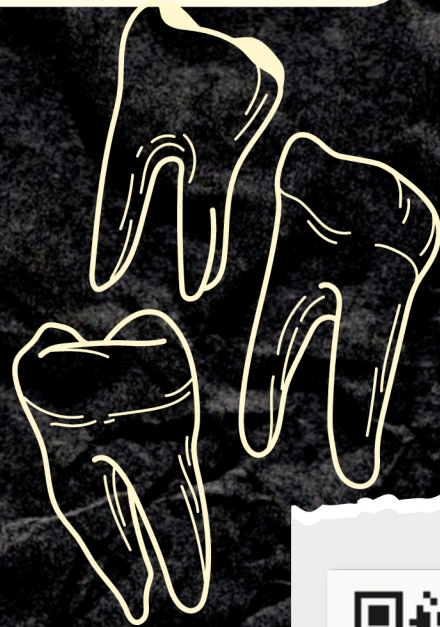


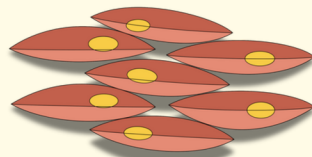
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ONLINE
DENTAL ACADEMY

Tooth
development



ORAL
HISTOLOGY



Tooth development

at: 5:6 wiv

-stomodeum lined by oral ectoderm which is formed of 2-3 layers of epithelial cells

- superficial layer → flattened
- basal layer → cuboidal cells
- Basal cells are separated from connective tissue by basement membrane

-stages of tooth development may be described by:

a. Morphological stages:

1-stage of dental lamina: at 6 week → deciduous dentition

- starts by proliferation of oral ectoderm into mesenchyme
- The basal cells proliferate faster → solidate islands in underlying mesenchyme.
- islands grow → form ectodermal band called Primary epithelial band
- at 7 week
- Primary epithelial band divides into
 - lingual dental lamina
 - facially vestibular lamina

1. Vestibular lamina: lamina proliferates into mesoderm

- Central cells degenerate → oral vestibule

2. Dental lamina:

- a. (lateral) extended along free margins of the jaws → deciduous teeth
- b. lingual extension → successional dental lamina
- c. Posterior extension → Permanent molars.

2-Bud stage:

deciduous teeth develops by proliferation of dental lamina at 10 sites in each jaw

- cells of the sites divide faster than adjacent cells to form bud shaped epithelium called enamel organ
- Buds of deciduous anterior teeth ahead first followed by canine and molars
 - **Dental papilla:** condensed ectomesenchymal cells beneath Dental organ
 - **Basement membrane:** separate dental organ from dental papilla
 - **Dental sac:** condensation of ectomesenchyme surrounding dental papilla and basement membrane

3-Cap stage:

tooth bud grow ununiformly

```
graph LR; A[ununiformly] --> B[outer E.E]; A --> C[inner E.E]; B --> D[grow]; C --> E[grow]
```

- unequal growth leads to increase size and change shape
- **Histological features of cap stage:**

