In the 'slime jungle' height matters

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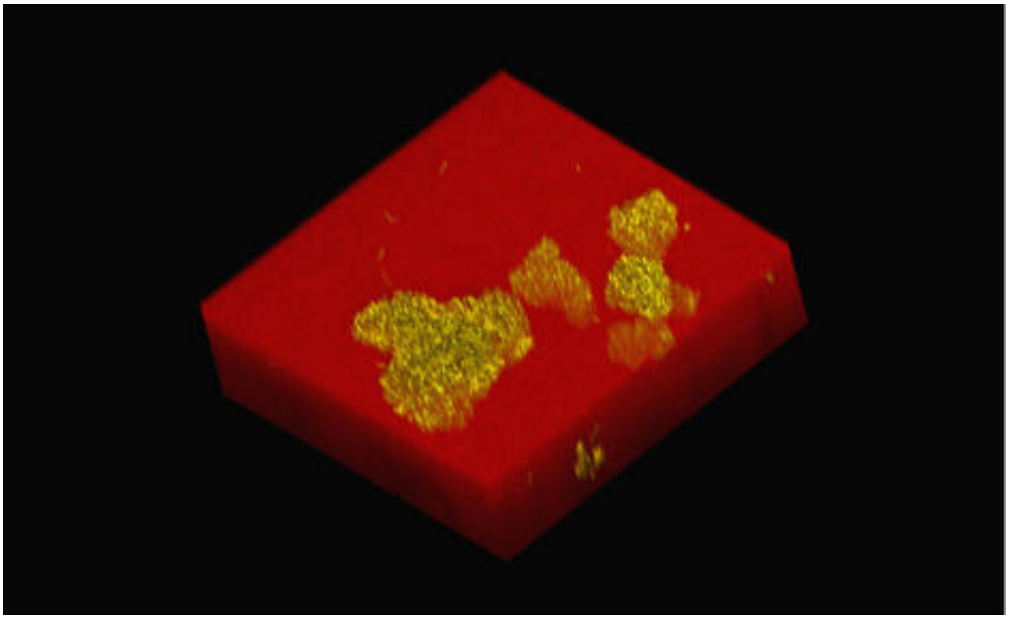

3D rendering showing multiple patches of loosely packed mutant cells (yellow) pushing through and over the densely packed parent cells (red).

(Phys.org) —In communities of microbes, akin to 'slime jungles', cells evolve not just to grow faster than their rivals but also to push themselves to the surface of colonies where they gain the best access to oxygen, new research shows.

An international team led by Oxford University researchers has demonstrated a link between the success of cells within a slime jungle and their ability to position themselves. In a series of experiments the team found that within these dense communities mutant bacteria that

used secretions to grow upwards into 'towers' were more successful than 'normal' bacteria that lay low. It suggests that in such dense communities natural selection drives cells to grow upwards.

Whilst the experiments used a soil bacterium (Pseudomonas fluorescens), understanding slime jungles is important as the microbes building such communities include many disease-causing bacteria – bacterial communities (biofilms) account for 80% of all chronic infections and many have evolved a resistance to antibiotics.

A report of the research is published in the journal *PNAS*.

'These biofilm colonies are the jungles of the microbial world, where bacteria live in close proximity and jostle for space and nutrients,' said Professor Kevin Foster of Oxford University's Department of Zoology, an author of the paper. 'This makes for a very competitive world where getting to the best position can be everything, like trees growing tall in a jungle to get the best access to light.'

Dr Wook Kim of Oxford University's Department of Zoology, first author of the paper said: 'Our experiments show that in these dense communities bacteria that evolve to push themselves to the surface of a colony gain a considerable advantage over their rivals – an advantage that disappears if these cells are moved around or prevented from building upwards.'

The team, which included researchers from Harvard University and Tufts University School of Medicine, say that the work demonstrates that positioning is a major basis for evolutionary competition in dense microbial communities and is comparable to the type of competition that sees the evolution of antibiotic resistance.

More information: Wook Kim, Fernando Racimo, Jonas Schluter,

Stuart B. Levy, and Kevin R. Foster. "Importance of positioning for microbial evolution." *PNAS* 2014 ; published ahead of print April 8, 2014, DOI: 10.1073/pnas.1323632111