Intercellular junctions in oral epithelial cells: ultrastructural and immunological aspects

Alberto Gasparoni, Christopher A. Squier ° and Luciano Fonzi

Dipartimento di Farmacologia "G. Segre" – Sezione di Anatomia
Università degli Studi di Siena, SIENA
° Dows Institute for Dental Research
University of Iowa, USA

Key words: intercellular junctions, cultured oral epithelial cells, E-cadherin, beta-catenin, TEM, SEM

SUMMARY

The activation of the molecular cascade leading to Ca^{++}-induced differentiation in cultured epithelial cells might be provided by the establishment of intercellular junctions between cells. In the present paper, we tested the hypothesis that Ca^{++} concentration would determine morphological and biochemical changes in intercellular junctions of cultured human gingival cells. Triplicate samples of monolayer cultures of human oral gingival cells were grown with two different Ca^{++} concentrations (0.3 and 1.8 mM), and examined by transmission (TEM) and scanning (SEM) electron microscopy at different time periods. To determine the role of the E-cadherin/beta-catenin complex in intercellular junction formation, oral epithelial cell cultures were grown in 0.3 mM Ca^{++} in presence of a blocking antibody anti human E-cadherin, stained with antibodies anti human beta-catenin, and examined by confocal laser scanning microscopy (CLSM). By TEM and SEM, cells grown at physiologic Ca^{++} concentrations (i.e., 1.8 mM) showed a subjective increase of the size of microvilli and of the number of intercellular junctions, which was more evident after 3 days in culture. Desmosome-like junctions were observed in cells grown in 1.8 mM Ca^{++}, not in cells grown in 0.3 mM. By CLSM, development of intercellular adhesion was marked by membranous localization of E-cadherin and beta-catenin within the first hours in both culture types. When cell-cell adhesion was prevented, cells showed round shape and no membranous localization of beta-catenin. Restoring cell adhesion brought about polygonal cell shape and membranous localization of beta-catenin. We can conclude that increased Ca^{++} concentration may determine biochemical and morphological changes at membranous level in human oral epithelial cells. These changes may facilitate the development of intercellular junctions.