Quantitative studies of bacteria in microfluidic devices

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We present microfluidic devices for various quantitative experiments on bacterial cells with single-cell resolution in controlled micro-environments. Bacterial cells are grown in micro-chambers in chemostatic conditions with a possibility to rapidly change the composition of the growth medium.¹ The colonies reach very high densities without major reduction of the growth rate and eventually fill the entire space of the micro-chambers.¹ The escape of cells from crowded micro-chambers leads to self-organization and ordering of cell orientation in the colonies.² The microfluidic technology is also used to set and rapidly change the level of oxygen in the culture chambers.³ In this fashion, microaerobic conditions are created and the level of oxygen is controlled with a higher accuracy than in macroscopic cultures.³ Finally, we will discuss experiments on oxygen-taxis of various microorganisms in specially-made microfluidic devices.


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