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| 5A-2 |
| **Basic Science Question:** |
| What are the main stages of Odontogenesis? |
| **Report:** |
| Odontogenesis, also known as tooth development, is “the processes of tooth formation, eruption and its integration with the supporting periodontal tissues, and the circulatory and nervous systems” (Kwon, et. al, 2018). The physiological process is continuous until finished, but the timing of stages can vary. Humans develop two sets of dentitions in a lifetime. The first is known as the deciduous dentition and it is gradually replaced by the permanent dentition. They both undergo the same developmental process. One of the many functions of teeth is to withstand biting forces and to chew food, which is reflected in the heavily coordinated signaling and cell mediated pathways of a tooth’s development.  The first stage, initiation, occurs at the sixth to seventh week, and involves the process of induction. The ectoderm lining the stomodeum, which develops later into the mouth, gives rise to the oral epithelium and then to the dental lamina, under the influence of the neural crest cells (Kwon, et. al, 2018). The “dental lamina is where the future tooth germs will form” (Kwon, et. al 2018). The second stage, known as the budding stage, occurs at the eighth week. It involves the process of proliferation of the dental lamina into a bud shape that penetrates growing ectomesenchyme.  The third stage, known as the cap stage, occurs at the ninth to tenth week. It involves the ectomesenchyme forming the soft tissue germ into an enamel organ cap shape surrounded by dental papilla, with an outside mass of dental sac. One of the cell types involved is “ameloblasts that make the enamel of the tooth” (Kwon, et. al, 2018). This is followed up by the fourth stage, the bell stage, at the eleventh to twelfth week. It involves the processes of differentiation of the enamel organ into a bell shape that encases the dental papilla with various cell types. The fifth stage, apposition, varies per tooth and involves the processes of induction and proliferation of dental tissue types, including enamel, dentin, and cementum. This is secreted in successive layers by ameloblasts and odontoblasts as matrixes (Kwon, et. al, 2018). The sixth stage also varies per tooth and involves the maturation of the dental tissue through mineralization. Overall, average expected age of eruption of the completed permanent dentition, excluding third molars, is 12-13 years of age (Chaitanya, et. al 2018). |
| **References:** |
| Chaitanya, Penmatsa et al. “Time and Eruption Sequence of Permanent Teeth in Hyderabad Children: A Descriptive Cross-sectional Study.” *International journal of clinical pediatric dentistry* vol. 11,4 (2018): 330-337. doi:10.5005/jp-journals-10005-1534  Kwon, Hyuk-Jae Edward, and Rulang Jiang. “Development of Teeth.” *Reference Module in Biomedical Sciences*, 9 Feb. 2018, doi:10.1016/b978-0-12-801238-3.64113-2. |