The Vanishing Act of RACK1: Insights from Quantitative Phase Imaging

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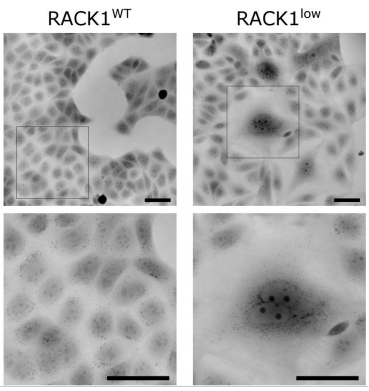
Abstract

The Receptor for Activated C Kinase 1 (RACK1) is a scaffold protein that plays a crucial role in regulating numerous cellular processes, including cell proliferation and cycle progression. In this study, we used CRISPR/Cas9 and siRNA to reduce the expression of RACK1 in Madin-Darby Canine Kidney (MDCK) epithelial cells and Rat2 fibroblasts, respectively, and Quantitative Phase Imaging (QPI), an innovative label-free approach of cell analysis, to study the effects of RACK1 depletion on these cells.

Our results showed that the depletion of RACK1 led to a significant decrease in cell proliferation rates in both epithelial and mesenchymal cell lines. Additionally, we observed an aberrant dry mass distribution and the appearance of large binucleated cells, indicating a defect in cell cycle progression. These findings suggest that RACK1 plays an essential role in regulating cell proliferation and cycle progression in mammalian cells.

Our study highlights the importance of RACK1 in the proper functioning of cellular processes and provides insight into its role in regulating cell cycle progression. The use of CRISPR/Cas9 and siRNA to study the effects of RACK1 depletion in different cell lines demonstrates the universal importance of this scaffold protein in maintaining proper cellular function. The application of QPI as an emerging technology for label-free cell visualisation and quantitative analysis offers a promising avenue for further investigations into the role of RACK1 in cancer and other diseases where aberrant cell cycle progression is a hallmark.



Quantitative Phase Image of MDCK cells: RACK1-depleted cells show a distinct phenotype with enlarged and binucleated cells (right) compared to WT cells (left).

[20x magnification, scale bar 50 µm, color-coding expresses the cell dry mass density, Telight Q-Phase microscope]