

Monitoring Living Cells

InsightCell is based on established InsightMR™ technology, originally for monitoring chemical reactions on-line. The flow unit and software can now be used for monitoring living cells.

There are several approaches for monitoring metabolites in biological processes. For example, cells can be fed with nutrients in the flow tube, or the culture can flow from the bio-reactor to the NMR spectrometer.

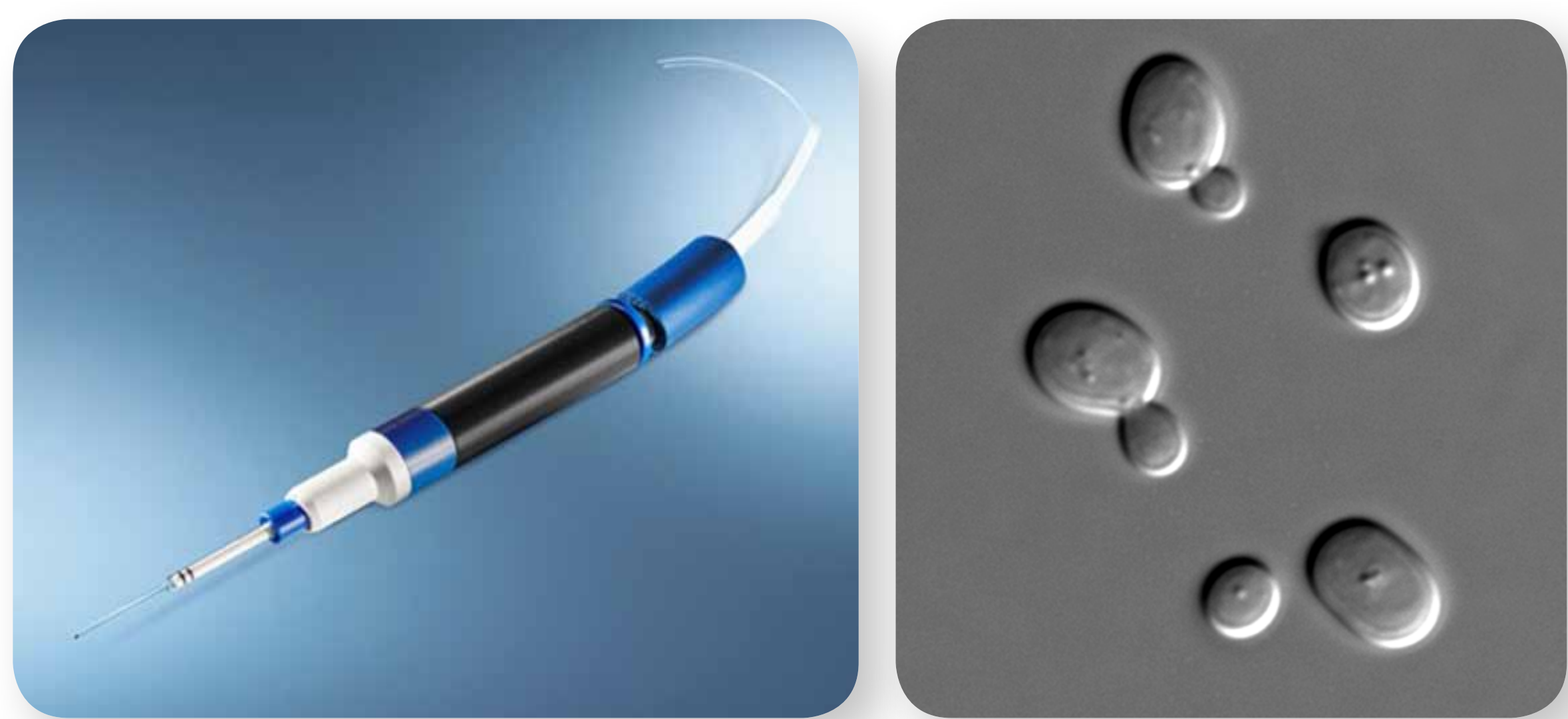


Fig. 1: InsightMR flow tube assembly (left) and yeast cells (right), and typical laboratory setup (bottom)>

Dynamic monitoring of bioprocesses is useful for understanding reactions and optimizing processes. Fermentation processes can be monitored easily using NMR, by measuring the increasing concentration of ethanol in the mixture.

InsightCell enables the optimization and control of conditions such as pH and temperature, which are critical factors affecting the yield of bioprocesses.*

The principle can be applied to the production of antibiotics, vaccines and vitamins.

InsightMR Software and Hardware

The existing InsightMR software has been specifically designed to facilitate chemical reactions monitoring in non-deuterated solvents. The same functionality is directly applied to the monitoring of metabolite concentrations in biological cultures.

* pH meter not included. Thermostat is optional.

InsightCell Case Study

Experiments were carried out using a 600 MHz spectrometer equipped with a QCI CryoProbe™. Measurements were performed on-line with the InsightMR flow unit.

