

## Large-scale and Integrated Platform for Digital Mass Culture of Anchorage-dependent Cells

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Industrial applications of anchorage-dependent cells require large-scale cell culture with multifunctional monitoring of culture conditions and control of cell behaviour. Here, we introduce a large-scale, integrated, and smart cell-culture platform (LISCCP) that facilitates digital mass culture of anchorage-dependent cells. LISCCP is devised through large-scale integration of ultrathin sensors and stimulator arrays in multiple layers. LISCCP provides real-time, 3D, and multimodal monitoring and localized control of the cultured cells, which thereby allows minimizing operation labour and maximizing cell culture performance. Wireless integration of multiple LISCCPs across multiple incubators further amplifies the culture scale and enables digital monitoring and local control of numerous culture layers, making the large-scale culture more efficient. Thus, LISCCP can transform conventional labour-intensive and high-cost cell cultures into efficient digital mass cell cultures. This platform could be useful for industrial applications of cell cultures such as in vitro toxicity testing of drugs and cosmetics and clinical scale production of cells for cell therapy.