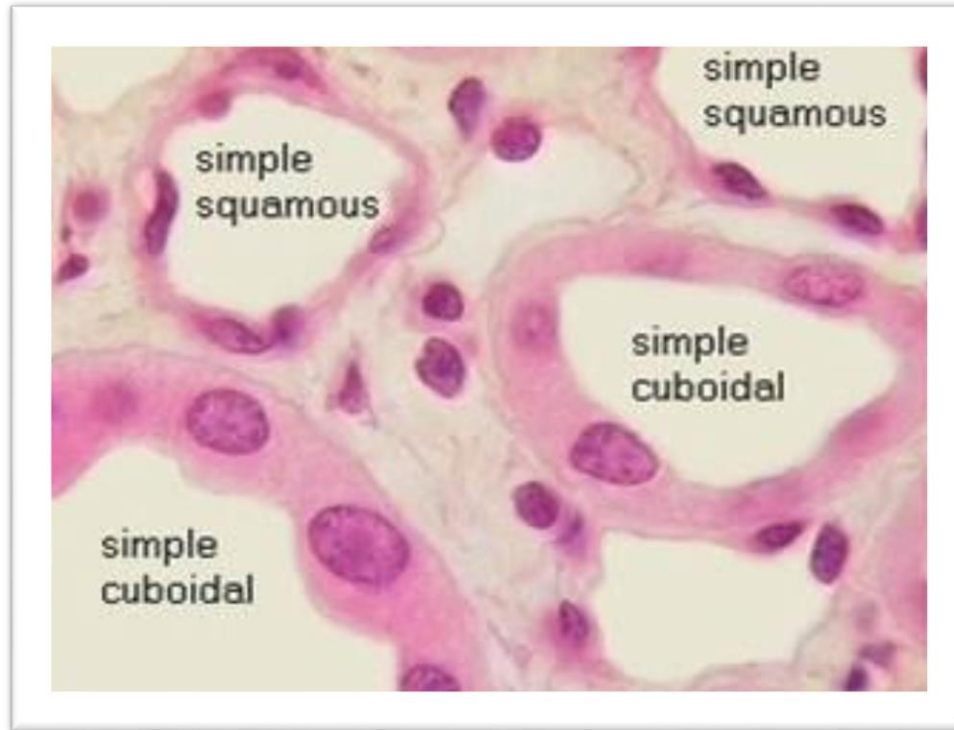
OEE AND IEE

- **Outer enamel Epithelium (OEE)**
 - Simple cuboidal cells
- **Inner enamel epithelium (IEE)**
 - Cuboidal ---> columnar (more active)
Form the enamel of the tooth

