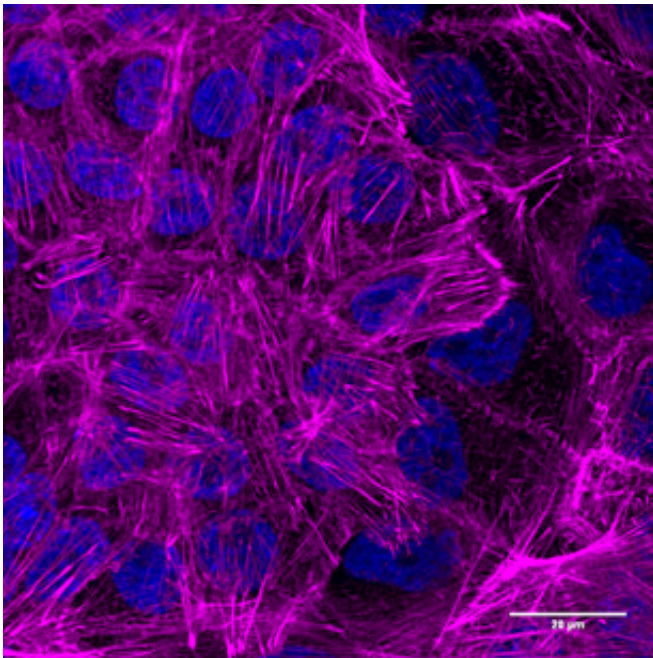


Researchers discover tumor cells stiffen before becoming invasive

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Accumulation of cytoskeleton fibers (magenta) in benign breast tumor cells. The cell nucleus is seen in blue. Credit: Sandra Tavares, IGC.

A study recently published in *Nature Communications* shows that breast cancer cells undergo a stiffening state prior to becoming malignant. The discovery, made by a research team led by Florence Janody, from Instituto Gulbenkian de Ciencia (IGC; Portugal), identifies a new signal in tumor cells that could be applicable in the design of cancer-targeting therapies.

The progression of breast cancer involves several stages, from a benign lesion to an invasive carcinoma, possibly with metastasis. But only 20 to 50% of [benign tumors](#) develop into [invasive cancer](#). Predicting which lesions will become malignant could result in a better use of therapeutics according to the severity of the disease.

Florence Janody's group sought signals inside the [cells](#) that could predict which benign tumors will progress to [invasive carcinoma](#). They focused on the cell skeleton—the cytoskeleton—an intricate network of fibers that can either exert or resist forces, and that may have an impact on tumor invasion and malignancy. These fibers can be organized into distinct architectures to confer cells a more rigid or soft structure.

"Previously, it had been shown that cancer cell invasion requires cell softening. What we have now observed is that prior to becoming invasive, cells undergo a transient stiffening state caused by the accumulation of cytoskeleton fibers," explains Sandra Tavares, first author of the study.

The research team discovered that cell stiffening induces the activity of proteins that promote cell proliferation, driving the growth of benign tumors. Most importantly, this cell rigidity state also triggers the subsequent progression into invasive cancer. The proteins involved in this mechanism were identified by studies on a human breast cell line, which recapitulates the multistep development of [breast cancer](#) and biopsies of breast cancers. The importance of these proteins for the formation of tumors was further confirmed in the fruit fly.

Janody says, "Our work adds an important piece to the intricate puzzle of breast tumor progression. Knowing what happens inside the cell before it becomes pre-invasive and acquires malignant features may help us predict which tumors might result in metastasis. Also, it may help in designing therapeutics better tailored for each type of lesion."

More information: Tavares, S., Vieira, A.F., Taubenberger, A.V., Araujo, M., Martins, N.P.S., Bras-Pereira, C., Polonia, A., Herbig, M., Barreto, C., Otto, O., Cardoso, J., Pereira-Leal, J.B., Guck, J., Paredes, J., Janody, F. (2017) Actin stress fiber organization promotes cell stiffening and proliferation of pre-invasive breast cancer cells. *Nature Communications*. [DOI: 10.1038/NCOMMS15237](https://doi.org/10.1038/NCOMMS15237)

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