Odontoblastic process

- They are the **cytoplasmic extensions of the odontoblasts.**
- **The odontoblasts reside in the peripheral pulp at the pulp- predentin border and their processes extend into the dentinal tubules**.
- The processes are largest in diameter near the pulp and taper further into dentin.
- The odontoblast cell bodies are approximately **7um in diameter and 40um in length.**

Types of dentin according to time and cause of its formation

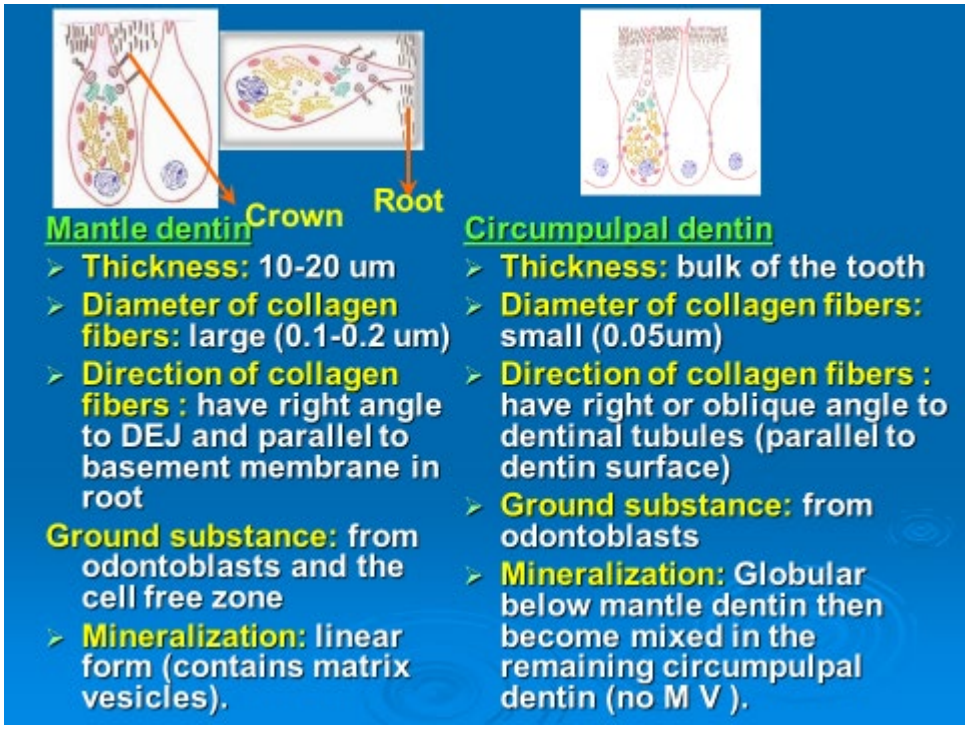
1. **Primary dentin** consist of :

a.Mantle dentin is the first formed dentin in the crown underlying the dentinoenamel junction.

- It is the **outer or most peripheral part** of the primary dentin & is about 20um thick.
- The fibrils found in this zone are perpendicular to the dentinoenamel junction.

b.Circumpulpal dentin forms the remaining primary dentin or bulk of the tooth.

- Represents all of the **dentin formed prior to root completion**.
- The fibrils are much smaller in diameter & are more closely packed together.
- Slightly more mineral content than mantle dentin



2.Secondary dentin

- A narrow band of dentin bordering the pulp and representing the **dentin formed after root completion.**
- Contains **fewer tubules** than primary dentin.
- There is usually a bend in the tubules where primary and secondary dentin interface.

3.Tertiary dentin(Reparative dentin)

• Its produced in reaction to various stimuli, such as attrition, caries, or a restorative dental procedure.

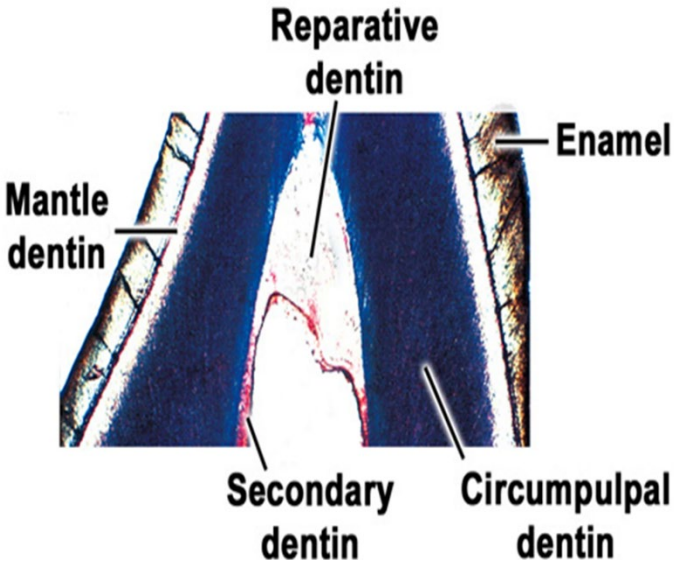
• Unlike primary or secondary D. that forms along the entire pulp-dentin border, tertiary D. is produced only by those cells directly affected by the stimulus.

