Quantum dot-based time-resolved adhesion assay for cell co-cultures

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Colloidal inorganic semi-conductor nanocrystals – commonly known as Quantum dots (QDs) – are prepared as fluorescent probes in biological staining. Compared with conventional fluorophores, QDs have a narrow, tunable (depending on the size), symetric emission spectrum and are photochemically stable [1]. The bright fluorescence allows for sensitive detection, the reduced photo-bleaching [2] permit measurements over long periods of time, and enable live cell imaging. Due to their narrow emission peaks they are suitable for multiplexing, in which multiple colors can be obtained in parallel from single excitation sources. Furthermore, QDs are spontaneously ingested by living cells [3], are confined in the cell and are only transferred to daughter cells upon cellular division. According to the advantageous characteristic of QDs, one of the main applications in cell biology is the use of QDs as marker for cell lineage. In this work, a QD label-based time resolved adhesion assay for co-cultures is presented. This is a novel technique, which allows for quantifying the adhesion properties of cell co-cultures on one substrate. Two different cell lineages were labeled with fluorescent QDs of two different colors and were grown within a co-culture onto different substrates. Due to the high contrast and the low brightness variations of the background, a software was developed to count the cells automatically. The adhesion of one against the other cell type was quantified by the ratio of the different colors. With this technique, the effect of different nano- and micro-structured surfaces on the adhesion behavior within co-cultures can be quantified.

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