Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Bacterial finite-size effects for population expansion under flow FEDERICO TOSCHI, FRANCESCA TESSER, JOS C.H. ZEEGERS, HERMAN J.H. CLERCX, LUC BRUNSVELD, Eindhoven Univ of Tech — For organisms living in a liquid ecosystem, flow and flow gradients have a dual role as they transport nutrient while, at the same time, dispersing the individuals. In absence of flow and under homogeneous conditions, the growth of a population towards an empty region is usually described by a reaction-diffusion equation. The effect of fluid flow is not yet well understood and the interplay between transport of individuals and growth opens a wide scenario of possible behaviors. In this work, we study experimentally the dynamics of non-motile E. coli bacteria colonies spreading inside rectangular channels, in PDMS microfluidic devices. By use of a fluorescent microscope we analyze the dynamics of the population density subjected to different co- and counter-flow conditions and shear rates. A simple model incorporating growth, dispersion and drift of finite size beads is able to explain the experimental findings. This indicates that models based on the Fisher-Kolmogorov-Petrovsky-Piscounov equation (FKPP) may have to be supplemented with bacterial finite-size effects in order to be able to accurately reproduce experimental results for population spatial growth.

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Date submitted: 26 Jul 2016 Electronic form version 1.4