Getting bacteria and yeast to talk to each other, thanks to a 'nanotranslator'

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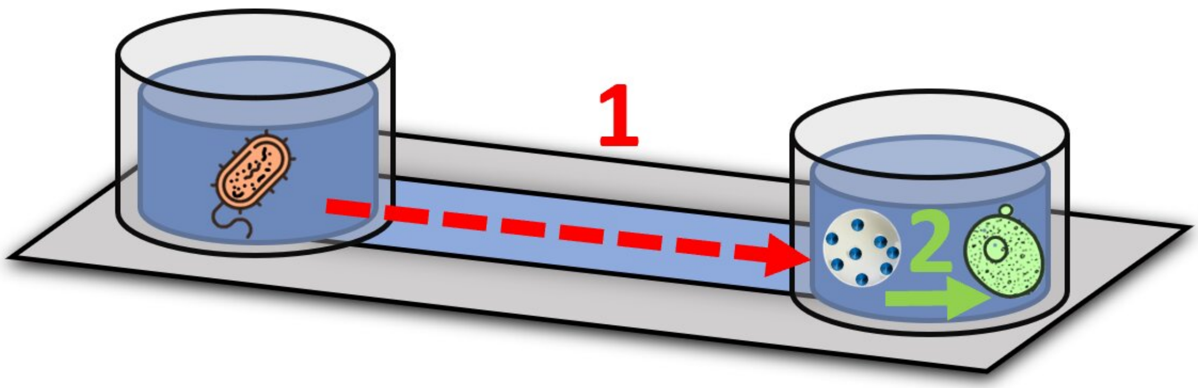

In the new system illustrated above, a nanotranslator (circle with dots) made it possible for yeast (green) to respond to a signal sent by bacteria (brown). Credit: *Nano Letters* (2022). DOI: 10.1021/acs.nanolett.1c02435

Cells communicate with one another in the language of chemistry, but those from different kingdoms, such as bacteria and yeast, speak dialects virtually unintelligible to the other. By learning how microbes "talk," researchers hope to one day manipulate their behavior to protect against disease, for example. Efforts like this are in their infancy, but in a new study in ACS' *Nano Letters,* researchers describe the first system that enables two unrelated organisms to communicate.

In nature, many cells send and receive chemical signals. This strategy allows bacteria to regulate their behavior, fungi to mate and human cells to notify each other of threats. This type of chemical communication has inspired researchers to devise their own means to join these conversations so they can give cells instructions. While some studies have examined micro- or nano-scale particles that communicate with one type of cell, the use of particles to enable communication between two different types of cells has not been explored. Antoni Llopis-Lorente, Ramón Martínez-Máñez and colleagues wanted to create a nano-scale translating device so they could send a chemical signal between members of two different kingdoms of life—something that rarely happens in the natural world.

The team built the nanotranslator from silica nanoparticles loaded with two molecules: one that reacts with glucose, and another molecule called phleomycin. The signaling system they constructed had two steps, which they tested independently then put together. First, the researchers initiated a signal by exposing E. coli to lactose. The bacteria converted the lactose into glucose, which reacted with the nanotranslator. Next, this device released phleomycin, another messenger compound. The yeast Saccharomyces cerevisiae detected the phleomycin and responded by fluorescing, something they had been genetically engineered to do. The researchers envision many possible applications for similar nanotranslator-based communication systems. For example, these devices could be used to tell cells to turn off certain processes and to switch on others, or to alter the activity of human immune cells to treat disease, the researchers say.

More information: Beatriz de Luis et al, Nanoprogrammed Cross-Kingdom Communication Between Living Microorganisms *Nano Letters* (2022). DOI: 10.1021/acs.nanolett.1c02435.
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