• It may have tubules continuous with those of secondary D. **tubules sparse in number and irregularly arranged, or no tubules at all.**

• The cells forming tertiary D, line its surface or become included in the D, and so in this case is referred to as **osteodentin,**

• Stimuli of different nature not only induce additional formation of reparative D. but also lead to changes in the D, itself, calcium salts may be deposited in or around degenerated odontoblastic processes and may obliterate the tubules. This type of D. called **transparent or sclerotic D.** and can be observed in teeth of elderly people, especially in the roots. Transparent D. can be demonstrated only in ground sections. It appears light in transmitted and dark in reflected light, because the light passes through the transparent D. but reflected from the normal D.

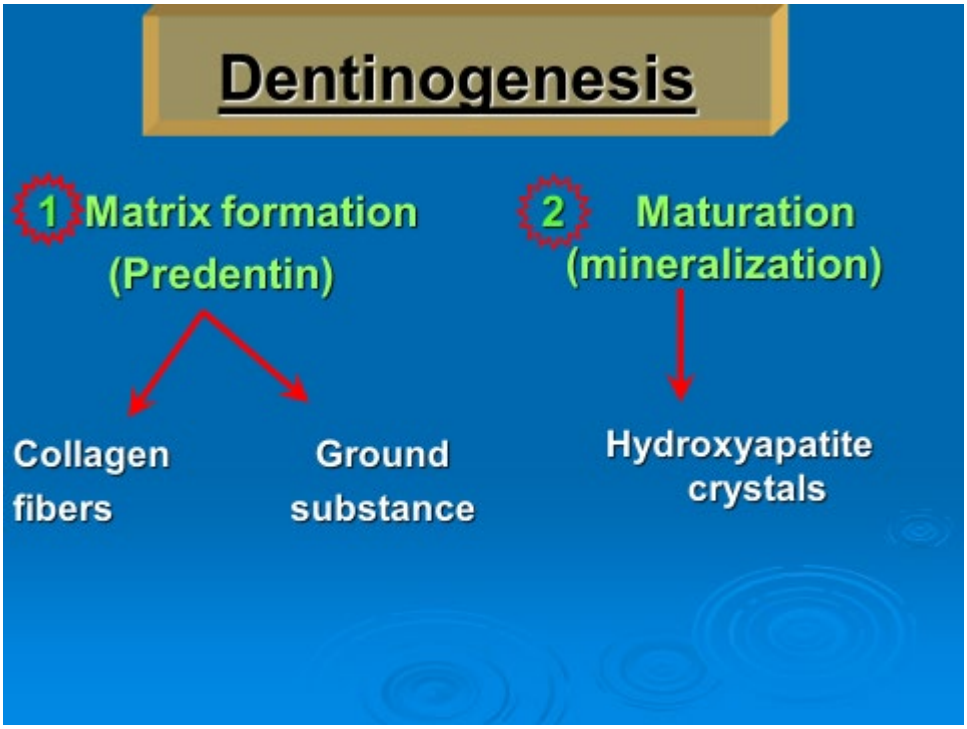
- **Dead tracts:** In ground sections of D-, the odontoblastic processes disintegrated as a result of sever stimuli to the pulp like caries, attrition or abrasion, and the empty tubules are filled with air. They appear dark in transmitted and white in reflected light this type of D, called dead tracts and its area of decreased sensitivity. Reparative D. seals these dead tracts at their pulpal end.



Dentinogenesis is process include dentin formation into 2 steps

1 Deposition of dentin matrix (predentin) as collagen and ground substance

2 Mineralization of dentin matrix by apposition of hydroxyapatite crysals among the matrix



Theories of sensitivity and pain transmission in dentin

1 direct neural stimulation

2 odontoblastic transduction theory

3 Hydrodynamic theory the **most accepted theory**