**Figure S1. Array design with interconnecting habitats facilitating injection cell seeding.** In the design shown, the array contains 64 microhabitats. Each individual habitat has a dimension of 100 μm × 100 μm × 100 μm, the gap between two adjacent habitats is of 100 μm, the interconnecting channel between the adjacent habitats has a width of 40 μm and length of 100 μm. Cells are introduced through the middle channel inlet.
Figure S2. **Baseline algae growth kinetics in test tubes.** Growth curves of *C. reinhardtii* cells in minimal medium using batch culture system. The specific growth rate is $1.47 \pm 0.18\ \text{day}^{-1}$. 
Movie S1. Heterogeneity of *C. reinhardtii* cell motility and morphology. The movie shows that *C. reinhardtii* cells stay either in single cell or clustered cell culture. In addition, the cell motility and morphology display a wide range of variations. This movie is taken on day 5 of the cell culture, using 8 × 8 microhabitat array. The size of each microhabitat is 100 μm × 100 μm × 100 μm, and the movie has 100 frames and the duration of the movie is 3 s.