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# Culturing rare microbes

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Getting microbes such as *Escherichia coli* to grow may be easy enough, but what if you want to amplify the rarer, slower-growing species within a microbe mixture? US biochemists are using microfluidics to do just this.

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Microbe mixtures occur widely in nature, from soils and oceans to animals, making studying them of interest in several scientific fields. Led by Rustem Ismagilov, a team at the University of Chicago has developed an approach to analyse such mixtures. The method involves mixing an aqueous cell suspension with an organic solvent. This mixture is passed through a series of tubes that splits the aqueous suspension into successively smaller droplets within the solvent, ultimately producing droplets containing just one cell. It is then possible, says Ismagilov, to isolate just those droplets containing the rarer cells. These can then be grown in cultures.

Ismagilov's approach allows the researchers to characterise live microbes. Although there are some other live microbe approaches, they can be complicated by difficulties in the culturing process - mixtures are often dominated by fast-growing species, making it difficult to study the slower-growing ones. A previous solution has been to dilute the mixture to separate the individual cells. However, such dilution makes detecting the cells and the chemicals they produce much more difficult, says Ismagilov.

Isolating rare bacterium *Paenibacillus curdlanolyticus* in droplets means the rare bacterium can be detected in mixtures

Ismagilov adds that their approach 'allows sampling directly from the environment, even from soil slurry.' This, he explains, allows them to cultivate microbes that rely strongly on the chemicals present in the original sample for growth.

The researchers tested their method on a mixture containing *E. coli* and a rare microbe, the slow-growing *Paenibacillus curdlanolyticus*. They found that they could separate and culture cells of the rare species even from mixtures containing the cells in ratios as low as 1 to 40. Using a conventional method, colonies of the rare microbe could be detected only at ratios higher than 1 to 15.

Doug Weibel, an expert in microbial biochemistry from the University of Wisconsin, Madison, US, describes the method as 'a clever and practical approach.' He adds that the droplet-based technique makes it possible to probe bacteria using a number of assays that may be mutually incompatible.

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Ismagilov suggests that the single-cell processing approach has applications in environmental and human microbiology, and that it could also be applied to other cell types, including mammalian cells, for use in disease diagnostics.

*David Barden*

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## Link to journal article

**Isolation, incubation, and parallel functional testing and identification by FISH of rare microbial single-copy cells from multi-species mixtures using the combination of chemistrode and stochastic confinement**
Weishan Liu, Hyun Jung Kim, Elena M. Lucchetta, Wenbin Du and Rustem F. Ismagilov, *Lab Chip*, 2009
**DOI:** 10.1039/b904958d

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