

## Neurulation

- Differentiate ectoderm to form brain & spinal cord
- Thicken ectodermal layer



### Neural plate



(further growth & thickening + deepen & invaginate centrally)

### Neural groove



(deepens further + forms raised margin)

### Neural fold



Neural folds fuse



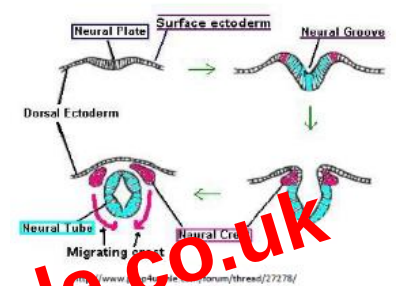
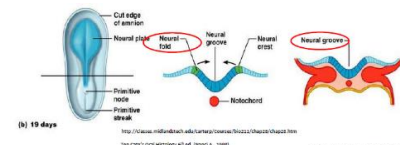
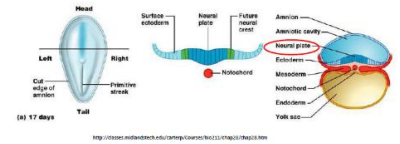
A neural tube separates from ectoderm



Ectodermal cells at crest of neural tube gets separated from epithelium:

### Neural crest cells

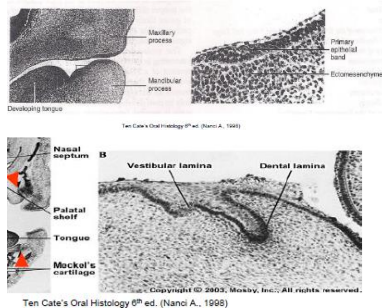
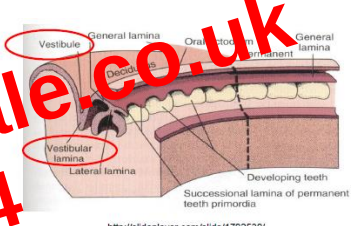
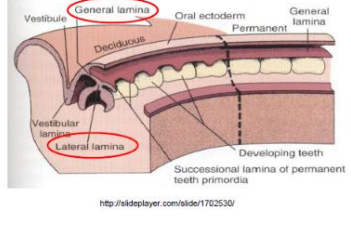
- Three germinal aggregates:
  - Paraxial mesoderm (break into **Somatomeres & Somites**)
  - Intermediate mesoderm
  - Lateral plate mesoderm
- Neural crest cells fx:
  - Migrate & differentiate within developing embryo
- NCC migrate to **1<sup>st</sup> branchial arch** below oral epithelium:
  - Known as **ectomesenchyme**
- Ectomesenchyme cells develop into:
  - Dentine, pulp & tooth supporting structures (cementum, PDL & alveolar bone)
- Mesenchyme =
  - Embryonic CT & it is derived from mesoderm



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## Topic 2: Tooth Development

### 1. Parts

| Parts                   | Descriptions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Pictures                                                                                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary epithelial band | <ul style="list-style-type: none"> <li>Ectoderm lining stomodeum gives rise to oral epithelium on <b>1<sup>st</sup> branchial arch</b></li> <li>6<sup>th</sup> week prenatal:<br/>Oral epithelium thickens &amp; invaginate into ectomesenchyme:<br/>Forms primary epithelial band</li> <li>Characteristics:<br/><b>Horseshoe shaped</b> correspond to future dental arches</li> <li>7<sup>th</sup> week prenatal:<br/>Primary epithelial band divides to form: <ul style="list-style-type: none"> <li>Vestibular lamina</li> <li>Dental lamina</li> </ul> </li> </ul> |  <p>Ten Cate's Oral Histology 6<sup>th</sup> ed. (Nanci A., 1998)</p> <p>Ten Cate's Oral Histology 6<sup>th</sup> ed. (Nanci A., 1998)</p> |
| Vestibular lamina       | <ul style="list-style-type: none"> <li>Fx: forms vestibule of mouth</li> <li>Processes:<br/>Cells of vestibular lamina proliferate<br/>↓<br/>Central epithelial cells degenerate<br/>↓<br/>To form sulcus of vestibule bet ween cheek &amp; tooth bearing area</li> </ul>                                                                                                                                                                                                                                                                                              |  <p><a href="http://slideplayer.com/slide/1702530/">http://slideplayer.com/slide/1702530/</a></p>                                         |
| Dental lamina           | <ul style="list-style-type: none"> <li>Not a strand but a sheet</li> <li>Is divided into: <ul style="list-style-type: none"> <li>General lamina &amp; lateral lamina</li> </ul> </li> <li>Dental lamina undergoes proliferative activity<br/>↓<br/>Forms epithelial outgrowths into ectomesenchyme<br/>(Outgrowth occurs at sites corresponding to positions of future deciduous teeth)</li> </ul>                                                                                                                                                                     |  <p><a href="http://slideplayer.com/slide/1702530/">http://slideplayer.com/slide/1702530/</a></p>                                        |

