InsightCell™

Real-Time Human Cell Monitoring by NMR

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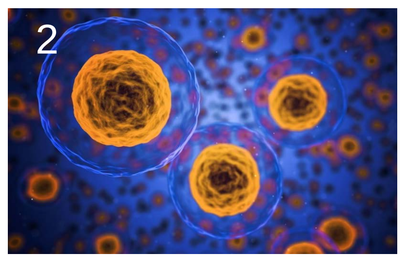
BRUKER

With InsightCell™, it is now possible to monitor the activity of living cells in real-time. Several approaches are feasible when monitoring biochemical variations over time.

(1) InsightCell™ flow unit. (2) Eukaryotic cells.



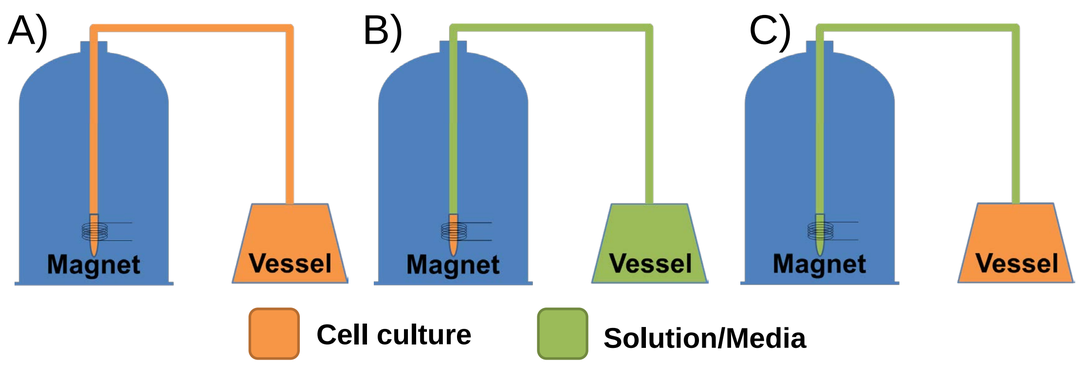
Technical Detail

There are three possible modes of operation to study the metabolism of living cells by NMR:

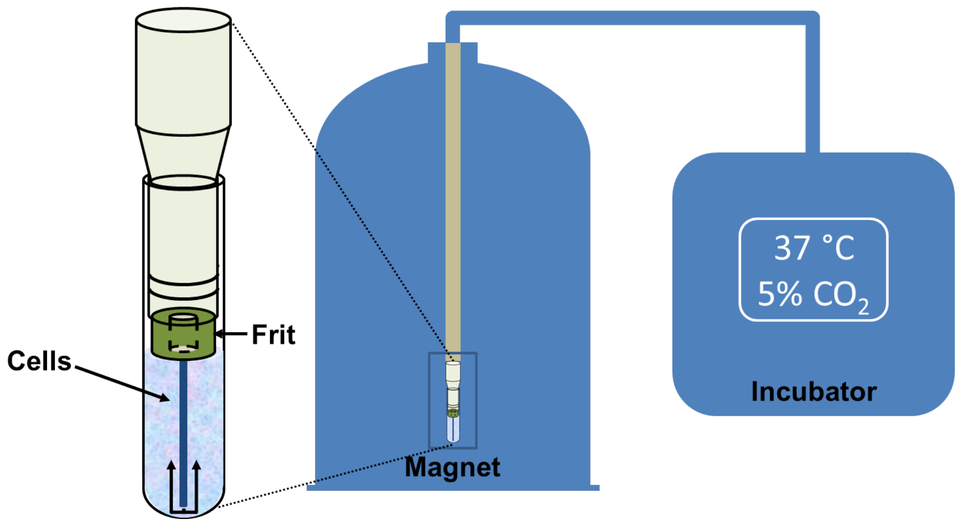
A. Flow the whole cell culture through the flow unit to the NMR tube.

