

# AMELOGENESIS

# Epithelial Enamel Organ

- Outer Enamel Epithelium
- Stellate Reticulum
- Stratum Intermedium
- Inner Enamel Epithelium
- Cervical Loop

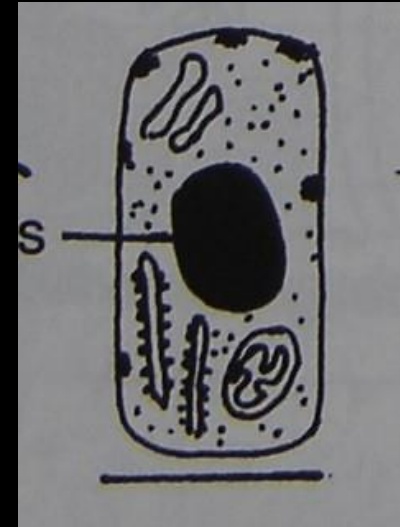


# Life Cycle of Ameloblasts

- Morphogenic stage
- Organizing Stage
- Formative Stage
- Maturative Stage
- Protective Stage
- Desmolytic Stage

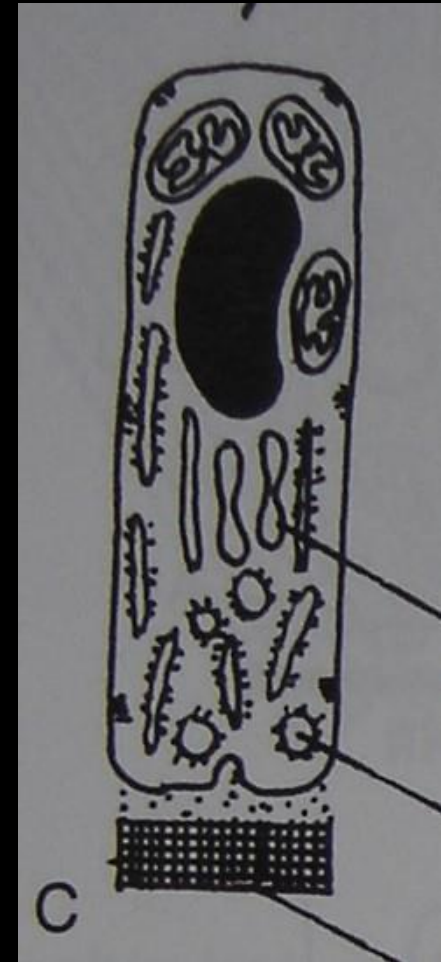
# Morphogenic Stage

- Cell Short Columnar
- Large oval nucleus
- Golgi apparatus and mitochondria are located at proximal end



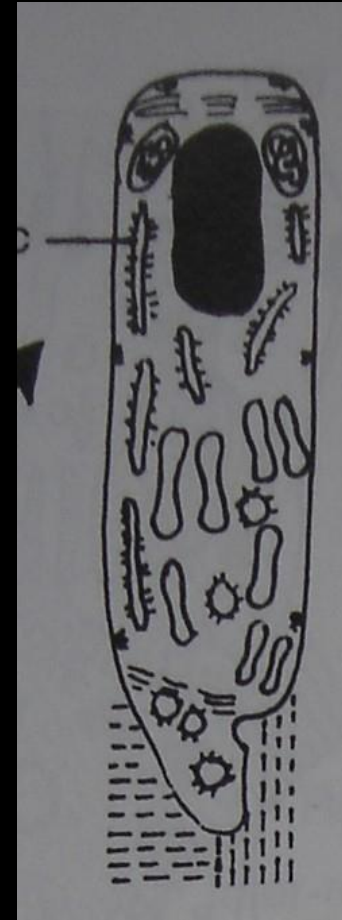
# Organizing Stage

- Cells become Longer
- Reversal of Polarity occurs by migration of Golgi apparatus and centrioles to distal parts of the cell.
- Nuclei shifts to the Proximal part of the cell.
- Amount of Rough E. R. increases
- Basal lamina supporting ameloblasts disintegrates after dentin formation
- change in nutritional supply of ameloblasts occurs



# Formative Stage

- This stage starts after first layer of Dentin is laid down
- Development of a blunt process occurs on ameloblast surface.
- It penetrates basal lamina to enter predentin



# Maturative or Mineralizing Stage

- Enamel maturation occurs after most of Enamel Matrix in occlusal or incisal areas is laid down
- Ameloblasts are slightly reduced in length with appearance of microvilli at their distal surface
- Most of the organelles associated with formation of enamel are enclosed in phagocytic vacuoles and are digested by lysosomal enzymes



# Protective Stage

- After mineralization of Enamel is complete, ameloblasts lose their striated border and also the shape.
- These cells form the reduced enamel epithelium over the newly formed enamel. It prevents connective tissue from coming in contact of enamel till eruption occurs



