Active depinning of bacterial droplets : The collective surfing of Bacillus subtilis

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How systems are endowed with migration capacity is a fascinating question with implications ranging from the design of novel active systems to the control of microbial populations. Bacteria, which can be found in a variety of environments, have developed among the richest set of locomotion mechanisms both at the microscopic and collective levels.

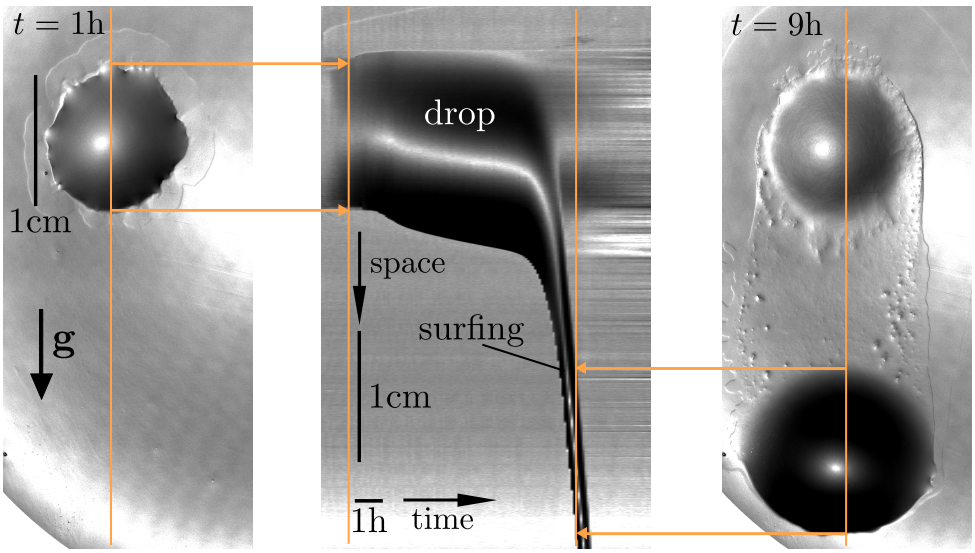

Figure 1. Top view of a bacterial drop on a weakly inclined hydrogel (1° slope indicated by **g** arrow), one hour (left) and nine hours (right) after inoculation. Middle : evolution of a vertical video strip (kymograph). The colony starts sliding approximately seven hours after inoculation. See [2] for a full movie.

Recently we discovered a mode of collective bacterial motility in humid environment through the depinning of bacterial droplets[1]. Although capillary forces are notoriously enormous at the bacterial scale, even capable of pinning water droplets of millimetric size on inclined surfaces, bacteria are capable of unpinning contact lines, by harnessing a variety of mechanisms which I will discuss, hence inducing a collective slipping of the colony across the surface (fig. 1, movies [2]). Contrary to flagella-dependent migration modes like swarming, we show that this much faster 'colony surfing' still occurs in mutant strains of Bacillus subtilis lacking flagella. The active unpinning seen in our experiments relies on a variety of microscopic mechanisms, which could each play an important role in the migration of microorganisms in humid environment.

Références

1. M. Hennes, J. Tailleur, G. Charron, A. Daerr, *Proc. Nat. Acad. Sc. USA*, **114**, 5958–5963, (2017)
2. Supp. movies : http://www.msc.univ-paris-diderot.fr/~daerr/research/colonysurfingmovies