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6. Immunohistochemical localization of TGF- β_1 receptor in developing rat tooth germ.

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Localization of transforming growth factor(TGF)- β_1 receptor during the development of tooth germ of the rat was studied by immunohistochemical method. TGF- β_1 receptor was detected in ameloblast, but it showed differential pattern between incisor and molar.

7. An investigation on the distribution of Mg ions in the calcified tissue by EPMA.

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The distribution of Mg ions in the bone and teeth of human and rat were examined by electron probe X-ray microanalyzer (EPMA). From the results of EPMA mapping, Mg was concentrated in the mineralized root surface through the early formation stages, but it decreased during the progress of the mineralization. After the completion of root formation, the Mg was detected predominantly in cementum.

8. In situ observation of thermal effect on dentine using E-SEM.

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Using an environment controllable E-SEM (Nikon, Tokyo), thermal morphological change of rat and bovine dentine were observed. Video recording was carried out during the observation with flowing dilute air into the sample space. By heating, rat dentine showed a granular structure, in contrast with a rectangular shaped crystals for bovine dentine. These results were in good accordance with the previous report (Sakae et al., 1994). The authors thank Nikon Co. Ltd. for their kind proposal to use the E-SEM.

9. Discovery and significance of the calcium-induced precipitation of enamel proteins.

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Functional mechanism of embryonic enamel protein has not yet clarified, although more than 30 years have passed since the detection of this unique protein. One of the crucial aspect of the functions that have not been pursued was the interaction of this protein with calcium ions. Thus, we discovered that aqueous solution of enamel protein (0.1%) could be precipitated by the addition calcium ion at a final concentration of only less than 1 mM, as determined by turbidimetry at 660 nm. The precipitates were solubilized by a further addition of EGTA. Significance of the remarkable phenomenon was interpreted as the result of conformational changes induced by binding of calcium ions with phosphoserine 16 residue in amelogenin, a major component of enamel proteins.

10. Studies on crystal chemistry and mineralization mechanism in developing enamel.

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The purpose of this study was to investigate the mineralization mechanism in developing enamel using the pH staining technique. Most of organic components of the enamel decomposed at 580°C. Except for the carbonate and hydrogen phosphate groups included in the apatite crystals. In the developing enamel, (Ca+Mg)/P molar ratio was lower than that of the stoichiometric hydroxyapatite. Furthermore, amount of carbonates, which were considered to replace the OH and PO₄ sites in the apatite crystal, was higher than those in the matured enamel. The a-axis dimension of the apatite crystals in the secretory stage enamel was confirmed to be greater than those in acidic zone and matured enamel. These results indicated that enamel mineralization followed by decarbonation in carbonate apatite.

11. Role of adhesion molecules in osteoclast differentiation in alveolar bone promoted by mechanical stress.

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When mechanical force is applied to rat molar osteoclast recruitment is promoted in the alveolar bone, particularly in interdental septum. Using this experimental model, role of adhe-