Researchers have broken the code for cell communication

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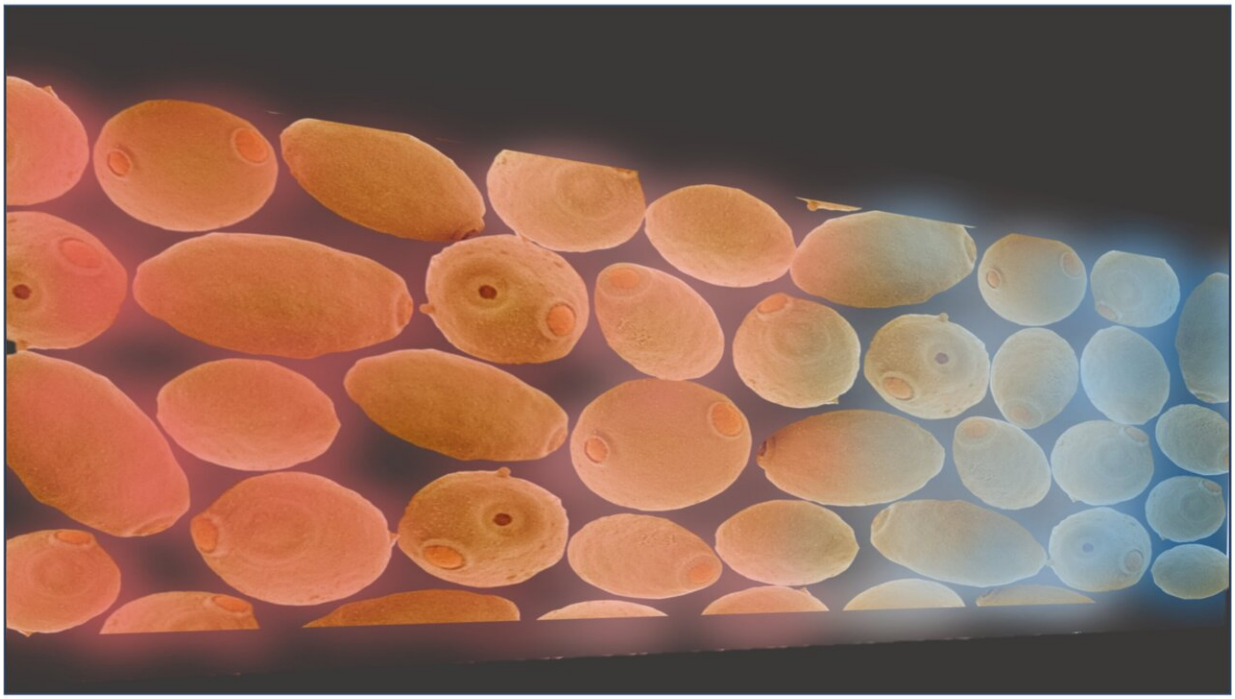

By studying yeast cells, researchers have successfully mapped how cells communicate and synchronize their behaviour. Credit: University of Gothenburg

Knowledge on how cells communicate is an important key to understanding many biological systems and diseases. A research team led

by researchers at the University of Gothenburg has now used a unique combination of methods to map the mechanism behind cellular communication. Their findings can potentially improve understanding of the underlying mechanism behind type 2 diabetes.

We know that human communication is important, but communication between the cells in our bodies is just as vital. The processes where cells synchronize and coordinate their behavior is required for an organism to function and for human organs to be able to perform their functions.

"How do cells go from monologs to dialogs? How do cells transit from acting as individuals to acting as a community? We need to better understand this complex and difficult-to-study behavior," says Caroline Beck Adiels, senior lecturer at the Department of Physics at the University of Gothenburg.

She is responsible for the study now published in the scientific journal *PNAS* in which the researchers established a method for studying cellular communication. In the study, they successfully mapped the mechanism behind cellular communication in the metabolic process, using small culture chambers that allow the control of the environment around the cells.

The researchers chose to study yeast cells, since they are similar to human cells, and their focus is on glycolyticoscillations—a series of chemical reactions during metabolism where the concentration of substances can pulse or oscillate. The study showed how cells that initially oscillated independent of each other shifted to being more synchronized, creating partially synchronized populations of cells.

"One of the unique things with this study is that we have been able to study individual cells instead of simply entire cell populations. This has allowed us to really be able to see how the cells transition from their

individual behavior to coordinating with their neighbors. We have been able to map their behavior both temporally and spatially, that is to say, when something occurs and in which cell," says Beck Adiels.

Opens up opportunities for understanding type 2 diabetes

According to Beck Adiels, this knowledge can be applied in many other biological systems and more complex cells where coordinated cell behavior plays an important role. This type of behavior is also found in cells such as heart muscle cells and in pancreatic cells, which can be an important piece of the puzzle in diabetes research.

"The study can contribute to understanding how pancreatic cells are regulated and how they secrete insulin, which can help us understand the underlying mechanism behind type 2 diabetes. Eventually, this could contribute to developing new medicines for treating the disease."

The study is a collaboration between eight researchers at Swedish and international universities, and Caroline Beck Adiels emphasizes that this interdisciplinary collaboration has been fundamental in studying the complex behavior of cells from multiple perspectives.

"I am very proud of this work, which had not been possible to complete if we had not collaborated across disciplines," she says.

More information: Martin Mojica-Benavides et al. Intercellular communication induces glycolytic synchronization waves between individually oscillating cells, *Proceedings of the National Academy of Sciences* (2021). DOI: 10.1073/pnas.2010075118