A 20 mL *Saccharomyces Cerevisiae* yeast culture was monitored for a total period of 6 hours at room temperature. The culture was flowed using a peristaltic pump. The NMR data were acquired and analysed using InsightMR software.

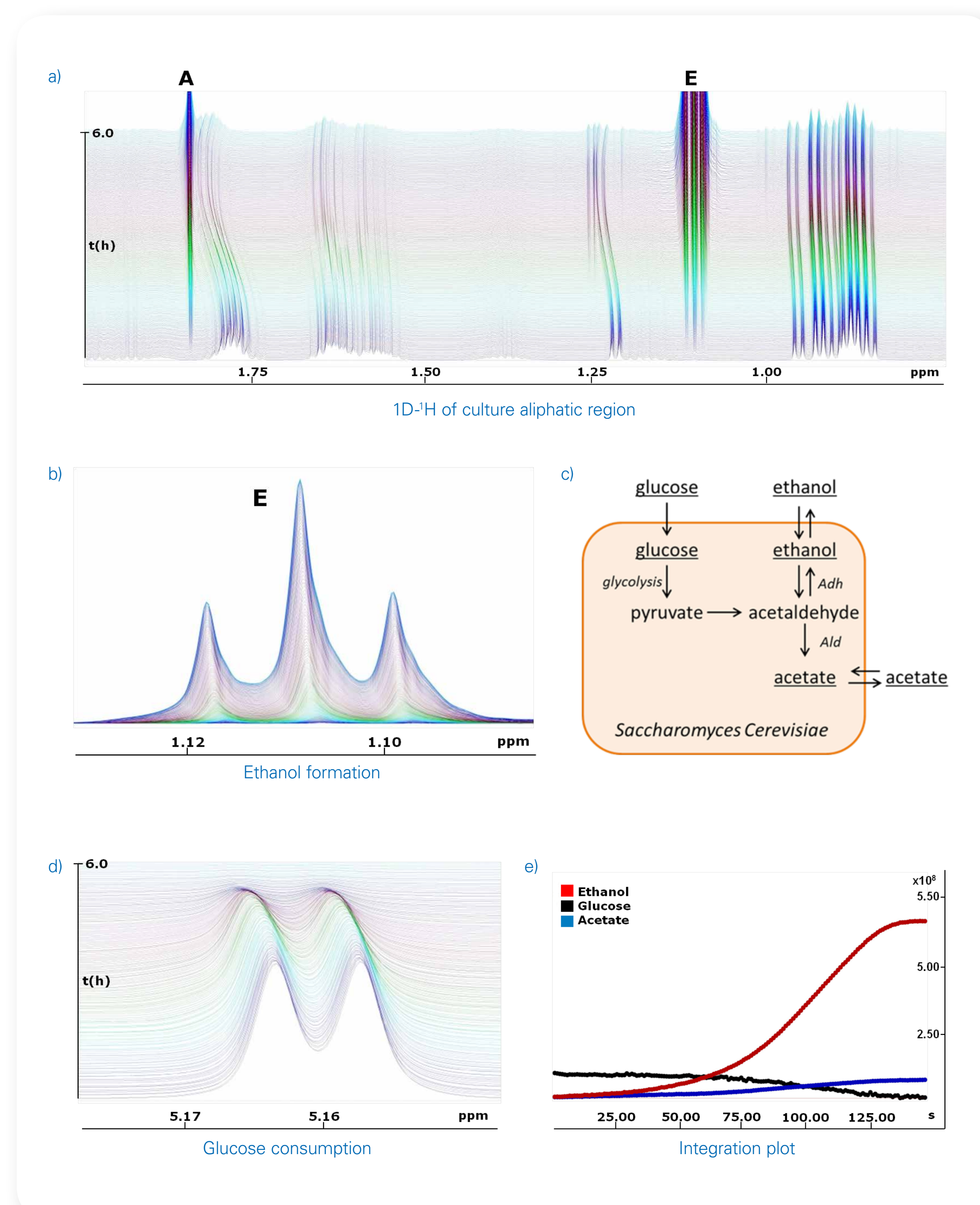


Fig. 2: a) Waterfall plot showing the aliphatic region of the fermentation culture; b) Ethanol (E) formation stack plot; c) Simplified metabolites pathway; d) Glucose consumption stack plot; e) Kinetic profiles for glucose, ethanol and acetate (A). Courtesy of A. Bunescu, Bioaster.

Combined with isotopic labeling methods, InsightCell has great potential as a useful tool for studying mechanistic information gained from monitoring bio-reactions.

Summary

- InsightCell monitors the activity of living cells.
- The set-up uses a flow tube compatible with all Bruker 5 mm probes.
- A temperature control transfer line keeps the biological culture at a constant, specified temperature for the duration of the kinetic study.
- Straightforward data acquisition and analysis with InsightMR software.