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Pili-mediated Interactions between Neisseria Gonorrhoeae Bacteria are the Driving Mechanism of Microcolony Merging WOLFRAM POENISCH, CHRISTOPH WEBER, Max Planck Institute for the Physics of Complex Systems, KHALED ALZURQA, HADI NASROLLAHI, NICOLAS BIAIS, Brooklyn College, NY, VASILY ZABURDAEV, Max Planck Institute for the Physics of Complex Systems, COLLECTIVE DYNAMICS OF CELLS TEAM, MECHANO-MICRO-BIOLOGY LAB TEAM — During the early infection with Neisseria gonorrhoeae the bacteria form microcolonies consisting of a few hundreds to a few thousands of cells. The formation of colonies is mediated by type IV pili, thin and long filaments that are also involved in the motion of single cells over a substrate. A related process causes attractive cell-cell-interactions. While the motion of single cells has been extensively studied during the past years, the physical principles driving the growth of these colonies are poorly understood. One key mechanism of colony growth is coalescence of smaller colonies. Therefore we experimentally examine the process of merging of two Neisseria gonorrhoeae colonies. We develop a theoretical microscopic model of single cells interacting solely by their pili. The experimental data and the results obtained from our model are in excellent quantitative agreement. We observe a fast initial approach of the two merging colonies within a few minutes, that is followed by a slow relaxation of the colony shape with a characteristic time of several hours. These findings suggest that pili-mediated interactions are the primary driving mechanism of the microcolony merging process.

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