1- Enamel organ

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graph LR; A[1- Enamel organ] --> B[outer EE]; A --> C[inner EE]; B --> D[single layer of cuboidal cells]; C --> E[single layer of columnar cells]
```

- **Enamel knot:** may be seen condensed cells in the region of inner enamel
- it disappear before enamel formation
- **Enamel cord:** is a vertical strand of cellular condensation
 - extend from enamel knot to outer enamel epithelium
 - when it completely divides the stellate reticulum into two parts it is termed enamel septum

- **Stellate Reticulum:** central part of dental organ

- consists of several layers of star shaped cells
- have long branches {processes}
- communicate with each other by desmosomes.

- The intercellular spaces of Stellate Reticulum is filled with fluid due to high concentration of Glycogen

- This substance is hydrophilic so attract water into the cells
- cells first adult → they become star shaped.

2- **Dental Papilla**: is condensation of ectomesenchymal cells

- is enclosed by Growth of D.P
- Peripheral Part of dental Papilla appears fibrous → Fibro Zone
- Free from cells but contains pre fiber

ال cells اكثر من fibers عشان كذا بتكون ال dentin

3- **Dental Sac**: ectomesenchyme at surrounding D.O

عشان بعد كذا هتكون bone & cementum → become denser and fibrous

4- Bell Stage

	Early Bell Stage	Late Bell Stage
Dental Lamina	Lateral D.L.: giving deciduous teeth successional D.L.: Giving successors	disintegrate and give remnants called epithelial rest of self
Enamel organ	OEE: low cuboidal IEE: became tall columnar - elongate toward dental papilla → disappearance of cell free zone -Vascularization: Preameloblast induce UMC odontoblast -Stellate reticulum: cells expand -stratum intermedium: 2-3 layers squamous - it secrete Alkaline phosphatase enzyme Cervical loop: for root formation	OEE: when 1st layer of dentin is laid down nutrition from dental papilla will stop and will be compensated from D.sac? who: 1. O.E.E become flattened 2. Folding of O.E.E surface Area 3. O.E.E develop Micro Villi IEE: - differentiate into ameloblast - start Enamel secretion by reciprocal induction of dentin stellate reticulum: loss intercellular fluids to provide space for developing enamel so → shrinkage stratum intermedium: React to Phosphatase E Cervical loop: → horizontally → Epithelial diaph → vertically → HERS
Dental Papilla	Peripheral cells: odontoblast become columnar Central cells: base of pulp	Peripheral cells: lay down pre dentin Central cells: pulp cells
Dental Sac	Inner layer: more vascular Outer layer: faces inner wall of bony crypt	Inner layer: Cementum Outer layer: PDL & alveolar bone

HistoPhysiological Changes

1- **Initiation:** in dental lamina and cap stages

starts by: migration of the ectome senchymal cell to oral cavity

2- **Proliferation:** in all morphological stages except in the area where dental tissue have been formed

3- **Histodifferentiation:** early, late bell stage

- where The stratum inter medium, odontoblasts, Ameloblast differentiation

4- **Morphodifferentiation:** early and late bell stage

- differential growth of formative cells → determination of ADJ, CEJ

5- **Apposition:** in late bell stage only

- Matrix of hard dental tissue is deposited by formative cells

Root formation

1- **Single Rooted teeth:**

starts: after complete crown formation {when enamel, dentin reach CEJ}

1- cervical loop bends into horizontal plane → epithelial diaphragm

- **function of diaphragm:** restricting cervical opening → Apical Foramen

2- cervical loop elongate in vertical direction → Hertwig epithelial root sheath

- **Function of H.E.R.S:** 1- mold the shape of Root

2- induction of U.M.C to form odontoblast → root dentin

- root dentin formation:

1- of inner enamel epithelium induce UMC → odontoblast

2- odontoblast secrete Pre dentin

3- As soon as the first dentin formation is completed → H.E.R.S is fragment

4- The remnants of ERS may assist in PDL → Epithelial Rest of malasez

- **cementum formation:** disintegration of HERS allows U.M.C of dental sac to come into contact with newly formed dentin

- dentin induce UMC to differentiate into cementoblast → cementum

2-Multiplerootsformation

- At level of furcation area (Trunk), epithelial diaphragm produce tongue like projection in horizontal direction
- in double rooted teeth → 2 tongue like projection
- in triple rooted teeth → 3 tongue like projection
- Then, each root continue as a single root.

Clinical consideration

1-Enamel pearls:

Cause: HERS remain adhere to the dentin surface and the I.E.E can differentiate into ameloblasts

So → Produce enamel called enamel Pearls

Site: Perforate molar at CEJ, Furcation area

2-Bare dentin:

Cause: HERS delayed in its separation from dentin

Effect: dentin Hypersensitivity specially in gingival recession

3-Accessory Canals:

Cause: 1- HERS is broken before odontoblastic differentiation

2- Failure of fusion of tongue like projection

Site: - lateral walls of root

- furcation area

4- Intermediate Cementum: is Zone between cementum, dentin

Causes: If The HERS is broken after odontoblastic differentiation but before dentin formation