ABSTRACT

Ability of cells to move is an integral function occurring within complex organisms, required for numerous physiological mechanisms including cellular immunity, differentiation and growth, as well as in pathological states such as cancer progression. This motility is facilitated by signaling cascades that determine the direction of movement, based on internal mechanisms and external forces, both mechanical and biochemical. Motility of the cells within the extracellular matrix and 3D scaffold is also determined by the function of the cellular junctions between them. Rho- associated Coiled – coil Kinases (ROCK) proteins are well known inducers of cellular contraction through the processing of cytoskeletal arrangement. In this study, we aim to use currently available computational tools to quantify cell motility and adhesion in a two-dimensional microenvironment.

Using the Keratinocyte Cell Tracking (KCT) program, several parameters that define cell and junction morphology are quantified on specific micropatterns, including junction angles, junction speed and junction distance. Results are then compared between different micropatterns and microenvironment. Kruskal-Wallis analysis between the variances of these patterns is conducted to determine the significance in the difference of the results.

Circular cell doublets have a significantly reduced motility when treated with ROCK inhibitors compared to the control group. Conversely, square and triangular microgeometries exhibit increased effect on cellular motility. From the given analysis, we conclude that the KCT program proves to be an effective tool for computationally measuring epithelial cell motility as well as that cellular geometries significantly affect the morphology of the cells.

Keywords: Cell morphology, Keratinocytes, Micropattern, Image analysis, 2-D migration