|                                                                                                                                                           |                                                                                                                                                                |                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                           |                                                                                                                                                                | <ul style="list-style-type: none"><li>Fx: <b>support enamel production</b></li></ul>                                                                              |
| Stellate reticulum (SR)                                                                                                                                   |                                                                                                                                                                | <ul style="list-style-type: none"><li>Star-shaped, forms network</li><li>Cells are connected by desmosomes</li><li>Fx: <b>support enamel production</b></li></ul> |
| <ul style="list-style-type: none"><li>Dental papilla differentiates into 2 types of tissues / layers:</li></ul>                                           |                                                                                                                                                                |                                                                                                                                                                   |
| <b>Types of tissues / layers</b>                                                                                                                          |                                                                                                                                                                | <b>Fxs</b>                                                                                                                                                        |
| Outer cells facing IEE                                                                                                                                    |                                                                                                                                                                | <ul style="list-style-type: none"><li>Differentiate into <b>odontoblasts</b> that forms dentine matrix</li></ul>                                                  |
| Inner cells of dental papilla                                                                                                                             |                                                                                                                                                                | <ul style="list-style-type: none"><li>Differentiate into <b>pulp tissue</b></li></ul>                                                                             |
| <ul style="list-style-type: none"><li>Fx of dental follicle:<br/>Differentiate into cementum, PDL &amp; alveolar bone</li><li>Other imp events:</li></ul> |                                                                                                                                                                |                                                                                                                                                                   |
| <b>Events</b>                                                                                                                                             | <b>Processes</b>                                                                                                                                               |                                                                                                                                                                   |
| Breakup of dental lamina                                                                                                                                  | Epithelial cells of dental lamina undergo <b>lysis</b><br><br>↓<br><b>Dental lamina disappears</b><br><br>↓<br>Developing tooth & oral epithelium is separated |                                                                                                                                                                   |
| Crown pattern determination                                                                                                                               | Intrinsic growth by <b>differential rates of mitotic division</b> within IEE<br><br>↓<br>Resulted in <b>folding of IEE</b>                                     |                                                                                                                                                                   |

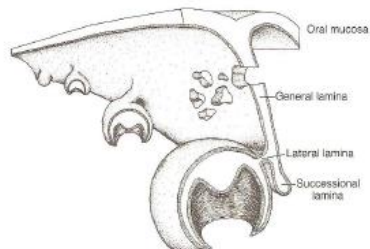
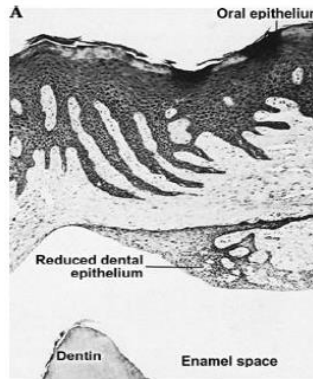
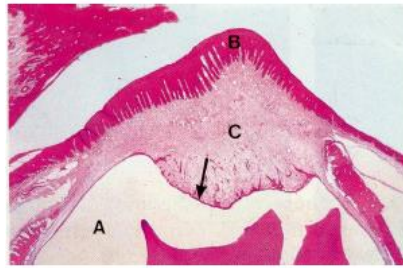


Figure 5-11. Diagram depicting the general and lateral lamina as well as the beginning of the dissolution of the dental lamina.

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Ten Cate's Oral Histology 6th ed. (Nanci A., 1998)



## 7. Root Formation

When crown formation is completed



Process of root formation starts



Tooth starts to erupt when 1/3 of root is formed

## 8. Parts

| Parts                                   | Fxs & Descriptions                                                                                                                                                                                                                                                                                                                                                                                                                                         | Pictures                                                                            |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Cervical loop                           | <ul style="list-style-type: none"> <li>Fx: For root development</li> <li><b>Most cervical portion of enamel organ</b></li> <li>Consists of <b>only IEE &amp; EEE</b></li> <li>Epithelial cells of it proliferate</li> </ul> <p>↓</p> <p>Forms <b>Hertwig's Epithelial Root Sheath (HERS)</b></p>                                                                                                                                                           | <p>Dental Embryology, Histology and Anatomy (Bath-Balogh &amp; Ferenbach, 2006)</p> |
| Hertwig's Epithelial Root Sheath (HERS) | <ul style="list-style-type: none"> <li>Fxs: <ul style="list-style-type: none"> <li>To determine <b>shape</b> of root</li> <li>To determine <b>no.</b> of roots</li> <li>To induce formation of <b>root dentine</b></li> </ul> </li> <li>By inducing outer cells of dental papilla (cells facing HERS) differentiate &amp; form <b>odontoblasts</b></li> </ul> <p>↓</p> <p>Odontoblasts undergo <b>dentinogenesis &amp; secrete predentine</b></p> <p>↓</p> | <p>Dental Embryology, Histology and Anatomy (Bath-Balogh &amp; Ferenbach, 2006)</p> |