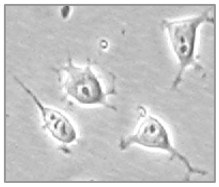
QUANTIFICATION OF CELL ADHESIVITY

using OPTICAL WAVEGUIDE LIGHTMODE SPECTROSCOPY (OWLS) detection



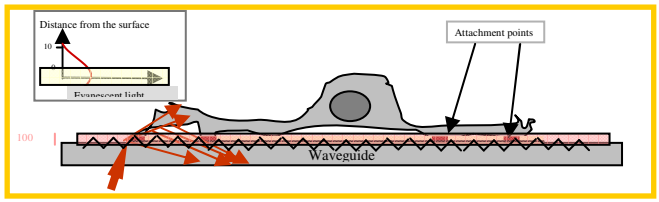
Abstract

The molecular interactions and cell-biological mechanisms behind the adhesive behavior of a cell are not properly understood. In the last decades, the development of bio-protheses and the hope for elaboration of successful cell replacement therapies accelerated the search for appropriate scaffold materials and conditions which may help to keep cells alive and functioning on artificial surfaces.

For understanding some crucial steps of cell-attachment, the initial phases of attachment of two different types of cloned cells – NE-4C neural stem and MDCK epithelial cells - were analyzed by optical waveguide light mode spectroscopic (OWLS) methods,

Application of OWLS sensors

as selective detectors of substrate-near cell components



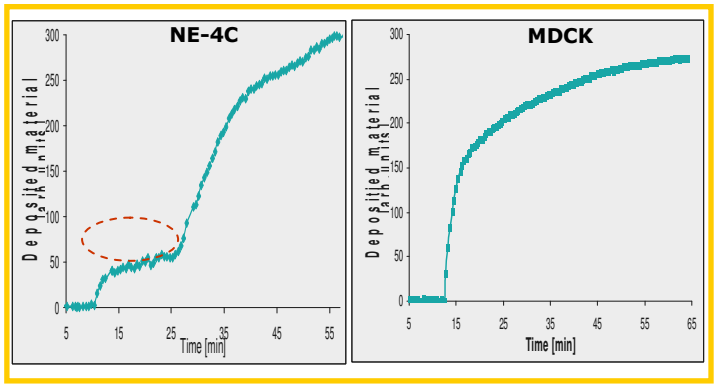
OWLS methods allow quantifying the deposition of material in a thin (<150 nm) layer above the solid sensor surface. In terms of cells, it can provide data on focal contacts and adhesion sites, while the rest of the cellular mass remains out of the field of detection.

Surface chemistry, sensitization of the sensor surface

Bare or amino-functionalized sensor surfaces were coated with different attachment-molecules including poly-L-lysine, laminin, fibronectin, and RGD peptide-mimetics.

Cell preparations

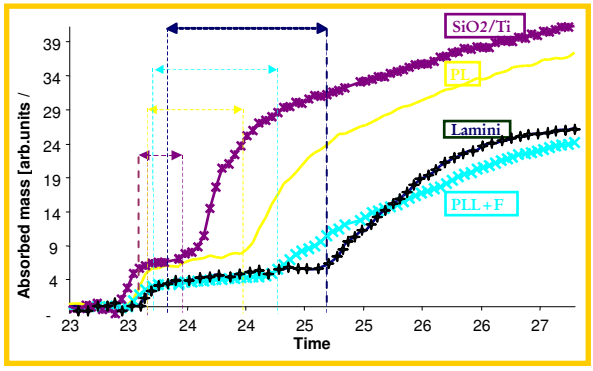
Cell suspensions in protein-free, artificial cerebro-spinal fluid were introduced into the measuring cuvette, and the cell - substrate interactions were monitored up to 80 – 120 min. For control, the "attachment" of cells fixed with paraformaldehyde, poisoned by Cytochalasin B, or sedimented at +4 °C were also assayed.



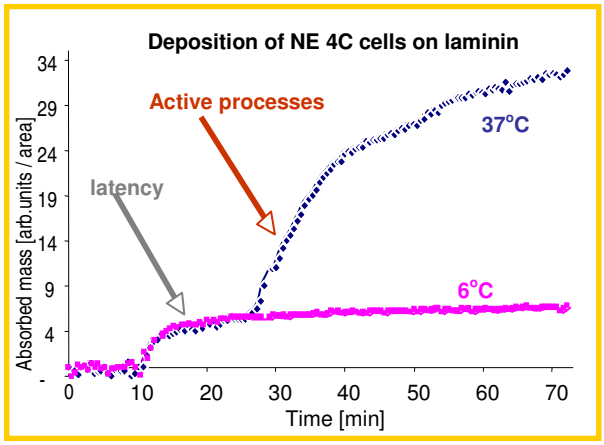
OWLS signals in the first 60 min of attachment

OWLS recordings revealed characteristic differences in cell-behavior between the two types of cells

Detection of substrate-dependent alterations in initial cell attachment



The length of the latency period depends on the adhesivity of the provided substrate



Conclusion

The ΔN *versus* time function clearly distinguished the active attachment from passive sedimentation.

The results indicate that OWLS techniques allow rapid evaluation of cell – matrix interactions and provide tools to characterize the composition of sets of adhesion molecules on cell surfaces.

References

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