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Effects of Substrate Roughness on E-Cadherin Junction of Oral Keratinocytes

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Abstract : Intercellular junction of keratinocytes is crucial for epithelia to build an epithelial barrier. Junctional epithelium (JE) seals the interfaces between tooth and gingival tissue. Keratinocytes of JE attach to surfaces roughened by abrasion or erosion with aging. Thus behavior of oral keratinocytes on the rough substrates may help understand the epithelial seal of JE of which major intercellular junction is E-cadherin junction (ECJ). The present study investigated the influence of various substrate roughnesses on the development of ECJ between normal human gingival epithelial keratinocytes, HOK-16B cells. HOK-16B cells were slow in the development of ECJ on the rough substrates compared to on the smooth substrates. Furthermore, oral keratinocytes on the substrates of higher roughnesses were delayed in the development of E-cadherin junction than on the substrates of lower roughnesses. Delayed development of E-cadherin junction on the rough substrates was ascribed to the impaired spreading of cells and its higher JNK activity. Cells on the smooth substrates rapidly spread wide cytoplasmic extensions around cells. However, cells on the rough substrates slowly extended narrow cytoplasmic extensions of which number was limited due to the substrate irregularity. As these cytoplasmic extensions formed ECJ when met with the extensions of neighboring cells, thus, the present study demonstrated that a limited chance of contacts between cytoplasmic extensions due to the limited number of cytoplasmic extensions and slow development of cytoplasmic extensions brought about a delayed development of ECJ in oral keratinocytes on the rougher substrates. Sealing between cells was not complete because only part of cell membrane contributes to the formation of intercellular junction between cells on the substrates of higher roughnesses. Interestingly, inhibition of JNK activity promoted the development of ECJ on the rough substrates, of which mechanism remains to be studied further.

Keywords : substrate roughness, E-cadherin junction, oral keratinocyte, cell spreading, JNK
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