THE ODONTOBLAST

Puşa Nela Gaje[1], Raluca Amalia Ceausu[1]

[1]Victor Babes University of Medicine and Pharmacy, Department of Microscopic Morphology/Histology, Angiogenesis Research Center Timisoara, Romania

The odontoblast, the most representative cell of the dental pulp, is known as the odontoplast, odontocyte or dentin-forming cell (dentinoblast) also.

Origin and differentiation. The odontoblast is a cell with origin in the neural crests, which differentiated from the ectomezenchymal cells of the dental papilla (embryonic pulp) under the influence of the internal epithelial layer of the enamel organ for the odontoblasts of the coronal pulp and under the internal epithelium of the Hertwig pulp for the odontoblasts of the radicular pulp. The ectomezenchymal cells, which are in contact with the basal membrane that separates the enamel organ from the dental papilla differentiate in the odontoblasts only. The cells disposed to the distance from the basal memebrane retain their stem cell potential.

Localisation. Odontoblasts form a continuous layer to the periphery of the pulp, with a palisade distribution pattern. The number of odontoblasts corresponds to the number of dentinal canaliculi.

Photonic morphology. Three main shapes of the odontoblasts may be noticed, according to their localization: columnar to the crown, cuboidal at the level of the neck and flattened at the apex of the tooth. The odontoblasts have three principal parts: the cell body (at the periphery of the pulp), the neck of the odontoblast (disposed in the directly contact with the predentine) and the prolongation of the odontoblast that enters in the dental canaliculi. The odontoblasts are the cells with functional polarity (figure 1), which has a non-secretory basal pole where the nucleus is disposed and a secretory apical pole, with secretory granules.

These last structures give a slightly acidophilic appearance to the cytoplasm at this level.

The cytoplasm of the cell is basophilic except for the apical pole. The odontoblastic process (Tomes fiber) is present to the apical pole also. The morphology of the odontoblasts reflects their functionality and varies from an active, secretory to a resting form.

Ultrastructure. The cell nucleus has a peripherally dispersed chromatin, with distinct nucleolus. The rough endoplasmic reticulum is well developed and laterally disposed. The Golgi complex is present in the juxtanuclear area. Mitochondria are dispersed throughout the cytoplasm. The odontoblastic process has few intracytoplasmic organelles, numerous microtubules and microfilaments, with linearly disposition along it and numerous secretory granules as well. The cells are connected by gap and desmosomes types junctions.

Functions. The main function of the odontoblast is the formation of the primary, secondary and tertiary dentin. They secrete and synthesizes the majority of the extracellular matrix molecules. They mantain the intergity of the pulp, acting as a selective barrier reducing the rate at which toxins can reach the pulp. Another important function of the odontoblasts is the capacity to produce inflammation mediators as a response to bacterial toxins. They are involved in the initiation, development and maintenance of the immunological function of the pulp. They can act as a sensorial cells, being involved in the mechanotransduction of the pulp.

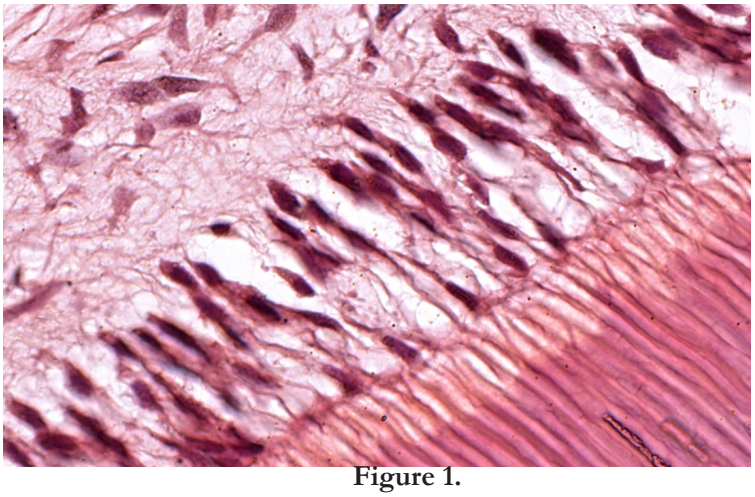

Figure 1.
Secretory odontoblast with functional polarity, located at the periphery of the pulp, haematoxylin and eosin staining, X400.

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