**Lab-in-a-cell SPAchip® sensing and filming live-cell physiology of relevance for drug discovery**

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*Imagine having an eye monitoring in real time what is going on inside live cells over long periods of time in a harmless and non-invasive way*

**Live-cell imaging in drug discovery** and cell biology research is hampered by **drawbacks of** **traditional fluorescent chemical probes in solution,** such ascytotoxicity over time, difficulty of multiplexing, expelling of molecular from cell, and poor cell penetration. Continuous monitoring of specific hallmarks for signalling, metabolism, and cell health in living cells (e.g. pH, calcium, ROS, or oxygen) over long periods of time is priceless. Therefore, there is a **demand for new technologies** advancing cell imaging studio from morphological cell painting to physiological feature films.

**SPAchip® is a groundbreaking technology which enables fluorescence-based intracellular analytics in single living cells and real-time (**[**explanatory video**](https://www.a4cell.com/wp-content/uploads/2023/11/a4Cell_HD.mp4)**).** Itis based on silicon chips functionalised for covalent tethering of either chemical or biological probes. Upon non-invasive cellular uptake, chips harbouring the probe remain accessible in the cytosol harmlessly without causing cytotoxicity. Signal from individual devices is quantified using fluorescence microscopy or flow cytometry. The technology is amenable to 2D and 3D biology.

Cells are challenged by insults and stimuli, including drugs, microbes and xenobiotics. In this context, A4cell have developed SPAchip® sensors for cellular messengers and markers such as **pH, Ca2+, ROS, O2 , transcripts and enzymes.** The chip technology is amenable to attaching aptamers, oligos and fluorogenic enzyme substrates, hence we can develop sensors for **monitoring the induction or repression of protein biomarkers** linked to pathological conditions in the cell. Dynamic monitoring of these physicochemical markers allows us to track health and physiological state of the cells, both in continuous kinetics and end-point mode. **Biological samples are precious and unique.** The more information you extract from your single specimen, the more time, reagents and costs you save. Moreover, experimental readouts obtained from the same single cell **diminishes variability** and allows establishing more reliable correlations. **The feasibility of multiplexing probes** **on the same chip** **enables high content analysis of physiological relevance** in complex biological phenomena in which changes are interconnected (e.g. cell proliferation, cell death, oxidative stress, toxicity testing, disease mechanisms, etc.).

*SPAchip® technology allows researchers to gain a deeper understanding of disease mechanisms, accelerate drug discovery, and develop more targeted and personalised treatment approaches in cancer, inflammation, neurodegeneration, CV, aging, etc.*