Organ-on-a-chip bioreactors As the previous examples illustrate, bioreactors typically have been employed to address challenges of scale-up. Microliter volumes of fluid are pumped to the cells through channels that allow the effects of multiple concentrations of growth factors or pharmacologi- cal agents to be rapidly tested. Early modifications to these systems enabled the use of high-density 3D cell culture using multi-cell aggregates, microspheres, and cell encapsulation to better recapitulate the cell-cell interactions of native tissues in ways not possible in 2D culture. However, miniaturized tissues created by using microfluidic bioreactors facilitate efficient, inexpensive, high-throughput drug screening or disease modeling.