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| **Real-time determination of glucose consumption by live cells using a lab-on-valve system with an integrated microbioreactor** |
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This paper describes a microquantitative method for glucose determination *in situ* of living cells in real-time. In this novel technique adherent cells are cultured onto microcarrier beads and packed into a renewable microcolumn within a microsequential injection lab-on-valve system (mSI-LOV). Glucose sensing is performed through the use of a two-step, NAD-linked enzymatic process. The course of the assay is monitored in real-time, by absorbance of NADH at 340 nm. The microsequential assay based on plug/nozzle design has a linear dynamic range for glucose of 0.1 to 5.6 mM. The design of the (mSI-LOV) system allows the assay to be carried out using only 40 mL of the enzyme reagent and 3 mL of sample. The technique was tested on a murine hepatocyte cell line (TABX2S) adhered to Cytopore beads. Rapid cellular glucose consumption, in this technique, is facilitated by a high cell density, which allows a large number of cells (104–105) to be retained in a very small volume (3 mL). In turn, this cell density results in the rapid depletion of glucose from the cell medium over short time periods ( < 2 min). In conjunction with the assay development, the plug/nozzle design and its ramifications on mixing in general are presented and discussed.

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