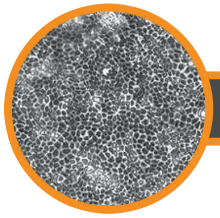
Excellence in Surface Plasmon Resonance

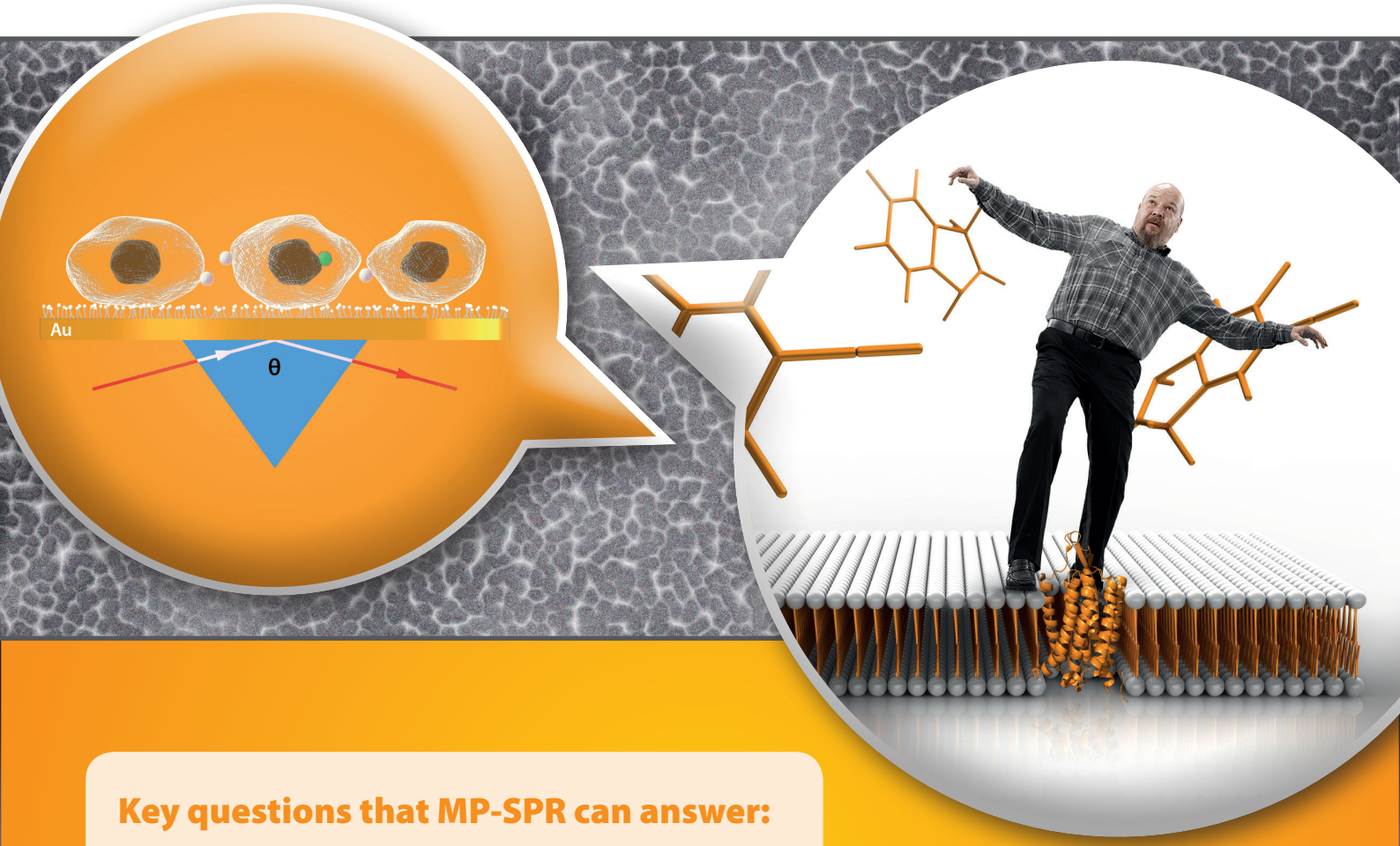
BioNavis



Cells

Living cells in SPR finally possible!

Surface plasmon resonance has originally been commercialized for protein interaction measurements. It is only recently that the researchers started developing the SPR for measurements on living cells. We are proud to be the first ones to enable measurements of trans- and paracellular uptake.



Key questions that MP-SPR can answer:

- What is the drug absorption route of this pharmaceutical?
- Which nanoparticle is the best one for drug delivery?
- How does a nanoparticle or virus enter the cell?
- What is the kinetics of cell attachment to a surface?
- Which surface is the most resistant to bacterial growth?

www.bionavis.com/cells

Why choose MP-SPR for measurements of living cells?

