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Polar organization of uterine epithelial cells and embryo implantation

M. Thie, P. Fuchs, A. Albers, and H.-W. Denker

Institute of Anatomy, University of Essen, Medical School, Hufelandstraße 55, D-45122 Essen

Embryo implantation in the human requires the formation of cell-to-cell contact between uterine and embryonic epithelium (= trophoblast). The apical cell pole of uterine epithelial cells, however, is non-adhesive for trophoblast throughout most of the menstrual cycle. Thus, the apical domain of epithelial cells must undergo developmental changes as a prerequisite for successful embryo implantation. A recent hypothesis postulates that uterine epithelial cells turn off genes for apicobasal polarity and turn on certain genes typical for a more fibroblast-like phenotype which allows the interaction of cells with trophoblast.

Insight into this system is gained from studies using HEC cells and RL cells, both of human uterine epithelial origin. HEC cells being non-adhesive for trophoblast are known to establish regular intercellular contacts upon confluency and to show basolateral distribution of integrins. In contrast, RL cells being adhesive for trophoblast lack regular intercellular contacts and show random distribution of integrins. Antibodies that specifically recognize tight junctions, adherens junctions, desmosomes, actin cytoskeleton, intermediate filaments, microtubules, and cell adhesion molecules were used to study the cytoarchitecture of the confluent cell layers in correlation to membrane polarity. In HEC monolayers cells showed apico-basal polarization with respect to the cortical distribution of the actin cytoskeleton, cytoplasmic arrangement of cytokeratin network, arrangement of microtubular system, and domain specific localization of E-cadherin. In contrast, RL cells showed perinuclear localization of actin, cytokeratin, and microtubules as well as random distribution of E-cadherin, and thus a lack of apico-basal polarity.

Therefore, adhesiveness of epithelial cells appears to be due to random distribution of cell adhesion molecules and might be triggered by distinct changes in the organization of cytoarchitecture.