# Desmolytic Stage

- The reduced enamel epithelium induces atrophy of connective tissue separating it from Oral epithelium and helps in eruption of tooth.
- Premature degeneration of REE can result in soft tissue impaction of tooth due to failure of desmolysis of connective tissue between tooth and oral epithelium

# Amelogenesis

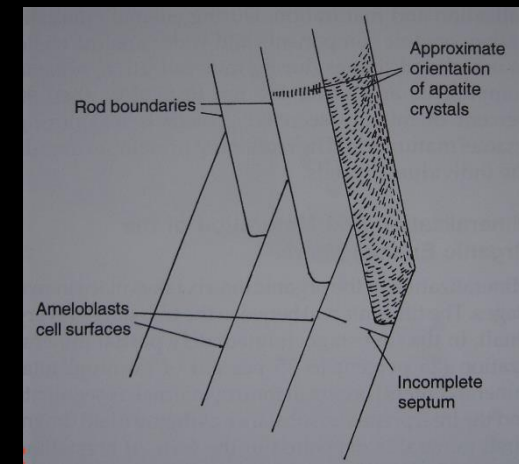
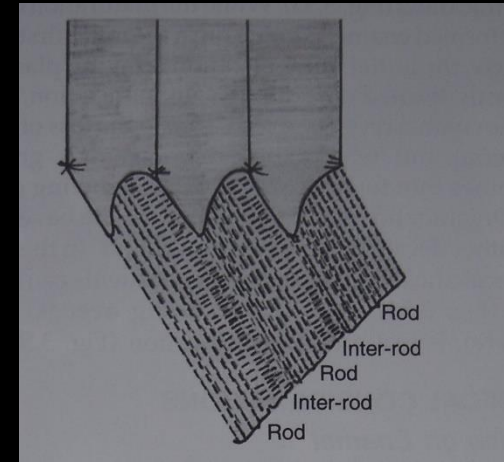
- Consists of two processes:
  - Formation of Enamel Matrix
  - Mineralization

# Formation of Enamel Matrix

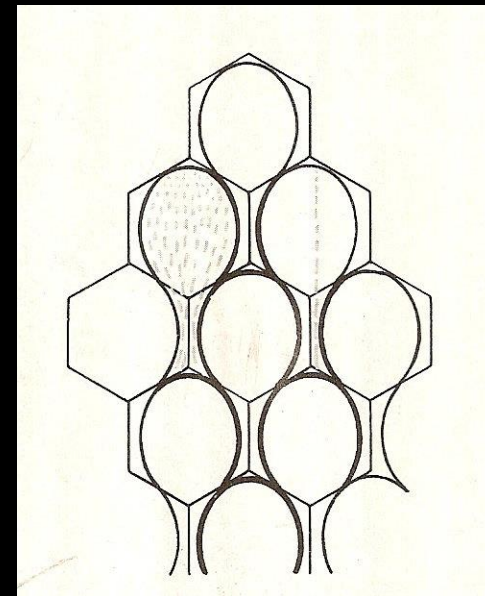
- Secretory activity of ameloblasts starts after some of the dentin is laid down.
- Dentinoenamel Membrane
- Because of presence of this membrane, Enamel rods are not in direct contact with Dentin

# Development of Tomes Processes

- Surface of Ameloblasts producing enamel is rough. They inter-digitate with enamel rods produced by them.
- The long axis of enamel rods is not parallel to long axis of ameloblasts.
- The projections of Ameloblasts into enamel Matrix are called as Tomes' Processes.
- These processes contain typical secretory granules, rough E. R. & Mitochondria



- Secretion of Enamel matrix from Secretary granules occurs via narrow channels
- Each Ameloblast contributes to four E. Rods, and each E. Rod is formed by four Ameloblasts
- Head is secreted by one ameloblast and tail is secreted by three different ameloblasts



## Distal Terminal Bars:

- These separate Tomes processes from cell proper
- These are localized condensations of cytoplasmic substance.
- They are closely associated with thickened cell wall.
- Function is not well understood

Ameloblasts covering mature Enamel are shorter and have a morphology of absorptive cells showing villi & Mitochondria

Organic contents as well as water is lost from E. Matrix during mineralization, almost 90% of initially secreted protein is lost during maturation and what remains forms envelop around individual crystals

# Mineralization and Maturation of Enamel Matrix

- Occurs in two stages
  - In first stage immediate partial mineralization of matrix occurs in organic matrix segments and inter-prismatic segments as they are laid down. This initial influx of minerals accounts for 25-30% of total mineral content.
  - Second stage or maturation: characterized by completion of mineralization. It begins at cusp tips and progresses cervically. However with each rod, mineralization begins at the dentinal end.

# Clinical Considerations

- Enamel Caries: Pits & Fissures, E. Lamellae
- Cavity Preparation
- Shade Selection
- Acid Etching
- Fluoridation
- Bleaching
- Lateral Spread of Caries at DEJ
- Dens Invaginatus