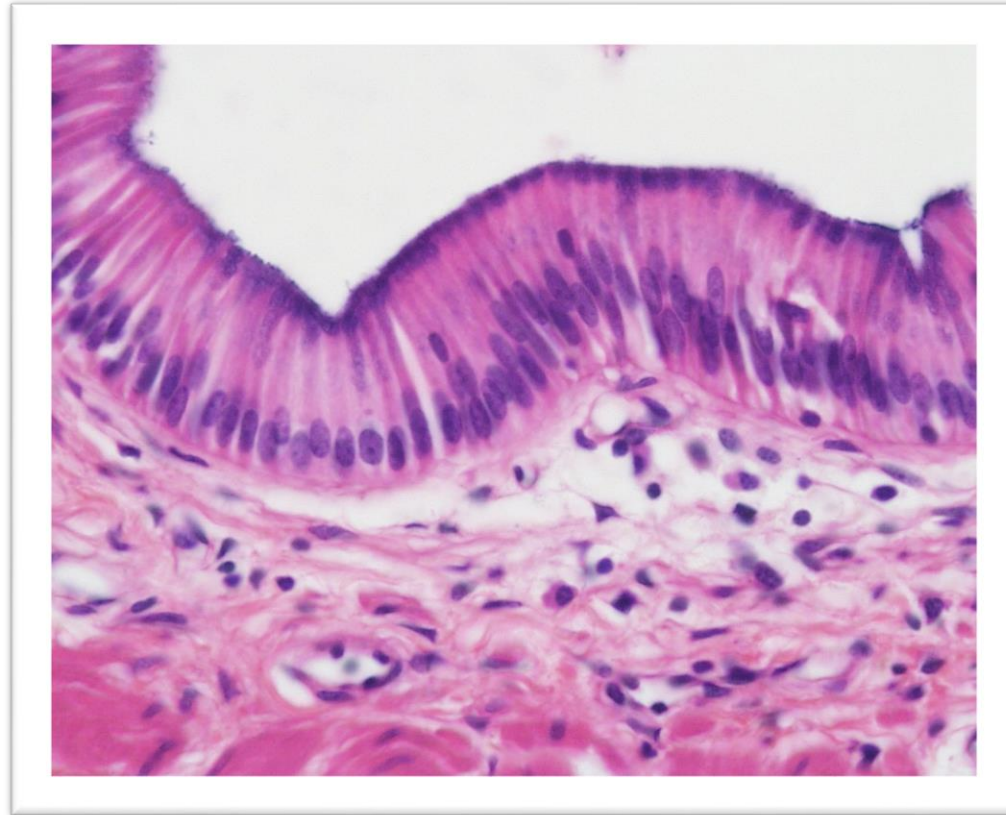
Photo



More



Columnar



Stelate reticulum

- **Stelate reticulum**
- **Star-shaped cells.**
- Attenuated by desmosomes (loosely connected)
Functions to cushion the developing crown
- The OEE and Stelate Reticulum in **late crown development** break up and there will be remnants of both.

Dental Laminas

- 1) dental lamina
- 2) successional lamina
- 3) Vestibular lamina
- 4) Extension of the dental lamina

Terms to remember

- **Dentinogenesis**: The process of dentin formation.
- **Odontoblasts**: Form dentin.
- **Odontogenesis**: Formation of the entire tooth
- **Odontoblast**: Cells that form dentin
- **Amelogenesis**: Ameloblasts form enamel

- **Epithelial rests**: remains of a structure.
May be remains of dental lamina

Dental Papilla

- Becomes visible at the **cap stage**.
- Name reserved for the area inside the IEE that eventually becomes the dental pulp
- When enamel formation is complete this space is no longer referred to as dental papilla, and is called dental pulp

Stages of Ameloblasts

- 1) Morphogenic stage
 - 2) Organizing stage
 - 3) Formative (secretory) stage (Tomes' processes appear)
 - 4) Maturative stage
 - 5) Protective stage
 - 6) Desmolytic stage
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- **Where does the enamel start forming? It starts at the cusp tips/incisal edges**
 - The ameloblasts and odontoblasts moving away from the DEJ in late crown development

Stratum Intermedium

- Cuboidal cells found in **late bell stage** between columnar ameloblasts (IEE) and **stellate reticulum**.
- The stratum intermedium appears as a layer in the late cap/ early bell stage.
- *Seems to aid in enamel production*

Basement Membrane

- As the enamel and dentin are laid down, the basement membrane is caught in between the **two layers and breaks up**
- Basement membrane breaks down and is the future location of the DEJ

Crown Formation

- 1) **ectomesenchymal stem cells** of Dental Papilla differentiate into odontoblasts
- 2) **predentin** forms
- 3) calcification of predentin yields dentin
- 4) pre-ameloblasts stop mitosis ---> secretory ameloblasts ---> form "young enamel"

References

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- <http://www.fourthmolar.com/m/photos/view/bud-cap-and-bell-stage>
- [http://en.wikipedia.org/wiki/Human_tooth_development#Cap stage](http://en.wikipedia.org/wiki/Human_tooth_development#Cap_stage)
- Mosbys Textbook