B. Keep the cells inside the NMR tube and perfuse with media.

C. Maintain cells in the bioreactor and flow only the culture medium to the NMR tube.



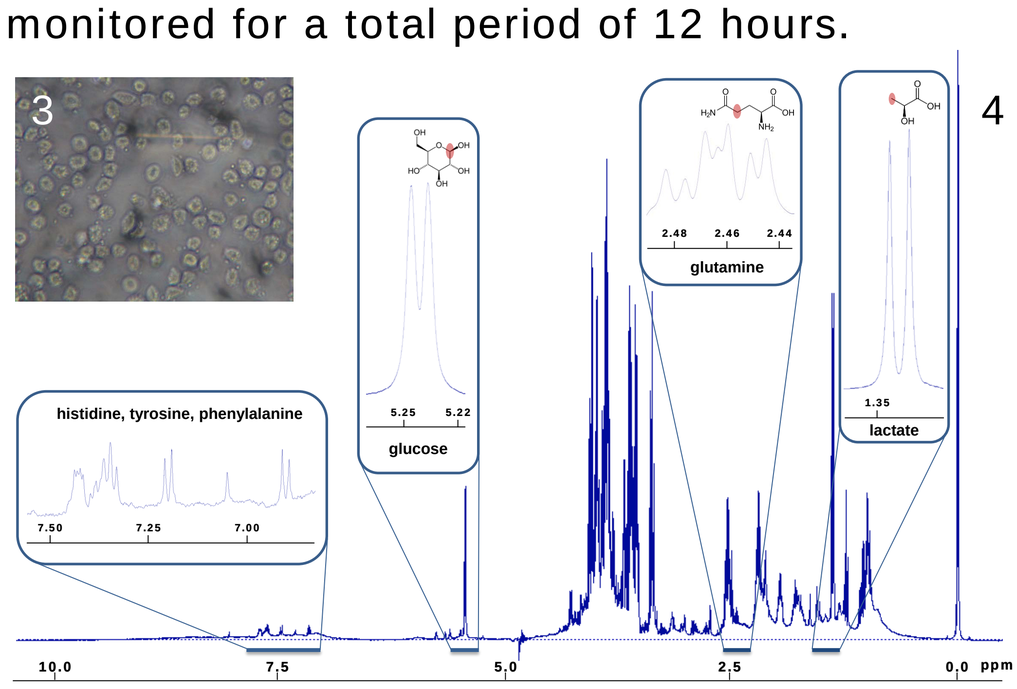
The last method has the possibility to increase the concentration of the extracellular metabolites in the detection coil region. A cylindrical porous frit is used to keep the cells inside the NMR tube. Different frits are available with variable pore size for specific applications.



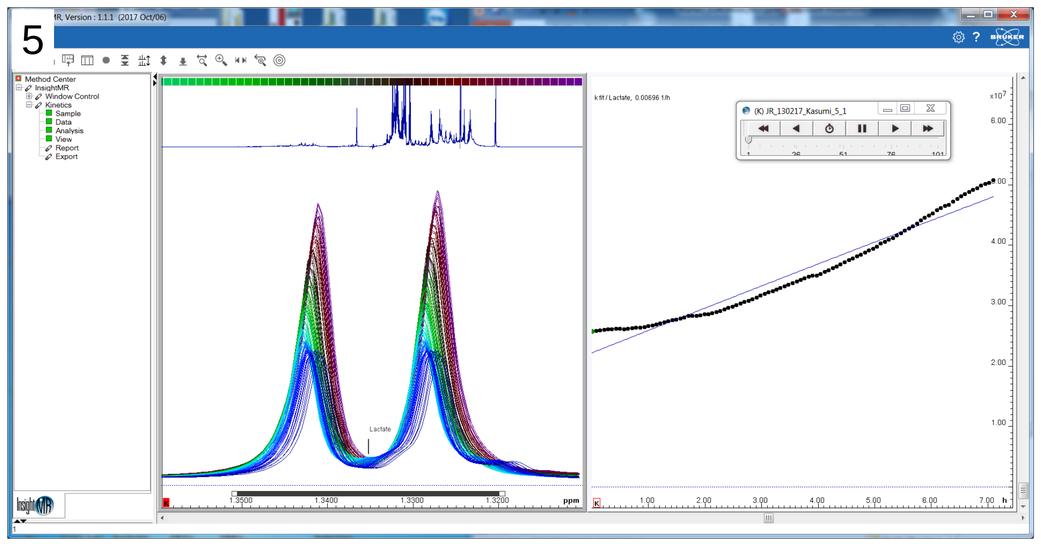
Flow unit with frit (modality B) to trap cells in the NMR tube. The system is equipped with a cell culture incubator for precise control of temperature, CO_2 and O_2 levels.

InsightCell™ Case Study

Experiments were carried out on a 500 MHz spectrometer equipped with a 5 mm TXI RT-probe. The *Kasumi-1* cell culture was kept in the NMR tube using a 5 µm frit. External metabolites variation and nutrients consumption was monitored for a total period of 12 hours.



(3) *Kasumi-1* cells line at the microscope and (4) ^{1}H-1D spectrum of the cell culture acquired for 12 hour time course in fully protonated media. The spectra contain resonances corresponding to over 30 extracellular metabolites.



(5) Lactate production. Waterfall plot and kinetic profile.

InsightMR SW was used for on-the-fly data acqusition and analysis. The lactacte production was monitored, obtaining the kinetic profile shown in Figure 5. Automatic solvent suppression and peak tracking were used.

Summary

- On-the-fly monitoring of cells activity
- Versatile: InsightCell™ uses a flow tube compatible with all Bruker 5 mm RT- and Cryo-Probes
- Flexible: 3 different modalities for different applications in 1 single InsightCell™ solution.
- Interdisciplinary: InsightCell™ enables the simultaneous acquisition of different techniques.
- Straightforward data acquisition and analysis with InsightMR™ software

The results shown in this poster are a courtesy of Prof. U. Günther and J. Roberts, University of Birmingham