The garden microbe with a sense of touch

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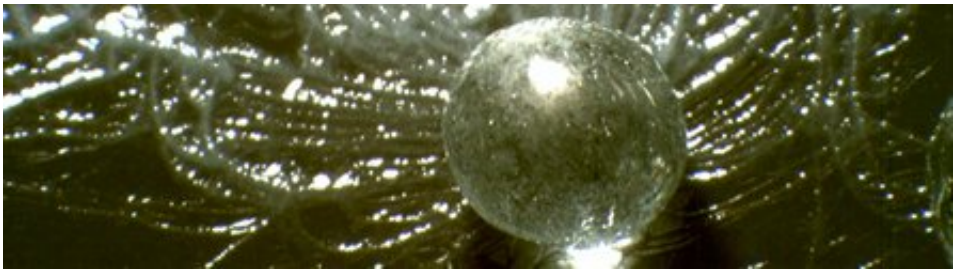

A common soil dwelling bacterium appears to possess a sense of touch, researchers have shown.

A study, by Dr James Stratford at The University of Nottingham and Dr Simon Park at the University of Surrey, has found that *Bacillus mycoides*, which has been known to science since 1842, responds to forces and curvature in the medium on which it's growing.

The microbe's ability to respond to subtle changes in its environment, as revealed in the journal *PLOS ONE*, could signal potential useful scientific, engineering and medical applications for *B. mycoides*.

Dr Stratford, a research fellow at Nottingham's School of Life Sciences, said: "We happened to notice the way the growing bacteria interacted with small defects in our solid culture media and thought what if that's more than just random variation?"

Like living spiral art, the organism produces a spreading colony made up of repeatedly curving filaments. While its response to changes occurs in individual bacterial filaments on a microscopic level, the resulting pattern is easily visible to the naked eye on culture plates.

Whirlpool shaped structures the size of a human hand are produced in response to growth on curved surfaces and the organism can even respond to damage—holes cut in the gel on which it is growing lead to changes in the direction of nearby filaments.

The ability to respond to force allows filaments of *B. mycoides* to orient themselves towards objects which are causing even the tiniest disruptions to the surface nearby. *B. mycoides* was even able to 'find' small glass beads placed in the vicinity of the bacterial colony.

The study used high magnification time lapse to capture *B. mycoides* responding to a compression force in the agar gel being used as a growth medium. Images were taken at 20 minute intervals after force was applied.

Using this method it was possible to steer bacterial cells under the microscope from a distance by changing the direction of force in the growth medium. The bacterial filaments grow parallel to stretching and perpendicular to compression force. When the gel was squeezed by only 1% it resulted in a full 90° turn by the filament. It is not known exactly how the response works but theories include a molecular sensing mechanism related to motility or possibly that the bacterium follows the distorted gel surface like a record player's stylus follows the grooves in a vinyl.

With its rapid growth and ability to respond to force, *B. mycoides* could function as an easy-to-read living early warning system detecting strain and failure in structures under mechanical load.

Mechanotaxis - the ability to respond to force - is also an important organising mechanism for the assembly of multicellular organisms, helping to sculpt developing tissues and organs including those of humans. Insights into how the response works in this simple bacterium may further understanding of how mechanotaxis evolved.

More information: The research paper, Variation in the Morphology of Bacillus mycoides Due to Applied Force and Substrate Structure, is available on the web at dx.plos.org/10.1371/journal.pone.0081549

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