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| **Real-time monitoring of lactate extrusion and glucose consumption of cultured cells using a lab-on-valve system** |
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Microsequential injection (mSI) provides microfluidic operations that are ideally suited for cellular function studies and as a means of validating targets for drug discovery. mSI carried out within the lab-on-valve (LOV) manifold, is an ideal platform for spectroscopic studies on living cells that are grown on microcarrier beads and kept thermostated while their metabolism is probed in real-time. In this paper a microbioreactor is integrated into the LOV manifold allowing measurement of cellular lactate extrusion and glucose consumption rates of a cell culture that is automatically renewed prior to each measurement. Glucose consumption and lactate extrusion are monitored using NAD-linked enzymatic assays. The mSI-LOV setup has demonstrated a linear analysis range of 0.05–1.00 mM for lactate and 0.1–5.6 mM for glucose. These assays were conducted in a serial fashion requiring 3 mL of cellular perfusate and 10 s for glucose determination and 30 s for the lactate assay. Overall waste generated per lactate/glucose assay is < 200 mL. This work was performed using two different transfected hepatocyte cell lines, which adhere to Cytopore® microcarrier beads. This novel approach to metabolic screening allows for the rapid evaluation of the effects of dosing cells with chemical agents.

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and integration time, can be used for both assays. The reaction that LDH catalyzes is expressed as follows:

lactate + NAD+ ? pyruvate + NADH + H+