# Slowdown of the surface diffusion during early stages of bacterial colonization

Thomas Vourc'h[1], Julien Léopoldès[2] & Hassan Peerhossaini[1]

[1] Laboratoire AstroParticules et Cosmologie, Université Paris-Diderot, 5 rue Thomas Mann 75013 Paris, France
[2] Université Paris-Est Marne-la-Vallée, 5 Bd Descartes, Champs-sur-Marne, Marne-la-Vallée cedex 2, France
ESPCI Paris, PSL Research University, CNRS, Institut Langevin, 1 rue Jussieu, F-75005 Paris, France
thomas.vourch@gmail.com

Cyanobacteria are among the first photosynthetic organisms, which appeared on earth 2 billion years ago. As many other microorganisms, they tend to colonize any surface by holding on to each other, creating thus a biofilm that protect them against external aggressions [4]. The colonization process is directly linked to the bacterial secretion of extracellular substance [3], that contains mainly exopolysaccharides (EPS).

Here, we focus on the initial steps of the colonization, with the cyanobacterium *Synechocystis* sp. PCC6803 as a model micro-organism. We study the surface diffusion of the model cyanobacterium *Synechosystis* sp. PCC 6803 during the incipient stages of cell contact with a glass surface in the dilute regime. The bacterial cells exhibit twitching motility, with alternating immobile "tumble" and mobile "run" periods [1]. Meanwhile, this motility results in a normal diffusion, which is described by a continuous time random walk of diffusion coefficient $D$.

Surprisingly, $D$ decreases with time down to a plateau. This is observed only when the cyanobacterial cells are able to release EPS, as shown by a comparative study between the wild-type strain and various EPS-depleted mutants [2]. Detailed analysis of the bacterial trajectories shows that the temporal characteristics of their intermittent motion depend on the instantaneous fraction of visited sites along the diffusion process, for strains able to produce released EPS.

A model based on the visited sites fraction,related to the progressive surface coverage by the polysaccharides, describes quantitatively the time dependence of $D$ [5]. The observed slowdown may constitute a basic precursor mechanism for microcolony formation and provides clues for controlling biofilm formation.

## Références

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