# Label-free and real-time biosensor device for cell assays and drug discovery

**Company:** The Hebrew University of Jerusalem, Jerusalem, Israel

**The Group:** Prof. (Emeritus) Dan Davidov , Dr. Michael Golosovsky, and Dr. Benjamin Aroeti

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| **Categories** | Biosensing device, Label-free cell assay, Drug discovery and screening |
| **Development Stage** | Prototype operates routinely |
| **Patent Status** | United States patent application filed, WO 2009/081406 |
| **Market** | Potential users are Pharma industry, R&D groups, academic research laboratories and, hopefully, diagnostic units in hospitals |

## Highlights

- New method for real-time and label-free studying dynamic processes in living cells without the use of fluorescent, radioactive or other chemical labels that may alter physiological activity.
- Infrared-based surface plasmon resonance sensor enables real-time monitoring drug and protein penetration into live cells, tracking of cell morphology, monitoring of lipid membranes of cells, and measurement of concentrations of glucose in red blood cells.
- Main results: cell morphology changes upon interaction with drugs; human melanoma cells MEL1106, A431 cells, MDCK cells, HeLa cells; Ferrotransferrin injection; $Ca^{2+}$ depletion/ replenishment; chlorpromazine treatment, etc.

## Our Innovation

Surface plasmon resonance (SPR) and a Fourier-transform-infrared spectrometer (FTIR) are employed in a new optical tool for studying real-time changes inside and on the surface of living cells. The new cell waveguiding phenomenon allows measuring cell-cell adhesion.

## Key Features

- Direct observations of biological interactions in living cells, enabling observation of interactions not previously detectable.
- Enables continuous follow-up of intracellular dynamic events without the need to label the interacting molecules.
- Useful for detection of bio-molecules in living cells based on their spectral fingerprints (not possible in the visible range).
- Cells do not suffer photo-damage or photo toxicity induced by infrared radiation.

## Development Milestones

The device is under operation, we are seeking funding for collaboration with pharmacological or other industries to focus on specific applications.

## The Opportunity

- Biochemical and cell-based drug discovery applications.
- The system offers developers the ability to evaluate promising new drug candidates and targets.
- Tool for future drug discovery and advanced diagnostic methods.

## Competition

- PerkinElmer, Label-free Cellular Assay Detection.
- SRU, Cell-based applications, BIND Product Platform.

Both technologies are based on cell refractive index monitoring by the visible light. The sampling depth is limited to 0.5 μm and the method measures mostly cell-substrate interface. On the contrary, our technique is based on infrared light and has increased sampling depth up to 2-5 μm, in such a way that it can probe the whole cell body.

## Business model

After our cell biosensing device is developed and verified, it will be manufactured as a plug-in for commercial FTIR spectrometers (Bruker, Nicolet, etc). The end user (pharma industry) will use our plug-in in conjunction with the available to them FTIR. Otherwise, we can assemble and supply the whole system including cell biosensor, microfluidics, and FTIR-spectrometer. After pinpointing the most important application/family of drugs, we will construct a dedicated device based on light-emitting diodes instead of FTIR) to operate in the narrow wavelength range.

## Management team

Our team consists of Prof. Dan Davidov, Dr. Michael Golosovsky (both physicists in the Hebrew University), Dr. Benny Aroeti (biologist in the same University), three Ph.D and M.Sc.students, and a postdoc, Dr. Vlad Lirtsman.

## Financial snapshot

So far, the project development has been supported by the babyseed grant by Yissum technology transfer company of the Hebrew University. At earlier stages of the development the project was supported by the Israeli Ministry of Commerce (Nofar program), Israeli Science foundation (Bikura program) and Johnson&Johnson.

## Contact

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**Project Information:** http://shum.huji.ac.il/~golos/CELL%20BIOSENSOR.html