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Differentiation of BeWo Choriocarcinoma Cells as Correlated with Biophysical Properties of the Cytoskeleton

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A profound effect of cell shape on differentiation parameters can be demonstrated in BeWo choriocarcinoma cells by modulation via extracellular matrix (ECM) properties (Hohn et al., Exptl. Cell Res. 215, 1994, 40-50). In the present communication, a correlation with modulation of biophysical parameters of the cytoskeleton was investigated by measuring cell stiffness in a magnetic twisting device (Hubmayr et al., Am. J. Physiol. 271, 1996, C1660-C1668). BeWo cells were grown on plastic coated with increasing concentrations of poly-hydroxethyl-methacrylate (p-HEMA) thus producing a series of cell shape types. The secretion of human chorionic gonadotropin (hCG) monitored as a differentiation parameter was gradually increased with shift from a flattened to a rounded cell shape. 4.5 µm ferromanetic beads coated with a RGD-peptide were then bound to matrix receptors of the cells followed by stressing the cells with a magnetic twisting device. After seeding of cells cytoskeletal stiffness increased and reached the maximum after 24 hours on all substrates. Cells on plastic coated with fibronectin (FN) appeared to be perfectly flat monolayers and their cytoskeleton displayed high stiffness (11.8 ± Pa at a stress of 3.3 ±0.2 Pa applied to the beads). Cells on immunological plastic appeared less flat which was reflected by reduced stiffness (8.2 ± 0.9 Pa). In the more rounded cells on substrates coated with high concentrations of p-HEMA (0.1 mg/cm^2) stiffness of the cytoskeleton was even more reduced (5.8 ± 0.6 Pa). Stiffness of the cells depended on the actin cytoskeleton as shown by incubation with cytochalasin-D. Nocodazole, colchicine, or acrylamide had no effect on BeWo cell stiffness. These correlations between hCG expression, cell shape, and mechanical properties of the integrin associated cytoskeleton indicate a role of the actin cytoskeleton in differentiation of BeWo cells.