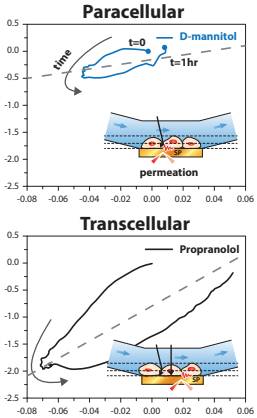
Kinetics of living cell and bacteria attachment in real-time

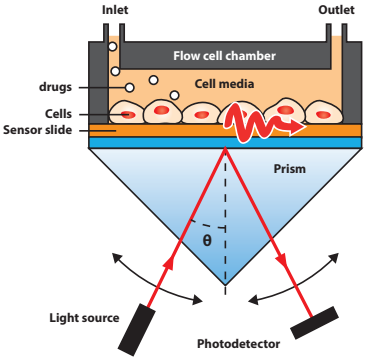
Thanks to unique SPR angular scanning configuration, MP-SPR is able to measure even micron thick samples including cells and bacteria. Some of the cell types that have been measured with MP-SPR instruments include cell lines, stem cells, as well as bacteria including HeLa, MDCKII, A549, LNCaP, ARPE19, PC-3, HepG2, MCF7, BK, CHO or E. coli.

Prove internalization label-free

Upon drug uptake by cells or drug binding to receptor such as GPCR the cell signaling cascade typically makes the cell to undergo dynamic mass redistribution (DMR) which can be clearly seen in the MP-SPR multiparametric plots. On the other hand, permeation can be seen as binding of drugs to the substrate. Thanks to the angular scan mode in MP-SPR, it is possible to capture all of this information and to provide high-content data about living cell interaction with drugs or nanoparticles. So far, other label-free instruments were only able to show cell spreading or interaction in nanoparticles in static assays. We push the boundaries further and show internalization in flow conditions. This brings the assay even closer to *in vivo* conditions and provides a better model for translation of results to clinical field. Until now, different types of cells were measured interacting with small molecular drugs, DNA polyplexes, liposomes, silica nanoparticles, gold nanoparticles, viruses and exosomes.

This pioneering work has so far been focused on drug delivery. However, similar approaches can be applied also to future nanotoxicity *in vitro* assays.

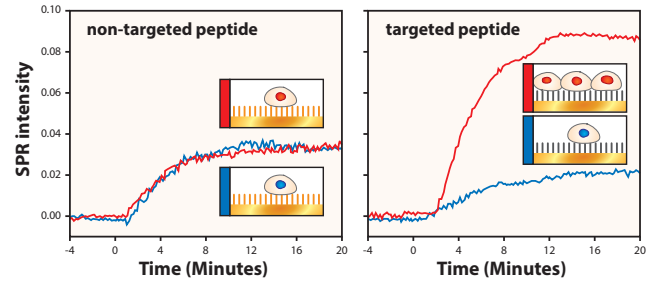




Tissue engineering and diagnostics

In tissue engineering as well as in *in vitro* assays, it is essential to ensure good adhesion of cells to the surface. Different cell types prefer different surfaces. In MP-SPR users are not limited by the surfaces provided by us, but that they can modify the surfaces with their own methods and coatings.

The most typical substrates for cell growth are Au, SiO_2 ("glass-like material"), calcium phosphate (CaP, "bone-like material") or polystyrene surfaces ("well-plate-like material"). These are later modified depending on the cell type with laminin, fibronectin or other growth-promoting proteins.



Binding of cancer cells to a targeted surface is stronger than of healthy cells.

Environmental control

The instrument allows temperature control in the measurement area between 15 to 40 °C. Also the shear-stress can be controlled by changing the flow-rate through the measurement channel. The measurements can be performed both in static and dynamic flow conditions.

Recommended MP-SPR Navi™ instruments for measurements of living cells:

200 OTSO **400 KONTIO** **210A VASA** **220A NAALI** **420A ILVES**

Further reading:

AN#160	Bacteria detection from powdered milk
AN#156	Nanoparticle uptake by living cells
AN#154	Cancer cell detection and cells adhesion on implant material surface
AN#145	Virus interaction studies using MP-SPR
AN#137	Drug - living cell interaction

Selected publications:

Elucidating the Signal Responses of Multi-Parametric Surface Plasmon Resonance Living Cell Sensing: A Comparison between Optical Modeling and Drug–MDCKII Cell Interaction Measurements (Viitala et al., PLoS ONE, 2013)

Biomimetic collagen I and IV double layer Langmuir–Schaefer films as microenvironment for human pluripotent stem cell derived retinal pigment epithelial cells (Sorkio et al., Biomaterials, 2015)

Structural and Viscoelastic Properties of Layer-by-Layer Extracellular Matrix (ECM) Nanofilms and Their Interactions with Living Cell (Nishiguchi et al., ACS Biomater. Sci. Eng., 2015)

Real-time monitoring of nanoparticle uptake by living cells (Suutari et al., Small, 2016)

Salmonella detection from milk products (Farka et al., Analytical Chemistry, 2016)

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