Bugs' flair for foraging inspires quest for new smart therapies

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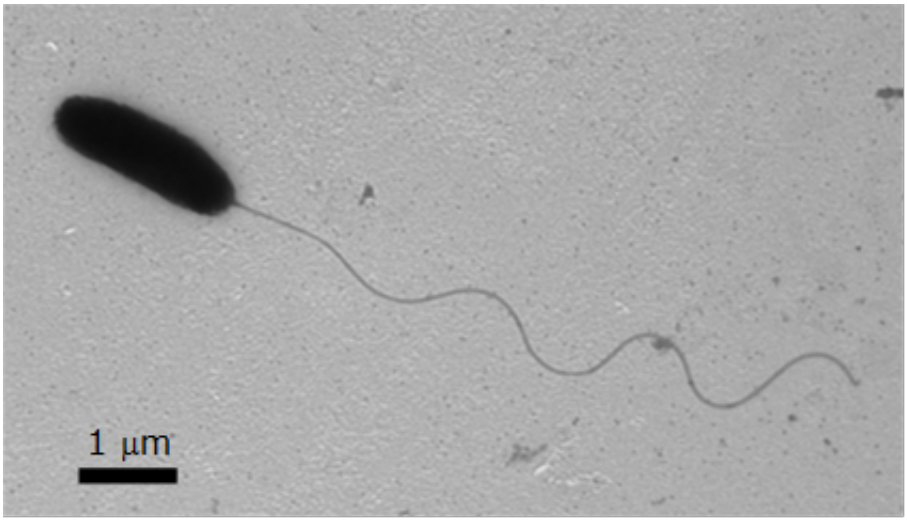

Marine bacteria *Vibrio alginolyticus* magnified several thousand times. Credit: Filippo Menolascina

Fresh insight into how ocean bacteria search for food could aid the development of a new generation of bacterial therapies programmed to treat disease.

The behaviour of marine bugs could inspire development of friendly bacteria engineered to carry out a range of tasks, such as searching organs for signs of illness, diagnosing diseases and delivering drugs to diseased tissue.

Scientists studied common ocean bacteria to understand how they can quickly and precisely propel themselves towards their source of food—such as spots of algae in the water—in order to survive.

They found that as the bugs swim around searching for food, those bugs that travel fastest changed direction most often, to precisely target the site of available food. The bugs also swim faster as they get closer to their target, making them faster at finding nutrients.

Researchers say this natural ability in marine bugs to sense a target and head towards it could be adapted in bacteria found in humans—such as *E. coli*.

Such bacteria could be engineered to incorporate genes that enable them to quickly seek out tumours and deliver drugs precisely, to kill only cancer cells. This approach could offer a major benefit over chemotherapy, which kills healthy and diseased cells.

Scientists used microscopes to study thousands of ocean bacteria searching for food, to analyse their movement and build a mathematical computer model of their behaviour.

Marine bacteria have long been known to be far more adept at finding food than bacteria that live in humans, but until now it was not well understood why this is the case.

The study, published in *Proceedings of the National Academy of Sciences*, was carried out in collaboration with the Massachusetts Institute of Technology and ETH Zurich.

Dr Filippo Menolascina of the University of Edinburgh's School of Engineering, who authored the study, said: "By understanding how nature solves a problem, we can design better artificial systems. Bacteria

which live in the ocean, where food is scarce, evolved to be masters in the art of finding nutrients. Our study suggests how they do this and provides us with the design principles to build smart living robots, tailored to the patient, engineered to diagnose and treat complex diseases such as cancer."

More information: Speed-dependent chemotactic precision in marine bacteria, www.pnas.org/cgi/doi/10.1073/pnas.1602307113

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