Lab on a Chip Supplementary Data



Figure 1: Microscopy images of *C. albicans* microcolony expansion over a period of 5 hours at 30° C and 0.12μ L/ min fluid flow

Microcolony growth rates in flow direction (vertical lines) in the absence and presence of media supply are determined by comparing colony sizes over 5 hours of using Leica imaging software. Following an initial lag phase (no sign. colony expansion) for 2 hours *C. albicans* showed stable exponential growth characteristics after 3 hours. In turn, under static conditions (no media supply) *Candida* colonies rapidly expand within the first 3 hours followed by a rapid reduction in growth rates due to the limiting availability of essential nutrients.



Figure 2: Microscopy images of *Candida* morphologies taken in a) standard culture shake flasks at 30°C and 250 rpm agitation b) standard culture shake flask at 37°C and 250 rpm agitation, c) on chip cultivation at 30°C and 0.1 μ L/min fluid flow and d) on chip cultivation at 37°C at 0.5 μ L/min fluid flow

It is well know that morphogenesis in *Candida* species can be triggered by increase in temperature and agitation speed. We have compared shake flask with microfluidic shear stress experiments to demonstrate the ability to trigger the formation of hyphae. While an increase in temperature induces the formation of hyphae and filaments in both methods the precise control over fluid mechanical forces using the microfluidic biofilm chip further allows adjustment of the extent of filamentous forms. For instance, at the high flow rate of 0.5 μ L/min the *Candida* population showed significant hyphae formation.



Figure 3: Normalized impedance traces of *Candida* biofilm response before and after

administration of 0.5 $\mu\text{g/mL}$ amphotericin B.

In theory, not all measured frequencies are equally sensitive to polarization events of subcellular structures. Consequently, the different electrical properties of cellular components may exhibit distinct relaxation modes within the applied frequency range. In an effort to compare impedance signals obtained from 501 frequencies we normalized impedance values by calculating the difference to peak maximum at each frequency. Although significant signal changes after the addition of amphotericin B (plasma membrane disrupter) were observed with all frequencies, highest variances were obtained between 20 to 145 kHz.