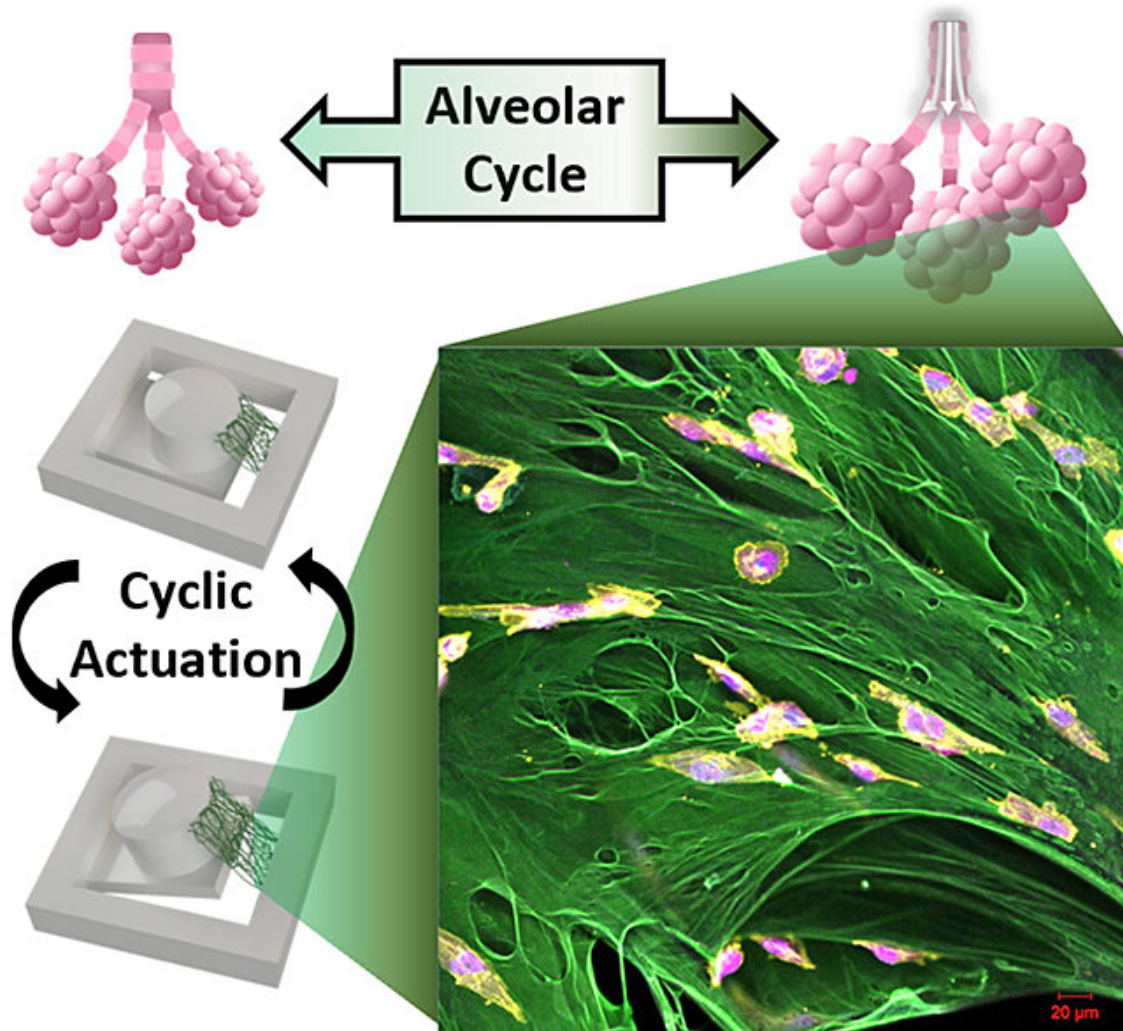


Novel testing platform designed for breast cancer cells

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A Purdue University team has developed a novel testing platform to evaluate how breast cancer cells respond to the recurrent stretching that occurs in the

lungs during breathing. Credit: Purdue University/Hyowon Lee

A Purdue University team has developed a novel testing platform to evaluate how breast cancer cells respond to the recurrent stretching that occurs in the lungs during breathing. The technology is designed to better understand the effects that the local tissue has on metastatic breast cancer to study how metastases grow in a new tissue.

"One of the key features of breast [cancer](#) is that most patients survive if the disease stays local, but there is a greater than 70% drop in survival if the [cells](#) have metastasized," said Luis Solorio, a Purdue assistant professor of engineering, who co-lead the research team. "However, once the cells leave the [primary tumor](#), they are often no longer responsive to the drugs that initially worked for the patient. We wanted to develop a system that could help us better understand how the physiology of a new tissue space effected [tumor cells](#) upon invasion into the new organ."

The Purdue researchers created a magnetically moving cell culturing system where the cancer cells can be grown in 3-D on a suspended extracellular matrix protein that is abundant in early metastatic lung tissue in order to evaluate the impact of mechanical forces.

They were able to incorporate the strain amplitude and rate of breathing in this tissue mimic. The researchers found that the cells quit dividing under these conditions. The research is published in *Advanced Functional Materials*.

"Never before has the concept of motion been interrogated as a component of the tumor microenvironment," said Michael Wendt, a Purdue associate professor of medicinal chemistry and molecular pharmacology. "We now understand that healthy organs utilize motion to

resist metastatic colonization. The development of this microactuator system will not only continue to yield increased biological understanding, of metastasis, but it will also serve as a platform for us to better evaluate pharmacological inhibitors of the most lethal aspect of cancer progression."

Hyowon "Hugh" Lee, an associate professor of engineering and a researcher at the Birck Nanotechnology Center, co-led the research team.

"This is the first attempt to engineer a cell culture system that can apply mechanical forces on a suspended tissue," Lee said. "Most bioreactors with mechanical stimulation capabilities rely on growing 2-D cell culture on flat non-biological substrates, but we are using a custom magnetic actuator and suspending a layer of fibronectin to grow 3-D cancer cells like a miniature [tissue](#)."

"Our system better mimics the physiological environment without using artificial substrates. Using this platform, we show that certain cancer cells slow down their proliferation due to the cyclic stretching of breathing."

This work was the collaboration of five different laboratories to characterize the mechanical and biological properties of the new device.

Sarah Calve, a Purdue adjunct professor of biomedical engineering, and Adrian Buganza Tepole, a Purdue assistant professor of mechanical engineering, interfaced with the mechanical characteristics of the stretching protein. They measured the response of the material to stretching and developing a mapping of the strains felt by the cancer cells at various locations on the device.

Angel Enriquez, a doctoral student in Lee's lab, said, "One key takeaway

has been the benefits of collaboration with people outside of your field of expertise and how they can provide more complete research."

Sarah Libring, a doctoral student and a co-first author from Solorio's Lab, said, "It's been amazing to be part of the development of a new device like this because by bringing together the expertise of multiple professors and multiple labs, we are now able to study [cancer cells](#) on dynamically moving fibronectin fibrils that hasn't been previously possible."

More information: Ángel Enríquez et al, High-Throughput Magnetic Actuation Platform for Evaluating the Effect of Mechanical Force on 3D Tumor Microenvironment, *Advanced Functional Materials* (2020). [DOI: 10.1002/adfm.202005021](https://doi.org/10.1002/adfm.202005021)

Provided by Purdue University

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