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Soil bacteria: searching for more efficient bio-fertilizers

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Life in porous media, as soil bacteria, are used since more than 40 years ago as bio-fertilizer contributing to the development of a sustainable agronomy. Even though they are extensively used due to their low cost, such biotechnology is still far from being efficient and many challenges are opened for basic research in porous media science.

Our microbiological system of study are the Bradyrhizobium diazoefficiens, bi-flagellar bacteria. One of the opened question regarding its efficiency is which is the aim of its bi-flagellum system developed by this specie and not developed in general in Bradyrhizobium. It may be an adaptive trade-off between energetic costs and ecological benefits among different species. We work interdisciplinary on bacteria diffusion in porous media, numerically and experimentally, imitating the complex and structured soil with artificial micro-fluidics devices. With a better visualization in transparent devices, easy to manipulate in a laboratory we aim to understand and control the transport properties of the system for further realistic applications. In this work we were able to report numerically their recent reported strategies to swim [Quelas et at, Sci.Rep. 2016]. Further we simulate their dynamics with those realistic parameters, under a broad spectrum of micro-confinement environments, contributing to micro-fabricate different geometries of porous media. All these studies contribute to understand their diffusion properties versus their flagellar systems (different motility) and versus the porous arrangement. These in vitro contributions hopefully will be useful for further development in a sustainable agronomy.

References

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