Abstract Submitted
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Microbes under pressure[1] OSKAR HALLATSCHEK, Univ of California - Berkeley — In natural settings, microbes tend to grow in dense populations where they need to push against their surroundings to accommodate space for new cells. The associated contact forces play a critical role in a variety of population-level processes, including biofilm formation, the colonization of porous media, and the invasion of biological tissues.Here, we reveal a collective mechanism of confinement that promotes the build-up of large mechanical pressures in microbial populations. Microfluidic experiments on budding yeast populations in space-limited environments show that self-driven jamming arises from the gradual formation and sudden collapse of force chains driven by microbial proliferation, extending the framework of driven granular matter. The resulting contact pressures can become large enough to slow down cell growth, to delay the cell cycle in the G1 phase, and to strain or even destroy the microenvironment through crack propagation. Finally, we discuss how discuss how collective pushing dynamics can promote the emergence of mutational jackpot events. Our results suggest that self-driven jamming and build-up of large mechanical pressures is a natural tendency of microbes growing in confined spaces, contributing to microbial pathogenesis and biofouling.

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